

EQUIPMENT OF SURGICAL INSTRUMENTS SUITABLE FOR MINIMALLY INVASIVE SURGERY

5 1) Title and technical field of the invention

The present invention relates to an equipment of surgical instruments suitable for minimally invasive surgery, defined by a number of operative pieces to be mounted inside the patient's cavity to be operated on.

10 2) State of the art and problems to solve

At present, in the prior art, laparoscopic and endoscopic surgical instruments are known.

In laparoscopic surgeries, multiple access ports or channels are used with several incisions on the skin, one for each access device. In turn, each access
15 port allows the entrance of one laparoscopic instrument at a time through only one operative channel. At present, since these laparoscopic instruments are rigid and function only on one directional axis, they are not adjustable to the different needs of variable angulation require either in space or at operative area.

20 In endoscopic surgery, instruments in use, contrary to laparoscopic instruments that have an extreme flexibility, do not have an own directional axis but instead the instrument is adapted to the artificial or natural duct along which it moves.

In endoscopic surgery conducted through natural orifices, endoscopic clamp tips are of small size since they move inside operative ducts of the endoscopy
25 and given their small operative area, they require a longer surgical time to attain the same result.

Either in laparoscopic as in endoscopic surgery, instruments presently used are already mounted and ready to be used before entering the working area.

The invention aims to solve the present limitations of laparoscopic and
30 endoscopic surgical instruments, to reduce surgical times, to obtain more security while handling organs during surgery, to reduce the post operative pain, to get better aesthetic results and to circumscribe, by means of one or multiple access ways, different possibilities of video-assisted and minimally

invasive diagnosis and surgical treatment. It also tends to solve those limitations found in the triangulation of monotrocar laparoscopic surgeries.

In the invention, this is attained by using:

- Access device that enables simultaneous operation of several operative clamps through only one access and besides with said device, the access area to be used may be adjusted as needed.

- Designs, devices, materials and media of minimum diameter and suitable to be intrasurgically mounted inside the patient's body such as the needle pliers which, it is worth mentioning, acquire three main advantages:

a) minimum access area or surface to be entered by means of a needle;

b) entrance of these needle pliers is direct without needing any additional access device; and

c) good control and handling of organs or objects to be treated since the clamp head and tip are of larger diameter than that where the needle is introduced because the clamp head and tip are inserted by an access device, by a natural means or incision, and finally due to the function of the ensambling clamp, the mounting of the needle pliers is attained intrasurgically inside the patient's body, that is: two accesses are used so that the needle pliers be ready for use.

- An articulated element of cauterization which allows spatial positioning and repositioning on different directional axis according to the angulation needed for the practice to be performed, improving performance at the surgical site.

3) Object of the invention

The object of the invention lies on the performance of surgical acts in which various operative devices inherent to surgery are manipulated through at least an access having an access device, said devices being mounted inside the patient's body, including an articulated element of cauterization and access of needle pliers through other accesses, allowing operation with several operative clamps that permit a clear maneuverability and control of the practice to be performed at different planes and angulations as the surgical technique may require, resulting in a minimum access surface and a greater operative scope.

This is attained by:

- Providing an access with an access device with a minimum incision and its opening may be adjusted according to the characteristics of the surgical act.
- 5 • Providing an equipment of surgical instruments suitable for minimally invasive surgery that allows the interchange of operative tips according to the different stages of the surgery without needing to perform other access incisions.
- 10 • Providing a needle plier having a puncture end that will not need any additional tools to perform the incision on the patient and that, in turn, said puncture end may permit an intrasurgical connection and to insert into the patient's body any kind of operative head to be used with no limitation as to diameters of said head.
- 15 • Providing an equipment of surgical instruments suitable for minimally invasive surgery which clamp tips may rotate 360° whatever the configuration of the operative element may be.
- 20 • Providing an equipment of surgical instruments suitable for minimally invasive surgery which access port can allow the entrance of operative tools which operative head is of greater diameter than the average transmission diameter of said tools, which can allow to combine the concept of minimal access with a surgical practice being safer than that of the laparoscopy due to the size of the operative ends of the tools.
- 25 • Providing a mounting clamp that transports heads of the needle pliers to the interior of the patient's cavity in different surgical acts and that allows the intrasurgical mounting of the needle plier permitting its coupling inside the patient's body.
- 30 • Providing an articulated element of cauterization that may adopt different angulations at the surgical site, overcoming the limitations of rigid working elements.

