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(19) **United States**(12) **Patent Application Publication**
Gordin et al.(10) **Pub. No.: US 2009/0209947 A1**(43) **Pub. Date: Aug. 20, 2009**(54) **INTERCHANGEABLE TIPS AND TOOL BOX
FOR ASSISTING SURGICAL PROCEDURES****Publication Classification**(51) **Int. Cl.**
A61B 17/00 (2006.01)(52) **U.S. Cl.** **606/1**(57) **ABSTRACT**

A toolbox system for interchanging a variety of interchangeable working tips within a body cavity, comprising:

(a) anchoring means reversibly attached to an internal wall with said body cavity such that said interchange of each of said at least interchangeable tip is obtained within said body cavity;

(b) a plurality of interchangeable working tip reversibly attached to said anchoring means, comprising a body, characterized by a longitudinal axis and having a distal end and a proximal end coupled together by one shaft, adapted to reciprocally move along said main longitudinal axis of said body; said proximal end comprising at least one actuation means coupled to the proximal end of said shaft; said distal end comprising at least one operable means in mechanical communication with the distal end of said shaft;

wherein said operable means are actuated by reciprocally moving said actuation means along said longitudinal axis of said working tip.

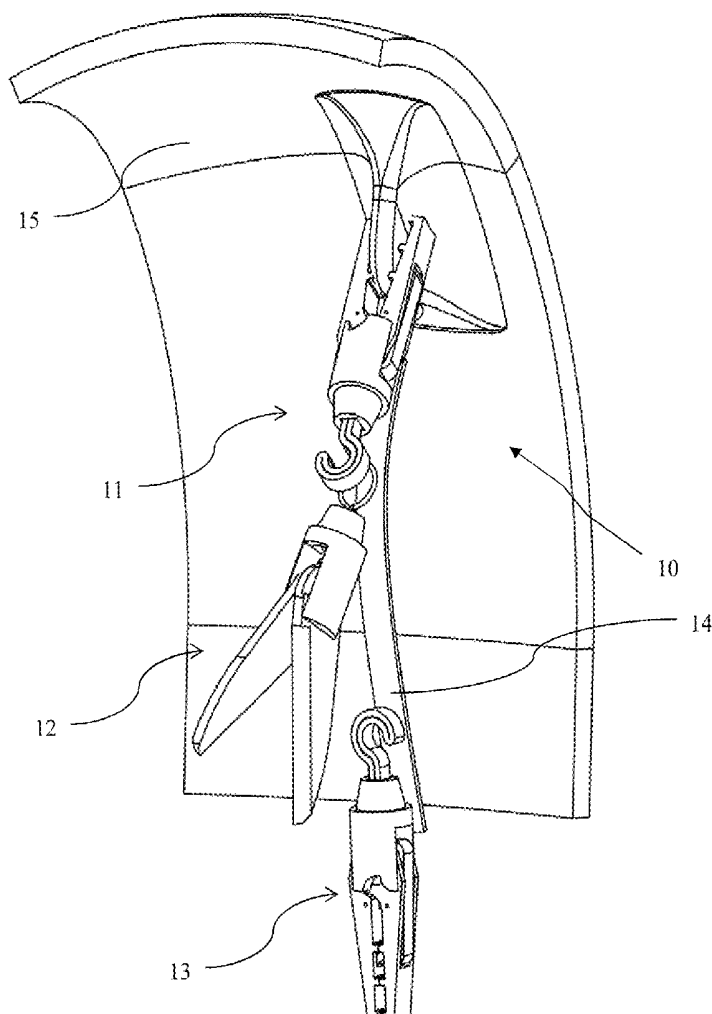
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MIAMI, FL 33180 (US)(21) Appl. No.: **12/418,128**(22) Filed: **Apr. 3, 2009****Related U.S. Application Data**

(63) Continuation-in-part of application No. PCT/IL2007/001186, filed on Sep. 25, 2007.

(60) Provisional application No. 60/848,636, filed on Oct. 3, 2006.



