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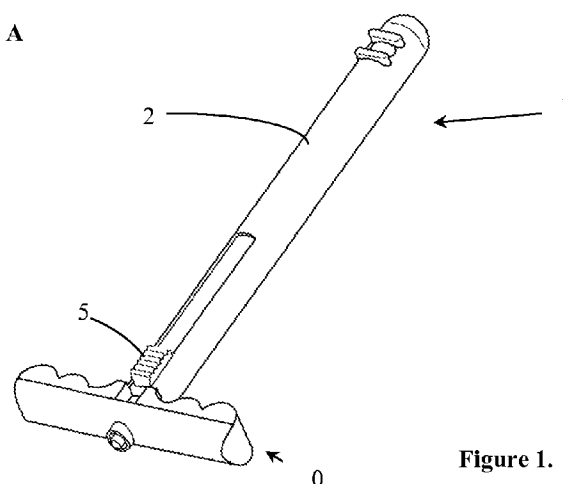


Figure 1.

(57) Abstract: In laparoscopic surgery, small (5-12 mm diameter) incisions are made in the abdominal wall through which instruments dissect and remove specimens that may be several centimeters in diameter. Removal of the sample typically requires either enlarging these incisions or morcellating the sample to pass through the sub-centimeter ports. The laparoscopic device permits extraction of the sample to be removed in a female using the vagina, which has sufficient elasticity to accommodate removal of large specimens. The posterior portion of the vagina communicates to the abdomen through a few tissue layers, and is distant from vital anatomic structures. Utilizing the vagina is optimal due to its ease of access to the abdomen and repair, minimal scarring and post-operative pain, and faster recovery following surgery. A deployable collection bag is housed in a sheath, which is deployed into the vagina or abdominal cavity to extract a large (multiple-centimeter) specimen(s) through the vagina. Optional insufflation system and inflatable balloon to maintain pneumoperitoneum may be used to reduce the number of laparoscopic ports required.

WO 2013/090909 A1

## 5        **TRANSVAGINAL SPECIMEN EXTRACTION DEVICE**

### **CROSS REFERENCE TO RELATED APPLICATIONS**

This application claims priority to U.S. Provisional Patent Application 61/576,759, entitled, "Transvaginal Specimen Extraction Device", filed 16 December, 2011, the contents of which  
10        are herein incorporated by reference.

### **FIELD OF INVENTION**

This invention relates to laparoscopic instrumentation and use. Specifically, the invention discloses an endoscopic instrument for transvaginal surgery.

### **BACKGROUND OF THE INVENTION**

15        Laparoscopic surgical techniques have been developed in order to avoid large skin incisions associated with traditional surgery, using small incisions (of 5-12 mm) in which surgical instruments are inserted. These surgical instruments may be used to dissect and remove tissues and organs (specimens) which may be several centimeters in diameter. Such minimally invasive surgical techniques have been evolving for more than 100 years, since  
20        Georg Kelling performed the first experimental laparoscopy in 1901. (Litynski, G. Endoscopic surgery, the history, the pioneers. World J. Surg. 1999 Aug;23(8):745-53). These minimally invasive laparoscopic surgeries result in less post-operative pain, quicker recovery and an improved cosmetic appearance for patients compared to traditional laparotomy. Currently, hybrid procedures combining flexible endoscopy and laparoscopy, such as intraoperative  
25        enteroscopy and laparoscopic-assisted endoscopic retrograde cholangiopancreatography, are performed in increasing numbers. (Ceppa, F., et al. Laparoscopic transgastric endoscopic retrograde endoscopy after Roux-en-Y gastric bypass. Surg. Obes. Relat. Dis. 3: 21-24 2007; Peters, M., et al. Laparoscopic transgastric endoscopic retrograde cholangiopancreatography for benign common bile duct structure after Roux-en-Y gastric bypass. Surg. Endosc. 16:1106  
30        2002).

One limitation, however, has been the removal of pathologic specimens that are larger than the port sites used to perform these surgeries. In abdominal laparoscopy, it is impossible to remove large specimens without cutting or morcellating the specimen within the abdominal cavity or making an incision in the abdominal wall that is large enough to accommodate  
35        removal of the large specimen. Recently, surgeons have taken advantage of natural orifices (vagina, rectum, urethra, and gastrointestinal tract) to perform Natural Orifice Transluminal Endoscopic Surgery (NOTES) procedures with good results (Bessler, M.; Gumbs, A. A.; Milone, L.; Evanko, J. C.; Stevens, P.; Fowler, D. Video. Pure natural orifice transluminal

5 endoscopic surgery (NOTES) cholecystectomy. Surg Endosc 24: 2316-2317; 2010; Kaouk, J.  
H.; White, W. M.; Goel, R. K.; Brethauer, S.; Crouzet, S.; Rackley, R. R.; Moore, C.; Ingber,  
M. S.; Haber, G. P. NOTES transvaginal nephrectomy: first human experience. Urology 74: 5-  
8; 2009). NOTES has been used for diagnostic and therapeutic procedures including) organ  
10 removal, though current articulating instruments for use with NOTES are disposable,  
increasing costs compared to standard laparoscopic procedures, and removal of large tumors  
or solid organs cannot be performed using NOTES (Dapri, Single access laparoscopic  
surgery: Complementary or alternative to NOTES? World J Gastrointest Surg. 2010 June 27;  
2(6): 207-9). Advantages of NOTES include cosmetic results, reduced anesthesia  
15 requirements; faster recovery and shorter hospital stays; decreased abdominal trauma and  
therefore potential complications of transabdominal wound infections, such as hernias, less  
need for immunosuppression and pain killers; and better postoperative pulmonary and  
diaphragmatic function.

Another limitation in traditional laparoscopic surgery is the size of the instruments used. A  
typical umbilicus laparoscopic port incision is no larger than 15mm, and other support  
20 incisions are usually much smaller. Larger incisions lead to more scarring and the potential  
for hernia formation. Therefore, the tools used for laparoscopy are small in size to fit these  
incision limitations.

The vagina is the ideal portal to access the abdominal cavity for women undergoing minimally  
invasive laparoscopic surgery, and is regaining interest in the surgical community (Auyang, E.  
25 D.; Santos, B. F.; Enter, D. H.; Hungness, E. S.; Soper, N. J. Natural orifice transluminal  
endoscopic surgery (NOTES((R))) : a technical review. Surg Endosc 25: 3135-3148; 2011;  
Stark, M.; Benhidjeb, T. Natural Orifice Surgery: Transdouglass surgery--a new concept. JLS  
12: 295-298; 2008) for peritoneal access. According to some computer generated models  
(Ashton-Miller, J. A.; DeLancey, J. O. Functional anatomy of the female pelvic floor. Ann N Y  
30 Acad Sci 1101: 266-296; 2007), its elasticity allows stretching to accommodate dimensions  
greater than three times its resting state. Accordingly, transvaginal NOTES is considered one  
of the safest and feasible methods for clinical application. Transvaginal cholecystectomy has  
been experimentally performed without using laparoscopic assistance.

Ghezzi et al. (Ghezzi, F.; Raio, L.; Mueller, M. D.; Gyr, T.; Buttarelli, M.; Franchi, M. Vaginal  
35 extraction of pelvic masses following operative laparoscopy. Surg Endosc 16: 1691-1696;  
2002.) and Spuhler et al. (Spuhler, S. C.; Sauthier, P. G.; Chardonens, E. G.; De Grandi, P.  
A new vaginal extractor for laparoscopic surgery. J Am Assoc Gynecol Laparosc 1: 401-404;  
1994) described devices for the extraction of pelvic masses following laparoscopy. These  
devices utilized a metal shaft with a fitted rubber ball to provide vaginal occlusion and prevent  
40 loss of pneumoperitoneum. Another device developed in Australia and marketed by  
Gynetech Pty Ltd, uses a similar hollow tube placed in the vagina (McCartney, A. J.

- 5 Transvaginal tube as an aid to laparoscopic surgery. Google Patents; 2003). The design of this device is such that the tube fits around the cervix to distinguish the cervicovaginal junction, similar to the Koh colpotomy cup already in use for hysterectomy procedures (Koh, C. H. Simplified total laparoscopic hysterectomy method employing colpotomy incisions. Google Patents; 1996).
- 10 However, to date, there are no devices marketed in the U.S. aimed at utilizing the vagina as an access to the peritoneal cavity for the introduction of laparoscopic surgical devices or implants, or the extraction of pathologic specimens. Accordingly, there is a need in the art for devices that permit enhanced access to the abdomen during surgery..

#### **SUMMARY OF THE INVENTION**

- 15 Recently, natural orifice transluminal endoscopic surgery (NOTES) has been performed by entering the peritoneal cavity via the stomach, colon, vagina, or bladder. (Pearl, J., Ponsky, J., Natural orifice transluminal endoscopic surgery: past present and future. J Min. Acc. Surg. 3:2 43-46 2008; Wilk, P., U.S. Pat. No 5,297,536). NOTES has been extensively studied in animal models, with tubal ligation, gallbladder surgery, oophorectomy, hysterectomy,
- 20 gastrojejunostomy, and splenectomy having been described. (Jagannath, S., et al. Peroral transgastric endoscopic ligation of fallopian tubes with long-term survival in a porcine model. Gastrointest. Endosc. 61: 449-453 2005; Experimental studies of transgastric gallbladder surgery: cholecystectomy and cholecystogastric anastomosis. Gastrointest. Endosc. 61: 601-606 2005; Wagh, M. et al., Survival studies after endoscopic transgastric oophorectomy and
- 25 tubectomy in a porcine model. Gastrointest. Endosc. 63: 473-478 2008; Merrifield, B., et al. Peroral transgastric organ resection: a feasibility study in pigs. Gastrointest. Endosc. 63: 693-697 2006; Kantsevoy, S., et al. Transgastric endoscopic splenectomy: is it possible? Surg. Endosc. 20: 522-525 2006). These surgical procedures are promising advances, due to the potential to eliminate traditional surgical complications, like postoperative abdominal wall pain,
- 30 wound infections, hernias, adhesions, and impaired immune function. (Wagh, M., Thompson, C. Surgery insight: natural oriice transluminal endoscopic surgery- an analysis of work to date. Gastr. & Hept. 4:7 386-392 2007). Further, NOTES procedures may be performed under conscious sedation and not general anesthesia. (Pearl, J., Ponsky, J., Natural orifice transluminal endoscopic surgery: past present and future. J Min. Acc. Surg. 3:2 43-46 2008).
- 35 The transluminal approach could be particularly important for morbidly obese patients and others at high risk for standard surgery.

- The vagina is the ideal portal to access the abdominal cavity for women undergoing minimally invasive laparoscopic surgery. According to some computer generated models (Ashton-Miller, J. A.; DeLancey, J. O. Functional anatomy of the female pelvic floor. Ann N Y Acad Sci 1101: 266-296; 2007), its elasticity allows stretching to accommodate dimensions greater than three
- 40

5 times its resting state. The posterior portion of the vagina also directly communicates with the abdomen through only a few tissue layers, and when placed on stretch, is distant from vital anatomic structures. A laparoscopic port utilizing transvaginal access would increase the surgeon's access to the abdominal cavity and provide a much larger incision site, without the concerns for hernia formation and scarring. Additionally, transvaginal removal of large  
10 specimens enables minimally invasive laparoscopic surgery without the need for morcellation within the abdominal cavity or large incisions in the abdominal wall to remove the specimens, thereby minimizing scarring and allowing faster recovery following surgery.

