US 20170150985A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2017/0150985 A1**

KIM (43) **Pub. Date: Jun. 1, 2017**

(54) **ULTRASONIC SURGERY APPARATUS, GRIPPING MEMBER PROVIDED ON JAW THEREOF, AND METHOD FOR PRODUCING GRIPPING MEMBERS**

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(21) Appl. No.: **15/122,401**

(22) PCT Filed: **Feb. 28, 2014**

(86) PCT No.: **PCT/KR14/01708**

§ 371 (c)(1),
(2) Date: **Jan. 30, 2017**

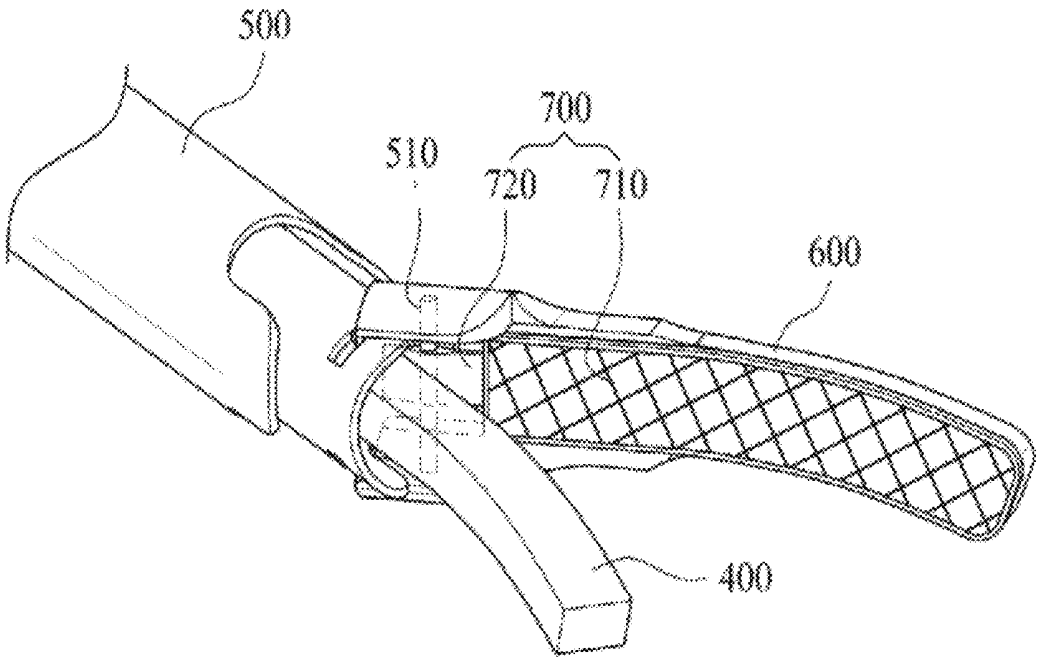
Publication Classification

(51) **Int. Cl.**
A61B 17/32 (2006.01)
B29C 45/00 (2006.01)

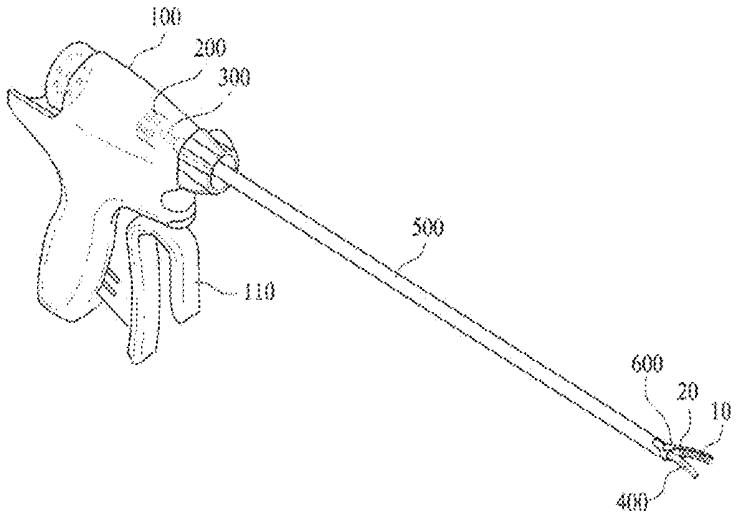
(52) **U.S. Cl.**
CPC .. ***A61B 17/320092*** (2013.01); ***B29C 45/0053*** (2013.01); *A61B 2017/2825* (2013.01)

(57) **ABSTRACT**

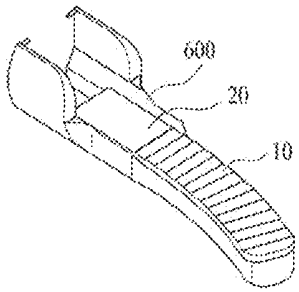
Disclosed is a gripping member provided on a jaw which grips a surgical site while tilting along with an amputator in an ultrasonic surgical apparatus for amputating the surgical site, the gripping member comprising a body portion formed along the lengthwise-direction of the jaw and coupled thereto; and a fixing portion having a through-hole at one end through which a shaft penetrates, and extending from the body portion along the lengthwise-direction thereof toward the shaft provided so as to tilt the jaw, so that the body portion is not released from the jaw.



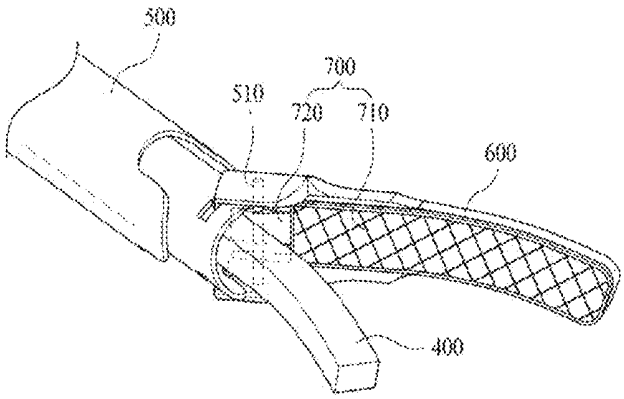
[Fig. 1]