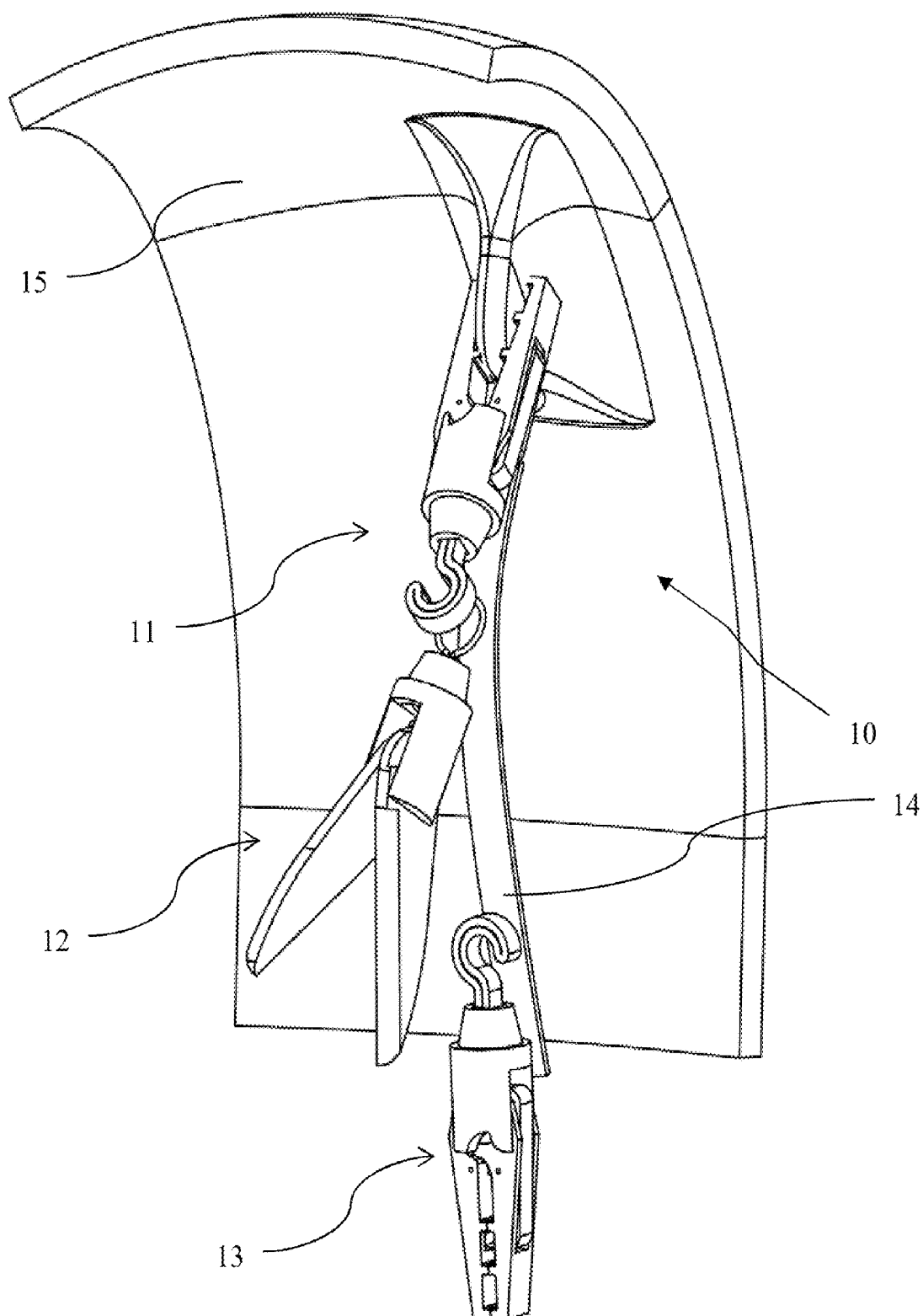


Fig 1

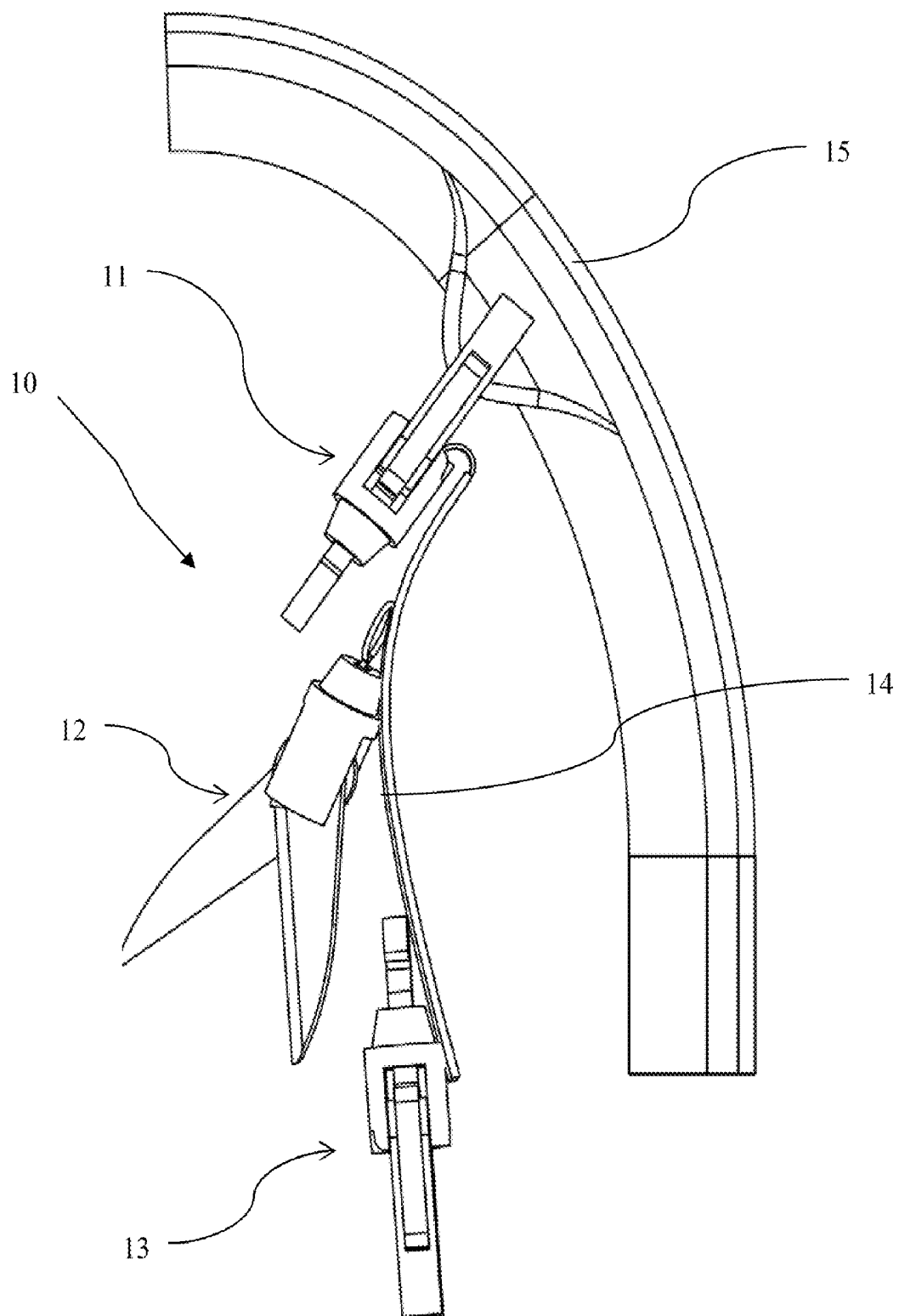


Fig 2

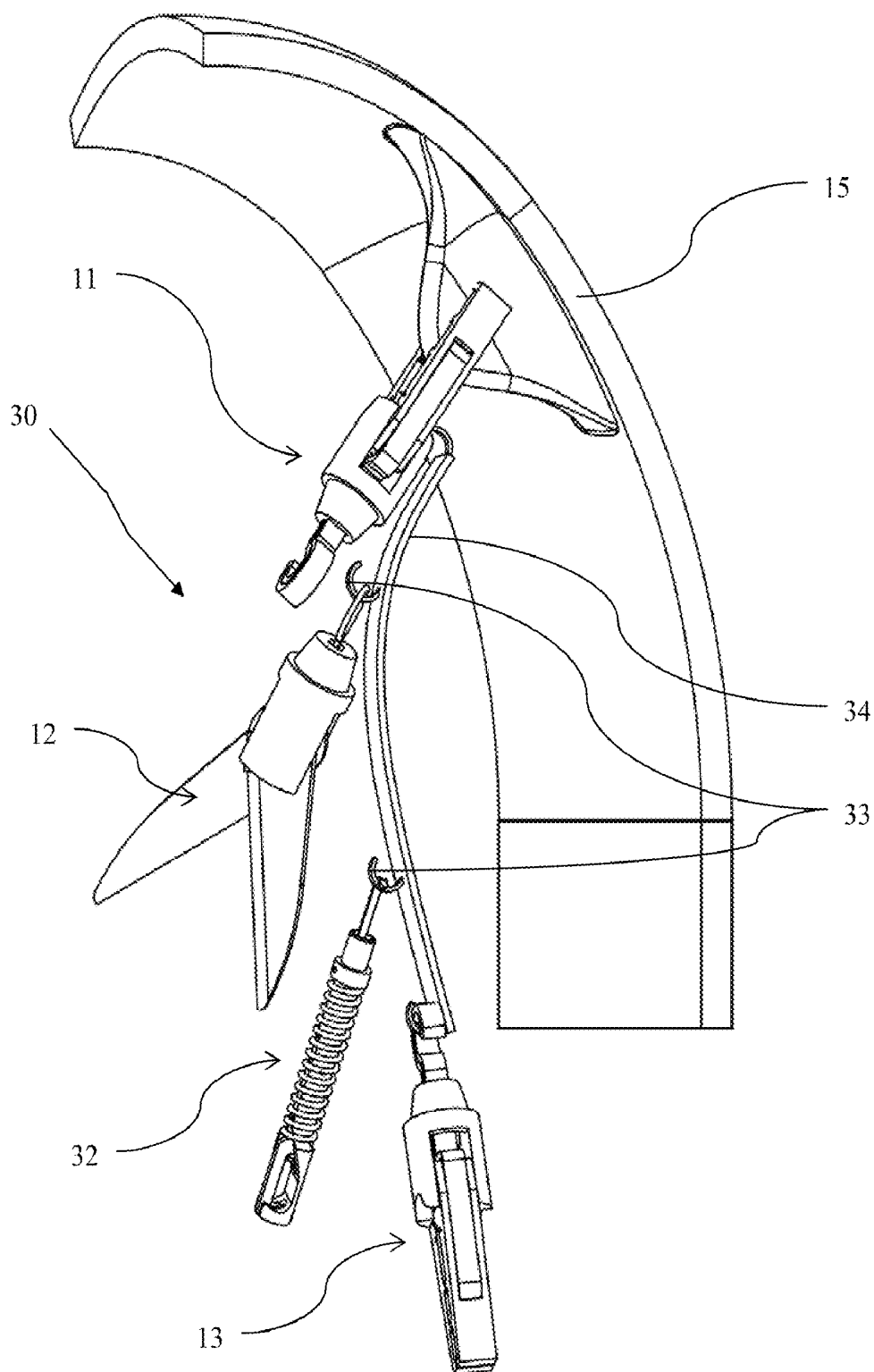


Fig 3

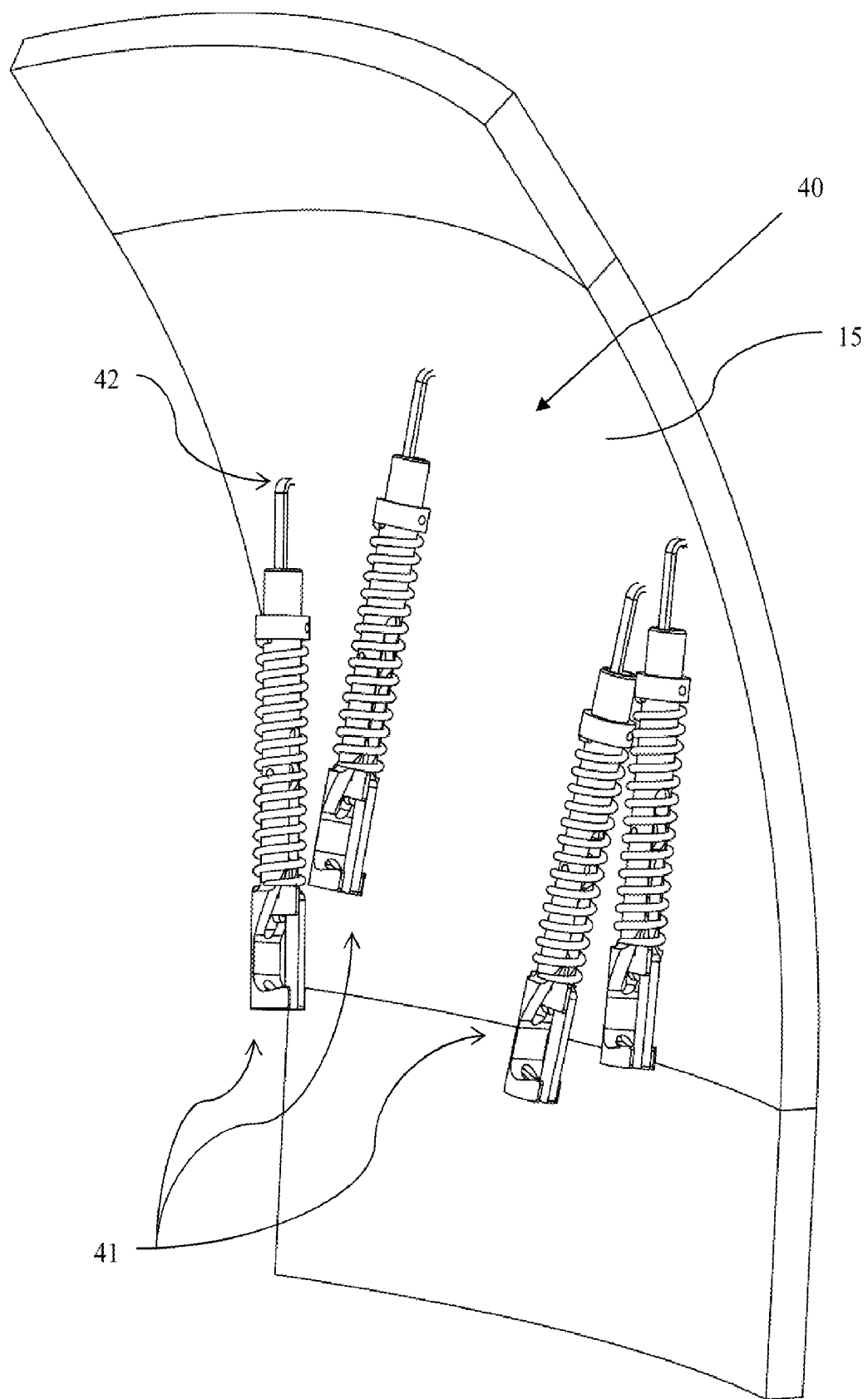


Fig 4

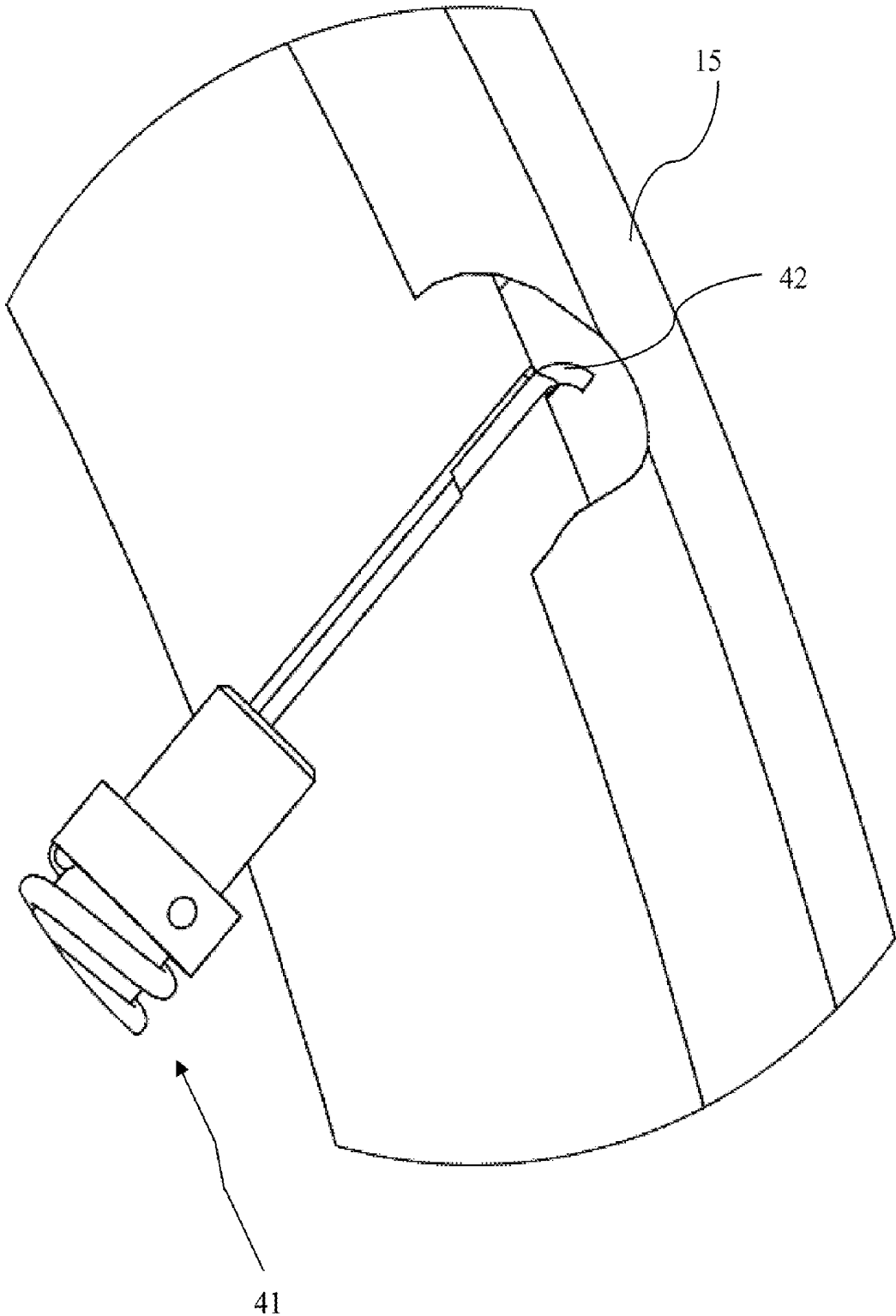


Fig 5

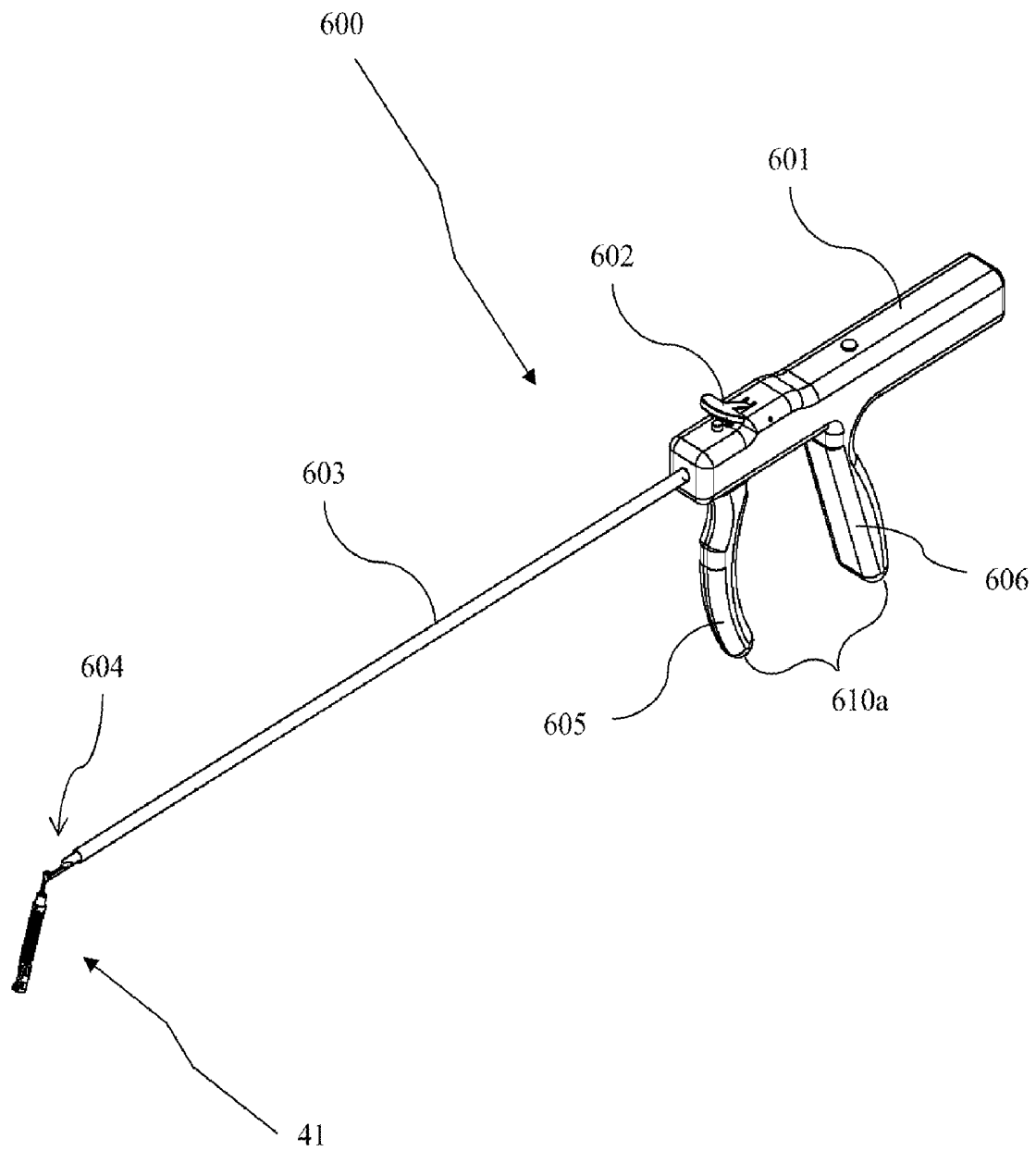


Fig 6

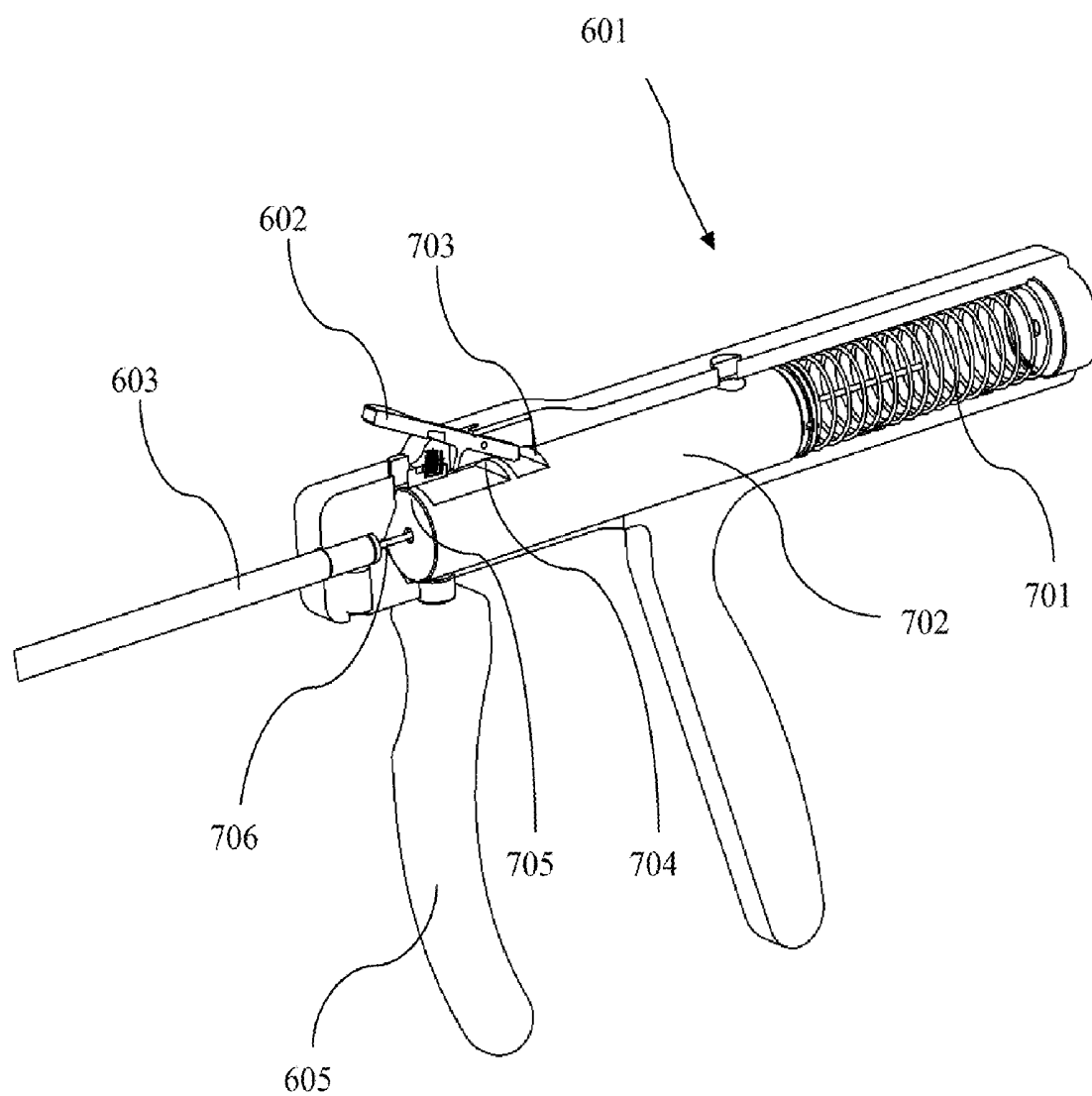