As such, the present invention provides an instrument adapted to provide access to the abdomen through the vagina. The instrument allows for the introduction of devices and  
15 implants, as well as the removal of tissues or organs (i.e., "specimens") from a woman's abdominal cavity during minimally invasive surgery. The instrument comprises a tubular shaft having a proximal end and a distal end made from any material known useful in the art for trocars or surgical instruments, such as plastic, resin, or metal. Exemplary metals include steel, like surgical steel, titanium, and aluminum. Useful plastics and resins  
20 include polyurethane, polyvinyl chloride, polytetrafluoroethylene, polyester, *para*-phenylenediamine and terephthaloyl chloride polymer, *meta*-phenylenediamine and terephthaloyl chloride polymer, nylon, rubber, latex, silicone, polyisoprene, polystyrene and polybutadiene polymer, urethane, polyethylene, polyisoprene, ethylene propylene diene monomer, neoprene, polyurethane, polyvinyl chloride, thermoplastic, and styrene butadiene.  
25 polyethylene terephthalate, polypropylene, polycarbonate polyetherimide, acrylonitrile butadiene styrene, vinyl ester, polyurethane, cyanate ester, polycyanurate, polystyrene plastic, acrylic, thermoplastic composite, polyester composite, epoxy resin composite, or melamine resin composite. Composite materials may include any fiber known in the art that is useful for forming solid or semi-solid structures, such as carbon fiber and aramids like Kevlar,  
30 Twaron, Nomex, New Star and Teijinconex. The tubular shaft may be straight or curved, and optionally includes a hemispherical end disposed on the distal end of the shaft. The tubular shaft may be additionally designed to conform more exactly to the shape of the vagina. The tubular shaft has at least an access opening disposed on the tubular shaft wall on the distal end of the shaft. Optionally, the tubular shaft may have an actuator mechanism disposed  
35 along the length of the shaft or a portion thereof to aid in deployment of a specimen bag. Optionally, elevations or raised features are disposed distally and proximally to the access opening to provide visual and haptic target for placement of an incision. A handle is optionally disposed on the proximal end of the shaft.

Optionally, a deployable specimen collector is disposed within the tubular shaft; adjacent to  
40 the access opening. The specimen collector is formed of a specimen bag, a deployable ring, and a specimen bag support. The specimen bag is made of any durable, flexible material

5 known in the art, such as silk, nylon, polyester, and acrylic, and is designed with an open end and a closed end. The deployable ring is disposed on the open end of the specimen bag, and is made of any semi-flexible material known in the art, such as thin wire, thin flexible plastic, and other materials that may bend. This permits the specimen bag to convert from collapsed, within the tubular shaft, to being able to accept a specimen. A specimen bag support is in  
10 communication with the deployable ring, and connected to an actuator mechanism. The specimen bag support may be any means, such as a connector bar, which may be made of any materials known in the art such as surgical steel, plastic, and titanium, and permits the actuator mechanism to advance the deployable ring by the surgeon.

The laparoscopic instrument optionally includes a means to insufflate the abdomen of the  
15 patient. An insufflation port is disposed on the proximal end of the laparoscopic instrument, such as on the tubular shaft or on the handle, where one is provided. The insufflation port is in fluid communication with the interstitial space of the tubular shaft, or to an insufflation channel disposed in the interstitial space of the tubular shaft. The insufflation channel ends in the distal third of the tubular shaft, such as forming a port on the distal end of the tubular shaft.

20 The laparoscopic instrument is optionally circumscribed by an inflatable balloon disposed on an exterior face of the tubular shaft. The inflatable balloon is in fluid communication with an inflation source, such as through an inflation channel. The inflation channel may be disposed on an exterior face of the tubular shaft or disposed on an interior face of the tubular shaft. Optionally, the proximal end of the inflation channel is in fluid communication with an inflation  
25 port. Variations of the instrument include surgical instrument seals, which may be made of one or more flexible compounds such as polyester, *para*-phenylenediamine and terephthaloyl chloride polymer, carbon fiber, expanded PTFE, *meta*-phenylenediamine and terephthaloyl chloride polymer, nylon, fiber glass, cotton, polypropylene and ceramic, rubber, latex, silicone, polyurethane, polyisoprene, polystyrene and polybutadiene polymer, urethane, polyethylene,  
30 polyisoprene, polyvinylchloride, ethylene propylene diene monomer, neoprene, and styrene butadiene. The seals may also be is coated a lubricant. Exemplary lubricants include hydrophilic polymer coatings, Teflon, cyanoacrylate, parylene, plasma surface treatments, cornstarch powder, silicone oil, silicone grease, astroglide lubricants, mineral oil, glycerin, alcohol, saline, Teflon lubricants, Krytox lubricants, molybdenum disulfide lubricants, and  
35 graphite. However, other lubricants known in the art may be used.

The posterior cul-de-sac, also known as the Pouch of Douglas, illustrated in Figure 8, has traditionally been considered a safe access site to enter the abdominal cavity through a vaginal incision. Alternatively, access to the Pouch of Douglas can be made laparoscopically, and posterior to the cervix in a patient. The laparoscopic instrument of the invention can be  
40 safely placed through a posterior vaginal incision into the abdomen with either technique, and the laparoscopic instrument is useful in performing removal of a specimen from a patient by

- 5 providing a laparoscopic instrument as described above. The laparoscopic instrument is introduced into a patient's vagina and positioned adjacent to a structure in the vagina, such as the Pouch of Douglas. Optionally an incision is made. The specimen bag is extended through the specimen bag opening and the specimen placed in the specimen bag. The specimen bag is then retracted and the laparoscopic instrument withdrawn from the patient's vagina.
- 10 Optionally, the patient's abdomen may be insufflated using variations of the device, by providing an insufflation system in the laparoscopic instrument. A closed insufflation system may be used, having an insufflation port attached to the proximal half of the laparoscopic instrument, an insufflation channel in fluid communication with the insufflation port, and a port disposed on the distal end of the laparoscopic instrument, in fluid communication with the
- 15 insufflation channel. Alternatively, an open insufflation system may be used, having an insufflation port disposed on the proximal half of the laparoscopic instrument, where the insufflation port is in fluid communication with the interstitial space of the tubular shaft. A fluid, such as is air or CO<sub>2</sub>, is introduced into the insufflation system, wherein the fluid insufflates the patient. To maintain insufflation, variations of the inventive laparoscopic instrument may
- 20 be used having an inflatable balloon on the laparoscopic instrument, wherein the inflatable balloon is disposed on an exterior face of the tubular shaft and wherein the inflatable balloon is in fluid communication with an inflation source. A fluid, such as is air or CO<sub>2</sub>, is introduced into the inflatable balloon, wherein the fluid inflates the inflatable balloon, thereby closing off the vaginal opening to maintain insufflation.
- 25 By using the natural elasticity characteristic of the vagina, surgeons can introduce large devices or implants, or extract large, multiple-centimeter specimens that are otherwise challenging to introduce or remove through traditional laparoscopic ports. The described laparoscopic instrument provides a novel approach to access the abdominal cavity and provide effective specimen removal through the vagina.

30 **BRIEF DESCRIPTION OF THE DRAWINGS**

For a fuller understanding of the invention, reference should be made to the following detailed description, taken in connection with the accompanying drawings, in which:

Figures 1(A) and (B) are isometric views of the present laparoscopic instrument (A) without an occlusion balloon; and (B) with the occlusion balloon deflated.

- 35 Figure 2 is an isometric view of the laparoscopic instrument showing an external inflation channel for the occlusion balloon.

Figure 3 is an isometric view of the laparoscopic instrument showing an internal inflation channel for the occlusion balloon.

5 Figure 4 is an isometric view of the present endoscopic instrument with the occlusion balloon inflated.

Figure 5 is an isometric cut-away view of the present laparoscopic instrument with the occlusion balloon deflated. The internal structures of the instrument are visible through the cut-away section.

10 Figure 6 is an isometric view of the laparoscopic instrument with the specimen bag being advanced through the specimen bag opening.

Figure 7 is a bottom-up view of the laparoscopic instrument with the specimen bag deployed.

Figure 8 is a side elevation view of the laparoscopic instrument inserted into a cut-away illustration of a vagina.

15 Figure 9 is an isometric view of the laparoscopic instrument with the specimen bag being deployed.

Figure 10 is a side elevation view of the laparoscopic instrument depicted in an alternative embodiment having a curved shaft.

20 Figure 11 is an isometric view of an instrument channel variant of the laparoscopic instrument having a curved shaft.

Figure 12 is a cross-section view of an instrument channel variant of the laparoscopic instrument having a curved shaft and straight instrument channel.

Figure 13 is a top-down view of an instrument channel variant of the laparoscopic instrument having a curved shaft showing the instrument channel opening.

25 Figure 14 is side view of the proximal end of an instrument channel variant of the laparoscopic instrument.

Figure 15 is an isometric view of the distal end of an instrument channel variant of the laparoscopic instrument having a curved shaft.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

30 The vagina is an underutilized portal for use during laparoscopic surgery. This may be due, in part, to the paucity of medical devices and instruments designed for this mode of access. While there are some vaginal colpotomizer rings and uterine manipulators commercially available, there are no devices specifically designed for use in the vagina during laparoscopic surgery. This invention involves a device used during laparoscopic surgery that is used to  
35 extract tissues or organs, referred herein as "specimens", from a woman's abdominal cavity through the woman's vagina, or to introduce devices or implants into the abdomen during surgery. The device shaft was designed to accommodate the average dimensions of the

5 animal's vagina, such as a human, with both a straight and curved design to allow the  
surgeon optimal flexibility when manipulating the device during actual use in laparoscopic  
surgical procedures. The inventive laparoscopic device uses a novel sheath and access  
opening. The sheath may also include a mechanism to deploy a pouch into a woman's  
10 abdominal cavity and extract large (multiple-centimeter) specimens through the vagina using  
traditional laparoscopic surgical technique. For added safety, the curved design also enables  
the surgeon to elevate the posterior aspect of the vagina further away from the rectosigmoid  
during surgical procedures. The handle grip was ergonomically designed to allow for ease of  
manipulation, deployment, and removal of the extraction bag through control of the actuator  
15 mechanism. With multiple applications including the retrieval of large abdominal masses and  
transfer of surgical instruments into the abdominal cavity, the laparoscopic device has the  
potential to expand the use of the vaginal opening as a natural surgical orifice while  
preserving the use of small port sites during the laparoscopic surgery. Unlike previously  
developed devices, it incorporates a actuator mechanism to deploy a specimen bag directly  
20 into the abdominal cavity. This device allows for removal of larger specimens than is possible  
through the abdomen, without the need for morcellation of tissue or enlarging incisions in the  
abdominal wall to remove them.

As used herein, "about" means approximately or nearly and in the context of a numerical  
value or range set forth means  $\pm 15\%$  of the numerical.

25 As used herein, the term "channel" refers to a path that directs fluid flow in a particular  
direction. The channel can be formed as a fully enclosed tube or conduit. The channel can  
have any cross-section known in the art, such as circular, square, rectangular, triangular,  
enclosed U-shaped, hexagonal, octagonal, irregular. The channel can have any configuration  
including, but not limited to, linear or curved, and may include different diameter sizes, such  
as due to different tubing being joined together.

30 As used herein, the term "curved" means the invention, when viewed from at least one angle,  
has a generally crescent shape, with one edge having a concave shape and the opposite  
edge having a convex shape. The angulation of the curve, i.e. curvature, may vary, for  
example having a customized curvature.

35 As used herein, the term "endoscope" or "scope" is used to refer to an endoscope,  
laparoscope, sigmoidoscope, proctoscope, colonoscope, or other types of medical  
endoscopes. As known to those skilled in the art, a typical endoscope generally comprises a  
connecting tube, a handle and an insertion tube (the part inserted into the patient).

As used herein, the term "hemispherical" means a configuration that is a portion of a sphere,  
including a half sphere, though does not require a full 180° arc and is intended to encompass

- 5 any arc sufficient to result in the major portion of the extraction device having a curved front face, as viewed during insertion of the device.

As used herein, the term "inflatable ring" or "insufflation ring" means a bladder capable of accepting and holding a fluid, such as air, having a vacant circular center with respect to the material forming the bladder. The ring may be a circular band, ovoid, or spherical.

- 10 As used herein, the term "interstitial space" means a hollow space, i.e. not occupied by a solid, which is bound by one or more solids in two dimensions. For example, the interstitial space may have a square cross-section, which is bound in two dimensions by four walls. Alternatively, the interstitial space may have an oval or circular cross-section, which is bound in two dimensions by a tubular structure.

- 15 As used herein, the term "laparoscopic" is meant to encompass any minimally invasive surgical technique, including endoscopy and NOTES. The term is intended to be used in its broadest sense, and not limited to specific laparoscopic techniques.