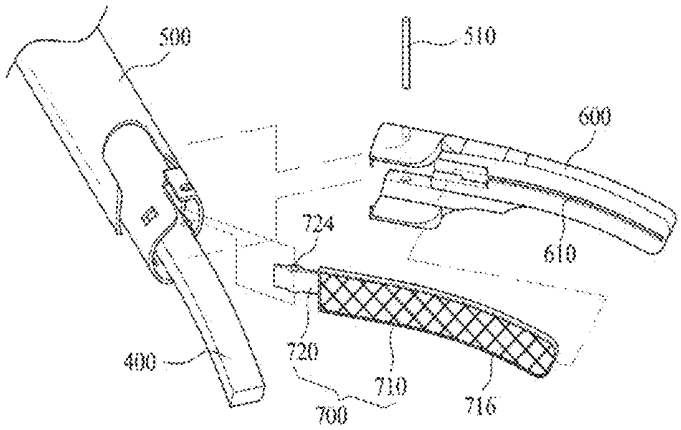
[Fig. 2]



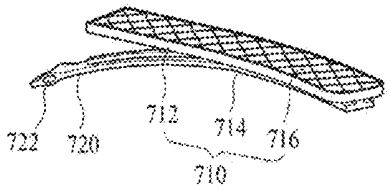
[Fig. 3]



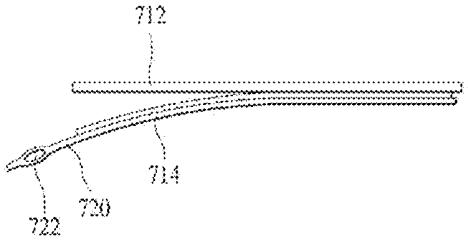
[Fig. 4]



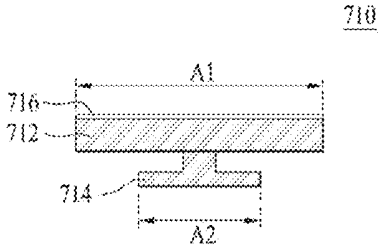
[Fig. 5]



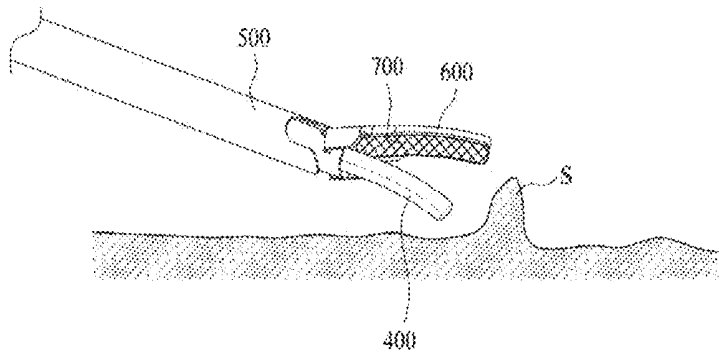
[Fig. 6]



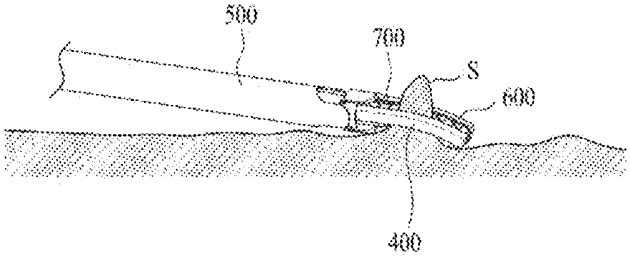
[Fig. 7]



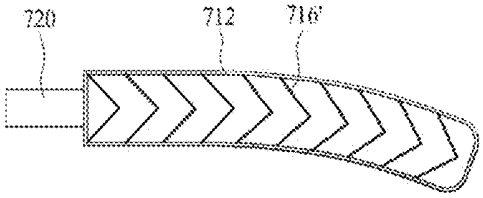
[Fig. 8]



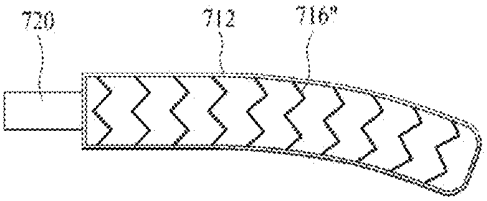
[Fig. 9]



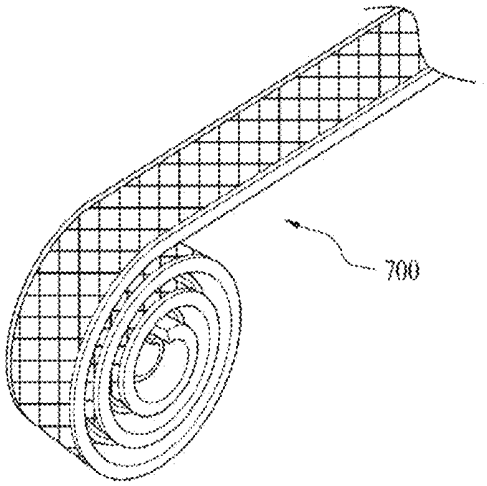
[Fig. 10]



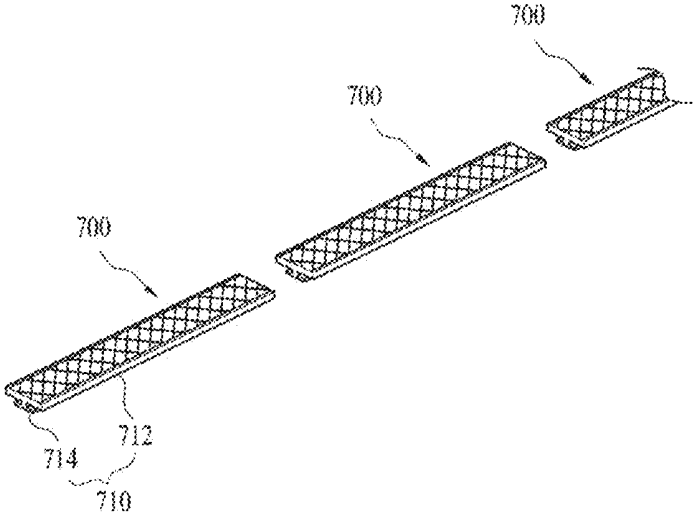
[Fig. 11]



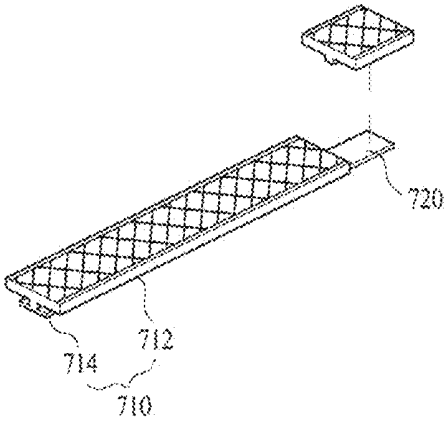
[Fig. 12]



