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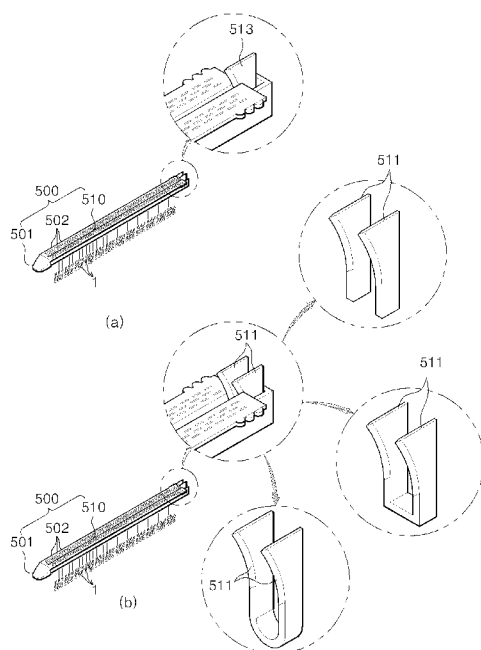
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(54) Title: DOUBLE BLADED SURGICAL STAPLING DEVICE



(57) Abstract: Provided is a surgical stapling device that staples a surgical area during a surgical operation, and in detail, a double bladed surgical stapling device including: the accommodation portion formed in a lower jaw that operates according to user manipulation, and the plurality of staples move upward according to user manipulation to staple a biopsy tissue; and a pair of cutters of the staple cartridge, and cut and at the same time collect a biopsy tissue located between an upper jaw and the lower jaw while moving forward along the cartridge body of the staple cartridge. Accordingly, the predetermined region that is being stapled may be cut to immediately collect a biopsy tissue, thereby performing a frozen section biopsy during the surgery.

Description

Title of Invention: DOUBLE BLADED SURGICAL STAPLING DEVICE

Technical Field

- [1] The present invention relates to a surgical stapling device, and more particularly, to a double bladed surgical stapling device, which staples a surgical area, cuts the surgical area that is being stapled, and collects a biopsy tissue sample required for a frozen section biopsy all at the same time during a surgical operation.

Background Art

- [2] Medical surgical staplers used during operations on abdominal or thoracic organs are medical devices widely used to resect and anastomose organs. Such devices resect and at the same time anastomose organs, and thus operation times may be reduced and surgical areas may be accurately sutured. Examples of a medical stapler include an open stapler used during thoracotomy or laparotomy, and an endostapler used during thoracoscopy or laparoscopy.
- [3] Recently, laparoscopic surgeries and robotic surgeries, which are endoscopic operations capable of reducing recovery times and complications after surgeries via small incisions, are actively used.
- [4] Laparoscopic surgeries, thoracoscopic surgeries, and robotic surgeries, which are endoscopic operations, are performed by making several small holes in an abdomen of a patient and then observing and operating on an organ in an abdominal cavity or thoracic cavity, and are widely used as general surgical operations.
- [5] During laparotomies, thoracotomies, laparoscopic surgeries, and thoracoscopic surgeries, suturing devices that are inserted into bodies are used to suture surgical areas of organs in abdominal cavities or thoracic cavities, and surgical stapling devices that suture the surgical areas by using medical staples may be used as the suturing devices.
- [6] The surgical stapling devices are devices for excising and suturing tissues, and are widely used during current surgical operations according to a quick recovery and a small scar compared to when surgical suture threads are used. In detail, the surgical stapling devices are widely used to resect cancer tissues and suture resected areas during surgeries on cancers.
- [7] Accordingly, various surgical stapling devices have been provided recently, and an example of the various surgical stapling devices includes a surgical instrument disclosed in KR 10-1226542 (21 January 2013), which includes a handle portion operable to produce a firing motion; and an implement portion responsive to the firing motions from the handle portion, the implement portion including: an elongate channel

coupled to the handle portion and including a channel slot, a staple cartridge received by the elongate channel and incorporating a proximally positioned wedge member aligned to cam upward a driver supporting a staple, an anvil pivotally coupled to the elongate channel and including an anvil channel, a firing device including a distally presented cutting edge longitudinally received between the elongate channel and the anvil, an upper member engageable to the anvil channel, a lower member engaging the channel slot, and a middle member operable to actuate the staple cartridge by distally translating the wedge member of the staple cartridge, the firing device positively engaging both the elongate channel and the anvil during longitudinal firing travel to provide spacing therebetween for staple formation, an articulation joint proximally coupled to the elongate channel, and a thinned firing strip proximally attached to the firing device for transferring the firing motion from the handle portion through the articulation joint.

- [8] Also, KR 10-1369235 (25 February 2014) discloses a disposable staple cartridge for a surgical cutting and fastening instrument, the disposable staple cartridge including: a disposable cartridge body operably supporting a plurality of staples therein, such that said staples are adapted to be sequentially fired therefrom by an axially movable driving portion of the surgical cutting and fastening instrument, and have dimensions to be removably supported in an elongated channel of the surgical cutting and fastening instrument during usage and to be removed from the elongated channel after usage; a disposable anvil connected to the disposable cartridge body such that said disposable anvil is movable between a closed position and an open position when the disposable cartridge body is fixed to the elongated channel, wherein a bottom surface of the disposable anvil is adjacent a top surface of the cartridge body in the closed position, the bottom surface of the disposable anvil is spaced away from the top surface of the cartridge body to permit tissue to be inserted between the disposable anvil and the cartridge body in the open position, the disposable anvil including stiffener rails spaced apart from each other to releasably engage a top anvil plate movable on the surgical cutting and fastening instrument when the disposable cartridge body is fixed in the elongated channel, and the disposable anvil is left together with the disposable cartridge body and the movable top anvil plate is left together with the surgical cutting and fastening instrument when the disposable cartridge body is removed from the elongated channel; and at least one tissue stop on the disposable anvil for contacting the tissue inserted between the bottom surface of the disposable anvil and the top surface of the cartridge body to orient the tissue relative to the staples supported within the cartridge body.

- [9] However, by using general surgical stapling devices, it is not possible to accurately test whether a cancer cell remains in a resection margin after resecting tissues.

- [10] A basic principle of a surgery on cancer is that no cancer cell should remain in a body of a patient, and R2 resection denotes a case when cancer cells are viewable with the naked eyes after the surgery, R1 resection denotes a case when cancer cells are cut when viewed through a microscope but remain in tissues, and R0 resection denotes a case when cancer cells are clearly resected.
- [11] In case of the R2 resection wherein cancer cells are viewable with the naked eyes during the surgery, tissues may be resected again to remove the cancer cells, thereby obtaining the R0 resection, but in case of the R1 resection wherein cancer cells cannot be viewed with the naked eyes, a frozen section biopsy may be performed during the surgery so as to re-check whether the cancer cells remain in the tissues.
- [12] In other words, a frozen section biopsy is performed by resecting an end of an organ again left after resecting tissues, and if an area around cancer is resected by using a surgical stapling device during a surgery, a resection margin test should be performed on remaining tissues in order to perform the frozen section biopsy on an accurate resection margin.
- [13] However, according to a surgical stapler having one blade, which is currently used, a frozen section biopsy is performed by obtaining a resection margin after removing a staple from tissues resected such that it is not possible to obtain an accurate resection margin. Here, the tissues are damaged by the staple in terms of pathological examination, and thus the tissues cannot be accurately examined, and the obtained resection margin is not accurate.
- [14] Accordingly, when the general surgical stapling devices are used, accuracy of a frozen section biopsy is low, and when an organ is divided into an area contaminated with cancer cells and an area not contaminated with cancer cells via resection, a method of checking existence of cancer cells in the area not contaminated with cancer cells is extremely limited.

Disclosure of Invention

Technical Problem

- [15] The present invention provides a double bladed surgical stapling device, wherein a staple cartridge is detachably attached to a jaw that clamps a biopsy tissue and a pair of cutters are advanced along the staple cartridge such that the biopsy tissue is stapled and at the same time a part of the biopsy tissue is cut and immediately collected, thereby performing a frozen section biopsy for determining existence of a cancer cell or an abnormal cell in the collected part of the biopsy tissue during a surgery.

Solution to Problem

- [16] According to an aspect of the present invention, there is provided a double bladed surgical stapling device that staples a surgical area as an upper jaw and a lower jaw

approach each other towards the surgical area according to user manipulation, the double bladed surgical stapling device including: a staple cartridge wherein a plurality of staples are disposed in an accommodation portion at left and right sides based on a center along a length direction, the accommodation portion formed in the lower jaw that operates according to user manipulation, and the plurality of staples move upward according to user manipulation to staple a biopsy tissue; and a pair of cutters that are disposed in parallel to each other at a rear end of a cartridge body of the staple cartridge, and cut and at the same time collect a biopsy tissue located between the upper jaw and the lower jaw while moving forward along the cartridge body of the staple cartridge.

