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(54) MULTI-PURPOSE SURGICAL INSTRUMENT

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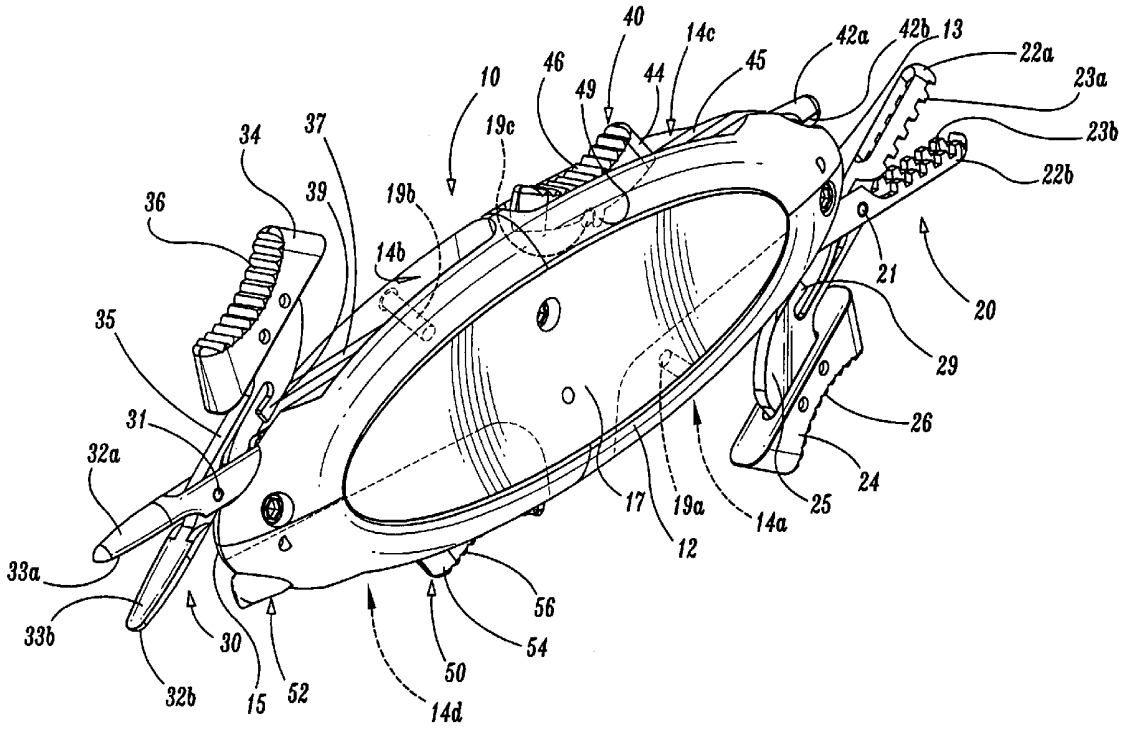
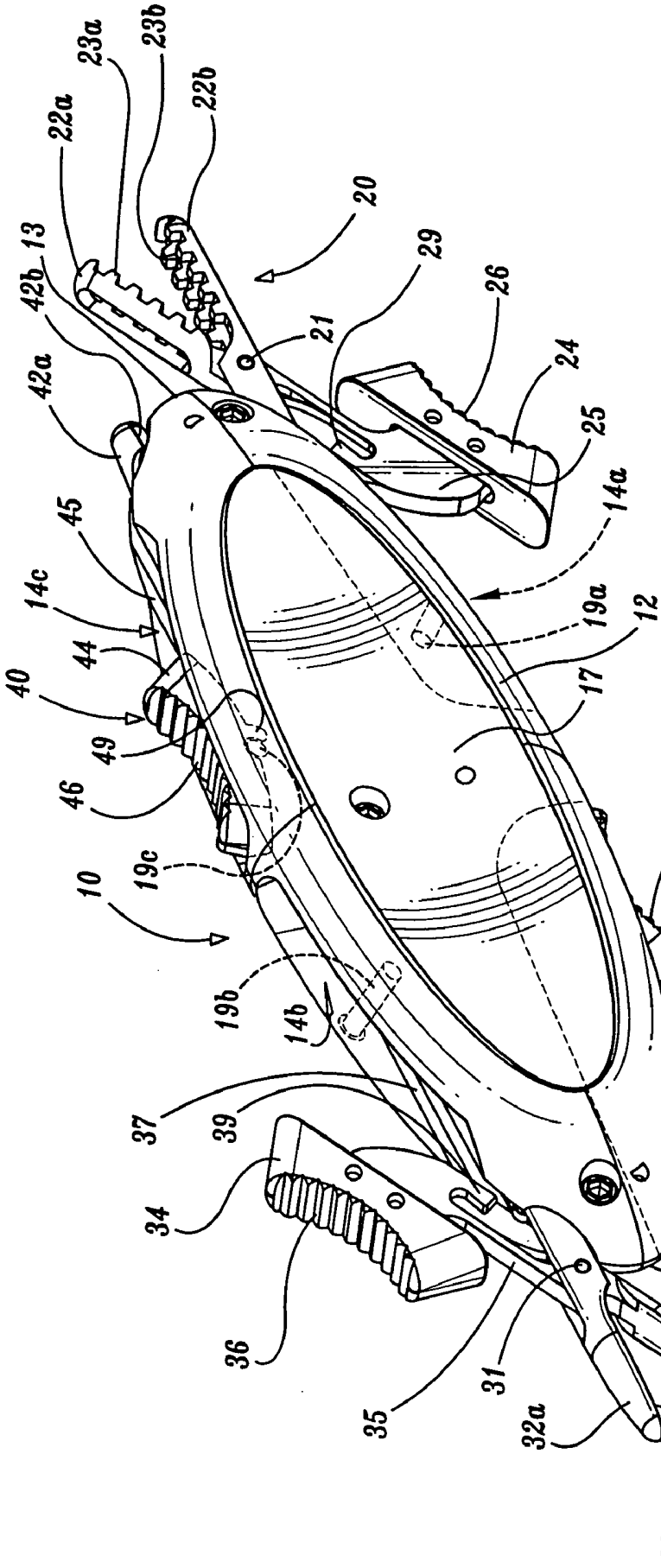
(57) ABSTRACT

A multi-instrument surgical tool for use during hand-assisted laparoscopic surgery includes a housing having a plurality of ports disposed therein which are each dimensioned to slidingly house one of a plurality of surgical instruments for selective deployment from the case. The housing also includes a corresponding plurality of elongated channels each in communication with a respective one of the plurality of ports. Each of the instruments including an actuator which is movable within a respective channel from a first position wherein the instrument is at least partially housed within the housing to a second position wherein the actuator is disengaged from the respective channel and the actuator is freely operable to actuate the instrument for its intended purpose.

