



(51) International Patent Classification:
A61B 17/34 (2006.01)

(21) International Application Number:
PCT/IB2023/057356

(22) International Filing Date:
19 July 2023 (19.07.2023)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
63/392,640 27 July 2022 (27.07.2022) US

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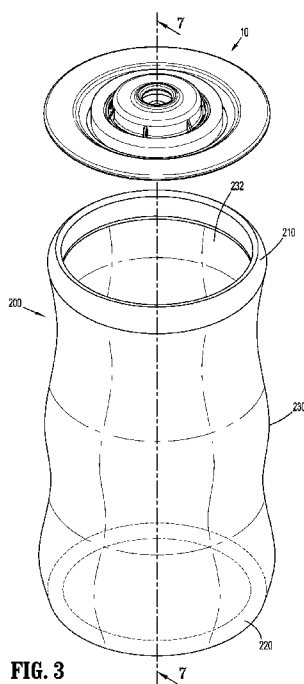
(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG,

KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, 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, ME, 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).

Published:
— with international search report (Art. 21(3))

(54) Title: SURGICAL ACCESS ASSEMBLY



(57) Abstract: A surgical access assembly includes a first ring, a second ring, and a tubular sleeve coupled to the first ring and the second ring. The tubular sleeve has a first opening proximate the first ring and a second opening proximate the second ring. Additionally, the tubular sleeve includes a lumen defined between the first opening and the second opening. A cap is disposed in the lumen of the sleeve in the vicinity of the first ring. The cap includes a disc having an outer region configured to engage an inner surface of the sleeve and a portion of the first ring. The cap also includes an opening extending through a center of the disc, an instrument seal located on a first side of the opening, and a duckbill seal located on a second side of opening. The duckbill seal extends distally into the lumen of the sleeve.



SURGICAL ACCESS ASSEMBLY

FIELD

[0001] The present disclosure generally relates to surgical instruments. In particular, the present disclosure relates to a surgical access assembly.

BACKGROUND

[0002] Today, many surgical procedures are performed through small incisions in the skin, as compared to large incisions that are typically required in traditional procedures, in an effort to reduce trauma to the patient and reduce the patient's recovery time. Generally, such procedures are referred to as “endoscopic,” unless performed on the patient’s abdomen, in which case the procedure is referred to as “laparoscopic.” Throughout the present disclosure, the term “minimally invasive” should be understood to encompass both endoscopic and laparoscopic procedures.

[0003] While it is desirable to minimize the size of an incision or to access internal body structures through a naturally occurring orifice, adequate anatomical exposure is needed to facilitate access to the surgical site. Adequate anatomical exposure can be achieved by separating the walls of the incision or the naturally occurring body orifice. Various retraction devices have been developed to facilitate access to underlying body structures.

[0004] During a typical minimally invasive procedure, surgical objects, such as endoscopes, graspers, staplers and forceps, are inserted into the patient’s body through the incision in tissue. In general, prior to the introduction of the surgical object into the patient’s body, insufflation fluid is supplied to the target surgical site to enlarge its surrounding area and create a larger, more accessible work area. This is accomplished with a substantially fluid-tight seal that maintains the insufflation gas at a pressure sufficient to inflate the target surgical site.

SUMMARY

[0005] The present disclosure relates to a surgical access assembly including an access device and a cap for use in a minimally invasive surgical procedure. In particular, the surgical access assembly is placed within a tissue tract to provide access to an underlying body cavity while providing protection to the tissue tract. Additionally, the cap includes a seal assembly that

maintains insufflation pressure in the body cavity during the minimally invasive surgical procedure while allowing instruments to be inserted into the body cavity.

[0006] According to an aspect of the present disclosure, a surgical access assembly includes a first ring, a second ring, and a tubular sleeve coupled to the first ring and the second ring. The tubular sleeve has a first opening proximate the first ring and a second opening proximate the second ring, and includes a lumen defined between the first opening and the second opening, and a cap disposed in the lumen proximate the first ring. The cap has a disc having an outer region configured to engage an inner surface of the sleeve and a portion of the first ring, an opening extending through a center of the disc, an instrument seal located on a first side of the opening, and a duckbill seal located on a second side of opening, the duckbill seal extending into the lumen.

[0007] In an aspect, the first ring may have a crescent-moon configuration and the second ring may have a circular configuration.

[0008] In aspects, the opening may be radially repositionable relative to a central longitudinal axis of the cap.

[0009] In one aspect, rolling the first ring in a first direction may reduce a distance between the first ring and the second ring and rolling the first ring in a second and opposite direction may increase the distance between the first ring and the second ring.

[0010] In another aspect, the disc may be configured to be positioned between an outer surface of tissue and the first ring.

[0011] In one aspect, the second ring may be configured to abut an inner surface of tissue such that tissue may be captured between the first ring and the second ring.

[0012] In a further aspect, the tubular sleeve may extend from the second ring adjacent the inner surface of tissue through an opening in tissue to the first ring adjacent to the outer surface of tissue.

[0013] According to another aspect of the present disclosure, a surgical access assembly has a first ring, a second ring, and a tubular sleeve coupled to the first ring and the second ring. The tubular sleeve includes a lumen defined between the first ring and the second ring, and a cap disposed in the lumen proximate the first ring. The cap includes a disc having an outer region configured to engage an inner surface of the first ring and an inner surface of the sleeve, an opening extending through a center of the disc, an instrument seal located on a first side of the

opening, and a duckbill seal located on a second side of opening, the duckbill seal extending into the lumen.

[0014] In an aspect, the first ring may have a crescent-moon configuration and the second ring may have a circular configuration.

[0015] In aspects, the opening may be radially repositionable relative to a central longitudinal axis of the cap.

[0016] In a further aspect, rolling the first ring in a first direction may reduce a distance between the first ring and the second ring and rolling the first ring in a second and opposite direction may increase the distance between the first ring and the second ring.

[0017] In another aspect, the disc may be configured to be positioned such that the disc may contact the inner surface of the first ring.

[0018] In a further aspect, the second ring may be configured to abut an inner surface of tissue such that tissue may be captured between the first ring and the second ring.

[0019] In yet a further aspect, the tubular sleeve may extend from the second ring adjacent the inner surface of tissue through an opening in tissue to the first ring proximate to the outer surface of tissue.

[0020] According to another aspect of the present disclosure, a surgical access assembly includes a first ring having a crescent moon configuration, a second ring having a circular configuration, and a tubular sleeve coupled to the first ring and the second ring. The tubular sleeve includes a lumen defined between a first opening proximate the first ring and a second opening proximate the second ring, and a cap disposed in the lumen proximate the first ring. The cap has a disc having an outer recess configured to receive a portion of the first ring. The disc is configured to engage an inner surface of the sleeve, an opening extending through a center of the disc, an instrument seal located on a first side of the opening, and a duckbill seal located on a second side of opening, the duckbill seal extending into the lumen.

[0021] In an aspect, rolling the first ring in a first direction may reduce a distance between the first ring and the second ring and rolling the first ring in a second and opposite direction may increase the distance between the first ring and the second ring.

[0022] In an aspect, the disc may be configured to be positioned adjacent to an outer surface of tissue and the disc may further include a recess configured to receive the first ring.

[0023] In a further aspect, the second ring may be configured to abut an inner surface of tissue such that tissue may be captured between the first ring and the second ring.

[0024] In another aspect, the tubular sleeve may extend from the second ring adjacent the inner surface of tissue through an opening in tissue to the first ring.

[0025] Other features of the disclosure will be appreciated from the following description.

DESCRIPTION OF THE DRAWINGS

[0026] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate aspects and features of the disclosure and, together with the detailed description below, serve to further explain the disclosure, in which:

[0027] FIG. 1 is a top perspective view of a cap according to an aspect of the present disclosure;

[0028] FIG. 2 is a bottom perspective view of the cap of FIG. 1;

[0029] FIG. 3 is a perspective view of a surgical access device and the cap of FIG. 1;

[0030] FIG. 4 is an exploded perspective view, with parts separated, of the cap of FIG. 1;

[0031] FIG. 5 is a bottom perspective view of a cover of the cap of FIG. 4;

[0032] FIG. 6 is a top perspective view of a base of the cap of FIG. 4;

[0033] FIG. 7 is a side cross-sectional view of the surgical access device and cap taken along section line 7-7 in FIG. 3;

[0034] FIG. 8 is an enlarged view of the area of detail in FIG. 7;

[0035] FIG. 9 is a top perspective view of the surgical access device of FIG. 3 shown inserted through an opening in tissue;

[0036] FIG. 10 is a side cross-sectional view of the surgical access device taken along section line 10-10 in FIG. 9;

[0037] FIG. 11 is a top perspective view of the seal assembly of FIG. 1 being coupled to the surgical access device of FIG. 10;

[0038] FIG. 12 is a top perspective view of the cap coupled to the surgical access device of FIG. 10;

[0039] FIG. 13 is a side cross-sectional view of the surgical access device and cap taken along section line 13-13 in FIG. 12;

[0040] FIG. 14 is a side cross-sectional view of a portion of the surgical access device and

cap of FIG. 13 showing rotation of a first ring of the surgical access device;

[0041] FIG. 15 is a perspective view of the surgical access device and cap positioned in tissue;

[0042] FIG. 16 is a perspective view of a cap according to an aspect of the present disclosure;

[0043] FIG. 17 is a side cross-sectional view of the surgical access device of FIG. 10 and the cap of FIG. 16;

[0044] FIG. 18 is a perspective view of a cap according to an aspect of the present disclosure;

[0045] FIG. 19 is a side cross-sectional view of the surgical access device of FIG. 10 and the cap of FIG. 18;

[0046] FIG. 20 is a perspective view of a cap according to an aspect of the present disclosure; and

[0047] FIG. 21 is a side cross-sectional view of the surgical access device of FIG. 10 and the cap of FIG. 20.

DETAILED DESCRIPTION

[0048] Aspects of the disclosure are described hereinbelow with reference to the accompanying drawings; however, it is to be understood that the disclosed aspects are merely exemplary of the disclosure and may be embodied in various forms. Well-known functions or constructions are not described in detail to avoid obscuring the disclosure in unnecessary detail. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the disclosure in virtually any appropriately detailed structure.

[0049] As used herein, the term “distal” refers to the portion that is being described which is further from a user, while the term “proximal” refers to the portion that is being described which is closer to a user. Descriptions of technical features of an aspect of the disclosure should typically be considered as available and applicable to other similar features of another aspect of the disclosure. Accordingly, technical features described herein according to one aspect of the disclosure may be applicable to other aspects of the disclosure, and thus duplicative descriptions

may be omitted herein. Like reference numerals may refer to like elements throughout the specification and drawings.

[0050] Initially, with reference to FIGS. 1 and 2, a cap 10 is illustrated. The cap 10 includes a disc 100 having a generally circular profile. The disc 100 has an outer portion 110 defining an outer diameter of the cap 10, an inner portion 120 with a central opening 122, and an intermediate portion 130 disposed between the outer portion 110 and the inner portion 120. The intermediate portion 130 is a bellows that facilitates radial and off-axis movement as will be described in further detail hereinafter. The outer portion 110 has opposed planar surfaces 112, 114 and an angled surface 116 joining the opposed planar surfaces 112, 114 (FIG. 7). A seal assembly 300 is coupled to the inner portion 120 and includes a cover 320 located on a proximal side of the inner portion 120 and a base 370 located on a distal side of the inner portion 120. A zero-closure valve or duckbill seal 342 extends distally from the seal assembly 300. The disc 100 is formed from a flexible and resilient polymeric material such as urethane, thermoplastic polyurethane, and thermoplastic elastomers (e.g., VERSAFLEX®). This construction makes it easy to install and remove the disc 100 from the surgical access device 200.

