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(54) **LAPAROSCOPIC MORCELLATOR**

LAPAROSKOPISCHER MORCELLATOR

MORCELLATEUR LAPAROSCOPIQUE

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(56) References cited:
WO-A1-2009/036875
US-A- 5 814 044
US-A1- 2003 225 344
US-A1- 2004 092 992
US-A1- 2008 039 883
US-A1- 2008 039 884
US-B1- 6 277 135

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to the field of surgery and more particularly to a surgical instrument to be used in gynecologic surgery and urological surgery and in other surgical fields. One of the most well-known procedures in the gynecology field is hysterectomies where the uterine body is removed. The advantages by doing the procedure laproscopicly are that the patient only needs two or 3 minor scars on the abdomen, and potentially has an easier recovery than when the abdominal muscle is cut in older forms of surgery. Once the uterus has been separated from the cervix the uterine tissue need to be removed from the patient throughout one of small incisions in the abdomen. Since the uterus has a diameter up to 300mm or more an appropriate tool is need to render the uterus into pieces sized in a way that they can be removed throughout one of the small incisions. The tool to do this is called a Morcellator. The morcellator renders the tissue into small pieces or preferably long strips which can be drawn out through the central lumen of the morcellator. Most of the morcellators uses a principle where a rotating sharp tube cuts into the uterus while the surgeon pulls the tissue backwards using an appropriate forceps.

[0002] The common morcellator is built from following basic parts:

[0003] Cutting tube, which is a driven rotating tube operating from 200 to 1000 RPM depending on brand/model, and which can be made from stainless steel or mild steel. The wall thickness vary such that for reusable blades relatively thick wall blades are often seen while single use blades tend to be made from thin wall steel.

[0004] Drive unit: The drive unit can be located in hand-piece or in a separate "drive unit" placed on the table away from the hand-piece. The separate drive unit can have a built in motor turning the cutting tube via a gearbox or a motor may be connected the gearbox through a mechanical cable extending from a remote drive or it can be a power supply feeding the motor in the hand-piece with electrical power.

[0005] Gear Box: The drive unit can be a separate unit from the drive unit and is typically intended to transfer the torque from the motor to the rotating cutting tube.

[0006] Control Mechanism. Various mechanisms are known in the prior art with the most common being a foot pedal connected to the drive unit and acting as an on/of switch for the morcellator. A few powered morselators are hand controlled operated and do not have a foot pedal...

[0007] **Hand piece:** The prior art hand pieces for powered morselators range from bulky to heavy.

[0008] **Charging stands and power supplies:** Prior art morcellators have been powered by remote and encased power supplies that were either renewable or rechargeable.

[0009] Previous morsellators were cumbersome could not deliver adequate functional capabilities unless they were driven by an external or rechargeable power supply. For example one widely used morsellator uses a remote drive which was connected to the cutting tube through a cable which extended from the sterile operating field to a rotary drive. As noted above this device could be controlled by a foot control connected to the rotary drive. None of the known powered morsellators are unitary integrated devices which are designed to be disposed of after a single use. Some may have disposable components such as a cutting tube, however the remaining parts are all parts that must be tediously sterilized and cleaned after each use, thereby increasing the labor cost of the medical services. If any component accidentally leaves the sterile operating field, the procedure must be halted until a new sterile replacement for the component can be obtained from supply. Likewise, should a component such as a drive cable become tangled during the course of a procedure, the surgeon's control of the morsellator is compromised by the tension in the cable and the procedure must be stopped and restarted with a replacement part. Document US-A-2008/039884 discloses a morcellator having the features of the preamble of claim 1. It is noteworthy to mention that some surgeons consider the driven morsellator the most dangerous surgical instrument in use today. Consequently a need exists for a ready to use, disposable, single piece morsellator that will be smaller and more ergonomic than existing morsellators.