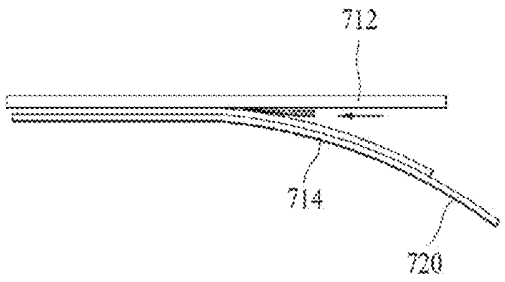
[Fig. 13]



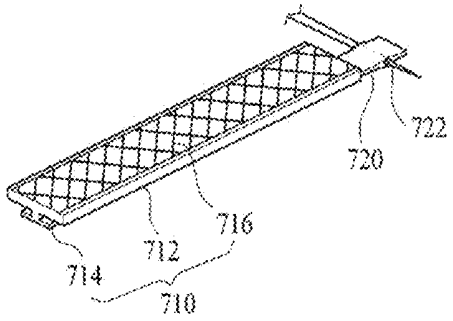
[Fig. 14]



[Fig. 15]



[Fig. 16]



ULTRASONIC SURGERY APPARATUS, GRIPPING MEMBER PROVIDED ON JAW THEREOF, AND METHOD FOR PRODUCING GRIPPING MEMBERS

TECHNICAL FIELD

[0001] The present invention relates to a surgical apparatus utilizing ultrasonic waves, and more particularly, the present invention relates to a gripping portion provided on a jaw, the gripping portion can be fixed stably without being separated by vibration of ultrasonic waves, and a surgical apparatus utilizing ultrasonic waves using the same.

BACKGROUND ART

[0002] Recently, surgical apparatuses using ultrasonic waves are being developed. Among them, the surgical apparatuses similar with harmonic scalpel are the most representative.

[0003] The surgical apparatuses having such shape normally comprises: a gun-shaped handle unit gripped in the operator's hand; an amputator provided in front of the handle unit for amputating a surgical site using ultrasonic waves transmitted from a vibration unit provided in the handle unit; and a jaw provided at a position facing with the amputator for gripping a surgical site together with the amputator.

[0004] Here, the jaw which grips a surgical site together with an amputator is normally provided with a gripping portion made from a synthetic resin, so that the gripping portion and the amputator together grip a surgical site.

[0005] For producing a conventional gripping portion, an additional fixing portion a portion of which is inserted in one side of a jaw to be coupled with the jaw is used to fix the gripping portion with the jaw which requires an additional process.

[0006] The additional fixing portion and the additional manufacturing process for fixing the gripping portion and jaw together take time and cost. In addition, such construction may result in separation of the fixing portion as the vibration of the amputator is transmitted to the jaw, or even separation of the gripping portion from the jaw by the vibration.

[0007] Because a surgical apparatus utilizing ultrasonic waves is used inside of a patient's body, separation or detachment of the fixing portion or gripping portion can cause a severe problem.

DETAILED DESCRIPTION OF THE INVENTION

Technical Objects

[0008] An aspect of the present invention is to provide a gripping portion provided on a jaw of a surgical apparatus utilizing ultrasonic waves, the gripping portion can be fixed stably without being separated by vibration of ultrasonic waves, and a surgical apparatus utilizing ultrasonic waves using the same which can be manufactured at a lower cost due to simplified process.

[0009] The invention is not restricted to the technical objective set forth above. The above and other aspects of the invention not described herein will become apparent to those skilled in the art to which the invention pertains by referencing the detailed description of the invention below.

Means for Achieving the Technical Object

[0010] The gripping portion provided on a jaw, which grips a surgical site together with an amputator by tilting from a surgical apparatus utilizing ultrasonic waves in the present embodiment in accordance with the present invention, comprises: a body portion formed along the lengthwise-direction of the jaw and coupled thereto; and a fixing portion having a through-hole at one end through which a shaft penetrates, and extending from the body portion along the lengthwise-direction thereof toward the shaft provided so as to tilt the jaw, so that the body portion is not released from the jaw.

[0011] The body portion can be formed comprising a first body portion having a length corresponding with the length of the jaw and a second body portion formed by protruding out from the underside of the first body portion and coupled in the coupling groove formed on the jaw.

[0012] To prevent a surgical site from being released from between the amputator and the jaw, the body portion can be provided with a structural pattem for further comprising a gripping portion on the top side of the first body portion, wherein the gripping portion is substantially formed in a plurality of grooves crisscrossing in the lengthwise and widthwise directions of the body portion.

[0013] In addition, the fixing portion is substantially formed extending from the second body portion in the lengthwise direction of the second body portion towards the shaft.

[0014] Here, the second body portion can be inserted into the coupling groove in a slidable way in the lengthwise direction, and the fixing portion is not coupled with the coupling groove.

[0015] The surgical apparatus utilizing ultrasonic waves in accordance with another aspect of the present invention comprises: a gun-shaped handle unit gripped in a hand of an operator; an amputator provided in front of the handle unit to amputate a surgical site utilizing the ultrasonic waves generated by a vibration unit provided inside of the handle unit; and a jaw provided at a position facing with the amputator, tiltable by an additional shaft to be attached to the amputator to grip a surgical site, and provided with a gripping portion formed on the surface attaching with the amputator to contact with the surgical site; and further comprising a body portion formed along the lengthwise direction of the jaw and coupled with the jaw, and a fixing portion formed by extending from the body portion towards the shaft for tilting the jaw along the lengthwise direction of the body portion and formed with a through hole where the shaft penetrates through.

[0016] Here, the body portion can be formed comprising a first body portion having a length corresponding with the length of the jaw and formed with a gripping portion which is formed in a plurality of grooves crisscrossing in the lengthwise and widthwise directions of the first body portion, and a second body portion formed by protruding out from the underside of the first body portion and coupled in the coupling groove formed on the jaw.

[0017] In addition, the fixing portion is formed by extending along the second body portion in the lengthwise direction towards the shaft, and the second body portion can be inserted into the coupling groove in a slidable way in the lengthwise direction, and the fixing portion is not coupled with the coupling groove.