As used herein "ovoid" means having a general oval structure, such as an egg-shape in three dimensions.

- 20 As used herein, the term "patient" is directed toward humans, but can also include any member of the animal kingdom, including mammals, such as but not limited to, primates including gorillas and monkeys; rodents, such as mice, fish, reptiles and birds. The patient may be any animal requiring any surgical therapy, treatment, or prophylaxis. The term treatment, as used in this definition only, is intended to mean that regiment described is  
25 continued until the underlying disease is resolved, whereas therapy requires that the regiment alleviate one or more symptoms of the underlying disease. Prophylaxis means that regiment is undertaken to prevent a possible occurrence, such as where a pre-cancerous lesion is identified.

- As used herein, the term "proximal" refers to a location that, during normal use, is closer to  
30 the operator or clinician using the device and farther from the patient in connection with whom the device is used. Conversely, the term "distal" refers to a location that, during normal use, is farther from the clinician using the device and closer to the patient in connection with whom the device is used

- As used herein, "specimen" means at least one tissue or organ extracted during a  
35 laparoscopic procedure. Exemplary specimens include organs and tissues from the female reproductive system, such as ovarian cysts, necrotic ovary, ectopic pregnancy, uterus or uterine tissue, as well as tissues and organs from the abdomen, such as gall bladder, portions of the stomach or intestine, or appendix. As is known in the art, the examples are not an exhaustive list of organs and tissues that may be removed using the present device.

5 As used herein, “substantially” means largely if not wholly that which is specified but so close that the difference is insignificant.

**Example**

Laparoscopic instrument **1** is formed of sheath **2**, having a circular or ovoid cross-section, as seen in Figure 1(A). Sheath **2** has an interstitial space in its center, distal end **6** and proximal  
10 end **7**. Sheath opening **9** is disposed distally along the length of sheath **2** and extends from the exterior space to the interstitial space of sheath **2**.

Optional specimen bag **40**, actuator mechanism **5**, and handle **20**, are seen in Figure 1(B). Optional inflatable balloon **10**, seen in Figure 1(B), surrounds the sheath for providing a seal to maintain pneumoperitoneum during surgery. Inflatable balloon **10**, such as a rumi balloon,  
15 and is in fluid communication with inflation channel **4**. Inflation channel **4** is disposed on the outer face of sheath **2**, as seen in Figure 2. The distal end of inflation channel **4** is fused with inflatable balloon **10** or otherwise in fluid communication such that the joining of inflation channel **4** and inflatable balloon **10** does not leak fluid from the joint. The proximal end of inflation channel **4** may end in inflatable port **3a** or other means to permit one of skill in the art  
20 to inflate and deflate inflatable balloon **10**. Alternatively, inflation channel **4** is disposed on the interior face of sheath **2**. Where inflation channel **4** is disposed on the interior wall of sheath **2**, a small balloon port **3b** is disposed through sheath **2**, under inflatable balloon **10** and adjacent to an opening in inflatable balloon **10**, as seen in Figure 3. The distal end of inflatable channel **4** is fused to the small port, such that the distal end of inflatable channel **4**, the port, and  
25 inflatable balloon **10** provide a seal. The proximal end of inflatable channel **4** may end in a port or other means to permit one of skill in the art to inflate and deflate inflatable balloon **10**.

Optionally, raised features **8** are disposed on the outer face of sheath **2**, one proximal to sheath opening **9**, and one distal to sheath opening **9**, as seen in Figure 4. Proximal end **7** includes handle **20** for manipulating the instrument. Specimen bag **40** is disposed in the  
30 interstitial space of sheath **2**, and adjacent to sheath opening **9**, as seen in Figure 5. The open end of specimen bag **40** contains deployable ring **41** that is initially compressed or folded within sheath **2**, as seen in Figure 5. Deployable ring **41** is made of any semi-flexible material known in the art, such as thin wire, thin flexible plastic, and other materials which may bend, yet forms a preformed shape upon release. Deployable ring **41** is fixed to  
35 deployment arm **42**, by means known in the art, such as thermal welding, electrical welding, soldering, or a pin hinge. Deployment arm **42**, which is made of any useful material known in the art, such as surgical steel, plastic, and titanium, runs the length of the sheath, and is connected to actuator mechanism **5**, by means known in the art. Non-limiting examples include thermal welding, electrical welding, soldering, or a pin hinge.

5 Actuator mechanism **5** is slidingly attached to the proximal end sheath **2**, such that advancing the actuator mechanism distally extends specimen bag **40** through sheath opening **9** and permits deployable ring **41** to open into its performed shape, as seen in Figure 6.

Optionally, laparoscopic instrument **1** provides insufflation for pneumoperitoneum during surgery. Insufflation channel **31** is disposed on the interior wall of sheath **2**. While insufflation  
10 channel **31** may be disposed on any interior wall, one of skill in the art will recognize optimal position of the insufflation channel will be opposite sheath opening **9**, thereby reducing the likelihood of interference with specimen bag **40**. The proximal end of insufflation channel **31** is in fluid communication with insufflation port **30**, which may be disposed on handle **20**, as seen in Figure 7. The distal end of insufflation channel **31** is in fluid communication with distal end  
15 cap **35**. A hole or other port is disposed in distal end cap **35**, in communication with insufflation channel **35**, thereby permitting insufflation fluids to exit insufflation channel **35** and into the patient.

#### Example

Laparoscopic instrument **1** comprises of sheath **2**, having a circular or ovoid cross-section, a  
20 specimen bag **40**, actuator mechanism **5**, and handle **20**, as disclosed in the previous example. However, the insufflation system of laparoscopic instrument **1** provides insufflation port **30**, such as the port disposed on handle **20** seen in Figure 7. Insufflation port **30** is in fluid communication with the interstitial space, i.e. there is no insufflation channel **31**, permitting sheath opening **9** to be used to attain pneumoperitoneum.

#### 25 Example

Laparoscopic instrument **1** comprises interstitial channels thereby permitting a surgeon to introduce instruments, implants, sponges, needles or other objects into the operative field during laparoscopic surgery, without having to place large ports in the abdomen or make larger incisions. Optionally, an instrument seal may be disposed on the proximal end of the  
30 sheath **2**, permitting use of the laparoscopic instrument as a laparoscopic port. The instrument seal is constructed of a compound capable of forming an air-tight seal, such as polyester, *para*-phenylenediamine and terephthaloyl chloride polymer, carbon fiber, expanded PTFE, *meta*-phenylenediamine and terephthaloyl chloride polymer, nylon, fiber glass, cotton, polypropylene and ceramic, rubber, latex, silicone, polyurethane, polyisoprene, polystyrene  
35 and polybutadiene polymer, urethane, polyethylene, polyisoprene, polyvinylchloride, ethylene propylene diene monomer, neoprene, and styrene butadiene. In specific embodiments, instrument seal is also coated in at least one additional compound. Useful compounds are hydrophilic polymer coatings, Teflon, thermoplastic, cyanoacrylate, parylene, plasma surface treatments, cornstarch powder, silicone oil, silicone grease, astroglide lubricants, mineral oil,

5 glycerin, alcohol, saline, Teflon lubricants, Krytox lubricants, molybdenum disulfide lubricants, and graphite.

#### Example

The laparoscopic instrument may safely facilitate entry into the abdominal cavity during laparoscopic surgery. Traditionally, peritoneal access has been obtained by a transabdominal  
10 approach. The Veress needle, which was originally developed to perform pleurodesis in tuberculosis patients, is commonly used to access the abdominal cavity and provide pneumoperitoneum. One disadvantage is the blind placement of the needle into the abdomen and the risk of injury to adjacent organs and blood vessels.

One method, reported in 1971 by Harry Hasson and now called the open technique, has  
15 overcome this blind entry to access the peritoneal cavity (Hasson, H. M. A modified instrument and method for laparoscopy. Am J Obstet Gynecol 110: 886-887; 1971). Also, some advances in optical trocar design have allowed for visualizing entry with the use of the laparoscope that often, but not necessarily, requires prior pneumoperitoneum. However, these techniques continue to use trans-abdominal entry, most commonly through the  
20 umbilicus, with the attributed risk for vital organ and vascular injury using this approach.

The laparoscopic instrument can allow for direct entry into the posterior cul-de-sac, or Pouch of Douglas, through the posterior portion of the vagina, which is perhaps the safest access site into the abdominal cavity. As the vagina is elastic, the posterior apex of the vagina is displaced away from the rectosigmoid, and provides a safe entry even in difficult surgical  
25 procedures. Combined with the relative ease of repair of the incision, colpotomy access to the abdominal cavity is safe for patients and convenient for surgeons.

Laparoscopic instrument **1** is introduced into vagina **100**, distal end first, to the upper portion of a patient's vagina and posterior to the cervix in a patient with a uterus/cervix **101** intact, as seen in Figure 8. Inflatable balloon **10** is oriented to approximately at the opening of the  
30 vagina. An air pump or other air source, such as CO<sub>2</sub> gas, is connected to inflatable channel **4**, and air flowed through inflatable channel **4** to inflate inflatable balloon **10**, thereby occluding the outlet of the vagina to prevent loss of pneumoperitoneum during surgery.

The raised features **8** provide a visual and haptic target for placement of an incision in the posterior cul-de-sac (i.e. pouch of Douglas) **103** by the surgical instruments inserted into  
35 abdominal cavity **104** during traditional laparoscopic surgery. Raised features **8** enable the laparoscopic surgeon to make a transverse incision between these elevated surfaces at the apex of the vagina. This type of incision in the posterior vaginal wall is called a posterior colpotomy, and is technically challenging for most surgeons to perform without a visible or tactile guide. The incision is made from above, or within the abdominal cavity, using

5 laparoscopic instruments, and accordingly requires that pneumoperitoneum has already been obtained.

An incision was made in the pouch of Douglas and distal end **6** of laparoscopic instrument **1** was placed into the incision. Alternatively, a posterior colpotomy incision can be made, through which the distal end of the sheath may be introduced directly. Upon creation of the vaginal incision, the surgeon positioned distal end cap **35** such that insufflation channel **31**  
10 was directed toward the abdominal cavity. An air source, or CO<sub>2</sub> gas, was attached to insufflation port **30** and pneumoperitoneum established.

Sheath opening **9** was aligned with the vaginal incision and actuator mechanism **5** advanced distally, causing deployment arm **42** to advance distally and extending specimen bag **40**  
15 through sheath opening **9**, through the vaginal incision and into the patient's abdominal cavity. Upon insertion into the patient's abdomen, deployable ring **11** rebounded to its preformed shape, opening specimen bag **40**, as seen in Figures 7 and 9. When deployable ring **11** is clear of sheath opening **9** and the vagina incision, the deployable ring springs open to a diameter that is sufficiently large to accommodate a specimen **50**. The deployable ring and  
20 open end of the specimen bag are held in place by the actuator mechanism.

Specimen **50** is placed into specimen bag **40** with laparoscopic tools, as seen in Figure 9. After placement of specimen **50** into specimen bag **40**, the surgeon pulls on actuator mechanism **5**, causing the deployable ring **41** to retract into sheath **2**, thereby causing the deployable ring to return into the sheath and closing the specimen bag **40**. Inflatable balloon  
25 **10** was then deflated, and actuator mechanism **5** retracted, withdrawing specimen bag **40** at least partially into sheath **2**. Sheath **2** was thereafter removed from the vagina, removing the specimen. Depending on size, specimen **50** may be removed by enlarging the incision in the vagina, or may be morcellated within the specimen bag in the abdominal cavity to facilitate removal of the specimen bag through the incision in the vagina.

### 30 **Example**

Laparoscopic instrument **1** optionally comprises a curved sheath **2**, having a specific radius to assist in the placement of device, as seen in Figure 10. The curve of the sheath permits the vagina to be moved out of the way of the surgeon during surgical procedures. The laparoscopic instrument is introduced into the vagina at an angle, distal end first, to the upper  
35 portion of a patient's vagina and posterior to the cervix in a patient with a uterus/cervix intact. Inflatable balloon **10** is oriented as described above and inflated using an air source, such as CO<sub>2</sub> gas, to occlude the outlet of the vagina as in the previous examples.

