coupled to the slide shaft 324 to the rear end of the slide shaft through hole 341c and which the bushing ring 325 is supported to support the horizontal reciprocating motion of the slide shaft 324. A coupling portion 341d is configured, and a right angle fixing pin coupling for coupling the right angle fixing pin 342 to the release guide preventing groove 324b of the slide shaft 324 fitted to one side of the slide shaft through hole 341c. Muscle jean characterized in that it comprises a portion (341e) East massage device.

4. According to claim 3, wherein the main body 100 is configured with a fixing hole 140 penetrating into the main body 100, the fixing bracket 341 is a fixing hole 341f in a position corresponding to the fixing hole 140) Is configured to be fixed to the bracket fixing portion 130 by a fastening means from the outside of the main body 100, characterized in that the muscle vibration massage device.

5. The muscle vibration massage device according to claim 3 or 4, wherein the fixing bracket (341) is manufactured integrally by aluminum extrusion processing or die casting.

6. The method of claim 1, wherein the fixing means of the main body 100 constitutes the motor support portion 120 to support the force acting from the slide shaft 324 to the rear end of the motor 200, the motor 200 The front end of the muscle vibration massage device, characterized in that it comprises a bracket fixing portion 130 for fixing the fixing bracket (341).

Description

Muscle Vibration Massage Device {VIBRATION MASSAGE APPARATUS FOR MUSCLE}

The present invention relates to a muscle massage device that can deliver a mechanical vibration to the muscles to relax the muscles, and more particularly, to a muscle vibration massage device composed of a gun (GUN) type to be easy to use by hand. will be.

Mechanical vibration massage therapy is commonly used to help muscle rehabilitation. Vibration massage treatment is the application of mechanical vibration for the purpose of treatment.It delivers vibration to the human body to create longitudinal wave flow, improve blood flow and relax the contracted muscle tissue, thereby rehabilitation of damaged muscle tissue. Will help.

In addition, the effects of muscle stimulation using vibration can be obtained, such as pain relief, lipolysis and cosmetic effects, increased blood circulation and congestion relief, muscle relaxation.

Previously, such a vibration massage device was available in a hospital or a rehabilitation center, but recently, due to the development of technology, various types of muscle vibration massage devices have been commercialized as well as being small enough to be portable and used at home.

1 shows Republic of Korea Patent No. 20-0311328 "Muscle Stimulators".

Conventional muscle stimulation massage device as shown in Figure 1 to the eccentric rotor having an eccentric rotation shaft formed to rotate in accordance with the rotation of the motor and the motor to the handle portion 1, the muscle stimulation as the rotor of the eccentric rotor rotates By allowing the slide shaft 3 to reciprocate back and forth while the eccentric rotation shaft strikes the inner surface of the slide shaft 3 of the member 2, the muscle stimulating member 2 is configured to stimulate the muscle.

Here, the conventional muscle stimulation massage device is composed of both the eccentric rotor and its supporting structure and the power circuit device that rotates in accordance with the rotation of the motor and the motor in the handle portion 1, so that the thickness can only be thickened, It is difficult to use on the body when the user is holding by hand.

In addition, the technical structure for the reciprocating of the slide member back and forth using the eccentric rotor for the rotational force of the motor is complicated, the manufacturing process is complicated and the manufacturing cost is high, as the power of the motor vertically slides the slide shaft (3), The center of gravity axis 4 must be constructed to balance it.

In the present invention to improve such a conventional problem in the construction of the muscle stimulation massage device, the rotational force of the motor as a vibration force providing means to act on the muscle stimulation member in the horizontal direction, the force transmission effectively balanced By making it possible, a separate center of gravity is unnecessary, and also to simplify the structure to further slimmer the handle portion to provide a muscle stimulation massage device that the user can easily hold and use.

The present invention muscle vibration massage device,

Consists of a main body having a gun-shaped handle portion, the upper portion of the main body to incorporate the vibration generating means for generating the vibration by converting the motor 200 and the rotational force of the motor to the horizontal and horizontal reciprocating motion to generate the vibration A space and a fixing part are formed, and a motor control means for controlling the operation of the motor by supplying a driving voltage of the motor is built into the handle part located at the lower part of the main body, and the fixing means thereof is configured. Where the finger is located, a gun switch for providing a user operation command to the motor control means is formed,

The vibration generating means,

One side of the rotating shaft is coupled to the rotating shaft of the motor in a horizontal direction and rotates, and the horizontal slide displacement means having a horizontal movement displacement according to the rotation on the rotating shaft to form a vibration slide unit according to the displacement of the horizontal movement displacement means formed on the cam Vibration slide unit for horizontal reciprocating motion, and a horizontal movement displacement means formed in the vibration rotation portion coupled to the horizontal slide movement of the horizontal displacement displacement of the horizontal movement displacement means according to the rotation of the vibration rotation portion, and the front end of the vibration slide portion Combined and exposed to the outside of the main body to provide vibration stimulation of the contact vibration slide unit to the user's muscles, the motor, the vibration rotating unit, the vibration slide unit is fixed and guided so that the vibration slide unit does not deviate from the left and right in the horizontal reciprocating motion Characterized in that comprises a departure prevention part for do.

In addition, the horizontal movement displacement means of the vibration rotating unit is composed of a disk with a rotation axis and a predetermined inclination to form a cam having a horizontal movement displacement as the rotation axis is rotated, the vibration slide portion of the disk configured in the cam of the vibration rotating part It is configured on both sides to rotate constantly in the opposite direction with respect to the rotation of the disc, characterized in that the forward and reverse bearings for moving the slide shaft horizontally by the force applied according to the horizontal displacement of the disc.

According to the present invention, by providing the rotational force of the motor for generating vibration in the horizontal direction, the structure is simple, it is possible to transmit a balanced force.

In addition, since the configuration for transmitting the rotational force transmission of the motor and the motor to the vertical shaft as in the prior art is not configured in the handle portion, the handle portion is made slim so that the user can easily hold and use the weight to balance the weight. No central axis is required and the design can be beautiful.

MassagerPriorArt0001587

Petitioner Therabody Ex-1004, 1045

In addition, the coupling process is formed by forming an integral fixed bracket manufactured by aluminum extrusion processing or die casting in order to couple the vibration rotating part for transmitting the rotational force of the motor and the horizontal movement conversion by the rotational force, and the vibration slide part. There is an advantage that it is simplified and the manufacturing cost is down.

In addition, in forming a cam for converting the rotational force into a horizontal movement force in accordance with the rotation of the motor, it constitutes a disc composed of a predetermined inclination on the axis and slides by a force applied from the disc in contact with both sides about the disc. By constructing the forward and reverse bearings so that the shaft can slide horizontally and horizontally, the forward and reverse bearings rotate only in a certain direction at their positions, thereby minimizing wear and damage of the bearings rotating in contact. can do.

1 is a perspective view showing a conventional muscle stimulation relaxer.
Figure 2 is a view showing the upper configuration in the body for showing the configuration of the present invention muscle vibration massage device.
Figure 3 is an exploded perspective view showing a fixed bracket coupling structure for explaining the coupling relationship and the horizontal movement operation of the vibration rotating unit and the vibration slide unit in the present invention.
4 is a view showing a fixed bracket coupling structure for explaining the coupling relationship and the horizontal movement operation of the vibration rotating unit and the vibration slide unit in the present invention.
5A and 5B illustrate a horizontal movement operation of the vibrating slide unit. FIG. 5A illustrates a forward movement and FIG. 5B illustrates a backward operation.
Figure 6 is a perspective view showing the appearance of the present invention muscle vibration massage device.

Referring to the embodiment of the present invention muscle vibration massage device attached to Figure 2 to 6 will be described the structure and operation as follows.

It is made of a main body 100 having a gun-shaped handle 110, the upper portion of the main body 100 is a horizontal reciprocating motion of the rotational force of the motor 200 and the motor 200 for generating vibration A space and a fixed part are formed for incorporating the vibration generating means for generating vibration by converting, and the motor for controlling the operation of the motor by supplying a driving voltage of the motor into the handle part 110 located below the main body 100. The control means is built and the fixing means thereof, the outside of the handle portion 110, where the finger is held by the hand where the gun switch 400 for providing a user operation command to the motor control means is formed,

The vibration generating means,

One side of the rotating shaft is coupled to the rotating shaft 210 of the motor 200 in a horizontal direction and rotates, and the horizontal displacement means having a horizontal movement displacement according to the rotation on the rotation axis by the displacement of the horizontal movement displacement means Vibration rotating part 310 for horizontal reciprocating motion of the vibration slide 320,

Vibration slide unit 320 coupled to the horizontal movement displacement means formed in the vibration rotation unit 310 to move horizontally reciprocating in the movement displacement width of the horizontal movement displacement means according to the rotation of the vibration rotation unit 310,

A vibration stimulator 330 coupled to the front end of the vibration slide 320 and exposed to the outside of the main body 100 to provide vibration stimulation of the contact vibration slide 320 to the muscles of the user;

Vibration slide unit 320 is configured to include a departure prevention unit 340 for guiding the left and right from moving in a horizontal reciprocating movement.

Such a present invention,

The main body 100 has a gun shape and a vibration generating means for converting the rotational force of the motor 200 and the motor 100 into the vibration in the horizontal direction is configured on the upper part, and the handle part 110 includes the motor. Motor control means for rotating the 200 is configured.

The vibration generating means is coupled to the front end of the motor 200 to provide a rotational force vibration to rotate the front and rear by the vibration rotation unit 310, the vibration rotation unit 310 to change the rotational force of the motor into a horizontal motion vibration to generate a vibration Vibration stimulation unit 330 for transmitting the vibration stimulation generated by the slide unit 320, the vibration slide unit 320 to the user, and the separation prevention unit 340 for preventing left and right separation of the vibration slide unit 320 It is configured to include.

The vibration generating means is coupled to the rotary shaft 210 of the motor 200, the vibration rotary unit 310 is coupled to the tip of the rotary shaft 210 of the motor 200 together with the rotation of the rotary shaft 210 of the motor 200 It consists of a rotating structure.

The vibration rotating part 310 is formed with a disc 311b on a shaft 311a at a predetermined inclination so that a horizontal movement displacement occurs according to the rotation, and one side of the shaft 311a is rotated with the rotation shaft 210 of the motor 200. Rotating shaft coupling portion 311c to be coupled is formed and prevents the flow of the shaft 311a at a position spaced apart from the coupling position with the bearing 312 to the other side of the rotary shaft coupling portion 311c by the width of the bearing 312 A cam 311 with a fixing groove 311d therein, a bearing 312 coupled to the other side of the rotary shaft coupling part 311c so that the cam 311 can be stably rotated, and the shaft 311a. Shaft fixing means 313 for fixing the cam 311 coupled to the formed fixing groove 311d and the bearing 312 to the separation prevention portion 340, and the bearing 314 to the separation prevention portion 340 Bearing fixing means 314 for fixedly engaging to the.

The disc 311b formed on the shaft 311a of the cam 311 is a horizontal displacement means for converting the rotational force of the motor 200 into a horizontal movement force, and has a predetermined inclination with respect to the axis 311a. When the shaft 311a is configured to be in an inclined state and rotates together as the shaft 311a rotates, the distal end of the disc 311b has a horizontal displacement.

That is, the horizontal movement width of the position which changes according to the inclination of the disc 311b becomes the horizontal movement range of the vibration slide part 320, and the vibration slide part 320 is caused by the disc 311b of the cam 311.) Consists of a horizontal reciprocating motion.

The rotary shaft coupling portion 311c is composed of a rotary shaft coupling groove so that the rotary shaft 210 of the motor 200 is fitted and coupled, and coupled to the rotary shaft 210 so that the rotary shaft 210 coupled into the rotary shaft coupling groove does not rotate while rotating. It includes structure that becomes.

The vibrating slide unit 320 is in contact with and rotates in accordance with the displacement of the disc 311b formed on the cam 311 of the vibrating rotating unit 310 to move forward and backward 321 to move the slide shaft 324 horizontally. A linker 323 connecting the reverse bearing 322, the forward bearing 321, the reverse bearing 322, and the slide shaft 324, a slide shaft 324 reciprocating horizontally by the linker 323; The front and rear ends of the slide shaft 324 is composed of a bushing ring 325 for fixing to the separation prevention portion 340.

The slide shaft 324 is a right angle formed in each of the linker coupling portion 324a and the separation prevention portion 340 for coupling the respective linker 323 to the forward bearing 321, reverse bearing 322. It constitutes a separation prevention guide groove 324b for coupling the fixing pin 342, and the release guide prevention groove 324b does not catch the right angle fixing pin 342 coupled when the slide shaft 324 slides back and forth. It is formed to have a length greater than the distance to move in the direction to be slid back and forth.

The vibration stimulator 330 is coupled to the distal end of the slide shaft 324 of the vibration slide 320 to be exposed to the outside through the inlet of the main body 100 to the user according to the vibration generated from the slide shaft 324 It is a means of transmitting vibration stimulation to muscles.

The vibration stimulator 330 is configured to be replaceable to the slide shaft 324, the shaft coupling groove is configured to couple to the slide shaft 324.

The vibrating stimulator 330 is made of raw rubber latex or silicone rubber to protect the user's skin, harmless to the human body, and do not cause discomfort.

MassagerPriorArt0001588

Petitioner Therabody Ex-1004, 1046

As in the present embodiment, by separately configuring the coupling adapter 331 for coupling and separation with the slide shaft 324 can be used to replace the vibration stimulator 330 as necessary.

The departure preventing part 340 is fixed to the motor 200, the vibration rotating part 310, the vibration slide part 320 to enable horizontal reciprocating movement of the slide shaft 324 and to prevent left and right departure during horizontal reciprocating movement As a means for, the fixing bracket 341, includes a right angle fixing pin 342.

The fixing bracket 341 is integrally manufactured by aluminum extrusion processing or die casting. In the present embodiment is made of an extrusion process form, in the case of precision casting follows the form according to the manufacturing method.

The fixing bracket 341 forms a rotary shaft through hole 341a for coupling the rotary shaft 210 of the motor 200 to the cam 311 at an upper end thereof, and a cam 311 is formed at the center thereof. On the opposite side of the 341a, a bearing coupling portion 341b to which a bearing 312 to which the shaft 311a of the cam 311 is coupled is formed is formed, and a slide shaft through hole into which the slide shaft 324 is fitted. 341c is formed, and the bushing ring which is coupled to the slide shaft 324 to the rear end of the slide shaft through hole 341c and which the bushing ring 325 is supported to support the horizontal reciprocating motion of the slide shaft 324. A coupling portion 341d is configured, and a right angle fixing pin coupling for coupling the right angle fixing pin 342 to the release guide preventing groove 324b of the slide shaft 324 fitted to one side of the slide shaft through hole 341c. A part 341e and a fixing hole 341f for fixing to the main body 100 are included. The.

The right angle fixing pin 342 is inserted into the release preventing guide hole 324b of the slide shaft 324 through the right angle fixing pin coupling portion 341e of the fixing bracket 341 so that the slide shaft 324 is horizontally reciprocated. It is a means to prevent departure.

4 is a view illustrating a coupling structure of the fixing bracket 341 for explaining the coupling relationship between the vibration rotating unit 310 and the vibration slide unit 320 and the horizontal movement operation.

The main body 100 has a motor 200 is disposed in the upper portion of the gun (gun), and constitutes a motor support portion 120 at the rear end and both ends of the motor 200.

In addition, a bracket fixing part 130 is configured to fix the fixing bracket 341 to the main body 100, and a fixing hole 140 penetrating into the bracket fixing part 130 is configured, and the fixing bracket 341 is A fixing hole 341f is formed at a position corresponding to the fixing hole 140, and is fixed to the bracket fixing unit 130 by a fastening means from the outside of the main body 100.

The motor support unit 120 is for preventing the motor 200 from being pushed back or flowed when the vibration occurs while the force is applied to the rear end by the elastic force acting from the slide shaft 324. Means.

The inlet of the main body 100 has a through-hole structure so that the slide shaft 324 to which the vibrating magnetic pole part 330 is coupled can be led to the outside.

A motor control means for controlling the motor 200 is configured in the handle part 110, and a gun switch for providing a control signal to the motor control means at a position where a user's finger is placed on the handle part 110. 400).

The gun switch 400 is configured so that the internal operation switch is pressed when the user presses with a finger, the elastic means for providing an elastic force to the gun switch 400 to be restored to its original position when the user releases the pressing force It consists of a general switch structure constituting the, can be configured in various forms of switch structure.

Here, the gun switch 400 is configured as a switch in the form of a gun for the user's convenience, it may be configured as a switch of the general form.

The motor control means includes a power supply means, circuit means for the control means for driving the motor by providing the power provided from the power supply means to the motor 200 in accordance with the switching of the gun switch 400.

The power supply means may be configured as a charging type including a battery and a charging and discharging means of the battery, or may be configured as a plug type using a power plug to connect a power plug to an outlet.

Unexplained reference numeral 150 denotes a heat sink, 500 denotes a fuse, and 600 denotes a speed control volume.

Referring to the coupling process and operation of the present invention muscle vibration massage device made in such a configuration as follows.

The rotating shaft 210 of the motor 200 enters the inside of the fixing bracket 341 through the rotation shaft through hole 341a of the fixing bracket 341, and the cam 311 is rotated to the inside of the fixing bracket 341. After 311c is positioned in the direction of the rotation shaft 210, the rotation shaft 210 of the motor 200 is coupled to the rotation shaft coupling portion 311c.

Then, after the bearing fixing means 313 is coupled to the fixing groove 311d formed on the opposite side of the rotating shaft coupling portion 311c of the cam 311 to engage the bearing 312, the bearing 312 is connected to the bearing fixing means 314. Fix the coupling to the bearing coupling portion 341b of the fixing bracket 341.

Meanwhile, the slide shaft 324 is inserted into the slide shaft through hole 341c of the fixed bracket 341 and coupled to the shaft through hole 341c by the bushing 325, and a bush formed at the rear end of the fixed bracket 341. A bushing 325 is fitted to the ring coupling portion 341d to support the rear end of the slide shaft 324.

Then, from the lower portion of the slide shaft 324, the linker 323 is coupled to the linker coupling portion 324a, and the forward bearing 321 and the backward bearing 322 are coupled to the linker 323 to the disc of the cam 311. Positioning both sides of the 311b, the forward bearing 321 and the reverse bearing 322 is in contact with the disc 311b is coupled to the rotatable structure.

At this time, the forward bearing 321 and the reverse bearing 322 is rotated constantly in the opposite direction as each other is configured around the disc 311b.

In addition, the right angle fixing pin 342 is fixed to the right angle fixing pin coupling portion 341e of the fixing bracket 341 using the right angle fixing pin fixing means 343.

The vibration stimulator 330 couples and couples the coupling adapter 331 to the slide shaft 324.

After mounting the fixed bracket 341 is completed in accordance with the motor support portion 120 and the bracket fixing portion 130 in the main body 100 and the bolt from the outside to the fixing hole 120 of the fixing bracket 341 The assembly is completed by fastening to the fixing hole 341f.

The operation of the present invention muscle vibration massage device is made as follows.

When the user pulls the gun switch 400, the switch of the motor control means configured in the handle 110 is touched and the power is supplied to the motor 200 so that the motor 200 rotates.

When the motor 200 rotates, the cam 311 coupled to the rotating shaft 210 of the motor 200 rotates.

A disc 311b inclined at a predetermined inclination angle is formed on the shaft 311a of the cam 311 of the vibration rotating unit 310. When the cam 311 rotates as described above, the cam 311 is formed on the cam 311. The original plate 311b is rotated.

MassagerPriorArt0001589

Petitioner Therabody Ex-1004, 1047

At this time, the disc 311b is formed with the shaft 311a at a predetermined inclination, so that the circumferential surface of the disc 311b has a constant displacement width according to the inclined angle.

Therefore, the forward and reverse bearings 321 and the reverse bearings 322 formed on the left and right sides of the disc 311b rotate in contact with the disc 311b and move to the disc 311b of the cam 311 according to the rotation period of the cam 311. Power is received from.

As the linker 323 moves left and right according to the displacement width of the disc 311b according to the force transmitted from the disc 311b, the slide shaft 324 to which the linker 323 is connected is horizontally moved from side to side.

As the cam 311 rotates as described above, as the circumferential surface of the disc 311b formed on the shaft 311a of the cam 311 moves left and right, the forward bearing 321 rotates in contact with both sides of the disc 311b.), As the reverse bearing 322 is moved left and right, the slide shaft 324 slides left and right, and the vibration is generated while repeating the above process.

As shown in FIG. 5A, when the disc 311b transmits a force to the forward bearing 321, the forward bearing 321 is pushed toward the vibration stimulator 330 according to the force transmitted from the disc 311b. When the linker 323 connected to the forward bearing 321 pushes the slide shaft 324, the slide shaft 324 is advanced, and the disc 311b transmits the force to the reverse bearing 322. 5B, the reverse bearing 322 is pushed to the rear end of the vibration stimulator 330, and the linker 323 connected to the reverse bearing 322 pushes the slide shaft 324 to the rear end. The slide shaft 324 is reversed.

At this time, the right angle fixing pin 342 fixedly supported by the fixing bracket 341 is prevented from moving left and right of the slide shaft 324 during horizontal movement in a state where the right angle fixing pin 342 is inserted into the release preventing guide groove 324b of the slide shaft 324.

5A and 5B are diagrams illustrating only a coupling state of the separation prevention part in order to explain the horizontal movement operation of the vibration rotating part and the vibration slide part.

The vibration generated in this way is transmitted to the muscles in the skin through the vibration stimulator 330 in contact with the user's skin.

At this time, the vibrating magnetic pole part 330 is coupled to the coupling adapter 331 is configured to be replaced from the slide shaft 324, it can be used to replace as necessary.

Patent Citations (3)

Publication number	Priority date	Publication date	Assignee	Title
KR200311328Y1	2003-01-14	2003-05-01	박종태	Muscle-slackening stimulator
JP2005204777A	2004-01-21	2005-08-04	Omron Healthcare Co Ltd	Massage device
JP2010534110A	2007-07-24	2010-11-04	アクティヴェイター メソッズ インターナショナル リミテッド	Portable acupressure corrector

Family To Family Citations

* Cited by examiner, † Cited by third party

Cited By (4)

Publication number	Priority date	Publication date	Assignee	Title
KR20160088686A	2015-01-16	2016-07-26	연세대학교 원주산학협력단	Vibration device for preventing and treating muscle atrophy
KR10164675581 *	2015-08-10	2016-08-08	심수용	Face massage apparatus
CN107252388A *	2017-05-03	2017-10-17	郑州飞龙医疗设备有限公司	Muscle arthrosis viberation therapeutic instrument
KR102016279B1 *	2019-01-28	2019-08-29	오수현	portable massage device

Family To Family Citations

* Cited by examiner, † Cited by third party, ‡ Family to family citation

Similar Documents

Publication	Publication Date	Title
KR20190000098U	2019-01-09	Vibration massage device
US20200046600A1	2020-02-13	Electro mechanical sexual stimulation device
US20190321253A1	2019-10-24	Personal massager with undulating arm
KR20150086512A	2015-07-28	Massaging appliance equipped with interchangeable and distinguishable massaging heads
CN105563469A	2016-05-11	Adjustable six-freedom-degree human body head massaging health care robot
CA2940672A1	2014-09-04	Methods and devices for flexural adult devices
CN102274107B	2013-03-27	Fixed exoskeleton rehabilitation training manipulator
KR20060110740A	2006-10-25	Massage belt
ES2753302T3	2020-04-08	Manual device for repeated puncture of human or animal skin

MassagerPriorArt0001590

Petitioner Therabody Ex-1004, 1048

EP2892493B1	2017-05-24	Stimulation device
JP2016533224A	2016-10-27	Massage device with massage head equipped with tapping fingers
CN105748192B	2018-11-06	A kind of eye nursing device
EP2537504B1	2014-01-15	Resonance massage device and method for massaging the acupuncture points on the wrist
US20060287620A1	2006-12-21	Power massager
KR101018728B1	2011-03-04	Chair massage equipment
CN107822843B	2020-05-05	Massage device
CN202568773U	2012-12-05	Multifunctional massage cushion with neck heating function
CN104771298B	2017-01-11	leg massager
KR101345771B1	2013-12-27	Massage
CN1292717A	2001-04-25	Portable therapeutic device
WO2008003204A1	2008-01-10	Medication head-massaging healthcare and therapy apparatus
CN203107603U	2013-08-07	Massaging machine core capable of achieving swinging massaging
TW398974B	2000-07-21	Portable massager
JP2016533226A	2016-10-27	Massage device comprising at least one massage head with eccentric rotation
CN104771299B	2017-01-04	Lower limb rehabilitation physiotherapy table

Priority And Related Applications

Priority Applications (1)

Application	Priority date	Filing date	Title
KR1020120013068A	2012-02-09	2012-02-09	Vibration massage apparatus for muscle

Applications Claiming Priority (1)

Application	Filing date	Title
KR1020120013068A	2012-02-09	Vibration massage apparatus for muscle

Legal Events

Date	Code	Title	Description
2012-02-09	A201	Request for examination	
2012-03-09	A302	Request for accelerated examination	
2012-05-22	E902	Notification of reason for refusal	
2012-06-22	E701	Decision to grant or registration of patent right	
2012-06-29	GRNT	Written decision to grant	
2015-04-23	FPAY	Annual fee payment	**Payment date**: 20150423 **Year of fee payment**: 4
2016-05-17	FPAY	Annual fee payment	**Payment date**: 20160517 **Year of fee payment**: 5
2017-06-05	FPAY	Annual fee payment	**Payment date**: 20170605 **Year of fee payment**: 6
2018-06-27	FPAY	Annual fee payment	**Payment date**: 20180627 **Year of fee payment**: 7
2019-06-19	FPAY	Annual fee payment	**Payment date**: 20190619 **Year of fee payment**: 8

MassagerPriorArt0001591

Petitioner Therabody Ex-1004, 1049

Concepts

machine-extracted

Download Filter table

Name	Image	Sections	Count	Query match
Muscles		title,claims,abstract,description	47	0.000
stimulation		claims,abstract,description	20	0.000
coupling process		claims,description	50	0.000
coupling		claims,description	48	0.000
coupling reaction		claims,description	48	0.000
displacement		claims,description	35	0.000
prevention		claims,description	14	0.000
separation method		claims,description	12	0.000
controlling effects		claims,description	4	0.000
extrusion		claims,description	4	0.000
aluminium		claims,description	3	0.000
aluminum		claims,description	3	0.000
die casting		claims,description	3	0.000
corresponding		claims,description	2	0.000
penetrating		claims,description	2	0.000
construction		abstract,description	2	0.000

Show all concepts from the description section

Data provided by IFI CLAIMS Patent Services

About Send Feedback Public Datasets Terms Privacy Policy

MassagerPriorArt0001592

Petitioner Therabody Ex-1004, 1050

(19) 대한민국특허청(KR)
(12) 등록특허공보(B1)

(45) 공고일자 2012년07월09일
(11) 등록번호 10-1162978
(24) 등록일자 2012년06월29일

(51) 국제특허분류(Int. Cl.)
A61H 23/02 (2006.01) *A61H 7/00* (2006.01)
(21) 출원번호 10-2012-0013068
(22) 출원일자 2012년02월09일
심사청구일자 2012년02월09일
(56) 선행기술조사문헌
KR200311328 Y1
JP2005204777 A
JP2010534110 A

(73) 특허권자
주식회사 에이티시스템
경기도 하남시 조정대로 150, 하남아이테코 846 (덕풍동)
(72) 발명자
최재민
서울특별시 성동구 왕십리로16길 11-8 (성수동1가)
(74) 대리인
문세환

전체 청구항 수 : 총 6 항 심사관 : 오창석

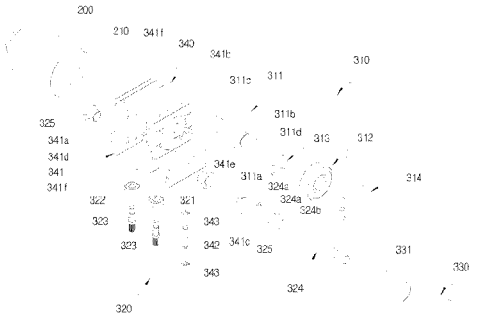
(54) 발명의 명칭 **근육 진동 마사지 장치**

(57) 요 약

본 발명은 기계적인 진동을 근육에 전달하여 근육을 이완시켜 줄 수 있도록 하는 근육마사지 장치에 관한 것으로, 더 상세하게는 손으로 잡아 사용이 편리하도록 건(GUN)타입으로 구성된 근육 진동 마사지 장치에 관한 것이다.

본 발명 근육 진동 마사지 장치는 근육자극 진동 마사지장치를 구성함에 있어서, 진동력 제공수단인 모터의 회전력이 수평방향으로 근육자극부재에 작용할 수 있도록 하여, 힘의 전달이 밸런스있게 효과적으로 이루어질 수 있도록 함으로써, 별도의 무게중심축이 불필요하며, 또한 그 구조를 단순화시켜 손잡이부를 더욱 더 슬림화시켜 디자인이 미려하고 사용자가 손쉽게 잡고 사용가능한 근육 자극 마사지장치를 제공하고자 한다.

대 표 도 - 도3



MassagerPriorArt0001593

Petitioner Therabody Ex-1004, 1051

특허청구의 범위

청구항 1

건(gun) 형상의 손잡이부(110)를 갖는 본체(100)로 이루어지고, 본체(100)의 상부는 진동을 발생시키기 위한 모터(200)와 모터(200)의 회전력을 전후 수평 왕복운동으로 변환하여 진동을 발생하기 위한 진동발생수단을 내장하기 위한 공간 및 고정부가 형성되고, 본체(100)의 하부에 위치한 손잡이부(110) 내로는 모터의 구동전압을 공급하여 모터를 동작제어하기 위한 모터제어수단이 내장되고 이의 고정수단이 구성되며, 손잡이부(110)의 외측, 손으로 잡아 손가락이 위치하는 곳에는 모터제어수단으로 사용자 동작지령을 제공하기 위한 건 스위치(400)가 형성되며,

상기 진동발생수단은,

회전축의 일 측이 모터(200)의 회전축(210)에 수평방향으로 결합되어 회전하며, 회전에 따라서 좌우 수평이동변위를 갖는 수평이동변위수단을 회전축 상에 구성하여 캠(311)에 형성된 수평이동변위수단의 변위에 따라서 진동슬라이드부(320)를 수평 왕복 운동시키기 위한 진동회전부(310)와, 진동회전부(310)에 형성된 수평이동변위수단과 결합되어 진동회전부(310)의 회전에 따른 수평이동변위수단의 이동변위 폭으로 수평왕복 운동하는 진동슬라이드부(320)와, 진동슬라이드부(320)의 전단부에 결합되고 본체(100)의 외부로 노출되어 사용자의 근육에 접촉 진동슬라이드부(320)의 진동자극을 제공하는 진동자극부(330)와, 모터(200), 진동회전부(310), 진동슬라이드부(320)를 결합 고정하며 진동슬라이드부(320)가 수평왕복 운동함에 있어서 좌우 이탈되지 않도록 가이드하기위한 이탈방지부(340)를 포함하여 구성되는 것을 특징으로 하는 근육 진동 마사지 장치.

청구항 2

제 1항에 있어서,

상기 진동회전부(310)는 회전에 따라서 수평 이동 변위가 발생되도록 소정의 경사도로 축(311a) 상에 원판(311b)이 형성되고 축(311a)의 일 측은 모터(200)의 회전축(210)과 결합되는 회전축결합부(311c)가 형성되고 회전축결합부(311c)의 그 타측으로 베어링(312)과의 결합위치로 부터 베어링(312)의 폭만큼 이격된 위치에 축(311a)의 유동을 방지하기 위한 고정홈(311d)이 형성된 캠(311)과, 캠(311)이 안정적으로 회전할 수 있도록 회전축결합부(311c)의 그 타측에 결합되는 베어링(312)과, 상기 축(311a)에 형성된 고정홈(311d)에 결합되어 베어링(312)에 결합된 캠(311)을 이탈방지부(340)에 고정시키기 위한 축고정수단(313)과, 베어링(314)을 이탈방지부(340)에 고정 결합시키기 위한 베어링고정수단(314)를 포함하여 구성되며,

상기 진동슬라이드부(320)는 상기 진동회전부(310)의 캠(311)에 구성된 원판(311b)의 양 측에 구성되어 원판(311b)의 회전에 대하여 서로 반대방향으로 일정하게 회전하며 원판(311b)의 수평이동변위에 따라서 가해지는 힘에 의해 슬라이드 샤프트(324)를 수평 왕복 이동시키기 위한 전진베어링(321), 후진베어링(322)과, 상기 전진베어링(321), 후진베어링(322)과 슬라이드 샤프트(324)를 연결하는 링커(323)와, 링커(323)에 의해 수평왕복 운동하는 슬라이드 샤프트(324)와, 슬라이드 샤프트(324)의 전 후단을 이탈방지부(340)에 결합 고정시키는 부시링(325)을 포함하여 구성되는 것을 특징으로 하는 근육 진동 마사지 장치.

청구항 3

제 2항에 있어서, 상기 슬라이드 샤프트(324)는 상기 전진베이링(321),후진베이링(322)에 대한 각 링키(323)를 결합하기 위한 각각의 링커결합부(324a)와, 이탈방지부(340)에 구성되는 직각고정편(342)을 결합하기 위한 이탈방지가이드홈(324b)를 구성하며, 이탈가이드방지홈(324b)은 슬라이드 샤프트(324)가 전 후 슬라이드 동작할 때 결합된 직각고정편(342)이 걸리지 않도록 전후 슬라이드 되는 방향으로 이동하는 거리이상의 길이를 갖도록 형성되며,

상기 이탈방지부(340)는 모터(200), 진동회전부(310), 진동슬라이드부(320)를 결합 고정시켜 슬라이드 샤프트(324)의 수평 왕복운동이 가능하도록 하며 수평 왕복 운동 시 좌우 이탈을 방지하기 위한 고정브라켓트(341), 수평 왕복 운동시 좌우 이탈을 방지하기 위한 직각고정편(342)을 포함하여 구성되며,

상기 고정브라켓트(341)는 상단으로 모터(200)의 회전축(210)을 캠(311)에 결합하기 위한 회전축통과공(341a)을 형성하고 중앙으로 캠(311)이 구성되며 상기 회전축통과공(341a)의 그 반대편으로 캠(311)의 축(311a)이

MassagerPriorArt0001594

Petitioner Therabody Ex-1004, 1052

결합되는 베어링(312)이 결합되는 베어링결합부(341b)가 형성되며, 그 하부로 슬라이드 샤프트(324)가 끼워지는 슬라이드샤프트통과공(341c)이 형성되고, 슬라이드 샤프트통과공(341c)의 선상으로 후단으로는 슬라이드 샤프트(324)와 결합되어 슬라이드 샤프트(324)의 수평왕복운동을 지지하는 부시링(325)이 끼워지는 부시링결합부(341d)가 구성되며, 상기 슬라이드 샤프트통과공(341c)의 그 일측으로 끼워진 슬라이드 샤프트(324)의 이탈가이드방지홈(324b)에 직각고정핀(342)을 결합하기 위한 직각고정핀결합부(341e)를 포함하여 구성된 것을 특징으로 하는 근육 진동 마사지 장치.

청구항 4

제 3항에 있어서, 상기 본체(100)는 본체(100)내로 관통되는 고정홀(140)이 구성되고, 상기 고정브라켓트(341)는 상기 고정홀(140)과 대응하는 위치에 고정홀(341f)이 구성되어 본체(100)의 외부로 부터 체결수단에 의해 브라켓트고정부(130)에 고정되는 구조로 이루어지는 것을 특징으로 하는 근육 진동 마사지 장치.