Fig 7

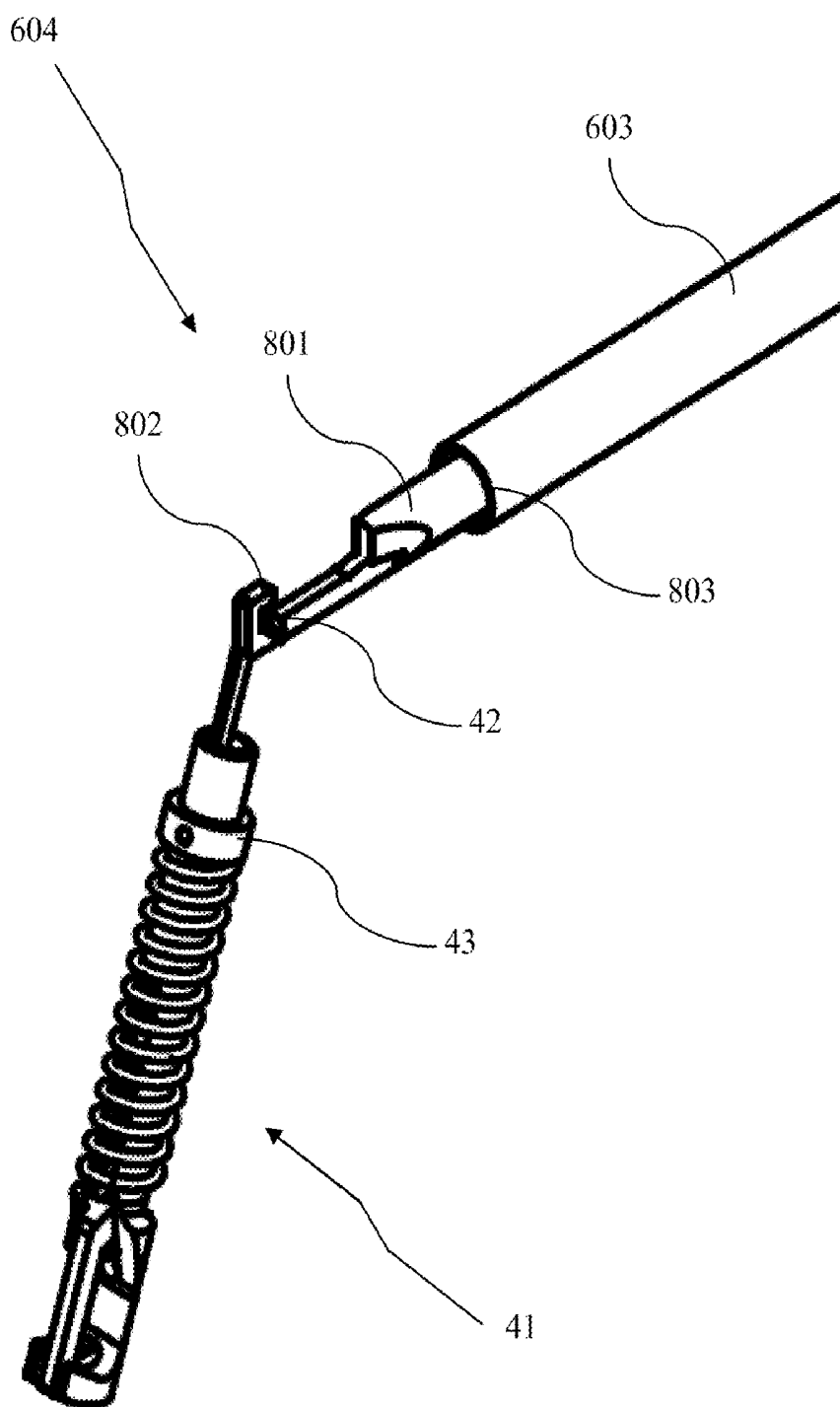


Fig 8

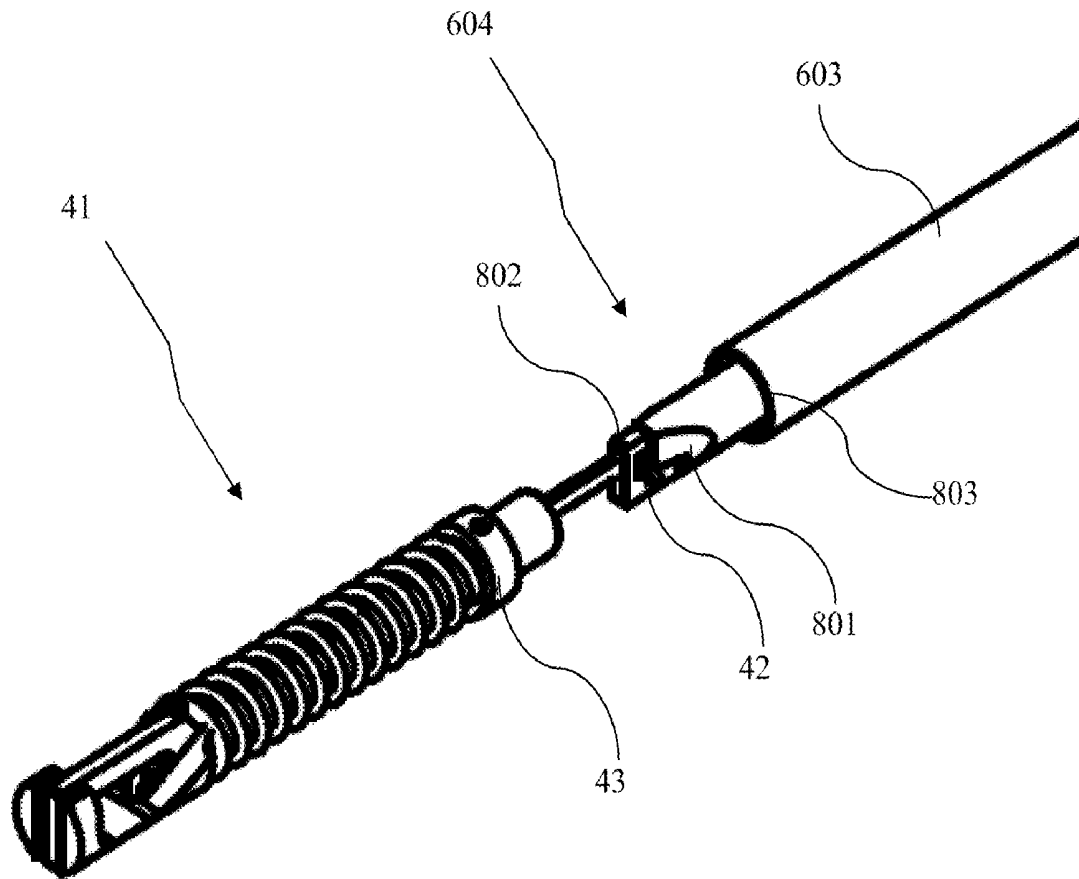


Fig 9

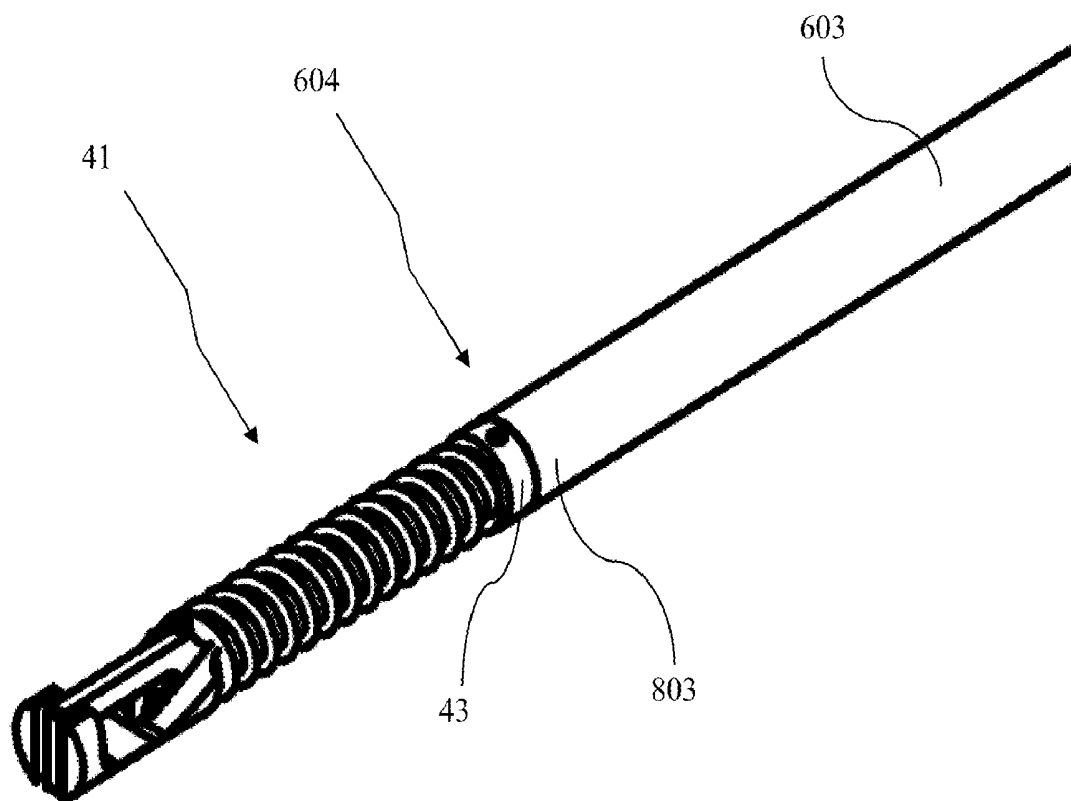


Fig 10

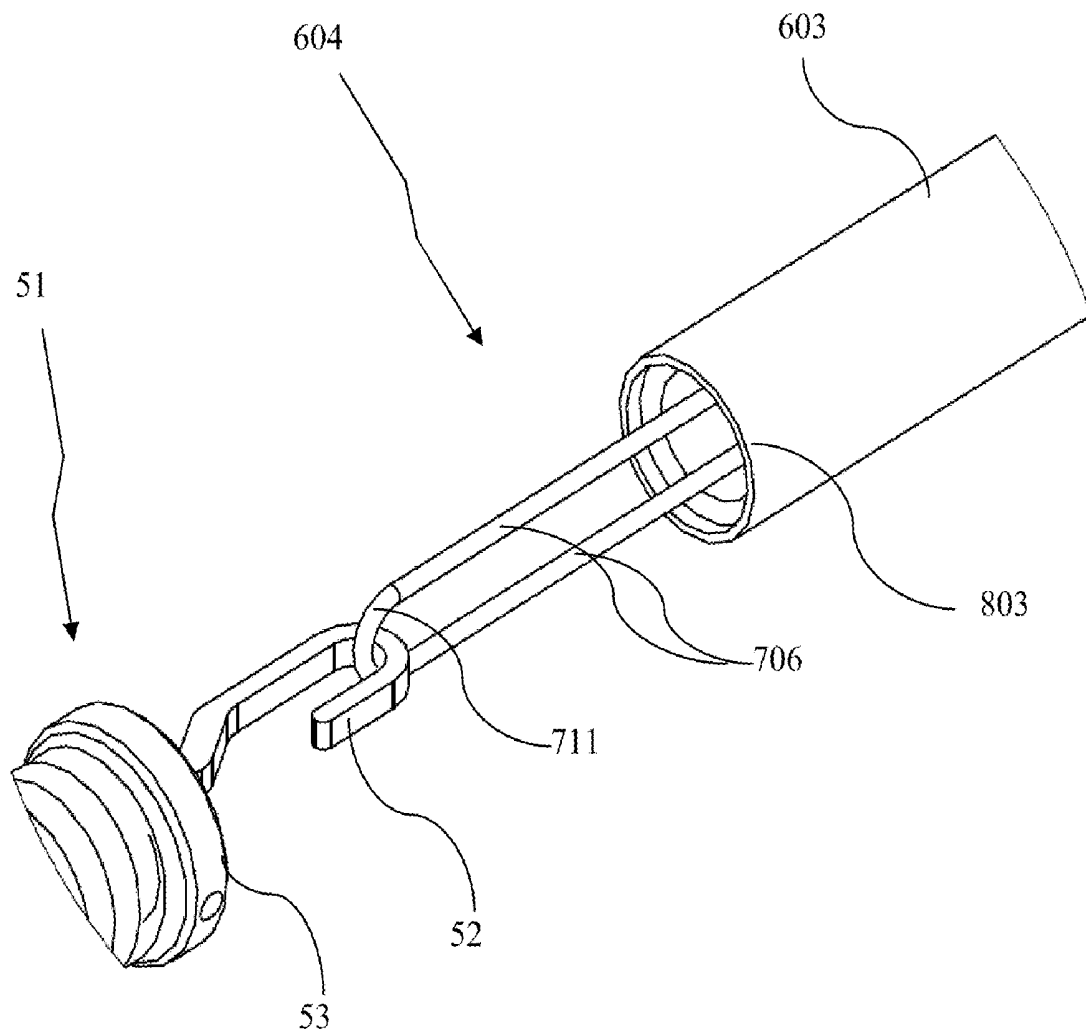


Fig 11

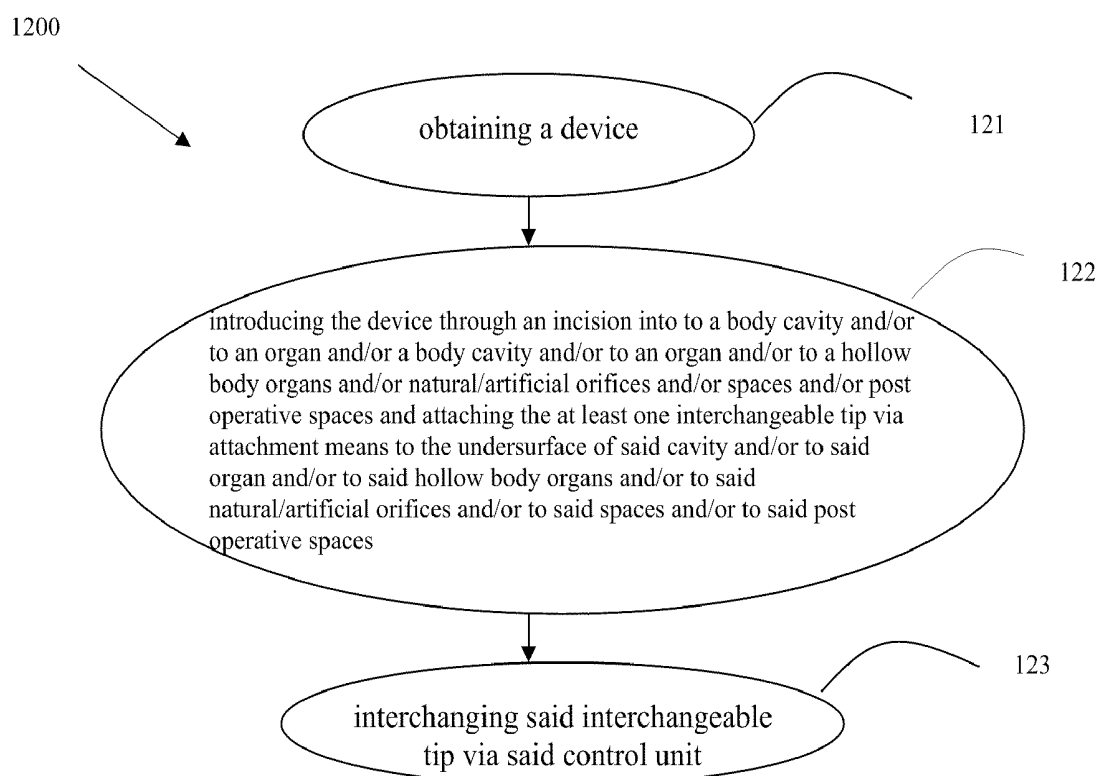


Fig 12

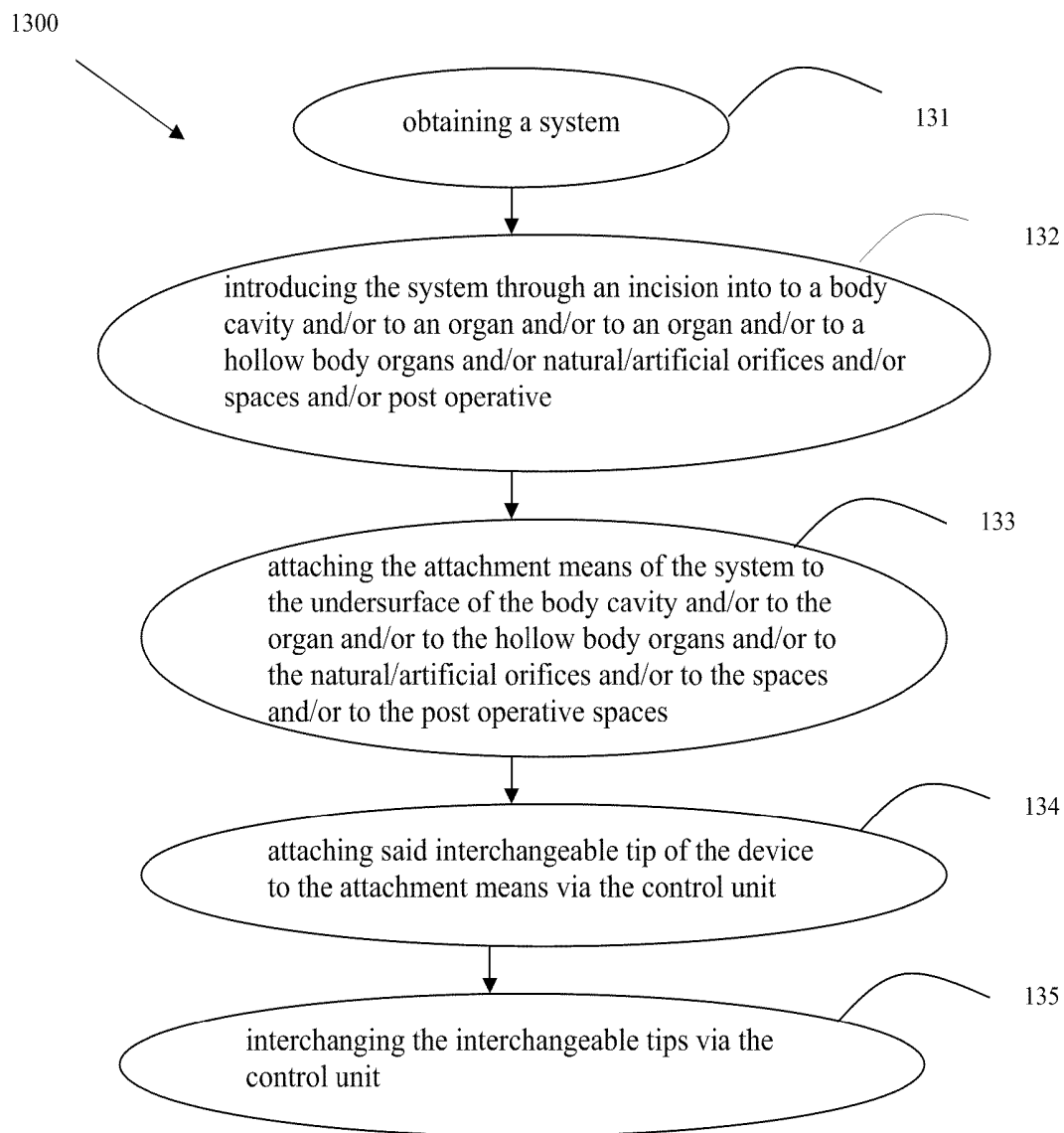


Fig 13

INTERCHANGEABLE TIPS AND TOOL BOX FOR ASSISTING SURGICAL PROCEDURES

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part application of International Application No. PCT/IL2007/001186, filed 25 Sep. 2007, which claims priority to U.S. Provisional Application No. 60/848,636, filed Oct. 3, 2006. The entire contents of each of these applications are incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention generally relates to anchoring devices attached to internal surface of a cavity for assisting laparoscopic procedures. More specifically, the present invention relates to interchangeable tips and a toolbox for minimal invasive surgery.