4) Description of figures

The present invention will be better understood by means of the figures, in which:

Figure 1 shows the equipment of surgical instruments with all elements included: an access device, a device for surgical work, a mounting clamp and a
5 cauterization device.

Figure 2 shows a partial lateral view and a partial upper view of the access device.

Figure 3A shows a view with the different shapes that the operative mounting device may adopt.

10 Figure 3B shows a perspective view of the front of the operative clamp.

Figure 4A shows a general lateral view of the needle pliers.

Figure 4B shows a detailed lateral view of the needle pliers connected to a double articulation head.

Figure 4C shows an upper view of the head of double articulation.

15 Figure 4 shows a detailed view of the head of single articulation.

Figure 4 shows a detailed lateral view of the head of elastic articulation.

Figure 4F shows a partial view according to plane A-A of figure 4B.

Figure 5 A shows a lateral detailed view of the cauterization device.

20 Figure 5B shows a lateral detailed view of the cauterization device with the isolating coating.

5) Detailed description of the invention

In figure 1 an equipment of surgical instruments (1) with all elements included is
25 seen, comprised by an access device (2), an operative mounting device (3), a needle plier (4) and a cauterization device (5).

Figure 2 shows an access device according to the present invention that widely overcomes the prior art in the sense that facilitates its use and that fixes separators. The access device (2) consists of a rigid ring (201) from which at its
30 inner side and opposite to each other, two extensions stem out in distal direction that act as separators, one extension will be the steady separator (202) tightly joined to the rigid ring and the other extension will be the movable

separator (203), being movable with respect to the rigid ring. Both separators are slightly bent towards the external side of the access device and all surfaces and angles are blunt. Distal ends show a "U" shape. The movable separator is tightly joined to a demilune (204) that pivots around bolts (205) with respect to the rigid ring. Therefore, the movable separator pivots with respect to the rigid ring.

Near the distal end of the rigid ring the demilune is lodged, which is joined to the rigid ring by bolts (205), at its ends, which allow its pivot. In the central part of the demilune, an articulation (206) is provided, which is connected to the opening adjusting device (207) by the corresponding bolt. Near the ends of the demilune, the movable separator is provided, tightly joined to said demilune.

On the internal face of the rigid ring of the access device, opposite to the steady separator and close to a proximal part of same, a lid (209) with a thru hole is provided. Inside the thru hole of the lid, the opening adjusting device (207) is provided. This is a rigid element, being cylindric and threaded at its proximal part and with a throttle (210) resting on the proximal face of the lid, and at its distal part it has flat sides opposing a central thru hole at its end which is connected to the articulation (206) by means of the bolt (208).

When a rotation is given to the throttle, this, when rotating, causes a displacement toward proximal part of the opening adjusting device (207), which drags, through the bolt (208) and the articulation (206) the demilune causing its pivot around the bolts (205). Therefore, a rotation around said bolts (205) of the movable separator occurs. In figure 2, in full lines, the movable separator in a first position is seen and in dotted lines the same movable separator in a second opening position is seen.

In figure 3A, a working mounting device is seen, which device is comprised by a control (301), a movement transmitting element (302) and an operative clamp (303) at different operative angulations. The movement transmitting element may be rigid or memorize the positioning and allows a 360° rotation of the operative clamp. The novelty of the present surgical element is the operative mounting clamp. This is designed not to work over the patient himself, with operations

such as cut, cauterization, pressing, etc., but to tightly maintain the head of the needle plier. The movement of this operative plier is also known in the prior art: branches and articulations that transform a linear movement in a transverse one. The novel feature of this operative plier, and which is seen in figure 3B, is that it has at least a furrow (304) on each branch of its pliers, which allows to rigidly tighten the head of the needle pliers not permitting said head to rotate.