[0018] The method for producing the gripping portion in accordance with another aspect of the present invention, which is a method for producing a body portion comprising a first body portion provided to a surgical apparatus utilizing ultrasonic waves for amputating a surgical site, whose one end is provided on the top side and coupled with a jaw which is tiltable by an additional shaft, to contact with and grip a surgical site together with an amputator, and a second body portion formed by extending from the underside of the first body portion and coupled with the jaw, and a gripping portion having a fixing portion formed by extending from the second body portion, wherein the method comprises: a first step for forming the body portion and the fixing portion in a long, linear shape by injection molding; a second step for cutting the body portion and the fixing portion injection molded in the first step into a predetermined length; a third step for forming the fixing portion from the body portion cut in the second step, by cutting off the upper portion of the fixing portion leaving the upper portion of the second body portion, and increasing the gap between the fixing portion and the first body portion by increasing the gap between the first body portion and the second body portion; and a fourth step for forming a through hole in the fixing portion formed in the third step in the widthwise direction.

[0019] Here, the second step can be characterized by cutting off the body portion leaving a length longer than that of the jaw.

[0020] In addition, the first step can be characterized by further comprising a step of forming a gripping portion on the top side of the first body portion in a form of a plurality of grooves crisscrossing in the lengthwise and widthwise directions of the first body portion.

[0021] In addition, the fixing portion can be characterized by being formed extending from the second body portion in the direction of the shaft and the first body portion is not formed on the top side.

Effects of the Invention

[0022] The effects of the present invention devised to solve above problems are as follows.

[0023] Firstly, regarding the gripping portion provided on the jaw of the surgical apparatus utilizing ultrasonic waves, since a fixing portion extending from the body portion and fixed by the shaft is formed in an integral portion, the gripping portion can be fixed reliably without the worry of being detached from the jaw, even without any additional means for fixing.

[0024] Secondly, since the fixing portion is injection molded as an integral member of the body portion, the step of coupling the gripping portion and jaw using an extra fixing means can be eliminated, simplifying the manufacturing process.

[0025] The effects of the invention are not restricted to those set forth above. The above and other aspects of the invention will become apparent to those skilled in the art to which the invention pertains by the description of the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] FIG. **1** is a schematic diagram showing the construction of a conventional surgical apparatus utilizing ultrasonic waves,

[0027] FIG. **2** is a schematic diagram showing a jaw applied with a gripping portion for gripping a surgical site of the surgical apparatus utilizing ultrasonic waves of FIG. **1**,

[0028] FIG. **3** is a schematic diagram showing a jaw applied with a gripping portion for gripping a surgical site of the surgical apparatus utilizing ultrasonic waves of in the present embodiment in accordance with the present invention.

[0029] FIG. **4** is an exploded perspective view of the gripping portion and jaw coupled together of the surgical apparatus utilizing ultrasonic waves of FIG. **2**,

[0030] FIG. **5** is a schematic diagram showing the construction of the surgical site gripping portion of FIG. **2**,

[0031] FIG. **6** is a side view of the surgical site gripping portion of FIG. **5**,

[0032] FIG. **7** is a cross-sectional view of the surgical site gripping portion of FIG. **5**,

[0033] FIG. **8** is a schematic diagram showing the surgical apparatus utilizing ultrasonic waves of FIG. **2** approaching a surgical site,

[0034] FIG. **9** is a schematic diagram showing the surgical apparatus utilizing ultrasonic waves of FIG. **8**, gripping and amputating a surgical site,

[0035] FIG. **10** is a plan view showing the deformed shape of the gripping portion of FIG. **2**,

[0036] FIG. **11** is a plan view showing another deformed shape of the gripping portion of FIG. **2**,

[0037] FIG. **12** is a diagram showing the step **1** of the manufacturing process of the gripping portion of the surgical apparatus utilizing ultrasonic waves of FIG. **2**,

[0038] FIG. **13** is a diagram showing the step **2** of the manufacturing process of the gripping portion of the surgical apparatus utilizing ultrasonic waves of FIG. **2**,

[0039] FIG. **14** is a diagram showing the step **3** of the manufacturing process of the gripping portion of the surgical apparatus utilizing ultrasonic waves of FIG. **2**, and

[0040] FIG. **16** is a diagram showing the step **4** of the manufacturing process of the gripping portion of the surgical apparatus utilizing ultrasonic waves of FIG. **2**,

[0041]

<Numbering Scheme of the Major Parts of the Drawings>

100: handle unit	200: vibration unit
300: transmission rod	400: amputator
500: rod cover	600: jaw
700: gripping portion	710: body portion
720: fixing portion	S: surgical site

MODE FOR CARRYING OUT THE INVENTION

[0042] The surgical apparatus utilizing ultrasonic waves, gripping portion provided on the jaw of the surgical apparatus utilizing ultrasonic waves, and method for producing the gripping portion are described in detail with preferable embodiments referring to accompanying drawings. It should be noted that the purpose of the description is not to limit the present invention to a specific form but to facilitate clear understanding with the embodiments.

[0043] In addition, in the description of the embodiments in accordance with the present invention, same elements shall be referred to with same names and numerals, without further description.

[0044] Meanwhile, in the description of the embodiments in accordance with the present invention, since an embodiment of a gripping portion provided on a surgical apparatus utilizing ultrasonic waves for amputating a surgical site can be included in an embodiment of the surgical apparatus utilizing ultrasonic waves, it will be included in the description of an embodiment of the surgical apparatus utilizing ultrasonic waves.

[0045] Referring to FIGS. **1** through **12**, the configuration of the surgical apparatus utilizing ultrasonic waves in the present embodiment in accordance with the present invention is described below.

[0046] The surgical apparatus utilizing ultrasonic waves in the present embodiment in accordance with the present invention comprises: a handle unit **100** gripped by an operator, a vibration unit **200**, a transmission rod **300**, an amputator **400**, a rod cover **500**, a jaw **600** and a gripping portion **700**.

[0047] The handle unit **100** is provided in a gun-shape for being held in a hand of an operator, comprising: a vibration unit **200** inside for generating vibration, a transmission rod **300** connected with the vibration unit **200** and a rod cover **500** connected in forward direction. In addition, an additional operating means **110** is provided to control the wavelength, amplitude and frequency of the ultrasonic waves generated by the vibration unit **200**.

[0048] The vibration unit **200** generates ultrasonic waves by receiving electric signals from input terminals. (However, the electric circuit and wiring for transmitting the signals between the vibration unit **200** and the input terminals are not indicated in the drawings.)

[0049] The frequency of the ultrasonic waves generated by the vibration unit **200** varies by the conditions of the transmission rod **300** and amputator **400** which will be described later. That is, the ultrasonic waves generated by the vibration unit **200** can be adjusted by the configuration and material of the transmission rod **300** and/or design of the gain steps and operating length of the amputator **400**.