BACKGROUND OF THE INVENTION

[0003] Endoscopic interventions represent a significant advance in various fields of surgery permitting the performance of the majority of interventions through a number of small incisions reducing postoperative pain and enhancing the postoperative recovery.

[0004] In Endoscopic surgery, the surgeon performs the operation through small holes using long instruments and observing the internal anatomy with an endoscope camera.

[0005] The surgeons need more than one tool during the laparoscopic surgery.

[0006] Replacing tools during the procedure requires extracting the current working tool outside the cavity, an activity which is distracting for surgeons.

[0007] Thus, there is a long felt need for an interchangeable tips system that enables the surgeon to interchange the tips of the surgical instruments within the body cavity, and for a tool box that can be anchored to the internal surface of a cavity or to various organs within a cavity, without negating the minimal invasive nature of the procedure.

SUMMARY OF THE INVENTION

[0008] It is one object of the invention to disclose a surgical device comprising: (a) at least two interchangeable tip (tool head); and (b) at least one control unit; wherein said device is adapted with means such that the replacement of said interchangeable tip via said control unit is enabled within the abdominal cavity and/or within a hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative spaces, during minimally invasive surgical procedure; further wherein said control unit is adapted to actuate said interchangeable tip.

[0009] It is another object of the invention to disclose the surgical device as defined above, wherein said control unit is adapted to engage and disengage said interchangeable tip within said abdominal cavity and/or within said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces, during minimally invasive surgical procedure; further wherein said control unit is adapted to introduce said interchangeable tip through an incision and/or trocar and/or natural orifice to the abdominal cavity and/or body cavity and/or hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative spaces; further wherein said control unit is adapted to extract

said interchangeable tip from said abdominal cavity and/or said body cavity and/or said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces.

[0010] It is another object of the invention to disclose the surgical device as defined above, wherein said interchangeable tip is selected from a group comprising cutting means, blood sealing units, illumination means, imaging means, grasping forceps, dissector, biopsy punch, needle holder, clamp or any combination thereof.

[0011] It is another object of the invention to disclose the surgical device as defined above, wherein said interchangeable tip is provided with a hook or/and loop engagement means.

[0012] It is another object of the invention to disclose the surgical device as defined above, wherein said interchangeable tip is actuated by pulling said engagement means via said control unit, while counter-force is exercised on the base of the interchangeable tip.

[0013] It is another object of the invention to disclose the surgical device as defined above, wherein said hook engagement means of said interchangeable tip is adapted to provide anchoring of said interchangeable tip to the internal walls of said abdominal cavity and/or said body cavity and/or said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces.

[0014] It is another object of the invention to disclose a system adapted to change a wide variety of different tool heads, or interchangeable tips during minimally invasive surgery; said system comprising: (a) at least one surgical device as defined above; (b) at least one anchoring means; wherein said anchoring means is anchored to the internal wall of the abdominal cavity and/or body cavity and/or hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative spaces during minimally invasive surgery; further wherein said interchangeable tip of said device is provided with means to be attached to said anchoring means whilst said interchangeable tip is not engaged to said control unit of said device during minimally invasive surgical procedure.

[0015] It is another object of the invention to disclose the system as defined above, wherein said interchangeable tip is selected from a group comprising cutting means, blood sealing units, illumination means, imaging means, grasping forceps, dissector, biopsy punch, needle holder, clamp or any combination thereof.

[0016] It is another object of the invention to disclose the system as defined above, wherein said interchangeable tip is provided with a hook or/and loop engagement means.

[0017] It is another object of the invention to disclose the system as defined above, wherein said interchangeable tip of said device is actuated by pulling said engagement means via said control unit of said device, while counter-force is exercised on the base of the interchangeable tip.

[0018] It is another object of the invention to disclose the system as defined above, wherein said attachment means are selected from a group comprising magnetic attachment means, suction attachment, adhesive attachment, mechanical attachment such as hook or loop attachments or other minimally invasive means any combination of these means, or other non-invasive or minimally invasive anchoring means.

[0019] It is another object of the invention to disclose the system as defined above, wherein said attachment means are releasable attachment means.

[0020] It is another object of the invention to disclose the system as defined above, additionally comprising means allowing said system to move from one position to another within said cavity and/or said organ and/or said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces.

[0021] It is another object of the invention to disclose the system as defined above, wherein said interchangeable tip of said surgical device are adapted with means to be released and reattached to said anchoring means.

[0022] It is another object of the invention to disclose a method for changing a wide variety of different tool heads, or interchangeable tips during minimally invasive surgical procedure. The method comprises steps selected inter alia from (a) obtaining a device as defined above; (b) introducing said device through an incision into to a body cavity and/or to an organ and/or a body cavity and/or to an organ and/or to a hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative spaces and attaching said at least one interchangeable tip via attachment means to the undersurface of said cavity and/or to said organ and/or to said hollow body organs and/or to said natural/artificial orifices and/or to said spaces and/or to said post operative spaces; (c) interchanging said interchangeable tip via said control unit; wherein said interchanging step of said interchangeable tips is enabled within said abdominal cavity and/or within said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces, during said minimally invasive surgical procedure.

[0023] It is another object of the invention to disclose a method for changing a wide variety of different tool heads, or interchangeable tips during laparoscopic surgery. The method comprises steps selected inter alia from (a) obtaining a system as defined above; (b) introducing said system through an incision into to a body cavity and/or to an organ and/or to an organ and/or to a hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative; (c) attaching said attachment means of said system to the undersurface of said body cavity and/or to said organ and/or to said hollow body organs and/or to said natural/artificial orifices and/or to said spaces and/or to said post operative spaces; (d) attaching said interchangeable tip of said device to said attachment means via said control unit; (e) interchanging said interchangeable tips via said control unit; wherein said interchanging step of said interchangeable tips is enabled within said abdominal cavity and/or within said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces, during said minimally invasive surgical procedure.

[0024] It is another object of the invention to disclose the method as defined above, wherein said step of interchanging said interchangeable tip additionally comprising steps of (a) disengaging said interchangeable tip via said control units; (b) attaching said interchangeable tip to the undersurface of said cavity and/or to said organ and/or to said hollow body organs and/or to said natural/artificial orifices and/or to said spaces and/or to said post operative spaces; and (c) engaging said interchangeable tip via said control units.

[0025] It is another object of the invention to disclose the method as defined above, wherein said step of interchanging said interchangeable tip additionally comprising steps of (a) disengaging said interchangeable tip of said device via said

control units; (b) attaching said interchangeable tip to said attachment means; and (c) engaging said interchangeable tip via said control units.

[0026] It is another object of the invention to disclose the method as defined above, additionally comprising the step of re-interchanging said interchangeable tips; wherein said step of re-interchanging said interchangeable tips is done according to a medical need.

[0027] It is another object of the invention to disclose the method as defined above, additionally comprising the step of extracting said device from said body cavity and/or to said organ and/or to said hollow body organs and/or to said natural/artificial orifices and/or to said spaces and/or to said post operative spaces.

[0028] It is another object of the invention to disclose the method as defined above, additionally comprising the step of extracting said system from said body cavity and/or to said organ and/or to said hollow body organs and/or to said natural/artificial orifices and/or to said spaces and/or to said post operative spaces.

[0029] It is another object of the invention to disclose the method as defined above, additionally comprising the step of selecting said interchangeable tip from a group comprising cutting means, blood sealing units, illumination means, imaging means, grasping forceps, dissector, biopsy punch, needle holder, clamp or any combination thereof.

[0030] It is another object of the invention to disclose the method as defined above, additionally comprising the step of providing said interchangeable tip with a hook or/and loop engagement means.

[0031] It is another object of the invention to disclose the method as defined above, additionally comprising the step of selecting said attachment means from a group comprising magnetic attachment means, suction attachment, adhesive attachment, mechanical attachment such as hook and loop attachments or other minimally invasive means any combination of these means, or other non-invasive or minimally invasive anchoring means.

[0032] It is another object of the invention to disclose the method as defined above, additionally comprising the step of disengaging said interchangeable tip from the internal wall within said abdominal cavity and/or within said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces.

[0033] It is another object of the invention to disclose the method as defined above, additionally comprising the step of disengaging said interchangeable tip from said attachment means.

[0034] It is another object of the invention to disclose the method as defined above, additionally comprising the steps of (a) releasing said interchangeable tip from the internal wall within said cavity and/or said organ and/or said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces; and (b) reattaching said interchangeable tip to the internal wall within said cavity and/or said organ and/or said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces; wherein the steps of releasing and reattaching is done according to the medical needs.

[0035] It is another object of the invention to disclose the method as defined above, additionally comprising the steps of (a) releasing said interchangeable tip from said attachment means; and (b) reattaching said interchangeable tip to said

attachment means; wherein the steps of releasing and reattaching is done according to the medical needs.

[0036] It is still object of the invention to disclose the method as defined above, additionally comprising the step of engaging and actuating said interchangeable tips in said cavity and/or said organ and/or said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces.

[0037] It is lastly object of the invention to disclose the method as defined above, additionally comprising the step of allowing said system to move from one position to another within said cavity and/or said organ and/or said hollow body organs and/or said natural/artificial orifices and/or said spaces and/or said post operative spaces.

BRIEF DESCRIPTION OF THE FIGURES

[0038] In order to understand the invention and to see how it may be implemented in practice, and by way of non-limiting example only, with reference to the accompanying drawing, in which

[0039] FIG. 1 is a perspective view of a toolbox with a plurality of instrument tips magnetically fixed to an attachment means according to one embodiment of the present invention.