SUMMARY OF THE PRESENT INVENTION

[0010] It is an object of the present invention to provide a fully integrated, one piece, disposable morcellator to be used for the surgical gynecological and urological field as claimed in claim 1. The fully disposable morcellator offers the surgeon several advantages including ease of use, no parts to be cleaned, and full control by the hand with high level of safety in combination with excellent maneuverability. Preferred embodiments are disclosed in the dependent claims.

[0011] These and other objects and advantages of the invention will become apparent from the following detailed description of the preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] An apparatus for tissue removal is depicted in the accompanying drawings which form a portion of this disclosure and wherein:

FIG. 1 is a perspective view of the integrated morsellator;

FIG. 2 is a side sectional view of the integrated morsellator;

FIG. 3 is a schematic diagram of the control circuit of the morsellator.

FIG. 4 is a schematic diagram of another embodiment of the control circuit.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] Referring to the Figures 1-4 for a clearer understanding of the invention, it may be seen that the preferred embodiment of the invention contemplates a fully disposable morcellator 11. Morcellator 11 includes a tubular cutting tube 101 which extends from a pistol grip type plastic housing 124 and defines a lumen 102 there through. Housing 124 contains an alkaline battery package 112 powering an enclosed motor 113. The motor 113 drives a toothed wheel or gear 114 which engages a second gear 103 formed on a radial extension 104 of a hub 106 as a part of the 90 degree gear 115 which rotates the cutting tube 101. Hub 106 includes an elongated tubular portion 107 within which cutting tube 101 is received and secured and radial extension 104. Cutting tube 101 is made from thin wall stainless steel or other acceptable metallic tube and is ground at the distal end to be as sharp as possible. Hub 106 is preferably made from plastic, thus the two parts are mechanically joined together with any suitable means such as fasteners or an adhesive that prevents any longitudinal or annular displacement between the two parts. Plastic includes any rigid polymer that will hold the cutting tube in place despite longitudinal forces applied to it during the surgery. It will be understood that any other suitable means of joining the cutting tube to the hub may be employed however, the tube must not be displaced longitudinally in the hub during use.. The secured end of hub 106 is also fitted with a sealing device such as a duckbill housing 125 which is rigidly secured to housing 124. The duckbill housing 125 avoids or minimizes gas leakage during the procedure. The duckbill house encompasses a duckbill seal 127 and a sealing disc 128. The duckbill seal 127 stops gas leakage when no forceps or instrument are inserted through the lumen 102 of the morcellator and the disc 128 stops leakage when the forceps are inserted through the lumen 102.

[0014] Hub 106 is rotatably mounted within housing 124 on a bearing 131 supported on gussets 132 such that the hub 106 and thus the cutting tube 101 are restrained from axial movement. A seal 133 prevents leakage about the hub 106 at bearing 131. The opposite end of hub 106 is mounted for rotation on bearing 136 in flange 137 on duckbill housing 125 such that lumen 102 is in communication with the interior of duckbill housing 125.

[0015] The morcellator 11 includes a built in trocar 122 which means that the morcellator in companion with the obturator 123 can be introduced through an incision without the necessity of a separate trocar. Trocar 122 is rotatably mounted to housing 124 such that by rotating trocar 122 it is movable axially along cutting tube 101 to cover more or less of the sharp distal end of the cutting tube 101. Preferably, trocar 122 can be adjusted using integral knob 139 to at least three positions. In the SAFE position the trocar completely shields the cutting tube 101 and the morcellator is safe and ready to be introduced through the incision in the abdomen, Cut 1 exposes the cutting edge of cutting tube 101, and Cut 2 retracts the trocar such that only an arc of the cutting edge is exposed. Preferentially, knob 139 is selectively turned to each position and is retentively held at that position by a detent and ball or other locking mechanism. In one embodiment, the trocar 122 and knob cooperate with a trigger guard 141 which is attached to housing 124 below a trigger switch 146 and extends outwardly to a free end 142 which engages slots in knob 139. To rotate the trocar 122 the trigger guard end 142 is disengaged and then re-engaged in a selected slot 143. The longitudinal movement of the trocar 122 is created by the interaction of the knob 139 with a cam surface such as a protrusion 155 formed on housing 124 and engaged in a slot 156 in knob 139. Various other camming combinations are contemplated.