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26
21
24
42a
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14a
14c
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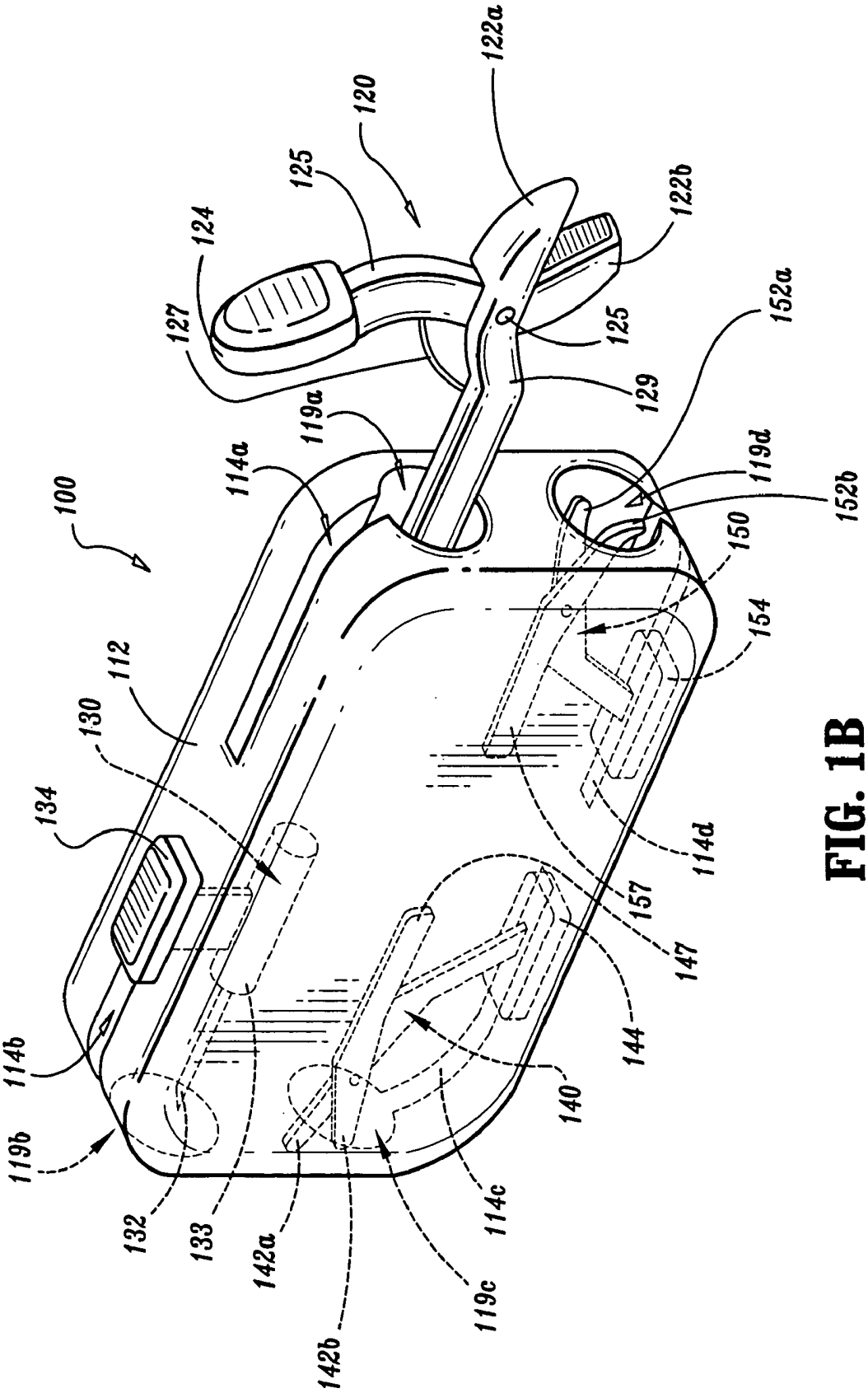
12
44
17
40
49
46
56
54
19c
10
50
14d
19b
14b
37
39
52
34
15
30
36
31
32b
35
32a
33a
33b

FIG. 1A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114c
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119b
119c
119d
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122b
124
125
125
127
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130
132
133
134
140
142a
142b
144
147
150
152a
152b
154
157

FIG. 1B

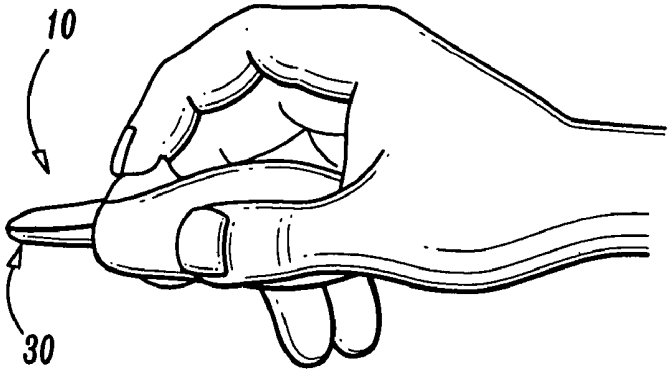


FIG. 1C

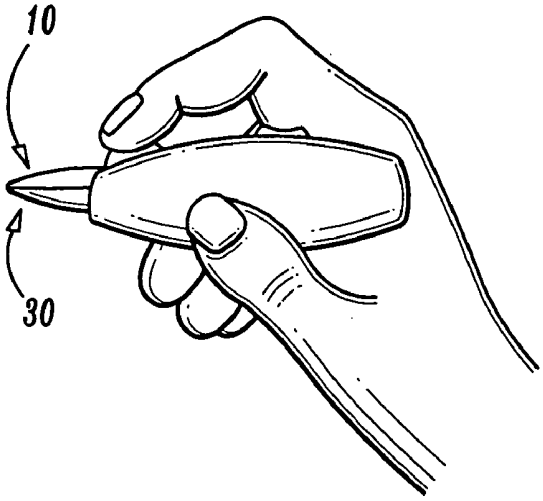


FIG. 1D

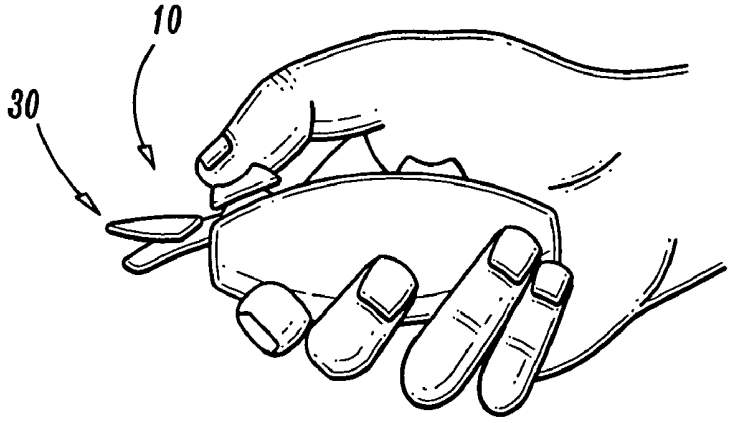


FIG. 1E

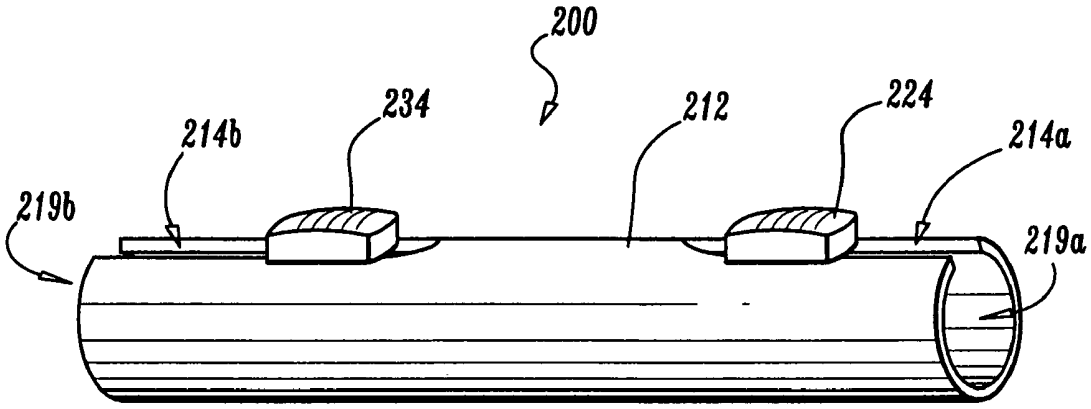
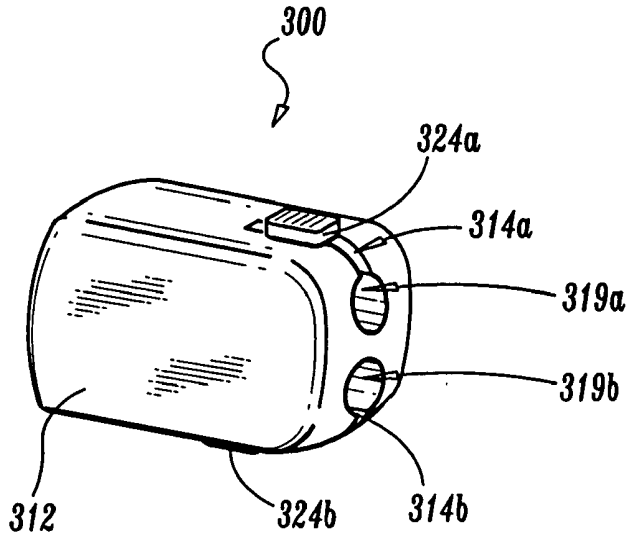