Optional raised features **8** are provided as described in the previous examples and an incision made in the pouch of Douglas and distal end **6** of laparoscopic instrument **1** was placed into  
40 the incision. The surgeon positions distal end cap **35** toward the abdominal cavity and

5 pneumoperitoneum established using an air source, like CO<sub>2</sub> gas, as described in previous examples. Specimen bag **40** is utilized to collect specimen **50** as described in the previous examples. During the surgical procedure, where the surgeon requires translation of the vagina, for example to retract the vagina from the surgical field, the surgeon may articulate the handle, thereby rotating the curved sheath and the vagina.

#### 10 **Example**

Access to the pouch of Douglas can be made by simply cutting through the vagina, posterior to the cervix, without requiring pneumoperitoneum. After the surgeon introduces the sheath through the colpotomy, inflatable balloon **10** is inflated, and actuator mechanism **5** advanced distally, deploying specimen bag **40** into the patient's abdominal cavity. The surgeon has the  
15 option of insufflating the patient using insufflation channel **31** and insufflation port **30**, located at the proximal end of laparoscopic instrument **1**, or maintain pneumoperitoneum following sheath placement.

After placement of the specimen into the collection bag, the surgeon retracts the specimen bag using actuator mechanism **5**, causing deployable ring **41** to retract into the sheath,  
20 thereby closing the specimen bag. The inflatable balloon **10** is deflated, and the sheath is removed from the vagina, leaving the closed specimen bag in place. The bag may be attached to a string to facilitate removal. For example, a string attached to the bag opening using a noose or other sliding knot, allowing the surgeon to close the bag and remove the bag concurrently. The bag may be removed by enlarging the incision in the vagina, or by  
25 morcellating the specimen within the bag in the abdominal cavity to facilitate removal through the existing incision in the vagina. The colpotomy incision may then be closed laparoscopically or through the vagina using standard suturing techniques.

#### **Example**

Laparoscopic instrument **1** is used to remove a structure from the female reproductive  
30 system, such as a hysterectomy. The laparoscopic instrument is introduced into the vagina and inflatable balloon **10** is oriented as described above and inflated using an air source, such as CO<sub>2</sub> gas, to occlude the outlet of the vagina as in the previous examples. Specimen bag **40** is utilized is utilized to collect specimen **50** as described in the previous examples.

#### **Example**

35 Laparoscopic instrument **1** optionally comprises a curved sheath **2**, comprising interstitial space **60**, seen in Figure 11. Instrument channel **65** is disposed in curved sheath **2**, and is adapted to accept laparoscopic surgical tools, such as instruments, implants, sponges, needles or other objects. The instrument channel is fixed within interstitial space **60** on the proximal and distal ends of the instrument channel to the interior walls of curved sheath **2** by

5 means known in the art, such as thermal welding. Alternatively, instrument channel **65** is formed in a solid curved sheath **2**, i.e. the instrument channel forms interstitial space **60**, as seen in Figure 12. Instrument seal **50** is disposed on the proximal end of instrument channel **65** and forms a seal against any laparoscopic tools used, thereby maintaining pneumoperitoneum. Instrument channel **65** may have a curve or be straight, fitting in sheath **2** as seen in Figure 12, and may end in the distal end of sheath **2** or on the wall of the sheath **2**, as seen in Figure 13. Insufflation port **30** is disposed on instrument seal **50**, distally to the seal itself, thereby providing a means for the surgeon to establish pneumoperitoneum. Optionally, insufflation port **30** is in fluid communication with the proximal end of insufflation channel **31**, which runs the length of the laparoscopic instrument or a portion thereof.

10

15 Distal end **6** of sheath **2** ends in a rounded tip, seen in Figure 12, facilitating insertion of the laparoscopic instrument with minimal risk of injury. Lower raised features **8a** and upper raised features **8b**, seen in Figures 14 and 15, are used to orient the laparoscopic instrument. The raised features provide a visual and/or haptic guide during surgery, though may also provide a lip function to protect the patient from injury during introduction of instruments that may

20 have blades or other sharp components. Optionally, the at least upper and lower feature, are alternatively a lip which completely encircles the opening.

The laparoscopic instrument may be used intravaginally, as described above, or inserted into the abdomen through an opening, as in abdominal laparoscopic surgeries. The upper and lower raised features, **8a** and **8b**, are used to orient the instrument adjacent to the abdominal

25 side of the vaginal wall and an incision made, permitting access to the vagina. Sheath opening **9** was moved adjacent to the opening in the vaginal wall and instruments inserted into the vagina and surgery performed. Where a tissue is removed, it may be placed into a specimen bag and removed through laparoscopic instrument **1** or through the vagina using a string.

30 In the preceding specification, all documents, acts, or information disclosed do not constitute an admission that the document, act, or information of any combination thereof was publicly available, known to the public, part of the general knowledge in the art, or was known to be relevant to solve any problem at the time of priority.

The disclosures of all publications cited above are expressly incorporated herein by

35 reference, each in its entirety, to the same extent as if each were incorporated by reference individually.

While there has been described and illustrated specific embodiments of an transvaginal specimen extractor, it will be apparent to those skilled in the art that variations and modifications are possible without deviating from the broad spirit and principle of the present

40 invention. It is intended that all matters contained in the foregoing description or shown in the

- 5 accompanying drawings shall be interpreted as illustrative and not in a limiting sense. It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

- 5 What is claimed is:
1. A laparoscopic instrument, comprising:
    - a tubular shaft having a proximal end and a distal end;
    - at least one interstitial space disposed in the tubular shaft; and
    - an opening disposed on the tubular shaft wall on the distal end of the shaft,  
10 extending from the at least one interstitial space to the exterior of the tubular shaft.
  2. The laparoscopic instrument of claim 1, further comprising a closed hemispherical end disposed on the distal end of the shaft.
  3. The laparoscopic instrument of claim 1, further comprising at least one raised feature  
15 along the edge of the access opening.
  4. The laparoscopic instrument of claim 1, wherein the tubular shaft is made of plastic, resin, or metal.
  5. The laparoscopic instrument of claim 1, further comprising a handle disposed on the proximal end of the shaft.
  - 20 6. The laparoscopic instrument of claim 1, further comprising an insufflation port disposed on the proximal end of the laparoscopic instrument.
  7. The laparoscopic instrument of claim 6, wherein the insufflation port is disposed on a handle, wherein the handle is disposed on the proximal end of the tubular shaft.
  8. The laparoscopic instrument of claim 6, further comprising an insufflation channel  
25 disposed in the interstitial space of the tubular shaft having a proximal end and a distal end, wherein the insufflation channel is in fluid communication with the insufflation port on the proximal end of the insufflation channel.
  9. The laparoscopic instrument of claim 7, wherein the distal end of the channel is disposed on the distal end of the tubular shaft.
  - 30 10. The laparoscopic instrument of claim 1, wherein the tubular shaft is curved.
  11. The laparoscopic instrument of claim 1, further comprising an inflatable balloon disposed on an exterior face of the tubular shaft and wherein the inflatable balloon is in fluid communication with an inflation source.
  12. The laparoscopic instrument of claim 11, wherein the inflatable balloon is in fluid  
35 communication with a distal end of an inflation channel, where the inflation channel is disposed on an exterior face of the tubular shaft or disposed on an interior face of the tubular shaft.

- 5           13. The laparoscopic instrument of claim 12, wherein a proximal end of the inflation channel is in fluid communication with an inflation port.
14. The laparoscopic instrument of claim 1, further comprising at least one surgical instrument channel disposed in the interstitial space of the tubular shaft, wherein the at least one instrument channel runs the length of the tubular shaft and has a proximal end and a distal end;
- 10           at least one instrument seal disposed on the proximal end of the instrument channel.
15. The laparoscopic instrument of claim 1, further comprising:
- a deployable specimen collector disposed within the tubular shaft, further comprising:
- 15           a specimen bag having an open end and a closed end;
- a deployable ring disposed on the open end of the specimen bag;
- a specimen bag support in communication with the deployable ring, wherein the specimen bag support is connected to an actuator mechanism;
- 20           wherein the deployable ring is disposed adjacent to the specimen bag opening; and
- the actuator mechanism disposed along the length of the shaft or a portion thereof.
- 25           16. A method of performing laparoscopic removal of a specimen from a patient, comprising the steps:
- providing a laparoscopic instrument, wherein the laparoscopic instrument comprises
- a tubular shaft having a proximal end and a distal end;
- 30           a specimen bag opening disposed on the tubular shaft wall on the distal end of the shaft;
- a deployable specimen collector disposed within the tubular shaft, further comprising
- a specimen bag having an open end and a closed end;
- 35           a deployable ring disposed on the open end of the specimen bag;

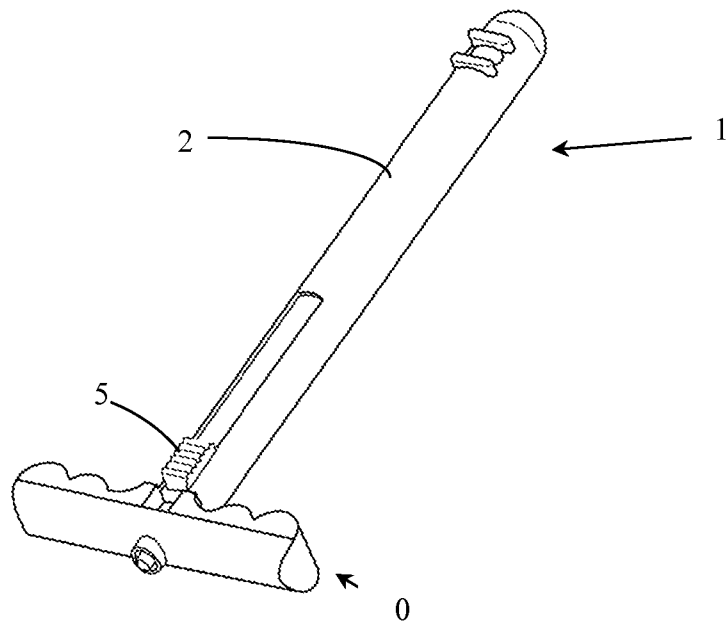
- 5 a specimen bag support in communication with the  
deployable ring, wherein the specimen bag support is  
connected to an actuator mechanism;
- wherein the deployable ring is disposed adjacent to the  
specimen bag opening;
- 10 the actuator mechanism disposed along the length of the shaft or a  
portion thereof;
- introducing the laparoscopic instrument into a patient's vagina;  
positioning the laparoscopic instrument adjacent to a structure in the vagina;  
extending the specimen bag through the specimen bag opening;
- 15 placing the specimen in the specimen bag;  
retracting the specimen bag; and  
withdrawing the laparoscopic instrument from the patient's vagina.
17. The method of claim 16, further comprising insufflating the patient comprising the  
steps:
- 20 providing an insufflation system in the laparoscopic instrument, wherein the  
insufflation system comprises
- a closed insufflation system, further comprising:
- an insufflation port disposed on the proximal half of the  
laparoscopic instrument;
- 25 an insufflation channel having a proximal end and distal end,  
wherein the proximal end is in fluid communication with the  
insufflation port;
- a port disposed on the distal end of the laparoscopic  
instrument, wherein the distal end of the insufflation channel  
is in fluid communication with the port;
- 30 an open insufflation system, further comprising
- an insufflation port disposed on the proximal half of the  
laparoscopic instrument, wherein a distal end of the  
insufflation port is in fluid communication with the interstitial  
space of the tubular shaft;
- 35 introducing a fluid into the insufflation system, wherein the fluid insufflates the  
patient.
18. The method of claim 17, wherein the fluid is air or CO<sub>2</sub> gas.
19. The method of claim 16, further comprising sealing the vaginal opening to maintain  
40 insufflation, comprising the steps:

5 providing an inflatable balloon on the laparoscopic instrument, wherein the inflatable balloon is disposed on an exterior face of the tubular shaft and wherein the inflatable balloon is in fluid communication with an inflation source;

10 introducing a fluid into the inflatable balloon, wherein the fluid inflates the inflatable balloon.