[0016] As will be seen in Fig. 1, the distal end 152 of trocar 122 is beveled and angled such that one side of the end of the trocar forms an elipse with the result that one side of the trocar is shorter than the other. As a result, one side of cutting tube 101 can be exposed without exposing the entire end of cutting tube 101. This feature enables the longitudinal movement of trocar 122 to selectively expose the cutting tube 101. The partial setting, or Cut 2 setting, is to be used when the surgeon wants to use the morcellator to engage the uterus at a selective area on the cutting tube. At the partial setting the sharp end of the cutting tube is partly shown. The Cut 1, or full, setting fully exposes the cutting edge of the cutting tube and is used when the surgeon wants to core out strips of tissue

[0017] The battery package 112 and motor 113 are electrically connected through a printed circuit board 117. Trigger 146 is mechanically coupled connected to two switches 171 and 172 which should have be functionality equivalent to a B3S-1002P.

[0018] Referring to Fig 2 to 4, the battery package 112 is preferably a 9V single use battery package including six 1.5V 2500mAH batteries connected in series connected with a overload protecting fuse or diode 188 such as an S175. It will be appreciated that any suitable battery can be used. The battery package is wrapped in plastic (shrink tube) and fitted with 0.5mm^2 leads.

[0019] The relays 161 and 162 on the PCB are miniature power PCB relays such as RY211009. The motor is connected to the battery through a normally open contact in each of the relays such that both relays have to be activated to close the contacts and power the motor. The other contacts in there relays are normally closed and cross connected such that when the trigger 146 is released and switches 171 and 172 are opened the two poles on the motor are short circuited through the relay

contacts. By short circuiting the two motor poles the motor stops immediately when the trigger is released. Unloaded the motor has a speed of about. 5800RPM and after the gearing the rotating tube has a speed of about 650RPM.

[0020] As seen in Fig 4 the voltage across the motor can be increased to give two speed operation using voltage booster 175 which may be a PCB mounted circuit or a supplemental battery selectively connected in series. A boost switch 176 can be separately actuated or can be incorporated as a second level of the depression of trigger 146.

[0021] The apparatus as described and illustrated is intended for one use on one patient and is not intended to be sterilized or reused, thus, the cutting tube is not replaceable or interchangeable and the batteries are not replaceable or rechargeable. However, the design is sufficiently light weight and compact as to allow the surgeon to comfortably manipulate the instrument during the procedure without cumbersome cords or drive cables. It is to be understood that the form of the invention shown is a preferred embodiment thereof and that various changes and modifications may be made therein without departing from the scope of the invention as defined in the following claims.

Claims

1. A disposable laparoscopic morcellator for removing tissue from within a living organism through a small incision comprising in combination:

   an elongated cylinder (101) having a first end sharpened to form a cutting edge;
   a trocar (122) whereby the morcellator in companion with an obturator (123) can be introduced through an incision, the trocar mounted coaxially with said cylinder and movable longitudinally to selectively expose said cutting edge for selective engagement with tissue to be cut;
   a housing adapted to be held in one hand of a surgeon supporting said elongated cylinder for rotation about the longitudinal axis of said cylinder and supporting said trocar for selective linear movement along said cylinder, said housing providing access to the interior of said cylinder for removal of tissue there through; **characterized by**
   a motor (113) mounted in said housing for selectively rotating said cylinder; and,
   a battery (112) mounted within said housing and operably connected to supply power to said motor;
   wherein the apparatus is a fully integrated one piece device for surgical gynaecological and urological field, and intended for a single use;
   wherein the morcellator further comprises a switch mounted on said housing and electrically connected between said motor and said battery so as to connect opposing wiring in said motor to prevent rotation of said motor when said motor is not energized through said switch.