200
234
212
224
214b
214a
219b
219a

FIG. 2A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324a
314a
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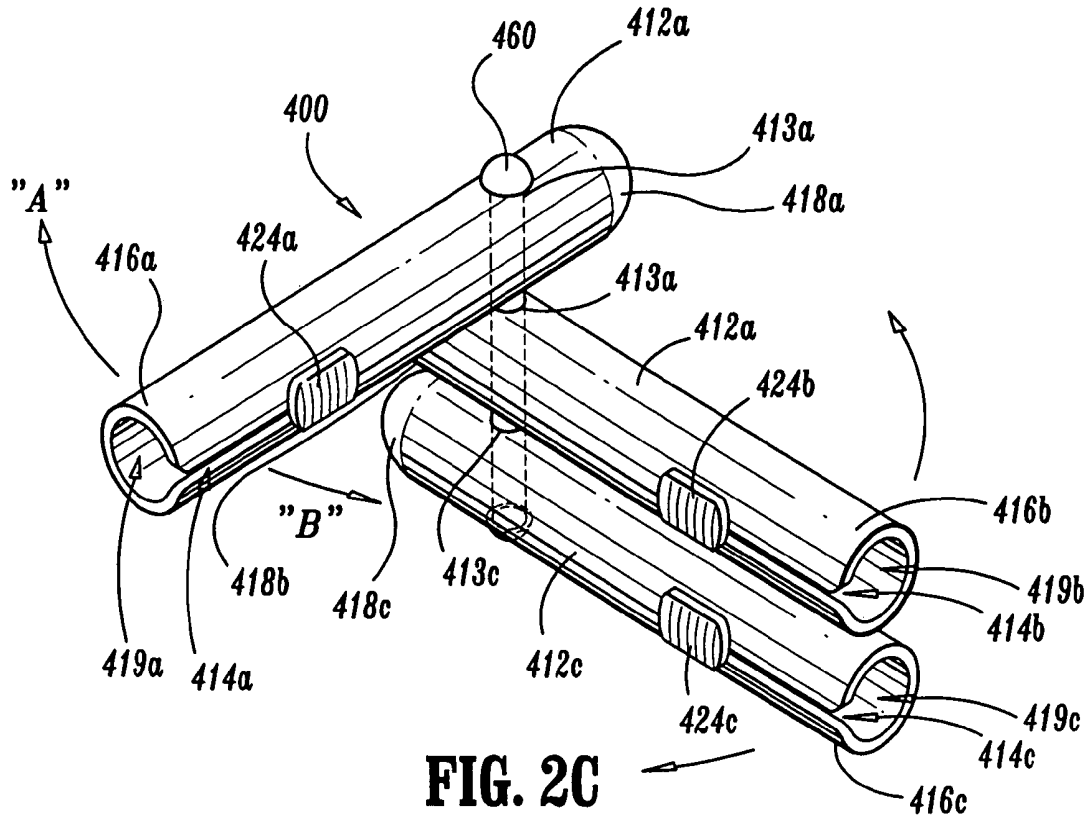
319b
312
324b
314b

FIG. 2B


460
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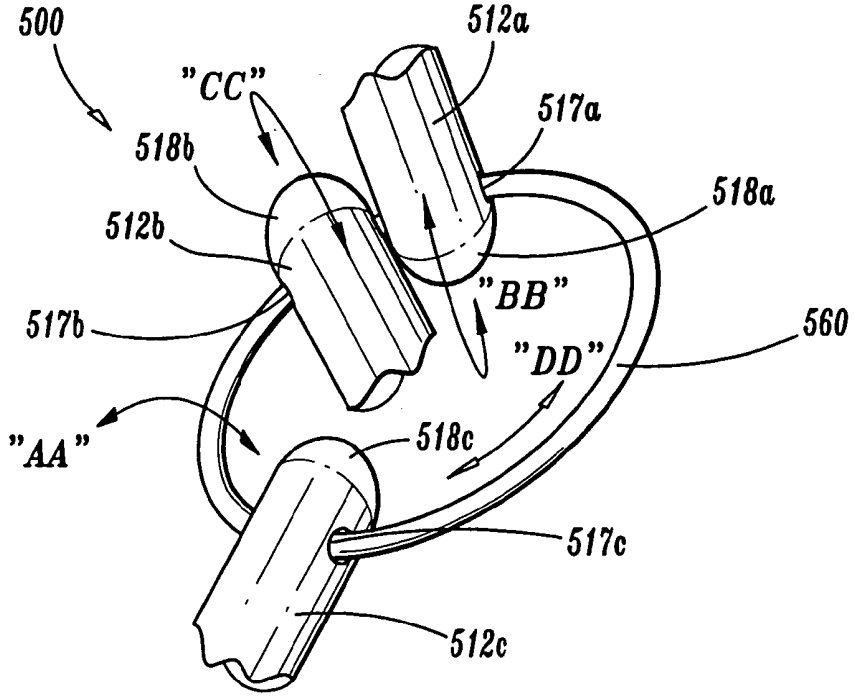
413a
"A"
418a
416a
424a
413a
412a
424b
"B"
416b
418b
418c
413c
419b
414b
419a
414a
412c
424c
419c
414c
416c

FIG. 2C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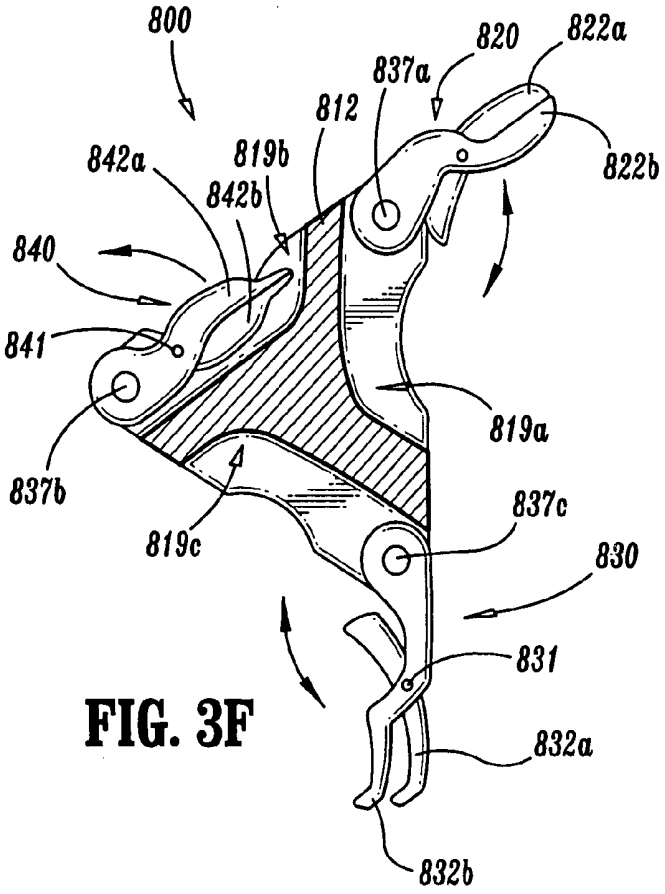
517b
560
"DD"
"AA"
518c
517c
512c

FIG. 2D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837a
812
822b
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819b
842b
840
841
819a
837b
837c
819c
830
831
832a
832b