청구항 5

제 3항 또는 제 4항에 있어서, 상기 고정브라켓트(341)는 알루미늄 압출가공 또는 정밀주조(die casting)로 일체형으로 제작되는 것을 특징으로 하는 근육 진동 마사지 장치.

청구항 6

제 1항에 있어서, 상기 본체(100)의 고정수단은 상기 모터(200)의 후단으로 슬라이드 샤프트(324)로부터 작용하는 힘을 받쳐주기 위하여 모터받침부(120)를 구성하고, 모터(200)의 전단으로는 고정브라켓트(341)를 고정하기 위한 브라켓트고정부(130)를 포함하는 것을 특징으로 하는 근육 진동 마사지 장치.

명 세 서

기 술 분 야

[0001] 본 발명은 기계적인 진동을 근육에 전달하여 근육을 이완시켜 줄 수 있도록 하는 근육마사지 장치에 관한 것으로, 더 상세하게는 손으로 잡아 사용이 편리하도록 건(GUN)타입으로 구성된 근육 진동 마사지 장치에 관한 것이다.

배 경 기 술

[0002] 근육의 재활을 돕기 위하여 기계적인 진동마사지 치료가 일반적으로 이용되고 있다. 진동 마사지 치료란 기계적인 진동을 치료 목적으로 적용한 것으로, 진동을 인체에 전달하여 세로방향의 파형의 흐름을 만들면서, 혈류를 개선시켜, 수축된 근육조직을 이완시켜 줌으로써, 손상된 근육조직의 재활을 돕게 된다.

[0003] 이외에도 진동을 이용한 근육자극에 의한 효과로는 동통완화, 지방분해 및 미용효과, 혈액순환 증대와 충혈경감, 근육의 긴장완화 등을 얻을 수 있다.

[0004] 이전에는 상기와 같은 진동마사지장치를 병원 또는 재활센터에서나 이용가능했지만, 근래에는 기술개발로 인하여 가정에서 사용함은 물론 휴대이동 가능할 정도로 소형화되면서도 성능은 향상된 다양한 형태의 근육 진동 마사지 장치가 상용화되고 있다.

[0005] 도 1은 대한민국 등록특허 20-0311328호 " 근육자극이완기"를 나타낸다.

[0006] 도 1에서와 같이 종래 근육 자극 마사지장치는 손잡이부(1)에 모터 및 모터의 회전에 따라 회전하도록 형성된 편심회전축을 갖는 편심회전자를 내장하도록 하고, 편심회전자의 회전자가 회전함에 따라서 근육자극부재(2)의 슬라이드축(3)의 내면을 편심회전축이 쳐주면서 슬라이드축(3)이 전후 왕복운동을 하도록 함으로써, 근육자극부재(2)가 근육을 자극시킬 있도록 구성된다.

[0007] 여기서, 종래 근육 자극 마사지장치는 손잡이부(1) 내에 모터 및 모터의 회전에 따라 회전하는 상기 편심회전자 및 이의 지지구조물과 전원회로장치들이 모두 구성되어 있어서, 그 두께가 두꺼워질 수 밖에 없어서, 사용자가 손으로 쥐고 치료할 때 몸에 사용하기에는 어려움이 있다.

[0008] 또한, 모터의 회전하는 힘을 편심회전자를 이용하여 슬라이드 부재를 전후 왕복시키도록 하는 기술적 구조가 복잡하여 제조공정이 복잡하고 제조비용이 상하며, 이와 같이 모터의 힘이 수직으로 슬라이드축(3)에 작용함

MassagerPriorArt0001595

Petitioner Therabody Ex-1004, 1053

으로써, 이의 밸런스를 잡아주기 위해서 무게중심축(4)을 구성하여야만 한다.

발명의 내용

해결하려는 과제

[0009] 본 발명에서는 이와 같은 종래의 문제점을 개선하기 위한 것으로 근육자극 마사지장치를 구성함에 있어서, 진동력 제공수단인 모터의 회전력이 수평방향으로 근육자극부재에 작용할 수 있도록 하여, 힘의 전달이 밸런스 있게 효과적으로 이루어질 수 있도록 함으로써, 별도의 무게중심축이 불필요하며, 또한 그 구조를 단순화시켜 손잡이부를 더욱 더 슬림화시켜 사용자가 손쉽게 잡고 사용가능한 근육 자극 마사지장치를 제공하고자 한 것이다.

과제의 해결 수단

[0010] 본 발명 근육 진동 마사지 장치는,

[0011] 건(gun) 형상의 손잡이부를 갖는 본체로 이루어지고, 본체의 상부는 진동을 발생시키기 위한 모터(200)와 모터의 회전력을 전후 수평 왕복운동으로 변환하여 진동을 발생하기 위한 진동발생수단을 내장하기 위한 공간 및 고정부가 형성되고, 본체의 하부에 위치한 손잡이부 내로는 모터의 구동전압을 공급하여 모터를 동작제어하기 위한 모터제어수단이 내장되고 이의 고정수단이 구성되며, 손잡이부의 외측, 손으로 잡아 손가락이 위치하는 곳에는 모터제어수단으로 사용자 동작지령을 제공하기 위한 건 스위치기 형성되며,

[0012] 상기 진동발생수단은,

[0013] 회전축의 일 측이 모터의 회전축에 수평방향으로 결합되어 회전하며, 회전에 따라서 좌우 수평이동 변위를 갖는 수평이동변위수단을 회전축 상에 구성하여 캠에 형성된 수평이동변위수단의 변위에 따라서 진동슬라이드부를 수평 왕복 운동시키기 위한 진동회전부와, 진동회전부에 형성된 수평이동변위수단과 결합되어 진동회전부의 회전에 따른 수평이동변위수단의 이동변위 폭으로 수평왕복 운동하는 진동슬라이드부와, 진동슬라이드부의 선단부에 결합되고 본체의 외부로 노출되어 사용자의 근육에 접촉 진동슬라이드부의 진동자극을 제공하는 진동자극부와, 모터, 진동회전부, 진동슬라이드부를 결합 고정하며 진동슬라이드부가 수평왕복 운동함에 있어서 좌우 이탈되지 않도록 가이드하기 위한 이탈방지부를 포함하여 구성되는 것을 특징으로 한다.

[0014] 또한, 상기 진동회전부의 수평이동변위수단은 회전축과 소정의 기울기로 원판으로 구성하여 회전축이 회전하게 됨에 따라서 수평이동 변위를 갖는 캠을 구성하고, 상기 진동슬라이드부는 상기 진동회전부의 캠에 구성된 원판의 양 측에 구성되어 원판의 회전에 대하여 서로 반대방향으로 일정하게 회전하며 원판의 수평이동변위에 따라서 가해지는 힘에 의해 슬라이드 샤프트를 수평 왕복 이동시키기 위한 전진베어링, 후진베어링을 구성한 것을 특징으로 한다.

발명의 효과

[0015] 본 발명에 따르면 진동을 발생시키기 위한 모터의 회전력을 수평방향으로 제공하도록 함으로써, 그 구조가 간단하고 밸런스 있는 힘의 전달이 가능하다.

[0016] 또한 종래에서와 같이 모터 및 모터의 회전력 전달을 수직상의 축에 전달하기 위한 구성이 손잡이부에 구성되지 않음으로써, 손잡이부를 슬림하게 구성하여 사용자가 쉽게 잡고 사용이 가능하며 무게 밸런스를 잡아주기 위한 무게중심축이 필요없고 디자인 또한 미려해질 수 있다.

[0017] 또한 모터의 회전력 전달 및 회전력에 의한 수평이동 변환을 위한 진동회전부, 진동슬라이드부를 결합하기 위하여 알루미늄 압출가공, 또는 정밀주조(die casting)를 통해 제작되는 일체형의 고정브라켓트를 구성함으로써, 그 결합공정이 단순화되고, 제조비용이 다운되는 장점이 있다.

[0018] 또한 모터의 회전에 따라서 그 회전력을 수평이동력으로 변환하기 위한 캠을 구성함에 있어서, 축 상에 소정의 기울기로 구성된 원판을 구성하고 원판을 중심으로 양측에 접촉하여 원판에서 가해지는 힘에 의해 슬라이드 샤프트를 좌우 수평으로 슬라이드 될 수 있도록 전진베어링과 후진베어링을 각각 구성함으로써, 전진베어링과 후진베어링이 자신의 위치에서 일정한 방향으로만 회전하도록 함으로써, 접촉된 상태에서 회전하는 베어링의 마모 및 손상을 최소화할 수 있다.

도면의 간단한 설명

MassagerPriorArt0001596

Petitioner Therabody Ex-1004, 1054

[0019] 도 1은 종래 근육자극이완기를 나타낸 사시도.

도 2는 본 발명 근육 진동 마사지 장치의 구성을 나타내기 위한 본체 내 상부 구성을 나타낸 도면.

도 3은 본 발명에 있어서, 진동회전부와 진동슬라이드부의 결합관계 및 수평이동 동작을 설명하기 위한 고정 브라켓트 결합구조를 나타낸 분리사시도.

도 4는 본 발명에 있어서, 진동회전부와 진동슬라이드부의 결합관계 및 수평이동 동작을 설명하기 위한 고정 브라켓트 결합구조를 나타낸 도면.

도 5a,도 5b는 진동슬라이드부의 수평이동 동작을 나타낸 도면으로, 도 5a는 전진, 도 5b는 후진 동작을 나타낸다.

도 6은 본 발명 근육 진동 마사지 장치의 외관을 보인 사시도.

발명을 실시하기 위한 구체적인 내용

[0020] 본 발명 근육 진동 마사지 장치를 첨부된 도면 도 2 내지 도 6에 도시된 그 실시 예를 참조하여 그 구조 및 작용을 설명하면 다음과 같다.

[0021] 건(gun) 형상의 손잡이부(110)를 갖는 본체(100)로 이루어지고, 본체(100)의 상부는 진동을 발생시키기 위한 모터(200)와 모터(200)의 회전력을 전후 수평 왕복운동으로 변환하여 진동을 발생하기 위한 진동발생수단을 내장하기 위한 공간 및 고정부기 형성되고, 본체(100)의 하부에 위치한 손잡이부(110) 내로는 모터의 구동전압을 공급하여 모터를 동작제어하기 위한 모터제어수단이 내장되고 이의 고정수단이 구성되며, 손잡이부(110)의 외측, 손으로 잡아 손가락이 위치하는 곳에는 모터제어수단으로 사용자 동작지령을 제공하기 위한 건 스위치(400)가 형성되며,

[0022] 상기 진동발생수단은,

[0023] 회전축의 일 측이 모터(200)의 회전축(210)에 수평방향으로 결합되어 회전하며, 회전에 따라서 좌우 수평이동 변위를 갖는 수평이동변위수단을 회전축 상에 구성하여 수평이동변위수단의 변위에 따라서 진동슬라이드부(320)를 수평 왕복 운동시키기 위한 진동회전부(310)와,

[0024] 진동회전부(310)에 형성된 수평이동변위수단과 결합되어 진동회전부(310)의 회전에 따른 수평이동변위수단의 이동변위 폭으로 수평왕복 운동하는 진동슬라이드부(320)와,

[0025] 진동슬라이드부(320)의 선단부에 결합되고 본체(100)의 외부로 노출되어 사용자의 근육에 접촉 진동슬라이드부(320)의 진동자극을 제공하는 진동자극부(330)와,

[0026] 진동슬라이드부(320)가 수평왕복 운동함에 있어서 좌우 이탈되지 않도록 가이드하기위한 이탈방지부(340)를 포함하여 구성된다.

[0027] 이와 같은 본 발명은,

[0028] 본체(100)는 건(gun)형상으로 이루어지고 상부에는 모터(200), 모터(100)의 회전력을 수평방향의 진동으로 전환하기 위한 진동발생수단이 구성되고, 손잡이부(110)로는 상기 모터(200)를 회전시키기 위한 모터제어수단이 구성된다.

[0029] 상기 진동발생수단은, 회전력을 제공하기 위한 모터(200)의 전단에 결합되어 모터의 회전력을 수평운동으로 변화시키는 진동회전부(310), 진동회전부(310)에 의해 전후 슬라이드 되면서 진동을 발생시키는 진동슬라이드부(320), 진동슬라이드부(320)에 의해 발생되는 진동자극을 사용자에게 전달하는 진동자극부(330)와, 진동슬라이드부(320)의 좌우 이탈을 방지하기 위한 이탈방지부(340)를 포함하여 구성된다.

[0030] 상기 진동발생수단은 모터(200)의 회전축(210)에 결합되고, 모터(200)의 회전축(210) 선단으로 진동회전부(310)가 결합되어 모터(200)의 회전축(210) 회전에 따라서 함께 회전하는 구조로 이루어진다.

[0031] 상기 진동회전부(310)는 회전에 따라서 수평 이동 변위가 발생되도록 소정의 경사도로 축(311a) 상에 원판(311b)이 형성되고 축(311a)의 일 측은 모터(200)의 회전축(210)과 결합되는 회전축결합부(311c)가 형성되고 회전축결합부(311c)의 그 타측으로 베어링(312)과의 결합위치로 부터 베어링(312)의 폭만큼 이격된 위치에 축(311a)의 유동을 방지하기 위한 고정홈(311d)이 형성된 캡(311)과, 캡(311)이 안정적으로 회전할 수 있도록 회전축결합부(311c)의 그 타측에 결합되는 베어링(312)과, 상기 축(311a)에 형성된 고정홈(311d)에 결합되어

MassagerPriorArt0001597

Petitioner Therabody Ex-1004, 1055

베어링(312)에 결합된 캠(311)을 이탈방지부(340)에 고정시키기 위한 축고정수단(313)과, 베어링(314)을 이탈방지부(340)에 고정 결합시키기 위한 베어링고정수단(314)를 포함한다.

[0032] 상기 캠(311)의 축(311a) 상에 형성된 원판(311b)은 모터(200)의 회전력을 수평이동력으로 변환하여 주기 위한 수평이동변위수단으로, 축(311a)을 기준으로 소정의 경사도로 기울어진 상태로 구성되어 축(311a)이 회전하게 됨에 따라서 함께 회전하게 될 때, 원판(311b)의 선단이 수평상에서 변위를 갖는다.

[0033] 즉, 상기 원판(311b)의 기울기에 따라서 변화되는 위치의 수평이동폭이 진동슬라이드부(320)의 수평이동 범위가 되는 것으로, 상기 캠(311)의 원판(311b)에 의해 진동슬라이드부(320)가 수평왕복운동하는 구조로 이루어진다.

[0034] 상기 회전축결합부(311c)는 모터(200)의 회전축(210)이 끼워져 결합되도록 회전축결합홈이 구성되며, 회전축결합홈 내로 결합된 회전축(210)이 회전하면서 겉돌지 않도록 회전축(210)에 결합되는 구조를 포함한다.

[0035] 상기 진동슬라이드부(320)는 상기 진동회전부(310)의 캠(311)에 구성된 원판(311b)의 변위에 따라서 접촉하여 회전하여 슬라이드 샤프트(324)를 수평 왕복이동시키기 위한 전진베어링(321), 후진베어링(322)과, 상기 전진베어링(321), 후진베어링(322)과 슬라이드 샤프트(324)를 연결하는 링커(323)와, 링커(323)에 의해 수평왕복운동하는 슬라이드 샤프트(324)와, 슬라이드 샤프트(324)의 전 후단을 이탈방지부(340)에 결합 고정시키는 부시링(325)으로 구성된다.

[0036] 상기 슬라이드 샤프트(324)는 상기 전진베어링(321),후진베어링(322)에 대한 각 링커(323)를 결합하기 위한 각각의 링커결합부(324a)와, 이탈방지부(340)에 구성되는 직각고정핀(342)을 결합하기 위한 이탈방지가이드홈(324b)를 구성하며, 이탈가이드방지홈(324b)은 슬라이드 샤프트(324)가 전 후 슬라이드 동작할 때 결합된 직각고정핀(342)이 걸리지 않도록 전후 슬라이드 되는 방향으로 이동하는 거리이상의 길이를 갖도록 형성된다.

[0037] 상기 진동자극부(330)는 진동슬라이드부(320)의 슬라이드 샤프트(324)의 선단에 결합되어 본체(100)의 입구를 통해 외부로 노출되어 슬라이드 샤프트(324)로부터 발생되는 진동에 따라 사용자의 근육에 진동자극을 전달하는 수단이다.

[0038] 상기 진동자극부(330)는 슬라이드 샤프트(324)에 교체 가능한 구조로 이루어지는 것으로, 슬라이드 샤프트(324)에 결합하기 위하여 샤프트결합홈이 구성된다.

[0039] 상기 진동자극부(330)는 사용자의 피부를 보호하고 인체에 무해하며 불쾌감을 주지 않도록 생고무 라텍스 또는 실리콘 고무로 제작된다.

[0040] 본 실시 예에서와 같이, 별도로 슬라이드 샤프트(324)와의 결합, 분리를 위한 결합어댑터(331)를 더 구성하여 필요에 따라서 진동자극부(330)를 교체하여 사용할 수 있다.

[0041] 상기 이탈방지부(340)는 모터(200), 진동회전부(310), 진동슬라이드부(320)를 결합 고정시켜 슬라이드 샤프트(324)의 수평 왕복운동이 가능하도록 하며 수평 왕복 운동 시 좌우 이탈을 방지하기 위한 수단으로, 고정브라켓트(341), 직각고정핀(342)을 포함한다.

[0042] 상기 고정브라켓트(341)는 알루미늄 압출가공 또는 정밀주조(die casting)로 일체형으로 제작된다. 본 실시 예에는 압출가공형태로 이루어진 것이며, 정밀주조인 경우에는 그 제작공법에 따른 형태를 따른다.

[0043] 상기 고정브라켓트(341)는 상단으로 모터(200)의 회전축(210)을 캠(311)에 결합하기 위한 회전축통과공(341a)을 형성하고 중앙으로 캠(311)이 구성되며 상기 회전축통과공(341a)의 그 반대편으로 캠(311)의 축(311a)이 결합되는 베어링(312)이 결합되는 베어링결합부(341b)가 형성되며, 그 하부로 슬라이드 샤프트(324)가 끼워지는 슬라이드샤프트통과공(341c)이 형성되고, 슬라이드 샤프트통과공(341c)의 선상으로 후단으로는 슬라이드 샤프트(324)와 결합되어 슬라이드 샤프트(324)의 수평왕복운동을 지지하는 부시링(325)이 끼워지는 부시링결합부(341d)가 구성되며, 상기 슬라이드 샤프트통과공(341c)의 그 일측으로 끼워진 슬라이드 샤프트(324)의 이탈가이드방지홈(324b)에 직각고정핀(342)을 결합하기 위한 직각고정핀결합부(341e)과, 본체(100)에 고정하기 위한 고정홀(341f)을 포함한다.

[0044] 상기 직각고정핀(342)은 고정브라켓트(341)의 직각고정핀결합부(341e)를 통해 슬라이드 샤프트(324)의 이탈방지가이드홀(324b)에 끼워져 슬라이드 샤프트(324)의 수평 왕복 운동시 좌우 이탈을 방지하기 위한 수단이다.

[0045] 도 4는 진동회전부(310)와 진동슬라이드부(320)의 결합관계 및 수평이동 동작을 설명하기 위한 고정브라켓트

MassagerPriorArt0001598

Petitioner Therabody Ex-1004, 1056

(341) 결합구조를 나타낸 도면이다.

[0046] 상기 본체(100)는 건(gun) 모양의 상부에 모터(200)가 배치되고, 상기 모터(200)의 후단 및 양단으로 모터받침부(120)를 구성한다.

[0047] 또한 고정브라켓트(341)를 본체(100)에 고정하기 위하여 브라켓트고정부(130)가 구성되고, 브라켓트고정부(130) 내로 관통되는 고정홀(140)이 구성되어, 상기 고정브라켓트(341)는 상기 고정홀(140)과 대응하는 위치에 고정홀(341f)이 구성되어 본체(100)의 외부로 부터 체결수단에 의해 브라켓트고정부(130)에 고정된다.

[0048] 상기 모터받침부(120)는 모터(200)가 슬라이드 샤프트(324)로부터 작용하는 탄성력에 의해 후단으로 힘이 작용하면서 진동이 발생될 때, 모터(200)가 뒤로 밀리거나 유동되어짐을 방지하기 위한 수단이다.

[0049] 본체(100)의 입구는 상기 진동자극부(330)가 결합된 슬라이드 샤프트(324)가 외부로 도출될 수 있도록 통공된 구조로 이루어진다.

[0050] 손잡이부(110) 내에는 상기 모터(200)를 제어하기 위한 모터제어수단이 구성되며, 손잡이부(110)에서 사용자의 손가락이 놓여지는 위치에 모터제어수단에 제어신호를 제공하기 위한 건 스위치(400)가 구성된다.

[0051] 상기 건 스위치(400)는 사용자가 손가락으로 눌렀을 때 내부의 동작스위치가 눌려질 수 있도록 구성되며, 사용자가 누르는 힘을 해제할 때 다시 원위치로 복구되도록 건 스위치(400)에 탄성력을 제공하는 탄성수단을 구성하는 일반적인 스위치 구조로 이루어지며, 다양한 형태의 스위치구조로 구성할 수 있다.

[0052] 여기서 상기 건 스위치(400)는 사용자의 편의를 위하여 총을 쏘는 형태의 스위치로 구성한 것이며, 일반 형태의 스위치로 구성할 수 있다.

[0053] 상기 모터제어수단은 전원공급수단, 전원공급수단으로부터 제공된 전원을 건스위치(400)의 스위칭에 따라 모터(200)에 제공하여 모터를 구동시키기 위한 제어수단에 대한 회로수단을 포함한다.

[0054] 상기 전원공급수단은 충전지(battery) 및 충전지의 충방전수단을 포함하여 구성하는 충전형으로 구성되거나, 전원플러그를 구성하여 콘센트에 전원플러그를 연결하여 사용하는 플러그 타입으로 구성할 수 있다.

[0055] 설명되지 않은 부호 150은 방열구, 500은 퓨즈, 600은 속도조절용 볼륨이다.

[0056] 이와 같은 구성으로 이루어지는 본 발명 근육 진동 마사지 장치의 결합과정 및 동작을 상세히 설명하면 다음과 같다.

[0057] 고정브라켓트(341)의 회전축통과공(341a)을 통하여 고정브라켓트(341)의 내측으로 모터(200)의 회전축(210)을 진입시키고 고정브라켓트(341)의 내측으로 캠(311)을 회전축결합부(311c)이 회전축(210)의 방향으로 위치하도록 한 후, 회전축 결합부(311c)에 모터(200)의 회전축(210)을 결합시킨다.

[0058] 그리고 캠(311)의 회전축결합부(311c)의 그 반대편에 형성된 고정홈(311d)에 베어링고정수단(313)을 결합시켜 베어링(312)을 결합한 후, 베어링(312)을 베어링고정수단(314)을 이용하여 고정브라켓트(341)의 베어링결합부(341b)에 결합고정시킨다.

[0059] 한편 슬라이드 샤프트(324)를 고정브라켓트(341)의 슬라이드 샤프트통과공(341c)에 끼우고 부시링(325)으로 샤프트통과공(341c)에 결합시키고, 고정브라켓트(341)의 그 후단에 형성된 부시링결합부(341d)에 부시링(325)을 끼워 슬라이드 샤프트(324)의 후단을 지지한다.

[0060] 이후 슬라이드 샤프트(324)의 하부로 부터 링키(323)를 링키결합부(324a)에 결합하고 전진베어링(321)과 후진베어링(322)을 상기 링커(323)에 결합시켜 캠(311)의 원판(311b)을 중심으로 양 측으로 위치시키면 전진베어링(321)과 후진베어링(322)이 원판(311b)에 접촉되어 회전 가능한 구조로 결합된다.

[0061] 이때 전진베어링(321)과 후진베어링(322)은 원판(311b)을 중심으로 구성됨에 따라서 서로 반대방향으로 일정하게 회전한다.

[0062] 또한 직각고정핀(342)을 직각고정핀고정수단(343)을 이용하여 고정브라켓트(341)의 직각고정핀결합부(341e)에 결합 고정시킨다.

[0063] 진동자극부(330)는 슬라이드 샤프트(324)에 결합어댑터(331)를 결합하고 결합시킨다.

[0064] 이후 결합 완료된 고정브라켓트(341)를 본체(100)내 모터받침부(120) 및 브라케트 고정부(130)에 맞추어 실장하고 외부로 부터 볼트를 고정홀(120)에 끼워 고정브라켓트(341)의 고정홀(341f)에 체결하여 조립을

MassagerPriorArt0001599

Petitioner Therabody Ex-1004, 1057

완료한다.

[0065] 이와 같은 본 발명 근육 진동 마사지 장치의 동작은 다음과 같이 이루어진다.

[0066] 사용자가 건 스위치(400)를 당기게 되면 손잡이부(110) 내에 구성된 모터제어수단의 스위치가 터치되면서 모터(200)에 전원이 공급되어 모터(200)가 회전하게 된다.

[0067] 모터(200)가 회전하면 모터(200)의 회전축(210)에 결합된 캠(311)이 회전하게 된다.

[0068] 진동회전부(310)의 캠(311)의 축(311a)에는 소정의 경사각도로 기울어진 원판(311b)이 형성되어 있는 데, 상기와 같이 캠(311)이 회전하게 되면, 캠(311)에 형성된 원판(311b)이 회전하게 된다.

[0069] 이때 원판(311b)은 축(311a)과 소정의 기울기로 형성되어 있음으로써, 기울어진 각도에 따라서 원판(311b)의 원주면은 일정한 변위 폭을 갖게 된다.

[0070] 따라서 원판(311b)의 좌우에 구성된 전진베어링(321)과 후진베어링(322)은 원판(311b)에 접촉하여 회전하며, 캠(311)의 회전주기에 따라서 캠(311)의 원판(311b)으로 부터 힘을 전달받게 된다.

[0071] 이와 같이 원판(311b)으로 부터 전달되는 힘에 따라서 링커(323)가 원판(311b)의 변위 폭에 따라서 좌우 이동하면서 링커(323)가 연결된 슬라이드 샤프트(324)가 좌우로 수평이동하게 된다.

[0072] 상기와 같이 캠(311)이 회전하면서 캠(311)의 축(311a)에 형성된 원판(311b)의 원주면이 좌우 이동하게 됨에 따라서 원판(311b)의 양 측면에 접촉되어 회전하는 전진베어링(321), 후진베어링(322)이 좌우로 이동되면서 슬라이드 샤프트(324)가 좌우 슬라이드하게 되며, 상기와 같은 과정을 반복하면서 진동이 발생하게 된다

[0073] 도 5a에 도시된 바와 같이, 원판(311b)이 전진베어링(321) 측으로 힘을 전달하게 되면 전진베어링(321)은 원판(311b)으로 부터 전달되는 힘에 따라 진동자극부(330) 방향으로 밀려나가게 되고, 전진베어링(321)에 연결된 링커(323)가 슬라이드 샤프트(324)를 밀어내게 됨으로써, 슬라이드 샤프트(324)가 전진하게 되고, 원판(311b)이 후진베어링(322) 측으로 힘을 전달하게 되면 도 5b에 도시된 바와 같이, 후진베어링(322)은 진동자극부(330)의 후단으로 밀려나가게 되고, 후진베어링(322)에 연결된 링커(323)가 슬라이드 샤프트(324)를 후단으로 밀어내어 슬라이드 샤프트(324)가 후진하게 된다.

[0074] 이때 고정브라켓트(341)에 고정 지지된 직각고정핀(342)이 슬라이드 샤프트(324)의 이탈방지가이드홈(324b)에 끼워진 상태에서 수평이동시 슬라이드 샤프트(324)의 좌우 이탈을 방지하게 된다.

[0075] 도 5a, 도 5b는 진동회전부, 진동슬라이드부의 수평이동 동작을 설명하기 위하여 이탈방지부의 결합상태만을 나타낸 도면이다.

[0076] 이와 같이 발생되는 진동은 사용자의 피부에 접촉된 진동자극부(330)를 통해 피부내 근육에 전달된다.

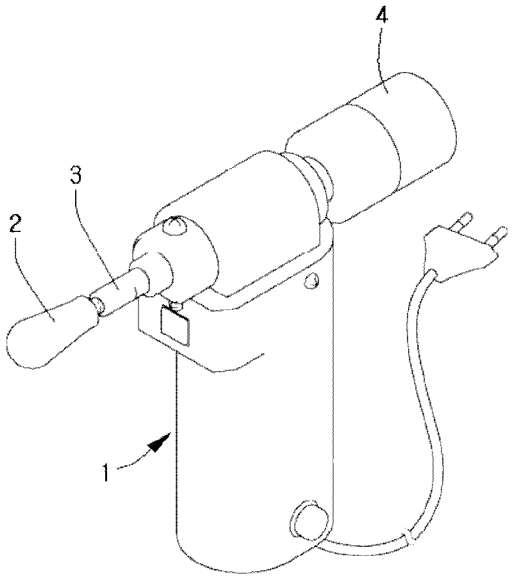
[0077] 이때 진동자극부(330)는 슬라이드 샤프트(324)로 부터 교체 가능하도록 결합어댑터(331)가 구성되어 있음으로, 필요에 따라서 교체하여 사용가능 하다.

MassagerPriorArt0001600

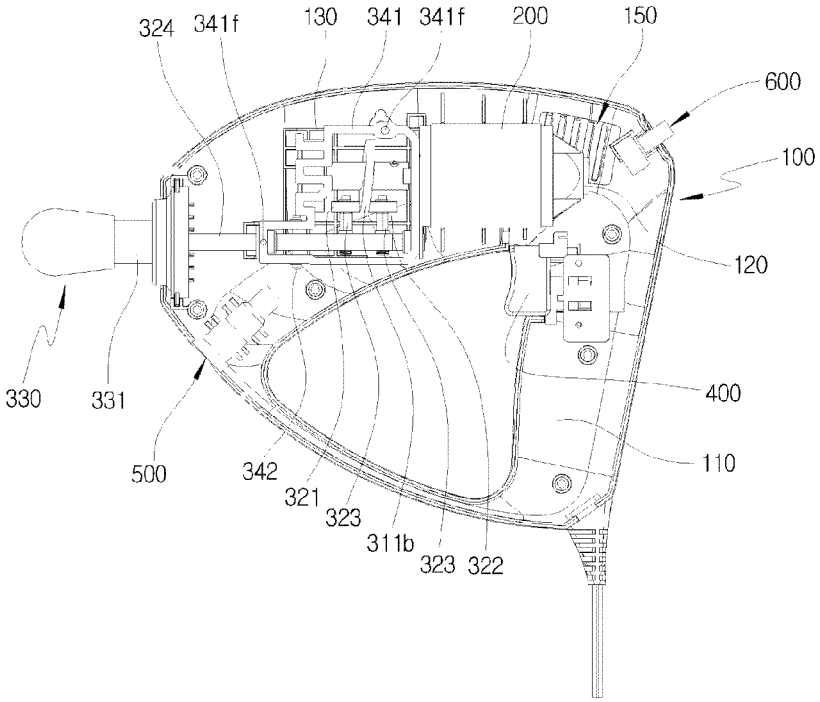
Petitioner Therabody Ex-1004, 1058

도면

도면1



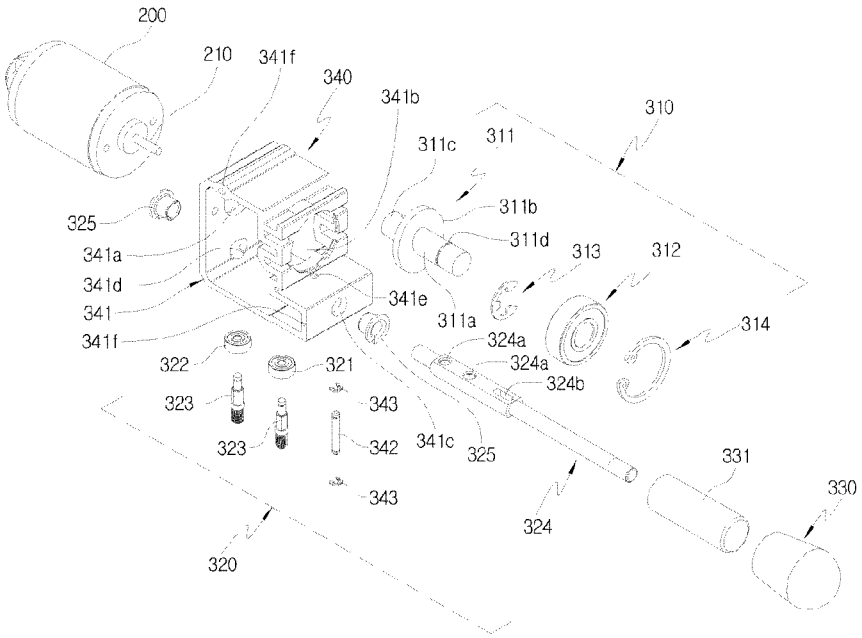
도면2



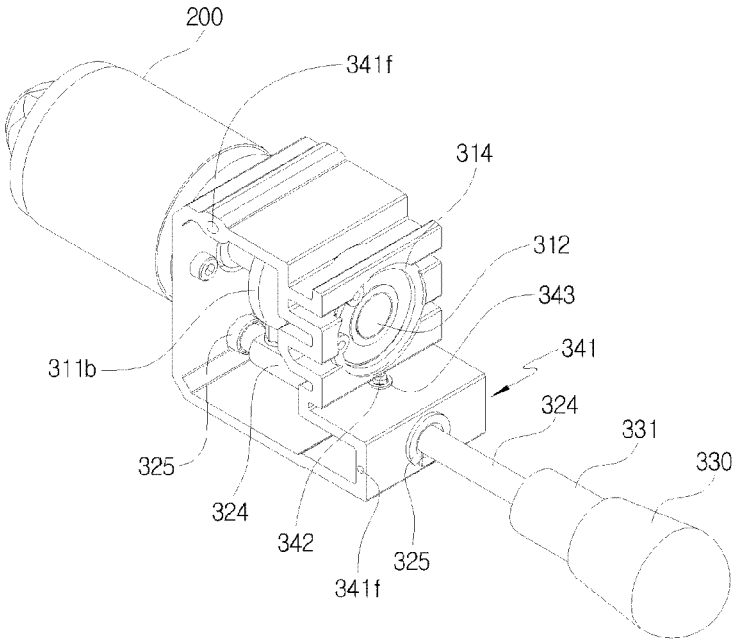
MassagerPriorArt0001601

Petitioner Therabody Ex-1004, 1059

도면3



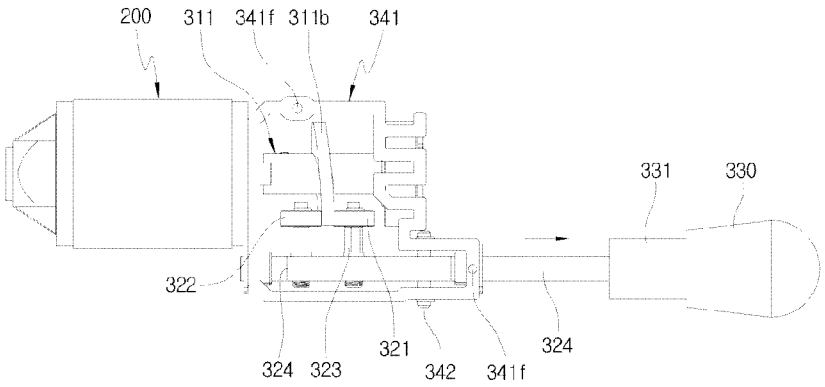
도면4



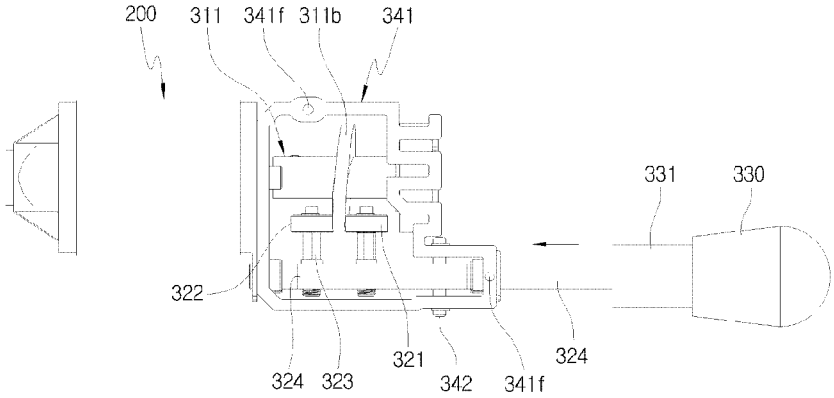
MassagerPriorArt0001602

Petitioner Therabody Ex-1004, 1060

도면5a



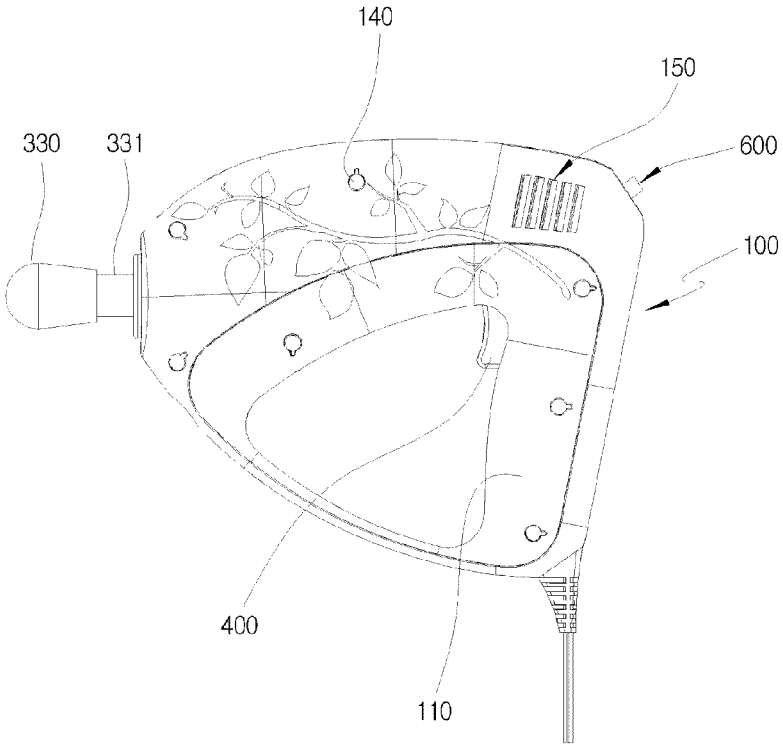
도면5b



MassagerPriorArt0001603

Petitioner Therabody Ex-1004, 1061

도면6



MassagerPriorArt0001604

Petitioner Therabody Ex-1004, 1062

Docket No.: HYP-034C3
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Philip C. Danby et al.