In figure 4A, a needle plier is seen comprised by a control (401), a sheath to connect to the head (head connecting sheath) (402) with its distal and proximal ends (418), with the connecting needle (403) provided inside, with its distal (406) and proximal (409) ends, and the operative head (404). In figures 4B and 4C, it is seen that the connecting needle is comprised by a body (405), which is a rigid, thin, elongated and cylindric element, which distal end is sharp (407) and having an external needle plier thread (408) and, at its proximal end (409) it provides an insert made up by two opposite slots (410) near to said end. This portion couples into the longitudinal slot (411) of the movable branch (412) of the control to attain the axial movement, which movement allows the connecting needle to function in combination with the operative head. The particular feature of the distal end, characterized for being sharp, allows the needle plier to be inserted through the patient's tissue to reach his inner body. Following the sharp end, an external thread (408) is provided, which is threaded into the internal thread (424) of the driving intrahead device (422). The connecting needle moves along the interior of the head connecting sheath (402).

The control of the needle plier has a movable branch (412) and a steady branch (413) joined at an articulation (414). The movable branch has a slot into which the proximal end of the connecting needle is fitted. The steady branch has, in coincidence with the slot of the movable branch, a furrow (415) with external thread (416). The distal end of the control is flat, wherein the connecting sheath rests. The body (405) of the connecting needle passes freely by said furrow. In figure 4F, a view by plane A-A of figure 4B is seen.

The head connecting sheath has a body (417), which is a rigid, thin, elongated and tubular element. The proximal portion finishes as a cylindric, washer type

abut (419) and with a fixing thread (420) with internal thread (421), which displaces over said abut and contacts the external thread (416) of the furrow of the steady branch of the control. This union does not allow the connecting sheath to move in longitudinal direction. The connecting sheath may be covered
5 along all its extension by an isolating sheath. At its distal end, an external thread (442) is provided.

The driving intrahead device (422) is a cylindric, solid device, which at its proximal part has an orifice (423) with internal thread (424) into which it couples to the thread (408) of the connecting needle (403). The intrahead device, at its
10 distal part, is provided with driving elements of the clamp head, and is lodged inside the head (427).

In a first embodiment, the driving element of the clamp tips is of double articulation, as seen in figures 4B and 4C. The double articulation is made up by a pair of clamp tips (428) joined by bolts to a pair of clamp articulations (426).
15 The clamp articulations are flat elements, with thru holes on each of their ends. A first bolt (425) joins the orifices of proximal ends of the clamp articulations to the intrahead device by means of its distal thru hole. The clamp tips have a first thru hole at their proximal ends and a second thru hole in the middle of said tips and the first hole. Both clamp tips are joined by means of second bolts (429) at
20 their proximal ends to the distal ends of the clamp articulations. By means of a third bolt (430) at its second holes, they are joined to the head (427). This set of elements make up an articulation which, when receiving the bi-directional movement of the driving intrahead device (422), causes the opening and closure of the clamp tips (428). The clamp tips show, at their distal ends,
25 devices that allow pression, cut, dissection, clipping, cauterization, suture, separators, etc. which belong to the prior art.

The head (427) is a tubular element. It has, at its proximal end, an internal thread (443) where the external thread (442) connects the head connecting sheath.

30 In a second embodiment, the driving element of the clamp tips is a single articulation, as seen in figure 4D. The head has a complete circumference

(434) at its proximal end, the rest being only the basis (435). In the middle of the basis, a pair of flanges (436) opposite to a thru hole are provided. Between said pair of flanges, the proximal end of the single articulation (437) is lodged, which has a first thru hole, and this set is joined by a bolt (438). Near this first thru
 5 hole, a second thru hole is provided to which an end of the intrahead device is joined, by means of a bolt (439). In this embodiment, a joining element (440) is provided between said driving intrahead device (422) and the single articulation (437). This joining element is joined to the driving intrahead device and, at its distal end, a thru hole is provided, where the bolt is coupled (439), which bolt
 10 drives the single articulation (437). By means of the control, an axial movement of the intrahead device is attained which is transformed into an opening and closing movement of the single articulation (437).

In a third embodiment, the driving element of the clamp tips is an elastic type articulation, as seen in figure 4E. The head (427) has, at its proximal end, an
 15 internal thread (443) that finishes, at its distal end, in tubular shape. By the interior of the head, the driving intrahead device (422) moves freely, having, at the proximal side, an orifice (423) with internal thread (424) where the external thread (408) of the connecting needle (403) is coupled. Following the internal thread and in distal direction of the bolt, the latter is divided into two elastic, "V"
 20 shaped branches (441), forming the clamp tips. Each of these "V" shaped branches finishes in the form of a clamp to perform pression, dissection, cutting, clipping, separating, suturing, cauterizing, etc.. When the driving chuck is displaced in bi-directional movement (from proximal to distal or viceversa), given the elastic feature of the "V" shaped branches, the latter are driven apart
 25 or put together causing the opening or closing of the clamp tips (441).