2. An apparatus as described in claim 1 wherein said trocar (122) can be selectively fixed in at least one position exposing at least a portion of said cutting edge and in a position exposing none of said cutting edge ..

3. Apparatus as described in claim 2 further comprising a cam surface formed on said housing proximal and cooperative with said trocar such that rotation of said trocar about said cylindrical tube cams said trocar between said positions.

4. Apparatus as described in claim 3 further comprising a plurality of annufarly spaced recesses formed on said trocar proximal said housing and a locking member formed on said housing for selectively engaging one of said recesses to selectively fix said trocar in relation to said cam surface.

5. Apparatus as described in claim 4 wherein said locking member is a guard for a human actuable switch for controlling said morcellator, wherein said guard is selectively movable into engagement with one of said plurality of recesses.

6. Apparatus as described in claim 1, wherein said cylindrical tube is captured within a drive sleeve said drive sleeve mounted for rotation in a bearing surface in said housing and restrained from axial motion within said housing by internal gussets formed in said grip.

Patentansprüche

1. Laparoskopischer Einweg-Morcellator zum Entfernen von Gewebe im Inneren eines lebenden Organismus durch einen schmalen Einschnitt, umfassend in Kombination:

   einen langgestreckten Zylinder (101) mit einem ersten geschärften Ende, um eine Schneidkante zu bilden,
   einen Trokar (122), wodurch der Morcellator zusammen mit einem Obturator (123) durch einen Einschnitt eingeführt werden kann, wobei der Trokar koaxial mit dem Zylinder befestigt und in Längsrichtung bewegbar ist, um wahlweise die Schneidkante für den selektiven Eingriff mit dem zu schneidenden Gewebe freizulegen;
   ein für das Halten in einer Hand eines Chirurgen eingerichtetes Gehäuse, welches den langgestreckten Zylinder zur Drehung um die Längs-

achse des Zylinders stützt und den Trokar für die ausgewählte lineare Bewegung entlang des Zylinders stützt, wobei das Gehäuse einen Zugang zu dem Innenraum des Zylinders für die Entfernung von Gewebe dort hindurch bereitstellt; **gekennzeichnet durch**
einen Motor (113), der in dem Gehäuse zum wahlweisen Drehen des Zylinders angebracht ist; und
eine Batterie (112), die innerhalb des Gehäuses angebracht und funktionell verbunden ist, um den Motor mit Strom zu versorgen;
wobei die Vorrichtung eine vollständig integrierte, einstückige Vorrichtung für das chirurgisch-gynäkologische und -urologische Gebiet und für den Einmalgebrauch vorgesehen ist;
wobei der Morcellator ferner einen Schalter aufweist, der an dem Gehäuse angebracht und elektrisch zwischen den Motor und die Batterie geschaltet ist, um gegenüberliegende elektrische Leitungen in dem Motor so zu verbinden, dass die Drehung des Motors verhindert wird, wenn der Motor **durch** den Schalter nicht mit Spannung versorgt ist.

2. Vorrichtung nach Anspruch 1, wobei der Trokar (122) in mindestens einer Position wahlweise fixiert werden kann, die mindestens einen Abschnitt der Schneidkante freilegt und in einer Position, die keine Schneidkante freilegt.

3. Vorrichtung nach Anspruch 2, die ferner eine Mitnehmerfläche umfasst, die proximal an dem Gehäuse ausgebildet ist und derart mit dem Trokar zusammenwirkt, dass die Drehung des Trokars um das zylinderförmige Rohr den Trokar zwischen den Positionen verschiebt.

4. Vorrichtung nach Anspruch 3, ferner umfassend eine Mehrzahl ringförmig beabstandeter Vertiefungen, die an dem Trokar proximal zum Gehäuse ausgebildet sind, und ein Verriegelungselement, das an dem Gehäuse für das wahlweise Eingreifen in eine der Vertiefungen ausgebildet ist, um den Trokar selektiv in Bezug auf die Mitnehmerfläche festzustellen.