Application No.: 17/681,367 Confirmation No.: 8567

Filed: February 25, 2022 Art Unit: 3785

For: MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH Examiner: T. A. Stanis

Submitted vias EFS-Web

INFORMATION DISCLOSURE STATEMENT (IDS)

Pursuant to 37 C.F.R. §§ 1.56, 1.97, and 1.98, the attention of the United States Patent and Trademark Office is hereby directed to the references listed on the attached PTO/SB/08. It is respectfully requested that the information be expressly considered during the prosecution of the above-identified application, and that the references be made of record therein and appear among the "References Cited" on any patent to issue therefrom.

This Information Disclosure Statement is filed before the mailing date of a first Office Action on the merits (37 C.F.R. § 1.97(b)(3)).

In accordance with 37 C.F.R. § 1.98(a)(2)(ii), copies of U.S. patents and U.S. patent application publications are not submitted.

In accordance with 37 C.F.R. § 1.98(d)(1) and as noted by a double-asterisk next to the Cite No. on the attached PTO/SB/08, the following references are not supplied because they were previously cited by or submitted to the Office in prior application numbers 15/892665 filed February 9, 2018 and 14/317573 filed June 27, 2014 and relied on in the above-identified application for an earlier effective filing date under 35 U.S.C. § 120.

In accordance with 37 C.F.R. § 1.97(g), the filing of this Information Disclosure Statement shall not be construed as a representation that a search has been made. In accordance

with 37 C.F.R. § 1.97(h), the filing of this Information Disclosure Statement shall not be construed to be an admission that the information cited in this Information Disclosure Statement is, or is considered to be, material to patentability as defined in 37 C.F.R. § 1.56(b).

It is submitted that the Information Disclosure Statement is in compliance with 37 C.F.R. § 1.98, and the Examiner is respectfully requested to consider the listed references.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 07-1700, under Order No. HYP-034C3 from which the undersigned is authorized to draw.

Dated: June 9, 2022

Respectfully submitted,

Electronic signature: /Hunter Malboeuf/
Hunter Malboeuf
Registration No.: 79,730
GOODWIN PROCTER LLP
100 Northern Avenue
IP DOCKETING DEPT./7TH FL
Boston, Massachusetts 02210
(617) 570-1000
Agent For Applicant

Petitioner Therabody Ex-1004, 1064

JPH07153440A BATTERY CASE

The EPO does not accept responsibility for the accuracy of data originating from authorities other than the EPO, nor does it guarantee that such data is complete, up-to-date or fit for specific purposes.

The wording below is an initial machine translation of the original publication. To apply more advanced translation technology, use Patent Translate.

[0001] [0001] The present invention is housed Ke of the battery - it relates to nest structure.

[0002] BACKGROUND ART In a battery to be used in a camera or the like, long-term cotton Tsute can use, Katsumo - those of high performance that can drive a large load as data is requested.

[0003] Based on such a request, a battery with a long performance of compact and large capacity self-discharge is low lifetime, for example Hutu graphite lithium battery, it has been developed, this battery up to 1 amperes strong since the current discharge is possible and summer, intentionally or rapidly heat is generated by Tsute battery to a large current flows and to short-circuit between the positive and negative electrode of the battery accidentally, danger of causing Continuous short circuit state of the fire and explosion accident there is.

[0004] On the other hand, many of them using the IC in the device such as a recent camera. Therefore, when loading the device with the positive and negative electrodes of the battery deliberately or accidentally reversed, not only the equipment is not working, the IC is at risk of being destroyed.

[0005] In addition, when loaded with if the electrode of the part of the battery to reverse in equipment that use multiple batteries, there is also a possibility that the accident of explosion is reverse charging is done occurs.

[0006] [Invention Problems to be Solved] For this reason, in the equipment that uses the battery as described above and as consumers of conventional general is not to replace the batteries, menu was produced equipment - mosquitoes - by the hand of such Tsute because you are to perform the exchange only, it has a summer thing very inconvenient on convex to the general consumer.

[0007] The present invention has been made to solve the inconveniences as described above, and an object, even a battery as described above as a consumer by Tsute loading errors that are handled is, fire and explosion accident, do not be such as destruction of the equipment takes place, a new battery compartment Ke - is to provide a scan.

[0008] Means for Solving the Problems The present invention is intended to solve the above problems, a holding portion for holding side by side cylindrical batteries connected in series to two parallel, external disposed on the outer wall surface of the holding portion positive and negative contact portion for contacting the device, battery housing to case and a connecting member for connecting each of the positive and negative electrodes of a battery that is accommodated in the holding portion and the positive and negative contact portion - in the scan, the holding portion contact portion arranged positive and negative on the outer wall surface, the battery housing hair - when rotated 180 degrees about the center line between the two cylindrical batteries aligned to scan in parallel, before the rotation the contact portion of the characterized in that it is arranged to come to not coincide with the position location.

[0009] [Action] positive and negative contact portion for connecting the external device and the battery, battery housing Ke - when brought into rotation to rotate 180 degrees of the center line between the two cylindrical batteries aligned to scan in parallel, before the rotation center a scan between the two cylindrical battery of - of because they are arranged so as to come to the position and does not match the position of the contact part, false Tsute battery compartment Ke - reverse direction a scan to an external device, namely a battery housing to case when loaded in a state of being rotated 180 degrees around the line, the position of the contact portion battery housing Ke - so deviated from the position of when loaded with scan in the normal direction, the positive and negative electrodes of the battery to an external device not be connected to the opposite polarity.

[0010] Example will be described below with reference to the accompanying drawings embodiments of the present invention. Battery in the present invention prior to sale battery housing to case according to the present invention - housed in the scan, the consumer is configured so as not directly addressed the cell. 1 to 3 show a first embodiment of the present invention.

Petitioner Therabody Ex-1004, 1065

[0011] 1 is a battery of large capacity having the risk of by Tsute explosion shorted, arranged in two parallel to face opposite directions both the electrodes, one end of such which each other's electrodes conductive metal 2 so as to connect is welded, both batteries are connected in series.

[0012] 3 battery housing Ke - scan a and is vertically divided into two is configured to accommodate the battery 1. Battery housing Ke - scan 3 holds the battery, the top surface of the upper 3a of (outer wall), narrow opening 3b having different opening diameters at positions corresponding to the positive electrode and the negative electrode of the battery 1 to be accommodated, 3c There is formed so as to penetrate through the top surface.

[0013] Also, the battery housing to case - scan 3 is recessed portion which is along Tsute formation of the outer shape of the two cells arranged in parallel are formed on only one, the battery housed in the recess viewed portion Ke - scan 3 Camera step portion 3d to only be inserted in the correct orientation when loading the apparatus etc. 10 (hereinafter referred to as device) is formed.

[0014] To accommodate the battery 1 Atatsute is the battery 1 battery compartment Ke - one to first be fitted which is divided into top and bottom of the scan 3, it is sold to the general consumer after fixing impossible up and down separated by fitting the other that.

[0015] More battery 1 as the battery housing to case almost completely when the consumer handles - covered by the scan 3, the electrode unit 1a, 1b is to allow contact with the outside only through a narrow opening 3b, 3c, the top surface is located from (outer wall) on the inside, it will not be short-circuited carelessly. In addition, the battery housing Ke - Atatsute to sale of the scan 3 battery compartment Ke - narrow opening 3b of the top surface of the scan 3, made of paper or the like so as to cover the 3c label before use the battery if in hearts Handling but it is possible to prevent intrusion of dust become more secure.

[0016] Battery chamber 10a further battery connection pins 11, 12 by Tsute supported by the biasing springs 15 and 16 is disposed housed in the apparatus 10 Ke - contrary to the position fitted to the stepped portion 3d when the scan 3 is loaded if it is not the direction that have input prevention projection 10b is provided with a stepped portion 3d and the reverse input preventing projection 10b is facing a battery housing to case - can not be loaded with vinegar.

[0017] Connecting pins 11 and 12 are each a battery housing Ke - narrow opening 3b provided to the nest 3, in the opposite direction are formed as different ivy thickness corresponding to the aperture diameter of the 3c battery compartment Ke - loading a scan 3 relatively thick connection pin 12 is narrow opening 3b of the also the connection pins 11 and 12 in an attempt to, connected to the more narrow cell 1 of the electrode can not be fitted into the opening 3b of one of the 3c pin 11, 12 but not connected.

[0018] Follow Tsute battery housing to case - in an apparatus for use with a plurality of electrically connected in series a scan 3, one of the battery compartment to case - are arranged so as to face the scan - scan of the step portion 3d other battery storage Ke When the battery compartment to be loaded is constituted, the battery housing Ke - scan can not be performed loading direction regulated by the step portion and the reverse input prevention projection, but there can be being reversed loaded, such such If the current also does not flow, it is possible to prevent the current I Tsute heat generation, explosion accident that flows occur in a battery of'm Tsute low voltage to the potential difference between the battery.

[0019] Prevention stepped portion 3d of the scan 3 and the reverse input preventing projection 10b and the connection pins 11 and 12 with the narrow opening 3b, 3c is an accident due to the to function as a reverse entering prevention device loading errors to double - In this way the battery compartment Ke it can.

[0020] Battery storage Ke - One per To load a scan 3 in the battery chamber 10a of device 10 first step portion 3d and the reverse input preventing projection 10b battery housed in a direction in which the face-to-face Ke - When you insert a scan 3, a battery housing Ke - scan 3 is placed in the battery chamber 10a is guided while being direction regulation to reverse input preventing projection 10b. In addition the battery compartment Ke - scan 3 to when the thinner of the connection pin 11 is narrow and the narrow opening 3b of those who have been formed through contact with the positive electrode 1a of battery 1 closet, the thicker connection pin 12 is relatively wide narrow opening 3c formed by the through negative electrodes 1b abuts the cell 1, the biasing springs 15 and 16 is compressed.

Petitioner Therabody Ex-1004, 1066

[0021] Fully battery storage Ke - When you close the battery lid 14 is loaded a scan 3 in the battery chamber 10a, the connecting pins 11 and 12 are pressed against the electrode 1a, 1b of by the biasing force Tsute battery 1 of the biasing spring 15 and 16 the connection is retained becomes state.

[0022] Battery storage Ke - by the biasing force of the biasing spring 15 and 16 and to open the Atatsute battery lid 14 to retrieve a scan 3 Tsute battery storage Ke - scan 3 is extremely is take-out for some projects from the battery chamber 10a it is easy.

[0023] Figure 4 shows a second embodiment of the present invention. Battery 1 and the battery housing to case in this embodiment - between the openings 3b of the scan 3, 3c, the connection portion is provided to connect housed battery 1 electrodes 1a, a connection pin provided on 1b and equipment with, diodes - which prevents the backflow of current using the de. 4,5 narrow opening 3b at the junction, contact with the connection pin provided on the device (not shown) via 3c.

[0024] Connection 5 is battery housing Ke - have been resilient contact piece 5a integrally formed provided in the battery chamber 3e of scan 3 is a negative electrode 1b and resiliently connected to the battery 1. Further, the connecting portion 4, the connecting member 6 and the diode are positive electrodes 1a and elastically connect the battery 1 with an elastic contact piece 6a - is connected via a de-7.

[0025] Electrodes 1a as in the first embodiment in this embodiment, short circuit 1b and battery housing to case - together with the loading errors can be prevented in the scan 3, a plurality of battery housing Ke - when used in parallel connection scan 3 it is possible to prevent the generation of heat, explosion of the battery to be by Tsute blocked by the de 7 - a potential difference is have Tsute between the battery also current to the battery of low voltage is possible to inflow of diode.

[0026] 5 to 8 show a third embodiment of the present invention. Battery housing Ke in the present embodiment - scan 3 same Ke provided with a contact projecting from - intermittent possible contacts in scan 3 is provided, the Ke - electrode of the battery 1 only when the scan 3 is loaded correctly connected contact piece and battery housing hair - are connected to the contact protruding from scan 3 contact piece is configured as a current flows connected.

[0027] 21 and 22 battery housing to case at the electrode contacts - has been installed so as to protrude the top of the scan 3, a battery housing to case, as shown in FIG. 5 - is provided at a position asymmetrical with respect to the center line of the scan 3 Therefore, never contacts 21 and 22 are connected contacts the opposite device side is reverse loaded.

[0028] Battery housing Ke - connected to the interior of the scan 3 is connected to the 7 and the negative electrode 1b and resiliently connected electrode contact 22 of the first battery 1 as shown in FIG. 8 members 27 and the elastic contact piece 6a, connecting member 6 is provided in which are positive electrodes 1a and resiliently connected to the battery 1.

[0029] The other end one end is fixed to the electrode contacts 21 from the bent end 28a to not make bent end 28a diodes - connections are connected de 7 to contacts 29 through a member 28 battery storage Ke - are fixed on the inner wall of the scan 3. In addition, the positive electrode 1a of battery 1 in contact with the second contact piece portion 25b of the other end to the first contact piece portion 25a is in contact with the contact piece 29 of the one end to the bent end 6b of the connecting member 6 battery storage Ke - conductor contact piece 25 mobile-like of the electrode contact 21 connected to state that because of the scan 3 is installed.

[0030] Conductor contact piece 25 have been fixed to the switching member 24, which is supported by the biasing spring 23, the battery housing to case - first contact conductor contact piece 25 by the biasing spring 23 in a state of not loading the scan 3 to the apparatus and between the bent end 6b of the strip portion 25a connecting member 6, in order to have been pulled apart between the second contact piece portion 25b and the contact piece 29, the connecting member 6 and the contact piece 29 is connected It not, is connected to electrode contacts 21, 22 short-circuited current is not caused short-circuit does not flow. The switching member 24 is battery housing to case - are arranged so as to be capable external contact through an opening 3f which is provided so as to penetrate the top surface of the scan 3.

[0031] Battery housing to case in the present embodiment - Atatsute to load the scan 3 to the apparatus (not shown), first battery housing Ke - mounting direction regulating pin which is fixed to the apparatus for inserting the scan 3 in the correct direction (not shown) of the battery housing to case - it pushes downward in the figure

Petitioner Therabody Ex-1004, 1067

against the biasing force of the penetrating openings 3f provided on the top surface of the scan 3 biases the switching member 24 the spring 23. In addition, the battery housing to case - the mounting direction control pin is also an attempt to load in a scan 3 to Ayamatsu was direction is the same Ke - loaded to contact the upper surface of the scan 3 is impossible.

[0032] First and second contact piece portion 25a of the conductor contact piece 25 by Tsute conductor contact piece 25 to be switching member 24 is moved downward in the figure is whoa, 25b is bent end 6b and each connection member 6 in contact with the contact piece 29, and the positive electrode 1a and the electrode contact 21 of the battery 1 is connected. At this time, is pushed to the colored tail 24a is mounting direction regulating pin of the switching member 24 (not shown) battery storage Ke - protrude from the scan 3 of the step portion 3d, the positive electrode portion has decreased to the connection state indicate. Further battery housing Ke - electrode contacts 21 and 22 when pushed to scan 3 in the apparatus is brought into contact with contacts fixed to the device side, loaded conduction been is completed.

[0033] Battery storage Ke - scan 3 is taken out from the device and the mounting direction regulating pin and the switching member 24 and the switching member 24 and the conductor contact piece 25 on cowpea the biasing force of the contact is biasing spring 23 to be released on the upper side of Fig. moved, first and second contact piece portion 25a, 25b and the positive electrode 1a and the electrode contact 21 of the contact is solved cell 1 of the bent end 6b and the contact piece 29 of the connecting member 6 is connected It is not.

[0034] Foregoing as electrodes 1a, short circuit 1b is prevented in the present embodiment, together with the accident due to erroneous loading can be prevented, diodes - a plurality of battery housing as in the second embodiment due to the de 7 provided Ke - scan 3 it is possible to prevent the accidents that may occur when used in connected in parallel. Incidentally, diode - de 7 a voltage detection circuit is provided in place may be configured to a voltage of the battery 1 is cut off the connection Suitsuchingu circuit Control Act electrode contact 21 and the battery 1 electrodes 1a when drops below a predetermined level .

[0035] 9 to 12 show a fourth embodiment of the present invention. Providing a shielding member between the scan aperture of battery housing Ke - - electrodes and battery housing to case of the battery in the present embodiment the shielding member when loaded into scan of the device is configured so as to be capable loading retracted there.

[0036] 30 is a shielding member, integrally by the molding that have been pin 30a Tsute battery storage Ke - shielding the opening of the scan 3 3b, 3c - are bearing the opening 3g provided on the top surface of the scan 3 battery compartment Ke It is pivotally supported so that it can pivot between a position to release the cormorant position. Shielding member 30 is a battery housing to case - contact with the inner wall of the elastic member 30c of the scan 3 is brought, finger portion 30b is the same Ke - part forming the stepped portion 3d of the outer wall portion of the scan 3, that is housed in the camera 50, which will be described later battery housing Ke facing the opening 3h protrude from an opening 3h provided on the portion facing the direction regulating member 53 - has been stopped in contact with the outer wall portion to form a stepped portion 3d of the scan 3, in this state the shielding member 30 is battery housing to case as shown in FIG. 12 (a) - shields the opening 3b of the top surface of the scan 3, 3c.

[0037] Atatsute To load the scan 3 in the battery compartment 51 of the camera 50, after opening the battery cover 52 of the camera 50 shown in FIG. 9, battery housing Ke - - battery housing Ke In the present embodiment stepped portion of the scan 3 3d is the insertion direction facing the accommodating direction regulating portion 53 provided inside the battery chamber 51, i.e. the step portion 3d figure below, the battery chamber 51 toward the top surface to the left in FIG. In addition, the battery housing to case - by scan 3 is housed direction regulating member 53, will not be loaded in the wrong direction.

[0038] Battery storage Ke - when the scan 3 is placed is guided to the battery chamber 51 in the direction of housing regulation member 53, the protruding portion of the finger portion 30b of'm Tsute shielding member 30 on the slopes 53a of the housing direction regulating member 53 is pressed shielding member 30 is rotated in the clockwise direction against the biasing force of the elastic piece portion 30c, FIG. 12 (b) in the battery housing as shown to case - the top surface of the opening 3b of the scan 3, to open the 3c. In addition followed by a battery housing to case - scan 3 connecting pins 11 and 12 which are installed in when you pushed the battery chamber 51 each opening 3b, electrode 1a of battery 1 fitted to 3c, is 1b and the contact with the connection. Connecting pins 11 and 12 electrode 1a by the urging force of the first embodiment by closing the battery cover 52 as well as the biasing spring (not shown), the connection becomes a state of being pressed against the 1b is maintained.

Petitioner Therabody Ex-1004, 1068

[0039] Battery storage Ke - and also the first example that a part of the scan 3 is projected from the battery chamber 51 - by the biasing force of the biasing spring and to open the Atatsute battery lid 52 to take out a scan 3 Tsute battery compartment Ke it is similar, in this embodiment the finger addressed it is possible to draw Tsute in the recessed portion 3i so recess 3i for taking out is provided, which facilitates further extraction summer. Battery housing Ke - shielding member 30 and taking out the scan 3 is rotated Control Act counterclockwise biasing force by the elastic force of the elastic piece portion 30c, abuts against the outer wall portion of the finger portion 30b faces the opening 30h stop shields the opening 3b, and 3c as shown in FIG. 12 (a). Follow shall be applied to any electrode 1a in this embodiment, 1b short circuit, the battery housing to case - it is possible to prevent accidents due to erroneous loading of the scan 3.

[0040] 13 to 16 show a modification in which assumes different shapes and operation of the shielding member of the fourth embodiment. Shielding member is a portion similar to the fourth embodiment battery housing to case - it is stopped to protrude from the opening 3h of the part forming the stepped portion 3d of the outer wall portion of the scan 3, provided inside the battery compartment and I Tsute projecting portion storing direction regulating member is pressed shielding member is retracted, the battery housing to case - is configured to open the opening of the scan 3 top face.

[0041] Shielding members 31 and 32 in the example shown in FIG. 13 is a pair, member 32 having one end portion is by Tsute pivotally supported on pin 32a at a position of the negative electrode near the positive electrode 1a, one end positive electrode member 31 which is by Tsute pivotally supported on pin 31a at a position deviation is shields the negative electrode 1 b, each of the shielding portion and the pin 31a, the intersection difference portion intersect each other at the middle of the 32a than the opening 3h battery housing Ke - scan 3 protrudes to the outside by signal portion 31b, to form a 32 b (see FIG. 13 (a)).

[0042] By the storing direction regulating member 53 Tsute signal section 31b, when 32b is pressed, shown in FIG. 13 (b) and the shielding member 31, 32 pivot pin 31a, to the respective counter-clockwise direction and the clockwise direction about the 32a open cell 1 of the electrode 1a, and 1b so. Those and contact is released shielding member 31, 32 battery housing the storing direction regulating member 53 to case - the elastic piece portion 31c which on the inner wall of scan 3 abuts, 32c by Tsute clockwise and anti-clockwise respectively the biasing force of the electrode 1b returns to the initial position by turning in the direction, to shield the 1a.

[0043] In the example shown in Figure 14 without the shielding members 33 and 34 pairs, each of one end the electrodes 1a, shields the 1 b, the pin 33a in the middle, is by Tsute axially supported to 34a, the other end portion It is projected to the outside. While the fixing pin 34d of the end portion protruding to the outside, fixing pins 34d and bifurcated cam face 33d is bifurcated cam surface 33d is formed is engaged on the other.

[0044] Storage direction regulating member 53 by the signal portion 33b is when the fixing pin 34 is pushed to the bifurcated cam surface 33d is rotated pressed of the shielding member 33 shielding members 33 and 34 is rotated clockwise and counterclockwise, respectively electrode 1a, and 1b to open on. When the contact is released to the storage direction regulating member 53 elastic piece portion 31c, shielding member 33 by the urging force of the 32c is moved backward to return to the original position, pushing that the employer fixing pin 34d into two cam surface 33d the shielding member 34 to return to.

[0045] Each end portion 35b are coaxially journalled, 36b are protruded stop together as a signal portion in the shield member 35, 36 common axis 37 of the pair in the example shown in FIG 15. Storage direction regulating member 53 by the signal section 35b, 36b is rotated to the shielding member 35 and 36 counter-clockwise direction and the clockwise direction respectively pressed electrode 1b, to open a 1a. When the contact is released to the storage direction regulating member 53 elastic piece portion 35c, I Tsute shielding member 35 and 36 to the biasing force of the 36c is moved backward to return to the original position, the signal section 35b, 36b is in contact with Stop.

[0046] Each electrode 1a by the shielding member 38 at both ends in the example illustrated in FIG. 16, 1 b front end of the arm portion arm portion is provided to protrude form the signal portion 38b in the central portion is shielded, and the arm portion Tsute arm portion protruding to have an opening 3h of the pair of pins 39, 40 and a signal portion 38b which are arranged so as to sandwich is configured to slide while being regulated.

[0047] Storage direction regulating member 53 Control Act signal portion 38b is a shielding member 38 is pressed at both ends to slide while being regulated by the pin 39, 40 is opened and saved from the electrodes 1a,

Petitioner Therabody Ex-1004, 1069

1b. Abutment is a shielding member 38 is out pursuant backward biasing force of the formed elastic piece portion 38c at both ends is by contact stopped by the pair of pins 39, 40 solved first and the receiving direction regulating member 53 to return to the position.

[0048] 17 to 19 show a fifth embodiment of the present invention. To scan the battery 1 electrodes 1a, but installing the shielding member 41 between the 1 b, unlike the fourth embodiment (not shown) - above fourth embodiment similar to the battery housing to case in this embodiment is O Tsute shielding member 41 in the installed connection pins 11, 12 are configured to retract.

[0049] Shielding member 41 as shown in FIG. 17 both end portions are connected by a central portion is forms a bifurcated shape, the opening 41a is provided between the connecting portion and the end portions, 41b are formed. In addition, the battery 1 and the battery compartment hair of the pair of pins 41c at both ends, 41d is the pin 41c is fixed, the two 41d are housed connecting portion of the shielding member 41 - formed between the scan 3 is Tsute shielding member 41 due to be fitted in the space is the cell 1 of the electrode 1a, 1b and the battery housing to case - the opening of the scan 3 3b, it is disposed at a position to shield the 3c.

[0050] Two surface contacting the connecting pins 11 and 12 of the split end portions is forms a V-shaped groove, have ceased to be divided into two at the bottom of the V-shaped groove, two divided respectively part is the reverse direction of the slope 41e, 41f and 41g, and forms a 41h.

[0051] When loaded into the device scan 3 (not shown), first 19 connecting pins 11 and 12 equal to case of the apparatus as shown in (a) - - the battery housing to case of the present embodiment the opening of the scan 3 3b, and 3c through to abut the two divided end portions of the shielding member 41. Then slope forms the tip V-shaped groove of the connecting pins 11 and 12, as shown in Figure 19 (b) 41e, 41f and 41g, is retracted to both sides push the 41h, the connection pins 11 and 12 are divided portions fitted to the battery 1 electrodes 1a, and connected abuts causes made 1b.

[0052] The battery housing to case - and the connecting pin 11 and 12 taking out a scan 3 is retracted, the shielding member 41 to close the contact with wedges each other to return is by Tsute divided into two portions in the elastic force, again V-shaped groove forming a, but in the present embodiment accommodating the battery as shown in FIG. 19 Ke - opening of scan 3 3b, Doke to 3c - the folding for folding part facing the inside of scan 3 is provided slope to the curved portion 41e, 41f and 41g, 41h is stopped in contact with, to shield electrode 1a of battery 1, a 1b. Also in the present embodiment as described above Dekiru preventing a short circuit of the fourth embodiment same electrode.

[0053] 20 to 21 show an example in which a different shape and operation of the shielding member of the aforementioned fifth embodiment. Shielding member 43 has a pin 43a is provided in the center portion, the pin 43a is battery housing Ke - opening 3b of the top surface of the scan 3, are bearing at the center of the 3c, further, each of the opposite ends of the shield member 43 slope 43b inclined in the opposite direction, 43c are being formed the slant surface 43b, respectively 43c opening 3b, it faces the 3c.

[0054] Connecting pins 11 and 12 opening 3b, 3c through to slope 43b, and comes into contact with the 43c, slope 43b, both ends of the shielding member 43 is pushed in the opposite direction each of which forms a 43c is about the pin 43a in the clockwise direction rotating the electrodes 1a, retracted from 1b, the connection pins 11 and 12 as shown in FIG. 21 (b) is the electrode 1a, the connection 1b abuts is made.

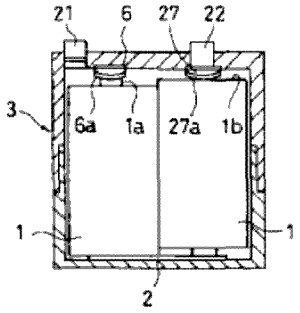
[0055] Shielding member 43 and the connection pin 11, 12 is retracted in a battery housing Ke - rotates to by the biasing force of the elastic piece portion 43b which on the inner wall of the scan 3 abuts Tsute counterclockwise shown in FIG. 21 (a) battery housing Ke as - top-face opening 3b of the scan 3, comes into contact with the bent portion provided in 3c is stopped, and the shielding electrode 1a of battery 1, the 1b.

[0056] As described above, according to the present invention, the battery housing to case of the present invention - vinegar, is a have high performance and large capacity of the accident of the destruction of'm Tsute explosion and equipment to reverse loading of the short circuit and the battery of the electrode shall apply as to accommodate the battery at risk, the battery compartment to case - by handling and storage to the nest, when used in loading the battery in the camera or other device, to loading errors, such as mistaking a loading direction Yotsute there is no possibility that the reverse connection of the electrodes occurs. Follow Tsute, the battery this battery storage Ke - when handling is housed in vinegar, without paying special attention to the handling, rather than the risk of accident occurrence of destruction of explosion and equipment, general consumers with peace of mind it can be handled.