- [17] The staple cartridge may include: the cartridge body having a shape corresponding to a shape of an inner space of the accommodation portion of the lower jaw; a cutter guiding elongated hole that is formed along a length direction at a center of the cartridge body; a plurality of staple embedding holes that are regularly formed along the length direction at left and right sides of the cartridge body based on the cutter guiding elongated hole and respectively include the plurality of staples; and a pressurizing block that is disposed to support the plurality of staples inside the plurality of staple embedding holes and elevates along the plurality of staple embedding holes.
- [18] The staple cartridge may further include a tissue accommodating groove that is formed along the cutter guiding elongated hole and accommodates the biopsy tissue cut by the pair of cutters.
- [19] Bottoms of the pair of cutters are connected to each other such that a cross-sectional shape of the pair of cutters may be '  ' or 'U'.
- [20] The double bladed surgical stapling device may further include: an upper body formed by extending an upper handle backwards from the upper jaw; a lower body formed by extending a guide slot backwards from the lower jaw; a combining protrusion protruding from each of left and right surfaces between the upper jaw and the upper handle of the upper body; a coupling portion that accommodates the combining protrusion of the upper body by being formed between the lower jaw and the guide slot of the lower body to couple the upper body and the lower body to each other; a lower handle that is hinged to a bottom of the coupling portion of the lower body and provides an elastic repulsive force by using an elastic material at a front portion of the lower handle to draw the lower jaw of the lower body near the upper jaw of the upper body; a pair of wedge sled bars that have rear ends fixed to a guide block moving along an inside of the guide slot, and push a pressurizing block accommodated in each of a plurality of staple embedding holes upward by advancing forward as the guide block moves forward to elevate and pressurize upward a staple from each of the plurality of staple embedding holes; a push bar that is disposed between the pair of

wedge sled bars and advances a cutter forward as the guide block moves forward; a stopper that is rotatably provided as a torsion spring is disposed inside the coupling portion, and provides a bump by rotating backwards according to a repulsive force of the torsion spring to prevent the pair of wedge sled bars and the push bar from advancing; and a slide handle that is connected to the guide block moving along the inside of the guide slot to manipulate movement of the guide block.

[21] The double bladed surgical stapling device may further include a hook that is formed downward at a rear end of the guide slot of the lower body and is hooked to one side of the lower handle to maintain an approached state of the lower jaw and the upper jaw when the lower jaw is approached to the upper jaw.

[22] The double bladed surgical stapling device may further include: a main body that includes a supporting handle formed downward from a front portion to be grabbed by a palm of a user, and a manipulating handle hinged at a front portion of the supporting handle and operating by using a hinge as an axis according to manipulation of fingers of the user located on the manipulating handle; a stroke bar that is embedded inside the main body and is interlockably connected to the manipulating handle of the main body such as to selectively move forward or backward as the manipulating handle is manipulated by the user; a rotating head that is rotatably combined to a front portion of the main body while embedding the stroke bar and rotates 360° based on the stroke bar according to user manipulation; an extending shaft that is combined to a front end of the rotating head while embedding the stroke bar; and a stapling shaft that has a rear end combined to a front end of the extending shaft, has a front end where one side end of each of the upper jaw and the lower jaw is hinged to a pivot portion, and interlocks with the stroke bar emerging from the extending shaft as the user manipulates the push bar penetrating from a rear portion of the pivot portion to clamp the biopsy tissue located between the upper jaw and the lower jaw by rotating any one of the upper jaw and the lower jaw by using a hinge as an axis.

Advantageous Effects of Invention

[23] A double bladed surgical stapling device according to the present invention has following effects.

[24] First, a staple cartridge is detachably attached to a jaw that clamps a biopsy tissue and a pair of cutters are advanced along the staple cartridge such that the biopsy tissue is stapled and at the same time a part of the biopsy tissue is cut and immediately collected, thereby performing a frozen section biopsy for determining existence of a cancer cell or an abnormal cell in the collected part of the biopsy tissue during a surgery.

[25] Second, a frozen section biopsy is performed by obtaining an accurate resection

margin without tissue damage in a surgical area during a surgery so that accuracy of R0 resection (a case where cancer cells are clearly resected) that is a principle of a surgery on cancer is determined even during the surgery.

Brief Description of Drawings

- [26] FIG. 1 is an exemplary diagram of a double bladed surgical stapling device according to an embodiment of the present invention.
- [27] FIG. 2 is an exemplary diagram of a wedge sled bar and a push bar, which advance as a through hole of a stopper opens, according to an embodiment of the present invention.
- [28] FIG. 3 is an exemplary diagram of a double bladed surgical stapling device according to another embodiment of the present invention.
- [29] FIG. 4 is an exemplary diagram of a stroke bar inside a cartridge body and a rotating head of a surgical stapling device, according to an embodiment of the present invention.
- [30] FIG. 5 is an exploded exemplary diagram of a stapling shaft according to an embodiment of the present invention.
- [31] FIG. 6 is an exemplary diagram for describing rotating states of an upper jaw and a lower jaw of a surgical stapling device, according to an embodiment of the present invention.
- [32] FIG. 7 is exemplary diagrams of a staple cartridge according to embodiments of the present invention.
- [33] FIG. 8 is an exemplary diagram for describing how pairs of cutters included in a staple cartridge operate, according to an embodiment of the present invention.
- [34] FIG. 9 is exemplary diagrams for describing how a cutter included in a staple cartridge operates, according to embodiments of the present invention.
- [35] FIG. 10 is an exemplary diagram for describing how an accommodating piece and a tissue separating piece, which are included in a staple cartridge, operate, according to an embodiment of the present invention.

Best Mode for Carrying out the Invention

- [36] According to an aspect of the present invention, there is provided a double bladed surgical stapling device that staples a surgical area as an upper jaw and a lower jaw approach each other towards the surgical area according to user manipulation, the double bladed surgical stapling device including: a staple cartridge wherein a plurality of staples are disposed in an accommodation portion at left and right sides based on a center along a length direction, the accommodation portion formed in the lower jaw that operates according to user manipulation, and the plurality of staples move upward according to user manipulation to staple a biopsy tissue; and a pair of cutters that are

disposed in parallel to each other at a rear end of a cartridge body of the staple cartridge, and cut and at the same time collect a biopsy tissue located between the upper jaw and the lower jaw while moving forward along the cartridge body of the staple cartridge.

Mode for the Invention

- [37] Hereinafter, exemplary embodiments of the present invention will be described in detail with reference to accompanying drawings. Terms or words used herein should not be limitedly interpreted as general or dictionary meanings, but should be construed as meanings and concepts matching the technical spirit of the present invention based on the principle that an inventor may suitably define concepts of terms in the best way to describe an invention.
- [38] Accordingly, embodiments and drawings of the present specification are only exemplary embodiments of the present invention and do not represent all technical spirits of the present invention, and thus there may be equivalents and substitutes.
- [39] Exemplary embodiments of the present invention will now be described in detail with reference to accompanying drawings.
- [40] The present invention relates to a double bladed surgical stapling device that staples a surgical area during a surgical operation and at the same time, advances a pair of cutters along a staple cartridge so as to cut the surgical area that is being stapled and collect a biopsy tissue sample required for a biopsy. A structure of the double bladed surgical stapling device will now be described with reference to drawings.
- [41] According to an embodiment of the present invention, the double bladed surgical stapling device includes an upper body 10, a lower body 20, a lower handle 30, and a staple cartridge 500 as shown in FIGS. 1 and 2.
- [42] First, an upper jaw 11 is located at a front portion of the upper body 10, and an upper handle 12 is extended backwards from the upper jaw 11 to form a rear portion of the upper body 10.
- [43] Here, bending grooves (not shown) that bend ends of a plurality of staples 1 are uniformly formed at a bottom surface of the upper jaw 11, respectively corresponding to the plurality of staples 1 mounted on the staple cartridge 500.
- [44] Also, a lower jaw 21 is located at a front portion of the lower body 20, and a guide slot 22 is extended backwards from the lower jaw 21 to form a rear portion of the lower body 20.
- [45] Here, an accommodation portion 23 where the staple cartridge 500 is accommodated is formed in the lower jaw 21 of the lower body 20, and a guide block 24 that moves along an inside of the guide slot 22 is formed inside the guide slot 22.
- [46] Also, a slide handle 25 is connected to the guide block 24 so that a user may use the

slide handle 25 to move the guide block 24 along the inside of the guide slot 22.

[47] Also, a pair of wedge sled bars 26 and a push bar 27 are fixed to a front end of the guide block 24, and here, the pair of wedge sled bars 26 advance forward as the guide block 24 moves forward, thereby pushing a pressurizing block 503 accommodated inside a plurality of staple embedding holes 502 so as to elevate and pressurize upward the staples 1 from the staple embedding holes 502, wherein the staple embedding holes 502 are formed at regular intervals along a length direction on left and right sides based on a center of a cartridge body 501 of the staple cartridge 500.