FIG. 3F

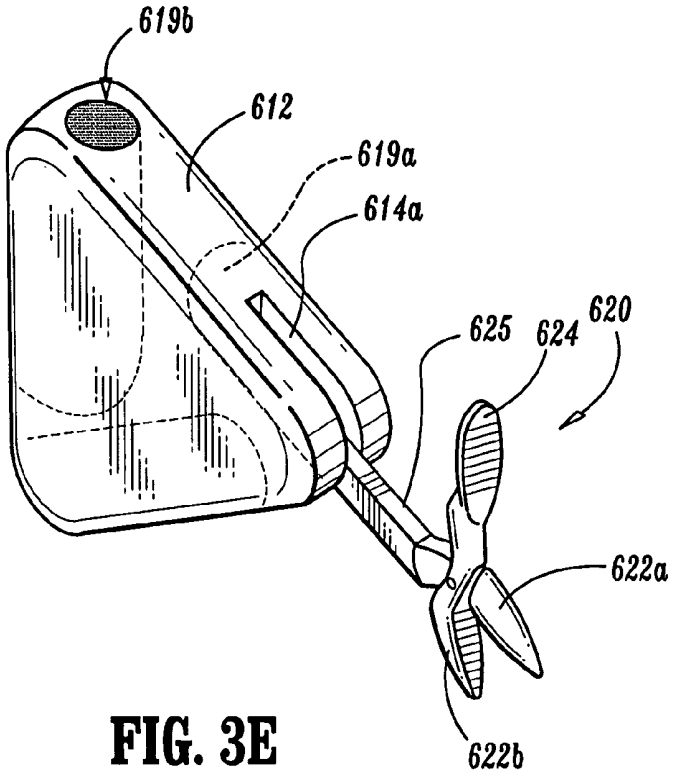
619b
612
619a
614a
625
624
620
622a
622b

FIG. 3E

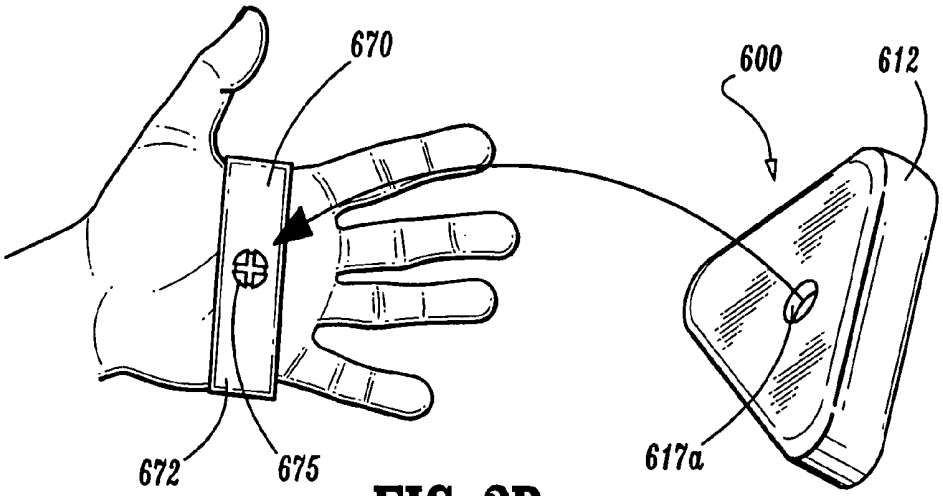

FIG. 3B

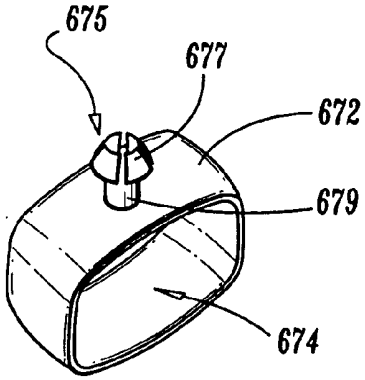

FIG. 3A

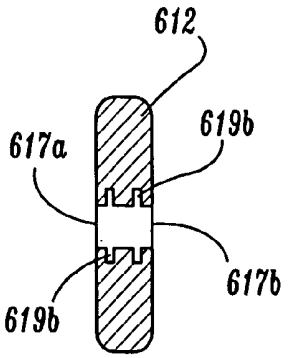

FIG. 3D

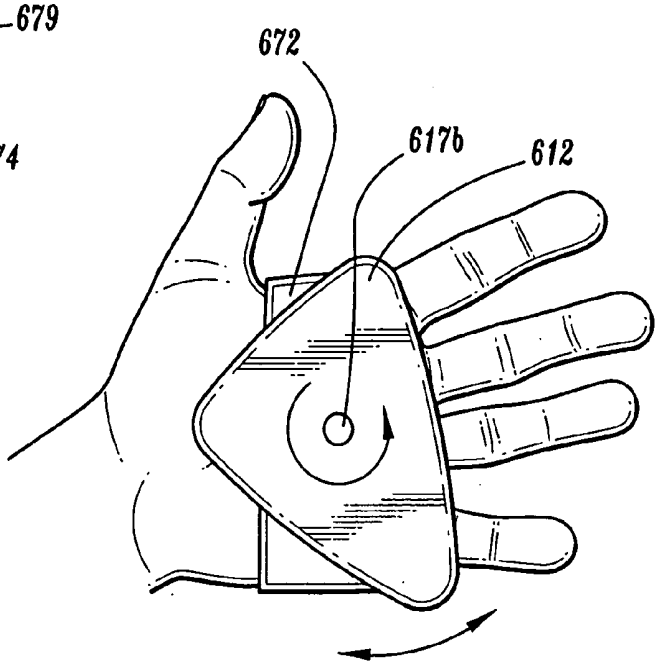

FIG. 3C

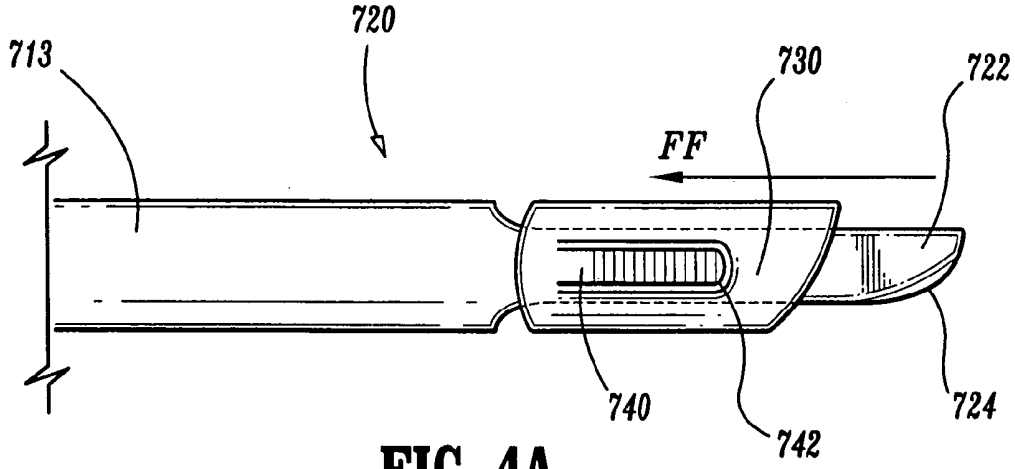

FIG. 4A

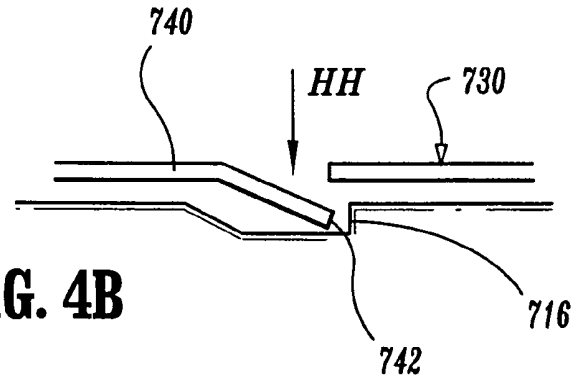

FIG. 4B

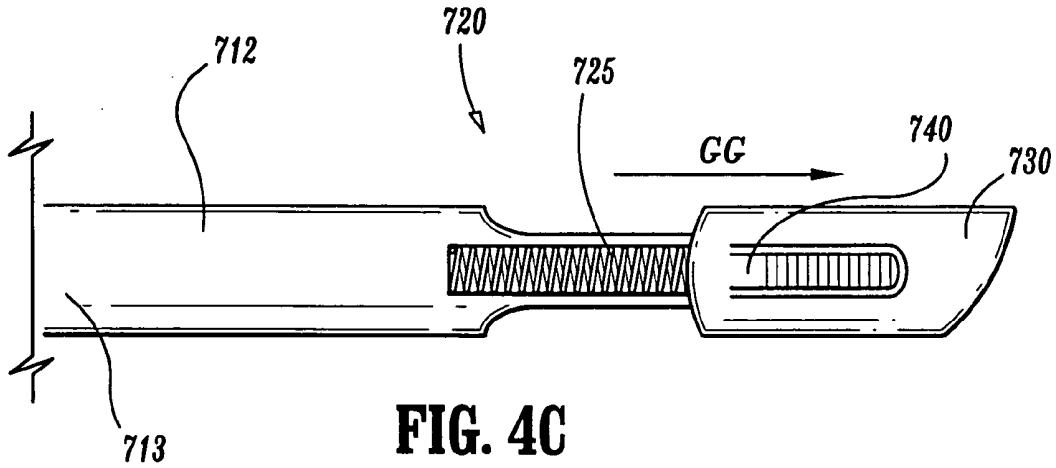

FIG. 4C

MULTI-PURPOSE SURGICAL INSTRUMENT

BACKGROUND

[0001] 1. Technical Field

[0002] The present invention relates to the field of surgical tools and more particularly to a multipurpose surgical tool for use during hand-assisted laparoscopic surgery, minimally invasive surgical procedures and traditional open surgical procedures.