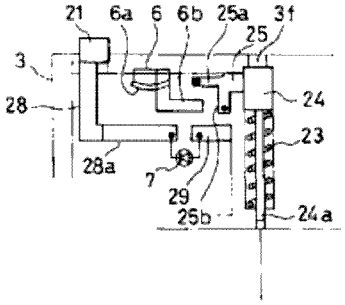
Petitioner Therabody Ex-1004, 1070

Drawings

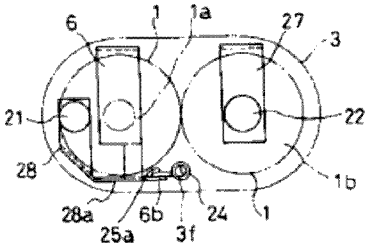
【図６】



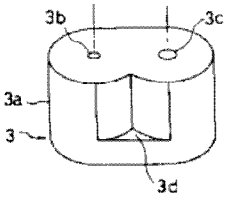
【図７】



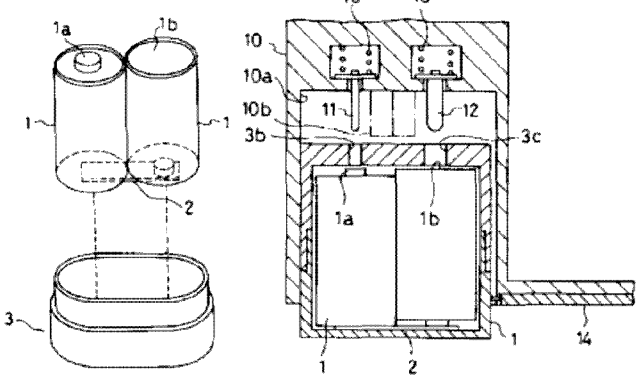
【図８】



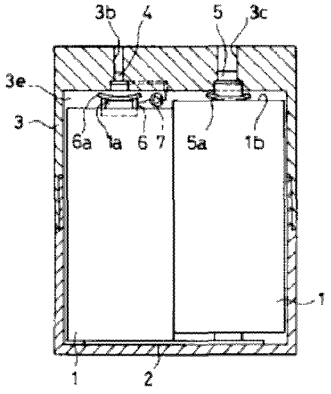
【図１】



【図２】



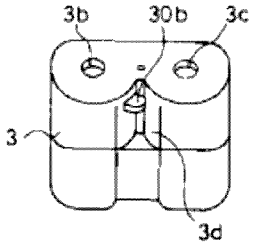
【図４】



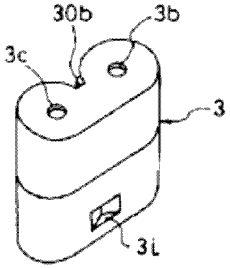
Petitioner Therabody Ex-1004, 1071

【図１０】

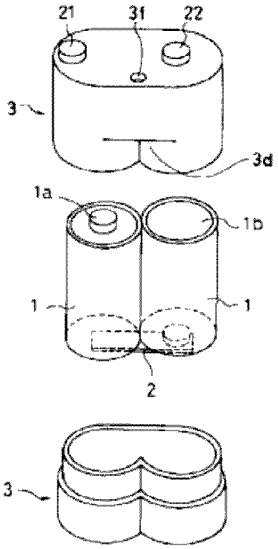
(a)



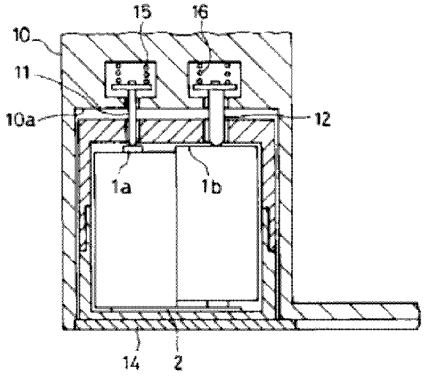
(b)



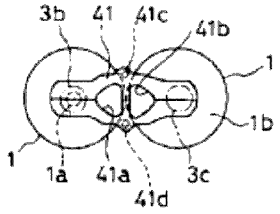
【図５】



【図３】

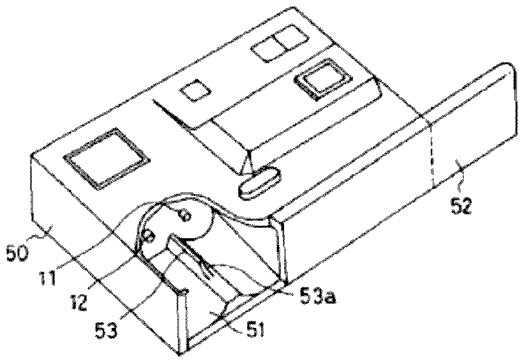


【図１８】

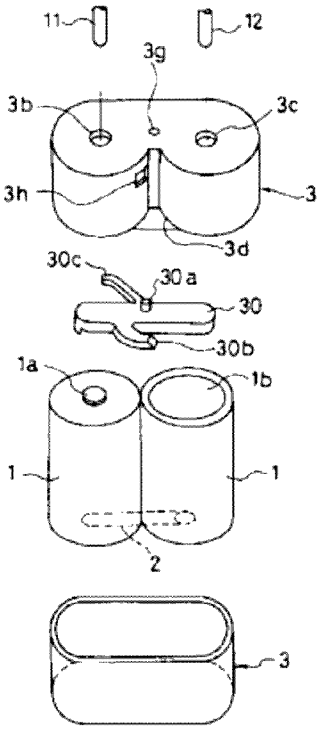


Petitioner Therabody Ex-1004, 1072

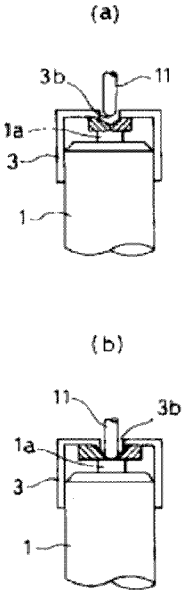
【図９】



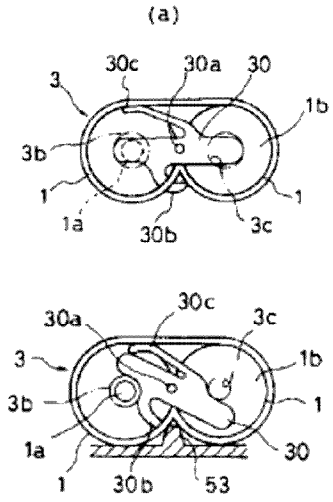
【図１１】

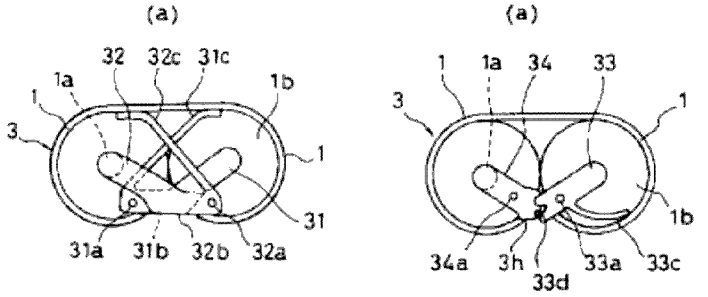


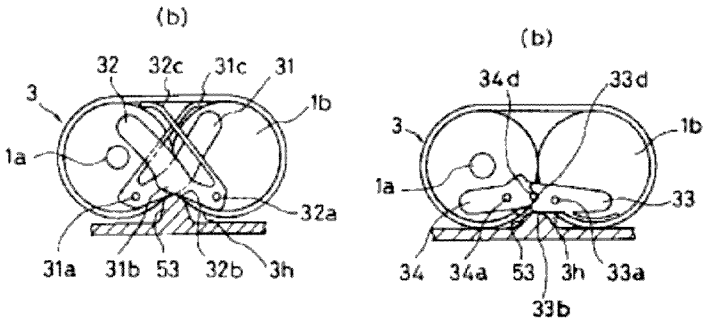
【図１９】



【図１２】



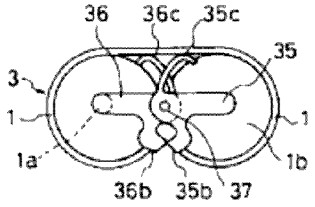




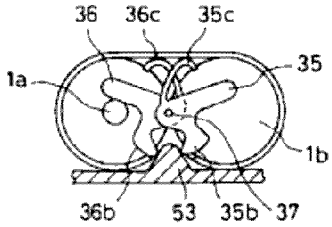
Petitioner Therabody Ex-1004, 1073

【図１５】

(a)

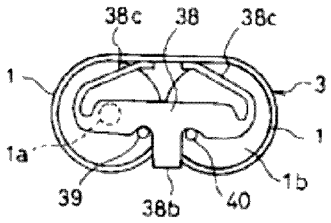


(b)

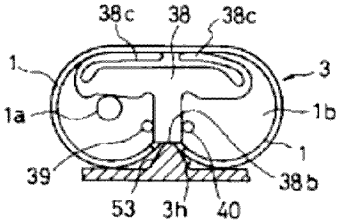


【図１６】

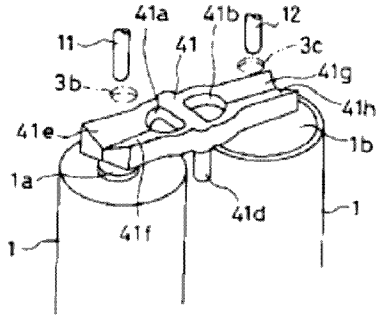
(a)



(b)

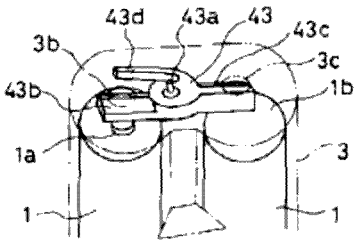


【図１７】

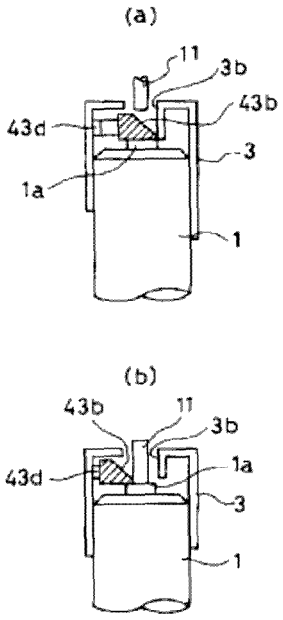


Petitioner Therabody Ex-1004, 1074

【図２０】



【図２１】



Petitioner Therabody Ex-1004, 1075

(19)日本国特許庁（ＪＰ）　(12) **公開特許公報**（Ａ）　(11)特許出願公開番号

特開平7－153440

(43)公開日　平成７年(1995)６月16日

(51)Int.Cl.[6]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ｈ０１Ｍ　2/10		Ｎ		

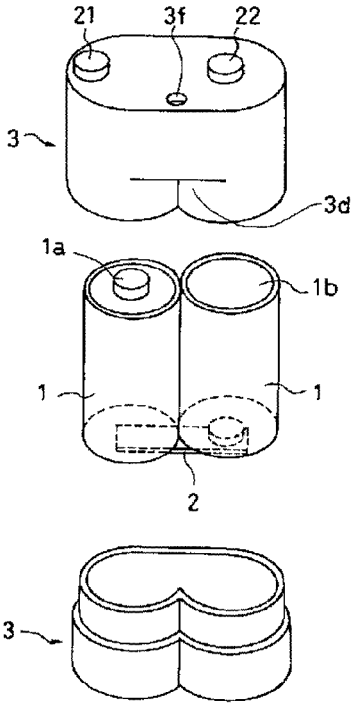
審査請求　有　　発明の数１　ＦＤ　（全　９　頁）

(21)出願番号　特願平6－259104
(62)分割の表示　特願昭57－169992の分割
(22)出願日　昭和57年(1982)９月28日

(71)出願人　000006079
ミノルタ株式会社
大阪府大阪市中央区安土町二丁目３番13号
大阪国際ビル
(72)発明者　田中　晴美
兵庫県西宮市宮西町10番29号　株式会社甲南カメラ研究所内
(72)発明者　吉崎　明
大阪府大阪市中央区安土町二丁目３番13号
大阪国際ビル　ミノルタ株式会社内
(74)代理人　弁理士　貞重　和生

(54)【発明の名称】　電池収納ケース

(57)【要約】
【目的】　電池の逆装填による爆発や機器の破壊等の事故を防ぐ電池収納ケースを提供する。
【構成】　円筒型電池１、１を収納する電池収納ケース３の頂面には、電極用接点２１、２２が配置されており、ケース３内部に収納され直列接続された円筒型電池１、１の正負の電極と接続されている。電極用接点２１、２２は電池収納ケース３を並列に並んだ円筒型電池の間の中心線の回りに１８０度回転したとき、電極用接点２１の位置と２２の位置は、回転前の電極用接点の位置と一致しない位置に配置されている。これにより電池収納ケース３をカメラなどの装置に逆方向に装填したとき電極用接点２１、２２は装置の接続端子に接触せず、爆発や装置の破壊等の事故を防ぐことができる。



MassagerPriorArt0000988

Petitioner Therabody Ex-1004, 1076

【特許請求の範囲】
【請求項１】　直列接続される円筒形電池を２本並列に並べて保持する保持部と、
上記保持部の外壁面に配置された外部機器に接触する正負の接触部と、
保持部の内部に収納される電池の正負の電極と前記正負の接触部とをそれぞれ接続する接続部材とを備えた電池収納ケースにおいて、
上記保持部の外壁面に配置された正負の接触部は、電池収納ケースを並列に並んだ２本の円筒形電池の間の中心線の回りに１８０度回転させたとき、回転前の接触部の位置と一致しない位置に来るように配置されていることを特徴とする電池収納ケース。
【発明の詳細な説明】
【０００１】
【産業上の利用分野】この発明は電池の収納ケースの構造に関するものである。
【０００２】
【従来の技術】カメラ等に使用する電池においては、長期にわたつて使用でき、かつモータのように大きな負荷を駆動できるような高性能のものが要請される。
【０００３】そのような要請に基づき、小型で大容量であり自己放電性が低く寿命の長い高性能を持つ電池、例えばフツ化黒鉛リチウム電池、が開発されているが、この電池は最大１アンペア以上の強電流放電が可能となつているため、故意もしくは偶然に電池の正負電極間を短絡させると急激に大電流が流れることによつて電池が発熱し、短絡状態を続けると火災や爆発事故を起こす危険がある。
【０００４】一方、最近のカメラ等の機器にはＩＣを使用したものが多い。このため、故意もしくは偶然に電池の正負の電極を逆にして機器に装填すると、単に機器が作動しないだけではなく、ＩＣが破壊される危険がある。
【０００５】また、電池を複数使用する機器においてもし一部の電池の電極を逆にして装填すると、逆充電が行われて爆発等の事故が生じる恐れもある。
【０００６】
【発明が解決しようとする課題】このため、上記のような電池を使用する機器では従来一般の消費者が電池交換を行わないようにし、機器を製造したメーカー等の手によつてのみ交換を行うようにしているため、一般消費者にとつて大変不便なものとなつている。
【０００７】本発明は、上記のような不便を解消するためになされたもので、その目的とするところは、上記のような電池を一般消費者が取り扱うことによつて誤装填がされたとしても、火災や爆発事故、機器の破壊などが起こることのない、新たな電池収納ケースを提供することにある。
【０００８】
【課題を解決するための手段】本発明は上記課題を解決するもので、直列接続される円筒形電池を２本並列に並べて保持する保持部と、上記保持部の外壁面に配置された外部機器に接触する正負の接触部と、保持部の内部に収納される電池の正負の電極と前記正負の接触部とをそれぞれ接続する接続部材とを備えた電池収納ケースにおいて、上記保持部の外壁面に配置された正負の接触部は、電池収納ケースを並列に並んだ２本の円筒形電池の間の中心線の回りに１８０度回転させたとき、回転前の接触部の位置と一致しない位置に来るように配置されていることを特徴とする。
【０００９】
【作用】外部機器と電池とを接続する正負の接触部は、電池収納ケースを並列に並んだ２本の円筒形電池の間の中心線の回りに１８０度回転させたとき、回転前の接触部の位置と一致しない位置に来るように配置されているから、誤つて電池収納ケースを外部機器に逆方向、即ち電池収納ケースを２本の円筒形電池の間の中心線の回りに１８０度回転させた状態で装填したときは、接触部の位置が電池収納ケースを正規の方向に装填した場合の位置からずれるので、電池の正負の電極が外部機器に対し逆極性に接続されることがない。
【００１０】
【実施例】以下、本発明の実施例について図面を参照して説明する。本発明において電池は販売前にこの発明の電池収納ケースに収納され、消費者は電池を直接扱わぬよう構成されている。図１乃至図３は本発明の第１の実施例を示す。
【００１１】１は短絡によつて爆発の危険性をもつ大容量の電池であり、双方の電極が互いに逆方向を向くように２個並列して並べられ、それ等の一方の端部は互いの電極を連結するように導体金属２が溶接され、両電池が直列に接続されている。
【００１２】３は電池収納ケースであり上下に二分割されて電池１を収納するよう構成されている。電池収納ケース３は電池を保持するとともに、上部３ａの頂面（外壁部）の、収納される電池１の正電極と負電極に対応する位置に開口径の異なる狭い開口部３ｂ、３ｃが頂面を貫通するように形成されている。
【００１３】また、電池収納ケース３は並列に並べた２本の電池の外形の沿つて形成される凹み部が一方にのみ形成されており、該凹み部には該電池収納ケース３をカメラ等の装置１０（以下装置という）に装填する時に正しい方向にのみ挿入可能とするための段部３ｄが形成されている。
【００１４】電池１を収納するにあたつては電池１を電池収納ケース３の上下に分割された一方にまず嵌入させ、他方を嵌入させて上下分離不可能に固着した後一般消費者に販売される。
【００１５】以上のように電池１は消費者が扱う時には

MassagerPriorArt0000989

Petitioner Therabody Ex-1004, 1077

ぼ完全に電池収納ケース３に覆われ、電極部１ａ、１ｂは狭い開口部３ｂ、３ｃを介してのみ外部と接触可能なように、前記頂面（外壁部）より内側に位置しており、不用意に短絡することはない。尚、電池収納ケース３の販売にあたつて電池収納ケース３の頂面の狭い開口部３ｂ、３ｃを覆うように紙等でできたラベルを貼つておけば電池使用前の取扱いがより安全となりゴミの侵入も防止できる。

【００１６】装置１０の電池室１０ａには付勢バネ１５、１６によつて支持された接続ピン１１、１２が設置され更に電池収納ケース３が装填されたときに段部３ｄに嵌入する位置に逆入防止突起１０ｂが設けられていて段部３ｄと逆入防止突起１０ｂが対面する方向でなければ電池収納ケースを装填することはできない。

【００１７】接続ピン１１、１２はそれぞれ電池収納ケース３に設けられた狭い開口部３ｂ、３ｃの開口径に対応するよう異なつた太さに形成されており逆方向に電池収納ケース３を装填しようとしても接続ピン１１、１２のうちの比較的太い接続ピン１２が狭い開口部３ｂ、３ｃのうちのより狭い方の開口３ｂに嵌入することはできず電池１の電極と接続ピン１１、１２が接続されない。

【００１８】従つて電池収納ケース３を複数個電気的に直列接続して使用する装置において、１つの電池収納ケースの段部３ｄが他の電池収納ケースと対面するように並べられて装填されるよう電池室が構成されていると、その電池収納ケースは段部と逆入防止突起による装填方向規制を行うことができず、逆装填されることが有り得るが、この様な場合にも電流は流れず、電池間の電位差によつて低電圧の電池に電流が流入することによつて発熱・爆発事故が起きることを防止できる。

【００１９】このように電池収納ケース３の段部３ｄと逆入防止突起１０ｂ及び接続ピン１１、１２と狭い開口部３ｂ、３ｃが二重に逆入防止装置として機能するので誤装填による事故を防止できる。

【００２０】電池収納ケース３を装置１０の電池室１０ａに装填するにあたつてまず段部３ｄと逆入防止突起１０ｂが対面する方向に電池収納ケース３を挿入すると、電池収納ケース３は逆入防止突起１０ｂに方向規制されながら案内されて電池室１０ａに入れられる。更に電池収納ケース３を押入すると細い方の接続ピン１１が狭く形成された方の狭い開口部３ｂを貫通して電池１の正電極１ａと当接し、太い方の接続ピン１２が比較的広く形成された狭い開口３ｃを貫通して電池１の負電極１ｂと当接し、付勢バネ１５、１６は圧縮される。

【００２１】完全に電池収納ケース３を電池室１０ａに装填し電池蓋１４を閉じると、接続ピン１１、１２は付勢バネ１５、１６の付勢力によつて電池１の電極１ａ、１ｂに押しつけられた状態になり接続が保持される。

【００２２】電池収納ケース３を取出すにあたつて電池蓋１４を開放すると付勢バネ１５、１６の付勢力によつて電池収納ケース３は電池室１０ａから一部が突出するため取出はきわめて容易である。

【００２３】図４は本発明の第２の実施例を示す。本実施例においては電池１と電池収納ケース３の開口部３ｂ、３ｃの間に、収納された電池１の電極１ａ、１ｂと装置に設けられた接続ピンを接続する接続部が設けられるとともに、ダイオードを使用して電流の逆流を防いでいる。４、５は接続部で狭い開口３ｂ、３ｃを介して装置（図示せず）に設けられた接続ピンと当接する。

【００２４】接続部５は電池収納ケース３の電池収納室３ｅに設けられている弾性接片５ａと一体的に形成されていて、電池１の負電極１ｂと弾性的に接続されている。又、接続部４は、弾性接片６ａで電池１の正電極１ａと弾性的に接続されている接続部材６とダイオード７を介して接続されている。

【００２５】本実施例においては第１実施例と同様に電極１ａ、１ｂの短絡及び電池収納ケース３の誤装填が防止できるとともに、複数の電池収納ケース３を並列接続して使用する場合に電池間に電位差が有つても低電圧の電池に電流が流入することがダイオード７によつて阻止されるため電池の発熱・爆発事故を防止できる。

【００２６】図５乃至図８は本発明の第３の実施例を示す。本実施例においては電池収納ケース３から突出した接点を設けるとともに同ケース３内に断続可能な接片を設け、同ケース３が正しく装填された場合にのみ電池１の電極に接続された接片と電池収納ケース３から突出した接点に接続された接片が接続して電流が流れるよう構成されている。

【００２７】２１、２２は電極用接点で電池収納ケース３の頂部に突出するよう設置されているが、図５に示すように電池収納ケース３の中央線に関して非対称の位置に設けられているため、逆装填されても接点２１、２２が装置側の接点と逆接続されることはない。

【００２８】電池収納ケース３の内部には図７及び図８に示すようにまず電池１の負電極１ｂと弾性的に接続され電極用接点２２と接続されている接続部材２７、及び弾性接片６ａで電池１の正電極１ａと弾性的に接続されている接続部材６が設けられている。

【００２９】また、電極用接点２１にその一端が固着され他端部が折曲端部２８ａを成していて同折曲端部２８ａからダイオード７を介して接片２９に接続されている接続部材２８が電池収納ケース３の内壁に固設されている。更に、接続部材６の折曲端部６ｂにその一端部の第一接片部２５ａが接触し接片２９にその他端部の第二接片部２５ｂが接触して電池１の正電極１ａと電池収納ケース３の電極用接点２１を接続状態とするための可動状の導体接片２５が設置されている。

【００３０】導体接片２５は付勢バネ２３に支持されている切換部材２４に固設されていて、電池収納ケース３を装置に装填しない状態では付勢バネ２３により導体接

MassagerPriorArt0000990

Petitioner Therabody Ex-1004, 1078

片２５の第一接片部２５ａと接続部材６の折曲端部６ｂの間と、第二接片部２５ｂと接片２９との間が引き離されているために、接続部材６及び接片２９とは接続されていず、電極用接点２１、２２を短絡状態に接続しても電流は流れず短絡は生じない。切換部材２４は電池収納ケース３の頂面を貫通するよう設けられた開口３ｆを介して外部接触可能となるよう配設されている。

【００３１】本実施例において電池収納ケース３を装置（図示せず）に装填するにあたつては、まず電池収納ケース３を正しい方向に挿入すると装置に固設されている装着方向規制ピン（図示せず）が電池収納ケース３の頂面に設けられた開口３ｆを貫通し切換部材２４を付勢バネ２３の付勢力に抗して図の下方へ押動する。尚、電池収納ケース３を誤つた方向にに装填しようとしても装着方向規制ピンが同ケース３の上面部に当接するため装填は不可能である。

【００３２】切換部材２４が図の下方に移動することによつて導体接片２５が同動し導体接片２５の第一・第二接片部２５ａ、２５ｂがそれぞれ接続部材６の折曲端部６ｂおよび接片２９と接触して、電池１の正電極１ａと電極用接点２１とが接続される。この時切換部材２４の着色された尾部２４ａが装着方向規制ピン（図示せず）に押動されて電池収納ケース３の段部３ｄから突出し、正電極部が接続状態になつたことを表示する。更に電池収納ケース３を装置に押入すると電極用接点２１、２２が装置側に固設された接点と接触し、導通がなされて装填が完了する。

【００３３】電池収納ケース３を装置から取り出すと装着方向規制ピンと切換部材２４との当接が解除されるため付勢バネ２３の付勢力によつて切換部材２４及び導体接片２５が図の上方に移動し、第一・第二接片部２５ａ、２５ｂと接続部材６のの折曲端部６ｂおよび接片２９の当接が解かれて電池１の正電極１ａと電極用接点２１とが接続されなくなる。

【００３４】本実施例においては前述のとおり電極１ａ、１ｂの短絡が防止され、誤装填による事故が防止されるとともに、ダイオード７を設けたため第２実施例と同様に複数の電池収納ケース３を並列接続して使用した場合に起り得る事故を防止できる。尚、ダイオード７にかえて電圧検出回路を設け、電池１の電圧が所定レベル以下に低下した時スイツチング回路によつて電極用接点２１と電池１の電極１ａの接続を絶つ構成としてもよい。

【００３５】図９乃至図１２は本発明の第４の実施例を示す。本実施例においては電池の電極と電池収納ケースの開口との間に遮蔽部材を設け、電池収納ケースの装置への装填時に遮蔽部材が退避して装填可能となるよう構成されている。

【００３６】３０は遮蔽部材で、一体的に成型されているピン３０ａによつて電池収納ケース３の頂面に設けられた開口３ｇに軸受けされて電池収納ケース３の開口３ｂ、３ｃを遮う位置と解放する位置の間を回動可能なよう軸支されている。遮蔽部材３０は電池収納ケース３の内壁に弾性部材３０ｃが当接し、指部３０ｂが同ケース３の外側壁部のうち段部３ｄを形成する部分、即ち後述するカメラ５０の収納方向規制部材５３と対面する部分に設けられた開口３ｈから突出して開口３ｈに対面する電池収納ケース３の段部３ｄを形成する外側壁部に当接して停止しており、この状態で同遮蔽部材３０は図１２（ａ）の如く電池収納ケース３の頂面の開口３ｂ、３ｃを遮蔽している。

【００３７】本実施例において電池収納ケース３をカメラ５０の電池室５１に装填するにあたつては、図９に示すカメラ５０の電池蓋５２を開放した後、電池収納ケース３の段部３ｄが電池室５１内部に設けられた収納方向規制部材５３に対面する方向、即ち段部３ｄを図の下方、頂面を図の左方に向けて電池室５１に挿入する。尚、電池収納ケース３は収納方向規制部材５３により、誤方向に装填されることはない。

【００３８】電池収納ケース３が収納方向規制部材５３に案内されて電池室５１に入れられる際、収納方向規制部材５３の斜面５３ａによつて遮蔽部材３０の指部３０ｂの突出部分が押され遮蔽部材３０は弾性片部３０ｃの付勢力に抗して時計方向に回動し、図１２（ｂ）に示す如く電池収納ケース３の頂面の開口３ｂ、３ｃを開放する。更に続けて電池収納ケース３を押入すると電池室５１内に設置された接続ピン１１、１２がそれぞれ開口３ｂ、３ｃに嵌入して電池１の電極１ａ、１ｂと当接し接続される。電池蓋５２を閉じることにより第１実施例と同様に付勢バネ（図示せず）の付勢力により接続ピン１１、１２が電極１ａ、１ｂに押しつけられた状態となり接続が維持される。

【００３９】電池収納ケース３を取り出すにあたつて電池蓋５２を開放すると付勢バネの付勢力によつて電池収納ケース３の一部が電池室５１より突出することも第１実施例と同様であるが、本実施例においては取出用凹陥部３ｉが設けられているので該凹陥部３ｉに指をあてがつて引き出すことができ、更に取出しが容易になつている。電池収納ケース３を取り出すと遮蔽部材３０は弾性片部３０ｃの弾性力による付勢力によつて反時計方向に回動し、指部３０ｂが開口３０ｈに対面する外側壁部に当接して停止し、図１２（ａ）に示すように開口３ｂ、３ｃを遮蔽する。従つて、本実施例においても電極１ａ、１ｂの短絡、電池収納ケース３の誤装填による事故を防止することができる。

【００４０】図１３乃至図１６は上記第４実施例の遮蔽部材の形状及び動作を異なるものとした変形例を示す。遮蔽部材は第４実施例と同様にその一部が電池収納ケース３の外側壁部のうち段部３ｄを形成する部分の開口３ｈより突出して停止しており、電池室内部に設けられた

MassagerPriorArt0000991

Petitioner Therabody Ex-1004, 1079

収納方向規制部材によつて突出部分が押されて遮蔽部材が退避し、電池収納ケース３頂面の開口を開放するよう構成されている。

【００４１】図１３に示す例において遮蔽部材３１、３２は対をなしており、一端部が負電極寄りの位置でピン３２ａによつて軸支されている部材３２が正電極１ａを、一端部が正電極寄りの位置でピン３１ａによつて軸支されている部材３１が負電極１ｂを遮蔽し、各々の遮蔽部分とピン３１ａ、３２ａとの中程で互いに交差しており該交差部分が開口３ｈより電池収納ケース３外へ突出して信号部３１ｂ、３２ｂを形成している（図１３（ａ）参照）。

【００４２】収納方向規制部材５３によつて信号部３１ｂ、３２ｂが押されると、遮蔽部材３１、３２はピン３１ａ、３２ａを中心としてそれぞれ反時計方向・時計方向へ回動して図１３（ｂ）に示すように電池１の電極１ａ、１ｂを開放する。収納方向規制部材５３との当接が解かれると遮蔽部材３１、３２は電池収納ケース３の内壁に当接している弾性片部３１ｃ、３２ｃの付勢力によつてそれぞれ時計方向・反時計方向に回動して当初位置に復帰し電極１ｂ、１ａを遮蔽する。

【００４３】図１４に示す例においては遮蔽部材３３、３４が対をなしており、それぞれの一端部が電極１ａ、１ｂを遮蔽し、中程においてピン３３ａ、３４ａによつて軸支され、他端部が外部へ突出している。外部へ突出した端部の一方に固定ピン３４ｄ、他方には二股カム面３３ｄが形成されており固定ピン３４ｄと二股カム面３３ｄが係合している。

【００４４】収納方向規制部材５３により遮蔽部材３３の信号部３３ｂが押されると二股カム面３３ｄに押動されて固定ピン３４が回動し遮蔽部材３３、３４がそれぞれ時計方向・反時計方向へ回動して電極１ａ、１ｂを開放する。収納方向規制部材５３との当接が解かれると弾性片部３１ｃ、３２ｃの付勢力により遮蔽部材３３が復動して当初位置に復帰し、二股カム面３３ｄによつて固定ピン３４ｄを押動して遮蔽部材３４が復帰する。

【００４５】図１５に示す例においては対をなす遮蔽部材３５、３６は共通軸３７において同軸的に軸支されておりそれぞれの一端部３５ｂ、３６ｂが信号部として突出し互いに停止している。収納方向規制部材５３により信号部３５ｂ、３６ｂが押されると遮蔽部材３５、３６がそれぞれ反時計方向・時計方向へ回動して電極１ｂ、１ａを開放する。収納方向規制部材５３との当接が解かれると弾性片部３５ｃ、３６ｃの付勢力によつて遮蔽部材３５、３６が復動して当初位置に復帰し、信号部３５ｂ、３６ｂが当接して停止する。

【００４６】図１６に示す例においては遮蔽部材３８は両端部でそれぞれ電極１ａ、１ｂを遮蔽しており中央部に腕部が設けられ該腕部の先端が突出して信号部３８ｂを成し、腕部を挟むように配設されている一対のピン３９、４０及び信号部３８ｂの突出している開口３ｈによつて腕部が規制されながら摺動するよう構成されている。

【００４７】収納方向規制部材５３によつて信号部３８ｂが押されると遮蔽部材３８はピン３９、４０に規制されながら摺動し両端部が電極１ａ、１ｂから退避して開放する。収納方向規制部材５３との当接が解かれると遮蔽部材３８はその両端部に形成された弾性片部３８ｃの付勢力によつて復動し一対のピン３９、４０によつて停止されて初位置に復帰する。

【００４８】図１７乃至図１９は本発明の第５実施例を示す。本実施例においては前述第４実施例と同様電池収納ケースと電池１の電極１ａ、１ｂとの間に遮蔽部材４１を設置するが、第４実施例と異なり装置（図示せず）に設置された接続ピン１１、１２によつて遮蔽部材４１が退避するように構成されている。

【００４９】図１７に示すように遮蔽部材４１は中央部で連結され両端部が二分割された形状を成しており、連結部分と両端部の間には開口４１ａ、４１ｂが形成されている。また、同遮蔽部材４１の連結部分の両端には一対のピン４１ｃ、４１ｄが固設され該ピン４１ｃ、４１ｄが収納されている二個の電池１と電池収納ケース３との間に形成される空間に嵌入することによつて遮蔽部材４１は電池１の電極１ａ、１ｂと電池収納ケース３の開口３ｂ、３ｃを遮蔽する位置に配設される。

【００５０】二分割された両端部の接続ピン１１、１２に当接する面はＶ字状溝を成しており、該Ｖ字状溝の底部で二分割されるようになつていて、二分割されたそれぞれの部分が逆方向の斜面４１ｅ、４１ｆ及び４１ｇ、４１ｈを成している。

【００５１】本実施例の電池収納ケース３を装置（図示せず）に装填すると、まず図１９（ａ）に示すように装置の接続ピン１１、１２が同ケース３の開口３ｂ、３ｃを貫通して遮蔽部材４１の二分割された両端部に当接する。次に図１９（ｂ）に示すように接続ピン１１、１２の先端Ｖ字状溝を成す斜面４１ｅ、４１ｆ及び４１ｇ、４１ｈを押しひろげて両側へ退避させ、接続ピン１１、１２が分割部分に嵌入し電池１の電極１ａ、１ｂに当接して接続がなさせてる。

【００５２】電池収納ケース３を取出すと接続ピン１１、１２が退避し、遮蔽部材４１は弾性力によつて二分割された部分が復帰して互いに当接して分割部分を閉じ、再度Ｖ字状溝を形成するが、本実施例に於いては図１９に示すように電池収納ケース３の開口３ｂ、３ｃに同ケース３の内側に臨む折曲部が設けられているためこの折曲部に斜面４１ｅ、４１ｆ及び４１ｇ、４１ｈが当接して停止し、電池１の電極１ａ、１ｂを遮蔽する。以上のように本実施例に於いても第４実施例同様電極の短絡を防止しできる。

【００５３】図２０乃至図２１は、前述第５実施例のう

Petitioner Therabody Ex-1004, 1080

ち遮蔽部材の形状及び動作を異なるものとした例を示す。遮蔽部材４３は中央部にピン４３ａが設けられ、このピン４３ａが電池収納ケース３の頂面の開口３ｂ、３ｃの中央部で軸受けされており、更に、遮蔽部材４３の両端にはそれぞれ反対方向に傾斜した斜面４３ｂ、４３ｃが形成されていて該斜面４３ｂ、４３ｃはそれぞれ開口３ｂ、３ｃに対面している。

【００５４】接続ピン１１、１２が開口３ｂ、３ｃを貫通して斜面４３ｂ、４３ｃに当接すると、斜面４３ｂ、４３ｃをなす両端部がそれぞれ反対方向に押され遮蔽部材４３はピン４３ａを中心として時計方向に回動し電極１ａ、１ｂから退避し、図２１（ｂ）に示すように接続ピン１１、１２が電極１ａ、１ｂ当接して接続がなされる。

【００５５】接続ピン１１、１２が退避すると遮蔽部材４３は電池収納ケース３の内壁に当接している弾性片部４３ｂの付勢力によつて反時計方向へ回動し、図２１（ａ）に示すように電池収納ケース３の頂面開口３ｂ、３ｃに設けられた折曲部に当接して停止し、電池１の電極１ａ、１ｂを遮蔽する。

【００５６】

【発明の効果】以上説明したように、本発明の電池収納ケースは、大容量をもち高性能であるが電極の短絡や電池の逆装填によつて爆発や装置の破壊等の事故の危険性のある電池を収納するものであつて、電池を収納ケースに収納して取り扱うことにより、電池をカメラその他の装置に装填して使用するとき、装填方向を間違えるなどの誤装填によつては電極の逆接続が起きるおそれがない。従つて、電池をこの電池収納ケースに収納して取り扱うときは、取り扱いに格別の注意を払わなくとも、爆発や装置の破壊等の事故発生の危険性はなく、一般消費者が安心して取り扱うことができる。

【図面の簡単な説明】

【図１】本発明の第１の実施例を示す分解斜視図。

【図２】同上実施例を装置の電池室に挿入する状態を示す縦断面図。

【図３】同上実施例の装填完了状態を示す縦断面図。

【図４】本発明の第２の実施例を示す縦断面図。

【図５】本発明の第３の実施例を示す分解斜視図。

【図６】同上実施例の縦断面図。

【図７】同上実施例の接片の配設状態を示す説明図。

【図８】同上実施例の接片の配設状態を示す説明図。

【図９】本発明の第４の実施例を使用する装置の電池室を示す部分切欠斜視図。

【図１０】同上実施例の外観斜視図。

【図１１】同上実施例の分解斜視図。

【図１２】同上実施例の横断面図。

【図１３】同上実施例の変形例を示す横断面図。

【図１４】同上実施例の別の変形例を示す横断面図。

【図１５】同上実施例の別の変形例を示す横断面図。

【図１６】同上実施例の別の変形例を示す横断面図。

【図１７】本発明の第５の実施例の内部を示す要部斜視図。

【図１８】同上実施例の内部を示す横断面図。

【図１９】同上実施例の部分縦断面図。

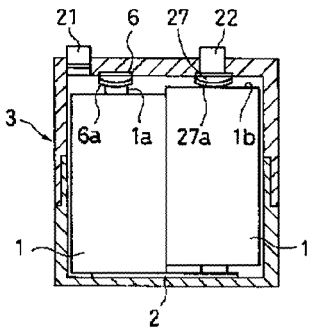
【図２０】同上実施例の変形例の内部を示す要部斜視図。

【図２１】同上実施例の変形例の部分縦断面図。

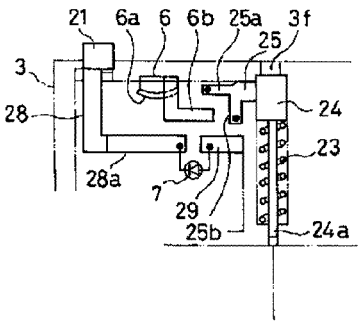
【符号の説明】

１　電池
１ａ、１ｂ　電極部
３　電池収納ケース
３ｂ、３ｃ　開口
３ｄ　段部
４、５　接続部
７　ダイオード
１０　装置
１０ｂ　逆入防止突起
１１、１２　接続ピン
２１、２２　電極用接点
３０、３１、３２、３３、３４、３５、３６、３８、４１、４３　遮蔽部材
５３　収納方向規制部材

