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**(54) ELECTROSURGICAL ELEMENT AND UTERINE MANIPULATOR FOR TOTAL LAPAROSCOPIC HYSTERECTOMY**

ELEKTROCHIRURGISCHES ELEMENT UND GEBÄRMUTTERSTIMULATOR FÜR UMFASSENDE LAPAROSkopISCHE HYSTEREKTOMIE

ÉLÉMENT ÉLECTROCHIRURGICAL ET MANIPULATEUR UTÉRIN POUR HYSTÉREKTOMIE  
TOTALE LAPAROSCOPIQUE

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**Description**Technical Field

**[0001]** The present invention relates generally the field of surgical devices, and more particularly the invention relates to an improvement to a uterine manipulator device used for total laparoscopic hysterectomy procedures.

Background Art

**[0002]** Various surgical procedures that are performed on women require that the women's uterus be manipulated such that the physician can view the uterus and cervix properly. Typical of these examinations and procedures would be a complete total laparoscopic hysterectomy, a partial laparoscopic hysterectomy, a colpotomy, as well as other procedures and examinations. Generally, during the performance of a laparoscopic procedure, a small incision is made in the wall of the abdomen and a laparoscope is inserted therethrough to permit visualization of the peritoneal cavity and the uterus.

**[0003]** According to multiple published reports, more than 600,000 hysterectomies are performed annually in the United States alone. Conventional hysterectomy surgical procedures typically involve one of four approaches—vaginal hysterectomy (VH), total abdominal hysterectomy (TAH), total laparoscopic hysterectomy (TLH), and laparoscopically assisted vaginal hysterectomy (LAVH). Vaginal, LAVH, and TLH have become more popular among surgeons because these approaches are less invasive than TAH, with VH being the least invasive approach. Close to 12% of those surgeries are done by a minimally invasive approach or laparoscopically, translating this into more than 70,000 surgeries annually in the United States, alone. VH is considered the least invasive; however, many women are not candidates for VH secondary to large uterus, previous surgery, and presence of adhesions. Unless medical indications require TAH (such as in the case of tumor removal and the associated need to avoid cell spillage), vaginal, TLH and LAVH are usually viewed as more preferable because each is less invasive when compared to major abdominal surgery. Thus, TLH and LAVH approaches usually result in shorter hospitalization and recovery times. With more advance instrumentation and better training of the gynecologic surgeons, the number of hysterectomies is expected to grow ever higher.

**[0004]** Difficulty, however, is encountered when employing TLH and LAVH techniques due to inherent limitations on visibility, anatomical identification, and the ability to manipulate organs (especially the uterus). In the case of TLH, these limitations are particularly pronounced because of higher degree of difficulty in securing the uterine arteries and cardinal ligaments associated with this approach. Altogether, TLH becomes a longer procedure, increasing intraoperative complications risks. During TLH, separation of the uterus and the cervix from

the vagina remains one of the most difficult and cumbersome steps of the procedure. A higher degree of surgical difficulty has been found empirically to give rise to an increased risk of inadvertent damage to or dissection into the bladder, ureters, uterine vessels, and uterosacral and cardinal ligaments during the surgical procedure. Although the risk of inadvertent damage, for example, to the ureters can be minimized by the insertion of ureteral stents and/or peritoneal dissection to delineate ureter location, such techniques increase the complexity and the cost of the hysterectomy, and was not found to be effective.

**[0005]** A number of instruments have been developed to assist the physician in visualizing the uterus and facilitating the performance of these various examinations and procedures. Typical of these prior art instruments are those which are described in U.S. Pat. Nos. 3,926,192 to Van Maren; 4,000,743 to Weaver; 4,976,717 to Boyle; and 4,997,419 to Lakatos et al. The patent to Van Maren is directed to a medical instrument that is inserted into the vagina and passes through the cervix to enter the uterus. A cup-shaped member is provided whose end wall is connected to a source of vacuum, the cup-shaped member including a conical element designed to be placed against the cervical os. The patent to Weaver describes a uterine anteverter that includes an arcuately curved shield, which limits the distance a manipulating arm can be extended into the uterine cavity.

**[0006]** U.S. Patent No. 5,209,754 to Ahluwalia describes a vaginal cervical retractor used to maneuver and visualize the uterus during various medical examinations and procedures. The Ahluwalia device has been commercialized by ConMed Corporation under the title Vcare for the Vaginal-Cervical Ahluwalia Retractor-Elevator.