[0040] FIG. 2 is a side view of the same.

[0041] FIG. 3 is a perspective side view of a toolbox with a plurality of instrument tips hanging from hooks on an attachment means according to another embodiment of the present invention.

[0042] FIG. 4 is a perspective view of a toolbox with a plurality of instrument tips attached to the wall of an internal body cavity according to another embodiment of the present invention.

[0043] FIG. 5 is an enlarged cross sectional view of FIG. 4, focused on the hook of an instrument tip as it is attached to the wall of an internal body cavity.

[0044] FIG. 6 is a perspective view of a control unit system according to one embodiment of the present invention engaging an interchangeable instrument tip.

[0045] FIG. 7 is a side perspective cross-sectional view of the body of the control unit;

[0046] FIG. 8 is an enlarged perspective view of the engaging end of the control unit and instrument tip at one configuration of work.

[0047] FIG. 9 is an enlarged perspective view of the engaging end of the control unit and instrument tip at a second configuration of work.

[0048] FIG. 10 is an enlarged perspective view of the engaging end of the control unit and instrument tip at a third configuration of work.

[0049] FIG. 11 is an enlarged perspective view of the engaging end of a control unit according to another embodiment of the present invention, engaging an interchangeable instrument tip at one configuration of work.

[0050] FIG. 12 schematically represents in a flow diagram, the method for changing a wide variety of different tool heads, or interchangeable tips during minimally invasive surgical procedures.

[0051] FIG. 13 schematically represents in a flow diagram, another method for changing a wide variety of different tool heads, or interchangeable tips during minimally invasive surgical procedure.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0052] The following description is provided, alongside all chapters of the present invention, so as to enable any person skilled in the art to make use of said invention and sets forth the best modes contemplated by the inventor of carrying out this invention. Various modifications, however, will remain apparent to those skilled in the art, since the generic principles of the present invention have been defined specifically to provide anchoring devices attached to undersurface of a cavity surface for assisting laparoscopic endoscopic procedures.

[0053] U.S. application Ser. No. 10/563,229, PCT publication no. WO2005/002415, and EP Application No 04 744 933.5 are incorporated in all its parts as a reference to the current invention.

[0054] Exemplary descriptions and embodiments of the anchoring of the device are found in U.S. application Ser. No. 10/563,229, PCT publication no. WO2005/002415, and EP Application No 04 744 933.5.

[0055] The present invention provides a surgical device comprising:

- (a) at least two interchangeable tips (tool head); and
- (b) at least one control unit.

[0056] The device is adapted with means such that the replacement of the interchangeable tip via the control unit is enabled within the abdominal cavity and/or within a hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative spaces, during minimally invasive surgical procedure; further wherein the control unit is adapted to actuate the interchangeable tip.

[0057] The present invention also provides a system adapted to change a wide variety of different tool heads, or interchangeable tips during minimally invasive surgery. The system comprising:

- (a) at least one surgical device; and
- (b) at least one anchoring means.

[0058] The anchoring means is anchored to the internal wall of the abdominal cavity and/or body cavity and/or hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative spaces during minimally invasive surgery. The interchangeable tip of said device is provided with means to be attached to the anchoring means whilst the interchangeable tip is not engaged to the control unit of the device during minimally invasive surgical procedures.

[0059] The present invention also provides a method for changing a wide variety of different tool heads, or interchangeable tips during minimally invasive surgical procedure. The method comprises steps selected inter alia from:

- (a) obtaining a device;
- (b) introducing the device through an incision into to a body cavity and/or to an organ and/or a body cavity and/or to an organ and/or to a hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative spaces and attaching the at least one interchangeable tip via attachment means to the undersurface of the cavity and/or to the organ and/or to the hollow body organs and/or to the natural/artificial orifices and/or to the spaces and/or to the post operative spaces;

(c) interchanging the interchangeable tip via the control unit; wherein the interchanging step of the interchangeable tips is enabled within the abdominal cavity and/or within the hollow body organs and/or the natural/artificial orifices and/or the spaces and/or the post operative spaces, during the minimally invasive surgical procedure.

[0060] The present invention also provides another method for changing a wide variety of different tool heads, or interchangeable tips during laparoscopic surgery. The method comprises steps selected inter alia from:

(a) obtaining a system;

(b) introducing said system through an incision into to a body cavity and/or to an organ and/or to an organ and/or to a hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative;

(c) attaching the attachment means of the system to the undersurface of the body cavity and/or to the organ and/or to the hollow body organs and/or to the natural/artificial orifices and/or to the spaces and/or to the post operative spaces;

(d) attaching the interchangeable tip of said device to the attachment means via the control unit;

(e) interchanging the interchangeable tips via the control unit; wherein the interchanging step of said interchangeable tips is enabled within said abdominal cavity and/or within said hollow body organs and/or said natural/artificial orifices and/or the spaces and/or the post operative spaces, during the minimally invasive surgical procedure.

[0061] The term “scope” refers hereinafter to laparoscope, endoscope, coeloscope or optical device used for observation within a body cavity and/or procedures being performed within a body cavity.

[0062] The term “minimally invasive surgery” refers hereinafter to a procedure that is carried out by entering the body through the skin or through a body cavity or anatomical opening, but with the smallest damage possible.

[0063] The term “virtual port” refers hereinafter to a surgical device introduced within a body cavity without need of dedicated incision and/or port but by using other port.

[0064] The term “control unit” refers hereinafter to any surgical instrument specially designed for providing access during a surgery or operation.

[0065] The term “trocar” refers hereinafter to a surgical instrument passed through the body, used to allow easy exchange of endoscopic instruments during endoscopic surgery.

[0066] The term “body cavity” refers hereinafter to any selected from the internal wall of the abdominal cavity and/or body cavity and/or hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative spaces during minimally invasive surgery or any combination thereof.

[0067] The present invention discloses a system adapted to change instruments during laparoscopic endoscopic surgery.

[0068] Reference is now made to FIGS. 1 and 2 which schematically display a toolbox system 10 adapted to change a wide variety of different tool heads, or interchangeable tips during endoscopic surgery. The toolbox comprises an anchoring device 11 attached to the undersurface of the cavity 15. The toolbox also comprises a plurality of interchangeable tips of surgical devices 12, 13 (shown for illustration) independently and releasably attached by magnetic force to the anchoring device 11 by a magnetic strip 14. The instrument tips all have a ferromagnetic adaptor at their proximal end by they are attached to the strip and by which a control unit engages the tip and enables its application.

[0069] Reference is now made to FIG. 3 which schematically displays a toolbox system 30 which comprises an anchoring device 11 attached to the undersurface of the cavity 15. The toolbox also comprises a plurality of interchangeable tips of surgical devices 12, 13, 32 (shown for illustration) independently and releasably attached by hanging on hooks 33 along a strip 34 attached to the anchoring device 11. The use and application of the tips is a mentioned above (toolbox system 10) with the difference that the distal adaptors need not be made of ferromagnetic material.

[0070] Reference is now made to FIGS. 4-5 which schematically illustrate a toolbox system 40 in which the various instrument tips 41 (shown for illustration) are directly and independently releasably attached to undersurface of the cavity 15. The instrument tips are attached to the cavity undersurface by a hook 42 on the distal end of each tip which pierces the cavity and remains hooked until needed for use.

[0071] Reference is now made to FIGS. 6-8 which schematically display a control unit 600 for the manipulation of the interchangeable instrument tip within body cavity. The control unit consists of a body 601 with a handle 606, a trigger 605, a stopper lever 602 and a tubular member 603 with an engaging site 604 at its distal end. The body 601 of the control unit conceals a piston 702 with three tabs 703, 704 and 705 for engaging the stopper lever 602. The piston is backed by a spring 701 which when compressed by proximal movement of the piston, tends to expand. Thus, applying force on the piston tends to return the piston to its distal position. A rigid wire 706 attached to the proximal end of the piston runs along its axis and extends through the tube 603 towards the distal engaging site 604, attaching to the hook 802 within the tube. At the engaging site, the hook 42 of an interchangeable instrument tip 41 is hinged on the control unit's (600) plate 801 and hook 802 system.

[0072] Reference is now made to FIG. 8 which is an enlarged perspective view of the engaging end of the control unit and instrument tip in one work configuration. FIG. 8 illustrates plate 801 and hook 802 of the control unit in a separated state, as the trigger 605 of the control unit is fully released. The configuration illustrated in FIG. 8 allows “fishing” of a tip's hook 42 which is attached to the toolbox as described in any of the embodiments in the present invention.

[0073] Reference is now made to FIG. 9 which is an enlarged perspective view of the engaging end of the control unit and the instrument tip at the second work configuration. FIG. 9 illustrates the plate 801 and hook 802 adjacent to each other, thus holding the tip 41 by its hook 42, as the trigger 605 has been partially pulled proximally so that the piston 702 consequentially moves proximally and the stopper lever 602 temporarily locks it in position by engaging the middle tab 704. The configuration illustrated in FIG. 9 allows attachment of the instrument tip to the toolbox.

[0074] Reference is now made to FIG. 10 which is an enlarged perspective view of the engaging end of the control unit and instrument tip at a third configuration of work. As the plate 801 and hook system 802 are concealed within tube 603 of the control unit, thus a ring 43 on the proximal end of an instrument tip 41 is adjacent to the tube's distal end 803, as the trigger has been nearly completely pulled proximally so that the piston 702 is now temporarily locked in position by the stopper lever engaging the distal tab 705. The configuration illustrated in FIG. 10 allows the manipulation of the interchangeable instrument tip 41 by further pulling the trigger in order to iteratively actuate and operate mechanical parts of

the tip, or by moving and manipulating the tip within the body cavity. Furthermore, this configuration enables the insertion and extraction of the tip from within the body cavity through a trocar.