5. Vorrichtung nach Anspruch 4, wobei das Verriegelungselement eine Schutzvorrichtung für einen durch einen Menschen betätigbaren Schalter zur Steuerung des Morcellators, wobei die Schutzvorrichtung selektiv in den Eingriff mit einer aus der Mehrzahl der Vertiefungen bewegbar ist.

6. Vorrichtung nach Anspruch 1, wobei das zylinderförmige Rohr innerhalb einer Antriebshülse festgehalten ist, wobei die Antriebshülse zur Drehung in einer Lagerfläche in dem Gehäuse gelagert ist und durch innenliegende Eckversteifungen, die in dem Griff ausgebildet sind, an einer axialen Bewegung gehindert wird.

Revendications

1. Morcellateur laparoscopique jetable pour extraire un tissu de l'intérieur d'un organisme vivant à travers une petite incision comprenant en combinaison :

un cylindre allongé (101) ayant une première extrémité affûtée pour former un bord tranchant ;
un trocart (122) permettant l'introduction du morcellateur en compagnie d'un obturateur (123) à travers une incision, le trocart étant coaxialement monté avec ledit cylindre et longitudinalement amovible pour sélectivement exposer ledit bord tranchant pour la mise en prise sélective avec un tissu à couper ;
un boîtier adapté à être tenu dans la main d'un chirurgien supportant ledit cylindre allongé pour la rotation autour de l'axe longitudinal dudit cylindre et supportant ledit trocart pour le mouvement linéaire sélectif le long dudit cylindre, ledit boîtier permettant un accès à l'intérieur dudit cylindre pour l'extraction de tissu à travers celui-ci ; **caractérisé par**
un moteur (113) monté dans ledit boîtier pour sélectivement entraîner en rotation ledit cylindre ; et
une batterie (112) montée à l'intérieur dudit boîtier et fonctionnellement raccordée au dit moteur pour l'alimenter en énergie ;
dans lequel l'appareil est un dispositif entièrement intégré en un seul tenant pour les domaines gynécologique et urologique, et prévu pour un usage unique ;
dans lequel le morcellateur comprend en outre un commutateur monté sur ledit boîtier et électriquement raccordé entre ledit moteur et ladite batterie pour raccorder des câblages opposés dans ledit moteur et empêcher la rotation dudit moteur lorsque ledit moteur n'est pas mis sous tension via ledit commutateur.

2. Appareil selon la revendication 1, dans lequel ledit trocart (122) peut être sélectivement fixé dans au moins une position exposant au moins une partie dudit bord tranchant et dans une position n'exposant aucune partie dudit bord tranchant.

3. Appareil selon la revendication 2, comprenant en outre une surface de came formée sur ledit boîtier à proximité dudit trocart et coopérant avec ledit trocart de telle sorte que la rotation dudit trocart autour dudit tube cylindrique fait passer ledit trocart d'une posi-

tion à l'autre.

4. Appareil selon la revendication 3, comprenant en outre une pluralité de cavités espacées de manière annulaire formées sur ledit trocart à proximité dudit boîtier et un élément de blocage formé sur ledit boîtier pour sélectivement se mettre en prise avec l'une desdites cavités pour sélectivement fixer ledit trocart relativement à ladite surface de came.

5. Appareil selon la revendication 4, dans lequel ledit élément de blocage est une protection pour un commutateur actionnable par un humain destiné à commander ledit morcellateur, dans lequel ladite protection peut sélectivement être mise en prise avec l'une des cavités de ladite pluralité de cavités.

6. Appareil selon la revendication 1, dans lequel ledit tube cylindrique est capturé à l'intérieur d'un manchon d'entraînement, ledit manchon d'entraînement étant monté pour la rotation dans une surface de support dans ledit boîtier, et ne peut pas se déplacer axialement à l'intérieur dudit boîtier en raison de soufflets internes formés dans ladite poignée.