20. The method of claim 19, wherein the fluid is air or CO<sub>2</sub> gas.

A



B

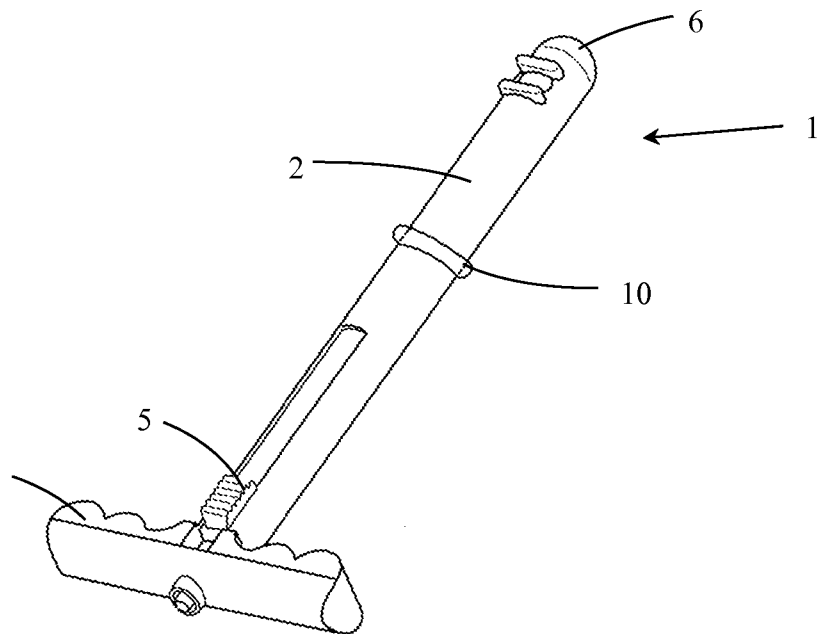


Figure 1.

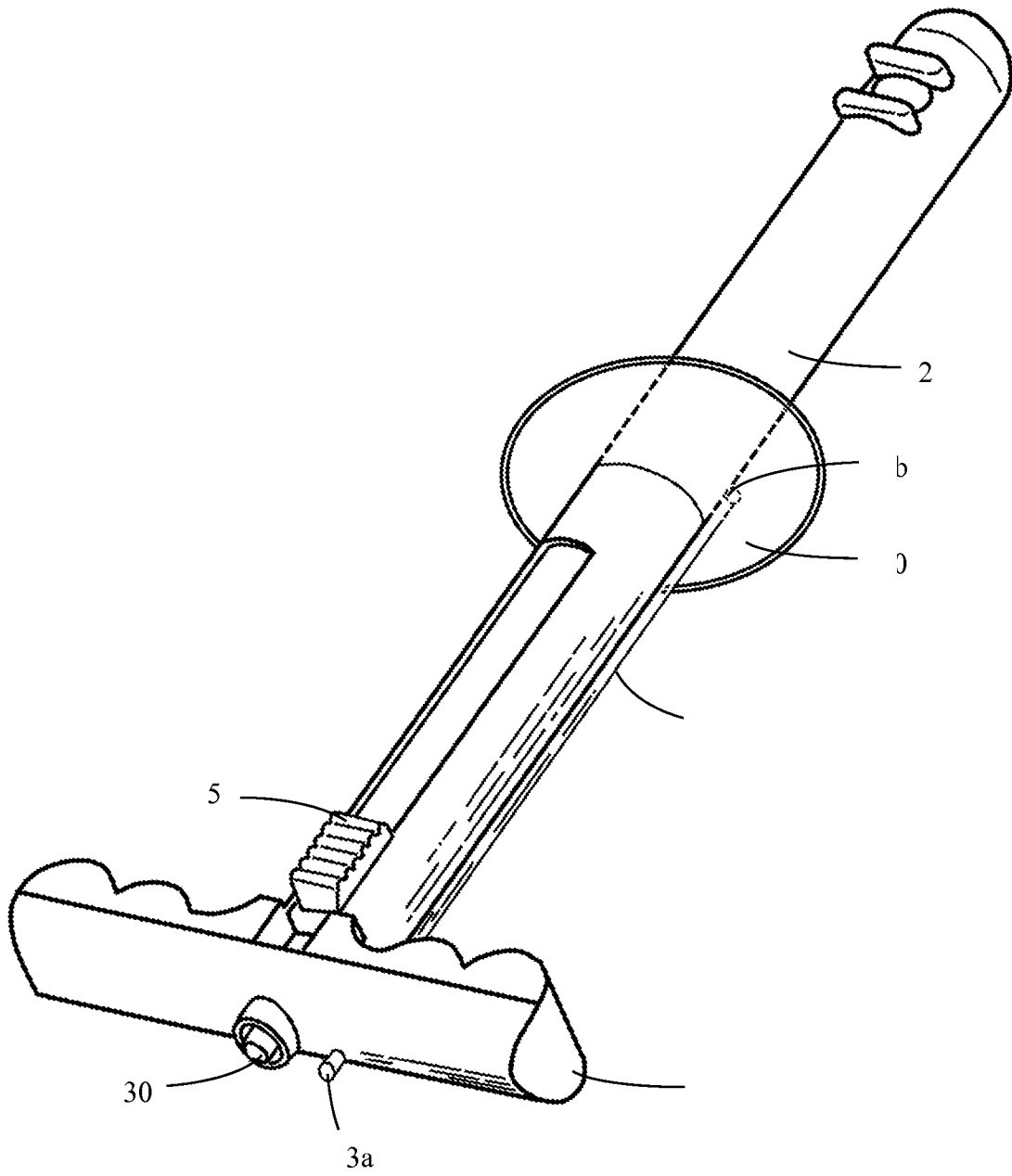


Figure 2.

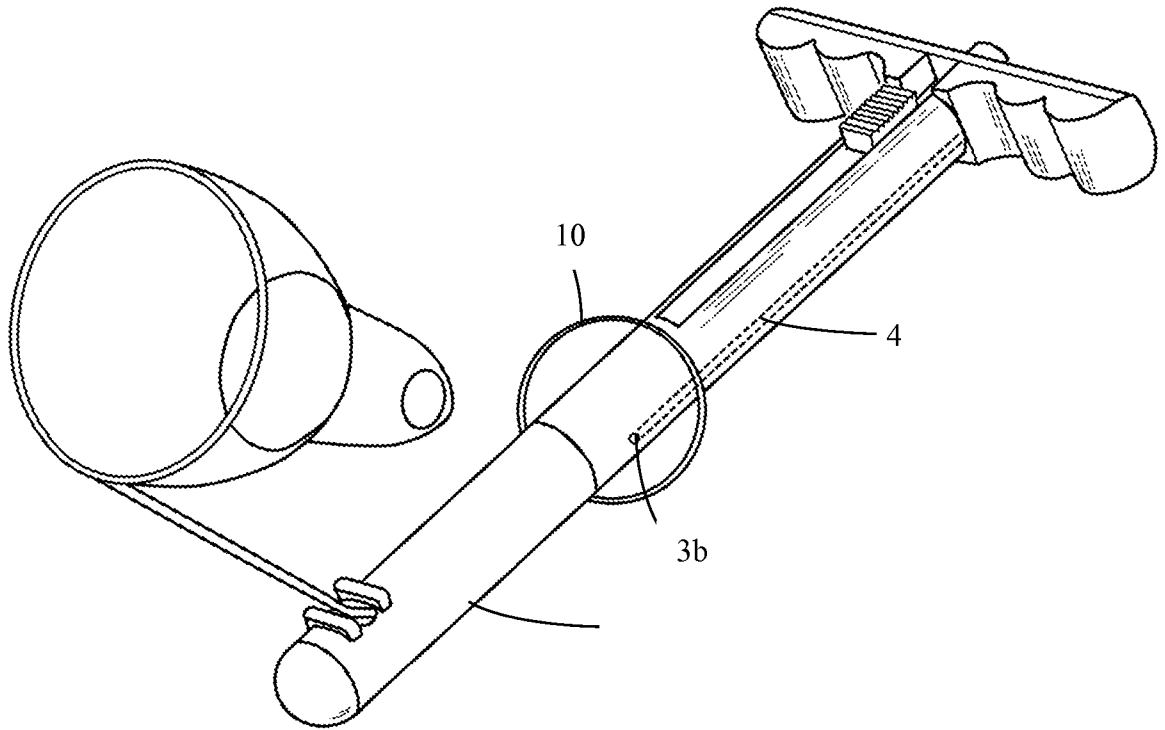


Figure 3.

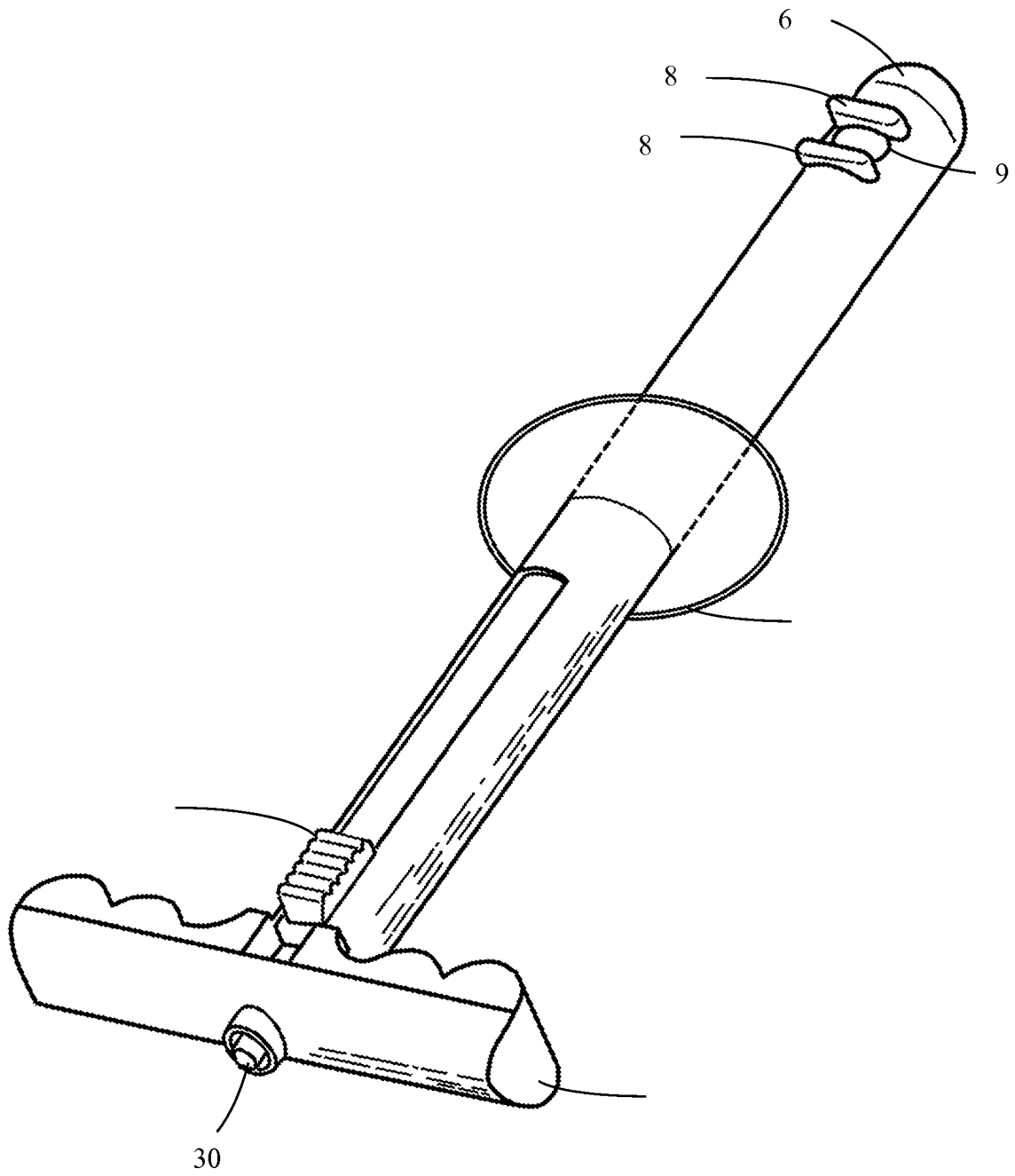


Figure 4.