In figure 5, a cauterization device is seen, comprising a control (501), a movement transmitting element (502) and the cautery itself (503). The control
 comprises a handle (504), being cylindric and isolating, with an axial thru hole (505) that has an internal thread (506). At its distal end it has, on the outer
 30 side, a cut (507) with an external thread (508). Inside the handle, a turning wrench (509) is provided, which consists of a cylindric piece with an external

thread (510) and a driving device (511) at its proximal end. At this end, an electricity connector (512) is also provided for the cautery. The distal end of the turning wrench is configured to receive an end of the driving chuck (513), so that the former may rotate around the latter and allow its pushing or retraction
5 together with the movement of the driving device. An electric continuity is provided between the electricity connector and the distal end that receives the end of the driving chuck.

The head connecting sheath has a body (514), which is a rigid, thin, elongated and tubular element. Inside this sheath, the driving chuck is lodged. The
10 proximal portion finishes in a cylindric, washer type abut (515) and with a fixing thread (516) with internal thread (517), which displaces over said abut, and contacts the external thread (508) of the cut (507) of the control. This union does not allow the connecting sheath to move in longitudinal direction. The connecting sheath may be covered along all its extension by an isolating
15 sheath. At its distal end, an external thread (518) is provided.

The head (519) is a piece with its proximal end being cylindric, with an internal thread (520) where the external thread (518) of the head connecting sheath is threaded. Near its distal end, which shows only a basis (521), a pair of flanges (522) is provided on which the cautery (503) pivots by a first bolt (523). The
20 cautery has an orifice for the second bolt (524) that is joined to the distal end of the driving chuck. The rotation of the turning wrench causes an axial displacement of the driving chuck and, due to the lever in the head end, transforms this linear movement into an angular movement of the cautery.

In figure 5B, the cautery with an insulated coating (525) is observed; said
25 coating covers the cautery except for the distal end of the cautery itself.

CLAIMS

Having described and defined the nature of the invention as well as the manner
5 in which same can be put into practice based on its main object, the following is
claimed as invention and of exclusive ownership:

1°) Equipment of surgical instruments suitable for minimally invasive surgery,
wherein same comprises an access device (2) with an adjustable separator
(202, 203) to have access to the patient's body and a number of components
10 that are mounted inside said patient's body and include:

- i) An operative mounting device (3) comprised by a handle (301), a
movement transmitting element (302) and an operative mounting
clamp (302) of the needle plier (4);
- 15 ii) a needle plier (4) comprised by a control (401), a head connecting
sheath (402) with its distal and proximal ends (418), with the
connecting needle (403) provided inside, with its distal (406) and
proximal (409) ends, and the operative head (404).
- iii) A cauterization device (5) comprising a control (501), a movement
transmitting element (505) and the cautery (503).

20 2°) Equipment of surgical instruments suitable for minimally invasive surgery
according to claim 1, wherein the access device (2) comprises a rigid ring (201)
from which, at its inner side and opposite to each other, two extensions stem
out in distal direction, which function as separators, being the steady separator
(202) tightly joined to the rigid ring and the movable separator (203) being
25 movable with respect to the rigid ring.

3°) Equipment of surgical instruments suitable for minimally invasive surgery
according to claim 2, wherein the movable separator is tightly joined to a
demilune (204) that pivots around bolts (205) with respect to the rigid ring.

4°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 3, wherein at the inner face of the rigid ring (201), opposite to the steady separator and next to the proximal portion of the lid, a lid (209) is provided with a thru hole inside which an adjustable opening device is provided
5 with its proximal end being threaded, driven by a throttle (210) which abuts the proximal face of said lid and whose distal end is connected to the articulation (206) of the demilune by means of a bolt (208).