**[0007]** US2001021854 relates to a uterine manipulator comprising at least (i) a handle which has a longitudinal axis, (ii) an arm which also has a longitudinal axis with a distal end connecting it to the handle and a proximal end, and (iii) a head which has a longitudinal axis and which is attached to the proximal end of the arm, the shape and length of said arm being sufficient to allow the head of said arm to be introduced into the vaginal cavity, characterized in that said head is provided with a sectioning device arranged on a support, allowing the vaginal wall to be sectioned, this sectioning device being arranged at a certain distance from the longitudinal axis of the head and being able to perform a rotating movement, preferably of 360 degrees, about said longitudinal axis.

**[0008]** US 5209754 relates to a vaginal cervical retractor used to maneuver and visualize the uterus during various medical examinations and procedures would include an innertube provided with a movable pair of plastic caps designed to be inserted into the uterine cavity. A cervical cap is secured to this tube to insure that the tube would not extend beyond a certain distance into the uterus. A hollow outer shaft is provided into which the inner tube can be inserted.

**[0009]** Available instruments, however, do not address

the issue of difficult and time-consuming separation of the uterus and the cervix from the vagina during total laparoscopic hysterectomy. Accordingly, there is a real and unsatisfied need in the surgical arts for a simplified total laparoscopic hysterectomy device that can reduce the time of the surgical procedure, minimize blood loss during surgery, minimize the risk of infection and injury to the patient during surgery, and minimize anesthesia time.

#### Disclosure of Invention

**[0010]** Accordingly, it is an object of the present invention to provide a surgical device that avoids the disadvantages of the prior art. Specifically, it is an object of the present invention to provide a combination uterine manipulator and electrosurgical element that avoids the disadvantages of the prior art.

**[0011]** It is an object of the present invention to provide an improvement to existing uterine manipulators. A related object of the present invention is to incorporate a retractable monopolar electrode needle into a uterine manipulator.

**[0012]** It is another object of the present invention to provide a surgical device that enables improved surgical control of the operating field. A related object of the present invention is to facilitate increased patient safety by minimizing surgical manipulation. A further related object is to reduce the cost of a total laparoscopic hysterectomy by eliminating the need for multiple surgical instruments and minimize anesthesia time.

**[0013]** These and other objects of the present invention are accomplished by enabling a device that can perform a total laparoscopic hysterectomy and colpotomy while maintaining pneumoperitoneum. The device of the present invention will allow a surgeon to manipulate the uterus while simultaneously performing colpotomy during total laparoscopic hysterectomy. By utilizing a vaginal cervical retractor elevator provided with an inner rigid tubing, inner and outer cups designed to move on the inner tubing, a hollow, plastic outer shaft into which the inner tubing can be inserted, and a retractable, flexible, electrosurgical needle, the colpotomy procedure can be performed with the improved uterine manipulator.

#### Brief Description of the Drawings

**[0014]** The above and other features, aspects, and advantages of the present invention are considered in more detail, in relation to the following description of embodiments thereof shown in the accompanying drawings, in which:

Figure 1 is a side elevational view of a combination uterine manipulator and electrosurgical element according to an embodiment of the present invention.

Figure 2 is an enlarged cross-sectional view taken along lines 2-2 of Figure 1.

Figure 3 is a partial section view of the surgical device, in use, according to an embodiment of the present invention.

Figure 4 is a front elevational view of a locking and tightening collar of the surgical device according to an embodiment of the present invention.

Figure 5 is a side elevational view of the locking and tightening collar of the surgical device according to an embodiment of the present invention.

Figure 6 is a rear elevational view of a locking and tightening collar according to an embodiment of the present invention.

Figure 7 is a cross-sectional view taken along lines 7-7 of Figure 4.

#### Best Mode(s) for Carrying Out the Invention

**[0015]** The invention summarized above may be better understood by referring to the following description, which should be read in conjunction with the accompanying drawings. This description of an embodiment, set out below to enable one to build and use an implementation of the invention, is not intended to limit the invention, but to serve as a particular example thereof.

**[0016]** The present invention is an improvement of a pre-existing uterine manipulator. The improvement involves the addition of a retractable electrosurgical needle into the uterine manipulator.