[48] Also, the push bar 27 is disposed between the pair of wedge sled bars 26, and the cutter is advanced forward as the guide block 24 moves forward.

[49] Moreover, a combining protrusion 14 protrudes from each of left and right surfaces between the upper jaw 11 and the upper handle 12 of the upper body 10, and a coupling portion 28 is formed between the guide slot 22 and the lower jaw 21 of the lower body 20. The coupling portion 28 accommodates the combining protrusions 14 of the upper body 10 so that the upper body 10 and the lower body 20 are coupled to each other.

[50] A stopper 40 is disposed inside the coupling portion 28, wherein the stopper 40 is rotatably disposed inside the coupling portion 28 while including a torsion spring 41 and includes a plurality of through holes through which the pair of wedge sled bars 26 and the push bar 27 may penetrate, such that the stopper 40 is disposed inside the coupling portion 28 while the pair of wedge sled bars 26 and the push bar 27 penetrate therethrough.

[51] Accordingly, the through hole is tilted as the stopper 40 rotates backward according to a repulsive force of the torsion spring 41, and one side of the through hole provides a bump, thereby blocking advancing of the wedge sled bars 26 and the push bar 27.

[52] Here, the bump provided by the stopper 40 may be released by forming a pressing piece 42 protruding at a front end of the stopper 40 such that when the staple cartridge 500 is accommodated in the accommodation portion 23 of the lower jaw 21, a rear end of the staple cartridge 500 presses the pressing piece 42 at the front end of the stopper 40 to open the through hole, thereby enabling the wedge sled bars 26 and the push bar 27 to advance.

[53] Also, the lower handle 30 is hinged to a bottom of the coupling portion 28 of the lower body 20, wherein the lower handle 30 provides an elastic repulsive force by using an elastic material at a front portion thereof such that the lower jaw 21 of the lower body 20 approaches the upper jaw 11 of the upper body 10 to be clamped through a biopsy tissue.

[54] A hook 29 is formed downward at a rear end of the guide slot 22 of the lower body 20, and thus when the lower jaw 21 approaches the upper jaw 11, the hook 29 is

hooked to one side of the lower handle 30 so as to maintain an approached state of the upper and lower jaws 11 and 21.

[55] Also, the staple cartridge 500 mounted on the double bladed surgical stapling device is disposable and the cutter and a sample collector are disposed at the center of the staple cartridge 500 so as to cut the biopsy tissue in a length direction while collecting a tissue sample during the stapling.

[56] The staple cartridge 500 according to the present invention described above is selectively mounted on the lower jaw 21 according to functions of cutting and collecting a tissue sample. The staple cartridge 500 will now be described in more detail.

[57] As shown in FIGS. 7 through 9, the cartridge body 501 is formed in a shape corresponding to that of an inner space of the accommodation portion 23 of the lower jaw 21, and the plurality of staple embedding holes 502 in which the staples 1 having a ‘’ shape are mounted are uniformly formed in the cartridge body 501 along a length direction on each of left and right sides based on the center of the cartridge body 501.

[58] The cartridge body 501 having the shape corresponding to that of the inner space of the accommodation portion 23 of the lower jaw 21 is formed and a cutter guiding elongated hole 504 is formed along the length direction in the center of the cartridge body 501. Here, a single cutter 513 that is pushed by the push bar 27 that advances to advance forward from a rear portion of the cutter guiding elongated hole 504 along the cutter guiding elongated hole 504 while cutting a biopsy tissue while stapling the biopsy tissue is disposed at the rear portion of the cutter guiding elongated hole 504.

[59] Also, the plurality of staple embedding holes 502 in which the staples 1 having a ‘’ shape are mounted are formed in the cartridge body 501, wherein the plurality of staple embedding holes 502 are uniformly formed along the length direction of the cartridge body 501 on left and right sides based on the cutter guiding elongated hole 504.

[60] The pressurizing block 503 that supports the staple 1 while being elevated along the staple embedding hole 502 is formed in each of the staple embedding holes 502.

[61] Here, when the wedge sled bars 26 approach from the bottom, the pressurizing block 503 elevates along a top surface of the wedge sled bars 26, which is oblique, thereby sequentially externally introducing the staples 1 mounted in the staple embedding holes 502 while further pressurizing the staples 1. Accordingly, ends of the staples 1 penetrate through the biopsy tissue disposed between the upper jaw 11 and the lower jaw 21 and then are bent by the bending groove (not shown) of the upper jaw 11, thereby stapling the biopsy tissue.

[62] Also, when the wedge sled bars 26 advances, the push bar 27 also advances, thereby advancing the single cutter 513 forward along the cutter guiding elongated hole 504 of

the cartridge body 501 so as to cut the biopsy tissue disposed between the upper jaw 11 and the lower jaw 21.

[63] The staple cartridge 500 for collecting a biopsy tissue, according to another embodiment, may include the cartridge body 501 having a shape corresponding to that of the inner space of the accommodation portion 23 of the lower jaw 21, and the plurality of staple embedding holes 502 in which the staples 1 having a '┐' shape are mounted may be uniformly formed along the length direction of the cartridge body 501 at left and right sides based on the center of the cartridge body 501.

[64] Then, the pressurizing block 503 that supports the staple 1 while being elevated along the staple embedding hole 502 is mounted inside each of the plurality of staple embedding holes 502.

[65] Here, when the wedge sled bars 26 approach from the bottom, the pressurizing block 503 elevates along the top surface of the wedge sled bars 26, which is oblique, thereby sequentially externally introducing the staples 1 mounted in the staple embedding holes 502 while further pressurizing the staples 1. Accordingly, the ends of the staples 1 penetrate through the biopsy tissue disposed between the upper jaw 11 and the lower jaw 21 and then are bent by the bending groove (not shown) of the upper jaw 11, thereby stapling the biopsy tissue.

[66] Also, the cartridge body 501 may include a sample collector. The sample collector is disposed in parallel to a rear end of the cartridge body 501 of the staple cartridge 500, and includes a pair of cutters 511 that cuts the biopsy tissue while advancing forward along the cartridge body 501. A tissue accommodating groove 512 that accommodates the biopsy tissue cut by the pair of cutters 511 is formed along a central direction of the center of the cartridge body 501 the pair of cutters 511 advances.

[67] Here, the pair of cutters 511 may be spaced apart from each other at a certain interval or may be disposed in parallel to move along left and right inner surfaces of the tissue accommodating groove 512, and bottoms of the pair of cutters 511 may be connected to each other such that the pair of cutters 511 operate together without any time error.

[68] Here, the bottoms of the pair of cutters 511 may be connected to each other such that a cross-sectional shape of the pair of cutters 511 is '┐' or 'U', or alternatively, tops of the pair of cutters 511 may be connected to each other.

[69] Also, as shown in FIG. 10, an accommodating piece 514 that advances forward after the pair of cutters 511 to push the biopsy tissue cut by the pair of cutters 511 into the tissue accommodating groove 512 may be formed.

[70] The accommodating piece 514 may be disposed at a rear portion of the pair of cutters 511 between the pair of cutters 511, and when the pair of cutters 511 advance forward, the accommodating piece 514 may advance forward after the pair of cutters 511.

[71] A tissue separating piece 515 that has a front end partially connected to a front end of

the tissue accommodating groove 512 and has an 'L' shape rotating by using a partially connected point as an axis may be included inside the tissue accommodating groove 512. The user may manipulate one side of the tissue separating piece 515 exposed at the tissue accommodating groove 512 to rotate the tissue separating piece 515 upward by using the partially connected point as an axis, thereby detaching the biopsy tissue from the tissue accommodating groove 512.

[72] A surgical staple device according to another embodiment of the present invention may include a main body 100, a rotating head 200, an extending shaft 300, a stapling shaft 400, and the staple cartridge 500.

[73] First, referring to FIGS. 3 through 6, in the main body 100, a supporting handle 110 is integrally formed downward from a front portion of a body to be grabbed by a palm of the user, and a manipulating handle 120 is hinged to a front portion of the supporting handle 110.

[74] Here, a grabbing hole 121 where fingers of the user are located is formed in the manipulating handle 120 such that after the fingers are located in the grabbing hole 121, the user may open and close the fingers to rotate the manipulating handle 120 by using a hinge as an axis.

[75] Also, a stroke bar 130 is mounted inside the main body 100, wherein the stroke bar 130 is interlockably connected to the manipulating handle 120 of the main body 100 to horizontally move forward or backward inside the main body 100 according to manipulation of the manipulating handle 120.