[0051] The cap 10 is usable with a surgical access device 200 as shown in FIG. 3. With additional reference to FIG. 10, the cap 10 is attachable to the surgical access device 200 when the surgical access device 200 is positioned through an opening **O** in tissue **T** as will be explained in detail hereinafter. The surgical access device 200 includes a proximal or first ring 210, a distal or second ring 220, and a sleeve 230 extending between the first ring 210 and the second ring 220. In particular, a distal end of the sleeve 230 is secured to the second ring 220 and a proximal end of the sleeve 230 is secured to the first ring 210. The first ring 210 has a crescent-moon or kidney bean cross-sectional profile while the second ring 220 has a circular cross-sectional profile. The first ring 210 is formed from a thermoplastic polyurethane such as PELLETHANE®. This allows the first ring 210 to be sufficiently compliant so as to be rollable. The first ring 210 includes a circular opening 216 and has the crescent-moon cross-sectional profile that defines a concave surface 212 and a convex surface 214. The first ring 210 is symmetrical about a transverse axis that intersects the first ring 210 at its center. The first ring 210 is configured to be repeatedly rolled upon itself to alternate between a first position wherein the concave surface 212 faces radially outward and the convex surface 214 faces radially inward (FIG. 14) and a second position wherein the concave surface 212 faces radially inward and the

convex surface 214 faces radially outward. The second ring 220 is also formed from a thermoplastic polyurethane such as PELLETHANE[®]. The second ring 220 is collapsible to facilitate insertion into the opening **O** in tissue **T**. In particular, the second ring 220 is sufficiently compliant so as to be deformable from its normal annular configuration into an oblong configuration for insertion through the opening **O** in tissue **T**. Furthermore, the circular cross-sectional profile of the second ring 220 provides it with a symmetrical configuration. The second ring 220 defines a circular opening 222. The sleeve 230 is formed from a clear polyurethane, which is a non-elastomeric material. The sleeve 230 defines a cylindrical tube with a passage or lumen 232 extending through the sleeve 230. A proximal end of the sleeve 230 is bonded or secured to the first ring 210 and a distal end of the sleeve 230 is bonded or secured to the second ring 220. The sleeve 230 may be bonded to the first and second rings 210, 220 using an adhesive or may be welded to the first and second rings 210, 220 using known welding techniques (e.g., impulse welding). Rolling the first ring 210 in a first direction rolls up the sleeve 230 about the first ring 210 thereby reducing a distance between the first ring 210 and the second ring 220. Conversely, rolling the first ring 210 in a second direction that is opposite the first direction unrolls the sleeve 230 from the first ring 210 and increases a distance between the first ring 210 and the second ring 220.

[0052] Turning now to FIG. 4, an exploded view of the cap 10 is shown. Briefly, the cap 10 includes, proximal to distal, a cover 320, an instrument seal 310, a support ring 340, the disc 100, the duckbill seal 342, and a base 370. The cover 320, the instrument seal 310, and the support ring 340 are located on a proximal side of the disc 100 while the duckbill seal 342 and the base 370 are located on a distal side of the disc 100. The support ring 340 acts as a spacer between a distal end of the instrument seal 310 and a proximal end of the duckbill seal 342. Collectively, the cover 320, the instrument seal 310, the support ring 340, the duckbill seal 342, and the base 370 define a seal assembly 300 (see also FIG. 7). The base includes a central opening 374.

[0053] The instrument seal 310 is configured to provide a seal about a surgical instrument **I** inserted through the instrument seal 310 (FIG. 15). The instrument seal 310 has an elastomeric septum seal 312 disposed between an upper seal support 316 and a lower seal support 318. The septum seal 312 is configured to provide a seal around an outer surface of the surgical instrument **I** passing through a central opening 314 of the septum seal 312. The lower seal support 318 includes a plurality of spring elements or spokes 362 extending radially outward from the lower

seal support 318. The upper seal support 316 has an outer wall configured to be received in the lower seal support 318. The upper seal support 316 and the lower seal support 318 cooperate to retain the septum seal 312 between the upper seal support 316 and the lower seal support 318. The instrument seal 310 is radially repositionable within the cover 320. The spokes 362 engage an inner surface 328 of the cover 320 (FIG. 19) and are configured to help maintain the central opening 314 of the septum seal 312 at or near the radial center within the cover 320 and to help prevent free lateral movement of the septum seal 312 within the cover 320. That is, the spokes 362 of the lower seal support 318 bias the instrument seal 310 towards the radial center of the cover 320. In instances where the surgical instrument **I** inserted through the instrument seal 310 moves the instrument seal 310 away from its rest position (FIG. 15), once the surgical instrument **I** is removed, the spokes 362 urge the instrument seal 310 into a centered orientation that is in alignment with the central longitudinal axis of the cover 320 (i.e., the rest position of the instrument seal 310). For a detailed explanation of a suitable instrument seal, see commonly owned U.S. Patent No. 10,022,149, the entire content of which is hereby incorporated by reference.

[0054] The instrument seal 310 is positioned adjacent a proximal side of the support ring 340 and the duckbill seal 342 is positioned adjacent a distal side of the support ring 340. The duckbill seal 342 is configured to allow fluids to flow in one direction (i.e., proximal to distal) and inhibit fluids from flowing in a second and opposite direction (i.e., distal to proximal).

[0055] With reference to FIGS. 4-8, the cover 320 has a raised dome 322 with a central orifice 324 and fingers 330 extending distally from a ring 326 surrounding the dome 322. The fingers 326 are configured to pass through slots 104 in the inner portion 120 of the disc 100 and to be received in receptacles 372 on the base 370 thereby coupling the cover 320 and the base 370. Each receptacle 372 of the base 370 has a corresponding locking tab 378. In particular, each finger 326 is flexibly and resiliently attached to the cover 320 and includes a prong 332 at its distal tip. Each receptacle 372 of the base 370 is a cavity configured to receive the distal tip of the finger 326. During insertion of the finger 326 into the receptacle 372, the distal tip flexes inwardly towards a centerline of the base 370 as the distal tip enters the receptacle 372 due to the camming action between the prong 332 and a lip 374 of the receptacle 372. Further still, as the finger 326 passes through the receptacle 372, it deflects the locking tab 378 in a distal direction. Once the distal tip and the prong 332 are fully seated in the receptacle 372, the finger 326 returns

to its rest position as it moves radially outwards away from the centerline of the base 370 and a planar surface 334 of the prong 332 engages an inner surface 376 of the receptacle 372 thereby retaining the distal tip of the finger 326 in the receptacle 372. Additionally, the locking tab 378 moves proximally until it is behind the finger 326 thereby inhibiting the finger 326 from deflecting inwards towards the centerline of the base 370. Once fingers 326 of the cover 320 are inserted into the slots 372 of the base 370, the cover 320 and the base 370 cannot be non-destructively separated from each other. This arrangement sandwiches the instrument seal 310, the support ring 340, and the duckbill seal 342 between the cover 320 and the base 370. Further, this arrangement couples the cover 320, the instrument seal 310, the support ring 340, the duckbill seal 342, and the base 370 with the inner portion 120 of the disc 100 such that movement of seal assembly 300 results in comparable movement of the inner portion 120 of the disc 100 and movement of the inner portion 120 of the disc 100 results in comparable movement of the seal assembly 300.

[0056] With reference now to FIGS. 9, 10, and 14, the surgical access device 200 is shown positioned through the opening **O** in tissue **T**. After making an opening **O** in tissue **T**, the second ring 220 is collapsed from its normal annular configuration into an oblong configuration and inserted through the opening **O** such that the second ring 220 is disposed within a working space **C** below the surface of tissue **T**, while the first ring 210 remains positioned externally of tissue **T** such that the sleeve 230 extends through the opening **O** in tissue **T**. Alternatively, the surgical access device 200 may be inserted into a naturally occurring opening rather than an opening created by the physician. Next, the first ring 210 is grasped and pulled upwardly or proximally such that the second ring 220 is brought into abutment with an internal surface of tissue **T** adjacent the opening **O**. The first ring 210 is then rolled in the direction of arrow **A** (i.e., repeatedly inverted) to roll-up the sleeve 230 about the first ring 210 and apply tension to the sleeve 230. Rolling the first ring 210 in the direction of arrow **A** (i.e., clockwise) gathers the sleeve 230 about the first ring 210 and reduces the distance between the first ring 210 and the second ring 220. The first ring 210 is rolled until the opening is sufficiently retracted, as a result of the tensioning of sleeve 230, and the first ring 210 abuts the external surface of the tissue **T** adjacent the opening **T**. The crescent-moon cross-sectional shape of the first ring 210 retains the first ring 210 in its rolled position (i.e., in either the first position or the second position) thus retaining the surgical access device 200 in position within the opening **O** and maintaining a

retraction force on the opening **O**. Conversely, rolling the first ring 210 in an opposite direction (i.e., counterclockwise) unwinds the sleeve 230 from the first ring 210 and increases a distance between the first ring 210 and the second ring 220. This reduces the tension applied to tissue **T** surrounding the outside of the sleeve 230 and facilitates removal of the cap 10 from the surgical access device 200 as well as removal of the surgical access device 200 from the opening **O**.

Removing the surgical access device 200 from the opening **O** in tissue **T** is basically the reverse of installing the surgical access device 200 into the opening **O** in tissue **T**. The first ring 210 is un-rolled by repeatedly inverting the first ring 210 in the second and opposite direction to release tension on the sleeve 230. Ultimately, the second ring 220 is collapsed and removed through the opening **O**, which completes removal of the surgical access device 200 from the opening **O** in tissue **T**.

[0057] With reference now to FIGS. 11-13, the cap 10 is coupled to the surgical access device 200 that it positioned in tissue **T**. Initially, as shown in FIG. 11, the surgical access device 200 is positioned through an opening **O** in tissue **T** and the first ring 210 is rolled to gather the sleeve 230 about the first ring 210 and reducing the distance between the first ring 210 and the second ring 220. This also tensions the sleeve 230 and helps maintain a size of the opening **O** in tissue **T** (FIG. 10). After the desired amount of the sleeve 230 is gathered about the first ring 210, the clinician manipulates the disc 100 of the cap 10 by depressing opposed edges of the disc 100 and slides the outer portion 110 of the disc 100 in the direction of arrow **B** and under the first ring 210. Positioning the disc 100 of the cap under the first ring applies additional tension to the sleeve 230 to ensure a snug fit between the cap 10 and the surgical access device 200 thereby creating a seal that maintains the pneumoperitoneum. Once positioned in the sleeve 230 of the surgical access device 200, the upper planar surface 112 of the outer portion 110 of the disc 100 supports the first ring 210 and the lower planar surface 114 of the outer portion 110 of the disc 100 presses a portion of the sleeve 230 into contact with an outer surface of tissue **T**. Thus, there is a snug fit of the cap 10 between the first ring 210 and the outer surface of tissue **T**. This arrangement, in combination with the duckbill seal 242 of the seal assembly 300, maintains pressure in the body cavity **C** by inhibiting the flow of fluids towards the first ring 210.

[0058] Referring now to FIG. 15, the surgical access device 200 and cap 10 are shown positioned in tissue **T** and a shaft of an endoscopic surgical instrument **I** is inserted through the orifice 324 of the cover 320 of the seal assembly 300. The seal assembly 300 is configured to

accommodate endoscopic surgical instruments ranging from about 5mm in diameter to about 12mm in diameter. The endoscopic surgical instrument **I** is manipulated by the clinician during performance of a surgical procedure. As the intermediate portion 130 of the disc 100 is a bellows and the instrument seal 310 of the seal assembly 300 is radially repositionable, the clinician has ample freedom of movement of the endoscopic surgical instrument **I**. Once the endoscopic surgical instrument **I** is removed, the bellows of the intermediate portion 130 of the disc 100 and the spokes 362 of the instrument seal 310 of the seal assembly 300 urge the seal assembly 300 into alignment with the central longitudinal axis of the surgical access device 200, which is the rest position for the instrument seal 310 and the inner portion 120 of the disc 100.