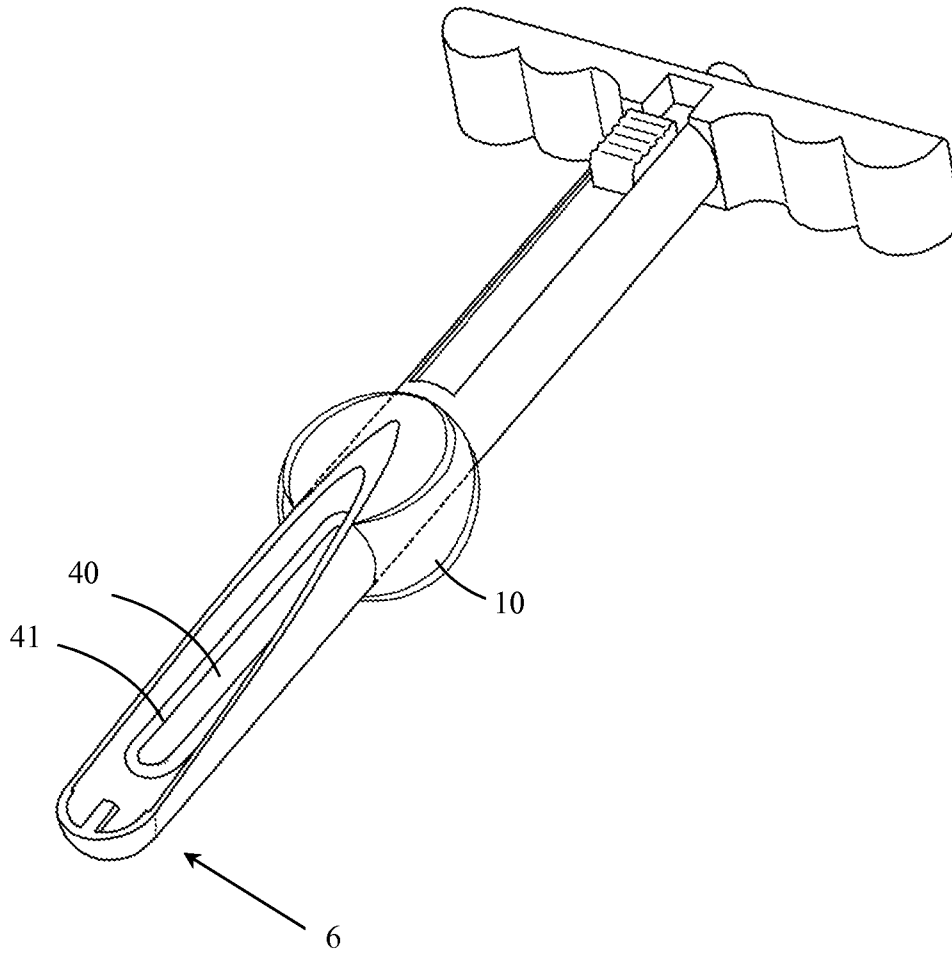


Figure 5.

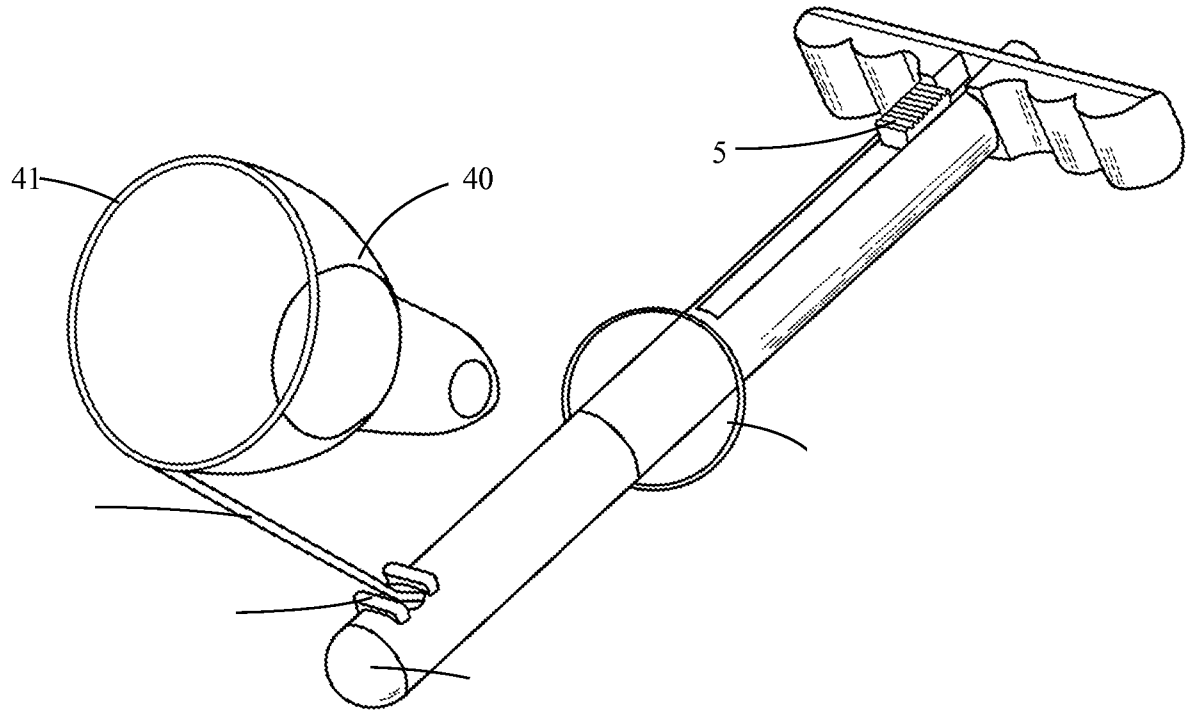


Figure 6.

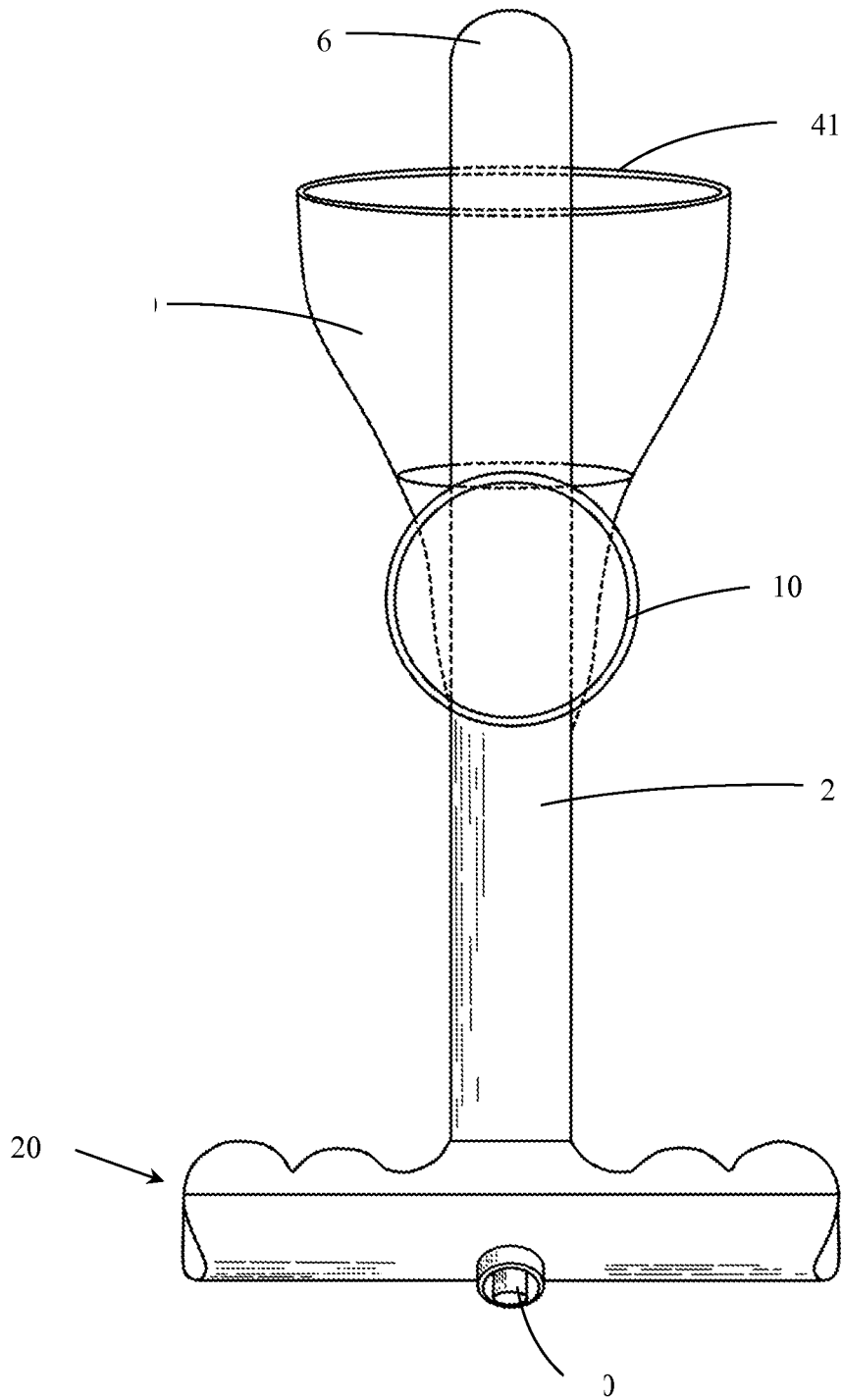


Figure 7.

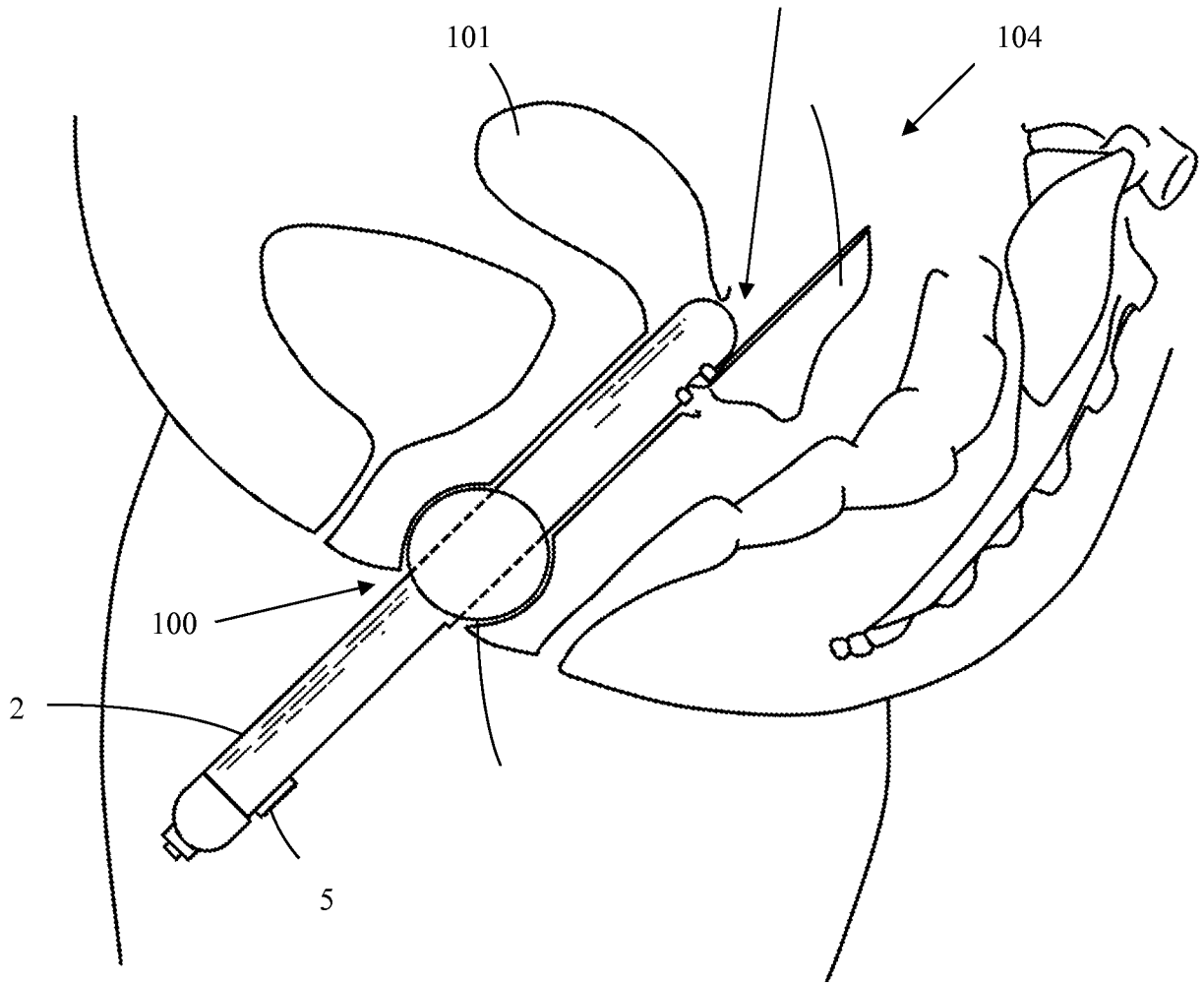


Figure 8.