[76] In detail, the stroke bar 130 may be connected to the manipulating handle 120 in a ratchet structure such that the stroke bar 130 moves forward according to manipulation of the manipulating handle 120.

[77] Here, a rear end of the stroke bar 130 is connected to a pulling handle 131, and the stroke bar 130 moves backward when the user pulls the pulling handle 131 backward.

[78] Also, the pulling handle 131 moves back and forth along a length direction of the main body 100 along a guide elongated hole 101 that is formed along a length direction at left and right surfaces of the main body 100, and is connected to the rear end of the stroke bar 130 through the guide elongated hole 101.

[79] Accordingly, the stroke bar 130 moves backward inside the main body 100 as the pulling handle 131 is pulled backward, and moves forward inside the main body 100 as the manipulating handle 120 is manipulated.

[80] Also, the rotating head 200 is disposed at front side end of the main body 100, wherein the rotating head 200 is combined to the front portion of the main body 100 to rotate 360° around the stroke bar 130 while embedding the stroke bar 130.

[81] Here, a plurality of grabbing grooves 201 may be formed along an outer circumference of the rotating head 200 at regular intervals such that the user rotates the

rotating head 200 around the stroke bar 130 by using the grabbing grooves 201 with the hand.

[82] Moreover, an angle adjusting handle 210 may be disposed at one surface of the rotating head 200 so as to adjust a rotating angle of an upper jaw 410 and a lower jaw 420 included in the stapling shaft 400 that will be described later.

[83] Also, the extending shaft 300 is disposed at a front end of the rotating head 200, wherein the extending shaft 300 has a tube shape and is also combined to the front end of the rotating head 200 while embedding the stroke bar 130.

[84] Accordingly, a length of the stroke bar 130 may be longer than a total length of the main body 100, the rotating head 200, and the extending shaft 300, and when the stroke bar 130 moves forward, the length of the stroke bar 130 appearing at the front end of the extending shaft 300 may be increased, thereby providing a pressurizing force forward.

[85] Also, the stapling shaft 400 may be combined to the front end of the extending shaft 300, and may clamp and staple a biopsy tissue and cut and collect the biopsy tissue via the pressurizing force provided as the stroke bar 130 moves forward inside the extending shaft 300.

[86] The stapling shaft 400 will now be described in detail. The upper jaw 410 and the lower jaw 420 are disposed at a front portion of the stapling shaft 400, wherein a rear end of each of the upper jaw 410 and the lower jaw 420 is hinged to a front end of a pivot portion 430 such that one of the upper jaw 410 and the lower jaw 420 is fixed and the other one rotates by using a hinge as an axis to clamp (a closed state) a biopsy tissue located between the upper jaw 410 and the lower jaw 420.

[87] Here, an accommodation portion 421 on which the staple cartridge 500 mounted with the plurality of staples 1 is formed in the other one of the upper jaw 410 and the lower jaw 420, which rotates, and bending grooves 411 that bend ends of the plurality of staples 1 are regularly formed in the fixed one of the upper jaw 410 and the lower jaw 420 respectively correspondingly to the plurality of staples 1 mounted in the staple cartridge 500.

[88] For convenience of description, a jaw that is fixed and in which the bending grooves 411 for respectively bending the plurality of staples 1 are regularly formed will now be referred to as the upper jaw 410, and a jaw that rotates by using a hinge as an axis and in which the accommodation portion 421 mounted with the staple cartridge 500 will now be referred to as the lower jaw 420.

[89] A push bar 440 moves forward by penetrating through a center of the pivot portion 430 where the upper jaw 410 and the lower jaw 420 are fixed, wherein the push bar 440 includes a plurality of thin plates bound to each other to have elasticity, and a coupling portion 441 coupled to the front end of the stroke bar 130 is formed at a rear

end of the push bar 440. Accordingly, the push bar 440 is coupled to the front end of the stroke bar 130 through the coupling portion 441, and thus advances forward by receiving a pressurizing force generated when the stroke bar 130 moves forward.

[90] Here, a guiding groove 412 for guiding an upper portion of the push bar 440 is formed at the center of the upper jaw 410, and a guiding elongated hole 422 for guiding a lower portion of the push bar 440 is formed at the center of the lower jaw 420.

[91] Also, a rotation operating piece 442 is disposed at a front bottom end of the push bar 440, wherein the rotation operating piece 442 is connected to the front bottom end of the push bar 440 at a right angle to contact an outer surface of the lower jaw 420. Thus, when the push bar 440 advances forward, the rotation operating piece 442 moves forward along a surface of the lower jaw 420 in a length direction to provide rotating power for the lower jaw 420 to rotate upward. As such, the biopsy tissue located between the upper jaw 410 and the lower jaw 420 may be clamped (a closed state).

[92] Accordingly, when the rotation operating piece 442 is located at the rear portion of the lower jaw 420, the upper jaw 410 and the lower jaw 420 are spaced apart from each other by using the hinge as an axis to maintain an opened state, and when the rotation operating piece 442 advances forward, the lower jaw 420 rotates by using the hinge as an axis to maintain the closed state, i.e., an approached state with the upper jaw 410.

[93] Also, an inner housing 450 that is divided into top and bottom along the length of the push bar 440 is disposed at the rear portion of the pivot portion 430, wherein the inner housing 450 is combined to the push bar 440 while embedding the push bar 440, and the push bar 440 moves horizontally inside the inner housing 450.

[94] Also, a through hole 451 is formed at a rear end of the inner housing 450 for communication with the inside, and the front end of the stroke bar 130 inserted into the inner housing 450 through the through hole 451 is coupled to the coupling portion 441 formed at the rear end of the push bar 440.

[95] Also, an angle adjusting bar 431 is connected to one side of the pivot portion 430 such that the upper jaw 410 and the lower jaw 420 pivot left and right around the pivot portion 430.

[96] Here, the angle adjusting bar 431 may extend up to a rear end of the inner housing 450 along a side surface of the inner housing 450 to be connected to the angle adjusting handle 210 of the main body 100, and the upper jaw 410 and the lower jaw 420 whose angles are adjusted by the angle adjusting bar 431 may return to original states by an elastic force of the push bar 440.

[97] Also, a tube case 460 for protecting the inner housing 450 and the angle adjusting bar 431 by accommodating the inner housing 450 and the angle adjusting bar 431 therein is disposed at the rear portion of the pivot portion 430, wherein, when the tube case

460 is assembled, a hinge protrusion forming a pivot shaft of the pivot portion 430 may be formed at each of top and bottom rear portions of the pivot portion 430 and an extending link may be disposed at the hinge protrusion such that the tube case 460 is assembled after the hinge protrusion is accommodated in an accommodation groove formed on a surface of the inner housing 450, thereby providing the pivot shaft.

[98] Moreover, the staple cartridge 500 mounted in the accommodation portion 421 of the lower jaw 420 of the stapling shaft 400 includes the plurality of staples 1 along the length direction at the left and right sides based on the center, such that the biopsy tissue located between the upper jaw 410 and the lower jaw 420 is stapled by using the staples 1.

[99] Here, a stapling function is performed by a wedge sled 443 included at the front end of the push bar 440, wherein the wedge sled 443 has a shape of a shark's fin having an upper inclined surface.

[100] The staple cartridge 500 of the surgical stapling device is disposal, and a cutter and a sample collector are disposed at the center of the staple cartridge 500 such that a biopsy tissue to be stapled is cut and collected at the same time in a length direction.

[101] The staple cartridge 500 according to the present invention described above is selectively mounted on the lower jaw 420 according to functions of cutting and collecting a tissue sample. The staple cartridge 500 will now be described in more detail.

[102] As shown in FIGS. 7 through 9, the cartridge body 501 is formed in a shape corresponding to that of an inner space of the accommodation portion 421 of the lower jaw 420, and the plurality of staple embedding holes 502 in which the staples 1 having a '┐' shape are mounted are uniformly formed in the cartridge body 501 along the length direction on each of left and right sides based on the center of the cartridge body 501.

[103] The cartridge body 501 having the shape corresponding to that of the inner space of the accommodation portion 421 of the lower jaw 420 is formed and the cutter guiding elongated hole 504 is formed along the length direction in the center of the cartridge body 501. Here, the single cutter 513 that is pushed by the push bar 440 that advances to advance forward from the rear portion of the cutter guiding elongated hole 504 along the cutter guiding elongated hole 504 while cutting the biopsy tissue while stapling the biopsy tissue is disposed at the rear portion of the cutter guiding elongated hole 504.

[104] Also, the plurality of staple embedding holes 502 in which the staples 1 having a '┐' shape are mounted are formed in the cartridge body 501, wherein the plurality of staple embedding holes 502 are uniformly formed along the length direction of the cartridge body 501 on left and right sides based on the cutter guiding elongated hole

504.