[0003] 2. Background of Related Art

[0004] Open surgery, in general, has remained the procedure of choice for many surgeons since it enhances a surgeon's view of the operating cavity and allows a surgeon to readily palpate the internal organs as needed during a surgical procedure. However, the relatively large incisions required can often be traumatic for patients and may result in a prolonged healing process. As a result and as an alternative to traditional open surgery, many surgeons utilize minimally invasive surgical techniques to treat tissue remotely through small incisions utilizing specialized endoscopic instruments. More particularly, endoscopic instruments are inserted into the patient through a cannula or port that has been made with a trocar. Typical sizes for cannulas range from three millimeters to twelve millimeters. Smaller cannulas are usually preferred, which, as can be appreciated, ultimately presents a design challenge to instrument manufacturers who must find ways to make surgical instruments that fit through the smaller cannulas.

[0005] Certain endoscopic surgical procedures require cutting, cauterizing and/or sealing blood vessels and/or vascular tissue which, typically, requires the surgeon to insert different instruments through the working lumen of the endoscope to treat the tissue. As can be appreciated, this simply adds to the overall complexity of the operation since it requires the repeated exchange of surgical instruments through the working lumen to perform the different tasks associated with the particular surgery involved.

[0006] There are also some disadvantages to endoscopic surgery. For example, endoscopic instruments tend to limit a surgeon's ability to freely manipulate organs and often limit the surgeon's view of the operating cavity. Moreover, when using endoscopic instruments, the surgeon loses tactile feedback of the tissue which can play an important role in some surgical procedures. Further, when the particular surgery dictates the removal of a tissue specimen, the tissue must be either be morselized to fit through the trocar lumen or the surgeon must create a larger opening to remove the specimen intact essentially abandoning the benefits associated with endoscopic surgery.

[0007] Combining the advantages of the traditional and the laparoscopic techniques for abdominal surgery is commonly referred to as "hand-assisted laparoscopic surgery" (HALS). In this procedure, the normal laparoscopic small puncture openings are made with the exception that one opening is made late in the procedure and large enough to allow a surgeon's hand to pass through the opening to manipulate tissue, deliver new instruments into the operating cavity and/or remove tissue specimens. HALS attempts to restore dexterity and tactile feedback by allowing the surgeon to place one hand within the operating space through a hand port. Once the hand is in the operating space, it can be used to manipulate and palpate tissues in much the same way as it is used in open surgical procedures.

[0008] When performing surgery in the abdominal cavity, air or gas is typically introduced to create a condition known as "pneumoperitoneum". Ideally, HALS procedures are performed while maintaining the pneumoperitoneum which eliminates re-insufflation of the surgical cavity. As can be appreciated, if a surgeon's hand has to be removed to retrieve additional surgical instruments, the cavity will deflate and subsequent re-insufflation of the pneumoperitoneum may be required. This simply prolongs the overall surgical procedure and makes HALS surgery very tedious especially when multiple instruments must be utilized during the surgical procedure. As a result, a need exists to develop an improved surgical tool which reduces the need to remove the instruments useful for performing hand assisted laparoscopic surgical procedures.

SUMMARY

[0009] The present disclosure relates to a multipurpose surgical tool for use in minimally invasive surgical procedures such as Hand Assisted Laparoscopic Surgery (HALS). Additionally, the multipurpose surgical tool of the present disclosure may be used in traditional open surgical procedures.

[0010] During HALS surgery, the multipurpose surgical tool may be inserted, in the hand, through a hand port which is made during the course of the surgery. The surgeon manipulates the tool as needed and switches among the plurality of specialized surgical instruments encased within the tool. As can be appreciated, this eliminates the need for the surgeon to remove his/her hand from the operating cavity to switch among instruments.

[0011] The present disclosure includes a multi-instrument surgical tool for use during hand-assisted laparoscopic surgery which includes a housing or casing having a plurality of ports disposed therein. The housing includes a corresponding plurality of elongated channels each in communication with a respective one of the plurality of ports. Each of the ports is dimensioned to slidingly house one of a plurality of surgical instruments therein for selective deployment from the housing. The instruments each include an actuator which is movable within a respective channel from a first position wherein the instrument is at least partially housed within the housing to a second position wherein the actuator is disengaged from the respective channel and the actuator is freely operable to actuate the instrument.

[0012] In one embodiment, the housing includes two ports for slidingly housing two instruments. Preferably, the ports are disposed adjacent one another, however, in an alternate embodiment, the ports are disposed on opposite sides of the housing. In yet another embodiment, the housing is generally triangular and includes three instruments disposed therein.

[0013] Preferably, the instruments are selected from a group consisting of: needle holders; needle drivers; graspers; forceps; vessel sealing devices; dissectors; resectors; probes; morselators; ultrasonic instruments; video-assisted devices; clip appliers; surgical staplers; coagulators; bipolar an mechanical scissors; irrigation instruments; and suction instruments.

[0014] In one embodiment, the housing includes a mechanical interface or aperture disposed on the outer periphery thereof which selectively engages a corresponding mechanical interface or press-lock which is affixable to a surgeon's hand by a clip or strap. Ideally, the mechanical interfaces are rotatable relative to one another which facilitates selection of one of the plurality of instruments within the housing.

[0015] Preferably, one of the plurality of instruments is a surgical scalpel which includes proximal and distal ends. The proximal end is dimensioned to slideably engage one of the ports of the housing and the distal end includes a cutting edge. A safety guard is also included which is movable relative to the scalpel from a first position wherein the guard substantially covers the cutting edge of the scalpel to a second position wherein the cutting edge is exposed.

[0016] In one embodiment according to the present disclosure, the guard includes a locking tab for releasably locking the guard in the second position. Preferably, the guard is spring-biased to return to the first safety position.

[0017] In yet another embodiment according to the present disclosure, the multi-instrument surgical tool includes a housing having a plurality of recesses disposed along the outer periphery thereof. Each of the recesses is dimensioned to receive one of a plurality of surgical instruments therein. A pivot rotatably affixes each instrument to the housing such that each instrument is selectively rotatable relative to the outer periphery of the housing. An actuator is movably affixed to the surgical instrument for activating the surgical instrument for the surgical instrument's intended purpose.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Other objects and features of the present invention will become apparent from the following detailed description considered in connection with the accompanied drawings. It should be understood, however, that the drawings are designed for the purpose of illustration only and not as a definition of the limits of the invention.