**[0017]** Referring to the drawings, Figures 1 and 2 show the improved surgical instrument, indicated generally as 10, according to the present invention. The surgical instrument 10 includes a rigid manipulation shaft 14, which is used as a central assembly axis upon which the parts of the surgical instrument 10 are centered. A cervical cup 12 is molded to a manipulator tube 18 that surrounds the manipulation shaft 14. The cervical cup 12 and manipulator tube 18 act as one-piece for passage of a retractable electrosurgical needle 26 and monopolar electrode 27 through a tunnel 28. The manipulator tube 18 is slightly

thickened and provides electrical insulation for the monopolar electrode 27. In a preferred embodiment, the tunnel 28 presents approximately 2mm clearance. The manipulation shaft 14 typically comprises a metal alloy covered by a non-conductive sheath. The sheath is normally

plastic. On the distal end of the manipulation shaft 14 is an inflatable balloon 22 to stabilize the manipulator tube 18 within the uterine cavity.

**[0018]** The manipulator tube 18 is sized and configured to conform to the sacral curve and is used for positioning the cervical cup 12 and the vaginal occlusion cup 16 during insertion of the surgical instrument 10. The cervical cup 12 is provided with a funnel-like base having a tapered body approximately 20mm in length with a maximum diameter of approximately 40mm. The cervical cup 12 displaces the cervix 32 away from the ureters, retracts the urinary bladder, and defines the colpotomy incision. Also mounted on the manipulator tube 18 is a vaginal occlusion cup 16, which includes a hole therein, allowing

the uterine manipulator tube 18 to be inserted therethrough such that the vaginal occlusion cup 16 freely rotates and slides around the manipulator tube 18. The vaginal occlusion cup 16 has a tapered body approximately 25mm in length with a maximum diameter of approximately 40mm. The vaginal occlusion cup 16 prevents loss of pneumoperitoneum. When the surgical instrument 10 is inserted into the vagina 24, the cervical cup 12 surrounds and supports the cervix 32 and the vaginal occlusion cup 16 stretches the upper vaginal canal, allowing the manipulator tube 18 to perform its particular procedure.

**[0019]** Referring to Figure 3, the surgical instrument 10 can be inserted into the vagina 24 so that the cervical cup 12 surrounds the cervix 32 and at least a portion of the uterus 30. The vaginal occlusion cup 16 make an airtight seal in the vagina 24 to maintain pneumoperitoneum when a circumferential colpotomy is completed. The balloon 22 is inserted inside the uterine cavity and is inflated to stay in place in the uterus 30 by injecting air into the balloon 22, as is known in the art. Once the manipulator tube 18 and cervical cup 12 are engaged, the assembly can be locked in place on the manipulation shaft 14 using thumbscrew 38, until such time that a colpotomy needs to be performed.

**[0020]** The flexible electrosurgical needle 26 and monopolar electrode 27 are housed inside the tunnel 28 that traverses the manipulator tube 18. The electrosurgical needle 26 remains in the tunnel 28 until the surgeon is ready to use it. The proximal end of the monopolar electrode 27 is attached to a standard operating room electrosurgical generator by means of a standard monopolar cord. The attachment point of the monopolar cord to the electrode 27 is located at the proximal end of a locking collar 20, as shown in Figure 4. The locking collar 20 is used to advance and fix in place the electrosurgical needle 26. The locking collar 20 freely slides and rotates on the manipulation shaft 14, together with the manipulation tube 18 and cervical cup 12.

**[0021]** Figures 4-7 show the locking and tightening collar for the surgical instrument 10. The locking collar 20 includes a cogwheel front outer portion 20a, which is shaped as a handle for easy handling and rotation by the hand of a surgeon, and a rear star-shaped outer portion 20b. The diameter of the proximal end 19 of the manipulator tube 18 is slightly enlarged and hollowed to enable the star-shaped portion 20b to be engaged therein. The electrosurgical needle 26 is retracted and housed inside the manipulator tube 18 and cervical cup 12 by means of pulling on the locking collar 20 until ready to be engaged.

**[0022]** After completing all other necessary steps of the surgical procedure, the surgeon must be ready to perform a colpotomy, the separation of the uterus 30 and cervix 32 from the vagina 24. With the surgical instrument 10 in place, the electrosurgical needle 26 is advanced through the vaginal-cervical junction 36 into the pelvic cavity 34, under direct laparoscopic vision, by means of

advancing the locking collar 20. The star-shaped portion 20b of the locking collar 20 is engaged into a correspondingly shaped receiving well 25 on the proximal end 19 of the manipulator tube 18. In a preferred embodiment, the

5 receiving well 25 is approximately 25mm deep and is sized and configured to receive the similarly sized star-shaped portion 20b of the locking collar 20. The star-shaped portion 20b fixes the assembly of the collar 20 within the manipulator tube 18 and provides rotational torque to the manipulator tube 18, cervical cup 12, and electrosurgical needle 26.