5°) Equipment of surgical instruments suitable for minimally invasive surgery
10 according to claim 1, wherein the movement transmitting element (302) of the operative mounting device (3) memorizes the positioning and whose operative mounting clamp (303) allows to perform a 360° rotation.

6°) Equipment of surgical instruments suitable for minimally invasive surgery
15 according to claim 5, wherein the operative mounting clamp (303) has two branches with at least one furrow (304) on each branch, as an engagement means to the head of the needle plier (4).

7°) Equipment of surgical instruments suitable for minimally invasive surgery
20 according to claim 1, wherein the connecting needle (403) comprises a cylindric, rigid, thin and elongated body (405), and its distal end is sharp (407) with an external needle plier thread (408) and its proximal end (409) inserts into the slot of the movable branch of the control (401).

8°) Equipment of surgical instruments suitable for minimally invasive surgery
25 according to claim 1, wherein the control (401) comprises a movable branch (412) and a steady branch (413) joined at an articulation (414), and said movable branch has a slot (411) in which the proximal end of the connecting needle fits, and the steady branch has, in coincidence with the slot (411) of the
30 movable branch, a furrow (415) with external thread (416) to lodge the connecting needle.

9°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 1, wherein the head connecting sheath (402) is a tubular, rigid, thin and elongated element, and whose proximal portion finishes with a cylindric, washer type abut (419) and with a fixing thread (420) with internal thread (421), and the distal end shows an external thread where the latter is threaded to the internal thread at the proximal side of the needle plier head, and where the fixing thread (420) moves over the washer type abut, and contacts the external thread (416) of the furrow of the steady branch of the control (401).

10°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 1, wherein the head connecting sheath (402) is provided along its entire extension with an electric isolation.

11°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 7, wherein the driving intrahead device (422) is cylindric and at its proximal side, it has an orifice (423) with internal thread (424), and at its distal side, it is provided with driving media of the clamp tips, and is lodged inside the needle plier head (427) along which its moves axially and where the internal thread (424) couples to the external thread of the needle plier tip (408) of the connecting needle (403).

12°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 11, wherein the driving element of the clamp tips is of double articulation, comprised by a pair of clamp tips (428) joined by their proximal ends by means of bolts (429) to the distal ends of a pair of clamp flat articulations (426) which, in turn, are joined by their proximal ends by means of a bolt (425) to the distal end of the intrahead device; and the clamp tips having a second orifice between the middle of the tips and the proximal end, being joined by a bolt (430) at said second holes, to the needle plier head (427).

13°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 11, wherein the driving element of the clamp tips is a single articulation and the head (427) has a complete circumference (434) at its proximal end, the rest being only the basis (435), in the middle of the basis, a pair of flanges (436) is provided opposing a thru hole; between said pair of flanges, the proximal end of the single articulation (437) is found, which articulation has a first thru hole and this set is joined by a bolt (438); near this first thru hole, a second thru hole is provided, which is joined, by means of a bolt (439) to an end of the joining element (440) between said driving intrahead device (422) and the single articulation (437).

14°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 11, wherein the driving element of the clamp tips is an elastic type articulation, where the needle plier head (427) has at its distal end a pair of elastic, "V" shaped branches (441), forming the clamp tips.

15°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 1, wherein the control (501) comprises a cylindric and isolating handle (504), with an axial thru hole (505) comprising an internal thread (506) and at its distal end it has, on the outer side, a cut (507) with an external thread (508); inside the control, an isolating turning wrench (509) is provided, which consists in a cylindric piece with an external thread (510) and a driving device (511) at its proximal end, being the distal end of the turning wrench (509) fitted to join to one end of the driving chuck (513) associated to a head connecting sheath; at the proximal end of the turning wrench (209), an electricity connector (512) is also provided for the cautery.

16°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 15, wherein the head connecting sheath, also isolated, has an external thread (518) at its distal end, which is threaded to a head (519) by the internal thread (520) at its proximal end.

17°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 16, wherein at the distal end of the head (519), a basis is found (521) wholly integrated to a pair of flanges (522) on which the cautery
5 (503) pivots by means of a first bolt (523) driven through a second bolt (524) which is joined to the distal end of the driving chuck (513).

20°) Equipment of surgical instruments suitable for minimally invasive surgery according to claim 19, wherein the cautery has, along its entire extension
10 except at its distal end, an electric insulation (525).