[0059] Referring now to FIGS. 16 and 17, another aspect of the cap 150 is shown in use with the surgical access device 200. The cap 150 has the seal assembly 300 and a disc 400 with an outer portion 410 with opposed planar surfaces 412, 414 that are bounded by a rib 416 that circumscribes the disc 400. The disc 400 also includes an inner portion 420 and an intermediate portion 430 disposed between the inner portion 420 and the outer portion 410. The inner portion 420 has a central opening 422 and the intermediate portion 430 is a bellows that facilitates radial and off-axis movement as was previously discussed. The seal assembly 300 is attachable to the disc 400 in the same manner as the seal assembly 300 was attached to the disc 100.

[0060] Turning now to FIGS. 18 and 19, a further aspect of the cap 250 is shown in use with the surgical access device 200. The cap 250 has the seal assembly 300 and a disc 500. The disc 500 includes an inner portion 520, an outer portion 510, and an intermediate portion 530 disposed between the inner portion 520 and the outer portion 510. The outer portion 510 has an incomplete D-shape. In particular, an inner wall 512 of the outer portion 510 is attached to the intermediate portion 530 and extends proximally from the intermediate portion 530. A proximal end of the inner wall 512 joins a proximal end of an outer wall 514 of the outer portion 510 that extends distally towards the second ring 220. A plurality of extensions 518 are spaced around the circumference of the cap. Ribs or ridges 516 extend radially from the outer wall 514 and are configured to engage the first ring 210. The engagement between the ridges 516 and the upper ring 210 improves the seal between the cap 250 and the first ring 210. The distal end of the outer wall 514 terminates in a ledge 540 that extends inwards towards the central longitudinal axis of the seal assembly 300. A ring 550 is positioned in a space defined between the ledge 540 and the junction of the inner wall 512 and the outer wall 514. The ring 550 is formed from plastic and

provides support and outward pressure to the outer wall 514. The inner portion 520 has a central opening 522 and the intermediate portion 530 is a bellows that facilitates radial and off-axis movement as was previously discussed. The seal assembly 300 is attachable to the disc 500 in the same manner as the seal assembly 300 was attached to the disc 100.

[0061] As shown in FIGS. 20 and 21, another aspect of the cap 350 is shown with the surgical access assembly. The cap 350 has the seal assembly 300 and a disc 600. The disc 600 includes an inner portion 620, an outer portion 610, and an intermediate portion 630 disposed between the inner portion 620 and the outer portion 610. The outer portion 610 of the disc 600 is generally C-shaped and extends from the intermediate portion 630 of the disc 600. The outer portion 610 has a wall 612 that extends orthogonally to a surface of the outer portion 610. Extending radially outwards from a proximal end of the wall 612 is a lip 614 and extending radially outwards from a distal end of the wall 612 is a shelf 616. A space between the lip 614 and the shelf 616 is configured to receive the first ring 210. The lip 614 and the shelf 616 have planar surfaces that contact the first ring 210. A bottom surface 606 of the wall 612 is planar for contacting an outer surface of tissue **T** and capturing a portion of the sleeve 230. A tapered surface 608 extends at an angle from the bottom surface 606 of the wall 612 towards an outer end of the shelf 616. The inner portion 620 has a central opening 622 and the intermediate portion 630 is a bellows that facilitates radial and off-axis movement as was previously discussed. The seal assembly 300 is attachable to the disc 600 in the same manner as the seal assembly 300 was attached to the disc 100.

[0062] Persons skilled in the art will understand that the devices and methods specifically described herein and illustrated in the accompanying drawings are non-limiting. It is envisioned that the elements and features 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.

WHAT IS CLAIMED IS:

1. A surgical access assembly comprising:
 - a first ring;
 - a second ring;
 - a tubular sleeve coupled to the first ring and the second ring, the tubular sleeve having a first opening proximate the first ring and a second opening proximate the second ring, the tubular sleeve including a lumen defined between the first opening and the second opening; and
 - a cap disposed in the lumen proximate the first ring, the cap including:
 - a disc having an outer region configured to engage an inner surface of the sleeve and a portion of the first ring;
 - an opening extending through a center of the disc;
 - an instrument seal located on a first side of the opening; and
 - a duckbill seal located on a second side of opening, the duckbill seal extending into the lumen.
2. The surgical access assembly according to claim 1, wherein the first ring has a crescent-moon configuration, and the second ring has a circular configuration.
3. The surgical access assembly according to claim 1, wherein the opening extending through the disc is radially repositionable relative to a central longitudinal axis of the cap.
4. The surgical access assembly according to claim 1, wherein rolling the first ring in a first direction reduces a distance between the first ring and the second ring and rolling the first ring in a second and opposite direction increases the distance between the first ring and the second ring.
5. The surgical access assembly according to claim 1, wherein the disc is configured to be positioned between an outer surface of tissue and the first ring.

6. The surgical access assembly according to claim 5, wherein the second ring is configured to abut an inner surface of tissue such that tissue is captured between the first ring and the second ring.
7. The surgical access assembly of claim 6, wherein the tubular sleeve extends from the second ring adjacent the inner surface of tissue through an opening in tissue to the first ring adjacent to the outer surface of tissue.
8. A surgical access assembly comprising:
 - a first ring;
 - a second ring;
 - a tubular sleeve coupled to the first ring and the second ring, the tubular sleeve including a lumen defined between the first ring and the second ring; and
 - a cap disposed in the lumen proximate the first ring, the cap including:
 - a disc having an outer region configured to engage an inner surface of the first ring and an inner surface of the sleeve;
 - an opening extending through a center of the disc;
 - an instrument seal located on a first side of the opening; and
 - a duckbill seal located on a second side of opening, the duckbill seal extending into the lumen.
9. The surgical access assembly according to claim 8, wherein the first ring has a crescent-moon configuration, and the second ring has a circular configuration.
10. The surgical access assembly according to claim 8, wherein the opening extending through the disc is radially repositionable relative to a central longitudinal axis of the cap.
11. The surgical access assembly according to claim 8, wherein rolling the first ring in a first direction reduces a distance between the first ring and the second ring and rolling the first ring in a second and opposite direction increases the distance between the first ring and the second ring.

12. The surgical access assembly according to claim 8, wherein the disc is configured to be positioned such that the disc contacts the inner surface of the first ring.

13. The surgical access assembly according to claim 12, wherein the second ring is configured to abut an inner surface of tissue such that tissue is captured between the first ring and the second ring.

14. The surgical access assembly of claim 13, wherein the tubular sleeve extends from the second ring adjacent the inner surface of tissue through an opening in tissue to the first ring proximate to the outer surface of tissue.

15. A surgical access assembly comprising:
a first ring having a crescent moon configuration;
a second ring having a circular configuration;
a tubular sleeve coupled to the first ring and the second ring, the tubular sleeve including a lumen defined between a first opening proximate the first ring and a second opening proximate the second ring; and
a cap disposed in the lumen proximate the first ring, the cap including:
a disc having an outer recess configured to receive a portion of the first ring, the disc further configured to engage an inner surface of the sleeve;
an opening extending through a center of the disc;
an instrument seal located on a first side of the opening; and
a duckbill seal located on a second side of opening, the duckbill seal extending into the lumen.

16. The surgical access assembly according to claim 15, wherein rolling the first ring in a first direction reduces a distance between the first ring and the second ring and rolling the first ring in a second and opposite direction increases the distance between the first ring and the second ring.

17. The surgical access assembly according to claim 15, wherein the disc is configured to be positioned adjacent to an outer surface of tissue and the disc further includes a recess configured to receive the first ring.
18. The surgical access assembly according to claim 17, wherein the second ring is configured to abut an inner surface of tissue such that tissue is captured between the first ring and the second ring.
19. The surgical access assembly of claim 18, wherein the tubular sleeve extends from the second ring adjacent the inner surface of tissue through an opening in tissue to the first ring.
20. The surgical access assembly of claim 15, wherein an outer surface of the disc contacts an inner surface of the first ring.