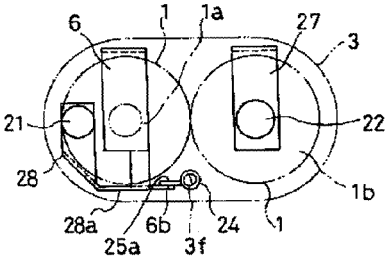
【図６】



【図７】



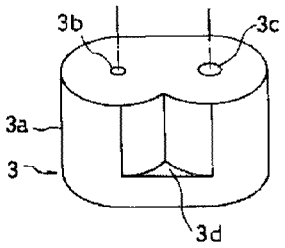
【図８】

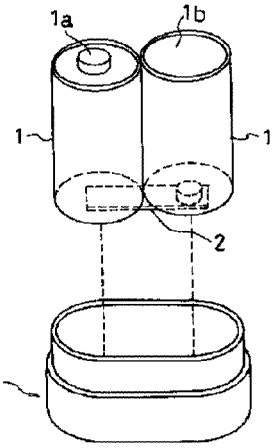


MassagerPriorArt0000993

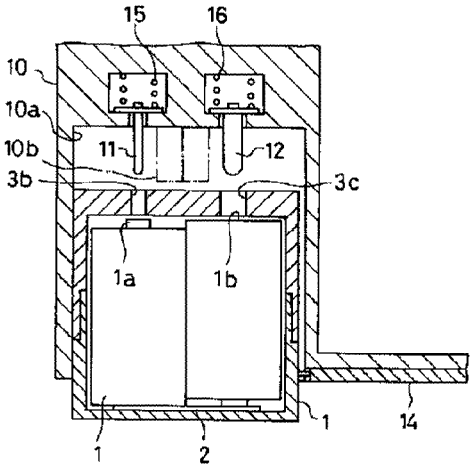
Petitioner Therabody Ex-1004, 1081

【図1】

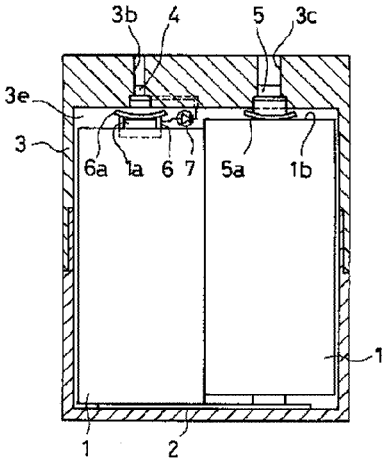




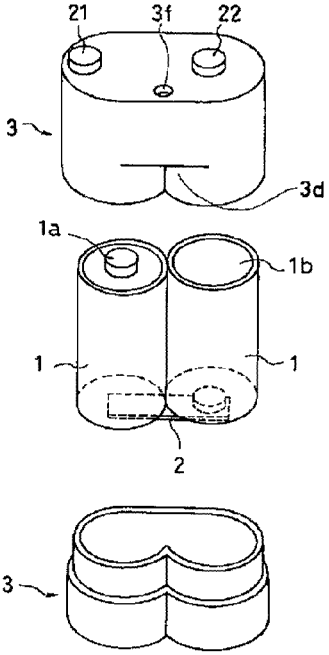
【図2】



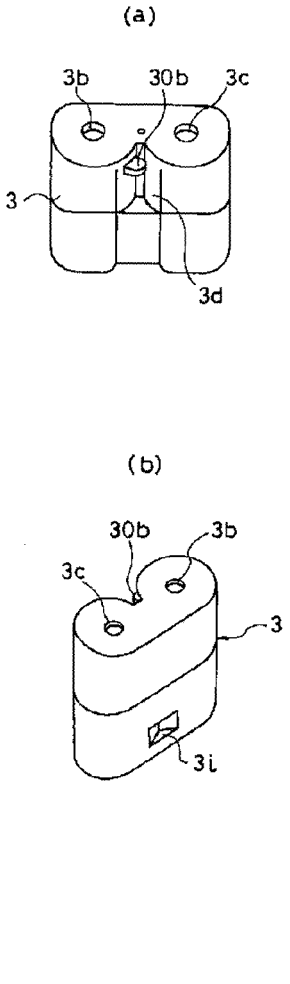
【図4】



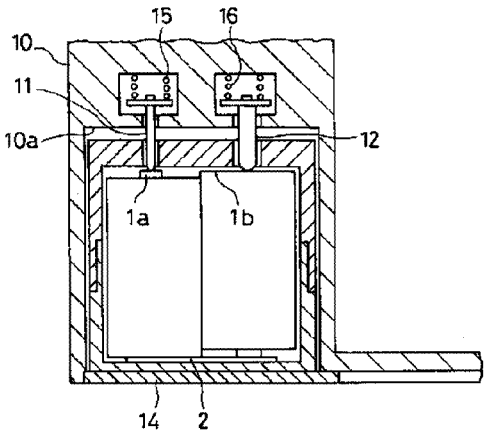
【図5】



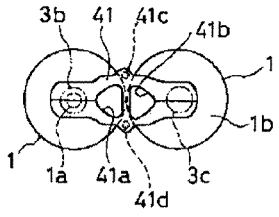
【図10】



【図3】



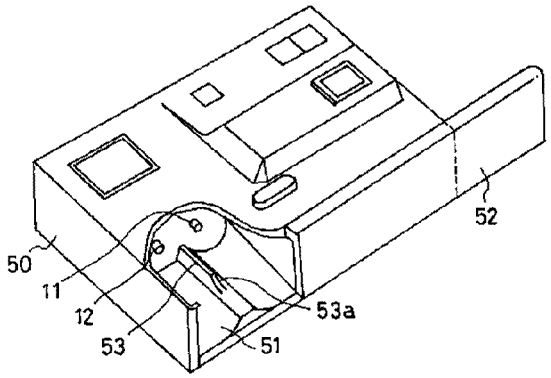
【図18】



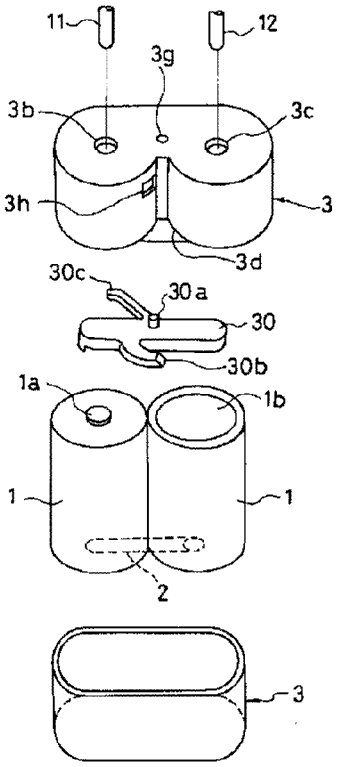
MassagerPriorArt0000994

Petitioner Therabody Ex-1004, 1082

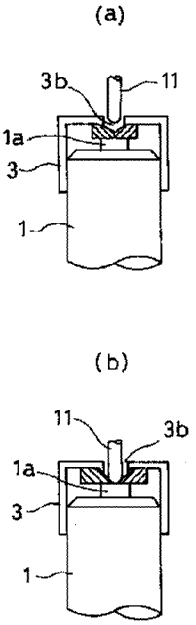
【図9】



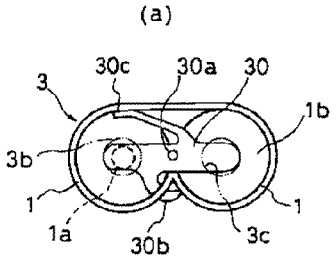
【図11】



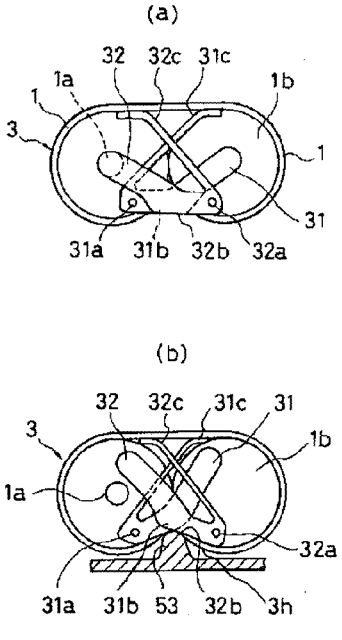
【図19】



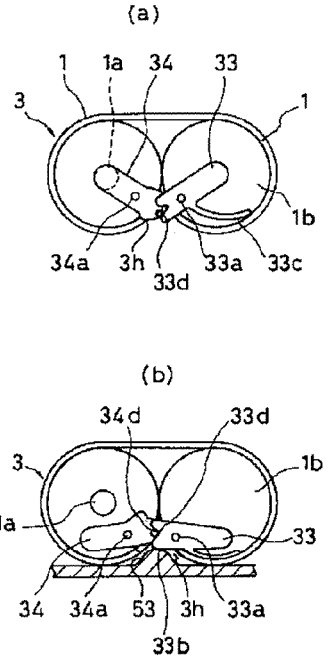
【図12】



【図13】

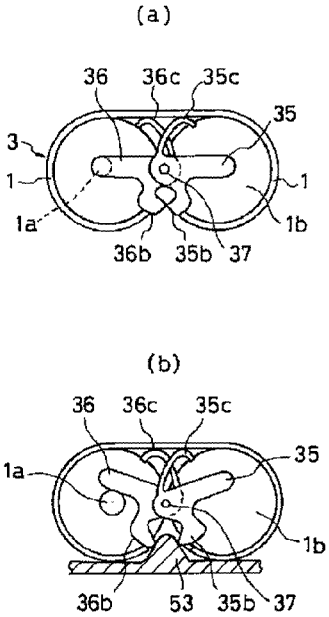


【図14】

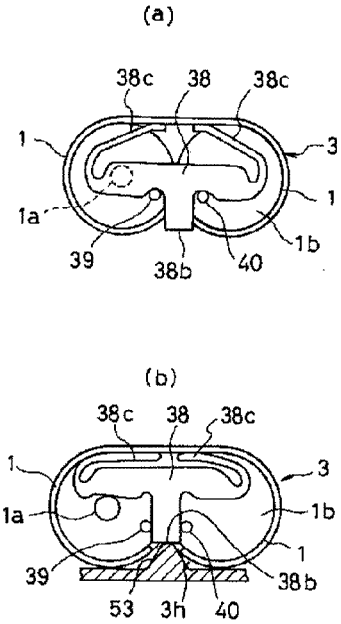


Petitioner Therabody Ex-1004, 1083

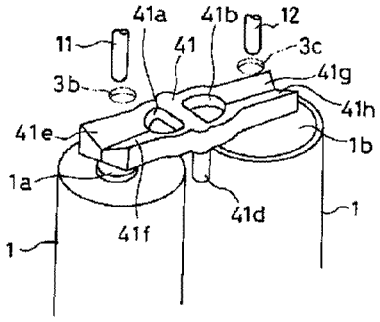
【図15】



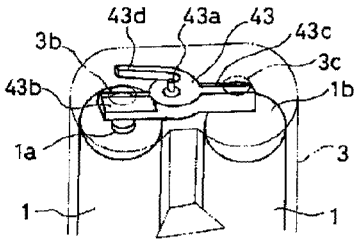
【図16】



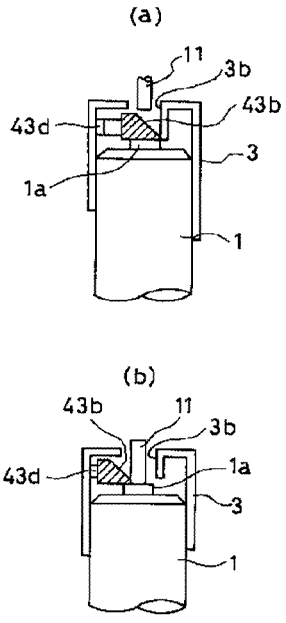
【図17】



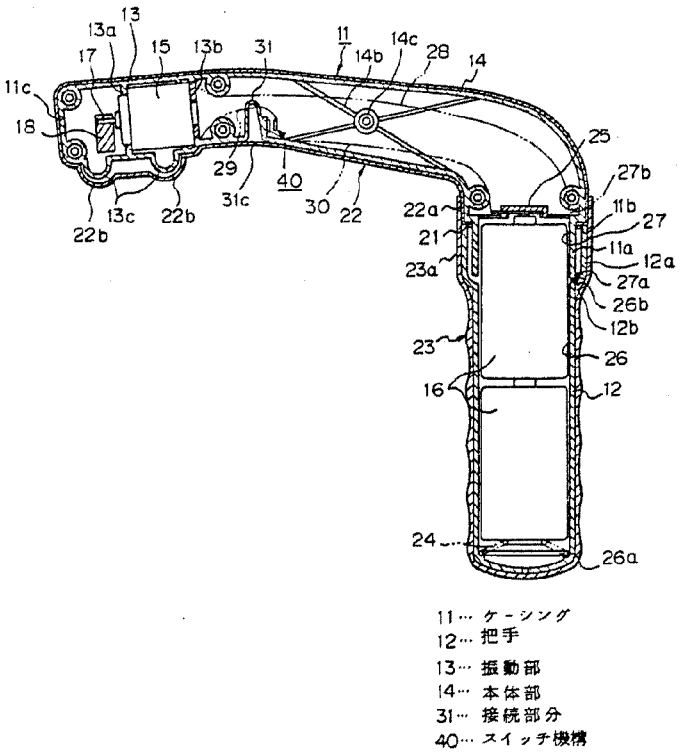
【図20】



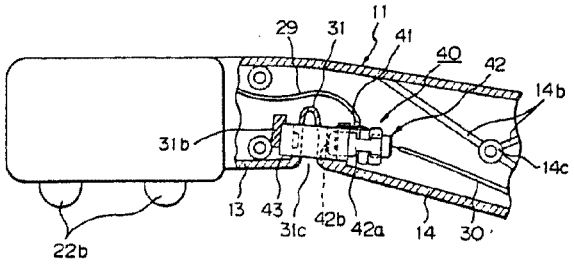
【図21】



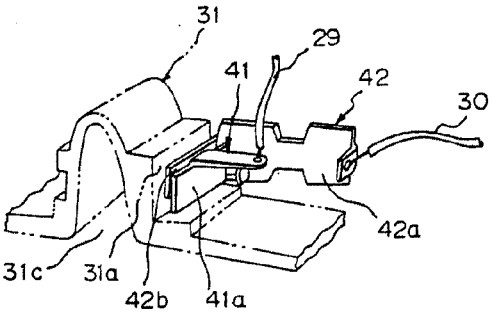
Petitioner Therabody Ex-1004, 1084



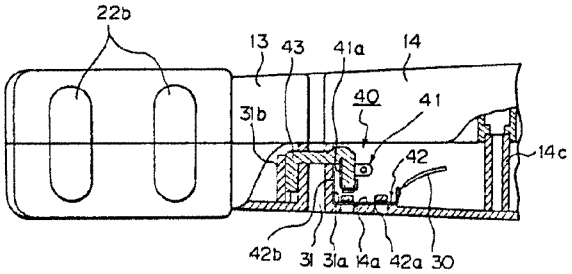
第 1 図



第 2 図



第 4 図



第 3 図　　1047

MassagerPriorArt0000026

Petitioner Therabody Ex-1004, 1085

Europäisches Patentamt
European Patent Office
Office européen des brevets

Patent Translate

Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

DESCRIPTION JPS6389158A

10 BACKGROUND OF THE INVENTION 1. Field of the Invention The present invention relates to a pine surger that vibrates and is pressed against an affected area. [Prior Art and Problems] Conventionally, as this type of Matsumatsu surger, an arm having a vibrating part to be pressed against the affected part is connected to a handle by a hinge, and a switch is activated by relative rotational displacement of the arm and the handle to cause vibration. It is known that parts vibrate. In other words, in use, when the vibration part is pressed against the affected part, the arm is rotationally displaced with respect to the handle in use, whereby the switch is turned on. However, in this conventional pine surger, the vibration of the vibrating part is transmitted to the handle, the vibration force applied to the affected part is weakened accordingly, and not only the pine surge effect cannot be sufficiently exerted, but also the handle vibrates. There is a problem that the hand holding the object feels uncomfortable. [Means for Solving Problems] In order to solve the above problems, the pine surger according to the present invention is integrally formed of a power source and a flexible material, and includes a vibrating portion and a main body portion that are pressed against an affected area. A casing having, a handle connected to the main body portion, a vibration source housed in the vibrating portion and driven by being supplied with electric power from the power source, and a switch for electrically connecting the power source and the vibration source. The casing is formed so as to be elastically deformed at the connecting portion between the vibrating portion and the main body portion, the switch mechanism is provided at the connecting portion, and the vibrating portion is bent by a predetermined amount or more with respect to the main body portion. It is characterized in that it is electrically conductive in the state. [Examples] The present invention will be described below with reference to illustrated examples. 1 to 4 show an embodiment of the present invention. In FIG. 1, a casing 11 and a handle 12 are made of polypropylene, for example, and the casing 11 has a vibrating portion 13 and a main body portion 14. A motor 15 is accommodated inside the vibrating portion 13, a switch mechanism 40 is accommodated inside the main body portion 14, and a dry battery 16 is accommodated inside the handle 12. An unbalanced portion jF118, which is eccentric to the shaft center, is attached to the output shaft 17 of the motor 15. When the switch R

MassagerPriorArt0000027

Petitioner Therabody Ex-1004, 1086

structure 40 is in the ONN state, the motor 15 is driven by being supplied with electric power from the dry battery 16, whereby the unbalance weight 18 rotates and the vibrating portion 13 of the casing 11 vibrates. The casing 11 and the handle 12 each have a cylindrical shape with a bottom, and an internal thread formed on the inner peripheral surface of the opening 12a of the handle 12 is screwed onto a male screw formed on the outer peripheral surface of the opening 11a of the casing 11. Are connected to each other by.

44 An O-ring 21 is inserted between the step 11b formed on the outer periphery of the base of the opening 11a of the casing 11 and the end surface of the opening 12g of the handle 12, whereby the inside and outside of the casing 11 and the handle 12 are watertight. Keep and shut off. The casing 11 and the handle 12 thus combined are covered with the first and second covers 22 and 23, which are cylindrical and have a bottom and are made of a flexible material such as polyvinyl chloride. The first cover 22 is in close contact with and covers the casing 11, and the opening 22g of this cover extends to the step portion flb of the casing opening 11a. On the other hand, the second cover 23 closely adheres to and covers the handle 12, and the opening 23a of this cover extends beyond the handle opening 12m to the outer peripheral surface of the opening 22m of the first cover 22 and closely adheres to this outer peripheral surface. And then fit. Thus, the inside and outside of the covers 22 and 23 are watertightly cut off, so that the insides of the casing 11 and the handle 12 are surely protected from the outside watertightness. The motor 15 is held by a pair of ribs 13a and 13b formed in the vibrating portion 13, and the output shaft 17 extends toward the bottom portion 11c of the casing 11. The vibrating portion 13 is formed with protrusions 1gc protruding outward, and the first cover 22 is formed with protrusions 22b corresponding to these protrusions 13c. The projections 13c and 22b are pressed against the affected area, and the vibration generated by the weight 18 is transmitted to the affected area via the projections. Two dry batteries 16 are accommodated in the handle 12 and connected in series.

0 The negative electrode of the dry battery 16 located in the lower part of the drawing abuts a spring 24 provided at the bottom of the handle 12, and the dry battery 16 located above The positive electrode contacts a contact fitting 25 provided at the base of the opening 11 a of the casing 11. The spring 24 is connected to a lower end portion 26a of a belt-shaped conductive member 26 provided along the inner wall of the handle 12, and an upper end portion 26b of the conductive member 26 is a hole formed at the base of the opening 12g of the handle 12. Lock to 12b. A conductive member 27 is provided on the inner wall surface 1 of the opening 11 a of the casing 11. The lower end portion 27a of the conductive member 27 is formed in an annular shape and is locked to the edge portion of the opening portion 11a to contact the upper end portion 26b of the conductive member 26 of the handle 12, and the upper end portion 27b of the conductive member 27 is located at the base portion of the opening portion 11a. Extend to. The lead wire 28 electrically connects the motor 15 to the upper end portion 27 b of the conductive member 27, that is, the negative electrode of the dry battery 16. On the other hand, the lead wires 29 and 30 electrically connect the motor 15 to the contact fitting 25, that is, the positive electrode of the dry battery 16 via the switch mechanism 40.

78 The switch mechanism 40 is provided at the connecting portion 31 between the vibrating portion 13 and the main body portion 14. The connecting portion 31 is thinner than the other

MassagerPriorArt0000028

Petitioner Therabody Ex-1004, 1087

portions, is formed by projecting inward of the casing 11 and is bent, and an opening 31c is formed below the connecting portion 31, and is provided over the entire width of the casing 11. The casing 11 is integrally molded from a flexible material, but substantially only the connecting portion 31 flexes. Therefore, when the vibration part 13 vibrates due to the rotation of the motor 15, this vibration is absorbed in the connection part 31 and is not transmitted to the main body part 14. Reinforcing ribs 14b and columns 14c are provided on the inner wall surface of the main body 14 to prevent the main body 14 itself from bending. 2 to 4 show the structure of the switch mechanism 40. The first contact fitting 41 is connected to the lead wire 29 on the motor 15 side, and the second contact fitting 42 is connected to the contact fitting 25 on the dry battery 16 side. It is connected to the lead wire 30. The second contact fitting 42 has a mounting portion 42 a fixed to the inner wall surface 14 a of the main body portion 14 and a contact portion 42 b that abuts on the outer surface 31 a of the connecting portion 31. The first contact metal fitting 41 is attached to a U-shaped mounting member 43 held between the connection portion 31 and the protrusion 31b provided in the vicinity thereof, and electrically connected to the contact portion 42b of the second contact metal fitting 42. It has a contact part 41a which can be contacted. When the vibrating part 13 is not pressed against the affected part of the user of the Matsumatsu surger, the connecting part 31 is in the illustrated state, and the contact parts 41a and 42b of the first and second contact fittings 41 and 42 are difficult to contact each other. Therefore, the switch nti40 is in the OFF state, and the motor 15 is stationary. On the other hand, when the protrusion 22b side of the vibrating portion 13 is pressed against the affected area, the connecting portion 31 is elastically deformed in the direction in which the opening 31c expands, whereby the second contact fitting 42 is displaced to the right in the figure, and the first contact fitting 42 is displaced. The 1st and 2nd contact point parts 41a and 42b electrically contact. As a result, the motor 15 rotates and the vibrating portion 13 vibrates. Next, when the vibrating part 13 is released from the affected part, the connection part 31 narrows the opening 31c and restores to the state shown in the drawing, and the contact parts 41a and 42b again pass N1 and the motor 15 stops. As described above, in this embodiment, the vibration part 13 is formed so as to be elastically deformed at the connection part 31 with respect to the main body part 14, and when the vibration part 13 is bent with respect to the main body part 14 by a predetermined amount or more, the switching device $ 140 is configured to be electrically conductive. Therefore, the switch Rt7A40 is not only reliable for 0N-OFF operation, but also has a simple structure and is inexpensive.

113 Further, substantially only the connecting portion 31 elastically bends and the other portions hardly bend, so that the vibration of the vibrating portion 13 is absorbed by the connecting portion 31 and is hardly transmitted to the main body portion 14. Therefore, most of the vibration of the vibrating part 13 is transmitted to the affected part, and the original effect of the pine surger is sufficiently exerted. Further, since the vibration of the handle 12 is small, it is easy to hold the handle 12. Further, since the casing 11 and the handle 12 are kept watertight and shielded from the outside to be assembled, the pine surge machine can be used in a place with a lot of water such as a bathroom. [Advantages of the Invention] As described above, according to the present invention, the vibration of the vibrating portion is

Petitioner Therabody Ex-1004, 1088

sufficiently large, the pine surge effect is increased, and the vibration of the handle is reduced to facilitate the handling. ..

124 Brief description of the drawings

125 FIG. 1 is a sectional view showing an embodiment of the present invention, FIG. 2 is a side view showing a switch mechanism, FIG. 3 is a horizontal sectional view of the switch mechanism, and FIG. 4 is positions of first and second contact fittings. It is a perspective view which shows a relationship. 11... Casing, 12... Grip, 13... Vibrating part, 14... Main body part, 15... Motor, 16... Dry battery, 18... Unbalance weight, 31... Connection part, 40...Switch mechanism. 2nd 3rd 1047 40th

MassagerPriorArt0000030

Petitioner Therabody Ex-1004, 1089

⑲日本国特許庁（JP）　⑪特許出願公開

⑫公開特許公報（A）　昭63－89158

⑤1Int.Cl.⁴	識別記号	庁内整理番号	⑬公開　昭和63年(1988)4月20日
A 61 H 23/02	3 3 2	7242－4C	

審査請求　有　発明の数 1　（全4頁）

⑤4発明の名称　マツサージ器

⑳特　願　昭61－233330
㉒出　願　昭61(1986)10月2日

⑦2発明者　松本　英夫　埼玉県浦和市太田窪1丁目22番7号
⑦1出願人　株式会社　安眠　群馬県太田市内ケ島1052
⑦4代理人　弁理士 青木　朗　外5名

明　細　書

1．発明の名称

マッサージ器

2．特許請求の範囲

1．電源と、可撓性材料から一体的に成形され、患部に押当てられる振動部と本体部を有するケーシングと、上記本体部に連結される把手と、上記振動部に収容され、上記電源から電力を供給されて駆動される振動源と、上記電源と振動源を電気的に接続させるためのスイッチ機構とを備え、上記ケーシングは、振動部と本体部の接続部分において弾性変形するように成形され、上記スイッチ機構は該接続部分に設けられ、振動部が本体部に対して所定量以上撓んだ状態において電気的に導通することを特徴とするマッサージ器。

3．発明の詳細な説明

〔産業上の利用分野〕

本発明は振動して患部に押当てられるマッサージ器に関する。

〔従来の技術および問題点〕

従来この種のマッサージ器として、患部に押当てられる振動部を有するアームが把手に対してヒンジにより連結され、アームと把手の相対回転変位によりスイッチが作動して振動部が振動するものが知られている。すなわち、使用に際しこのマッサージ器は、振動部を患部に押当てるとアームが把手に対して回転変位し、これによりスイッチがオン状態となる。ところがこの従来のマッサージ器は、振動部の振動が把手に伝わり、この分だけ患部に付与される振動力が弱められてマッサージ効果が充分発揮し得ないばかりでなく、把手が振動するためにこれを保持する手が不快感を覚えるという問題がある。

〔問題点を解決するための手段〕

上記問題点を解決するため、本発明に係るマッサージ器は、電源と可撓性材料から一体的に成形され、患部に押当てられる振動部と本体部を有するケーシングと、上記本体部に連結される把手と、

MassagerPriorArt0000836

Petitioner Therabody Ex-1004, 1090

上記振動部に収容され、上記電源から電力を供給されて駆動される振動源と、上記電源と振動源を電気的に接続させるためのスイッチ機構とを備え、上記ケーシングは、振動部と本体部の接続部分において弾性変形するように成形され、上記スイッチ機構は接続部分に設けられ、振動部が本体部に対して所定量以上撓んだ状態において電気的に導通することを特徴としている。

〔実施例〕

以下図示実施例により本発明を説明する。

第１図～第４図は本発明の一実施例を示す。第１図において、ケーシング１１と把手１２は例えばポリプロピレンから成形され、ケーシング１１は、振動部１３と本体部１４を有する。振動部１３の内部にはモータ１５が、本体部１４の内部にはスイッチ機構４０が、また把手１２内には乾電池１６がそれぞれ収容される。モータ１５の出力軸１７には軸心に対して偏心するアンバランス分銅１８が取付けられる。モータ１５は、スイッチ機構４０がＯＮ状態となった時、乾電池１６から電力を供給されて駆動され、これによりアンバランス分銅１８が回転してケーシング１１の振動部１３が振動する。

ケーシング１１と把手１２はそれぞれ有底筒状を有し、把手１２の開口部12a の内周面に形成された雌ねじをケーシング１１の開口部11a の外周面に形成された雄ねじに螺合させることにより相互に結合される。ケーシング１１の開口部11a の基部外周に形成された段部11b と把手１２の開口部12a の端面との間にはＯリング２１が介挿され、これによりケーシング１１および把手１２の内外は水密を保って遮断される。このようにして結合されたケーシング１１および把手１２は、例えばポリ塩化ビニル等の可撓性材料から成形される有底筒状の第１および第２カバー22，23により被覆される。第１カバー２２はケーシング１１に密着してこれを覆い、このカバーの開口部22a はケーシング開口部11a の段部11b まで延びる。一方、第２カバー２３は把手１２に密着してこれを覆い、このカバーの開口部23a は把手開口部12a を越えて第１カバー２２の開口部22a の外周面まで延び、この外周面に密着して嵌合する。しかしてこれらカバー22，23の内外は水密を保って遮断され、これによりケーシング１１および把手１２の内部は確実に外部から水密を保って保護される。

モータ１５は振動部１３内に形成された一対のリブ13a，13bによって保持され、出力軸１７はケーシング１１の底部11c に向けて延びる。振動部１３には外方へ突出する突起13c が形成され、また第１カバー２２ にはこれらの突起13cに対応して突起22b が形成される。これらの突起13c，22b の部分は患部に押当てられ、分銅１８により生じる振動はこの突起の部分を介して患部に伝達される。

乾電池１６は把手１２の中に２個収容されて直列に接続される。図中下方に位置する乾電池１６の負極は把手１２の底部に設けられたばね２４に当接し、上方に位置する乾電池１６の正極はケーシング１１の開口部11a の基部に設けられた接点金具２５に当接する。ばね２４は、把手１２の内壁に沿って設けられた帯状の導電部材２６の下端部26a に接続し、この導電部材２６の上端部 26b は把手１２の開口部12aの基部に穿設された孔12b に係止する。ケーシング１１の開口部11a の内壁面には導電部材２７が設けられる。導電部材２７の下端部27a は環状に成形され開口部11a の縁部に係止して把手１２の導電部材２６の上端部26b に接触し、導電部材２７の上端部27bは開口部11a の基部まで延びる。リード線２８は、モータ１５を導電部材２７の上端部27b 、すなわち乾電池１６の負電極に電気的に接続させる。一方リード線29，30はスイッチ機構４０を介してモータ１５を接点金具２５、すなわち乾電池１６の正電極に電気的に接続させる。

スイッチ機構４０は、振動部１３と本体部１４の接続部分３１に設けられる。この接続部分３１は、他の部分よりも薄肉であり、ケーシング１１の内方へ突出させて折曲成形され、下方には開口31c が形成されており、ケーシング１１の全幅に

MassagerPriorArt0000837

Petitioner Therabody Ex-1004, 1091

わたって設けられている。ケーシング１１は可撓性材料から一体的に成形されるが、実質的に撓むのは接続部分３１のみである。したがって、モータ１５の回転により振動部１３が振動する時、この振動は接続部分３１において吸収され、本体部１４には伝達されない。なお本体部１４の内壁面には補強用リブ14b および支柱14c が設けられ、本体部１４自体の撓みが防止されている。

第２図～第４図はスイッチ機構４０の構造を示す。第１接点金具４１はモータ１５側のリード線２９に接続され、第２接点金具４２は乾電池１６側の接点金具２５に連結されるリード線３０に接続される。第２接点金具４２は本体部１４の内壁面14a に固定される取付部42a と、接続部分３１の外面31a に当接する接点部42b とを有する。第１接点金具４１は、接続部分３１とこれに近接して設けられた突起31b とにより挟持されるコ字状の取付部材４３に取付けられ、第２接点金具４２の接点部42b に電気的に接触可能な接点部41a.を有する。

振動部１３が本マッサージ器の使用者の患部に押当てられない時、接続部分３１は図示状態にあり、第１および第２接点金具41，42の各接点部41a，42bは互に離間し、したがってスイッチ機構４０はＯＦＦ状態にあり、モータ１５は静止している。これに対し、振動部１３の突起22b 側が患部に押当てられる時、接続部分３１は開口31c が拡大する方向に弾性変形し、これにより第２接点金具４２が図中右方へ変位して第１および第２接点部41a，42bが電気的に接触する。この結果、モータ１５が回動し、振動部１３が振動する。次で、振動部１３を患部から解放すると、接続部分３１が開口31c を狭めて図示状態まで復元し、接点部41a，42bが再び離間してモータ１５が停止する。

このように本実施例は、振動部１３が本体部１４に対し接続部分３１において弾性変形するように形成され、振動部１３が本体部１４に対して所定量以上撓んだ状態においてスイッチ機構４０が電気的に導通するように構成されている。したがってスイッチ機構４０は、ON－OFF 動作が確実であるばかりでなく、構造が簡単であり、安価なものとなる。また実質的に接続部分３１のみにおいて弾性的に撓み、他の部分はほとんど撓まないため、振動部１３の振動は接続部分３１において吸収され、本体部１４へはほとんど伝達されない。このため、振動部１３の振動はほとんど患部へ伝わり、マッサージ器の本来の効果が充分発揮されるようになり、また把手１２の振動が小さいために把手１２の保持が容易になる。さらに、ケーシング１１と把手１２は水密を保って外部から遮断されて組立てられるので、本マッサージ器を浴室等のように水分の多い所で使用することが可能となる。

〔発明の効果〕

以上のように本発明によれば、振動部の振動が充分大きなものとなってマッサージ効果が増大し、また把手の振動が減少して取扱いが容易になるという効果が得られる。

4. 図面の簡単な説明

第１図は本発明の一実施例を示す断面図、

第２図はスイッチ機構を示す側面図、

第３図はスイッチ機構の水平断面図、

第４図は第１および第２接点金具の位置関係を示す斜視図である。

１１…ケーシング、

１２…把手、

１３…振動部、

１４…本体部、

１５…モータ、

１６…乾電池、

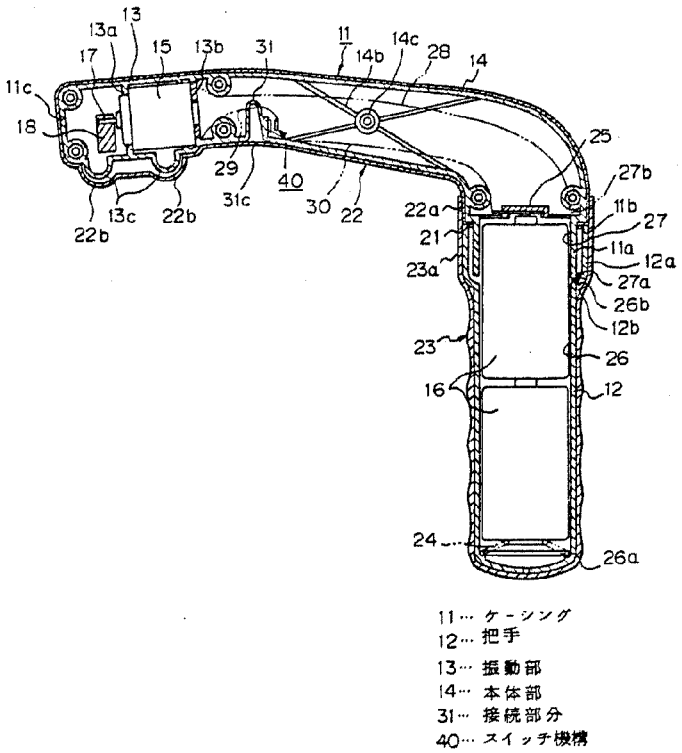
１８…アンバランス分銅、

３１…接続部分、

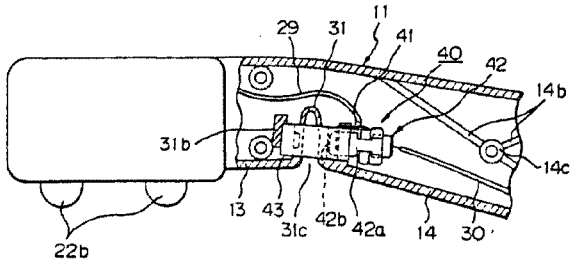
４０…スイッチ機構。

MassagerPriorArt0000838

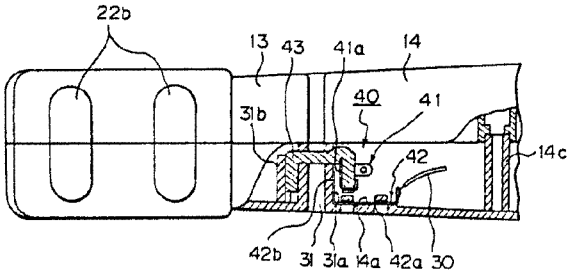
Petitioner Therabody Ex-1004, 1092



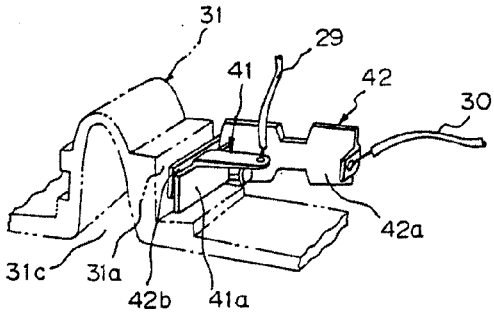
第 1 図



第 2 図



第 3 図　　1047



第 4 図

MassagerPriorArt0000839

Petitioner Therabody Ex-1004, 1093

[19] China National Intellectual Property Administration

[12] Utility Model Patent

[10] Grant No. CN 205251993 U

[45] Date of Grant May 25, 2016

[21] APPLICATION NUMBER
201521036680.9

[22] APPLICATION DATE 2015.12.04

[73] Patentee Shaanxi Dongfang Aviation Instrument Co., Ltd.