10 The sharp point of the electrosurgical needle 26 punctures the tissue at the vaginal-cervical junction 36. The advancement of the electrosurgical needle 26 will be achieved by the cephalad sliding motion of the electrosurgical needle 26 and monopolar electrode 27 within the protective tunnel 28.

**[0023]** The monopolar electrode 27 is activated so that the electrosurgical needle 26 can then be rotated around the rigid manipulation shaft 14 as indicated by arrow 40.

15 With the star-shaped portion 20b locked in place, rotating the cogwheel 20a results in electrosurgical separation of the uterus 30 and cervix 32 from the vagina 24. By utilizing the principles of electrosurgery applied to the monopolar electrosurgical needle 26, the separation of the uterus 30 and cervix 32 from the vagina 24 is performed by electric current passing through the monopolar electrode 27 and electrosurgical needle 26 while the surgical instrument is rotated in a circular pattern around the vaginal-cervical junction 36.

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### Industrial Applicability

**[0024]** The present invention is applicable to surgical instruments. The invention discloses a colpotomy assembly having an electrosurgical needle retractably mounted therein. The device can be made in industry and can be used in the medical field.

### Claims

1. A colpotomy assembly (10) adapted for insertion into a vaginal cavity for use in female pelvic surgical procedures comprising:

40 a rigid elongated inner tube (14) having a distal end and a proximal end; an elongated outer tube (18) having a distal end and a proximal end surrounding said inner tube (14), said elongated outer tube (18) being free to slide and rotate on said inner tube; an outer cervical cup (12) having a top portion of a first diameter and a bottom portion having a second diameter less than said first diameter, said bottom portion of said outer cup provided with a hole therein, said outer cup being joined to the distal end of said elongated outer tube (18);

an inner occlusion cup (16) having a top portion of a third diameter and a bottom portion having a fourth diameter less than said third diameter, said bottom portion of said inner cup (16) provided with a hole therein, said inner cup being free to slide and rotate on said elongated outer tube (18); and

an electro surgical needle (26) retractably mounted in said outer cervical cup; wherein when said device is utilized, said outer cup (12) would surround and support the cervix and said inner cup (16) would stretch the upper vaginal canal, and wherein said electro surgical needle would puncture the vaginal-cervical junction to separate the uterus and cervix from the vagina.

2. The colpotomy assembly (10) according to claim 1, said outer tube (18) further including a tunnel (28) having a monopolar electrode portion (27) of said electro surgical needle therein.

3. The colpotomy assembly (10) according to claim 2, wherein said tunnel is electrically insulated.

4. The colpotomy assembly (10) according to claim 1, said inner tube (14) comprising a metal alloy and wherein said inner tube includes a non-conductive sheath to electrically insulate said inner tube (14).

5. The colpotomy assembly (10) according to claim 1, wherein the distal end of said inner tube (14) is provided with a balloon (22).

6. The colpotomy assembly (10) according to claim 1 further comprising a locking collar (20) surrounding said inner tube (14) and removably attached to said outer tube (18), said locking collar (20) being free to slide and rotate on said elongated inner tube (14).

7. The colpotomy assembly (10) according to claim 6, said locking collar (20) comprising a front outer portion (20a) and a rear outer portion (20b),

said front outer portion being configured for handling and rotation, and said rear outer portion being configured for engagement with the proximal end of said outer tube (18).

8. The colpotomy assembly (10) according to claim 7, wherein the proximal end of said outer tube (18) is configured for engagement with the rear portion of said locking collar (20).

9. The colpotomy assembly (10) according to any one of claims 1 to 8 further comprising a handle (20a) mounted to said proximal end of said outer tube (18).