[0050] For example, if the transmission rod **300** is made of titanium in a cylindrical shape, the gain step and operating length of the amputator **400** is about 20 mm and 15 mm, respectively, the vibration unit **200** will generated ultrasonic waves at about 55.5 kHz of frequency.

[0051] In addition, the wavelength, amplitude and frequency of the ultrasonic waves generated by the vibration unit **200** can be controlled with the operating means **110** taking the surgical site S to be amputated into consideration.

[0052] For example, if the surgical site S is a thick tissue or containing a blood vessel, the intensity of the ultrasonic waves should be adjusted to be higher, or the intensity can be controlled to be lower to avoid hindrance of the byproducts of amputation to the operation.

[0053] Meanwhile, the transmission rod **300** connects the vibration unit **200** and amputator **400** to transmit the ultrasonic waves generated by the vibration unit **200** to the amputator **400**.

[0054] The transmission rod **300** in the present embodiment in accordance with the present invention is provided in a long, rod-shape whose one end and the opposite end are connected to the vibration unit **200** described earlier and amputator **400** described later, respectively.

[0055] While not shown in the drawings, the transmission rod **300** can be configured in a long, thin, cylindrical bar so that the amputator **400** can be inserted in a hole formed on a trocar used in laparoscopy to reach a surgical site S easily.

[0056] In addition, the length of the transmission rod **300** can be provided sufficiently for laparoscopy, and allow for the ultrasonic waves generated by the vibration unit **200** for repetition of the vibration nodes (the points where the intensity of ultrasonic wave is substantially zero) and vibration anti-node (a concept opposite to the vibration node, the points where the intensity of ultrasonic wave is the highest) by a plurality of number lengths.

[0057] In addition, while the transmission rod **300** can be made with various materials, titanium material would be preferable for efficient transmission of the 55.5 kHz of ultrasonic waves generated in the vibration unit **200** as described earlier.

[0058] In the present embodiment, the transmission rod **300** is formed in a long cylindrical bar shape, a portion of which is connected inside of the handle unit **100** and the opposite portion protrudes out forward.

[0059] The amputator **400** for cutting a surgical site S utilizing ultrasonic waves is provided on one end of the transmission rod **300** to receive the ultrasonic waves generated by the vibration unit **200** to cut a surgical site S.

[0060] More particularly, the amputator **400** in accordance with the present invention can be formed by being extended from one end of the transmission rod **300** described earlier, and can cut a surgical site S by pressing and gripping the surgical site S together with the jaw **600**, to be described later, provided on the opposite side, using vibration energy and thermal energy.

[0061] Here, the amputator **400** and the transmission rod **300** can be made of different materials in order to avoid the heat transfer from the amputator **400** to the transmission rod **300**.

[0062] Since the amputator **400** operates utilizing ultrasonic waves, it does not have a sharp edge, different from other ordinary cutting devices. That is, the amputator **400** is designed to cut a surgical site S using vibration energy and thermal energy, thus, it is effective when amputating a surgical site S through which a blood vessel or vessels pass.

[0063] The amputator **400** in the present embodiment in accordance with the present invention can be formed with a smaller diameter than that of the transmission rod **300** and may be curved along in the lengthwise direction, as shown in the drawings. This is to facilitate stable contact or grip with a surgical site S, however, the shape can be changed to be fit for specific application. Here, the amputator **400** shall be so formed as to be able to make use of the vibration energy and thermal energy of the ultrasonic waves received from the vibration unit **200**.

[0064] Since the amputator **400** should be able to amputate a surgical site S utilizing the ultrasonic waves transmitted through the transmission rod **300**, it should have a gain step (indicating that the actual ratio of amplification is 1 or higher).

[0065] For a means to provide the amputator **400** with a gain step, the shape and structure of the amputator **400** can be diversified, In the present embodiment in accordance with the present invention, the lateral cross-sectional area of the amputator **400** is reduced to be smaller than that at the vibration node so that the energy of the ultrasonic waves can be amplified according to the ratio of the cross-sectional area. Accordingly, when the amputator **400** is formed by

being extended from the transmission rod **300**, a portion of the round cross-sectional area is flattened to reduce the area and to form a gain step.

[0066] The rod cover **500** surrounds the transmission rod **300** to protect the ultrasonic waves transmitted through the transmission rod **300**. As such, the rod cover **500** in the present embodiment in accordance with the present invention is a long, hollow rod, allowing the transmission rod **300** to penetrate through the hollow portion.

[0067] In addition, the opposite end is coupled and fixed with the handle unit **100** described earlier, and the amputator **400** penetrates and exposed outwards through the one end.

[0068] The rod cover **500** in the present embodiment in accordance with the present invention has a length corresponding with the length of the transmission rod **300** described earlier, the opposite end is coupled with the handle unit **100** and the amputator **400** protrudes out from the hollow of the rod cover.

[0069] While the rod cover **500** is preferably not contacting with the transmission rod **300**, however, it may be necessary to be connected if the transmission rod **300** is long. Here, the connection point is preferably be made on a plurality of the vibration nodes on the transmission rod **300** formed by the ultrasonic waves.

[0070] This is because, since the intensity of the ultrasonic waves is not zero at any other points than the vibration nodes, if the transmission rod **300** and rod cover **500** are connected at any other points than the vibration nodes, the energy of the ultrasonic waves being transmitted through the transmission rod **300** is transmitted to the rod cover **500** and lost (wasted).

[0071] That is, though not shown, the rod cover **500** and transmission rod **300** in the present embodiment in accordance with the present invention can be configured to contact with each other partially along on the lengthwise direction.

[0072] The jaw **600**, positioned facing with the amputator **400** to grip a surgical site S by adhering to the amputator **400**. As shown in the drawings, it is coupled to the opposite end of the rod cover **500** in a tiltable way using an additional shaft **510**.

[0073] More particularly, the jaw **600**, formed in a long shape having a certain length, whose one end is so configured as to allow tilting from the rod cover **500**, enabling adjustment of the rotating angle. As such, the jaw **600** can grip the surgical site S together with the amputator **400** penetrating through and protruding out from the rod cover **500**.

[0074] The jaw **600** in the present embodiment in accordance with the present invention is provided with a gripping portion **700** to be described later on one side. The gripping portion **700** is provided on one side of the jaw **600** to grip the surgical site S together with the amputator **400**.