[0019] Illustrative embodiments of the subject surgical tool are described herein with reference to the drawings wherein:

[0020] **FIG. 1A** is a perspective view of multi-instrument surgical tool in accordance with the present disclosure;

[0021] **FIG. 1B** is a perspective view of another embodiment of a four-instrument surgical tool in accordance with the present disclosure wherein four instruments are deployable from a rectangular-shaped housing;

[0022] FIGS. 1C-1E are schematic representations showing various hand orientations for using the instruments of **FIGS. 1A and 1B**;

[0023] **FIG. 2A** is a side view showing a two-instrument surgical tool according to the present disclosure wherein the instruments are deployable from opposite sides of the housing;

[0024] **FIG. 2B** is a perspective view showing a two-instrument surgical tool according to the present disclosure wherein the instruments are deployable from the same side of the housing;

[0025] **FIG. 2C** is a perspective view showing a three-instrument surgical tool according to the present disclosure wherein the instruments are rotatable about a common pin for selective deployment of each instrument;

[0026] **FIG. 2D** is a perspective view showing a three-instrument surgical tool according to the present disclosure wherein the instruments are positionable about a key chain for selective deployment of each instrument;

[0027] **FIG. 3A** is a perspective view of a mounting strap for use with the surgical tool according to the present invention;

[0028] **FIG. 3B** is a schematic view showing the proper orientation of the mounting strap of **FIG. 3A** on the surgeon's hand and the method of engaging the mounting strap within a corresponding mounting slot in the outer housing of the surgical tool;

[0029] **FIG. 3C** is a schematic view showing the surgical tool rotationally mounted atop the mounting strap on the surgeon's hand;

[0030] **FIG. 3D** is a cross section of the mounting slot of **FIG. 3B**;

[0031] **FIG. 3E** is shows the embodiment of **FIG. 3B** with a surgical grasping instrument shown in a deployed configuration;

[0032] **FIG. 3F** shows another embodiment of the surgical tool according to the present invention wherein each of the plurality of surgical instruments is housed in a corresponding recess disposed along the outer periphery of the housing;

[0033] **FIG. 4A** is a side view of another embodiment of the present disclosure which shows a spring-biased blade guard for protecting a cutting blade of a scalpel;

[0034] **FIG. 4B** is a schematic illustration of a locking mechanism for the blade guard of **FIG. 4A** which locks the blade guard in a retracted position to enable use of the cutting blade; and

[0035] **FIG. 4C** is a side view of the embodiment of **FIG. 4A** showing the distal movement of the spring-biased blade guard after release of the locking mechanism.

DETAILED DESCRIPTION

[0036] Preferred embodiments of the multipurpose surgical tool will be described in terms of a HALS procedure wherein the typical laparoscopic incisions are made with the exception that one, larger opening is made during the course of the procedure which is large enough to allow a surgeon's hand to pass through the opening to manipulate tissue, deliver new instruments into the operating cavity and/or remove tissue specimens. Air or gas is introduced to create the pneumoperitoneum and the HALS procedure is performed while maintaining the pneumoperitoneum.

[0037] In the drawings and in the description which follows, the term "proximal", as is traditional, will refer to the end of the instrument which is closer to the user, while the term "distal" will refer to the end which is further from the user. When described in accordance with a particular figure, the proximal and distal ends are designated for the purpose of clarification only since the nature and use of the surgical

tool of the present invention enables the surgeon to freely position and rotate the tool within the surgeon's hand.

[0038] Referring now in detail to the drawing figures in which like reference numerals identify similar or identical elements, one embodiment of the present disclosure is illustrated generally in **FIG. 1**A and is designated therein as multipurpose surgical tool **10**. Surgical tool **10** includes a case or housing **12** which has a plurality of elongated instrument slots or ports **14***a*, **14***b*, **14***c* and **14***d* defined therein for removably housing a corresponding plurality of surgical instruments **20**, **30**, **40** and **50**, respectively. More particularly, **FIG. 1A** shows one embodiment of the present multipurpose surgical tool **10** which includes four surgical instruments **20**, **30**, **40** and **50** mounted for selective deployment within elongated ports **14***a*, **14***b*, **14***c* and **14***d*. Other embodiments are described in the figure descriptions which follow and include two-instrument (**FIGS. 2A and 2B**) and three-instrument (**FIGS. 2C, 2D**, 3B, 3C, 3E and 3F) embodiments of the multipurpose tool **10** and variations thereof.

[0039] Turning back to the embodiment shown in **FIG. 1**A, each of the corresponding plurality of surgical instruments, e.g., **20**, is deployably housed within a corresponding elongated port **14***a* defined within the housing **12**. With the four-instrument embodiment, two elongated ports **14***a* and **14***c* are located at one end, e.g., proximal end **13**, for housing instruments **20** and **40**, respectively, and two elongated ports, e.g., **14***b* and **14***d* are located at the opposite end, e.g., distal end **15**, for housing instruments **30** and **50**. As can be appreciated, each elongated port, e.g., **14***a*, is dimensioned to house the particular port's surgical instrument **20** and, as such, the relative dimensions of each port **14***a* may vary depending upon the particular instrument **20** being housed. Preferably, the outer surface of the housing **12** includes an ergonomically enhanced scallop to facilitate handling the tool **10** under wet operating conditions.

[0040] Alternatively, it is envisioned that all or some of the elongated ports **14***a*-**14***d* may be dimensioned in a substantially uniform manner to enable an interchange of different surgical instruments **20**, **30**, **40** and **50**. For example, it is envisioned that the surgeon may be able to select a combination of surgical instruments needed for a particular operation and assemble the tool **10** with these selected instruments prior to insertion. Preferably, the surgical instruments are selected from a group consisting of: needle holders; needle drivers; graspers; forceps; vessel sealing devices; dissectors; resectors; probes; morselators; ultrasonic instruments; video-assisted devices; clip appliers; surgical staplers; coagulators; bipolar an mechanical scissors; irrigation instruments; and suction instruments.

[0041] Moreover, it is also envisioned that certain elongated ports, e.g., **14***a* and **14***c*, may be dimensioned to accommodate one category of surgical instruments, e.g., **20** and **40**, and the remaining ports **14***b* and **14***d* may be dimensioned to accommodate a second category of surgical instruments, e.g., **30** and **50**. The surgeon is then able to interchange among the different categories of surgical instruments and removably engage the selected instruments in the correspondingly dimensioned or appropriate elongated ports as needed.

[0042] **FIG. 1A** shows the multi-purpose surgical instrument **10** having a forceps **30** deployed at the distal end **15** of the housing **12**. The forceps includes two opposing jaw members **32***a* and **32***b* which are movable relative to one another about pivot **31** by virtue of an actuator **34**. The jaw members **32***a* and **32***b* have inner facing surfaces **33***a* and **33***b* which cooperate to grasp tissue therebetween upon selective movement of the actuator **34**. Preferably, the actuator **34** includes an ergonomically enhanced thumb tab **36** to facilitate deployment of the forceps **30** and subsequent actuation of the jaw members **32***a* and **32***b* within the operating cavity under wet conditions. A lever arm **35** is disposed between the actuator **34** and the movable jaw member, e.g., **32***b*, to increase the grasping pressure by mechanical advantage.

[0043] The forceps **30** also includes a locking flange **39** which engages a corresponding locking post **19***b* to releasably lock the forceps **30** within the corresponding elongated port **14***b* when retracted within housing **12**. Preferably, a spring arm or leaf spring **37** biases the locking flange **39** against the locking post **19***b* in a pre-loaded configuration. As can be appreciated, when the actuator **34** is retracted proximally, the actuator **34** releases the locking flange **39** from the locking post **19***b* and allows the forceps **30** to deploy from the housing **12**, i.e., the pre-loaded spring arm **37** forces the forceps **30** distally or outwardly from the housing **12** when released. Once deployed from elongated port **14***b*, the spring arm **37** also biases the jaws **32***a* and **32***b* in an open configuration to facilitate approximation of the tissue. Downward movement of the actuator **34** moves the jaw members **32***a* and **32***b* relative to one another about pivot **31** to grasp tissue.

[0044] A second instrument, namely, a grasping forceps **20**, is shown deployed from the proximal end of the housing **12** of tool **10**. Grasping forceps **20** includes two opposing jaw members **22***a* and **22***b* which are movable relative to one another about pivot **21** in much the same manner as forceps **30**, i.e., by an actuator **24**. Preferably, the inner facing surfaces **23***a* and **23***b* of the jaw members **22***a* and **22***b* are corrugated to facilitate grasping and manipulation of tissue.