ADDRESS
Mailbox 57, South Zone of Hanzhong Economic Development Zone, Nanzheng County, Shaanxi Province, P. R. China 723102

[72] INVENTOR
Han Rui; Zhou Xiaoyu; Yuan Bo; He Baodong; Zhang Zhenping

[51] Int.Cl
A61Hl 23/02 (2006. 01)

Claims 1 page, Description 2 pages
Drawings 1 page

[54] UTILITY MODEL TITLE

Vibration Massager

[57] ABSTRACT

The present utility model relates to a vibration massager, wherein a ram is connected to a driving assembly via a piston link assembly provided at the upper end of a handle; the driving assembly comprises a driving motor connected with a control circuit module, a motor support and an eccentric shaft; the piston link assembly comprises a piston, a main pin and a link; the central shaft of the eccentric shaft is connected to the driving shaft of the driving motor via a flexible coupling, the driving motor is fixedly connected to the lower end of the motor support, an off-shaft of the eccentric shaft is connected to a small bearing embedded in one end of the link, the other end of the link is connected to one end of the piston via a main pin, the other end of the piston is threadably connected to the ram, and the outer cover of the piston link assembly has a shell; and the handle and the shell are threadably connected. Since the driving assembly is connected to the ram via the piston link mechanism, when the user uses the driving assembly, only one hand is required to hold the handle, the ram is aligned with the part to be massaged, and the power supply of the driving assembly is turned on to carry out the vibration massage. The utility model has simple structure, small

MERCHSOURCE, LLC - EX 1006

Petitioner Therabody Ex-1004, 1094

size and convenient operation.

Claims

1. A vibrating massager comprising a handle provided with a ram, characterized in that: a driving assembly is provided in the handle, and the ram is connected to the driving assembly via a piston link assembly provided at an upper end of the handle; the driving assembly comprises a driving motor connected with a control circuit module, a motor support and an eccentric shaft, wherein a central shaft of the eccentric shaft is inserted into the interior of the motor support, an off-shaft of the eccentric shaft extends out of the upper end of the motor support, an upper section of the central shaft of the eccentric shaft is connected to the motor support via a large bearing, a lower section of the central shaft of the eccentric shaft is connected to the driving shaft of the driving motor via a flexible coupling, a shell of the driving motor is fixedly connected to the lower end of the motor support, and the handle cover is outside the motor support and the driving motor; the piston link assembly comprises a piston, a main pin and a link, a small bearing is embedded in one end of the link, the small bearing is connected to an off-shaft of the eccentric shaft, the other end of the link is connected to one end of the piston via the main pin, and the other end of the piston is threadably connected to the ram; an outer cover of the piston link assembly is provided with a shell, a sliding hole is provided at a position of the shell corresponding to the piston, and the piston reciprocates in the sliding hole; the handle is threadedly connected to the shell.

2. The vibrating massager as claimed in claim 1, characterized in that the ram has a tip diameter of 35 mm.

3. The vibrating massager as claimed in claim 1, characterized in that the ram has a tip diameter of 20 mm.

4. The vibrating massager as claimed in claim 1, characterized in that the ram has a tip diameter of 10 mm.

Petitioner Therabody Ex-1004, 1096

Vibration Massager

Technical Field

[0001] The utility model relates to a health massage device, in particular to a vibration massager.

Background Art

[0002] A person's stay in a same posture for a long time during work and learning would have easily caused muscle fatigue in the shoulder, neck, lumbar spine and other parts. Ha mmering a sour muscle is an effective means of massage. However, existing ha mmering devices often require the user to ha mmer on his or her own to achieve massaging. This is not only laborious, but also less desirable for massaging.

Su mmary of the Utility Model

[0003] In view of this, the present utility model provides a vibration massager, which is not only simple in structure, but also can be held by one hand during use, and can place the knocking end at the part requiring massage, so as to effectively improve the massage effect, and is simple and convenient in operation.

[0004] The technical solution of the present utility model relates to a vibrating massager comprising a handle provided with a ram, characterized in that: a driving assembly is provided in the handle, and the ram is connected to the driving assembly via a piston link assembly provided at an upper end of the handle; the driving assembly comprises a driving motor connected with a control circuit module, a motor support and an eccentric shaft, wherein a central shaft of the eccentric shaft is inserted into the interior of the motor support, an off-shaft of the eccentric shaft extends out of the upper end of the motor support, an upper section of the central shaft of the eccentric shaft is connected to the motor support via a large bearing, a lower section of the central shaft of the eccentric shaft is connected to the driving shaft of the driving motor via a flexible coupling, a shell of the driving motor is fixedly connected to the lower end of the motor support, and the handle cover is outside the motor support and the driving motor; the piston link assembly comprises a piston, a main pin and a link, a small bearing is embedded in one end of the link, the small bearing is connected to an off-shaft of the eccentric shaft, the other end of the link is connected to one end of the piston via the main pin, and the other end of the piston is threadably connected to the ram; an outer cover of the piston link assembly is provided with a shell, a sliding hole is provided at a position of the shell corresponding to the piston, and the piston reciprocates in the sliding hole; the handle is threadedly connected to the shell.

[0005] Further, the ram has a tip diameter of 35 mm.

[0006] Further, the ram has a tip diameter of 20 mm.

[0007] Further, the ram has a tip diameter of 10 mm.

[0008] The advantageous effect of the present utility model is that since the driving assembly is connected to the ram via the piston link mechanism, when the user uses the driving assembly, only one hand is required to hold the handle, the ram is aligned with the part to be massaged, and the power supply of the driving assembly is turned on to carry out the vibration massage. The utility model has simple structure, small size and convenient operation.

Brief Description of the Drawings

[0009] FIG. 1 is a schematic diagram of the overall structure of the utility model.

[0010] FIG. 2 is a schematic diagram of a piston link assembly in the present utility model.

[0011] FIG. 3 is a schematic diagram of an eccentric shaft in the present utility model.

[0012] FIG. 4 is a schematic diagram of a driving assembly in the present utility model.

[0013] FIG. 5 is a schematic diagram showing the connection between the piston link assembly and the driving assembly in the present utility model.

[0014] FIG. 6 is a schematic view of a 20 mm ram in the present utility model.

[0015] FIG. 7 is a schematic view of a 10 mm ram in the present utility model.

[0016] In the figure: 1. shell, 2. cover plate, 3. bottom cover, 4. piston link assembly, 5. driving assembly, 6. handle, 7. a ram of 35 mm, 8. a ram of 20 mm, 9. a ram of 10 mm, 10. piston, 11. main pin, 12. link, 13. small bearing, 14. eccentric shaft, 15. large bearing, 16. flexible coupling, 17. motor support, 18. driving motor, 19. control circuit module.

Detailed Description of the Utility model

[0017] In order to enable those skilled in the art to better understand the technical solution of the present utility model, a further detailed description of the present utility model is provided below with reference to the accompanying drawings and specific embodiments.

[0018] As shown in FIG. 1, a vibration massager comprises a handle 6 in which a driving assembly 5 is provided, a piston link assembly 4 connected to the driving assembly 5 is provided on the upper end of the handle 6, and a ram is connected to the driving assembly 5 via the piston link assembly 4, thereby achieving the effect of vibration massage. It should be noted that the ram can be provided in a plurality of sizes, and in FIG. 1, the ram is a ram 7 with a tip diameter of 35 mm. The structure of

each component is described in detail:

[0019] as shown in FIG. 1, the driving assembly 5 is provided inside the handle 6, and includes a driving motor 18 connected to a control circuit module 19, a motor support 17, and an eccentric shaft 14. The control circuit module 19 is used to adjust the vibration frequency. As shown in FIGS. 3 and 4, the central axis of the eccentric shaft 14 is inserted inside the motor support 17, and the eccentric shaft 14 extends off-axis from the upper end of the motor support 17. As shown in FIGS. 1 and 4, the upper section of the central shaft of the eccentric shaft 14 is connected to a motor support 17 via a large bearing 15, and the lower section of the central shaft of the eccentric shaft 14 is connected to a driving shaft of a driving motor 18 via a flexible coupling 16. The shell of the driving motor 18 is fixedly connected to the lower end of the motor support 17. A power switch for controlling the driving motor 18 and an adjustment switch for adjusting the control circuit module 19 are provided on the handle 6.

[0020] As shown in FIGS. 1, 2, and 5, the piston link assembly 4 includes a piston 10, a main pin 11, and a link 12. One end of the link 12 is provided with a through hole, and a small bearing 13 is embedded inside the through hole. The small bearing 13 is intended for connection with an off-shaft of an eccentric shaft 14. The other end of the link 12 is connected to one end of the piston 10 via a main pin 11, and the other end of the piston 10 is fixed to the ram via a threaded connection. A shell 1 is housed outside the piston rod assembly 4. The shell 1 is provided with a sliding hole corresponding to the position of the piston 10, and the piston 10 reciprocates in the sliding hole.

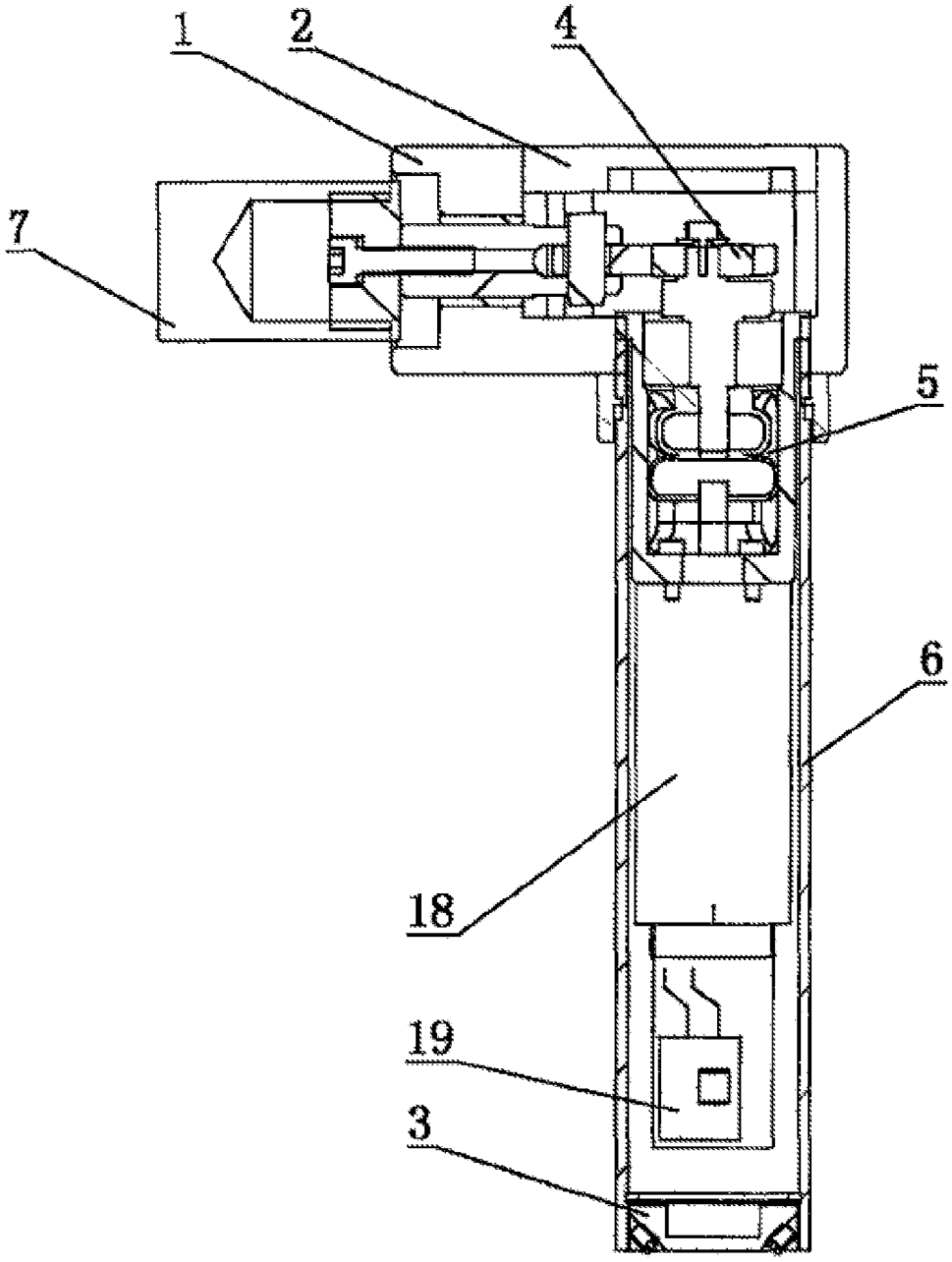
[0021] In the present utility model, the handle 6 and the shell 1 are threadably connected. In addition, in order to facilitate the adjustment and installation of the interior of the handle 6, a detachable cover plate 2 is provided on the upper top surface of the shell 1, and a detachable bottom cover 3 is provided on the lower bottom surface of the handle 6.

[0022] In order to adapt to the massage requirements of different parts, the ram has various specifications, such as: ram 7 with a tip diameter of 35 mm, as shown in FIG. 1: a ram 8 with a tip diameter of 20 mm, as shown in FIG. 6: a ram 9 with a tip diameter of 10 mm, as shown in FIG. 7.

[0023] In use of the present utility model, firstly, a ram of a suitable specification and a piston 10 are selected to be screwed tightly, secondly, a power switch is turned on and a vibration frequency is modulated at an acceptable speed, and finally, the massaging effect can be obtained by holding the handle 6 and placing the ram at the part needing to be massaged.

Petitioner Therabody Ex-1004, 1099

Accompanying Drawings of the Abstract



Petitioner Therabody Ex-1004, 1100

Accompanying Drawings of the Description

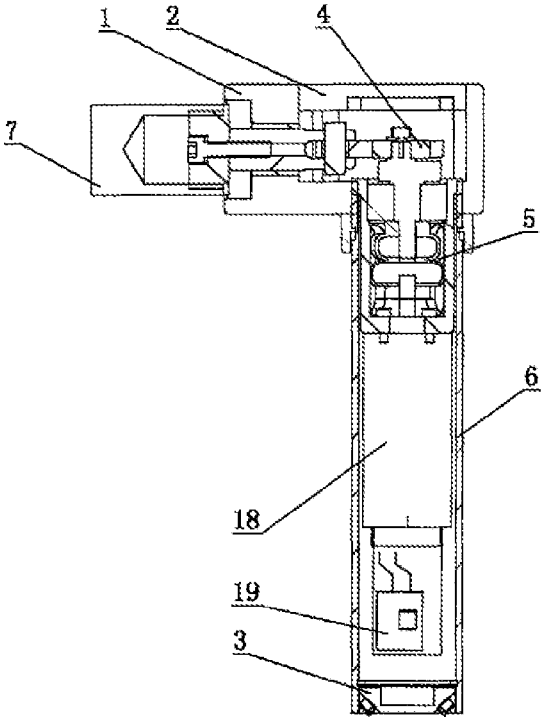


Fig. 1

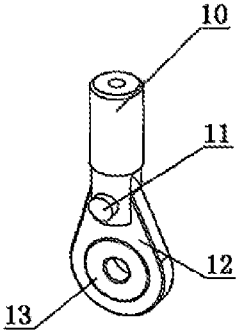


Fig. 2

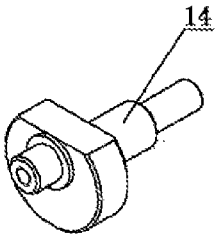


Fig. 3

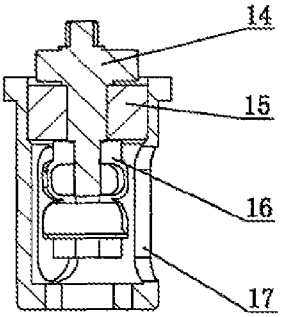


Fig. 4

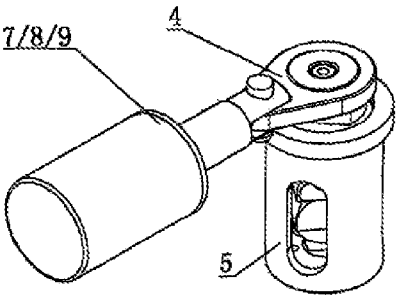


Fig. 5

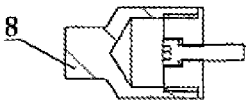


Fig. 6

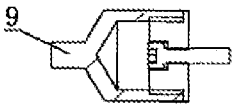


Fig. 7

Petitioner Therabody Ex-1004, 1101

REF.: **MERC.L0112**

UNITED STATES PATENT AND TRADEMARK OFFICE
VERIFICATION OF A TRANSLATION

I, the below named translator, hereby declare that:

My name and post office address are as stated below:

That I am knowledgeable in the English language and in the Chinese language, and that I believe the English translation of the attached Chinese document **CN205251993U** is true and complete.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and, that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Date
January 6, 2022

Full name of the translator:
Jie PENG

Signature of the translator:

Jie PENG

Post Office Address:
No. 55, Xiwaitaipingzhuang, Beixiaguan Substreet,
Haidian District, Beijing, P.R.China, 100081

(19)中华人民共和国国家知识产权局

(12)实用新型专利

(10)授权公告号 CN 205251993 U
(45)授权公告日 2016.05.25

(21)申请号 201521036680.9

(22)申请日 2015.12.04

(73)专利权人 陕西东方航空仪表有限责任公司
地址 723102 陕西省南郑县汉中经济开发区南区57号信箱

(72)发明人 韩睿 周晓瑜 袁博 何宝东 张振平

(51)Int.Cl.
A61H 23/02(2006.01)

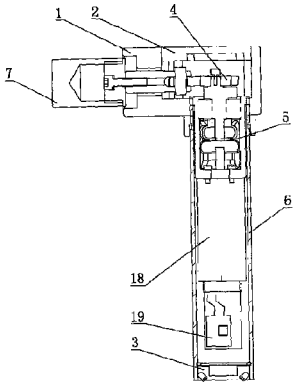
权利要求书1页 说明书2页 附图1页

(54)实用新型名称

振动按摩仪

(57)摘要

本实用新型为一种振动按摩仪，撞锤通过设置在把手上端的活塞连杆组件与驱动组件连接；驱动组件包括连有控制电路模块的驱动电机、电机支架和偏心轴；活塞连杆组件包括活塞、主销以及连杆；偏心轴的中轴通过柔性联轴器与驱动电机的驱动轴连接，驱动电机与电机支架的下端固定连接，偏心轴的偏轴与连杆一端内嵌的小轴承连接，连杆的另一端通过主销与活塞的一端连接，活塞的另一端与撞锤通过螺纹连接，活塞连杆组件的外部罩有壳体；把手与壳体之间通过螺纹连接。由于驱动组件通过活塞连杆机构与撞锤连接，所以用户在使用时，只需单手握持把手，将撞锤对准需要按摩的部位，打开驱动组件的电源即可进行振动按摩。本实用新型结构简单、小巧，操作方便。



CN 205251993 U

MERCHSOURCE, LLC - EX 1005

Petitioner Therabody Ex-1004, 1103

1.一种振动按摩仪，包括设有撞锤的把手，其特征在于：所述把手内设有驱动组件，所述撞锤通过设置在把手上端的活塞连杆组件与驱动组件连接；所述驱动组件包括连有控制电路模块的驱动电机、电机支架和偏心轴，所述偏心轴的中轴插接在电机支架的内部，偏心轴的偏轴伸出电机支架的上端，所述偏心轴中轴的上段通过大轴承与电机支架连接，偏心轴中轴的下段通过柔性联轴器与所述驱动电机的驱动轴连接，驱动电机的外壳与电机支架的下端固定连接，所述把手罩于电机支架和驱动电机的外部；所述活塞连杆组件包括活塞、主销以及连杆，所述连杆的一端内嵌有小轴承，该小轴承与所述偏心轴的偏轴连接，连杆的另一端通过主销与活塞的一端连接，活塞的另一端与所述撞锤通过螺纹连接，所述活塞连杆组件的外部罩有壳体，壳体对应活塞的位置设有滑孔，活塞在滑孔中做往复运动；所述把手与壳体之间通过螺纹连接。

2.如权利要求1所述的一种振动按摩仪，其特征在于：所述撞锤的端头直径为35mm。

3.如权利要求1所述的一种振动按摩仪，其特征在于：所述撞锤的端头直径为20mm。

4.如权利要求1所述的一种振动按摩仪，其特征在于：所述撞锤的端头直径为10mm。

Petitioner Therabody Ex-1004, 1104

振动按摩仪

技术领域

[0001] 本实用新型属于一种保健按摩设备，具体为一种振动按摩仪。

背景技术

[0002] 人们在工作和学习中会长时间保持同一个姿势，这样很容易造成肩颈、腰椎以及其他部位肌肉的疲劳。捶打酸困的肌肉是一种有效地按摩方式。但是，现有的捶打设备往往需要使用者依靠自己敲击才可达到按摩的目的。这样不仅费力，而且按摩效果不尽如人意。

实用新型内容

[0003] 有鉴于此，本实用新型提供一种振动按摩仪，不仅结构简单，而且在使用时可单手握持，将敲击端放置于需要按摩的部位即可，有效提高按摩效果，操作简单方便。

[0004] 本实用新型的技术方案是，一种振动按摩仪，包括设有撞锤的把手，其特征在于：所述把手内设有驱动组件，所述撞锤通过设置在把手上端的活塞连杆组件与驱动组件连接；所述驱动组件包括连有控制电路模块的驱动电机、电机支架和偏心轴，所述偏心轴的中轴插接在电机支架的内部，偏心轴的偏轴伸出电机支架的上端，所述偏心轴中轴的上段通过大轴承与电机支架连接，偏心轴中轴的下段通过柔性联轴器与所述驱动电机的驱动轴连接，驱动电机的外壳与电机支架的下端固定连接，所述把手罩于电机支架和驱动电机的外部；所述活塞连杆组件包括活塞、主销以及连杆，所述连杆的一端内嵌有小轴承，该小轴承与所述偏心轴的偏轴连接，连杆的另一端通过主销与活塞的一端连接，活塞的另一端与所述撞锤通过螺纹连接，所述活塞连杆组件的外部罩有壳体，壳体对应活塞的位置设有滑孔，活塞在滑孔中做往复运动；所述把手与壳体之间通过螺纹连接。

[0005] 进一步，所述撞锤的端头直径为35mm。

[0006] 进一步，所述撞锤的端头直径为20mm。

[0007] 进一步，所述撞锤的端头直径为10mm。

[0008] 本实用新型的有益效果在于，由于驱动组件通过活塞连杆组件与撞锤连接，所以用户在使用时，只需单手握持把手，将撞锤对准需要按摩的部位，打开驱动组件的电源即可进行振动按摩。本实用新型结构简单、小巧，操作方便。

附图说明

[0009] 图1是本实用新型的整体结构示意图。

[0010] 图2是本实用新型中活塞连杆组件示意图。

[0011] 图3是本实用新型中偏心轴示意图。

[0012] 图4是本实用新型中驱动组件示意图。

[0013] 图5是本实用新型中活塞连杆组件和驱动组件连接示意图。

[0014] 图6是本实用新型中20mm撞锤示意图。

[0015] 图7是本实用新型中10mm撞锤示意图。

Petitioner Therabody Ex-1004, 1105

[0016] 图中：1.壳体，2.盖板，3.底盖，4.活塞连杆组件，5.驱动组件，6.手把，7. 35mm撞锤，8. 20mm撞锤，9. 10mm撞锤，10.活塞，11.主销，12.连杆，13.小轴承，14.偏心轴，15.大轴承，16.柔性联轴器，17.电机支架，18.驱动电机，19.控制电路模块。

具体实施方式

[0017] 为了使本领域的技术人员更好地理解本实用新型的技术方案，下面结合附图和具体实施例对本实用新型作进一步的详细说明。

[0018] 如图1所示，一种振动按摩仪，包括内设有驱动组件5的把手6，把手6的上端设有与驱动组件5连接的活塞连杆组件4，撞锤则通过活塞连杆组件4与驱动组件5连接，以此实现振动按摩的效果。需要说明的是，撞锤可设置多个规格，图1中撞锤为端头直径35mm撞锤7。现对各部件的结构进行具体描述：

[0019] 如图1所示，驱动组件5设置在把手6的内部，包括与控制电路模块19连接的驱动电机18、电机支架17和偏心轴14。控制电路模块19用于调节振动频率。如图3和图4所示，偏心轴14的中轴插接在电机支架17的内部，偏心轴14的偏轴伸出电机支架17的上端。如图1和4所示，偏心轴14中轴的上段通过大轴承15与电机支架17连接，偏心轴14中轴的下段则通过柔性联轴器16与驱动电机18的驱动轴连接。驱动电机18的外壳与电机支架17的下端固定连接。在把手6上设有控制驱动电机18的电源开关，以及调节控制电路模块19的调节开关。

[0020] 如图1、图2以及图5所示，活塞连杆组件4包括活塞10、主销11以及连杆12。连杆12的一端设有通孔，通孔的内部内嵌有小轴承13。该小轴承13用于与偏心轴14的偏轴连接。连杆12的另一端通过主销11与活塞10的一端连接，活塞10的另一端与撞锤通过螺纹连接固定。在活塞连杆组件4的外部罩有壳体1。壳体1对应活塞10的位置设有滑孔，活塞10在滑孔中做往复运动。

[0021] 在本实用新型中，把手6与壳体1之间通过螺纹连接。此外，为了便于对把手6内部进行调整安装，故在壳体1的上顶面设置一个可拆卸的盖板2，在把手6的下底面设置一个可拆卸的底盖3。

[0022] 为了适应不同部位的按摩需求，故撞锤具有多种规格，如：端头直径为35mm撞锤7，如图1所示；端头直径为20mm撞锤8，如图6所示；端头直径为10mm撞锤9如图7所示。

[0023] 本实用新型在使用时，首先选定合适规格的撞锤与活塞10螺纹旋紧，其次开启电源开关并将振动频率调制可接受的速度，最后握持把手6将撞锤置于需要按摩的部位即可获得按摩效果。

Petitioner Therabody Ex-1004, 1106

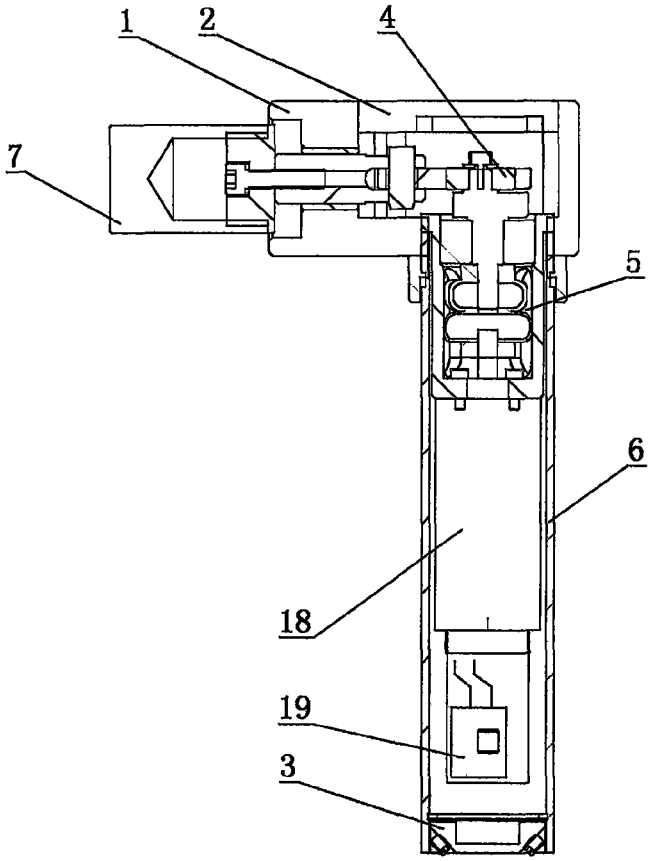


图1

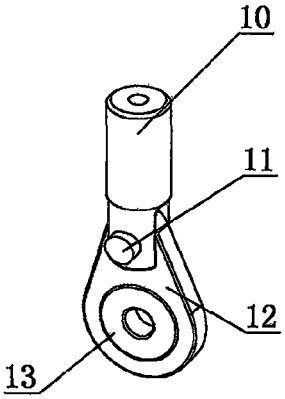


图2

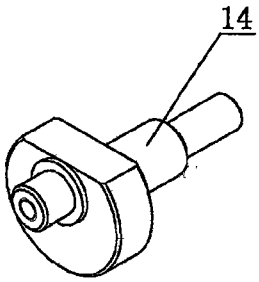


图3

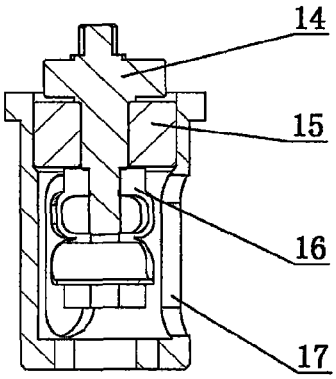


图4

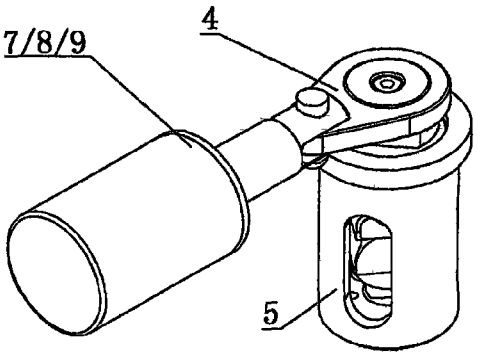


图5

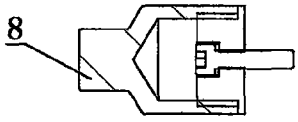


图6

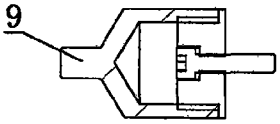


图7

Petitioner Therabody Ex-1004, 1107

Espacenet

Bibliographic data: CN210872953 (U) — 2020-06-30

Massage gun

Inventor(s): CHEN KE ± (陈克)

Applicant(s): CHEN KE ± (陈克)

Classification: **- international:** ***A61H15/00; A61H39/04; A61H7/00***
- cooperative:

Application number: CN201920893462U 20190613

Priority number(s): CN201920893462U 20190613

Abstract of CN210872953 (U)

The utility model belongs to the technical field of massage equipment. The massage gun, the gun comprises a gun body, a power supply, a motor, an eccentric transmission mechanism and a massage head are arranged in an inner cavity of the gun body; the power supply drives the motor to rotate; the motor drives the massage head to reciprocate back and forth through the eccentric transmission mechanism; the eccentric transmission mechanism comprises an eccentric wheel, a first bearing, a connecting rod and a piston connected with the massage head; the front end of the connecting rod is connected with a piston through a pin; a bearing hole is formed in the rear end of the connecting rod; a first bearing is mounted in the bearing hole; an eccentric wheel is mounted in the first bearing; an eccentric hole for mounting a main shaft of the motor is formed in the eccentric wheel; acting force among the eccentric wheel, the first bearing, the connecting rod and the piston is on the same plane, loss caused by vertical staggering of the acting force in the prior art is reduced, transmission efficiency is greatly improved, and in addition, the structure further has the advantages of being simple,compact, low in noise, low in cost and the like.

Petitioner Therabody Ex-1004, 1108

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

DESCRIPTION CN210872953U

a massage gun

[0001]

technical field

[0002]

The utility model belongs to the technical field of massage equipment, in particular to a massage gun.

[0003]

Background technique

[0004]

At present, the hand-held massage gun in use includes a casing, a motor, a driving device and a massage head. The motor drives the driving device to push the massage head to telescopically move. The massage head massages human muscles, acupoints and meridians to relax muscles, dredge meridians, Fatigue relief.

[0005]

The Chinese utility model patent with the application number of 201721296606X discloses a driving device for a massage gun, including a motor, a mounting plate, an eccentric wheel, a transmission rod, a guide seat, a massage shaft and a connecting pin. The mounting plate is provided with a shaft hole, and the mounting plate The lower surface of the motor is provided with a motor end cover, and the guide seat is arranged on the upper surface of one end of the mounting plate; the rotating shaft of the motor is connected and fixed with the eccentric hole of the eccentric wheel through the shaft hole on the mounting plate from bottom to top; the two ends of the transmission rod are fixed. The main connecting hole and the slave connecting hole are arranged on the part, the drive shaft on the eccentric wheel penetrates the rolling bearing in the main connecting hole to rotate together, and the connecting pin passes through the through hole on the massage shaft to cooperate with the rolling bearing in the slave connecting hole to rotate, and the transmission The rod and the massage shaft are hinged and driven together; the massage shaft horizontally passes through the guide seat and slides with the sliding bearing.

The above drives have the following problems:

[0006]

Petitioner Therabody Ex-1004, 1109

1、A transmission shaft is arranged on the center of the top surface of the eccentric wheel, which increases the upper and lower dimensions of the driving device, and the structure is not compact enough.

[0007]

2、The force of the eccentric wheel, the transmission rod and the massage shaft is not on the same level, and the transmission rod and the massage shaft are fixed on one side by the connecting pin, the force is uneven, the transmission efficiency is affected, and the noise is relatively large.

[0008]

SUMMARY OF THE INVENTION

[0009]

The purpose of the utility model is to provide a massage gun with simple and compact structure, high transmission efficiency, low noise, low cost and long service life.

[0010]

The purpose of this utility model is achieved in this way:

[0011]

A massage gun comprises a gun body, a power supply, a motor, an eccentric transmission mechanism and a massage head are arranged in the inner cavity of the gun body, the power supply drives the motor to rotate, and the motor drives the massage head to reciprocate back and forth through the eccentric transmission mechanism, and the eccentric transmission mechanism it includes an eccentric wheel, a first bearing, a connecting rod and a piston connected to the massage head. The front end of the connecting rod is connected to the piston through a pin, and the rear end of the connecting rod is provided with a bearing hole, and the first bearing is installed in the bearing hole, and the first bearing is installed in the bearing hole. An eccentric wheel is installed in a bearing, the eccentric wheel is provided with an eccentric hole for installing the main shaft of the motor, and the acting force among the eccentric wheel, the first bearing, the connecting rod and the piston is on the same plane.

[0012]

The utility model is further provided that the rear end of the piston is laterally provided with a rotation groove for placing the connecting rod, and the upper and lower side walls of the rotation groove are provided with pins.

[0013]

The utility model further provides that the gun body includes an upper casing, a lower casing, a front cover, a rear cover and a bottom cover, the upper casing is fixed on the lower casing by screws, and the front cover and the rear cover are respectively it is installed on the front and rear ends of the upper casing and the lower casing; the lower casing is provided with a handle extending downward, and the bottom of the handle is provided with a bottom cover, and the motor is fixed in the lower casing through a motor fixing plate.

[0014]

The utility model is further provided that the outer parts of the upper casing and the lower casing are provided with protective sleeves, and the protective sleeves are slidably installed on the gun body by means of clamping grooves and clamping strips.

[0015]

The utility model is further provided with an anti-skid cover on the handle.