## Patentansprüche

1. Kolpotomiebaugruppe (10), die zum Einführen in eine Vaginalkavität angepasst ist, zur Verwendung bei chirurgischen Eingriffen am weiblichen Becken, umfassend:

eine starre längliche innere Röhre (14) mit einem distalen Ende und einem proximalen Ende; eine längliche äußere Röhre (18) mit einem distalen Ende und einem proximalen Ende, die die innere Röhre (14) umgibt, wobei die längliche äußere Röhre (18) frei an der inneren Röhre gleiten und rotieren kann; einen äußeren Zervixbecher (12) mit einem oberen Abschnitt eines ersten Durchmessers und einem unteren Abschnitt mit einem zweiten Durchmesser, der kleiner als der erste Durchmesser ist, wobei der untere Abschnitt des äußeren Bechers mit einem Loch darin versehen ist, wobei der äußere Becher mit dem distalen Ende der länglichen äußeren Röhre (18) verbunden ist; einen inneren Okklusionsbecher (16) mit einem oberen Abschnitt eines dritten Durchmessers und einem unteren Abschnitt mit einem vierten Durchmesser, der kleiner als der dritte Durchmesser ist, wobei der untere Abschnitt des inneren Bechers (16) mit einem Loch darin versehen ist, wobei der innere Becher frei an der länglichen äußeren Röhre (18) gleiten und rotieren kann; eine elektrochirurgische Nadel (26), die rückfahrbar im äußeren Zervixbecher angebracht ist; wobei beim Gebrauch der Vorrichtung der äußere Becher (12) die Zervix umgibt und abstützt und der innere Becher (16) den oberen Vaginalkanal dehnt, und wobei die elektrochirurgische Nadel die Vaginal-Zervix-Verbindung durchsticht, um die Gebärmutter und die Zervix von der Vagina zu trennen.

2. Kolpotomiebaugruppe (10) nach Anspruch 1, wobei die äußere Röhre (18) ferner einen Tunnel (28) mit einem monopolen Elektrodenabschnitt (27) der elektrochirurgischen Nadel darin beinhaltet.

3. Kolpotomiebaugruppe (10) nach Anspruch 2, wobei der Tunnel elektrisch isoliert ist.

4. Kolpotomiebaugruppe (10) nach Anspruch 1, wobei die innere Röhre (14) eine Metalllegierung umfasst und wobei die innere Röhre eine nichtleitende Hülse beinhaltet, um die innere Röhre (14) elektrisch zu isolieren.

5. Kolpotomiebaugruppe (10) nach Anspruch 1, wobei

das distale Ende der inneren Röhre (14) mit einem Ballon (22) versehen ist.

6. Kolpotomiebaugruppe (10) nach Anspruch 1, ferner umfassend eine Verriegelungsmanschette (20), die die innere Röhre (14) umgibt und lösbar an der äußeren Röhre (18) angebracht ist, wobei die Verriegelungsmanschette (20) frei an der länglichen inneren Röhre (14) gleiten und rotieren kann. 5

7. Kolpotomiebaugruppe (10) nach Anspruch 6, wobei die Verriegelungsmanschette (20) einen vorderen äußeren Abschnitt (20a) und einen hinteren äußeren Abschnitt (20b) umfasst, wobei der vordere äußere Abschnitt zur Handhabung und Rotation ausgestaltet ist und der hintere äußere Abschnitt zum Eingriff mit dem proximalen Ende der äußeren Röhre (18) ausgestaltet ist. 15

8. Kolpotomiebaugruppe (10) nach Anspruch 7, wobei das proximale Ende der äußeren Röhre (18) zum Eingriff mit dem hinteren Abschnitt der Verriegelungsmanschette (20) ausgestaltet ist. 20

9. Kolpotomiebaugruppe (10) nach einem der Ansprüche 1 bis 8, ferner umfassend einen Griff (20a), der am proximalen Ende der äußeren Röhre (18) angebracht ist. 25

**Revendications**

1. Ensemble de colpotomie (10) adapté pour être inséré dans une cavité vaginale pour une utilisation dans des procédures chirurgicales pelviennes chez la femme comprenant:

un tube intérieur allongé rigide (14) ayant une extrémité distale et une extrémité proximale; un tube extérieur allongé (18) ayant une extrémité distale et une extrémité proximale encerclant ledit tube intérieur (14), ledit tube extérieur allongé (18) étant libre de glisser et de tourner sur ledit tube intérieur; 30

une cupule cervicale extérieure (12) ayant une portion supérieure d'un premier diamètre et une portion inférieure ayant un deuxième diamètre inférieur audit premier diamètre, ladite portion inférieure de ladite cupule extérieure étant dotée d'un trou à l'intérieur de celle-ci, ladite cupule extérieure étant reliée à l'extrémité distale dudit tube extérieur allongé (18); 35