[0045] Grasping forceps **20** includes many of the same or similar components as forceps **30**. For example, grasping forceps **20** also deploys in much the same fashion as forceps **30** (i.e., depression of an ergonomically enhanced tab surface **24** to disengage the locking flange **29** from locking post **19***a* to release spring arm (not shown)). The forceps **20** also releasably locks into housing in a similar manner (i.e., by virtue of the mechanical engagement of the locking flange **29** and a corresponding locking post **19***a*). As can be appreciated, both of the forceps **20** or **30** may be deployed at any one time or the locking posts **19***a* and **19***b* may be interconnected (either mechanically or electro-mechanically) to allow deployment of only one instrument at a time.

[0046] **FIG. 1A** also shows third and fourth instruments **40** and **50** which are shown in a retracted or "housed" position within housing **12**. These instruments **40** and **50** may include any of the instruments identified in the group described above. Preferably, each of these instruments is designed to lock within the housing **12** and deploy from the housing **12** in much the same fashion and described above with respect to forceps **20** and **30**. Moreover, each of these instruments includes similar components as described above which have similar functions. For example, instrument **40** includes an actuator **44**, ergonomic surface **46**, lever arm **45**,

jaw members **42***a* and **42***b* and locking flange **49** (which engages locking post **19***c*). Instrument **50** includes an actuator **54**, ergonomic surface **56** and jaw members **52** which again cooperate in much the same fashion as described above.

[**0047**] **FIG. 1B** shows another embodiment of the surgical tool **100** of the present disclosure which shows a plurality of surgical instruments (forceps **120**, needle driver **130**, shears **140** and curved shears **150**) for use with a rectilinear-shaped housing **112**. Each instrument **120**, **130**, **140** and **150** is housed within a respective port **119***a*, **119***b*, **119***c* and **119***d*. Each instrument, e.g., forceps **120**, is manually deployable by moving a corresponding slide-like actuator or slide member, e.g., **124**, distally (or forwardly) within an elongated slot **114***a* disposed within the forceps' port **119***a*. One arm **125** of the forceps **120** is attached at one end to the slide member **124** and at the other end to a corresponding jaw member **122***b*. The other jaw member **122***a* is attached to a second arm **129** which slidingly reciprocates within port **119***a*. Initial distal movement of the slide member **124** rides arm **125** along slot **114***a* until the slide member **124** releases from slot **114***a*. Preferably, a spring **127** biases the slide member **124** against arm **129** which, in turn, biases the jaw members **122***a* and **112***b* in an open configuration for approximating tissue.

[**0048**] To retract or store the forceps **120** in the housing **112**, the surgeon simply re-engages the slide member **124** within slot **114***a* and moves the slide member **124** proximally along slot **114***a* until substantially all of the forceps **120** is seated within port **119***a*. Preferably, the spring **127** holds the forceps **120** in friction-fit engagement within slot **114***a*. Alternatively, a locking mechanism (not shown) may be employed to secure the forceps **120** within port **119***a*.

[**0049**] The other instruments, namely, needle driver **130**, shears **140** and curved shears **150**, all include similar components and are deployable in a similar fashion. More particularly, needle driver **130** includes a slide member **134** which slides along slot **114***b* to selectively deploy a needle tip **132** through port **119***b*. Shears **140** include a slide member **144** which slides along slot **114***c* to selectively deploy arm **147** and blade members **142***a* and **142***b* through port **119***c*. Curved shears **150** include a slide member **154** which slides along slot **114***d* to selectively deploy arm **157** and blade members **152***a* and **152***b* through port **119***d*.

[**0050**] As best illustrated in FIGS. 1C-1E, the surgeon can grasp and hold the surgical tool **10**, **100** in a variety of different orientations for utilizing the different instruments contained therein. Moreover, the symmetrical aspects of the surgical tool **10**, **100** allow the surgeon to comfortably use the tool **10**, **100** in either a right-handed or left-handed orientation.

[**0051**] **FIG. 2A** shows an alternative embodiment of a two-instrument surgical tool **200** which utilizes two ports **219***a* and **219***b* disposed on opposite sides of an elongated tube-like housing **212**. Each of the housed instruments (not shown) includes a slide-like actuator or slide member **224** and **234** which moves along a corresponding slot **214***a* and **214***b* disposed within the housing **212** to deploy the particular instrument as needed during a given surgical procedure much in the same (or similar) manner as described above with respect to the four-instrument embodiment of FIGS. 1A-1D.

[**0052**] **FIG. 2B** shows another version of a two-instrument surgical tool **300** which utilizes two ports **319***a* and **319***b* disposed adjacent one another (i.e., on the same side). Each instrument (not shown) includes an actuator **324***a* and **324***b* which moves along a corresponding slot **314***a* and **314***b* disposed within the housing **312** to deploy the particular instrument in the same (or similar) manner as described above.

[**0053**] **FIG. 2C** shows an alternative embodiment of a three-instrument surgical tool **400** which utilizes three elongated instrument housings **412***a*, **412***b* and **412***c* each having a respective instrument port **419***a*, **419***b* and **419***c* disposed at a distal end **416***a*, **416***b* and **416***c* of each housing (**412***a*, **412***b* and **412***c*). The three-instrument housings **412***a*, **412***b* and **412***c* are commonly attached to an elongated rod or cylinder **460** which engages each housing **412***a*, **412***b* and **412***c* through an aperture **413***a*, **413***b* and **413***c* located at a proximal end **418***a*, **418***b* and **418***c* of housings **412***a*, **412***b* and **412***c*, respectively. Each instrument (not shown) includes an actuator **424***a*, **424***b* and **424***c* which moves along a corresponding slot **414***a*, **414***b* and **414***c* disposed within housings **412***a*, **412***b* and **412***c* to deploy the particular instrument in the same (or similar) fashion as described with respect to FIGS. 1A-1E.

[**0054**] As can be appreciated, the user simply rotates one of the three housings, e.g., **412***a*, which contains a particular surgical instrument (not shown) about rod **460** in the direction "A" and slides the actuator **424***a* distally to deploy the surgical instrument for introduction into the surgical field. To select a different instrument, the user retracts slide **424***a*, rotates housing **412***a* back into vertical registration with the other housings **412***b* and **412***c* in the direction "B" and rotates a new housing, e.g., **412***b*, in the direction "A" to selectively deploy another instrument (not shown).

[**0055**] **FIG. 2D** shows another version of the three-instrument surgical tool **500** wherein the housings **512***a*, **512***b* and **512***c* are commonly mounted to a key ring **560** through an aperture **517***a*, **517***b* and **517***c* located at the proximal end **518***a*, **518***b* and **518***c* of housings **512***a*, **512***b* and **512***c*, respectively. Much like the above three-instrument embodiment, the user simply rotates one of the three housings, e.g., **512***a*, about ring **560** in the direction of the arrows "AA", "BB" and "CC" to position the surgical instrument for introduction into the surgical field. The user can also move a particular instrument in the direction "DD" along ring **560** to facilitate selection and handling of the instrument in the surgical field.

[**0056**] FIGS. 3A-3D show another embodiment of a three-instrument surgical tool **600** which utilizes a mounting strap or hand clip **670** to permit selective rotation of the surgical tool within a surgeon's hand. Preferably, hand clip **670** includes at least one mechanical interface which mates with a corresponding mechanical interface disposed on the housing **612** of the surgical tool **600**. More particularly and as shown in **FIGS. 3A and 3B**, hand clip **670** includes a press-lock fitting **675** which mechanically engages a corresponding aperture **617***a* (or **617***b*) located within the outer periphery of the housing **612**. As best shown in **FIGS. 3A and 3D**, the press lock is designed for snap-fit engagement within aperture **617***a* (or **617***b*).

[**0057**] More particularly, the press-lock includes a segmented top portion **677** which is supported by a stem section

679. Upon introduction of the top portion 677 into one of the two apertures 617*a* or 617*b* (for right-handed or left-handed use of the surgical tool, respectively), the segmented top portion 677 initially compresses inwardly to facilitate engagement within the respective aperture 617*a* (or 617*b*). Once the top portion 677 is fully engaged within aperture 617*a* (or 617*b*), the top portion 677 expands or "snaps" into engagement with a ring-like flange 619*a* (or 619*b*) disposed within the inner periphery of aperture 617*a* (or 617B). Preferably, the top portion 677 and the ring-like flange 619*a* (or 619*b*) are dimensioned to facilitate rotation of the surgical tool 600 relative to the hand clip 670 to allow a surgeon to select and orient the particular surgical tool 600 as needed during surgery (See FIG. 3C).