[0075] The jaw **600** coupled with the rod cover **500** in a tiltable manner with a tilting angle controllable by the operating means **110** described earlier. Accordingly, the gripping portion **700** and amputator **400** can grip the surgical site S.

[0076] That is, the jaw **600** is configured not to contacting directly with the surgical site S, but the gripping portion **700** provided on one side of the jaw grips the surgical site S together with the amputator **400**.

[0077] When the surgical site S is gripped by the gripping portion **700** and amputator **400**, the amputator **400** can amputate the surgical site S utilizing the ultrasonic waves generated by the vibration unit **200**.

[0078] The jaw **600** in the present embodiment in accordance with the present invention can be curved along the lengthwise direction, as shown in the drawing, for stable gripping of the surgical site S. However, its actual shape can be formed selectively according to the surgical site S or application.

[0079] In addition, the jaw **600** in the present embodiment in accordance with the present invention is formed with a coupling groove **610** in which a portion of the gripping portion **700** is coupled with. As shown in the drawing, the coupling groove **610** is formed along the lengthwise direction of the jaw **600**, and a portion of the gripping portion **700** is inserted in the coupling groove **610** to support the gripping portion **700** not to be detached from one side of the jaw **600**.

[0080] Meanwhile, the gripping portion **700** provided on one side of the jaw **600** described earlier grips the surgical site S together with the amputator **400**, at the position adjusted selectively according to the tilting condition of the jaw **600**.

[0081] More particularly, the gripping portion **700** in the present embodiment in accordance with the present invention can be made of a synthetic resin in a form corresponding with that of the jaw **600** and provided on one side of the jaw **600**.

[0082] The gripping portion **700** in the present embodiment in accordance with the present invention can comprise a body portion **710** and a fixing portion **720**.

[0083] Here, the body portion **710** which is formed along the lengthwise direction of the jaw **600** is so configured that at least a portion of it is coupled with the jaw **600**.

[0084] More particularly, the body portion **710** in the present embodiment in accordance with the present invention has a protruding portion which is inserted in the coupling groove **610** described earlier to facilitate stable coupling of the jaw **600** and gripping portion **700**.

[0085] The body portion **710** in the present embodiment in accordance with the present invention can comprise: a first body portion formed with a length corresponding with that of the jaw **600**; and a second body portion **714** protruding outwards from the bottom of the first body portion **712** and coupled with the coupling groove **610** formed on the jaw **600**. The body portion **710** can, but not limited to, be formed as an integral member, instead of comprising the first body portion **712** and the second body portion **714**.

[0086] The first body portion **712** in the present embodiment in accordance with the present invention whose length corresponds with that of the jaw **600** is provided with an additional gripping portion **716** on one side to grip a surgical site S together with the amputator **400**.

[0087] Here, the first body portion **712** has an area corresponding with the size of the jaw **600**, as described earlier, and the second body portion **714** is formed by protruding out from the bottom side.

[0088] More particularly, the first body portion **712** in the present embodiment in accordance with the present invention can be formed with an additional structural pattern and a gripping portion **716** on the top side of the first body portion **712** to prevent the surgical site S from being released from between the amputator **400** and jaw **600** when the surgical site S grips or cuts.

[0089] The gripping portion **716** is formed in a plurality of grooves crisscrossing in the lengthwise and widthwise direc-

tions of the first body portion **712** to prevent slip in the contacting surface with the surgical site S for firm gripping.

[0090] In addition, the gripping portion **716** prevents the surgical site S from slipping from the amputator **400** which is vibrating by ultrasonic waves.

[0091] While the gripping portion **716** in the present embodiment in accordance with the present invention is formed with a structural patter comprising a plurality of grooves crisscrossing in the lengthwise and widthwise directions of the first body portion **712**, however, it may be formed in various other pattems.

[0092] More particularly, the gripping portion **716** can be formed in a different shape than the simple perpendicularly crossing lines as shown in FIGS. **11** and **12**, e.g., the examples of variants. The structural pattern of the gripping portion **716**, as shown in FIGS. **11** and **12** can be replaced with angled, zigzag lines (**716'**, **716"**) directing from the center to the opposite sides of the gripping portion **700**.

[0093] As described above, the first body portion **712** is provided on the top side of the jaw **600** described earlier and formed with the gripping portion **716** for stable gripping of a surgical site S when gripping the surgical site S together with the amputator **400**.

[0094] The second body portion **714**, as shown in FIG. **7**, protrudes from the bottom side of the first body portion **712** in an 'H' shape.

[0095] Here, the second body portion **714**, as shown in FIG. **6**, has relatively smaller width (A**2**) and area than the width (A**1**) of the first body portion **712**, and a portion of the cross-section of the lower portion is sunk.

[0096] As the second body portion **714** is formed as described above, a portion of the second body portion **714** is coupled with by sliding into the coupling groove **610** formed on the jaw **600**. As a result, the body portion **710** can be fixed on one side of the jaw **600**.

[0097] More particularly, the second body portion **714** is formed on the first body portion **712** protruding from the opposite side to the side where the gripping portion **716** is formed, and inserted into the coupling groove **610** to fasten the first body portion **712** and jaw **600** without being released from mating member.

[0098] In the present embodiment in accordance with the present invention, a portion of the second body portion **714** is inserted into the coupling groove **610** along the lengthwise direction in a slidable manner.

[0099] This configuration of the body portion **710** provided on one side of the jaw **600** enables stable gripping and amputating a surgical site S together with the amputator **400**.

[0100] Meanwhile, the fixing portion **720** is formed by extending from the body portion **710** towards the shaft **510** along the lengthwise direction of the body portion **710** to prevent the body portion **710** from separating from the jaw **600** and provided with a through hole **724** on one end through which the shaft **510** penetrates.

[0101] More particularly, the fixing portion **720** in accordance with an embodiment of the present invention protrudes from the first body portion **712** or second body portion **714** towards the shaft **510** and formed with a through hole **724** perpendicular with the lengthwise direction.

[0102] The extending fixing portion **720** is penetrated by the shaft **510** to provide a secondary fixture to prevent the body portion **710** from separating from the jaw **600**.

[0103] The fixing portion **720** in the present embodiment in accordance with the present invention, as shown in FIGS. **5** and **6**, is formed by extending from the second body portion **714** towards the shaft **510** and provided a through hole **724** on one side of the extension. That is, the fixing portion **720** is formed by an extension of the second body portion **714** and not provided with a first body portion **712** on the top side.

[0104] Accordingly, the fixing portion **720** is formed with the same width as of the second body portion **714**.