- [105] The pressurizing block 503 that supports the staple 1 while being elevated along the staple embedding hole 502 is formed in each of the staple embedding holes 502.
- [106] Here, when the wedge sled 443 approaches from the bottom, the pressurizing block 503 elevates along a top surface of the wedge sled 443, which is oblique, thereby sequentially externally introducing the staples 1 mounted in the staple embedding holes 502 while further pressurizing the staples 1. Accordingly, the ends of the staples 1 penetrate through the biopsy tissue disposed between the upper jaw 410 and the lower jaw 420 and then are bent by bending groove of the upper jaw 410, thereby stapling the biopsy tissue.
- [107] Also, when the wedge sled 443 advances, the push bar 440 also advances, thereby advancing the single cutter 513 forward along the cutter guiding elongated hole 504 of the cartridge body 501 so as to cut the biopsy tissue disposed between the upper jaw 410 and the lower jaw 420.
- [108] Referring to the staple cartridge 500 for collecting a biopsy tissue, the cartridge body 501 having a shape corresponding to that of the inner space of the accommodation portion 421 of the lower jaw 420 may be formed, and the plurality of staple embedding holes 502 in which the staples 1 having a '┐' shape are mounted may be uniformly formed along the length direction of the cartridge body 501 at left and right sides based on the center of the cartridge body 501.
- [109] Then, the pressurizing block 503 that supports the staple 1 while being elevated along the staple embedding hole 502 is mounted inside each of the plurality of staple embedding holes 502.
- [110] Here, when the wedge sled 443 approaches from the bottom, the pressurizing block 503 elevates along the top surface of the wedge sled 443, which is oblique, thereby sequentially externally introducing the staples 1 mounted in the staple embedding holes 502 while further pressurizing the staples 1. Accordingly, the ends of the staples 1 penetrate through the biopsy tissue disposed between the upper jaw 410 and the lower jaw 420 and then are bent by the bending groove of the upper jaw 410, thereby stapling the biopsy tissue.
- [111] Also, the cartridge body 501 may include a sample collector. The sample collector is disposed in parallel to the rear end of the cartridge body 501 of the staple cartridge 500, and includes the pair of cutters 511 that cut the biopsy tissue while advancing forward along the cartridge body 501. The tissue accommodating groove 512 that accommodates the biopsy tissue cut by the pair of cutters 511 is formed along a central direction of the center of the cartridge body 501 the pair of cutters 511 advances.
- [112] Here, the pair of cutters 511 may be spaced apart from each other at a certain interval or may be disposed in parallel to move along the left and right inner surfaces of the

tissue accommodating groove 512, and the bottoms of the pair of cutters 511 may be connected to each other such that the pair of cutters 511 operate together without any time error.

- [113] Here, the bottoms of the pair of cutters 511 may be connected to each other such that a cross-sectional shape of the pair of cutters 511 is '└┘' or 'U'.
- [114] Also, as shown in FIG. 10, the accommodating piece 514 that advances forward after the pair of cutters 511 to push the biopsy tissue cut by the pair of cutters 511 into the tissue accommodating groove 512 may be formed.
- [115] The accommodating piece 514 may be disposed at a rear portion of the pair of cutters 511 between the pair of cutters 511, and when the pair of cutters 511 advance forward, the accommodating piece 514 may advance forward after the pair of cutters 511.
- [116] The tissue separating piece 515 that has the front end partially connected to the front end of the tissue accommodating groove 512 and has an 'L' shape rotating by using the partially connected point as an axis may be included inside the tissue accommodating groove 512. The user may manipulate one side of the tissue separating piece 515 exposed at the tissue accommodating groove 512 to rotate the tissue separating piece 515 upward by using the partially connected point as an axis, thereby detaching the biopsy tissue from the tissue accommodating groove 512.
- [117] According to a double bladed surgical stapling device of the present invention, a staple cartridge is detachably assembled to a jaw that clamps a biopsy tissue, and by selectively mounting the staple cartridge according to functions of cutting and collecting a tissue sample by advancing a pair of cutters along the staple cartridge, a biopsy tissue is stapled and at the same time, a part of the biopsy tissue is cut and collected. Then, a frozen section biopsy for determining existence of a cancer cell or an abnormal cell in the collected part of biopsy tissue may be performed during a surgery.
- [118] Also, by differentiating colors of a cartridge body including a single cutter (a cutting function) and a cartridge body including a pair of cutters (collecting a tissue sample), functions of the staple cartridge may be determined with eyes before being mounted in a lower jaw, thereby preventing an error generated by mounting a wrong staple cartridge.
- [119] While the present invention has been particularly shown and described with reference to exemplary embodiments thereof, it will be understood by those of ordinary skill in the art that various changes in form.
- [120] Details may be made therein without departing from the spirit and scope of the present invention as defined by the following claims.

Claims

- [Claim 1] A double bladed surgical stapling device that staples a surgical area as an upper jaw and a lower jaw approach each other towards the surgical area according to user manipulation, the double bladed surgical stapling device comprising:
- a staple cartridge wherein a plurality of staples are disposed in an accommodation portion at left and right sides based on a center along a length direction, the accommodation portion formed in the lower jaw that operates according to user manipulation, and the plurality of staples move upward according to user manipulation to staple a biopsy tissue; and
 - a pair of cutters that are disposed in parallel to each other at a rear end of a cartridge body of the staple cartridge, and cut and at the same time collect a biopsy tissue located between the upper jaw and the lower jaw while moving forward along the cartridge body of the staple cartridge.
- [Claim 2] The double bladed surgical stapling device of claim 1, wherein the staple cartridge comprises:
- the cartridge body having a shape corresponding to a shape of an inner space of the accommodation portion of the lower jaw;
 - a cutter guiding elongated hole that is formed along a length direction at a center of the cartridge body;
 - a plurality of staple embedding holes that are regularly formed along the length direction at left and right sides of the cartridge body based on the cutter guiding elongated hole and respectively include the plurality of staples; and
 - a pressurizing block that is disposed to support the plurality of staples inside the plurality of staple embedding holes and elevates along the plurality of staple embedding holes.
- [Claim 3] The double bladed surgical stapling device of claim 2, wherein the staple cartridge further comprises a tissue accommodating groove that is formed along the cutter guiding elongated hole and accommodates the biopsy tissue cut by the pair of cutters.
- [Claim 4] The double bladed surgical stapling device of claim 1, wherein bottoms of the pair of cutters are connected to each other such that a cross-sectional shape of the pair of cutters is ‘’.
- [Claim 5] The double bladed surgical stapling device of claim 1, wherein bottoms of the pair of cutters are connected to each other such that a cross-

sectional shape of the pair of cutters is 'U'.

[Claim 6]

The double bladed surgical stapling device of claim 1, further comprising:

an upper body formed by extending an upper handle backwards from the upper jaw;

a lower body formed by extending a guide slot backwards from the lower jaw;

a combining protrusion protruding from each of left and right surfaces between the upper jaw and the upper handle of the upper body;

a coupling portion that accommodates the combining protrusion of the upper body by being formed between the lower jaw and the guide slot of the lower body to couple the upper body and the lower body to each other;

a lower handle that is hinged to a bottom of the coupling portion of the lower body and provides an elastic repulsive force by using an elastic material at a front portion of the lower handle to draw the lower jaw of the lower body near the upper jaw of the upper body;

a pair of wedge sled bars that have rear ends fixed to a guide block moving along an inside of the guide slot, and push a pressurizing block accommodated in each of a plurality of staple embedding holes upward by advancing forward as the guide block moves forward to elevate and pressurize upward a staple from each of the plurality of staple embedding holes;

a push bar that is disposed between the pair of wedge sled bars and advances a cutter forward as the guide block moves forward;

a stopper that is rotatably provided as a torsion spring is disposed inside the coupling portion, and provides a bump by rotating backwards according to a repulsive force of the torsion spring to prevent the pair of wedge sled bars and the push bar from advancing; and

a slide handle that is connected to the guide block moving along the inside of the guide slot to manipulate movement of the guide block.

[Claim 7]

The double bladed surgical stapling device of claim 6, further comprising a hook that is formed downward at a rear end of the guide slot of the lower body and is hooked to one side of the lower handle to maintain an approached state of the lower jaw and the upper jaw when the lower jaw is approached to the upper jaw.