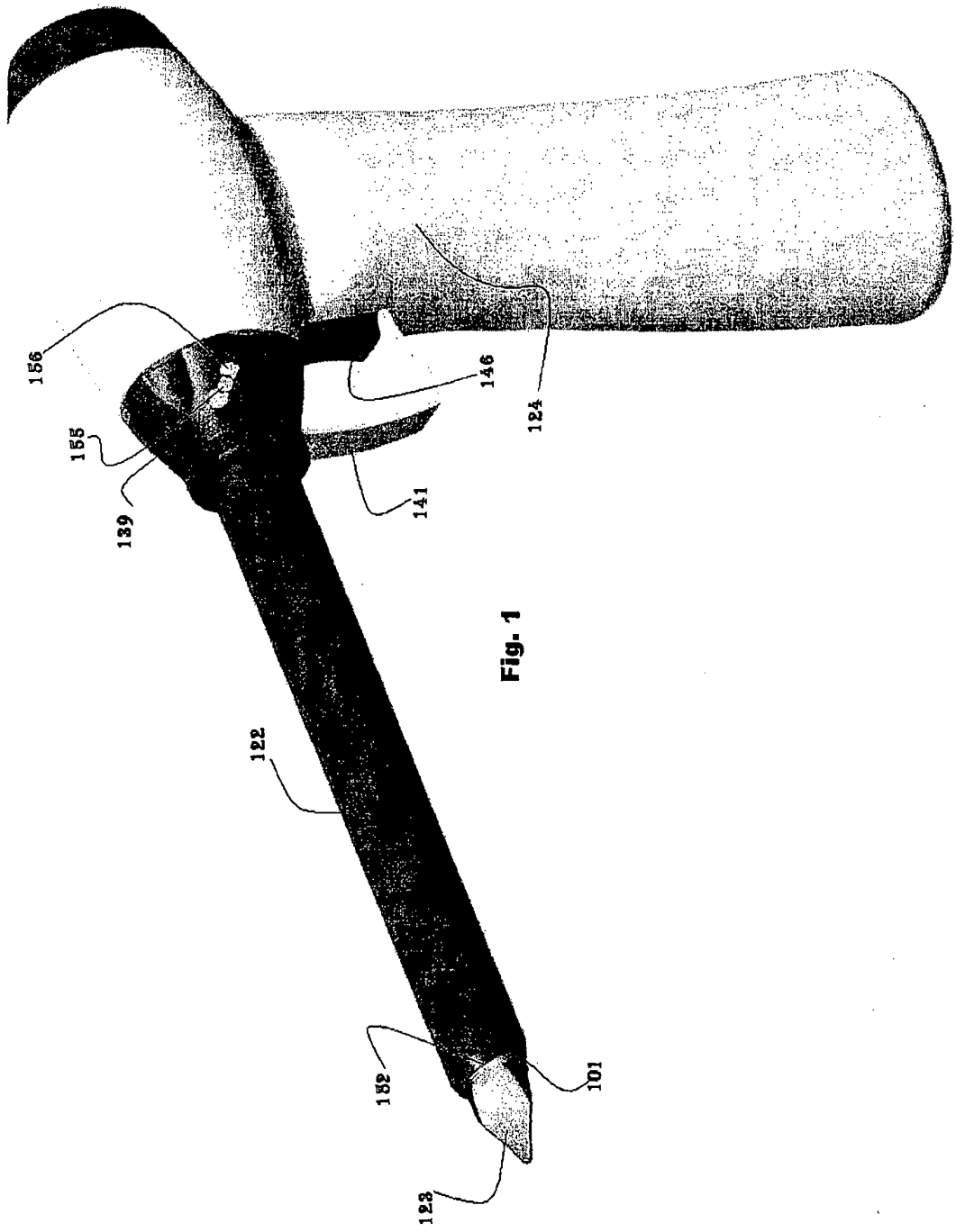

Fig. 1

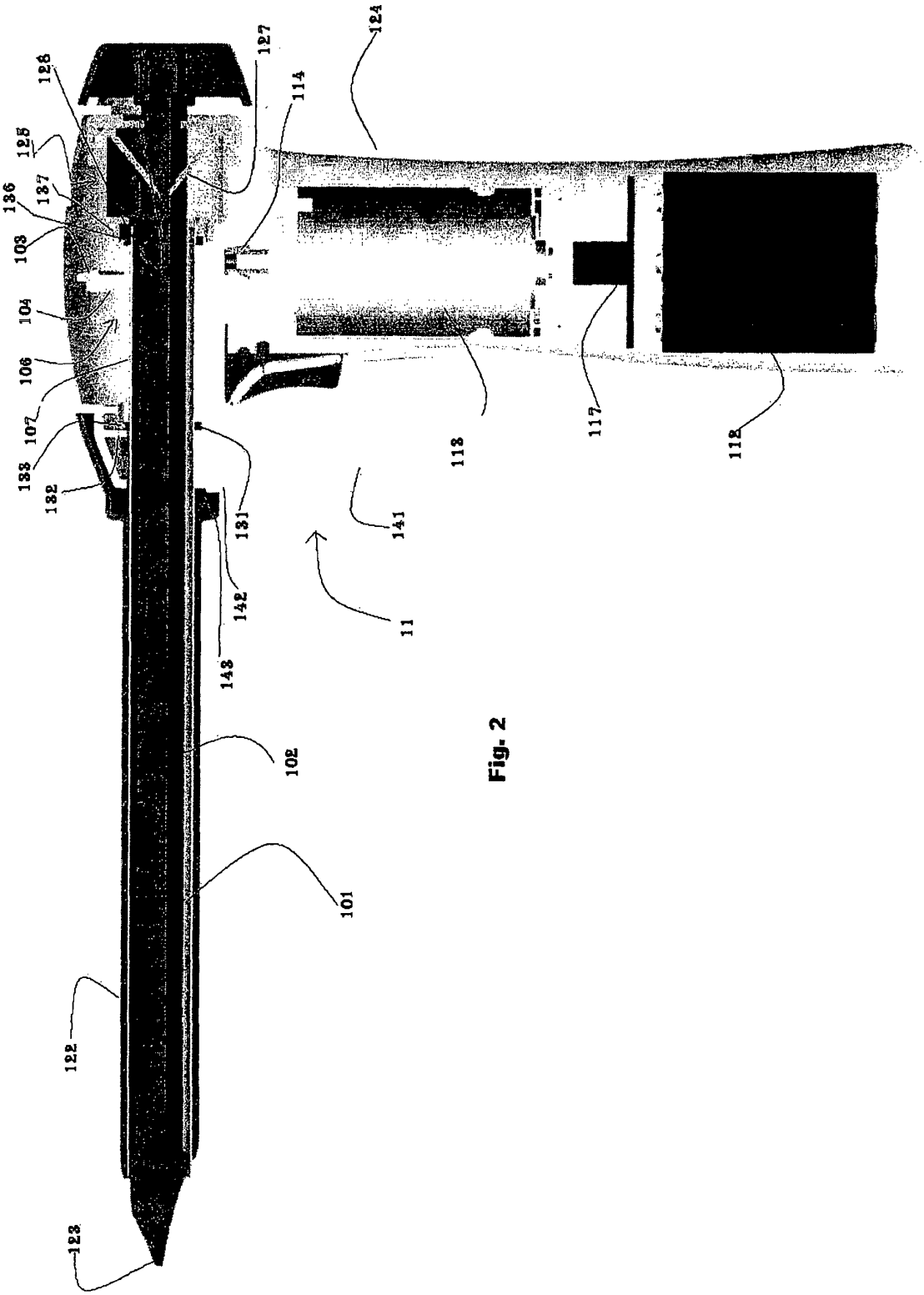
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Fig. 2