[0105] Meanwhile, the fixing portion **720** is formed providing a gap between the first body portion **712** and second body portion **714**, as shown in FIGS. **5** and **6**, in order to provide the fixing portion **720** with more degree of freedom.

[0106] The purpose of providing the fixing portion **720** with degree of freedom is for further reinforcement of the performance of the fixing portion **720**.

[0107] That is, if the fixing portion **720** has no degree of freedom the fixing portion **720** cannot buff vibration transmitted to it, and the fixing portion **720** may fail to be fixed, for example, by an unexpected external force caused by vibration applied to a point between the fixing portion **720** and the member fixed by the fixing portion **720**.

[0108] As suc, the fixing portion **720** is preferably formed providing a gap between the first body portion **712** and second body portion **714**, as shown in FIGS. **5** and **6**, in order to provide the fixing portion **720** with more degree of freedom.

[0109] As the gripping portion **700** is so configured, considering the joint between the fixing portion **700** and the jaw **600**, as shown in FIG. **4**, the second body portion **714** is sliding-coupled through the coupling groove **610** formed on the jaw **600** in the first step.

[0110] Here, since the coupling groove **610** is formed in a long shape along the longwise direction of the jaw **600** and the second body portion **714** is also formed in a long shape corresponding with the shape of the groove with an 'H-shaped' cross-section, the second body portion **714** can be coupled with the coupling groove **610** by sliding.

[0111] Then, with the second body portion **714** coupled with the coupling groove **610**, the through hole **724** formed in the fixing portion **720** is fastened by being penetrated by the shaft **510**.

[0112] That is, the shaft **510** couples the jaw **600** and the rod cover **500** in a tiltable manner and penetrates the through hole **724** for coupling additionally.

[0113] Accordingly, even though the gripping portion **700** slide-couples with the jaw **600**, it can maintain the coupled state stably without separating from the jaw **600** because the fixing portion **720** is fixed by the shaft **510**.

[0114] When the amputator **400** vibrated by ultrasonic waves, the vibration is transmitted to the jaw **600** and separation of the gripping portion **700** can be prevented by fine vibration.

[0115] Since the conventional gripping portion **10** has not been provided with the fixing portion **720**, the gripping portion **10** which is slide-coupled was fixed using an additional fixing member **20** as shown in FIG. **2** in order to prevent separation of the gripping portion **10** and jaw **600** by the vibration of the amputator **400**.

[0116] Here, the conventional fixing portion **20** made a metallic material is coupled to the jaw **600** after coupling the gripping portion **10** with the jaw **600**.

[0117] As described above, the conventional configuration requires an additional fixing portion **20** and the related steps in the manufacturing process. In addition, the conventional

surgical apparatus utilizing ultrasonic waves has the problem that the conventional gripping portion **10** may be detached by the separation of the fixing portion **20**.

[0118] To this end, the gripping portion **700** in accordance with the present invention can be formed as an integral member without additional fixing portion **20**, simplifying the manufacturing process and substantially preventing separation of the gripping portion **700**.

[0119] As described above, the gripping portion **700** in accordance with an embodiment of the present invention can maintain coupling state with the jaw **600** stably.

[0120] The surgical apparatus utilizing ultrasonic waves and the gripping portion **700** provided on the jaw **600** of the surgical apparatus utilizing ultrasonic waves are described in detail hereinabove. The gripping of the surgical site S by the surgical apparatus utilizing ultrasonic waves in accordance with an embodiment of the present invention is described in detail below.

[0121] As shown in FIG. **7**, the gripping portion **700** and amputator **400** in accordance with an embodiment of the present invention approach dose to a surgical site S without contacting with each other and with the jaw **600** being tilted. Here, a portion of the surgical apparatus utilizing ultrasonic waves has already been inserted in the body of an operatee, and the surgical site S refers to a portion of the body which is the target of the operation.

[0122] After inserted into the body of the operate, the amputator **400** and jaw **600** grip the surgical site S or part to be cut off, as shown in FIG. **9**. At this time, the operator tilts the jaw **600** by using the operating means **110**, so that the amputator **400** and gripping portion **700** contact with and grip the surgical site S.

[0123] Then, the operator starts the vibration unit **200** to amputate the surgical site S.

[0124] At this time, the gripping portion **700** in accordance with an embodiment of the present invention is fixed is fixed to the jaw **600** doubly by the fixing portion **20**, thus, can grip the surgical site S stably, not being detached from the jaw **600** by the vibration caused by ultrasonic waves.

[0125] Referring to FIGS. **12** through **16**, the process of manufacturing the gripping portion **700** of the surgical apparatus utilizing ultrasonic waves in accordance with an embodiment of the present invention is described below.

[0126] The manufacturing process of the gripping portion **700** in accordance with the present invention comprises a first step of injection molding the body portion **710** and fixing portion **720** combined in a long single part.

[0127] Here, the body portion **710** and fixing portion **720** may be injection molded with an identical material in a long, rod-like shape. The body portion **710** is injection molded with a cross-section area corresponding with the shape of the first body portion **712** and second body portion **714**.

[0128] On the other hand, the body portion **710** and fixing portion **720** can be injection molded in addition with the gripping portion **716** described earlier on the portion which will become the first body portion **712**.

[0129] That is, the body portion **710** and fixing portion **720** can be injection molded as a single part, or alternatively, the gripping portion **716** can be additionally formed on the top side of the first body portion **712**. In addition, the body portion **710** and fixing portion **720** can be injection molded as a single part, and then formed with the gripping portion **716** additionally on the top side of the first body portion **712**.

[0130] Above two processes can be selected by the manufacturer according to the situation.

[0131] The body portion **710** and fixing portion **720** injection molded in a long, single part in the step **1** is cut into unit members by a predetermined lengths in step **2**. Here, since each of the cut units are processed into one gripping portion **700**, they are cut by a length longer than that of the jaw **600**.

[0132] The cut body portion **710** and fixing portion **720** have H-shape cross-sections and lengths longer than that of the jaw **600**.

[0133] To form fixing portion **720**, from each of the body portion **710** and fixing portion **720** cut in the step **2**, the portion on top side of the fixing portion **720** is cut off, leaving the portion on the top side of the second body portion **714**, of the first body portion **712**, and the gap between the fixing portion **720** and first body portion **712** is increased by widening the gap between the first body portion **712** 와 second body portion **714** close to the fixing portion **720**, in step **3**.