[0075] Reference is now made to FIG. 11 is an enlarged perspective view of the engaging end of a control unit according to another embodiment of the present invention, engaging an interchangeable instrument tip at one configuration of work. FIG. 11 illustrates the engaging end 604 of the control unit with a loop 711 which is integral to the wire 706 of the control unit 600. The loop is engaging with hook 52 of the interchangeable instrument tip 51 (located on its proximal end). Loop 711 has two configurations: an open configuration and a closed configuration. In the open configuration the loop 711 is open and hook 52 of the interchangeable instrument tip 51 can be engaged with said loop (i.e., inserted into the loop 711). In the closed configuration the loop 711 is closed and hook 52 can not be inserted into it or extracted from it.

[0076] In the configuration illustrated in FIG. 11, the trigger 605 is fully released, allowing attachment and release of the instrument tip hook to the loop. Pulling the trigger bring about the proximal retraction of the loop, thus retracting the instrument tip 51 until the ring 53 at its proximal end abuts against the distal rim 803 of the tube 603, allowing the actuation and maneuvering of the instrument tip.

[0077] Reference is now made to FIG. 12 which schematically represents in a flow diagram, a method (1200) for changing a wide variety of different tool heads, or interchangeable tips during minimally invasive surgical procedure. At the first stage (121) a device is obtained. Next (122), the device is introduced through an incision into to a body cavity and/or to an organ and/or a body cavity and/or to an organ and/or to a hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative spaces. Furthermore, at least one interchangeable tip is attached via attachment means to the undersurface of the cavity and/or to the organ and/or to the hollow body organs and/or to the natural/artificial orifices and/or to the spaces and/or to the post operative spaces. The last stage (123) the interchangeable tip is interchanges via said control unit.

[0078] Reference is now made to FIG. 13 which schematically represents in a flow diagram, another method (1300) for changing a wide variety of different tool heads, or interchangeable tips during minimally invasive surgical procedure. At the first stage (131) a system is obtained. Next (132), the system is introduced through an incision into to a body cavity and/or to an organ and/or to an organ and/or to a hollow body organs and/or natural/artificial orifices and/or spaces and/or post operative. At the next stage (133), the attachment means of the system is attached to the undersurface of the body cavity and/or to the organ and/or to the hollow body organs and/or to the natural/artificial orifices and/or to the spaces and/or to the post operative spaces. Next (134), the interchangeable tip of the device is attached to the attachment means via the control unit. The final stage (135) is interchanging the interchangeable tips via the control unit.

1. A toolbox system for interchanging a variety of different interchangeable working tips within a body cavity during minimally invasive surgery; said system comprising:

- a. at least one anchoring means (11); said anchoring means (11) are internally and at least partially reversibly attached to an internal wall with said body cavity such that said interchange of each of said at least interchangeable

able working tip is obtained within said body cavity during said minimally invasive surgery;

- b. at least one interchangeable working tip (12, 13) reversibly attached to said anchoring means (11); said interchangeable working tip (12, 13) comprising a body, said body is characterized by a main longitudinal axis and having a distal end and a proximal end coupled together by at least one shaft adapted to reciprocally move along said main longitudinal axis of said body;
- said proximal end comprising at least one actuation means coupled to the proximal end of said shaft;
- said distal end comprising at least one operable means in mechanical communication with the distal end of said shaft; said operable means are adapted to perform a medical operation;

wherein said operable means are actuated by reciprocally and linearly moving said actuation means along said longitudinal axis of said working tip such that said shaft is linearly moved towards and away said proximal end of said body.

2. The toolbox system according to claim 1, wherein said interchangeable working tip (12, 13) is selected from a group comprising of cutting means, blood sealing units, illumination means, imaging means, grasping forceps or provided with hook or/and loop engagement means, dissector, biopsy punch, needle holder, clamp or any combination thereof.

3. The toolbox system according to claim 1, wherein said interchangeable working tip (12, 13) is provided with a hook or/and loop engagement means used for attaching said interchangeable working tip to said anchoring means (11) or directly to said an internal wall with said body cavity.

4. The toolbox system according to claim 1, wherein said interchangeable working tip is provided with attachment means providing said reversible attachment to said anchoring means (11) selected from a group comprising magnetic attachment means, suction attachment means, adhesive attachment, mechanical attachment such as hook or loop attachments, other minimally invasive, or means any combination thereof.

5. The toolbox system according to claim 1, wherein movement of said toolbox system from one position to another within said body cavity is obtained by said reversible attachment of said anchoring means (11) to said body cavity.

6. The toolbox system according to claim 1, wherein said reversible attachment of said interchangeable tip is obtained by applying linear movement to said interchangeable tip.

7. A method for providing at least one interchangeable working tip within a body cavity during laparoscopic surgery; said method comprising steps of:

- a. obtaining a toolbox system comprising:
 - i. at least one anchoring means (11);
 - ii. at least one interchangeable working tip (12, 13) reversibly attached to said anchoring means (11);
- b. introducing said toolbox system through an incision into to said body cavity;
- c. reversibly attaching said attachment means (11) to the undersurface of said body cavity;
- d. reversibly attaching said at least one interchangeable working tip to said attachment means (11); thereby providing said at least one interchangeable working tip within said body cavity.

8. The method according to claim 7, additionally comprising step of interchanging said interchangeable working tip:

- a. disengaging said interchangeable working tip from said attachment means (11);

b. attaching said interchangeable working tip to said attachment means (11) or to the undersurface of said body cavity; and,

c. engaging another interchangeable working tip; thereby interchanging said interchangeable working tip.

9. The method according to claim 7, additionally comprising step of extracting said toolbox system from said body cavity.

10. The method according to claim 7, additionally comprising step of selecting said interchangeable tip from a group comprising cutting means, blood sealing units, illumination means, imaging means, grasping forceps or provided with a hook or/and loop engagement means, dissector, biopsy punch, needle holder, clamp or any combination thereof.

11. The method according to claim 7, additionally comprising step of selecting said attachment means from a group comprising magnetic attachment means, suction attachment, adhesive attachment, mechanical attachment such as hook and loop attachments, any other minimally invasive means, or any combination thereof.

12. The method according to claim 7, additionally comprising step of disengaging said interchangeable working tip from the internal wall within said body abdominal cavity or from said attachment means.

13. The method according to claim 7, additionally comprising step of re-locating said toolbox system from a first position to a second within said body cavity via releasing said attachment means (11) from said undersurface of said body cavity in said first position; and, re-attaching said attachment means (11) to the undersurface of said body cavity in said second position.

14. The method according to claim 7, additionally comprising step of manipulating said at least one interchangeable working tip within said body cavity:

a. obtaining a surgical device (600) for a reversible manipulation of at least one interchangeable working tip within a body cavity, during minimally invasive surgery, said device is characterized by having a distal portion, adapted to be inserted into said body cavity and a proximal portion, located adjacent to a user; said proximal end comprising at least one engagement site (604); said distal end comprising means for activating said at least one engagement site (604);

b. introducing said distal portion of said surgical device through an incision into to said body cavity;

c. reversibly engaging said engagement site with said at least one interchangeable working tip; thereby manipulating said interchangeable working tip.

15. A method of interchanging at least one interchangeable working tip within a body cavity during laparoscopic surgery; said method comprising steps of:

a. obtaining a plurality of interchangeable working tip (12, 13), each of which comprising a body, said body is characterized by a main longitudinal axis and having a distal end and a proximal end coupled together by at least one shaft adapted to reciprocally move along said main longitudinal axis of said body; said proximal end comprising at least one actuation means coupled to the proximal end of said shaft; said distal end comprising at least one operable means in mechanical communication with the distal end of said shaft; said operable means are adapted to perform a medical operation;

b. sequentially introducing said plurality of interchangeable working tip (12, 13) through an incision into to said body cavity;

c. reversibly attaching each of said plurality of interchangeable working tip (12, 13) to the undersurface of said body cavity;

d. removing at least one of said interchangeable working tip (12, 13);

e. actuating said at least one of said interchangeable working tip (12, 13) thereby performing a medical operation via said at least one of said interchangeable working tip (12, 13);

f. interchanging said interchangeable working tip within said body cavity;

wherein said step (e) of actuating is performed by reciprocally and linearly moving said actuation means along said longitudinal axis of said working tip such that said shaft is linearly moved towards and away said proximal end of said body.

16. The method according to claim 15, wherein said step of interchanging said interchangeable working tip comprising steps of:

d. disengaging said interchangeable working tip from said undersurface of said body cavity; and,

e. engaging another interchangeable working tip; thereby interchanging said interchangeable working tip.

17. The method according to claim 15, additionally comprising step of selecting said interchangeable tip from a group comprising cutting means, blood sealing units, illumination means, imaging means, grasping forceps or provided with a hook or/and loop engagement means, dissector, biopsy punch, needle holder, clamp or any combination thereof.

18. The method according to claim 15, additionally comprising step of re-locating said interchangeable tip from a first position to a second within said body cavity via releasing said interchangeable tip from said undersurface of said body cavity in said first position; and, re-attaching said interchangeable tip to the undersurface of said body cavity in said second position.

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专利名称(译)	可互换的尖端和工具箱，用于辅助外科手术		
公开(公告)号	US20090209947A1	公开(公告)日	2009-08-20
申请号	US12/418128	申请日	2009-04-03
[标]申请(专利权)人(译)	GORDIN UDI HEFTMAN吉拉德		
申请(专利权)人(译)	GORDIN UDI HEFTMAN吉拉德		
当前申请(专利权)人(译)	虚拟端口有限公司.		
[标]发明人	GORDIN UDI HEFTMAN GILAD		
发明人	GORDIN, UDI HEFTMAN, GILAD		
IPC分类号	A61B17/00		
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摘要(译)

一种用于在体腔内互换各种可互换工作尖端的工具箱系统，包括：(a) 锚固装置，其可逆地附接到具有所述体腔的内壁，使得在所述体内获得所述至少可互换尖端中的每一个的所述互换(b) 多个可互换的工作尖端，其可逆地连接到所述锚固装置，包括主体，其特征在于纵向轴线并且具有通过一个轴连接在一起的远端和近端，适于沿着所述主纵向往复移动所述身体的轴；所述近端包括至少一个与所述轴的近端连接的致动装置；所述远端包括至少一个与所述轴的远端机械连通的可操作装置；其中所述可操作装置通过沿所述工作尖端的所述纵向轴线往复移动所述致动装置而致动。