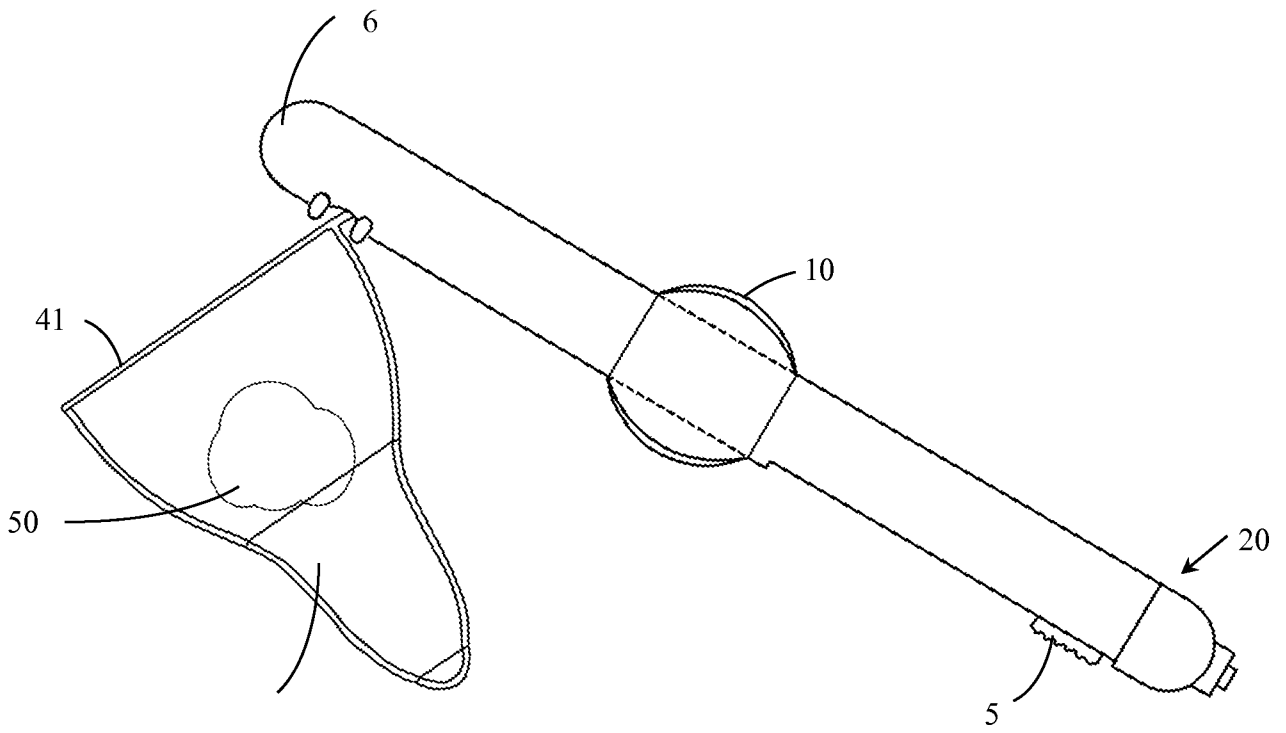


Figure 9.

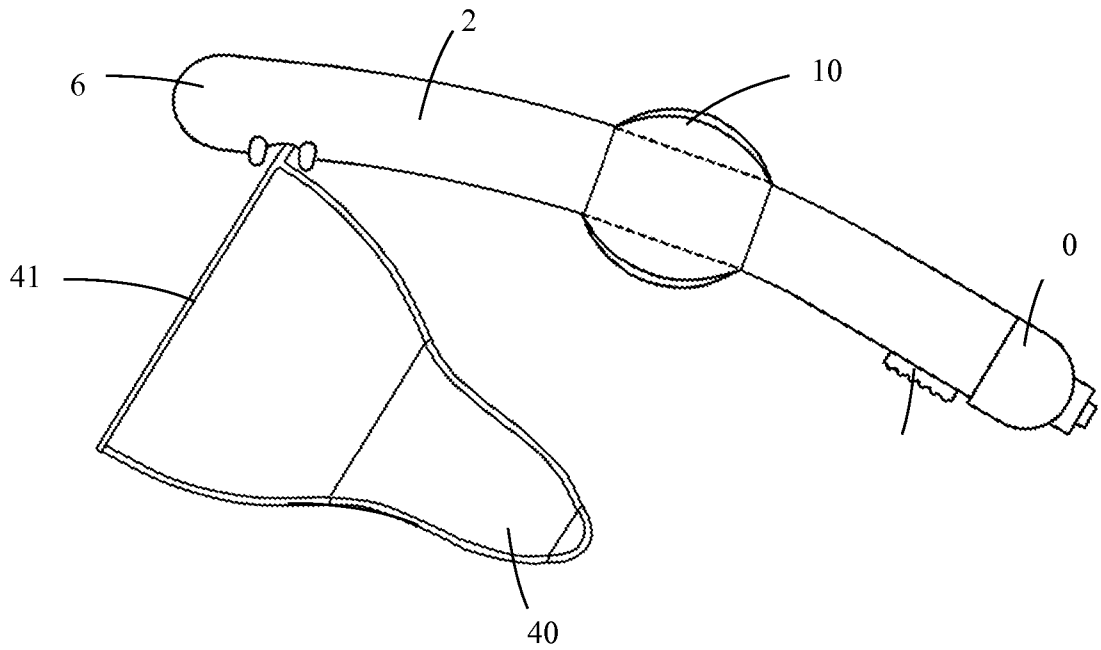


Figure 10.

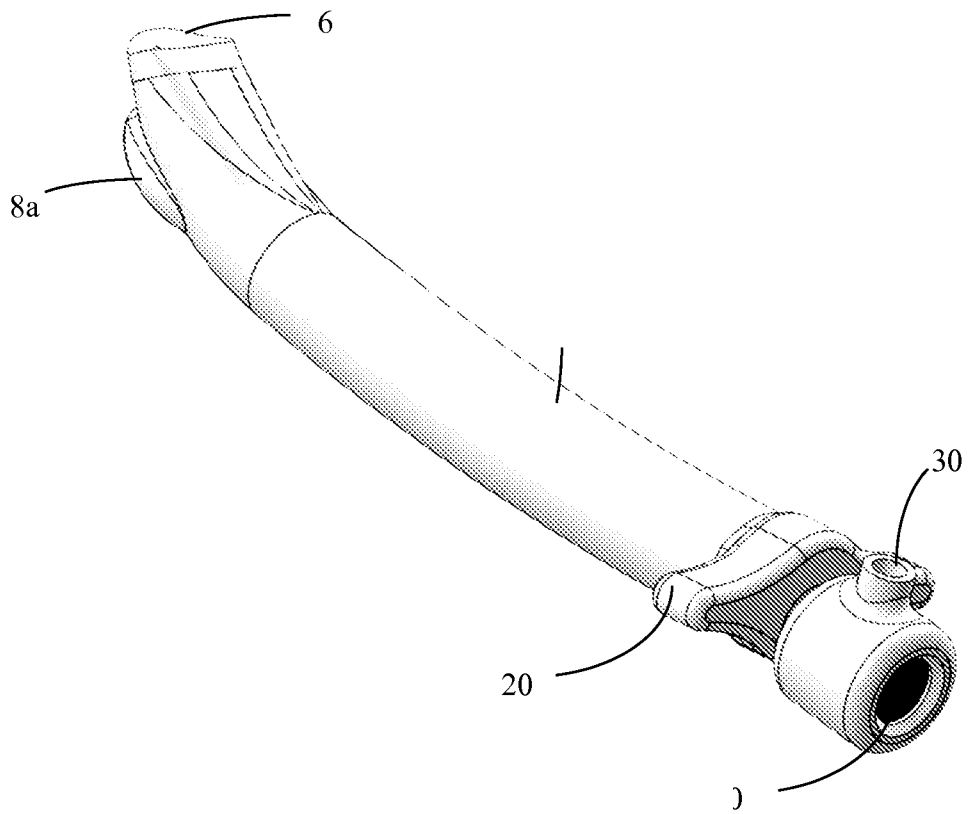


Figure 11.

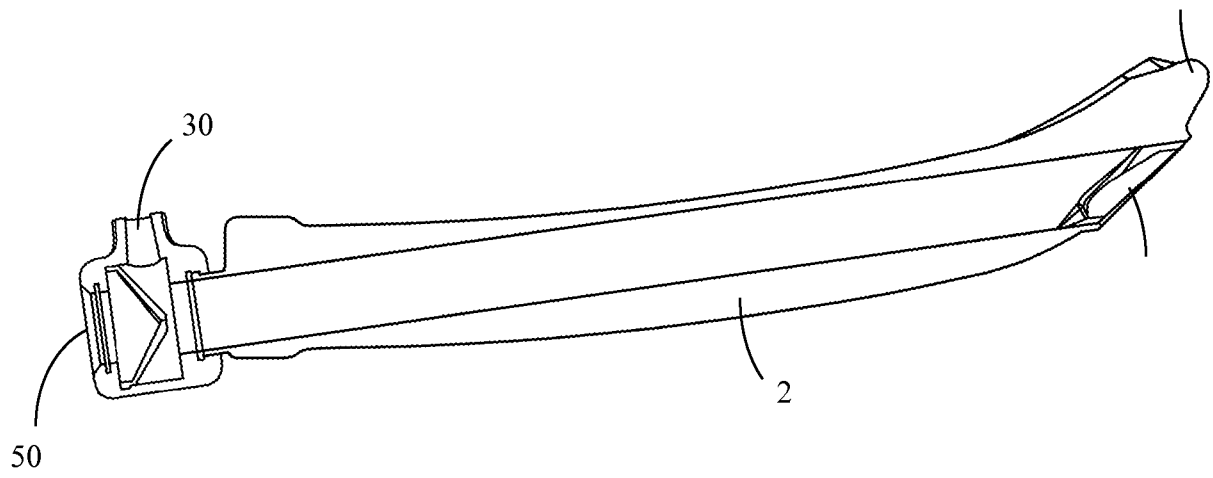


Figure 12.