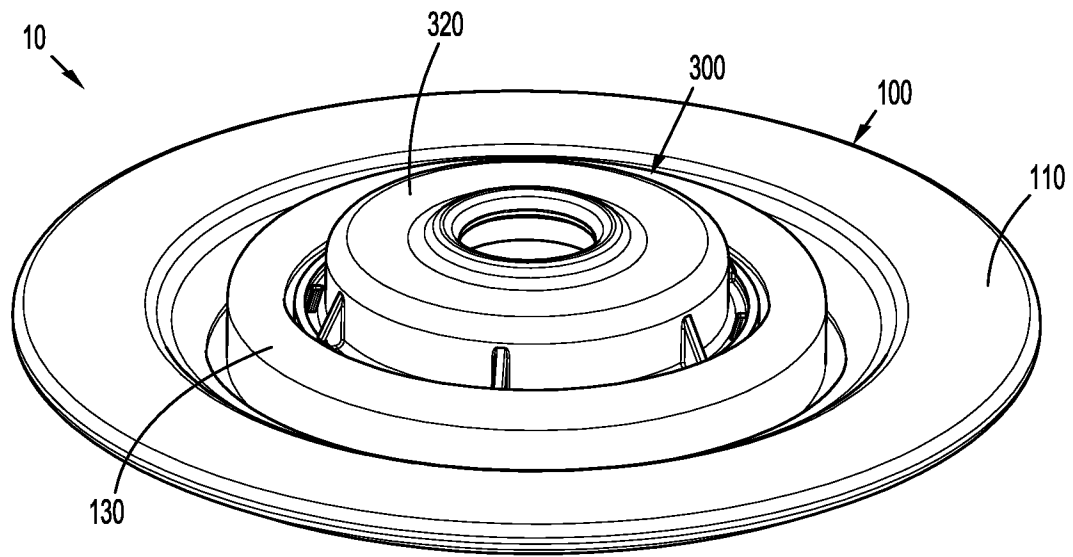


FIG. 1

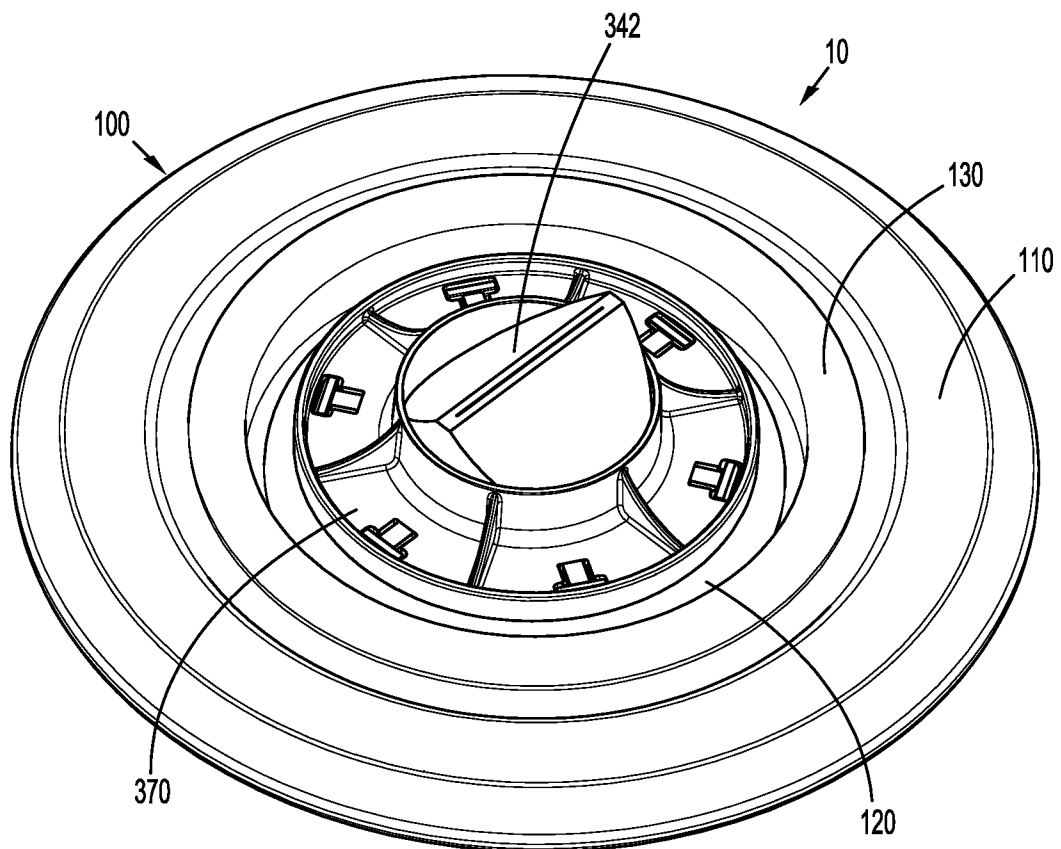
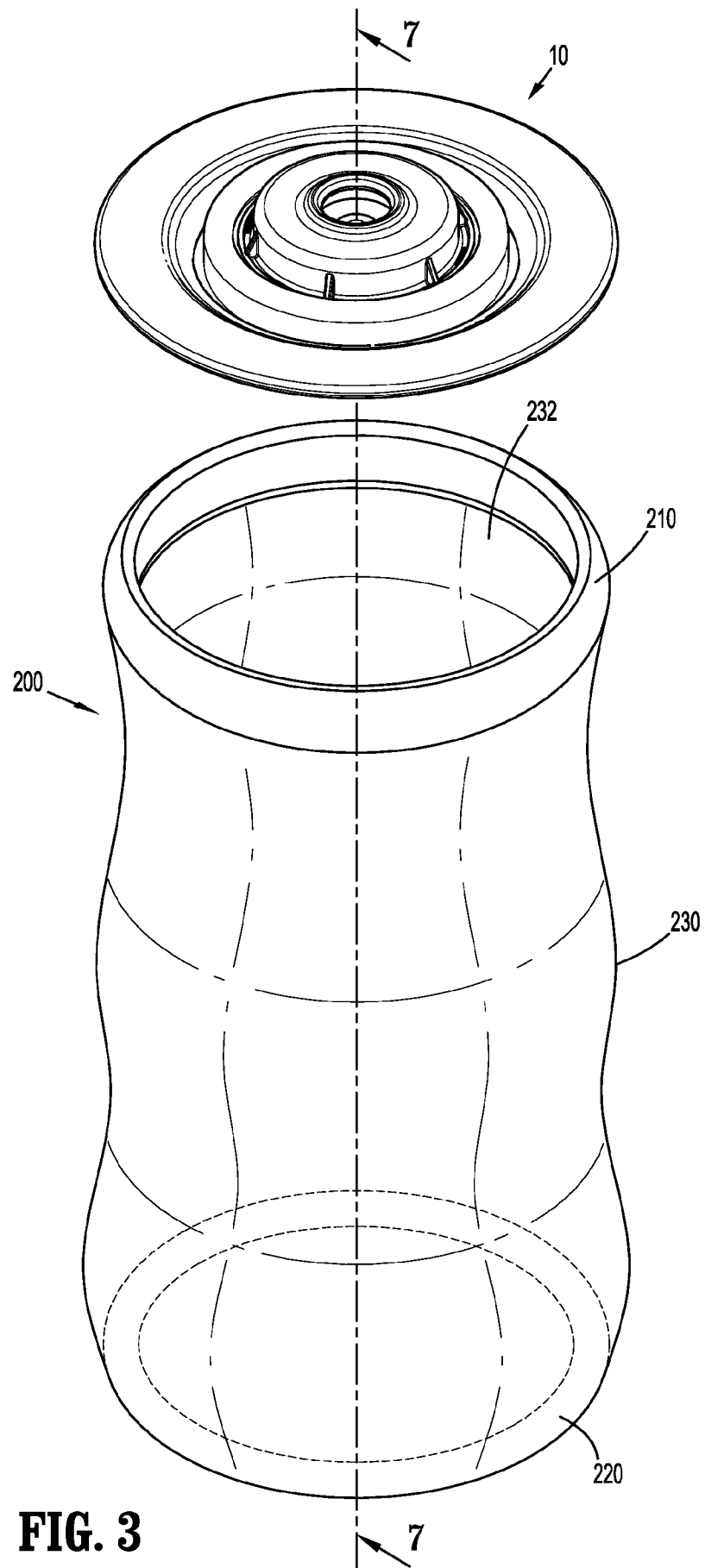


FIG. 2



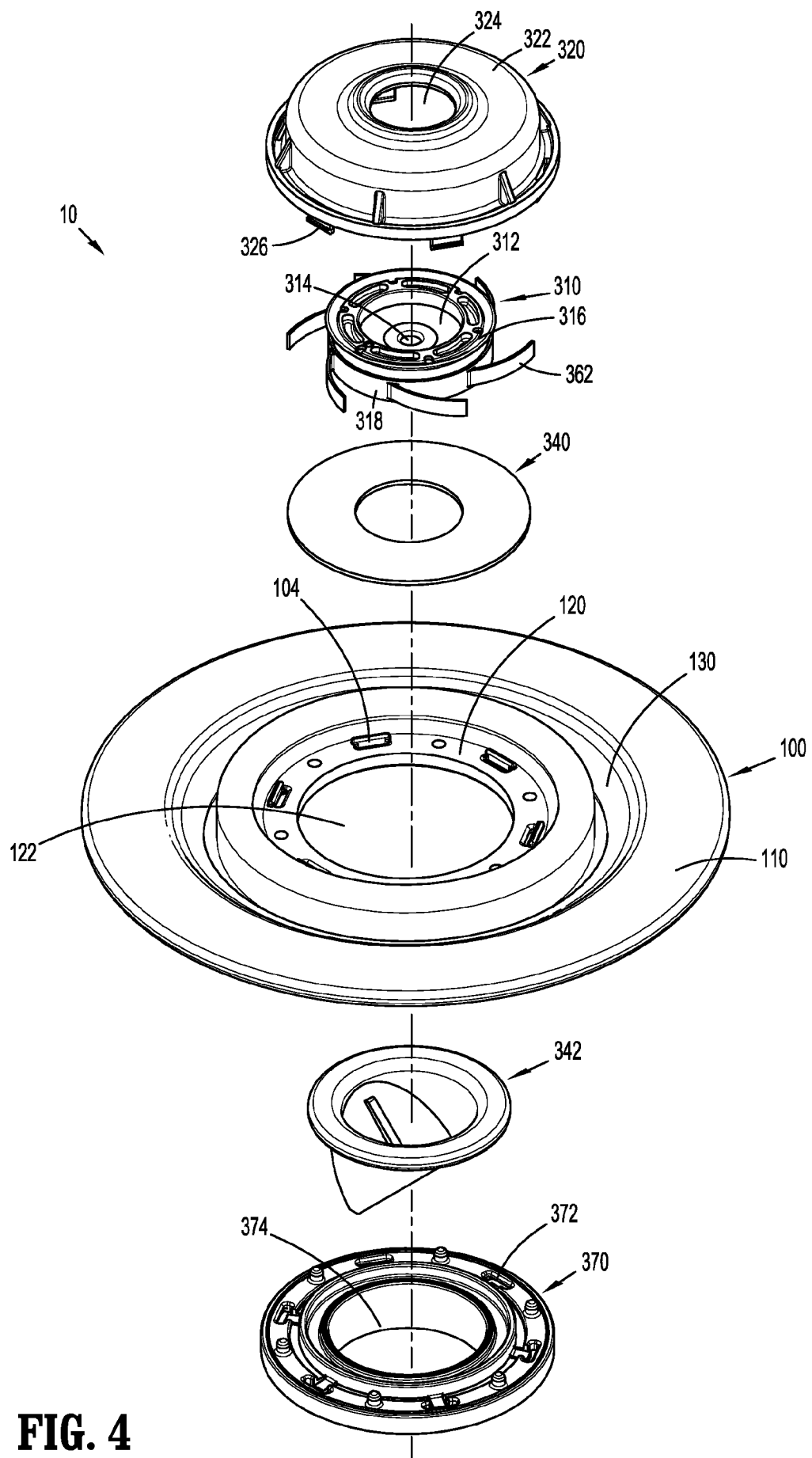
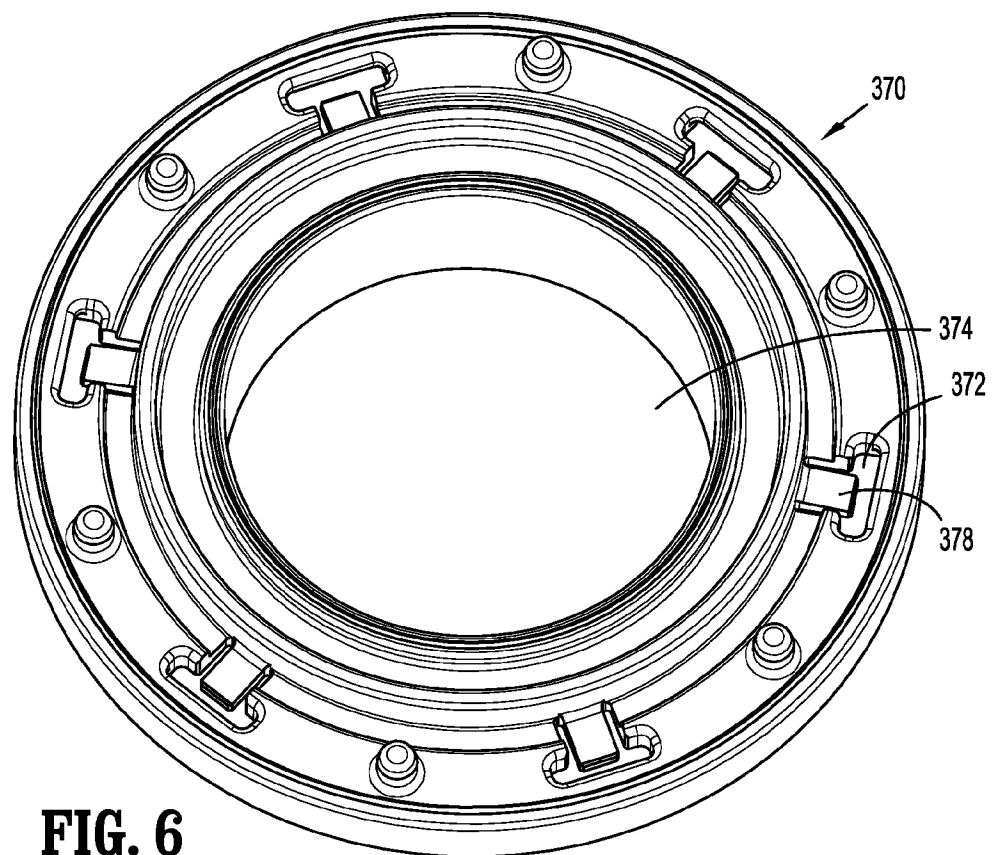
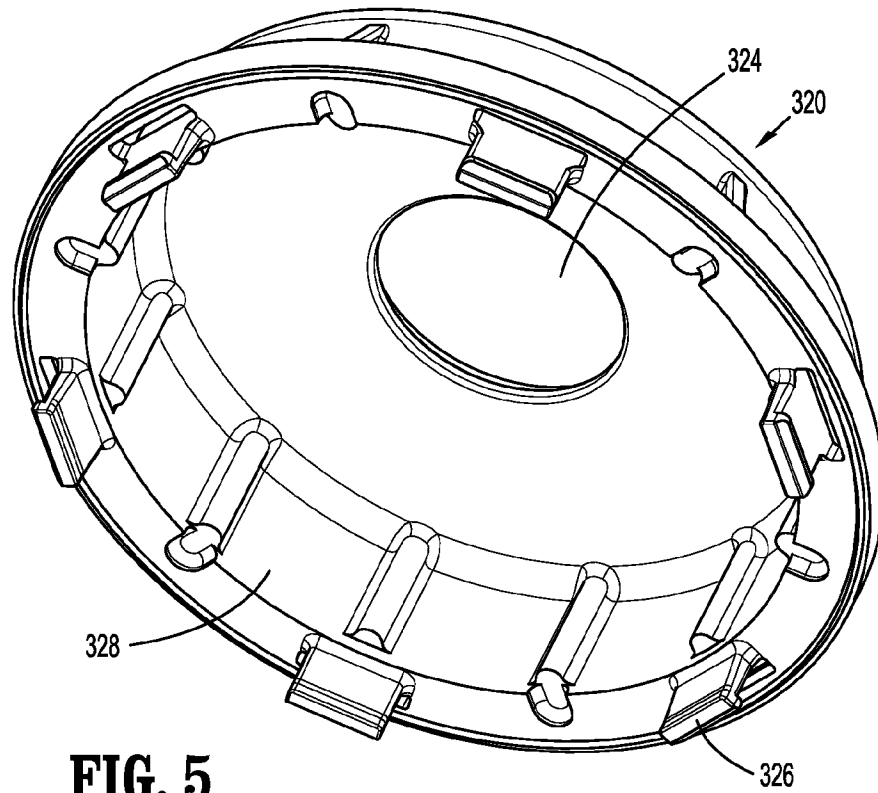