[Claim 8]

The double bladed surgical stapling device of claim 1, further comprising:

a main body that comprises a supporting handle formed downward from a front portion to be grabbed by a palm of a user, and a manipulating handle hinged at a front portion of the supporting handle and operating by using a hinge as an axis according to manipulation of fingers of the user located on the manipulating handle;

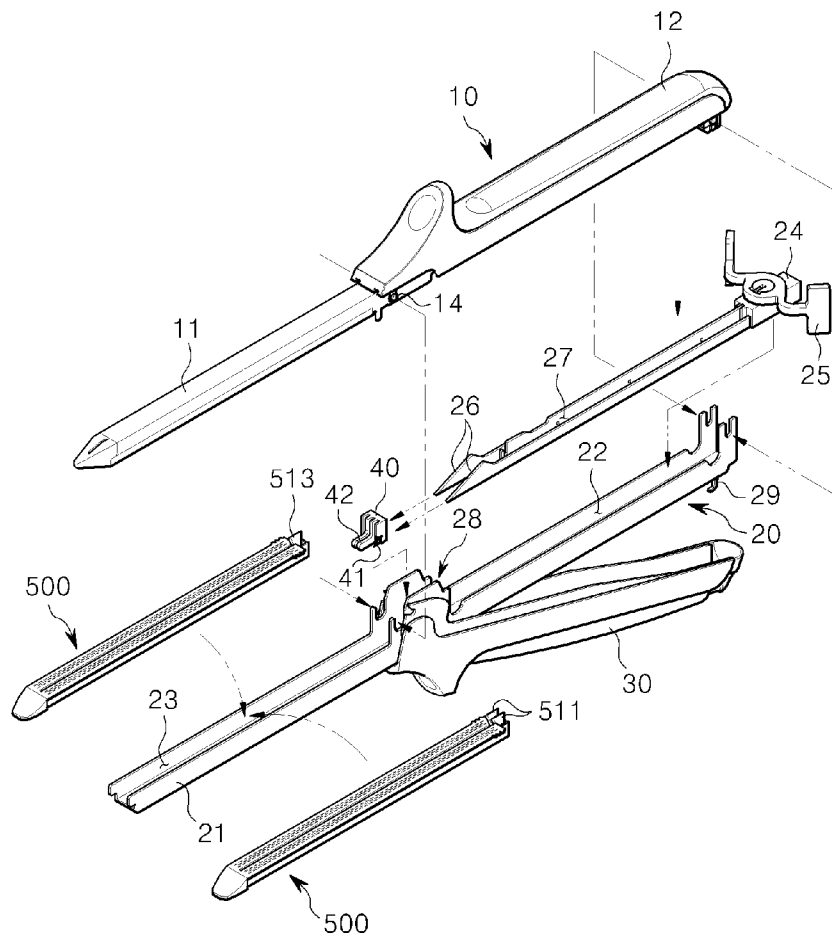
a stroke bar that is embedded inside the main body and is interlockably connected to the manipulating handle of the main body such as to selectively move forward or backward as the manipulating handle is manipulated by the user;

a rotating head that is rotatably combined to a front portion of the main body while embedding the stroke bar and rotates 360° based on the stroke bar according to user manipulation;

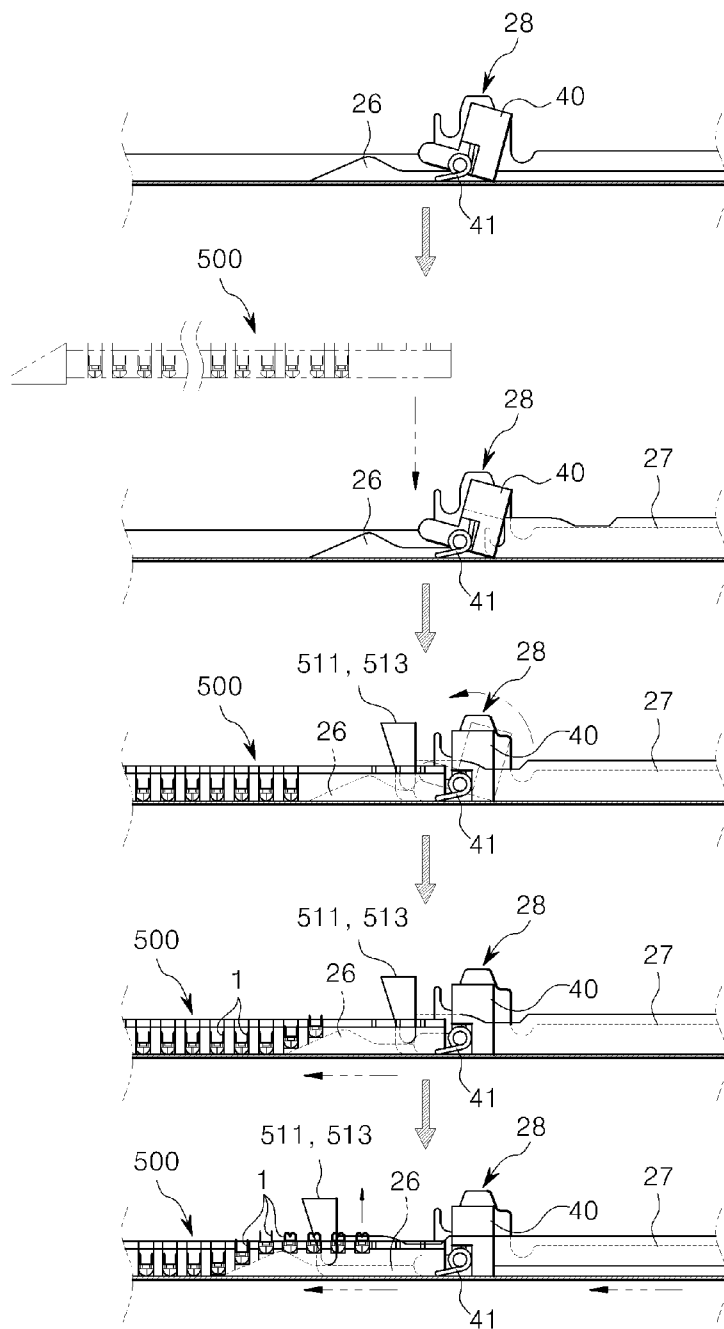
an extending shaft that is combined to a front end of the rotating head while embedding the stroke bar; and

a stapling shaft that has a rear end combined to a front end of the extending shaft, has a front end where one side end of each of the upper jaw and the lower jaw is hinged to a pivot portion, and interlocks with the stroke bar emerging from the extending shaft as the user manipulates the push bar penetrating from a rear portion of the pivot portion to clamp the biopsy tissue located between the upper jaw and the lower jaw by rotating any one of the upper jaw and the lower jaw by using a hinge as an axis.

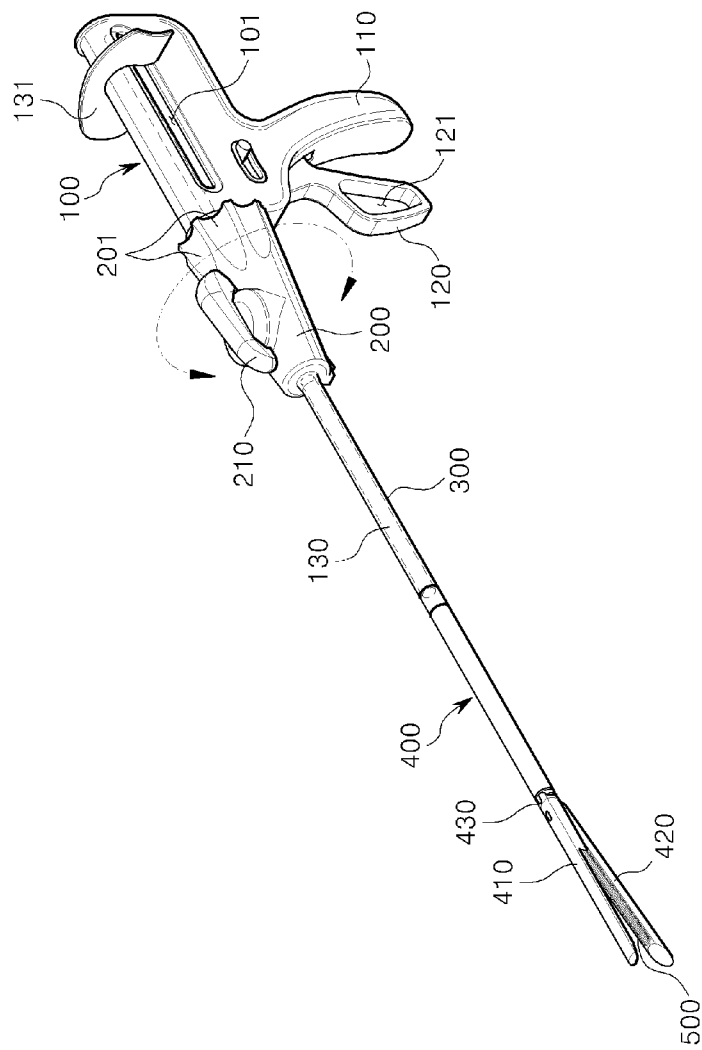
[Fig. 1]