[0016]

Petitioner Therabody Ex-1004, 1110

The utility model is further provided that the power source is a lithium battery.

[0017]

The utility model is further provided with a control system for controlling the motor at the rear end of the cavity of the gun body, the control system includes an integrated board and a control panel provided with a master control circuit, and the control panel is provided with a master switch, a power indicator light As well as the plus and minus buttons for controlling the speed of the motor, the integrated board is also integrated with a motor control circuit and a battery charging and discharging circuit.

[0018]

The utility model is further provided that the motor is an outer rotor motor.

[0019]

The utility model is further provided that the front end of the connecting rod is provided with a mounting hole, the mounting hole is provided with a sliding sleeve or a second bearing, and the connecting rod is provided with the pin through the sliding sleeve or the second bearing.

[0020]

The utility model is further provided with a balance hole on the eccentric wheel.

[0021]

Compared with the prior art, the present utility model has the following outstanding and beneficial technical effects:

[0022]

1、The acting force among the eccentric wheel, the first bearing, the connecting rod and the piston of the utility model is on the same plane, which reduces the loss of the acting force caused by the staggered up and down in the prior art, greatly improves the transmission efficiency, and in addition, the The structure also has the advantages of simple and compact, low noise and low cost.

[0023]

2、The upper and lower side walls of the rotating groove of the utility model are provided with pins, and the connecting rod acts on the piston through the two ends of the pins, and applies force symmetrically, with higher structural stability and greater strength; in addition, the rotating groove can make the connecting rod No interference occurs when turning on the piston.

[0024]

3、The outer parts of the upper casing and the lower casing of the utility model are provided with protective sleeves by means of clamping grooves and clamping strips, which can protect the gun body on the one hand; You can set up decorations such as LOGO.

[0025]

4、The integrated board of the utility model integrates a general control circuit, a motor control circuit and a battery charging and discharging circuit, which is convenient for manufacture and installation.

[0026]

Description of drawings

Petitioner Therabody Ex-1004, 1111

[0027]

Figure 1 is a schematic structural diagram of the present invention.

[0028]

Figure 2 is a schematic structural diagram of the eccentric transmission mechanism of the present invention.

[0029]

Figure 3 is an exploded view of the massage head and the eccentric transmission mechanism of the present invention.

[0030]

Figure 4 is an exploded view of other structures of the present invention except the massage head and the eccentric transmission mechanism.

[0031]

The meaning of the symbols in the figure:

[0032]

1-Gun body; 2-eccentric transmission mechanism; 3-massage head; 4-power supply; 5-motor; 6-integrated board; 7-control panel; 8-motor fixing plate;

[0033]

11-Upper shell; 12-Lower shell; 13-Front cover; 14-Rear cover; 15-Bottom cover; 16-Protective cover; 17-Clamping groove; 18-Clip; aisle;

[0034]

21- Eccentric wheel; 22 - first bearing; 23 - connecting rod; 24 - piston; 25 - bearing hole; 26 - eccentric hole; 27 - pin; 28 - turning groove; 29 - mounting hole, 30 - balance hole.

[0035]

Detailed ways

[0036]

Below in conjunction with specific embodiment, the utility model is further described:

[0037]

As shown in Figures 1-4, a massage gun includes a gun body 1, the gun body 1 includes an upper casing 11, a lower casing 12, a front cover 13, a rear cover 14 and a bottom cover 15. The upper casing The body 11 is fixed on the lower casing 12 by screws, and the front cover 13 and the rear cover 14 are respectively installed on the front and rear ends of the upper casing 11 and the lower casing 12 .

The lower casing 12 is provided with a handle extending downward, an anti-skid cover 19 is provided on the handle, and a bottom cover 15 is provided at the bottom of the handle. The power source 4 is a lithium battery and is arranged in the handle.

[0038]

Petitioner Therabody Ex-1004, 1112

The front cover 13 is provided with a sliding channel 20, the inner cavity of the gun body 1 is provided with a power source 4, a motor 5, an eccentric transmission mechanism 2 and a massage head 3, the motor 5 is an outer rotor motor, and the power source 4 drives The motor 5 rotates, and the motor 5 drives the spherical massage head 3 to reciprocate back and forth through the eccentric transmission mechanism 2. The eccentric transmission mechanism 2 includes an eccentric wheel 21, a first bearing 22, a connecting rod 23 and a piston 24 connected to the massage head 3. The sliding channel 20 is movably provided with a massage head 3 and a piston 24. The rear end of the piston 24 is laterally provided with a rotating groove 28 for placing the connecting rod 23. The upper and lower side walls of the rotating groove 28 are provided with pins 27. The front end of the connecting rod 23 is connected to the piston 24 through a pin 27, the rear end of the connecting rod 23 is provided with a bearing hole 25, the first bearing 22 is installed in the bearing hole 25, and the eccentric wheel 21 is installed in the first bearing 22. The eccentric wheel 21 is provided with an eccentric hole 26 for installing the main shaft of the motor, and the acting forces among the eccentric wheel 21 , the first bearing 22 , the connecting rod 23 and the piston 24 are on the same plane.

[0039]

In order to promote the rotation of the pin, the front end of the connecting rod 23 is provided with a mounting hole 29, the mounting hole 29 is provided with a sliding sleeve or a second bearing, and the connecting rod 23 is provided with the pin 27 through the sliding sleeve or the second bearing.

[0040]

In order to facilitate installation and fixation, the bottom of the eccentric wheel 21 extends outward with a first limit edge, and the bottom of the bearing hole 25 is provided with a second limit edge. The eccentric wheel 21 is installed to the first bearing from bottom to top The inner hole of 22 is limited by the first limiting edge. The first bearing 22 is installed into the bearing hole 25 from top to bottom and limited by the second limiting edge. The eccentric wheel 21 is also provided with There are balancing holes 30 for balancing the center of gravity of the eccentric.

[0041]

The present invention further provides that a protective cover 16 is provided on the outside of the upper shell 11 and the lower shell 12 , the protective cover 16 is provided with a clip 18 , and the upper shell 11 or the lower shell 12 is provided with a protective cover 16 . A snap groove 17 , the front cover is provided with a guide port corresponding to the snap groove 17 , and the protective sleeve 16 is slidably installed on the gun body 1 .

[0042]

The utility model is further provided that, the rear end of the inner cavity of the gun body 1 is provided with a control system for controlling the motor 5, the control system includes an integrated board 6 provided with a general control circuit and a control panel 7, and the control panel 7 is provided with a The main switch, the battery indicator and the plus and minus buttons to control the speed of the motor 5.

The integrated board 6 is also integrated with a motor control circuit and a battery charging and discharging circuit.

[0043]

The above-mentioned embodiments are only preferred embodiments of the present invention, and are not intended to limit the scope of protection of the present invention. Therefore: all equivalent changes made according to the structure, shape and principle of the present invention shall be covered by the present invention. within the scope of protection of the utility model.

Petitioner Therabody Ex-1004, 1113

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

CLAIMS CN210872953U

1.

A massage gun, comprising a gun body (1), a power supply (4), a motor (5), an eccentric transmission mechanism (2) and a massage head (3) are arranged in the inner cavity of the gun body (1), the power supply (4) The motor (5) is driven to rotate, and the motor (5) drives the massage head (3) to reciprocate back and forth through the eccentric transmission mechanism (2), wherein the eccentric transmission mechanism (2) comprises an eccentric wheel (21), a first A bearing (22), a connecting rod (23) and a piston (24) connected to the massage head (3), the front end of the connecting rod (23) is connected to the piston (24) through a pin (27), the connecting rod (23) A bearing hole (25) is opened at the rear end of the bearing hole (25), a first bearing (22) is installed in the bearing hole (25), an eccentric wheel (21) is installed in the first bearing (22), and an eccentric wheel (21) is provided on the There is an eccentric hole (26) for installing the main shaft of the motor, and the acting force among the eccentric wheel (21), the first bearing (22), the connecting rod (23) and the piston (24) is on the same plane.

2.

A massage gun according to claim 1, characterized in that: the rear end of the piston (24) is laterally provided with a rotation groove (28) for placing the connecting rod (23), and the upper and lower side walls of the rotation groove (28) A pin (27) is pierced through it.

3.

A massage gun according to claim 1 or 2, characterized in that: the gun body (1) comprises an upper casing (11), a lower casing (12), a front cover (13), and a rear cover (14)) and a bottom cover (15), the upper casing (11) is fixed on the lower casing (12) by screws, and the front cover (13) and the rear cover (14) are respectively mounted on the upper casing (11) and the lower casing (12). The front and rear ends of the lower casing (12); the lower casing (12) is provided with a handle extending downward, and the bottom of the handle is provided with a bottom cover (15), and the motor is fixed to the lower casing by a motor fixing plate (8) inside the body (12).

4.

A massage gun according to claim 3, characterized in that: a protective cover (16) is provided on the outside of the upper casing (11) and the lower casing (12), and the protective cover (16) passes through a card The slot (17) and the clip (18) are slidably installed on the gun body (1).

5.

The massage gun according to claim 3, wherein a non-slip cover (19) is provided on the handle.

6.

Petitioner Therabody Ex-1004, 1114

A massage gun according to claim 1, characterized in that: the power source (4) is a lithium battery.

7.

A massage gun according to claim 6, characterized in that: the rear end of the inner cavity of the gun body (1) is provided with a control system for controlling the motor (5), and the control system includes an integrated circuit provided with a general control circuit. The board (6) and the control panel (7), the control panel (7) is provided with a master switch, a power indicator light and an addition and subtraction button for controlling the speed of the motor (5); the integrated board (6) is also integrally integrated with a motor Control circuit and battery charging and discharging circuit.

8.

A massage gun according to claim 1, characterized in that: the motor (5) is an outer rotor motor.

9.

A massage gun according to claim 1, characterized in that: the front end of the connecting rod (23) is provided with a mounting hole (29), the mounting hole (29) is provided with a sliding sleeve or a second bearing, the connecting rod (23) is provided with a mounting hole (29) The rod (23) is provided with said pin (27) through a sliding sleeve or a second bearing.

10.

A massage gun according to claim 1, characterized in that: the eccentric wheel (21) is further provided with a balance hole (30).

Petitioner Therabody Ex-1004, 1115

(19)中华人民共和国国家知识产权局

(12)实用新型专利

(10)授权公告号 CN 210872953 U
(45)授权公告日 2020.06.30

(21)申请号 201920893462.9

(22)申请日 2019.06.13

(73)专利权人 陈克
地址 321302 浙江省金华市永康市西城街道大徐村1弄20号

(72)发明人 陈克

(74)专利代理机构 北京科家知识产权代理事务所(普通合伙) 11427
代理人 宫建华

(51)Int.Cl.
A61H 39/04(2006.01)
A61H 7/00(2006.01)
A61H 15/00(2006.01)

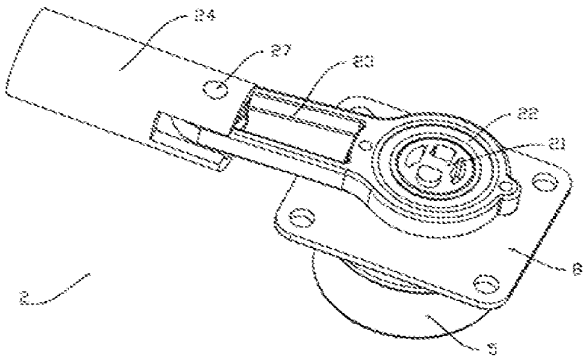
权利要求书1页 说明书3页 附图4页

(54)实用新型名称

一种按摩枪

(57)摘要

本实用新型属于按摩设备技术领域，特指一种按摩枪，包括枪体，枪体内腔设置有电源、电机、偏心传动机构和按摩头，所述电源驱动电机转动，电机通过偏心传动机构带动按摩头做前后往复运动，所述偏心传动机构包括偏心轮、第一轴承、连杆以及连接按摩头的活塞，所述连杆的前端通过销连接活塞，所述连杆的后端开设有轴承孔，轴承孔内安装有第一轴承，第一轴承内安装有偏心轮，所述偏心轮上开设有安装电机主轴的偏心孔，所述偏心轮、第一轴承、连杆以及活塞之间的作用力在同一平面上，减少了现有技术中作用力因上下交错而产生的损失，大大提高了传动效率高，另外所述结构还具有简单紧凑、噪音低、成本低等优点。



CN 210872953 U

Petitioner Therabody Ex-1004, 1116

1.一种按摩枪，包括枪体(1)，枪体(1)内腔设置有电源(4)、电机(5)、偏心传动机构(2)和按摩头(3)，所述电源(4)驱动电机(5)转动，电机(5)通过偏心传动机构(2)带动按摩头(3)做前后往复运动，其特征在于：所述偏心传动机构(2)包括偏心轮(21)、第一轴承(22)、连杆(23)以及连接按摩头(3)的活塞(24)，所述连杆(23)的前端通过销(27)连接活塞(24)，所述连杆(23)的后端开设有轴承孔(25)，轴承孔(25)内安装有第一轴承(22)，第一轴承(22)内安装有偏心轮(21)，所述偏心轮(21)上开设有安装电机主轴的偏心孔(26)，所述偏心轮(21)、第一轴承(22)、连杆(23)以及活塞(24)之间的作用力在同一平面上。

2.根据权利要求1所述的一种按摩枪，其特征在于：所述活塞(24)的后端横向开设有放置连杆(23)的转动槽(28)，转动槽(28)上下两侧壁上穿设有销(27)。

3.根据权利要求1或2所述的一种按摩枪，其特征在于：所述枪体(1)包括上壳体(11)、下壳体(12)、前盖(13)、后盖(14)以及底盖(15)，所述上壳体(11)通过螺钉固定在下壳体(12)上，所述前盖(13)、后盖(14)分别安装在上壳体(11)和下壳体(12)的前后端；所述下壳体(12)向下延伸设置有手把，手把底部设置有底盖(15)，所述电机通过电机固定板(8)固定在下壳体(12)内。

4.根据权利要求3所述的一种按摩枪，其特征在于：所述上壳体(11)和下壳体(12)的外部设置有保护套(16)，所述保护套(16)通过卡接槽(17)和卡条(18)的方式滑动安装在枪体(1)上。

5.根据权利要求3所述的一种按摩枪，其特征在于：所述手把上设置有防滑套(19)。

6.根据权利要求1所述的一种按摩枪，其特征在于：所述电源(4)为锂电池。

7.根据权利要求6所述的一种按摩枪，其特征在于：所述枪体(1)内腔后端设置有控制电机(5)的控制系统，所述控制系统包括设置有总控电路的集成板(6)和控制面板(7)，控制面板(7)上设置有总开关、电量显示灯以及控制电机(5)速度的加减按键；所述集成板(6)上还一体集成有电机控制电路以及电池充放电电路。

8.根据权利要求1所述的一种按摩枪，其特征在于：所述电机(5)为外转子电机。

9.根据权利要求1所述的一种按摩枪，其特征在于：所述连杆(23)的前端设置有安装孔(29)，安装孔(29)设置有滑套或者第二轴承，所述连杆(23)通过滑套或者第二轴承设置有所述销(27)。

10.根据权利要求1所述的一种按摩枪，其特征在于：所述偏心轮(21)上还设有平衡孔(30)。

Petitioner Therabody Ex-1004, 1117

一种按摩枪

技术领域

[0001] 本实用新型属于按摩设备技术领域，特指一种按摩枪。

背景技术

[0002] 目前，使用的手持式按摩枪包括壳体、电机、驱动装置和按摩头，所述电机带动驱动装置推动按摩头伸缩移动，按摩头按摩人体肌肉、穴位和经络，起到放松肌肉、疏通经络、缓解疲劳的作用。

[0003] 申请号为201721296606X的中国实用新型专利公开了一种按摩枪的驱动装置，包括电机、安装板、偏心轮、传动杆、导向座、按摩轴和连接销，安装板上设有轴孔，安装板的下表面上设有电机端盖，导向座设置在安装板一端的上表面上；电机的转轴由下向上穿过安装板上的轴孔与偏心轮的偏心孔连接固定；传动杆的两端部上设有主连接孔和从连接孔，偏心轮上的传动轴穿入主连接孔体内的滚动轴承配合转动，连接销穿过按摩轴上的通孔与从连接孔体内的滚动轴承配合转动，传动杆与按摩轴铰接一起传动；按摩轴水平穿过导向座与滑动轴承配合滑动。上述驱动装置存在以下问题：

[0004] 1、偏心轮顶面中心上设有传动轴，增加了驱动装置的上下尺寸，结构不够紧凑。

[0005] 2、偏心轮、传动杆和按摩轴的作用力不在一个水平面上，且传动杆和按摩轴通过连接销单侧固定，受力不均匀，影响传动效率，并且噪音比较大。

发明内容

[0006] 本实用新型的目的是提供一种结构简单紧凑、传动效率高、噪音低、成本低、寿命长的按摩枪。

[0007] 本实用新型的目的是这样实现的：

[0008] 一种按摩枪，包括枪体，枪体内腔设置有电源、电机、偏心传动机构和按摩头，所述电源驱动电机转动，电机通过偏心传动机构带动按摩头做前后往复运动，所述偏心传动机构包括偏心轮、第一轴承、连杆以及连接按摩头的活塞，所述连杆的前端通过销连接活塞，所述连杆的后端开设有轴承孔，轴承孔内安装有第一轴承，第一轴承内安装有偏心轮，所述偏心轮上开设有安装电机主轴的偏心孔，所述偏心轮、第一轴承、连杆以及活塞之间的作用力在同一平面上。

[0009] 本实用新型进一步设置有，所述活塞的后端横向开设有放置连杆的转动槽，转动槽上下两侧壁上穿设有销。

[0010] 本实用新型进一步设置有，所述枪体包括上壳体、下壳体、前盖、后盖以及底盖，所述上壳体通过螺钉固定在下壳体上，所述前盖、后盖分别安装在上壳体和下壳体的前后端；所述下壳体向下延伸设置有手把，手把底部设置有底盖，所述电机通过电机固定板固定在下壳体内。

[0011] 本实用新型进一步设置有，所述上壳体和下壳体的外部设置有保护套，所述保护套通过卡接槽和卡条的方式滑动安装在枪体上。

Petitioner Therabody Ex-1004, 1118

[0012] 本实用新型进一步设置有，所述手把上设置有防滑套。

[0013] 本实用新型进一步设置有，所述电源为锂电池。

[0014] 本实用新型进一步设置有，所述枪体内腔后端设置有控制电机的控制系统，所述控制系统包括设置有总控电路的集成板和控制面板，控制面板上设置有总开关、电量显示灯以及控制电机速度的加减按键，所述集成板上还一体集成有电机控制电路以及电池充放电电路。

[0015] 本实用新型进一步设置有，所述电机为外转子电机。

[0016] 本实用新型进一步设置有，所述连杆的前端设置有安装孔，安装孔设置有滑套或者第二轴承，所述连杆通过滑套或者第二轴承设置有所述销。

[0017] 本实用新型进一步设置有，所述偏心轮上还设有平衡孔。

[0018] 本实用新型相比现有技术突出且有益的技术效果是：

[0019] 1、本实用新型的偏心轮、第一轴承、连杆以及活塞之间的作用力在同一平面上，减少了现有技术中作用力因上下交错而产生的损失，大大提高了传动效率高，另外所述结构还具有简单紧凑、噪音低、成本低等优点。

[0020] 2、本实用新型的转动槽上下两侧壁上穿设有销，连杆通过销的两端作用在活塞上，对称施力，结构稳定性更高、强度更大；另外，转动槽可以使连杆在活塞上转动时不发生干涉。

[0021] 3、本实用新型上壳体和下壳体的外部通过卡接槽和卡条的方式设置有保护套，一方面保护枪身；另一方面可以遮挡上壳的螺钉，美观大方；同时保护壳上还可以设置LOGO等装饰物。

[0022] 4、本实用新型的集成板一体集成有总控电路、电机控制电路以及电池充放电电路，方便制造和安装。

附图说明

[0023] 图1是本实用新型的结构示意图。

[0024] 图2是本实用新型偏心传动机构的结构示意图。

[0025] 图3是本实用新型按摩头和偏心传动机构的爆炸图。

[0026] 图4是本实用新型除了按摩头和偏心传动机构之外其他结构的爆炸图。

[0027] 图中标号所表示的含义：

[0028] 1-枪体；2-偏心传动机构；3-按摩头；4-电源；5-电机；6-集成板；7-控制面板；8-电机固定板；

[0029] 11-上壳体；12-下壳体；13-前盖；14-后盖；15-底盖；16-保护套；17-卡接槽；18-卡条；19-防滑套；20-滑动通道；

[0030] 21-偏心轮；22-第一轴承；23-连杆；24-活塞；25-轴承孔；26-偏心孔；27-销；28-转动槽；29-安装孔，30-平衡孔。

具体实施方式

[0031] 下面结合具体实施例对本实用新型作进一步描述：

[0032] 如图1-4所示，一种按摩枪，包括枪体1，所述枪体1包括上壳体11、下壳体12、前盖

Petitioner Therabody Ex-1004, 1119

13、后盖14以及底盖15，所述上壳体11通过螺钉固定在下壳体12上，所述前盖13、后盖14分别安装在上壳体11和下壳体12的前后端。所述下壳体12向下延伸设置有手把，所述手把上设置有防滑套19，手把底部设置有底盖15，所述电源4为锂电池并设置在手把内。

[0033] 所述前盖13开设有有滑动通道20，所述枪体1内腔设置有电源4、电机5、偏心传动机构2和按摩头3，所述电机5为外转子电机，所述电源4驱动电机5转动，电机5通过偏心传动机构2带动球形按摩头3做前后往复运动，所述偏心传动机构2包括偏心轮21、第一轴承22、连杆23以及连接按摩头3的活塞24，所述滑动通道20内活动设置有按摩头3和活塞24，所述活塞24的后端横向开设有放置连杆23的转动槽28，转动槽28上下两侧壁上穿设有销27，所述连杆23的前端通过销27连接活塞24，所述连杆23的后端开设有轴承孔25，轴承孔25内安装有第一轴承22，第一轴承22内安装有偏心轮21，所述偏心轮21上开设有安装电机主轴的偏心孔26，所述偏心轮21、第一轴承22、连杆23以及活塞24之间的作用力在同一平面上。

[0034] 为了促进销的转动，所述连杆23的前端设置有安装孔29，安装孔29设置有滑套或者第二轴承，所述连杆23通过滑套或者第二轴承设置有所述销27。

[0035] 为了方便安装固定，所述偏心轮21底部向外延伸有第一限位边，所述轴承孔25的底部设置有第二限位边，所述偏心轮21从下往上安装到第一轴承22的内孔内并通过第一限位边限位，所述第一轴承22的从上往下安装到轴承孔25内并通过第二限位边限位，所述偏心轮21上还设有平衡孔30，用于平衡偏心轮的重心。

[0036] 本实用新型进一步设置有，所述上壳体11和下壳体12的外部设置有保护套16，所述保护套16上设置有卡条18，上壳体11或者下壳体12上设置有卡接槽17，所述前盖上设置有卡接槽17对应的导向口，保护套16滑动安装在枪体1上。

[0037] 本实用新型进一步设置有，所述枪体1内腔后端设置有控制电机5的控制系统，所述控制系统包括设置有总控电路的集成板6和控制面板7，控制面板7上设置有总开关、电量显示灯以及控制电机5速度的加减按键。所述集成板6上还一体集成有电机控制电路以及电池充放电电路。

[0038] 上述实施例仅为本实用新型的较佳实施例，并非依此限制本实用新型的保护范围，故：凡依本实用新型的结构、形状、原理所做的等效变化，均应涵盖于本实用新型的保护范围之内。

Petitioner Therabody Ex-1004, 1120

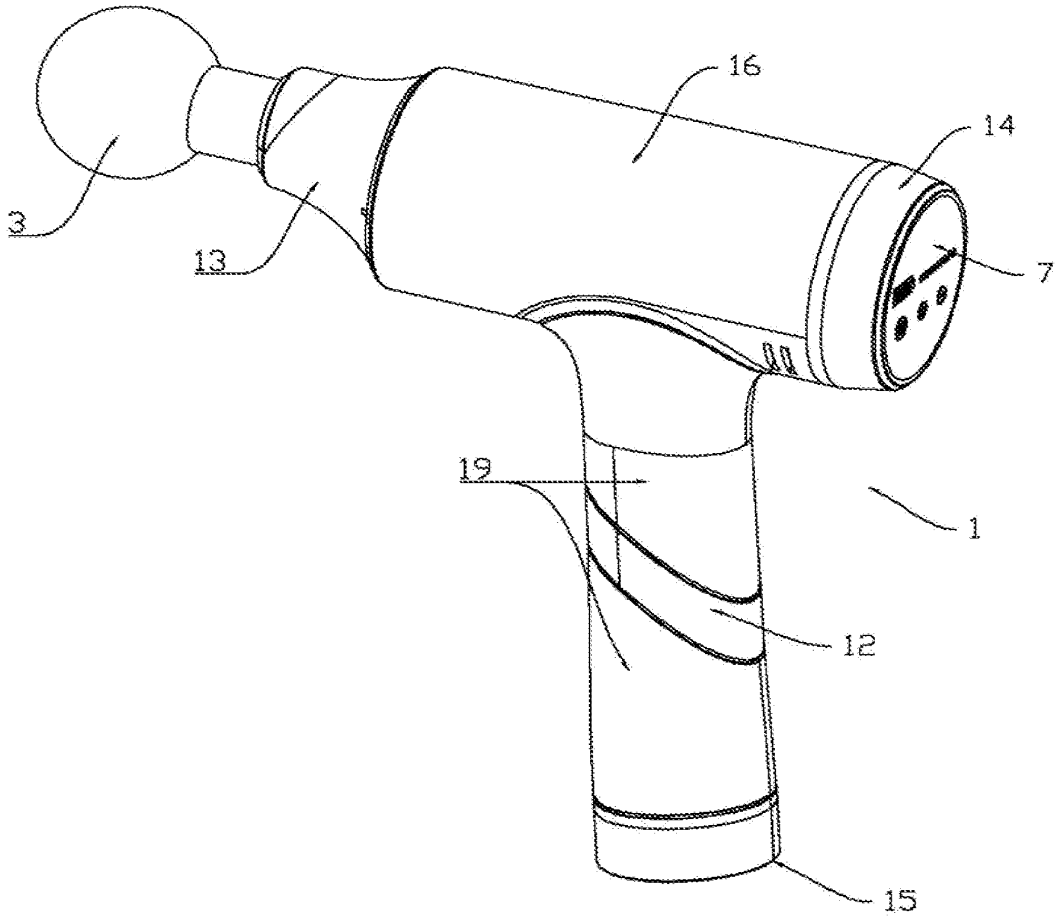


图1

Petitioner Therabody Ex-1004, 1121

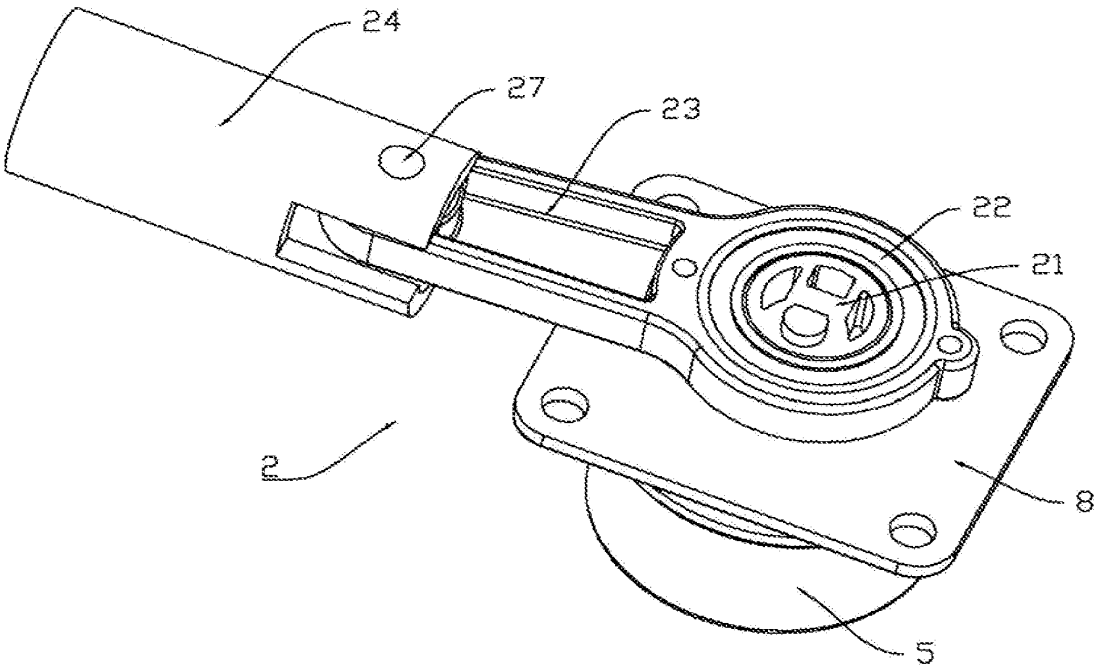


图2

Petitioner Therabody Ex-1004, 1122

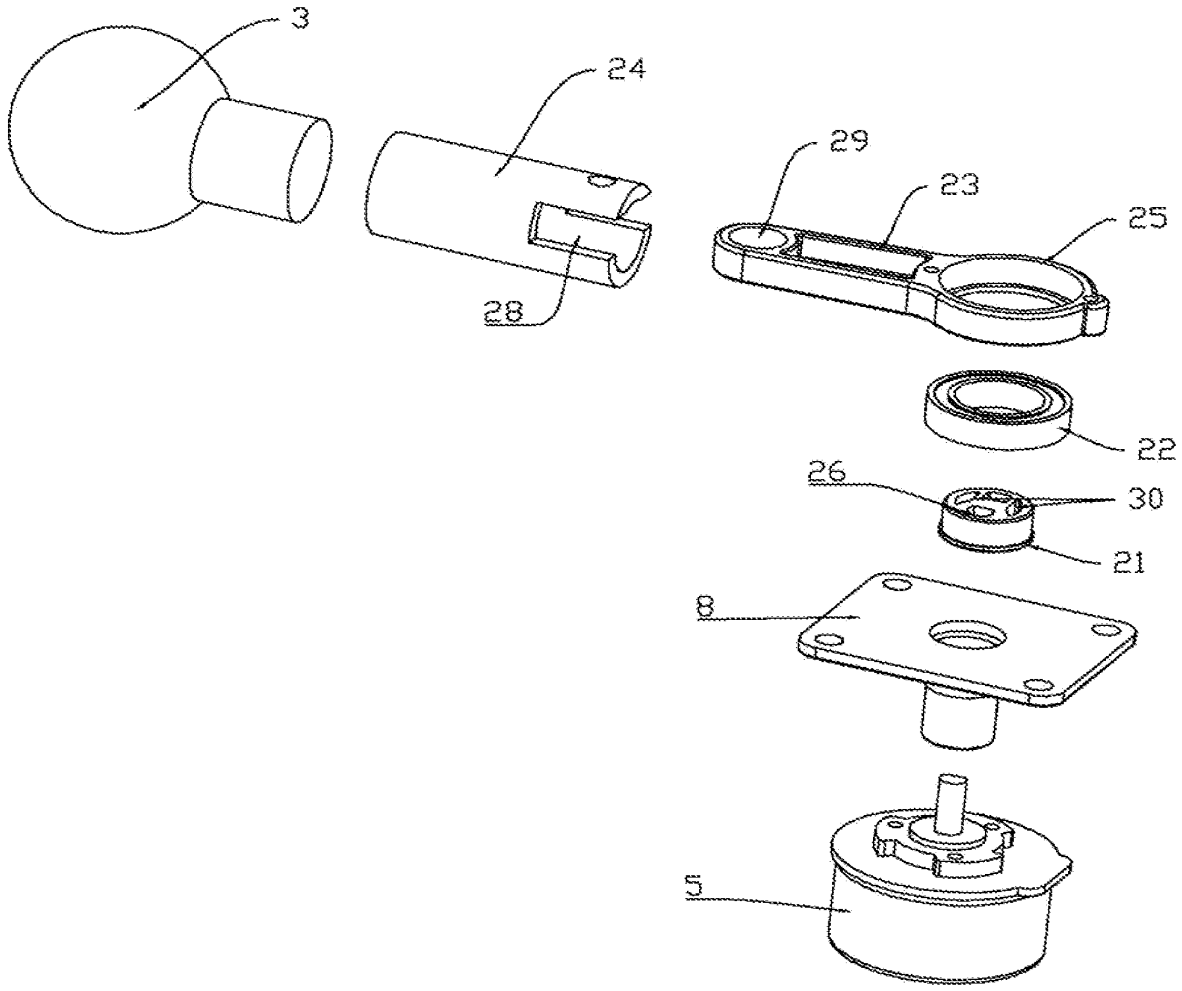


图3

Petitioner Therabody Ex-1004, 1123

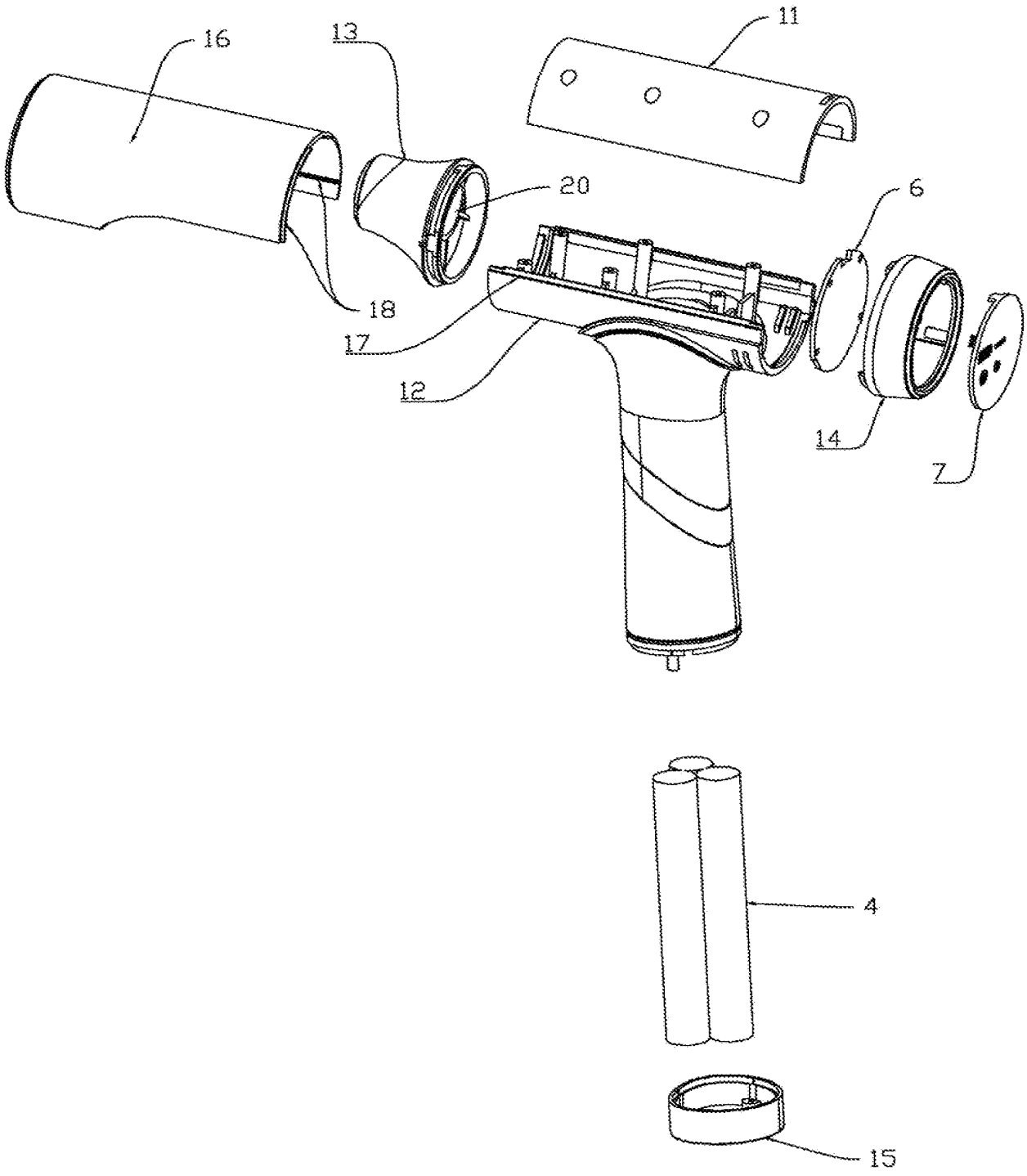


图4

Petitioner Therabody Ex-1004, 1124

Muscle-slackening stimulator

Abstract

The present invention provides a muscle stimulation relaxer (100). The muscle stimulator 100 has a slide member 30 which is installed in the inner cavity 45 of the housing 40. The slide member 30 receives the eccentric rotation of the motor (M) to reciprocate back and forth in the cavity (45).