FIG. 4



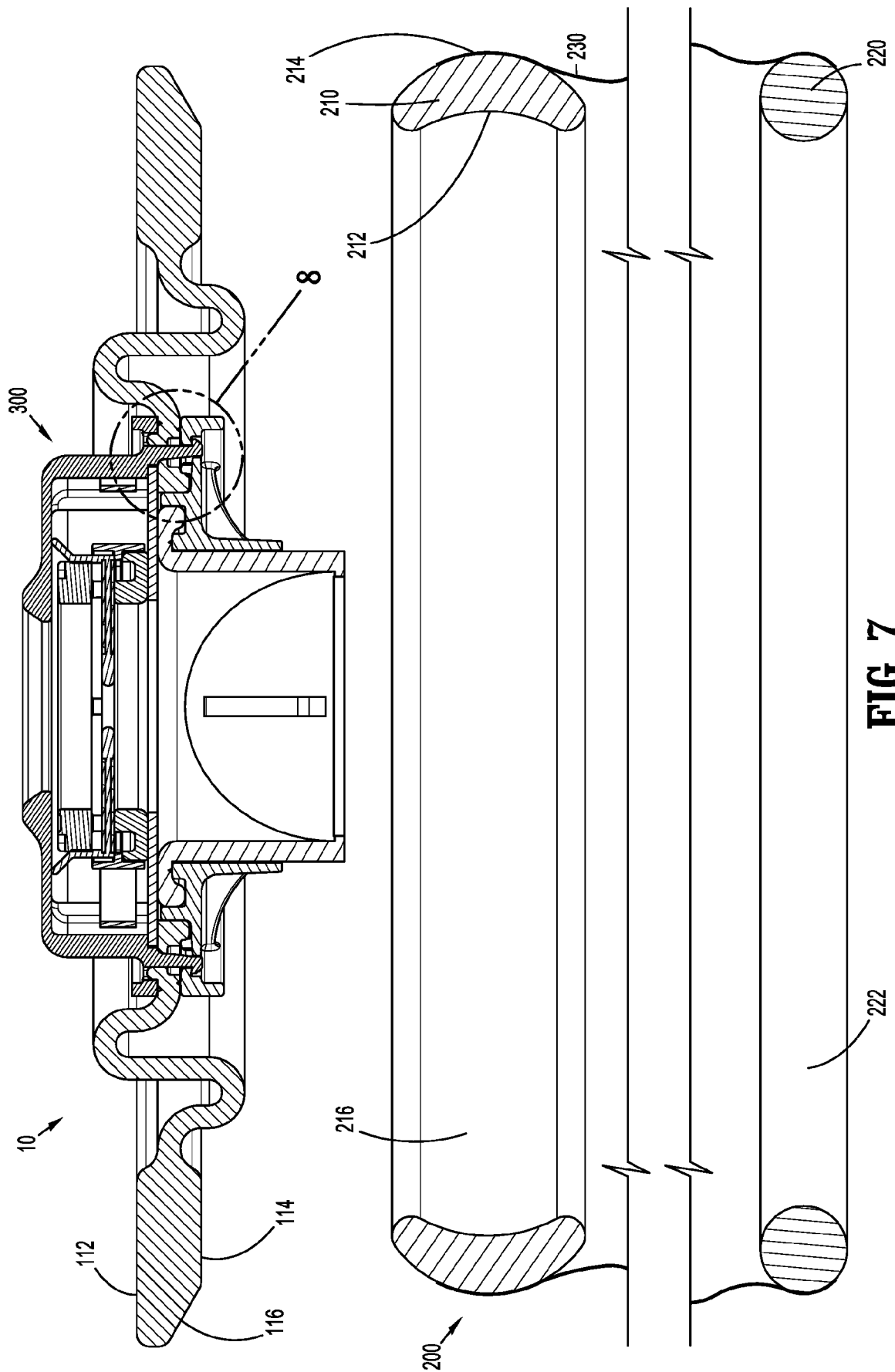
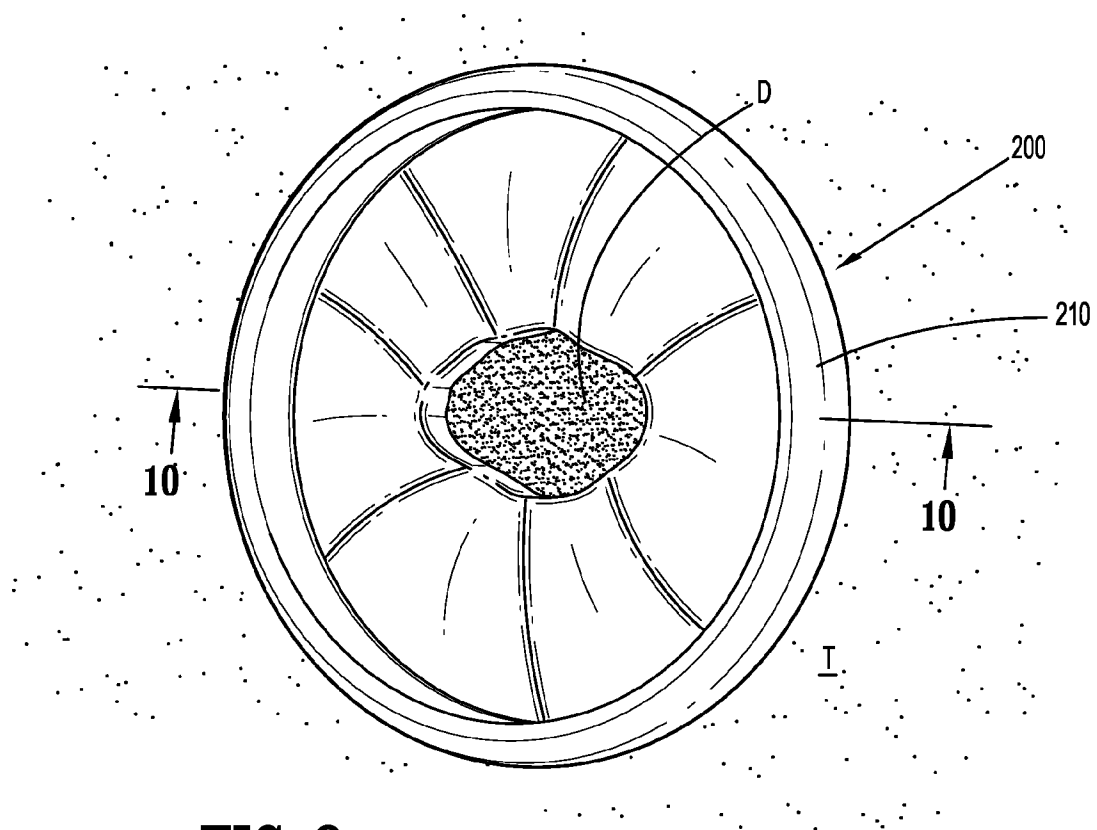
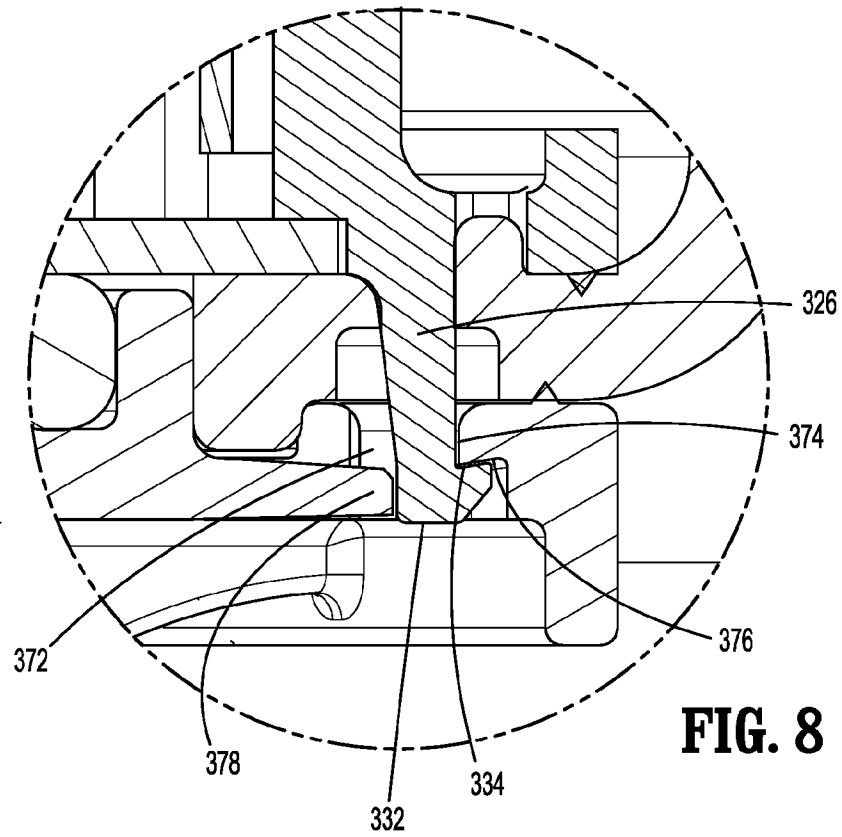