une cupule d'occlusion intérieure (16) ayant une portion supérieure d'un troisième diamètre et une portion inférieure ayant un quatrième diamètre inférieur audit troisième diamètre, ladite portion inférieure de ladite cupule intérieure (16) étant dotée d'un trou à l'intérieur de celle-ci, ladite cupule intérieure étant libre de glisser et de tourner sur ledit tube extérieur allongé (18); 40

une aiguille électrochirurgicale (26) montée de manière rétractable dans ladite cupule cervicale extérieure ; dans lequel lorsque ledit dispositif est utilisé, ladite cupule extérieure (12) pourrait encercler et supporter le col de l'utérus et ladite cupule intérieure (16) pourrait étirer le canal vaginal supérieur, et dans lequel ladite aiguille électrochirurgicale pourrait ponctionner la jonction vaginale-cervicale pour séparer l'utérus et le col de l'utérus du vagin. 45

2. Ensemble de colpotomie (10) selon la revendication 1, ledit tube extérieur (18) comprenant en outre un tunnel (28) ayant une portion d'électrode monopolaire (27) de ladite aiguille électrochirurgicale à l'intérieur de celui-ci. 50

3. Ensemble de colpotomie (10) selon la revendication 2, dans lequel ledit tunnel est isolé électriquement.

4. Ensemble de colpotomie (10) selon la revendication 1, ledit tube intérieur (14) comprenant un alliage métallique et dans lequel ledit tube intérieur comprend une gaine non conductrice pour isoler électriquement ledit tube intérieur (14). 55

5. Ensemble de colpotomie (10) selon la revendication 1, dans lequel l'extrémité distale dudit tube intérieur (14) est dotée d'un ballon (22).

6. Ensemble de colpotomie (10) selon la revendication 1 comprenant en outre un collier de verrouillage (20) encerclant ledit tube intérieur (14) et fixé de manière amovible audit tube extérieur (18), ledit collier de verrouillage (20) étant libre de glisser et de tourner sur ledit tube intérieur allongé (14). 60

7. Ensemble de colpotomie (10) selon la revendication 6, ledit collier de verrouillage (20) comprenant une portion extérieure avant (20a) et une portion extérieure arrière (20b), ladite portion extérieure avant étant configurée pour la manipulation et la rotation, et ladite portion extérieure arrière étant configurée pour l'engagement avec l'extrémité proximale dudit tube extérieur (18). 65

8. Ensemble de colpotomie (10) selon la revendication 7, dans lequel l'extrémité proximale dudit tube extérieur (18) est configurée pour l'engagement avec la portion arrière dudit collier de verrouillage (20). 70

9. Ensemble de colpotomie (10) selon l'une quelconque des revendications 1 à 8 comprenant en outre

une poignée (20a) montée à ladite extrémité proximale dudit tube extérieur (18).

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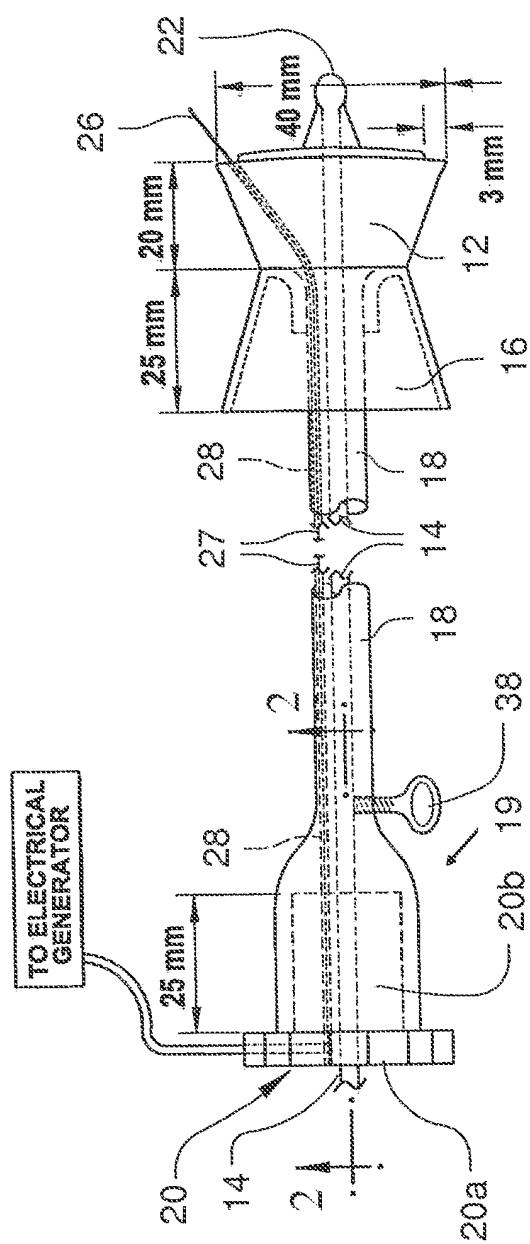