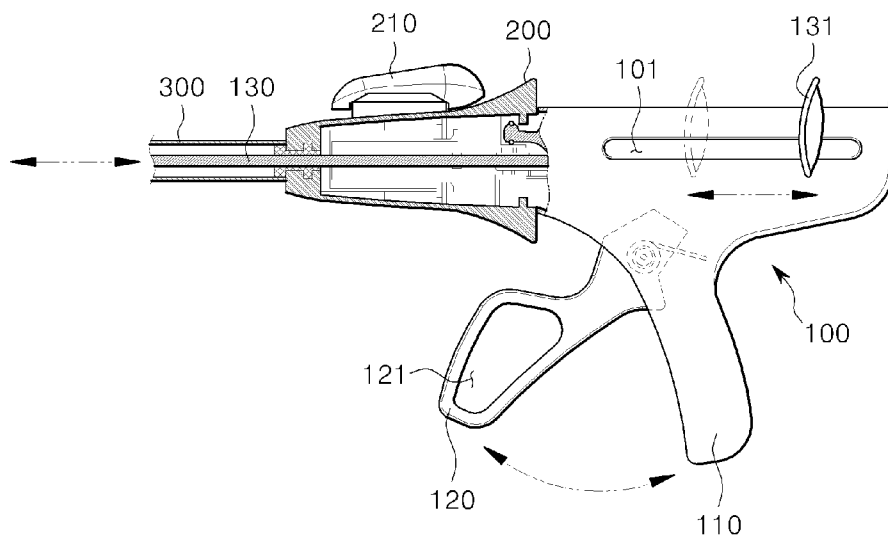
[Fig. 2]



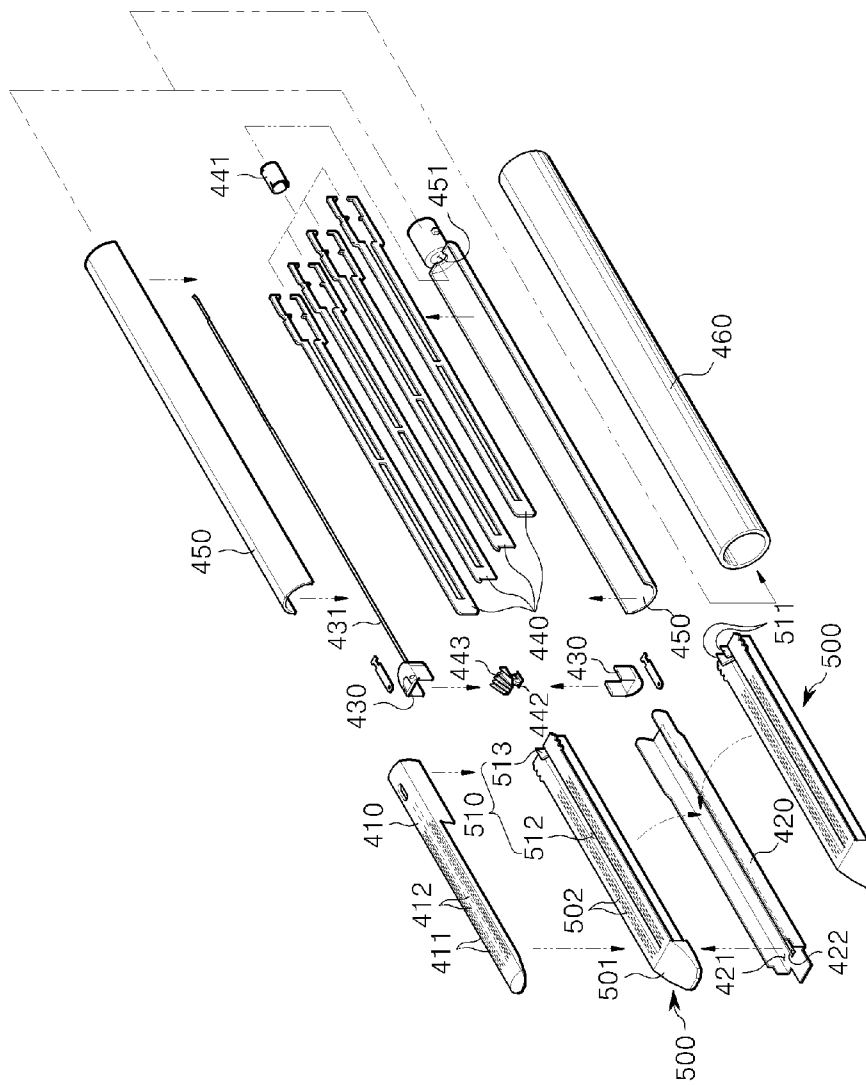
[Fig. 3]



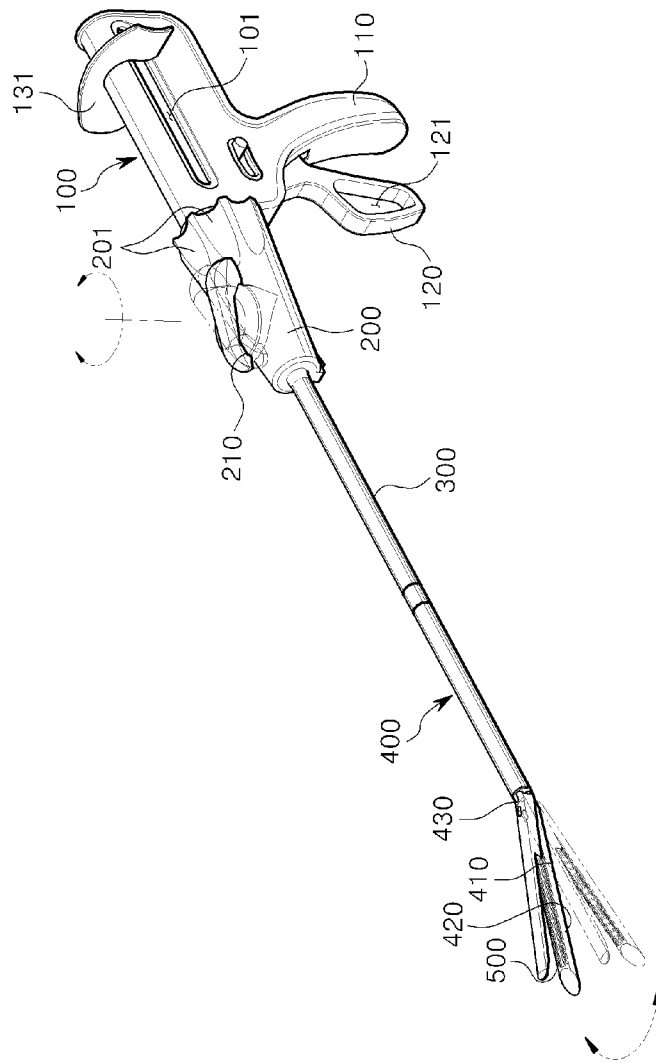
[Fig. 4]



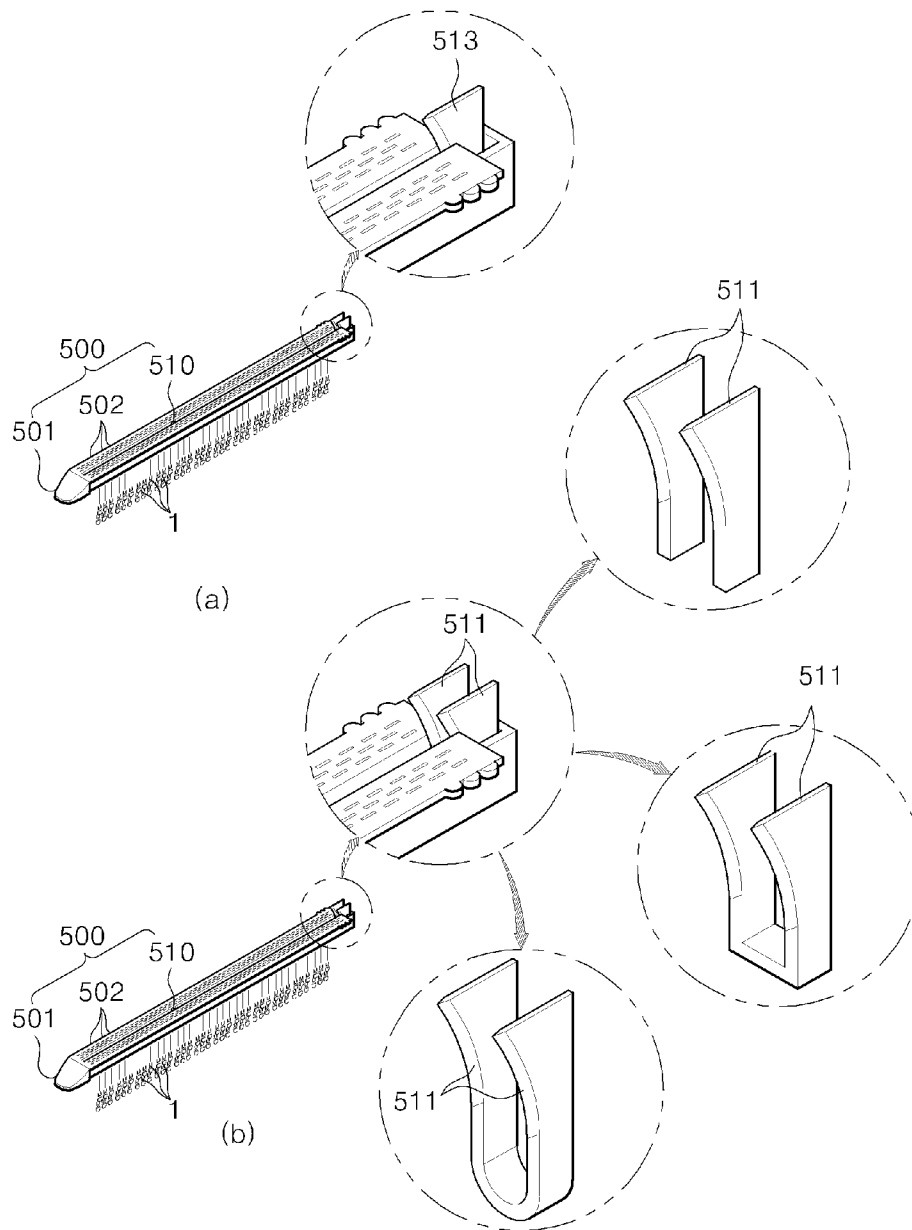
[Fig. 5]