FIG. 7



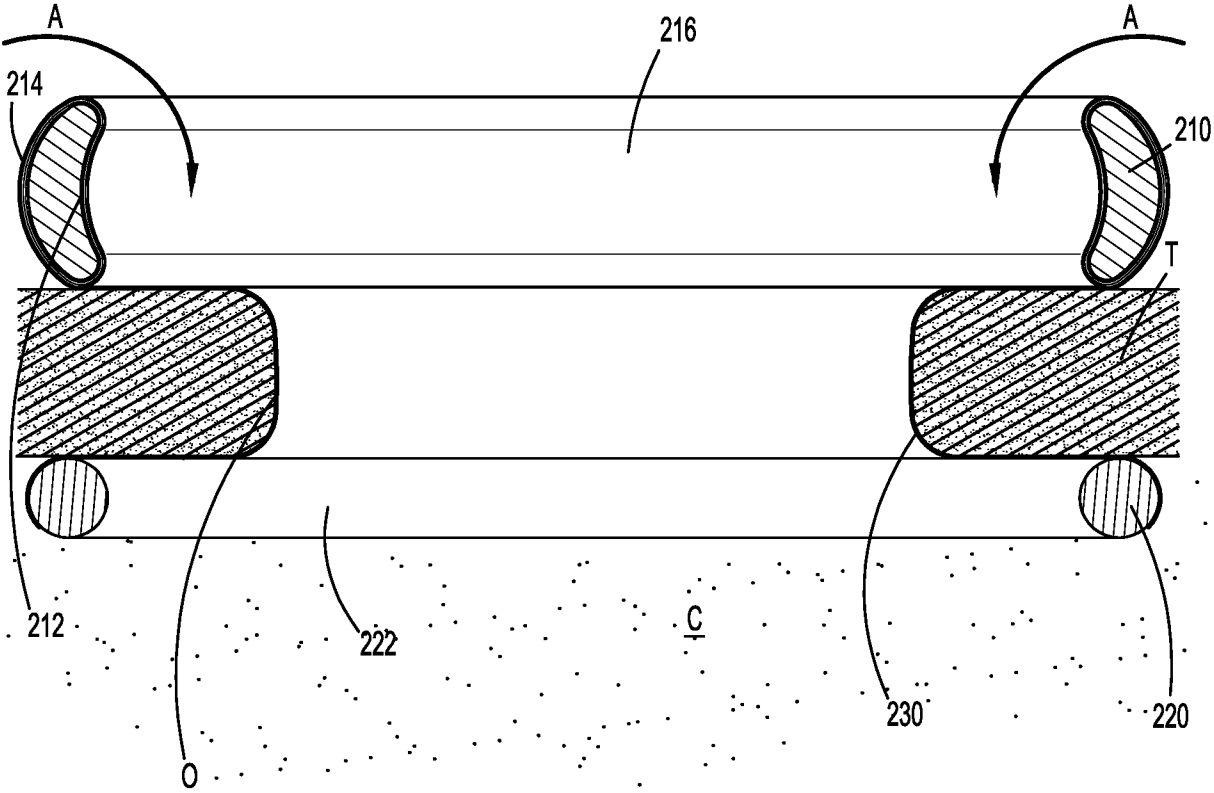


FIG. 10

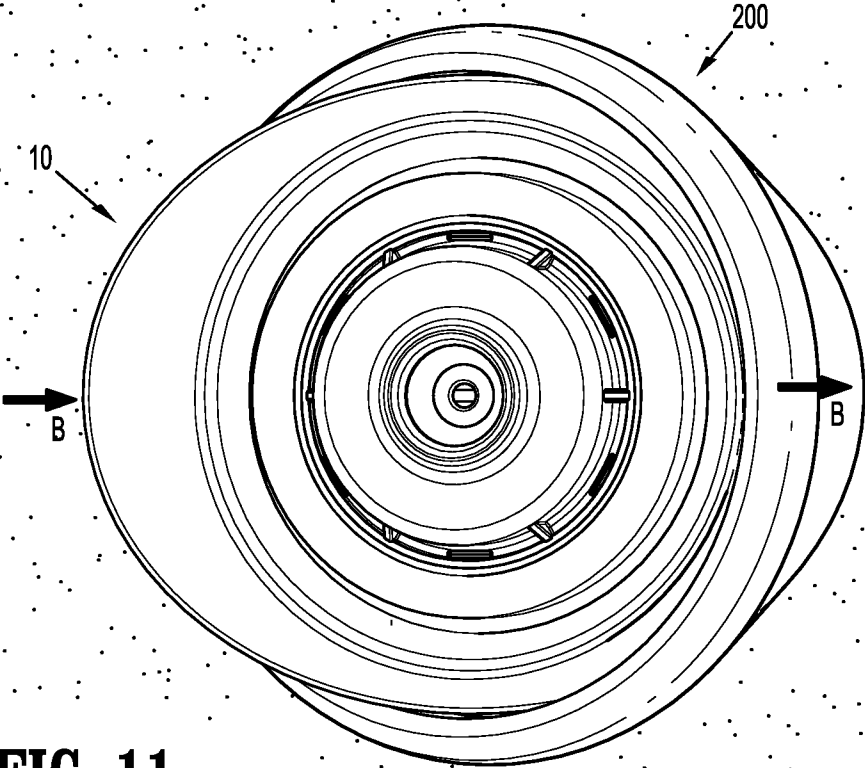


FIG. 11

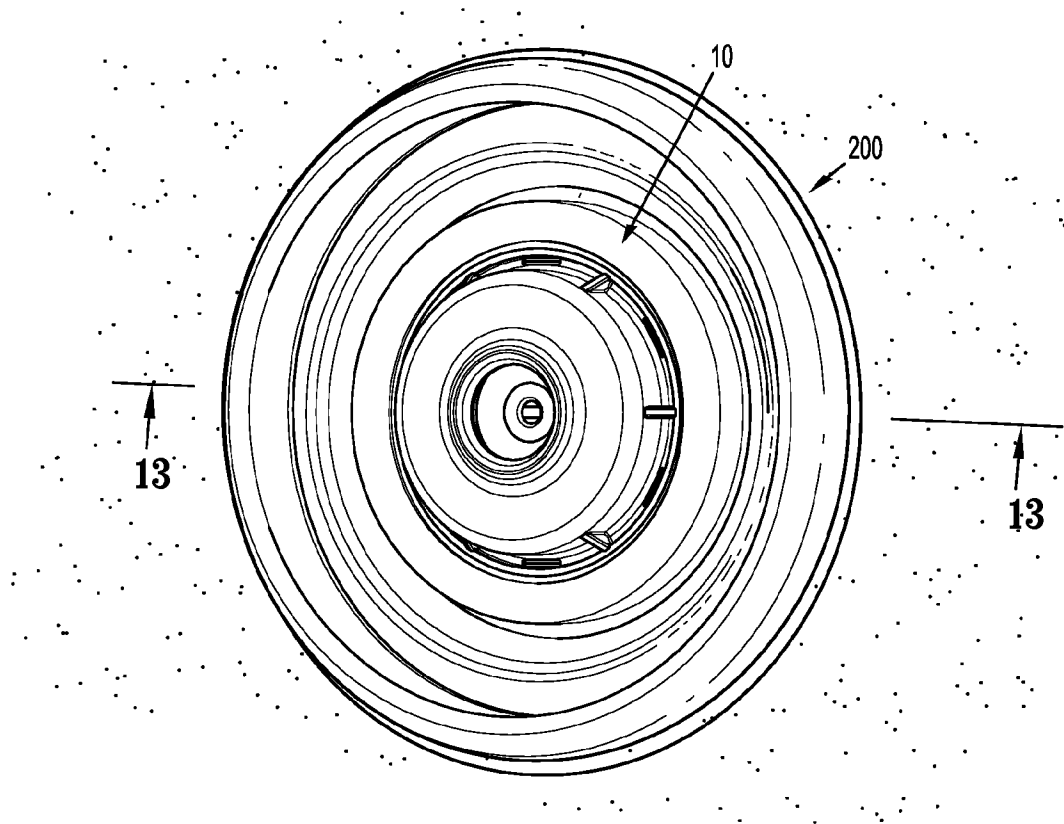


FIG. 12

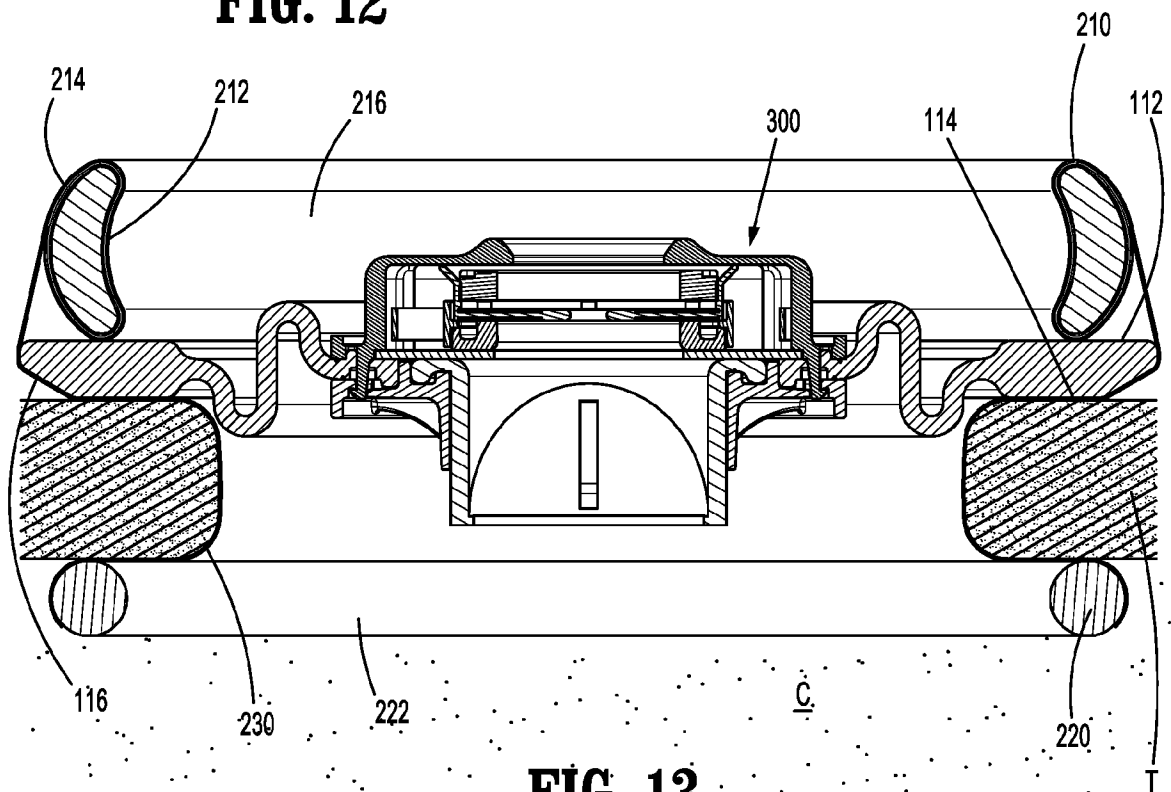


FIG. 13

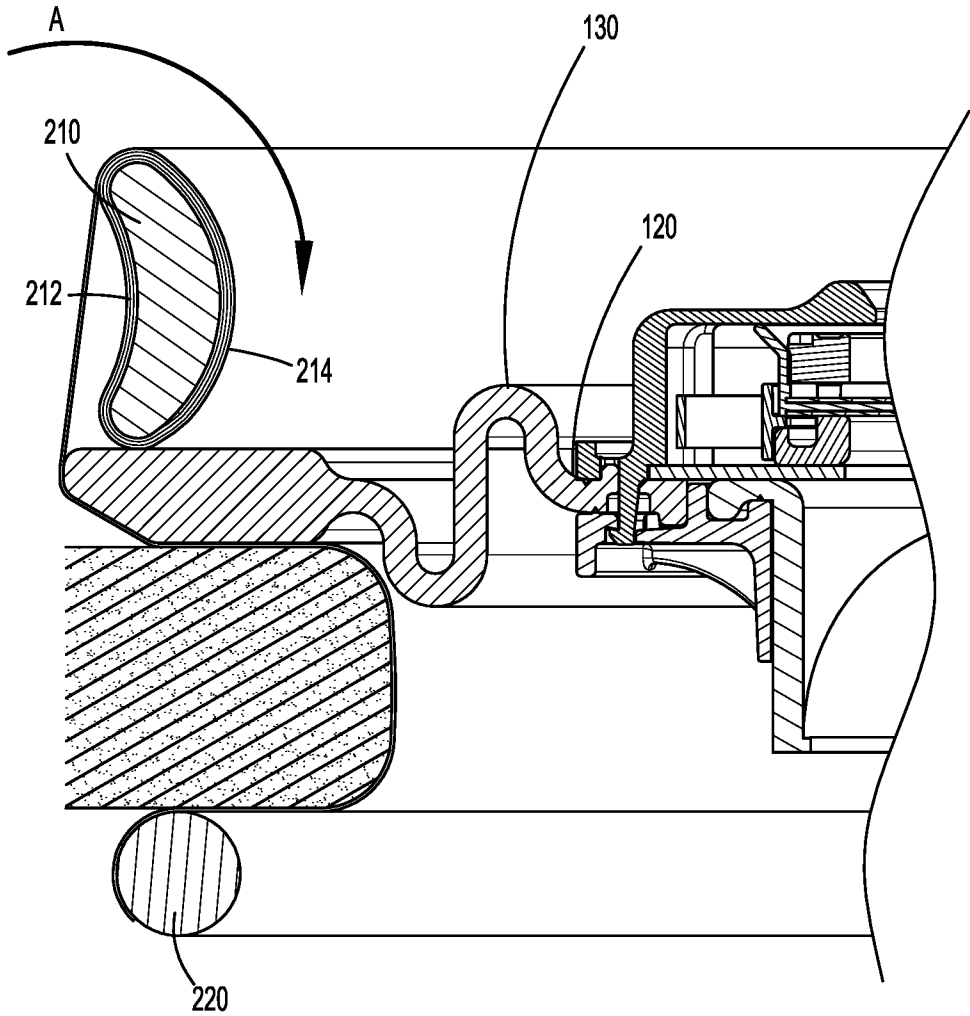


FIG. 14

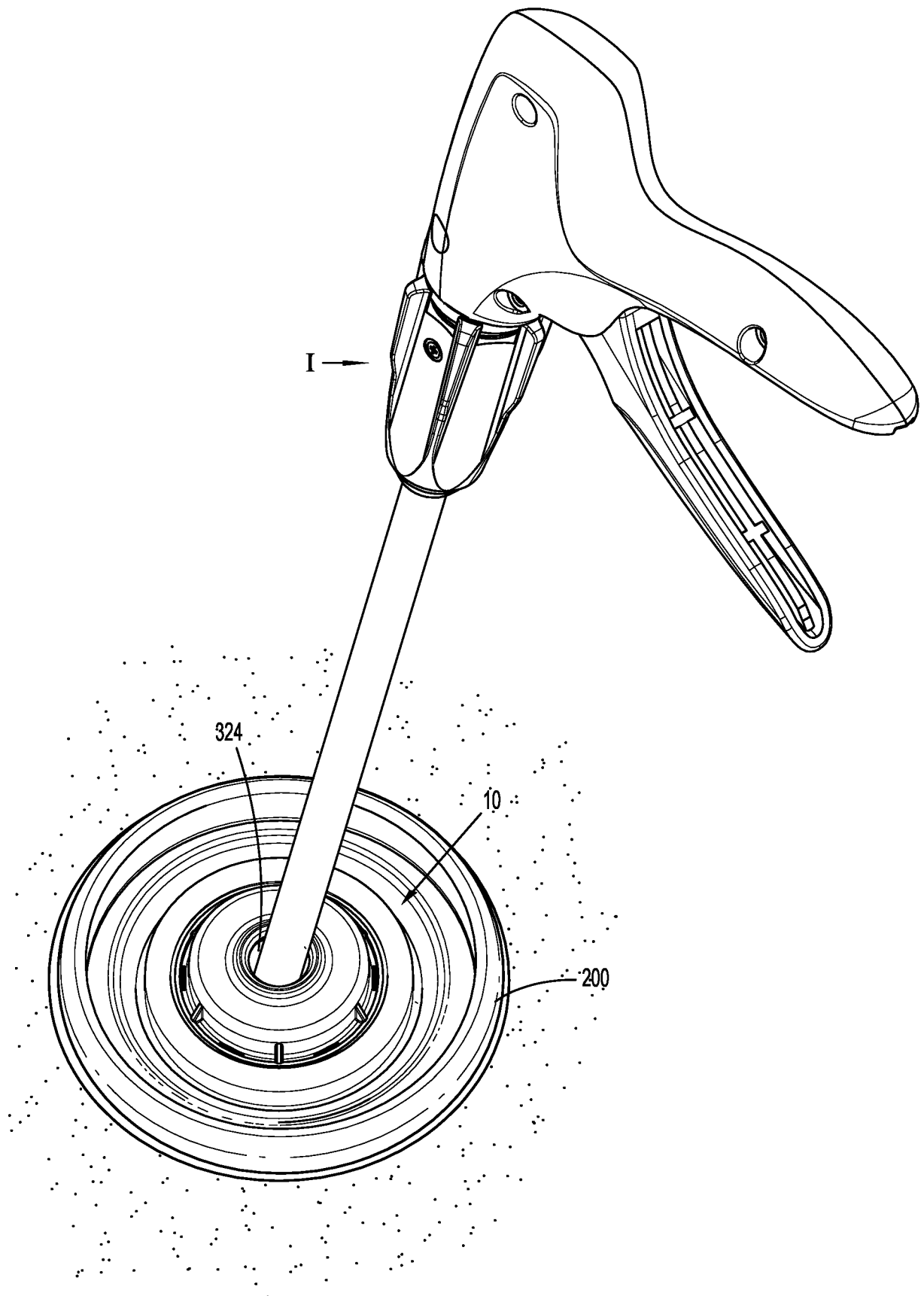


FIG. 15

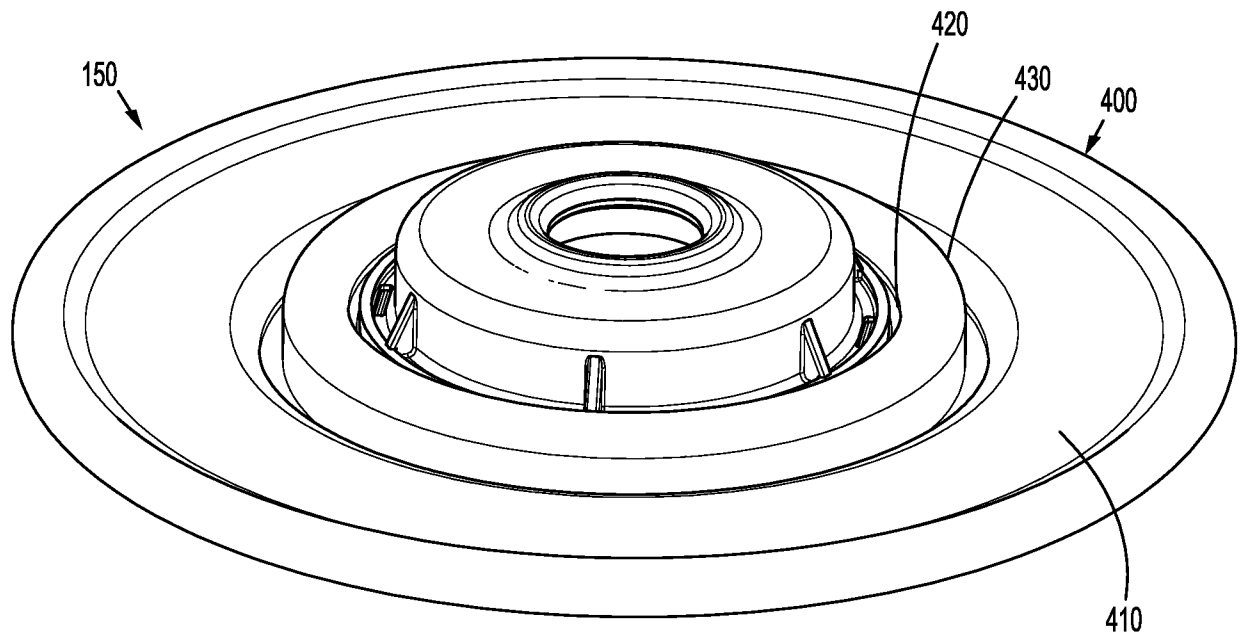


FIG. 16

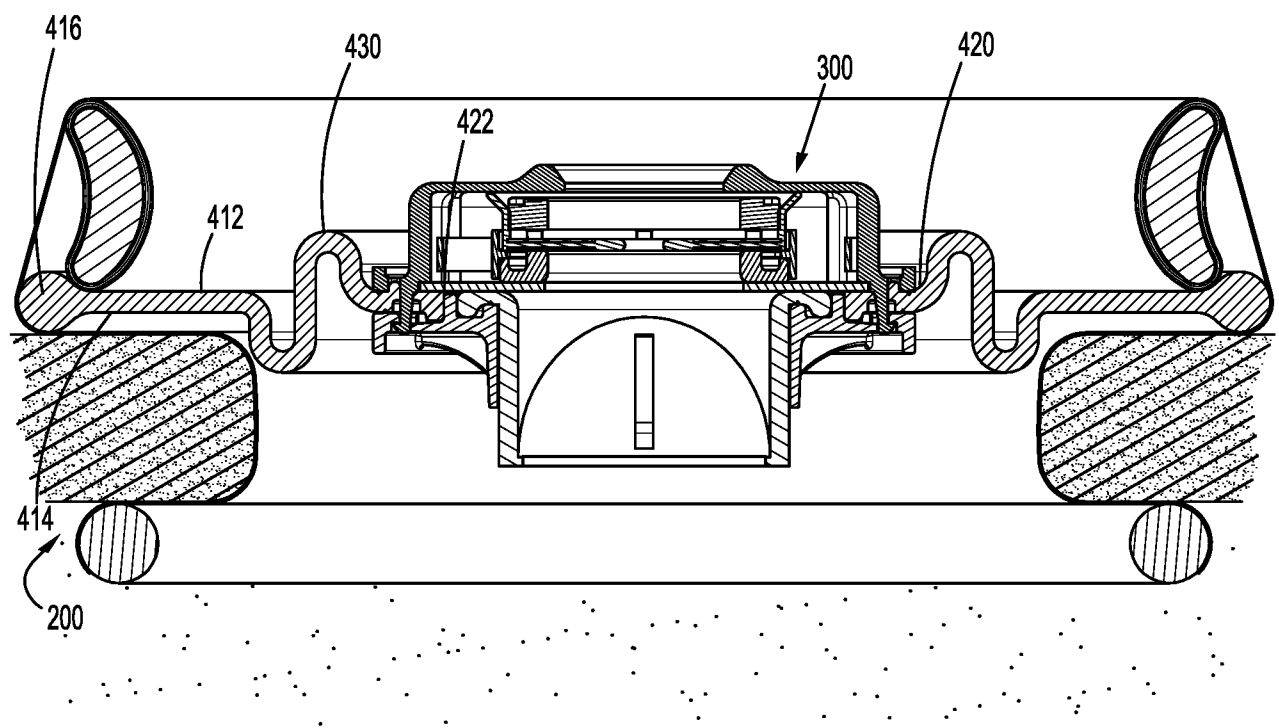


FIG. 17

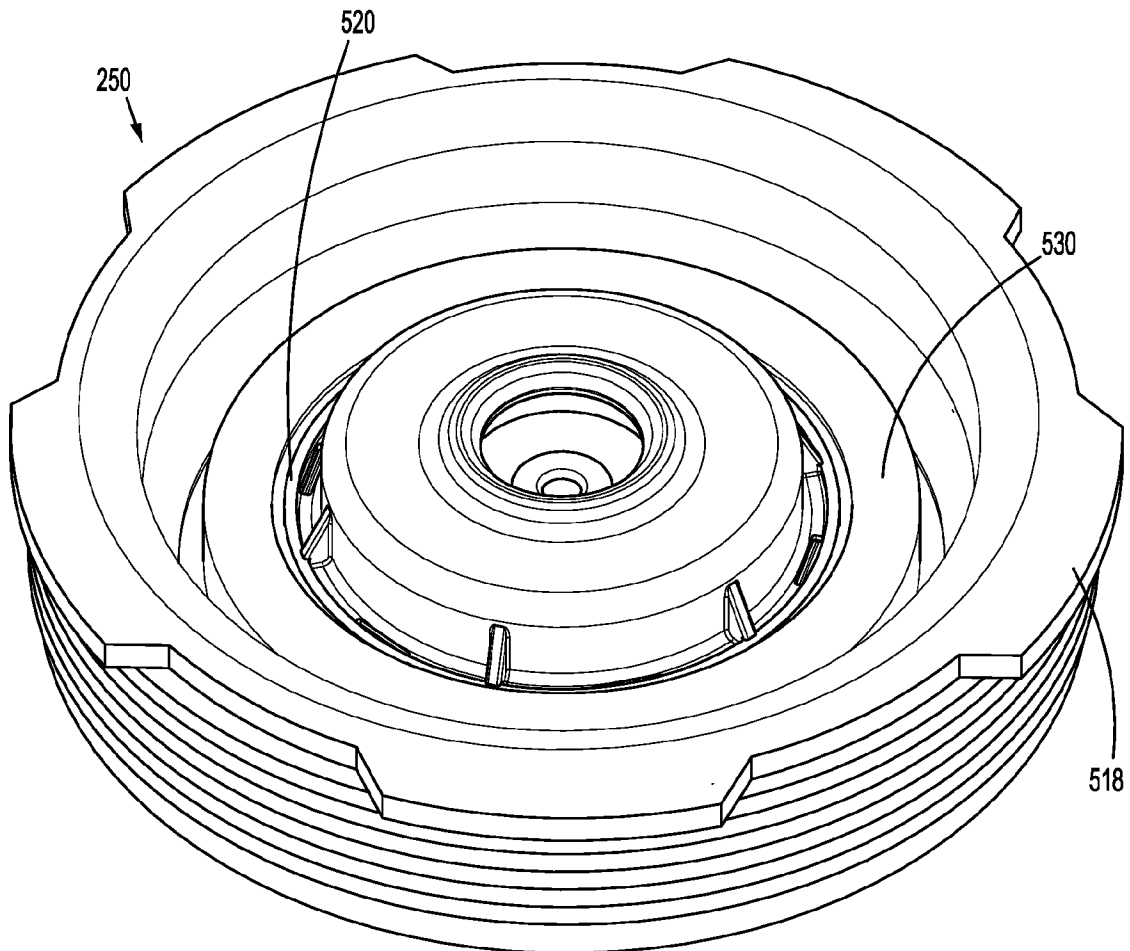


FIG. 18

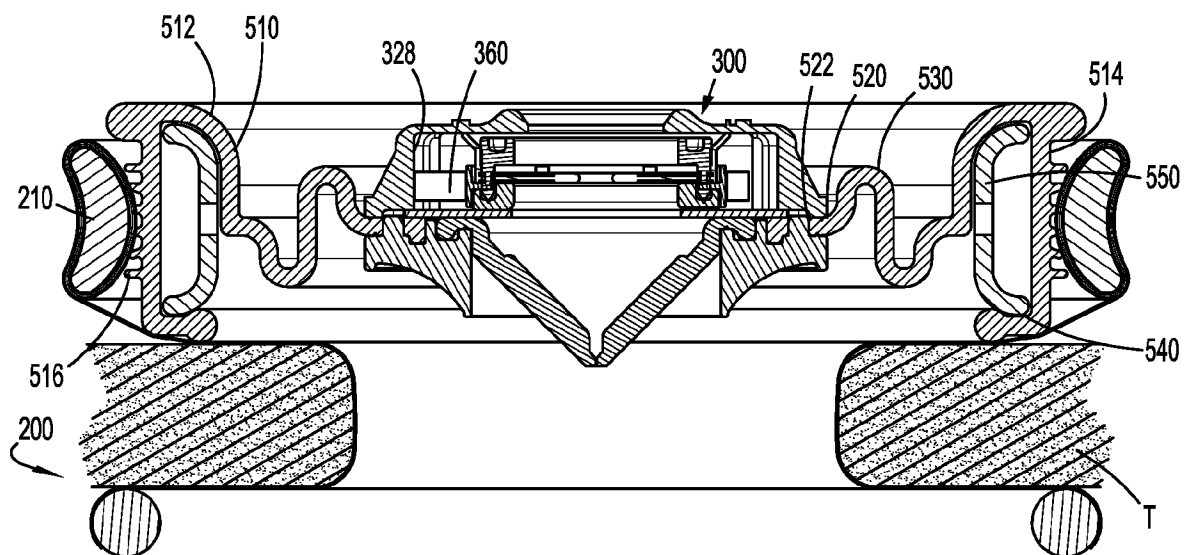