[0134] That is, in the step **3**, the body portion **710** and fixing portion **720** cut in the step **2** maintains only the first body portion **712** and second body portion **714**. Then, one end in the lengthwise direction of the first body portion **712** is cut off so that a portion of the second body portion **714** becomes the fixing portion **720**. Here, the gap between the fixing portion **720** and first body portion **712** can be increased to increase the degree of freedom to improve the functionality of the fixing portion **720**.

[0135] Lastly, in step **4**, a through hole **724** is formed in the fixing portion **720** formed in step **3** in the direction perpendicular with the lengthwise direction of the fixing portion **720**. The method for forming the through hole **724** is not limited as long as the method can form the hole.

[0136] The gripping portion **700** in accordance with an embodiment of the present invention can be produced by the method described above. Each gripping portion **700** so produced is attached to each of the jaw **600** of a surgical apparatus utilizing ultrasonic waves.

[0137] From the foregoing it is believed that those skilled in the pertinent art will recognize the meritorious advancement of this invention and will readily understand that while the present invention has been described in association with a preferred embodiment thereof, and in the accompanying drawings, numerous changes and modifications may be made therein by those skilled in the art without departing from the spirit and scope of this invention. However, the present invention is not limited to the embodiments provided here but can be implemented in various ways within the scope of the claim.

What is claimed is:

1. A gripping portion provided on a jaw of a surgical apparatus utilizing ultrasonic waves for gripping a surgical site, comprising:

a body portion formed along the lengthwise direction of the jaw and attached to the jaw; and a fixing portion formed by extending from the body portion towards the shaft for tilting the jaw along the lengthwise direction of the body portion and formed with a through hole where the shaft penetrates through.

2. The gripping portion of claim **1**,

wherein the body portion comprises: a first body portion having a length corresponding with the length of the jaw; and a second body portion formed by protruding

out from the bottom side of the first body portion and coupled in the coupling groove formed on the jaw.

3. The gripping portion of claim **2**,

wherein the body portion further comprises a gripping portion formed on the top side of the first body portion and provided with structural pattem to prevent the surgical site from being released from between an amputator and the jaw when amputating the surgical site, and

the gripping portion is characterized by being formed with a plurality of crisscrossing grooves.

4. The gripping portion of claim **2**,

wherein the fixing portion is characterized by being formed extending from the second body portion in the lengthwise direction of the second body portion towards a shaft.

5. The gripping portion of claim **3**,

wherein the second body portion is inserted into the coupling groove in a slidable way in the lengthwise direction, and the fixing portion is not coupled with the coupling groove.

6. A surgical apparatus utilizing ultrasonic waves comprising: a gun-shaped handle unit gripped by a hand of an operator; an amputator provided in front of the handle unit to amputate a surgical site utilizing the ultrasonic waves generated by a vibration unit provided inside of the handle unit; and a jaw provided at a position facing with the amputator, tiltable by an additional shaft to be attached to the amputator to grip a surgical site, and provided with a gripping portion formed on the surface attaching with the amputator to contact with the surgical site; and further comprising a body portion formed along the lengthwise direction of the jaw and coupled with the jaw, and a fixing portion formed by extending from the body portion towards the shaft for tilting the jaw along the lengthwise direction of the body portion and formed with a through hole where the shaft penetrates through.

7. The surgical apparatus utilizing ultrasonic waves of claim **6**,

wherein the body portion comprises: a first body portion having a length corresponding with the length of the jaw and formed with a plurality of crisscrossing grooves on the top side; and a second body portion formed by protruding out from the bottom side of the first body portion and coupled in the coupling groove formed on the jaw.

8. The surgical apparatus utilizing ultrasonic waves of claim **7**,

wherein the fixing portion is formed by extending along the second body portion in the lengthwise direction towards the shaft, and the second body portion can be inserted into the coupling groove in a slidable way in the lengthwise direction, and the fixing portion is not coupled with the coupling groove.

9. A method for producing a gripping portion used in a surgical apparatus utilizing ultrasonic waves for amputating a surgical site, the gripping portion provided on a jaw whose one end can be tilted by a shaft, gripping a surgical site together with an amputator, and the gripping portion comprises: a body portion comprising a first body portion provided on the top side of the jaw and a second body portion formed by protruding out from the bottom side of the first body portion and coupled with the jaw; and a fixing portion formed by extending from the second body portion, the method comprising:

a first step for injection-molding the body portion and the fixing portion in a long, single part;

a second step for cutting the body portion and the fixing portion injection-molded in the first step into predetermined lengths;

a third step for cutting off the upper portion of the fixing portion while leaving the upper portion of the second body portion, of the first body portion, in order to be able to form the fixing portion on the body portion cut in the second step, and increasing the gap between the fixing portion from the first body portion by increasing the gap between the first body portion and the second body portion adjacent to the fixing portion; and a fourth step for forming a through hole in the fixing portion formed in the third step in the direction perpendicular with the lengthwise direction.

10. The method of claim **9**,

wherein the second step is characterized by,

the body portion is cut off with a length longer than the length of the jaw.

11. The method of claim **9**,

wherein the first step is characterized by,

further comprising a step of forming a gripping portion on the top side of the first body portion in a form of a plurality of grooves crisscrossing in the lengthwise and widthwise directions of the first body portion.

12. The method of claim **9**,

wherein the fixing portion is characterized by,

being formed extending from the second body portion in the direction of the shaft and the first body portion is not formed on the top side.

* * * * *

专利名称(译)	超声波手术装置，设置在其下颚上的夹持构件，以及用于制造夹持构件的方法		
公开(公告)号	US20170150985A1	公开(公告)日	2017-06-01
申请号	US15/122401	申请日	2014-02-28
[标]申请(专利权)人(译)	ligasonix公司		
申请(专利权)人(译)	ligasonix，Inc.		
当前申请(专利权)人(译)	ligasonix，Inc.		
[标]发明人	KIM EUNG KOOK		
发明人	KIM, EUNG KOOK		
IPC分类号	A61B17/32 B29C45/00		
CPC分类号	A61B17/320092 B29C45/0053 B29C2793/009 A61B2017/00526 B29C2793/0054 A61B2017/2825 A61B17/32 A61B2017/320093		
外部链接	Espacenet USPTO		

摘要(译)

本发明公开了一种夹持构件，其设置在钳口上，该夹持件在与超声外科手术装置中的截肢器一起倾斜的同时夹持手术部位以截断手术部位，该夹持构件包括沿着钳口的长度方向形成并与其连接的主体部分。;固定部分，在一端具有通孔，轴穿过该通孔，并且从主体部分沿其长度方向朝向设置成使颚部倾斜的轴延伸，使得主体部分不会从下巴。