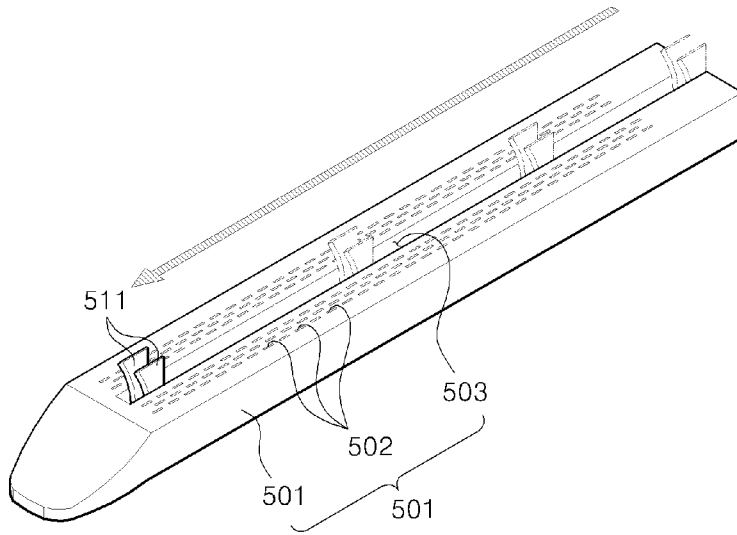
[Fig. 6]



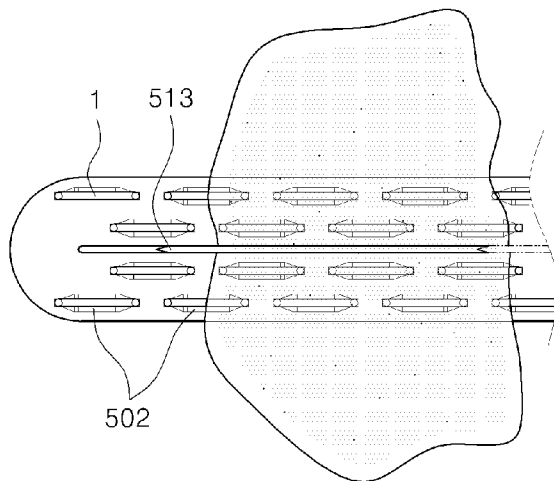
[Fig. 7]



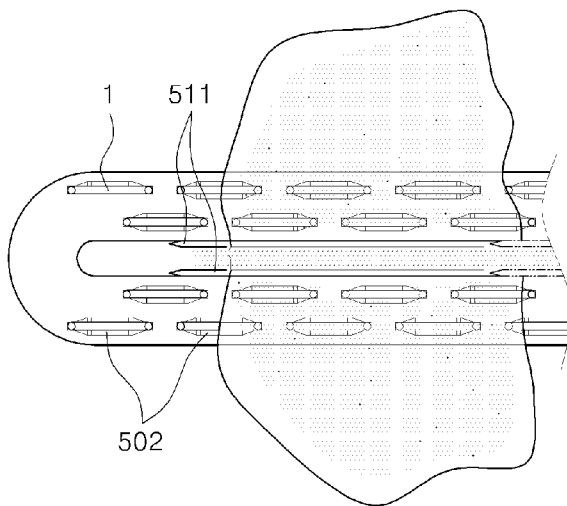
[Fig. 8]



[Fig. 9]

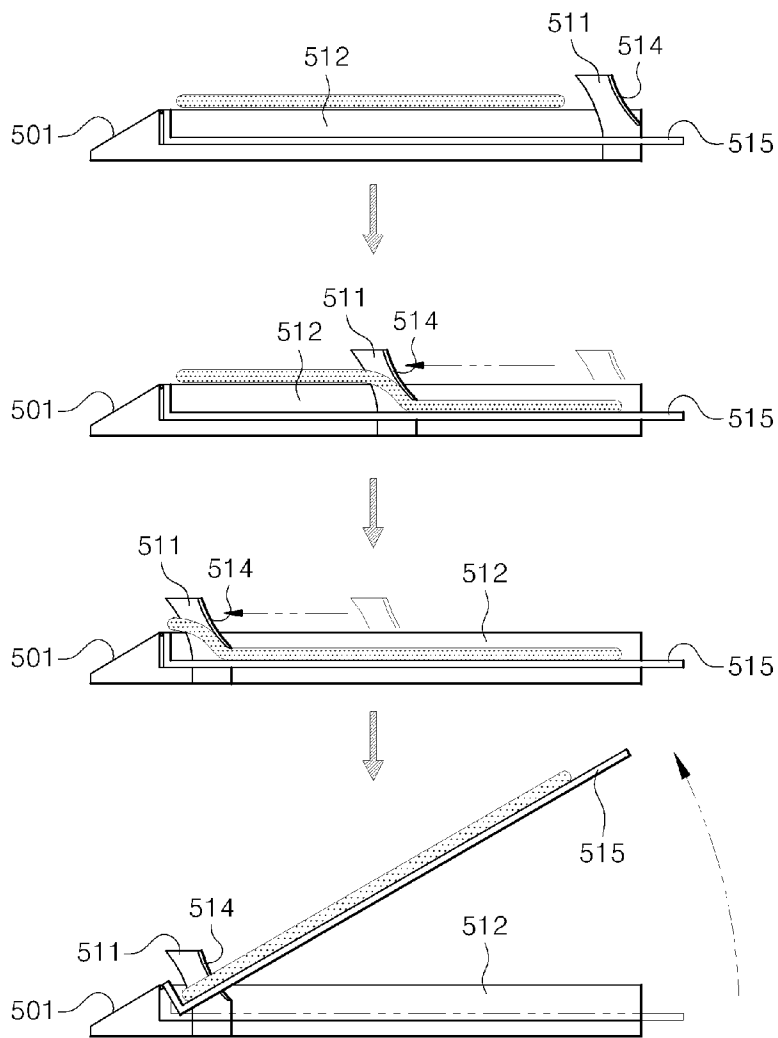


(a)



(b)

[Fig. 10]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2014/010116**A. CLASSIFICATION OF SUBJECT MATTER****A61B 17/068(2006.01)i, A61B 17/115(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61B 17/068; A61B 17/10; A61B 17/115

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: double, twin, blade, cutter, surgical, stapling, device, instrument

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010-0320252 A1 (VIOLA FRANK et al.) 23 December 2010 See abstract, paragraph[0069]; claims 1-16 and figure 2.	1-8
A	US 2007-0075115 A1 (OLSON LEE A. et al.) 05 April 2007 See abstract, paragraph[0078]; claims 1-11 and figures 3-5.	1-8
A	US 2011-0210157 A1 (KNODEL BRYAN D. et al.) 01 September 2011 See abstract; claims 12-15 and figures 7-8, 13-14.	1-8
A	US 2012-0168487 A1 (HOLSTEN HENRY E. et al.) 05 July 2012 See abstract, paragraph[0014]; claims 57-71 and figure 7.	1-8



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

17 April 2015 (17.04.2015)

Date of mailing of the international search report

17 April 2015 (17.04.2015)

Name and mailing address of the ISA/KR

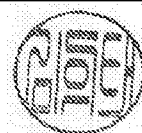
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Republic of Korea

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

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