Figure 1

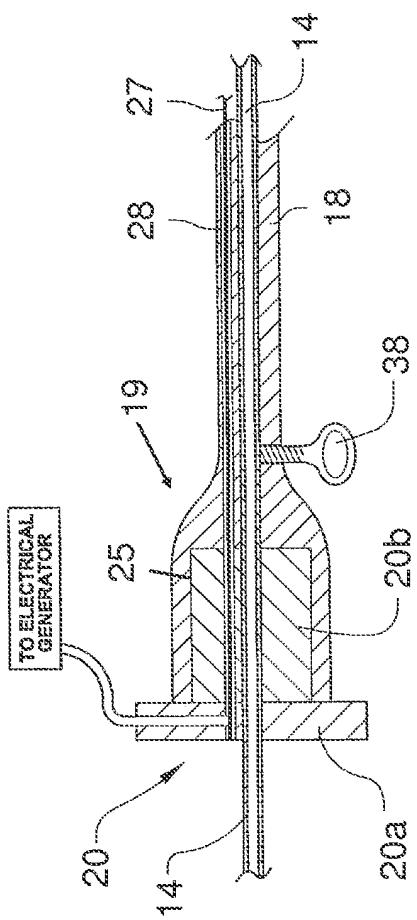


Figure 2

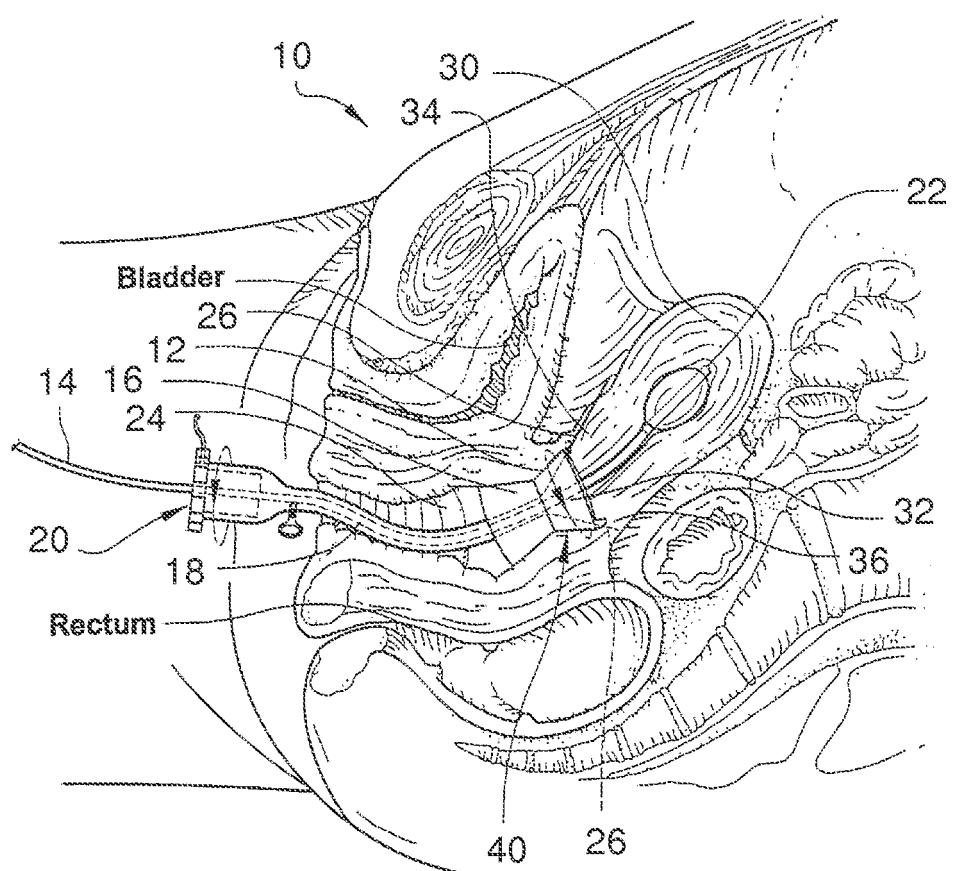


Figure 3

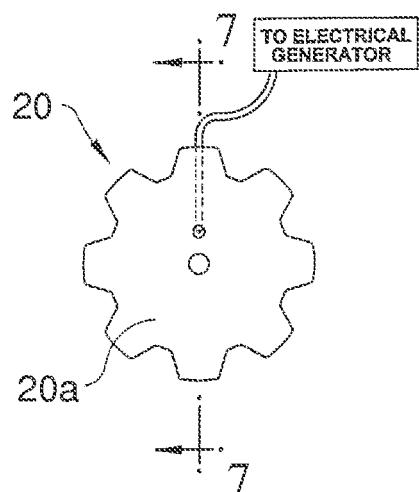


Figure 4

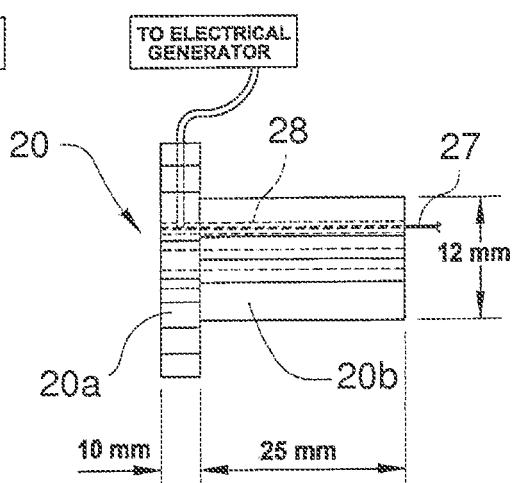


Figure 5

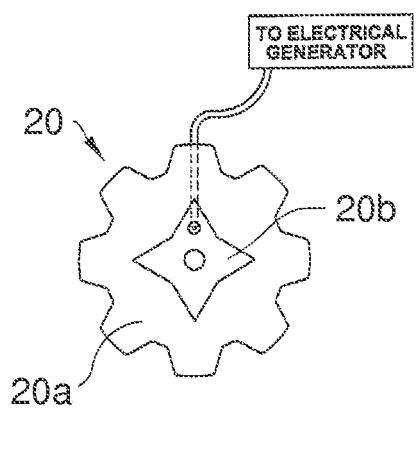


Figure 6

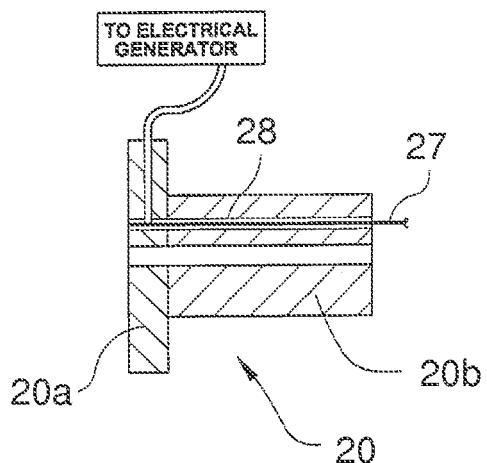


Figure 7

**REFERENCES CITED IN THE DESCRIPTION**

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专利名称(译)	用于全腹腔镜子宫切除术的电外科元件和子宫操纵器		
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#### 摘要(译)

用于在各种医学检查和过程中操纵和可视化子宫的阴道宫颈牵开器将包括内管，该内管配备有可移动的塑料杯组件（子宫颈杯和阴道杯），该塑料杯被设计成可插入子宫腔并插入可伸缩的电外科针头。宫颈杯模制到中空的外轴上以形成可移动杯组件。设置有该空心轴，内管可通过该空心轴插入。通过利用配备有内部刚性管的阴道颈椎牵开器升降器，可自由滑动的阴道杯和设计成在内管上移动的宫颈杯，并连接到可插入内管的中空塑料外轴上，并具有可伸缩性，灵活的电外科手术针头，可以使用改良的子宫操纵器进行结肠切开术。