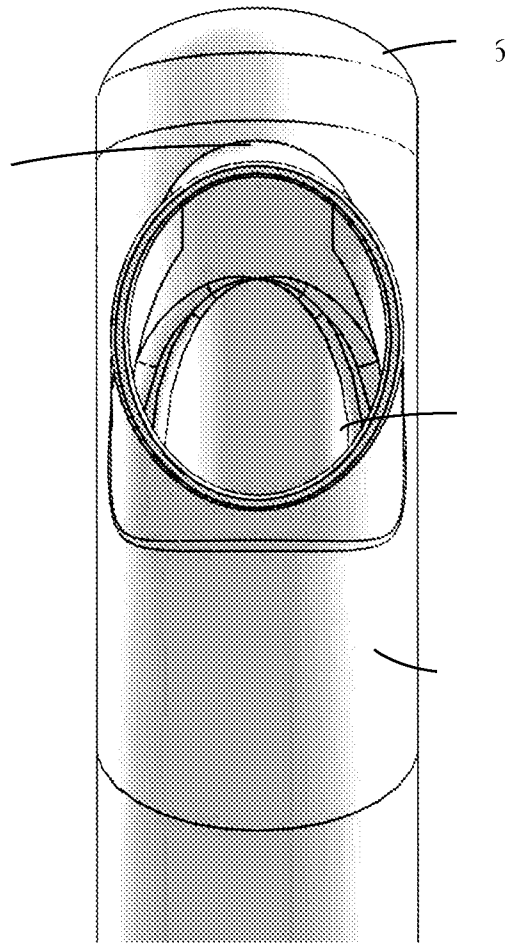


Figure 13.

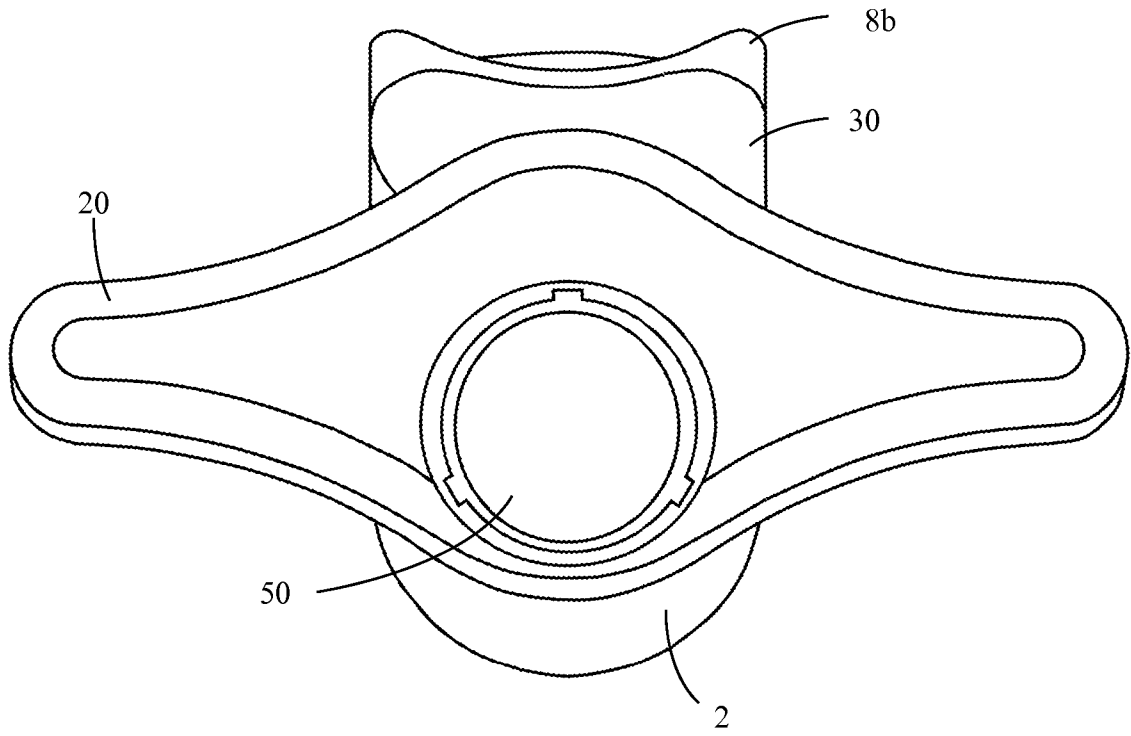


Figure 14.

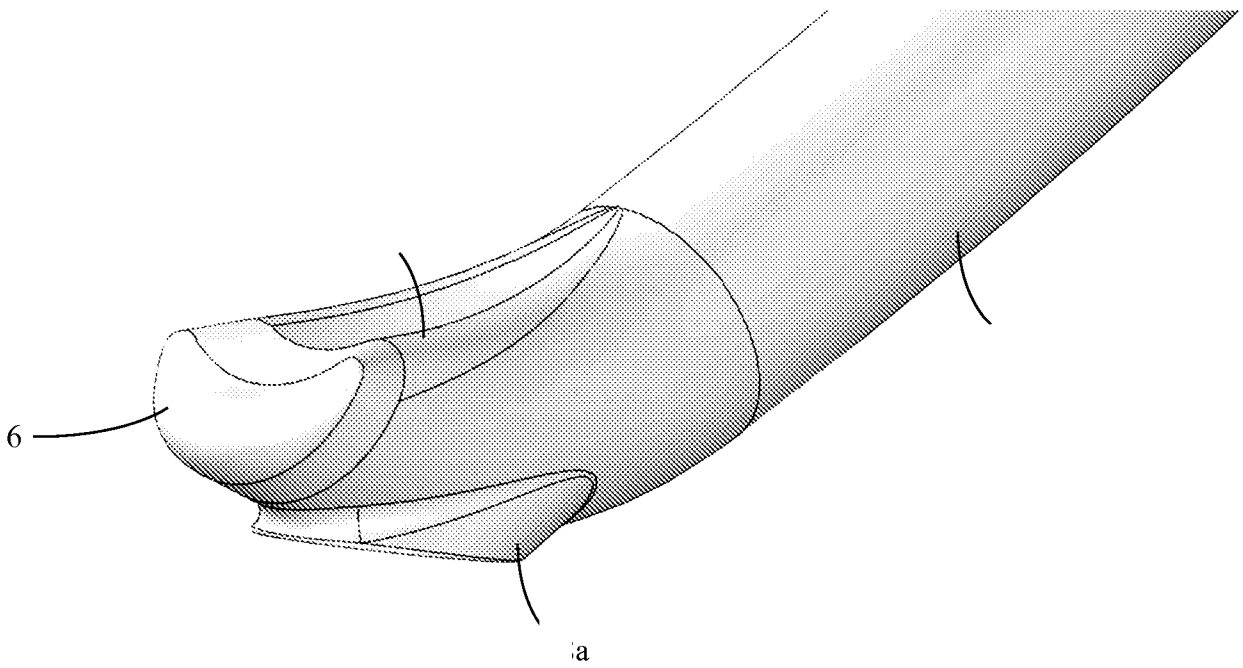


Figure 15.

**INTERNATIONAL SEARCH REPORT**

International application No.  
**PCT/US2012/070147**

**A. CLASSIFICATION OF SUBJECT MATTER**

*A61B 10/04(2006.01)i, A61B 17/94(2006.01)i, A61B 1/313(2006.01)i, A61B 17/42(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)

A61B 10/04; A61M 31/00; A61B 17/42; A61B 18/14; A61B 10/00; A61B 17/32; A61B 1/04

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

Korean utility models and applications for utility models  
Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & keywords: transvaginal, laparoscopic, inflatable, balloon, specimen, insufflation

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6544248 B1 (BASS, L. S.) 8 April 2003 See abstract; column 6, line 67; column 6, lines 64-65; column 7, lines 5-6;	1-5,10
Y	column 8, lines 5-6; claim 1; and fig. 1.	6,8,11-13,15
A		7,9,14
Y	US 5643285 A (ROWDEN, J. M. et al.) 1 July 1997	6,8,11-13
A	See abstract; column 4, lines 3-6; and fig. 1.	1-5,7,9-10,14-15
Y	US 2004-0138587 A1 (LYONS, IV, W. L.) 15 July 2004	15
A	See abstract; paragraph [0072]; claim 1; and figs. 1-2, 4.	1-14
A	US 6572631 B1 (MCCARTNEY, A. J.) 3 June 2003	1-15
	See abstract; column 4, lines 36-39; column 4, lines 62-67; column 5, lines 5-11; claim 1; and figs. 5-6.	
A	US 2010-0305566 A1 (RISENBLATT, P. L. et al.) 2 December 2010	1-15
	See abstract; paragraphs [0068]-[0070]; claims 1-2, 7; and figs. 5-7.	

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance  
"E" earlier application or patent but published on or after the international filing date  
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)  
"O" document referring to an oral disclosure, use, exhibition or other means  
"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art  
"&" document member of the same patent family


Date of the actual completion of the international search

17 April 2013 (17.04.2013)

Date of mailing of the international search report

**22 April 2013 (22.04.2013)**

Name and mailing address of the ISA/KR

 Korean Intellectual Property Office  
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan  
City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

HAN, In Ho

Telephone No. 82-42-481-3362



# INTERNATIONAL SEARCH REPORT

International application No.

**PCT/US2012/070147**

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6440061 B1 (WENNER, D. E. et al.) 27 August 2002 See abstract: column 11, lines 17-27; claims 1, 3-4; and figs. 1, 3, 5.	1-15

# INTERNATIONAL SEARCH REPORT

International application No.

**PCT/US2012/070147**

## Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: 16-20  
because they relate to subject matter not required to be searched by this Authority, namely:  
Claims 16-20, pertain to methods for treatment of the human and thus relate to a subject-matter which this International Searching Authority is not required, under Article 17(2)(a)(i) of the PCT and Rule 39.1(iv) of the Regulations under the PCT, to search.
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

- Remark on Protest**
- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
  - The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
  - No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2012/070147**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6544248 B1	08.04.2003	US 2003-0176851 A1	18.09.2003
		US 2005-0256498 A1	17.11.2005
		US 2009-0143717 A1	04.06.2009
		US 6918903 B2	19.07.2005
		US 7462176 B2	09.12.2008
US 5643285 A	01.07.1997	EP 0786962 A1	06.08.1997
		EP 0786962 A4	16.09.1998
		EP 0786962 B1	21.01.2004
		JP 10-507384 A	21.07.1998
		WO 96-11641 A1	25.04.1996
US 2004-0138587 A1	15.07.2004	WO 2004-064669 A2	05.08.2004
		WO 2004-064669 A3	14.04.2005
US 6572631 B1	03.06.2003	EP 0726727 A1	21.08.1996
		EP 0726727 A4	02.05.1997
		EP 0726727 B1	21.04.2004
		JP 09-503936 A	22.04.1997
		KR 10-0416489 B1	12.06.2004
		US 2005-0261714 A1	24.11.2005
		US 2007-0112356 A1	17.05.2007
		US 8082925 B2	27.12.2011
WO 95-10973 A1	27.04.1995		
US 2010-0305566 A1	02.12.2010	JP 2011-505203 A	24.02.2011
		WO 2009-073619 A2	11.06.2009
US 6440061 B1	27.08.2002	AU 2001-249333 B2	18.11.2004
		AU 2001-49333 A1	08.10.2001
		AU 4933301 A	08.10.2001
		BR 0109511 A	13.01.2004
		CA 2403970 A1	04.10.2001
		EP 1267700 A1	02.01.2003
		EP 1267700 A4	02.04.2003
		EP 1267700 B1	27.07.2005
		WO 01-72209 A1	04.10.2001

专利名称(译)	经阴道标本提取装置		
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外部链接	<a href="#">Espacenet</a>		

#### 摘要(译)

在腹腔镜手术中，在腹壁上制作小的（直径5-12mm）切口，通过该切口，器械解剖并移除直径可能为几厘米的样本。去除样品通常需要扩大这些切口或粉碎样品以通过亚厘米端口。腹腔镜装置允许使用阴道提取要在雌性中移除的样本，阴道具有足够的弹性以适应大样本的移除。阴道的后部通过一些组织层与腹部连通，并且远离重要的解剖结构。利用阴道是最佳的，因为它易于进入腹部和修复，最小的疤痕和术后疼痛，以及手术后更快的恢复。可展开的收集袋容纳在护套中，护套展开到阴道或腹腔中以通过阴道抽取大的（多厘米）样本。可选的吹气系统和可充气气囊以维持肺气管，可用于减少所需的腹腔镜端口的数量。