FIG. 19

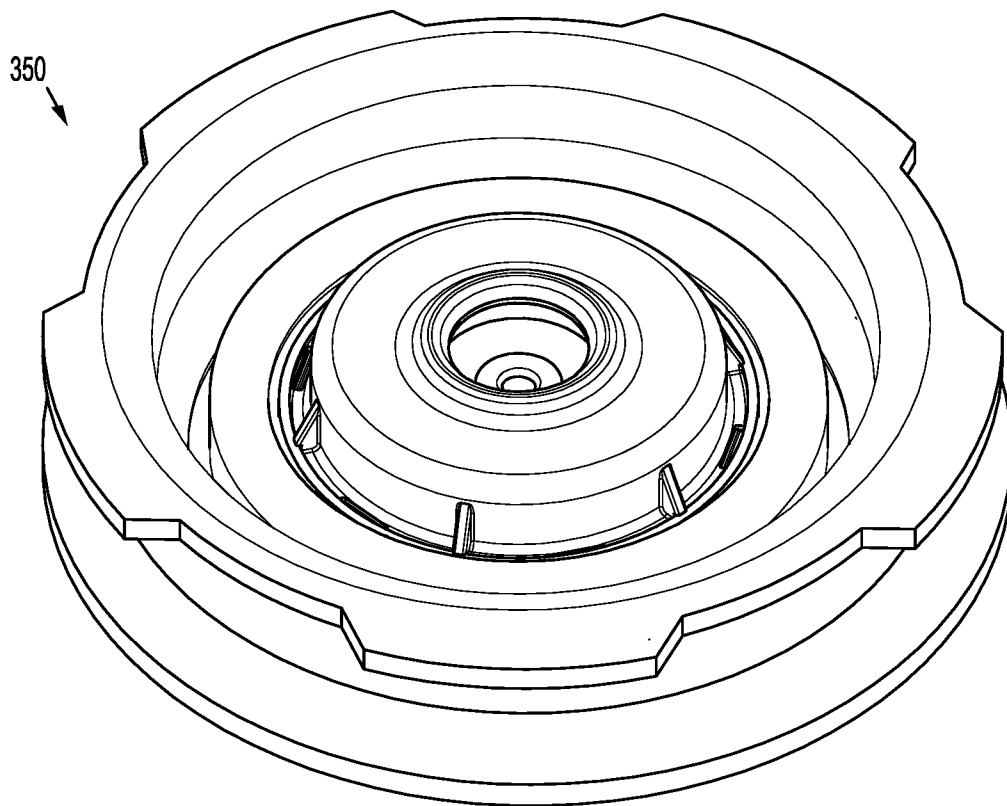


FIG. 20

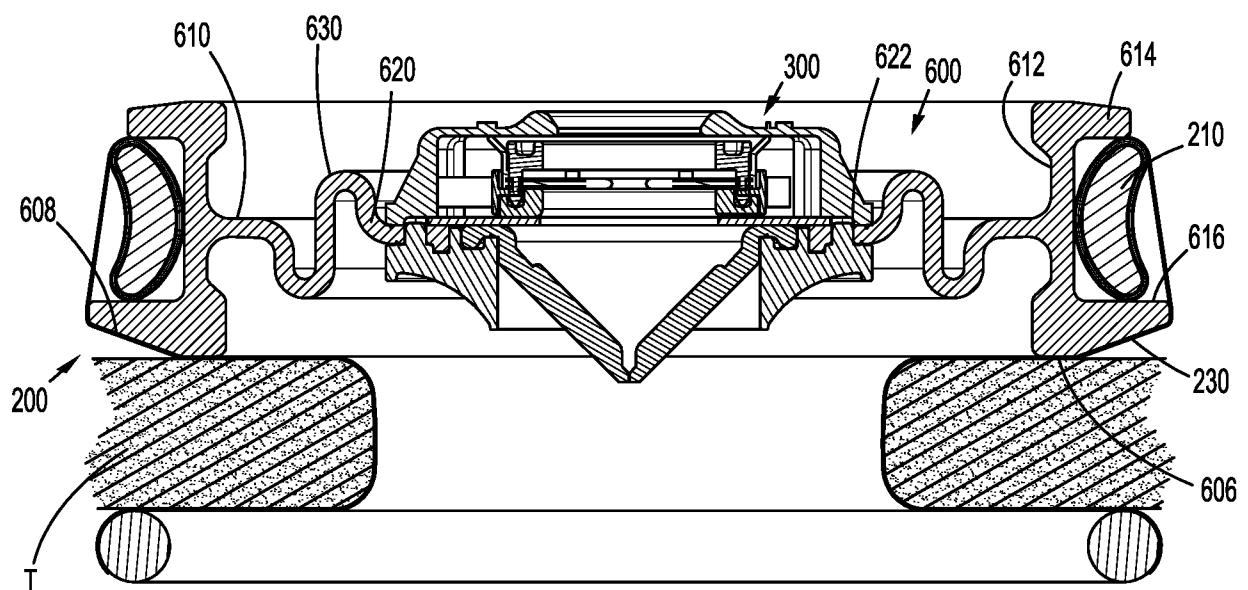


FIG. 21

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2023/057356

A. CLASSIFICATION OF SUBJECT MATTER**INV. A61B17/34****ADD.**

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	US 2011/028794 A1 (WIDENHOUSE CHRISTOPHER W [US] ET AL) 3 February 2011 (2011-02-03) paragraphs [0063], [0080] - [0085]; figures 2-5 -----	1-20
X	EP 2 168 511 A2 (ETHICON ENDO SURGERY INC [US]) 31 March 2010 (2010-03-31) paragraphs [0022] - [0028]; figures 1-4 -----	1-20



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

"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

7 September 2023

Date of mailing of the international search report

15/09/2023

Name and mailing address of the ISA/

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Fax: (+31-70) 340-3016

Authorized officer

Lee, Ronan

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2023/057356

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