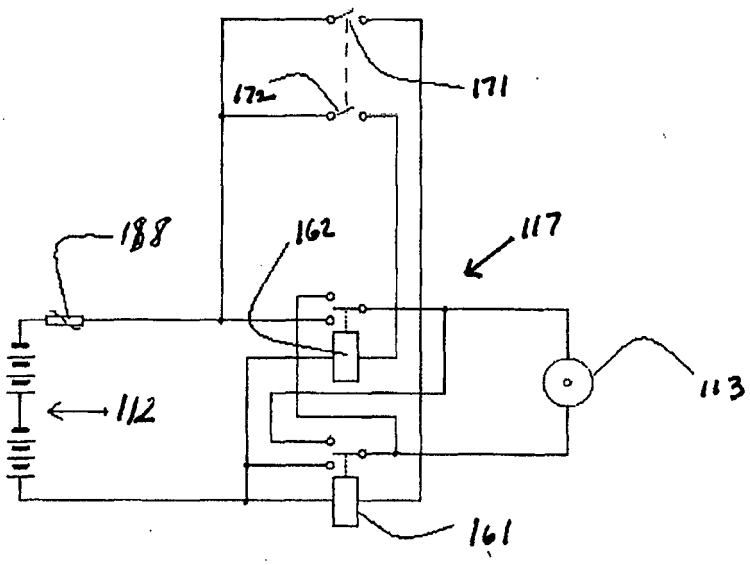

Fig. 3

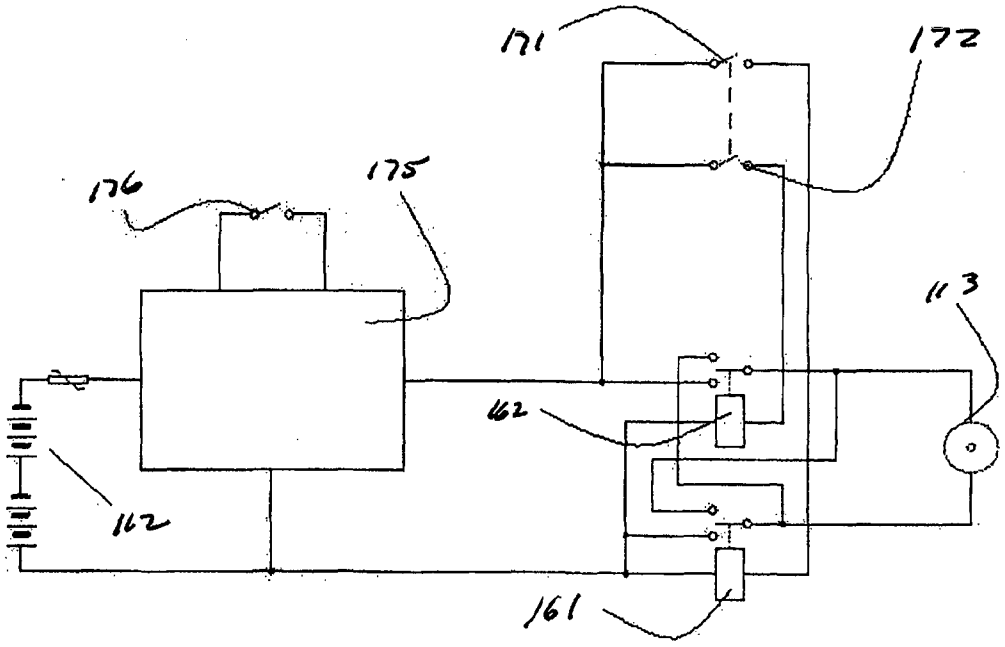

Fig. 4

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2008039884 A **[0009]**

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摘要(译)

一次性使用的外壳加工器利用一次性外壳，切割管，电池和马达以及附接且可调节的套管针，以使外科医生能够选择性地利用管的切割边缘。电池和控制电路完全包含在整体式气动吸收器内，因此不需要单独的部件。