[0058] FIG. 3E shows the surgical tool 600 of FIG. 3B with a surgical grasping instrument 620 shown deployed from port 619*a* of housing 612 and ready for use. Much in the same (or similar) manner as described above with respect to the embodiment of FIGS. 1A-1D, the grasping instrument 620 includes a slide-like actuator 624 which moves along slot 614*a* to extend the shaft 625 and jaws 622*a* and 622*b* from the housing 612 to enable use of the grasping instrument 620 as needed during a surgical procedure.

[0059] FIG. 3F shows another embodiment of the surgical tool 800 according to the present disclosure wherein a plurality of surgical instruments 820, 830 and 840 are each housed in a corresponding recess 819*a*, 819*b* and 819*c*, respectively, disposed along the outer periphery of the housing 812. More particularly, each instrument, e.g., grasper 820, is rotatingly mounted to housing 812 about a pivot 837*a* and is selectively movable from a first "stored" position to a second "deployed" position. Preferably, each recess, e.g., 819*a*, is dimensioned to store the respective instrument, e.g., grasper 820, in a generally flush manner with respect to the outer periphery of the housing 812. Moreover, each recess 819A is preferably dimensioned such that the jaw members or end effectors 822*a* and 822*b* remain properly seated in a generally closed configuration when stored.

[0060] As can be appreciated, the other instruments of surgical tool 800 are deployed in much the same fashion as grasper 820 and include similar elements to those instruments described above. For example, instrument 830 is a curved forceps and includes jaws 832*a* and 832*b* which are rotatable about pivot 831 to approximate and grasp tissue. The forceps 830 mounts to housing 812 about pivot 837*c* and is stored within recess 819*c* when not is use. Likewise, scissors 840 include jaws 842*a* and 842*b* which are rotatable about pivot 841 to sever tissue. The scissors 840 mount to housing 812 about pivot 837*b* and are stored within recess 819*b* when not is use.

[0061] As shown best in FIGS. 4A-4C, one of the plurality of instruments may be a surgical scalpel 720 having proximal and distal ends 713 and 722, respectively. The proximal end 713 is preferably dimensioned to slideably engage one of the ports (not shown) of the housing (not shown) and the distal end 722 includes a cutting edge 724. A spring-loaded safety guard 730 is also included which is movable relative to the scalpel 720 from a first position wherein the guard 730 substantially covers the cutting edge 724 of the scalpel 720 (See FIG. 4C) to a second position wherein the cutting edge 724 is exposed.

[0062] Preferably, the safety guard 730 includes a locking tab 740 for releasably locking the guard 730 in the second position (See FIG. 4B). The guard 730 may also include a spring 725 which automatically extends the guard 730 once the locking tab 740 is released to cover the cutting edge 724 when not in use. More particularly, during use the user retracts the guard 730 proximally against spring 725 in the direction "FF" and simultaneously depresses locking flange 740 inwardly (i.e., in the direction of arrow "HH") such that a distal end 742 of the locking tab 740 abuts against a corresponding flange or notch 716 disposed within the outer periphery of scalpel 730 (See FIG. 4B). The biasing force of the spring 725 retains the locking tab 740 within the notch 716 and locks the guard 730 in a retracted position to expose the cutting edge 724 of the scalpel 720 for use. Once the surgeon has completed the cut using the scalpel 720, the surgeon simply retracts the guard 730 proximally (i.e., in the direction "FF") which releases the locking tab 742 from the notch 716 and allows the guard 730 to extend distally in the direction "GG" over the cutting edge 724 under the force of the spring 725.

[0063] From the foregoing and with reference to the various figure drawings, those skilled in the art will appreciate that certain modifications can also be made to the present disclosure without departing from the scope of the same. While several embodiments of the disclosure have been shown in the drawings, it is not intended that the disclosure be limited thereto, as it is intended that the disclosure be as broad in scope as the art will allow and that the specification be read likewise. Therefore, the above description should not be construed as limiting, but merely as exemplifications of preferred embodiments. Those skilled in the art will envision other modifications within the scope and spirit of the claims appended hereto.

What is claimed:

1. A multi-instrument surgical tool for use during hand-assisted laparoscopic surgery, comprising:

a housing having a plurality of ports disposed therein, each of said ports being dimensioned to slidingly house one of a plurality of surgical instruments therein for selective deployment from said case, said housing including a corresponding plurality of elongated channels each in communication with a respective one of said plurality of ports; and

each of said instruments having an actuator which is movable within a respective channel from a first position wherein said instrument is at least partially housed within said housing to a second position wherein said actuator is disengaged from said respective channel and said actuator is freely operable to actuate said instrument.

2. A multi-instrument surgical tool according to claim 1 wherein said housing includes two ports disposed therein for slidingly housing two instruments.

3. A multi-instrument surgical tool according to claim 2 wherein said ports are disposed adjacent one another.

4. A multi-instrument surgical tool according to claim 2 wherein said ports are disposed on opposite sides of said case.

5. A multi-instrument surgical tool according to claim 1 wherein said housing is generally triangular.

6. A multi-instrument surgical tool according to claim 1 wherein said instruments are selected from a group consisting of: needle holders; needle drivers; graspers; forceps; vessel sealing devices; dissectors; resectors; probes; morselators; ultrasonic instruments; video-assisted devices; clip appliers; surgical staplers; coagulators; bipolar an mechanical scissors; irrigation instruments; and suction instruments.

7. A multi-instrument surgical tool according to claim 1 wherein said housing includes a mechanical interface disposed on the outer periphery thereof, said mechanical interface being selectively enageable with a corresponding mechanical interface which is affixable to a surgeon's hand.

8. A multi-instrument surgical tool according to claim 7 wherein said mechanical interfaces are rotatable relative to one another to orient a given instrument for deployment and use.

9. A multi-instrument surgical tool according to claim 1 wherein one of said instruments includes a surgical scalpel which includes:

proximal and distal ends, said proximal end being dimensioned to slideably engage one of said ports of said housing and said distal end having a cutting edge;

a safety guard which is movable relative to said scalpel from a first position wherein said guard substantially covers the cutting edge of said scalpel to a second position wherein said cutting edge is exposed.

10. A multi-instrument surgical tool according to claim 9 wherein said guard includes a locking tab for releasably locking said guard in said second position.

11. A multi-instrument surgical tool according to claim 9 wherein said guard is spring-biased to return to said first position.

12. A multi-instrument surgical tool for use during hand-assisted laparoscopic surgery, comprising:

a housing having a plurality of recesses disposed in the outer periphery thereof, each of said recesses being dimensioned to receive one of a plurality of surgical instruments therein;

a pivot which rotatably affixes said instrument to said housing such that said surgical instrument is selectively rotatable relative to the outer periphery of said case; and

an actuator movably affixed with said surgical instrument for actuating the surgical instrument for the surgical instrument's intended purpose.

* * * * *

专利名称(译)	多功能手术器械		
公开(公告)号	US20040068253A1	公开(公告)日	2004-04-08
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[标]申请(专利权)人(译)	BAYER HANSPETERř 海因里希RUSSELL		
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IPC分类号	A61B17/00 A61B17/04 A61B17/064 A61B17/122 A61B17/128 A61B17/28 A61B17/32		
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其他公开文献	US7156839		
外部链接	Espacenet USPTO		

摘要(译)

在手辅助腹腔镜手术期间使用的多器械手术工具包括壳体，壳体具有设置在其中的多个端口，每个端口的尺寸设计成可滑动地容纳多个手术器械中的一个，用于从壳体选择性地展开。壳体还包括相应的多个细长通道，每个细长通道与多个端口中的相应一个连通。每个仪器包括致动器，该致动器可在相应的通道内从第一位置移动，其中器械至少部分地容纳在壳体内至第二位置，其中致动器从相应的通道脱离，致动器可自由操作以致动该工具用于其预期目的。