Classifications

- A61H23/0254 Percussion or vibration massage, e.g. using supersonic vibration; Suction-vibration massage; Massage with moving diaphragms with electric or magnetic drive with rotary motor

View 4 more classifications

KR200311328Y1
South Korea

Download PDF | Find Prior Art | Similar

Other languages: Korean

Inventor: [redacted]

Worldwide applications

2003 · KR

Application KR20-2003-0001084U events

2003-01-14 · Application filed by [redacted]

2003-01-14 · Priority to KR20-2003-0001084U

2003-05-01 · Application granted

2003-05-01 · Publication of KR200311328Y1

Info: Cited by (2), Legal events, Similar documents, Priority and Related Applications

External links: Espacenet, Global Dossier, Discuss

Claims (5)

Hide Dependent

1. (a) a housing having a cavity formed therein and having an opening formed therein in communication with the cavity;

   (b) a slide member which is installed in the cavity of the housing and moves forward and backward along its longitudinal direction, in front of which is provided with a stimulating member for stimulating the muscles and an inner groove formed in the lower surface thereof; ;

   (c) the case;

Petitioner Therabody Ex-1004, 1125

(d) an eccentric is installed in the case, the eccentric moves eccentrically according to the rotation of the power shaft, and the eccentric includes a motor passing through the opening of the housing and placed in the inner groove of the lower side of the slide member;

(e) The eccentric rotates eccentrically in the groove according to the rotation of the power shaft of the motor, whereby the slide member slides back and forth within the cavity of the housing so that the magnetic pole member in front of the motor periodically rotates. Muscle stimulator, characterized in that it can stimulate.

2. The method of claim 1,

And the eccentric to which the eccentric is attached to the motor power shaft of the motor to which the eccentric is attached.

3. The method according to claim 1 or 2,

The slide member is a muscle stimulator, characterized in that the step of lowering the height is formed in the front side and the stopper is applied to the end of the cavity of the housing is formed.

4. The method of claim 3,

Muscle back stimulator, characterized in that the weight portion is formed in the rear portion of the housing is formed with an air hole formed through the inside.

5. The method of claim 4, wherein the motor

(a) a diode D1 connected between the AC power input terminal AC1 and the first node N1, and a capacitor C1 connected between the AC power input terminal AC1 and the second node N2. And a diode D2 connected between the AC power input terminal AC1 and the third node N3, a resistor R1 connected between the output terminal and the first node N1, the output terminal and the first node. A resistor R2, a switch SW, a variable resistor VR and a resistor R3 connected in series between two nodes N2, and a resistor R4 connected between the output terminal and the third node N3; The thyristor (A) and the cathode (K) are connected to the output terminal and the AC power input terminal (AC1), respectively, and the gate (G) is connected to the second node (N2) through the diac (DIAC) A phase control unit made of TYN);

(b) a muscle stimulation relaxation device, characterized in that it is driven by a motor drive unit comprising a rectifying unit for converting the AC power controlled phase by the phase control unit to a DC power source.

Description

Muscle-slackening stimulator

The present invention relates to a muscle stimulator. According to the present invention, when the muscle is contracted or damaged due to overload or abnormalities in blood circulation of the muscle area, effective treatment is possible.

Excessive use of body muscles or heavy loads can cause muscle tissue to contract or damage. In addition, in this case, the abnormal blood flow (导 流) associated with muscle tissue can cause problems in the use of muscle. Conventional treatments in this case were to knead the muscles by hand or to exercise lightly. However, following these methods requires a lot of time and is not very efficient. Particularly, in case of exercise, a certain space and tools are required, which is a burden on the patient's point of view.

The conventional massager is to vibrate the muscles by vibrating according to the eccentric rotation of the weight connected to the motor, and may not give a direct stimulus to the muscles periodically. Therefore, there is a need for a device capable of treating muscle damage by relaxing muscles by giving direct stimulation to the muscles at regular intervals.

Petitioner Therabody Ex-1004, 1126

The present invention satisfies the aforementioned request. Therefore, an object of the present invention is to provide a muscle stimulation diastolic that can cure muscle damage caused by overload by stimulating the muscles to relax the muscles. Particularly, according to the present invention, the slide member equipped with the muscle stimulation member reciprocates back and forth, thereby stimulating the muscle, thereby achieving relaxation of the muscle.

According to the present invention, a muscle stimulation relaxation device according to the purpose is provided with a cavity formed therein and an opening communicating with the cavity at the bottom thereof, and installed in the cavity of the housing to move forward and backward along its longitudinal direction. In front of it, a stimulation member for stimulating muscles is provided, the lower surface is provided with a slide member having an inner groove formed therein, a case, and an eccentric which is installed in the case and eccentrically moves according to the rotation of the power shaft. The eccentric may include a motor passing through an opening of the housing and placed in an inner groove of a lower side of the slide member. According to this configuration, the eccentric rotates eccentrically in the groove according to the rotation of the power shaft of the motor, so that the slide member slides back and forth in the cavity of the housing so that the magnetic pole member in front of the muscle it can be stimulated periodically.

In one embodiment of the present invention, the eccentric is attached to the motor by being coupled to the power shaft of the additional motor to which the eccentric is attached.

In addition, the slide member is formed with a step of lowering its height toward the front side, and a stopper that is caught by the end is formed in the cavity of the housing.

In particular, according to the present invention, it is preferable that the weight portion having an air hole formed through the inside thereof is coupled to the rear portion of the housing.

In addition, the motor includes a diode D1 connected between the AC power input terminal AC1 and the first node N1, and a capacitor C1 connected between the AC power input terminal AC1 and the second node N2.), A diode D2 connected between the AC power input terminal AC1 and the third node N3, a resistor R1 connected between the output terminal and the first node N1, the output terminal and A resistor R2, a switch SW, a variable resistor VR and a resistor R3 connected in series between the second node N2, and a resistor R4 connected between the output terminal and the third node N3.), An anode A and a cathode K are connected to the output terminal and the AC power input terminal AC1, respectively, and a gate G is connected to the second node N2 through a diac DIAC. And a rectifier for converting the AC power whose phase is controlled through the phase controller to DC power through a phase control part formed of a connected thyristor (TYN). It is driven by a motor drive.

1 is an exploded perspective view of a muscle stimulation relaxer according to the present invention;

2 is a cross-sectional view of the present invention;

3 is an example of a circuit for controlling a motor in the present invention; And

Figure 4 is a view showing a state in which the muscle relaxer assembled according to the present invention.

<Description of Major Symbols in Drawing>

100: muscle stimulation relaxer 30: slide member 40: housing

M: motor 80: mold part 60: case

Now, with reference to the accompanying drawings, preferred embodiments of the present invention will be described.

1 is an exploded perspective view of the muscle stimulation relaxation device 100 according to the present invention and Figure 2 is a cross-sectional view of the combined state.

As shown in Figures 1 and 2, the muscle stimulation relaxer 100 according to the present invention has a housing 40, the cavity 45 is formed therein. An opening 48 is formed in the lower surface of the housing 40 to communicate with the cavity 45. In this embodiment, the opening 48 has a female threaded portion. In addition, as

Petitioner Therabody Ex-1004, 1127

shown, the rear portion of the cavity portion 45 is formed with a screw portion 455 therein, the weight 50 may be coupled thereto.

A slide member 30 is installed in the cavity 45 of the housing 40, and periodically and reciprocates periodically according to the eccentric rotation of the eccentric 15 of the motor M as described below.

The slide member 30 has a stage 375 having a height lowered toward the front side, and a screw 408 is installed at the front portion of the housing 40 through the cavity 45 to the stage 305.), And acts as a stopper 403 that prevents the slide member 30 from moving forward or more.

A bolt portion 31 is formed at the front of the slide member 30 and coupled to the female screw portion 91 of the muscle stimulation member 90. The muscle stimulating member 90 is made of a soft material such as silicon or rubber.

The lower surface of the slide member 30 is formed with an end inward to form an inner groove 328.

The slide member 40 is installed in the cavity 45 of the housing 40 so that the inner groove 328 of the slide member 30 and the opening 48 in which the female thread of the housing 40 is formed correspond to each other. do.

In the present embodiment, the housing 40 is fixedly installed in the cavity 85 of the mold part 80 and corresponds to the opening 48 of the housing 40 in the cavity part 85 of the mold part 80. The opening 88 is formed at the position to be.

The slide member 40 according to the present invention forms a reciprocating motion back and forth according to the rotation of the motor (M). The motor M is built in the case 60, and the power shaft 3 is coupled to the penetrating portion 13 of the weight 10 to which the eccentric 15 is attached. Accordingly, when the power shaft 3 of the motor M rotates, the weight 10 rotates, and thus the eccentric 15 forms an eccentric rotational motion. 18 is a bearing member 15 which is coupled to the eccentric 15.

As shown in the figure, the motor M has a cylindrical shape in which a screw portion 28 is formed on its outer circumferential surface, and a coupling member 20 having a wing portion on its lower surface is coupled via a screw 7. The weight 10 coupled with the motor M is placed in the cavity of the cylinder of the coupling member 20 and forms a rotation therein.

The screw portion 28 of the coupling member 20 penetrates through the opening 88 of the mold portion 80 and is coupled to the opening 48 having a female thread formed on the lower surface of the housing 40. At this time, the eccentric 15 of the eccentric weight 10 is placed inside the groove 328 installed in the cavity 45 of the housing 40.

Accordingly, when the eccentric 15 rotates eccentrically according to the rotation of the power shaft 3 of the motor M, the eccentric 15 hits the inner surface of the groove 328 and consequently the slide. In the cavity 45 of the housing 40, the member 30 forms a reciprocating movement forward and backward according to the eccentric movement period of the eccentric 15.

The weight 50 may be coupled to the rear end of the housing 40. The weight 50 is balanced by applying a stimulus to the muscle by using the muscle stimulation relaxation device 100 according to the present invention and also reduces the vibration due to the eccentric rotation of the motor. In the embodiment of the present invention, the weight 50 is composed of two 51, 53, each is detachably coupled by the coupling of the bolt portion 511 and the corresponding female screw portion 531. . In addition, the weight 51 is coupled to the bolt portion 515 of the weight 51 to the female screw portion 455 formed on the inner surface of the opening of the housing 40. In this case, the cavity portions 512 and 532 communicating with the outside are formed in the weights 51 and 53, respectively. This is to discharge the compressed air formed therein as the slide member 30 performs the forward and backward reciprocating slide movement in the interior of the housing 40.

3 shows a driving circuit for driving the motor M according to the present invention.

In the motor driving unit 200 of the present invention, the phase control unit 10 connected to the first AC power input terminal AC1, the first and second input terminals, the output terminal of the phase control unit 10 and the second AC power input terminal (Rectifiers 20 respectively connected to AC2) and the motor M operated by a DC voltage output from the rectifier 20.

Petitioner Therabody Ex-1004, 1128

The phase controller 10 is connected between a diode D1 connected between a first AC power input terminal AC1 and a first node N1, a first AC power input terminal AC1, and a second node N2. The diode D2 connected between the capacitor C1, the first AC power input terminal AC1, and the third node N3, the resistor R1, the output terminal, and the first connected between the output terminal and the first node N1. The resistor R2, the switch SW, the variable resistor VR and the resistor R3 connected in series between the two nodes N2, the resistor R4 connected between the output terminal and the third node N3, and the anode (A) and the cathode (K) are connected to the output terminal and the first AC power input terminal (AC1), respectively, and the gate (G) to the thyristor (TYN) connected to the second node (N2) through the DIAC (DIAC) It is composed.

Accordingly, when the AC voltage is input through the first and second AC power input terminals AC1 and AC2 while the switch SW is turned off, the diode D2 and the resistor R4 of the phase controller 10 are input.) Or a DC voltage is output from the rectifier 20 by the flow of current through the resistor R1 and the diode D1, thereby driving the motor 30.

In this state, when the switch SW is turned on, charging occurs in the capacitor C1 by forming a path through the resistor R2, the variable resistor VR, and the resistor R3, and the charging is completed after a predetermined time. When the potential of the second node N2 is increased, the diaak DIAC conducts, and thus a current flows through the thyristor TYN. At this time, the flow time of the current through the thyristor (TYN) is determined by the resistance value of the variable resistor (VR) and resistor (R3) and the time constant of the capacitor (C1). For example, when the resistance value of the variable resistor VR increases, the flow time of the current through the thyristor TYN becomes long, and when the resistance value of the variable resistor VR decreases, the flow time of the current through the thyristor TYN increases. Will be shortened.

Accordingly, the waveform of the DC voltage output from the rectifying unit 20 changes according to the phase control of the AC power, thereby driving time and driving force of the motor 30 are controlled. In FIGS. 1 and 2, the variable switch 70 controlling the phase controller 10 is exposed to the outside of the case 60.

In the figure, diodes D3 and D4 serve to prevent reverse current flow between nodes N2 and N1 and nodes N3 and N2, and capacitor C2 increases the efficiency of the motor 30 and removes ripple. It plays a role.

4 shows a state in which the muscle stimulation relaxer 100 is assembled according to the present invention.

As such, the present invention provides a muscle stimulation relaxor having a slide member that receives an eccentric rotation of the motor and moves back and forth within the housing. The slide member is equipped with a muscle stimulation member in front of the slide member to stimulate the muscles periodically according to the reciprocating movement of the slide member, thereby relaxing the muscles.

It will be understood that the purpose of the present invention has been achieved.

Although the present invention has been described with reference to the embodiments, the present invention is not limited thereto. In accordance with the spirit of the present invention, the scope of the present invention is defined by the following claims.

Cited By (2)

Publication number	*Priority date*	*Publication date*	*Assignee*	*Title*
KR101162978B1	2012-02-09	2012-07-09	주식회사 에이티시스템	Vibration massage apparatus for muscle
WO2019164355A1 *	2018-02-22	2019-08-29	Hyper Ice, Inc.	Battery-powered percussive massage device
Family To Family Citations				

* Cited by examiner, † Cited by third party, ‡ Family to family citation

Similar Documents

Petitioner Therabody Ex-1004, 1129

Publication	Publication Date	Title
CN111166643B	2021-07-30	Battery-powered percussion massage device with pressure sensor
KR20190143475A	2019-12-30	Battery powered shock massager
JP2017185220A	2017-10-12	Compression wave massage device
JP5778263B2	2015-09-16	Functional electrical stimulator and system and use thereof
KR200311328Y1	2003-05-01	Muscle-slackening stimulator
US5542907A	1996-08-06	Massage apparatus with multiple vibrator units
US8712516B2	2014-04-29	Biomedical electro-stimulator
US10993874B1	2021-05-04	Motor and piston assembly for percussive massage device
JP4832904B2	2010-08-25	Method and apparatus for supplying defibrillation and pacing energy from a single power source
JP2005052273A	2005-03-03	Insole and footwear
KR200439164Y1	2008-03-26	Multi Function Electolysis Foot Washing Apparatus having Heater and Puls Probe
KR20180116701A	2018-10-25	Device for caring skin
US20160184602A1	2016-06-30	Portable high-frequency therapeutic apparatus having internal battery
KR10031030581	2001-09-29	Portable electrical stimulator
KR102062731B1	2020-01-06	Portable acupressure device
US20190247271A1	2019-08-15	Dual Action, Single Motor Massager
JP2019198599A	2019-11-21	Bed-ridden aging prevention device
KR20200086236A	2020-07-16	Device for caring skin
KR200304479Y1	2003-02-15	A vibrator for the breast
EP3871647A1	2021-09-01	Massaging device with negative pressure cavity
DE102019113623A1	2020-11-26	Massage device for interdigital holding
KR19980073628A	1998-11-05	Portable skin massager
KR200298351Y1	2002-12-16	Vibrator for the abdominal region by Control method of Vibration

Petitioner Therabody Ex-1004, 1130

CN2503019Y	2003-02-26	Vibrative health mouse
KR100344774B1	2002-07-20	The Control system for head skin massage instruments

Priority And Related Applications

Priority Applications (1)

Application	Priority date	Filing date	Title
KR20-2003-0001084U	2003-01-14	2003-01-14	Muscle-slackening stimulator

Applications Claiming Priority (1)

Application	Filing date	Title
KR20-2003-0001084U	2003-01-14	Muscle-slackening stimulator

Legal Events

Date	Code	Title	Description
2003-04-10	REGI	Registration of establishment	
2004-01-14	T201	Request for technology evaluation of utility model	
2005-01-07	T701	Written decision to grant on technology evaluation	
2012-04-24	FPAY	Annual fee payment	**Payment date**: 20120424 **Year of fee payment**: 10
2013-01-15	EXPY	Expiration of term	

Concepts

machine-extracted

Download Filter table

Name	Image	Sections	Count	Query match
Muscles		claims,abstract,description	42	0.000
stimulation		claims,abstract,description	16	0.000

Petitioner Therabody Ex-1004, 1131

capacitor	claims,description	6	0.000
stimulating	claims,description	6	0.000

Show all concepts from the description section

Data provided by IFI CLAIMS Patent Services

Petitioner Therabody Ex-1004, 1132

(19)대한민국특허청(KR)
(12) 등록실용신안공보(Y1)

(51) 。Int. Cl. 7
A61H 23/02

(45) 공고일자 2003년05월01일
(11) 등록번호 20-0311328
(24) 등록일자 2003년04월10일

(21) 출원번호 20-2003-0001084
(22) 출원일자 2003년01월14일

(73) 실용신안권자 박종태
서울특별시 강북구 미아7동 1353 에스케이북한산시티아파트 105동 1402호

(72) 고안자 박종태
서울특별시 강북구 미아7동 1353 에스케이북한산시티아파트 105동 1402호

(74) 대리인 조혁근

기초적요건 심사관 : 변종진

기술평가청구 : 없음

(54)근육자극이완기

요약

본 고안은 근육자극이완기(100)를 제공한다. 상기 근육자극이완기(100)는 하우징(40)의 내부공동부(45)에 설치되는 슬라이드부재(30)를 가진다. 상기 슬라이드부재(30)는 모터(M)의 편심 회전운동을 받아 상기 공동부(45)에서 전후로 왕복운동을 이룬다.

대표도

도 2

색인어

근육자극, 이완, 슬라이드, 편심

명세서

도면의 간단한 설명

도 1은 본 고안에 따른 근육자극이완기의 분해사시도;

도 2는 본 고안의 단면도;

Petitioner Therabody Ex-1004, 1133

도 3은 본 고안에서 모터를 제어하는 회로의 일 예; 그리고

도 4는 본 고안에 따른 근육이완기가 조립된 상태를 보이는 도면.

<도면의 주요부호에 대한 설명>

100: 근육자극이완기 30: 슬라이드부재 40: 하우징

M:모터 80: 몰드부 60: 케이스

고안의 상세한 설명

고안의 목적

고안이 속하는 기술 및 그 분야의 종래기술

본 고안은 근육자극이완기에 관한 것이다. 본 고안에 따라서 과부하에 의하여 근육이 수축 또는 손상되거나 근육부위의 혈액순환 등에 이상이 있는 경우 효과적인 치료가 가능하게 된다.

신체 근육을 과도하게 사용하거나 또는 과중한 짐을 옮기거나 하는 등의 경우 근육조직이 수축되거나 손상될 수 있다. 또한, 이러한 경우 근육조직과 관련된 혈류(血流)에 이상이 생겨 근육의 사용에 문제를 일으킬 수 있다. 종래 이러한 경우 의 치료법은 근육을 손으로 주무르거나 가벼운 운동을 하는 것이 있었다. 그러나, 이러한 방법을 따를 경우 많은 시간이 필요하여 그리 효율적이지 못하였으며, 특별히 운동의 경우는 일정공간과 도구가 필요하여 환자의 입장에서는 부담이 되고 있다.

종래의 안마기는 모터에 연결된 웨이트(weight)의 편심 회전에 따른 진동으로 근육에 진동을 주는 것으로서 근육에 주기적으로 직접적인 자극을 줄 수 있는 것은 아니다. 따라서, 일정 주기로 근육에 직접적인 자극을 주어 근육을 이완시켜 근육손상 등을 치료할 수 있는 장치가 요망된다.

고안이 이루고자 하는 기술적 과제

본 고안은 상술한 요청을 만족시킨다. 따라서, 본 고안의 목적은 근육에 자극을 주어 근육을 이완시켜 과부하 등에 의하여 근육에 생긴 손상을 치료할 수 있는 근육자극 이완기를 제공하는 것이다. 특별히, 본 발명에 따를 경우 근육자극 부재가 장착된 슬라이드 부재가 전후로 왕복운동을 이르며 근육을 자극하여 이에 따라 근육의 이완을 이룬다.

이러한 본 고안에 목적에 따른 근육자극이완기는 내부에 공동부가 형성되며 그 하부에 상기 공동부와 연통하는 개구부가 형성된 하우징과, 상기 하우징의 공동부에 설치되어 그 길이방향을 따라 전.후진하는 것으로서, 그 전방에는 근육에 자극을 주기 위한 자극부재가 설치되어 있고 그 하부면에는 내측 홈이 형성되어 있는 슬라이드 부재와, 케이스와, 상기 케이스 내에 설치되며, 동력축의 회전에 따라 편심 운동하는 편심자가 부착되고, 상기 편심자는 상기 하우징의 개구부를 통과하여 상기 슬라이드 부재의 하측면의 내측 홈에 놓이는 모터를 포함하여 이루어지는 것을 특징으로 한다. 이러한 구성에 따라서, 상기 모터의 동력축의 회전에 따라 상기 편심자가 상기 홈 내부에서 편심회전운동을 하고 이에 따라 상기 슬라이드부재가 상기 하우징의 공동부내에서 전후로 슬라이드 운동을 하여 그 전방의 자극부재가 근육에 주기적으로 자극을 줄 수 있게 된다.

본 고안의 일 실시 예에서, 상기 편심자가 부착된 추가 상기 모터의 동력축에 결합되어 상기 모터에 대하여 상기 편심자가 부착된다.

또한, 상기 슬라이드 부재는 전방측으로 그 높이가 낮아지는 단이 형성되며 상기 하우징의 공동부에는 상기 단에 걸리는 스토퍼가 형성되어 있다.

특별히, 본 고안에 따를 경우, 상기 하우징의 후부에는 그 내부를 관통하여 형성되는 공기구멍이 형성된 무게추가 결합되어 있는 것이 바람직하다.

또한, 상기 모터는 상기 교류전원 입력단자(AC1) 및 제 1 노드(N1) 간에 접속된 다이오드(D1)와, 상기 교류전원 입력단자(AC1) 및 제 2 노드(N2) 간에 접속된 캐패시터(C1)와, 상기 교류전원 입력단자(AC1) 및 제 3 노드(N3) 간에 접속된 다이오드(D2)와, 출력단자 및 상기 제 1 노드(N1) 간에는 접속된 저항(R1)과, 상기 출력단자 및 상기 제 2 노드(N2) 간에 직렬 접속된 저항(R2), 스위치(SW), 가변저항(VR) 및 저항(R3)과, 상기 출력단자 및 상기 제 3 노드(N3) 간에 접속된 저항(R4)과, 에노드(A) 및 캐소드(K)가 상기 출력단자 및 교류전원 입력단자(AC1)에 각각 접속되며, 게이트(G)가 다이악(DIAC)을 통해 상기 제 2 노드(N2)에 연결된 사이리스터(TYN)로 이루어진 위상제어부와, 상기 위상제어부를 통해 위상이 제어 된 상기 교류전원을 직류전원으로 변환하는 정류부를 포함하여 이루어지는 모터 구동부에 의하여 구동된다.

고안의 구성 및 작용

이제, 본 고안의 바람직한 실시예를 첨부한 도면을 참고로 하여 설명한다.

도 1은 본 고안에 따른 근육자극이완기(100)의 분해사시도이고 도 2는 결합된 상태의 단면도이다.

도 1 및 도 2에서 도시된 바와 같이, 본 고안에 따른 근육자극이완기(100)는 그 내부에 공동부(45)가 형성되는 하우징(40)을 가진다. 상기 하우징(40)의 그 하부면에는 상기 공동부(45)와 연통하는 개구부(48)가 형성되며 본 실시예에서 상기 개구부(48)에는 암나사부가 형성되어 있다. 또한 도시한 바와 같이 상기 공동부(45)의 그 후부측에는 내부에 나사부(455)가 형성되어 여기에 무게추(50)가 결합될 수 있다.

상기 하우징(40)의 공동부(45)에는 슬라이드부재(30)가 설치되어, 후술하는 바와 같이 모터(M)의 편심자(15)의 편심회전에 따라 주기적으로 전후 왕복운동을 이룬다.

상기 슬라이드부재(30)는 전방측으로 높이가 낮아지는 단(375)이 형성되며, 상기 하우징(40)의 전방부에는 그 공동부(45)를 관통하여 나사(408)가 설치되어 상기 단(305)에 걸리며, 상기 슬라이드부재(30)가 전방으로 일정 이상 움직이기 못하게 하는 스토퍼(403)역할을 한다.

상기 슬라이드부재(30)의 전방에는 볼트부(31)가 형성되어 근육자극부재(90)의 암나사부(91)에 결합된다. 상기 근육자극부재(90)는 실리콘이나 고무과 같은 연질재질로 이루어진다.

상기 슬라이드부재(30)의 하부면에는 안쪽으로 단이 형성되어 내측 홈(328)이 형성된다.

상기 슬라이드부재(30)의 내측홈(328)과 상기 하우징(40)의 암나사가 형성된 개구부(48)가 대응되도록 하여 상기 슬라이드부재(40)는 상기 하우징(40)의 공동부(45)에 설치된다.

본 실시예에서 상기 하우징(40)은 몰드부(80)의 공동부(85)에 고정설치되며 상기 몰드부(80)의 공동부(85)에서 상기 하우징(40)의 개구부(48)와 대응되는 위치에는 개구부(88)가 형성된다.

본 고안에 따른 상기 슬라이드부재(40)는 모터(M)의 회전에 따라 전후로 왕복운동을 이룬다. 상기 모터(M)는 케이스(60)에 내장되며, 그 동력축(3)이 편심자(15)가 부착된 추(10)의 관통부(13)에 결합된다. 따라서, 상기 모터(M)의 동력축(3)이 회전하면 상기 추(10)가 회전하며 이에 따라 상기 편심자(15)는 편심회전운동을 이룬다. 도시부호 18은 상기 편심자(15)에 결합되는 베어링 부재(15)이다.

상기 모터(M)에는, 도시한 것과 같이, 그 외주면에 나사부(28)가 형성되는 실린더 형상으로 그 하면에 날개부를 가지는 결합부재(20)가 나사(7)를 통하여 결합된다. 상기 모터(M)와 결합된 상기 추(10)는 상기 결합부재(20)의 실린더의 공동부에 놓이며 그 내부에서 회전을 이룬다.

상기 결합부재(20)의 나사부(28)는 상기 몰드부(80)의 개구부(88)를 관통하여 상기 하우징(40)의 하면의 암나사가 형성된 개구부(48)에 결합된다. 이때, 상기 편심추(10)의 편심자(15)가 상기 하우징(40)의 공동부(45)에 설치된 홈부(328)의 내부에 놓이게 된다.

따라서, 상기 모터(M)의 동력축(3)의 회전에 따라 상기 편심자(15)가 편심회전을 하면, 상기 편심자(15)는 상기 홈부(328)의 내면을 치게되어 결과적으로 상기 슬라이드부재(30)는 상기 하우징(40)의 공동부(45)에서 그 길이방향을 따라, 상기 편심자(15)의 편심운동주기에 따라 전후왕복운동을 이루게 된다.

상기 하우징(40)의 후단에는 무게추(50)가 결합될 수 있다. 상기 무게추(50)는 본 고안에 따른 근육자극이완기(100)를 이용하여 근육에 자극을 가할 때 밸런스(balance)를 맞추어주며 또한 모터의 편심회전에 따른 진동을 감소시킨다.

본 고안의 실시예에서, 상기 무게추(50)는 두 개(51)(53)로 이루어지며 각각은 볼트부(511)와 이에 대응하는 암나사부(531)의 결합에 의하여 분리 가능하게 결합된다. 또한 무게추(51)는 상기 하우징(40)의 개구부의 내면에 형성된 암나사부(455)부에 상기 무게추(51)의 볼트부(515)가 결합된다. 이때 상기 무게추(51)(53)의 내부에는 외부로 연통되는 공동부(512)(532)가 각각 형성된다. 이것은 상기 슬라이드부재(30)가 상기 하우징(40)의 내부에서 전후 왕복 슬라이드 운동을 함에 따라 그 내부에서 형성되는 압축공기를 외부로 배출하기 위함이다.

도 3은 본 고안에 따른 모터(M)를 구동시키는 구동회로를 보인다.

본 고안의 모터구동부(200)는 제 1 교류전원 입력단자(AC1)에 연결된 위상 제 어부(10), 제 1 및 제 2 입력단자가 위상 제어부(10)의 출력단자 및 제 2 교류전원 입력단자(AC2)에 각각 연결된 정류부(20), 그리고 정류부(20)로부터 출력되는 직류 전압에 의해 동작되는 상기 모터(M)로 이루어진다.

상기 위상 제어부(10)는 제 1 교류전원 입력단자(AC1) 및 제 1 노드(N1) 간에 접속된 다이오드(D1), 제 1 교류전원 입력단자(AC1) 및 제 2 노드(N2) 간에 접속된 캐패시터(C1), 제 1 교류전원 입력단자(AC1) 및 제 3 노드(N3) 간에 접속된 다이오드(D2), 출력단자 및 제 1 노드(N1) 간에는 접속된 저항(R1), 출력단자 및 제 2 노드(N2) 간에 직렬 접속된 저항(R2), 스위치(SW), 가변저항(VR) 및 저항(R3), 출력단자 및 제 3 노드(N3) 간에 접속된 저항(R4), 그리고 에노드(A) 및 캐소드(K)가 출력단자 및 제 1 교류전원 입력단자(AC1)에 각각 접속되며 게이트(G)가 다이악(DIAC)을 통해 제 2 노드(N2)에 연결된 사이리스터(TYN)로 구성된다.

이에 따라, 스위치(SW)가 오프(Off)된 상태에서 제 1 및 제 2 교류전원 입력단자(AC1 및 AC2)를 통해 교류전압이 입력되면 위상 제어부(10)의 다이오드(D2) 및 저항(R4) 또는 저항(R1) 및 다이오드(D1)를 통한 전류의 흐름에 의해 정류부(20)로부터 직류전압이 출력되고, 이에 의해 모터(30)의 구동이 이루어진다.

이 상태에서 스위치(SW)가 온(On)되면 저항(R2), 가변저항(VR) 및 저항(R3)을 통한 경로의 형성에 의해 캐패시터(C1)에 충전이 일어나는데, 소정 시간 후 충전이 완료되면 제 2 노드(N2)의 전위가 상승되어 다이악(DIAC)이 도통되고, 이에 따라 사이리스터(TYN)를 통한 전류의 흐름이 발생된다. 이 때, 사이리스터(TYN)를 통한 전류의 흐름 시간은 가변저항(VR) 및 저항(R3)의 저항값과 캐패시터(C1)의 시상수 에 의해 정해진다. 예를 들어, 가변저항(VR)의 저항값이 커지면 사이리스터(TYN)를 통한 전류의 흐름 시간이 길어지고, 가변저항(VR)의 저항값이 작아지면 사이리스터(TYN)를 통한 전류의 흐름 시간이 짧아지게 된다.

따라서 이와 같은 교류전원의 위상제어에 따라 정류부(20)로부터 출력되는 직류전압의 파형이 변화되고, 이에 따라 모터(30)의 구동시간 및 구동력이 제어된다. 도 1 및 2에서 상기 위상제어부(10)를 제어하는 가변 스위치(70)가 케이스(60)의 외부에 노출된다.

도면에서 다이오드(D3 및 D4)는 노드(N2 및 N1) 그리고 노드(N3 및 N2) 간의 역전류 흐름을 방지하는 역할을 하며, 캐패시터(C2)는 모터(30)의 효율을 높이는 동시에 리플을 제거하는 역할을 한다.

도 4는 본 고안에 따른 근육자극이완기(100)가 조립된 상태를 보인다.

고안의 효과

이와 같이 본 고안은, 모터의 편심회전운동을 받아 하우징내부에서 전후 왕복운동을 하는 슬라이드 부재를 가지는 근육자극이완기를 제공한다. 상기 슬라이드부재는 그 전방에 근육자극부재가 장착되어, 슬라이드부재의 왕복운둥에 따라 주기적으로 근육을 자극하게 되고 이에 따라 근육이 이완된다.

이로서 본 고안의 목적이 달성되었음을 이해할 수 있을 것이다.

본 고안은 실시예를 중심으로 설명되었으나, 이에 한정되지 않으며, 본 고안의 사상에 따라 그 권리범위는 다음의 청구범위에 의한다.

(57) 청구의 범위

청구항 1.

(a) 내부에 공동부가 형성되며 그 하부에 상기 공동부와 연통하는 개구부가 형성된 하우징과;

Petitioner Therabody Ex-1004, 1136

(b) 상기 하우징의 공동부에 설치되어 그 길이방향을 따라 전.후진하는 것으로서, 그 전방에는 근육에 자극을 주기 위한 자극부재가 설치되어 있고 그 하부면에는 내측 홈이 형성되어 있는 슬라이드 부재와;

(c) 케이스와;

(d) 상기 케이스 내에 설치되며, 동력축의 회전에 따라 편심 운동하는 편심자가 부착되고, 상기 편심자는 상기 하우징의 개구부를 통과하여 상기 슬라이드 부재의 하측면의 내측 홈에 놓이는 모터를 포함하여 이루어져;

(e) 상기 모터의 동력축의 회전에 따라 상기 편심자가 상기 홈 내부에서 편심회전운동을 하고 이에 따라 상기 슬라이드부재가 상기 하우징의 공동부내에서 전후로 슬라이드 운동을 하여 그 전방의 자극부재가 근육에 주기적으로 자극을 줄 수 있음을 특징으로 하는 근육자극이완기.

청구항 2.
제1항에 있어서,

상기 편심자가 부착된 추가 상기 모터의 동력축에 결합되어 상기 모터에 대하여 상기 편심자가 부착되는 것을 특징으로 하는 근육자극이완기.

청구항 3.
제1항 또는 제2항에 있어서,

상기 슬라이드 부재는 전방측으로 그 높이가 낮아지는 단이 형성되며 상기 하우징의 공동부에는 상기 단에 걸리는 스토퍼가 형성되어 있음을 특징으로 하는 근육자극이완기.

청구항 4.
제3항에 있어서,

상기 하우징의 후부에는 그 내부를 관통하여 형성되는 공기구멍이 형성된 무게추가 결합되어 있는 것을 특징으로 하는 근육자극이완기.

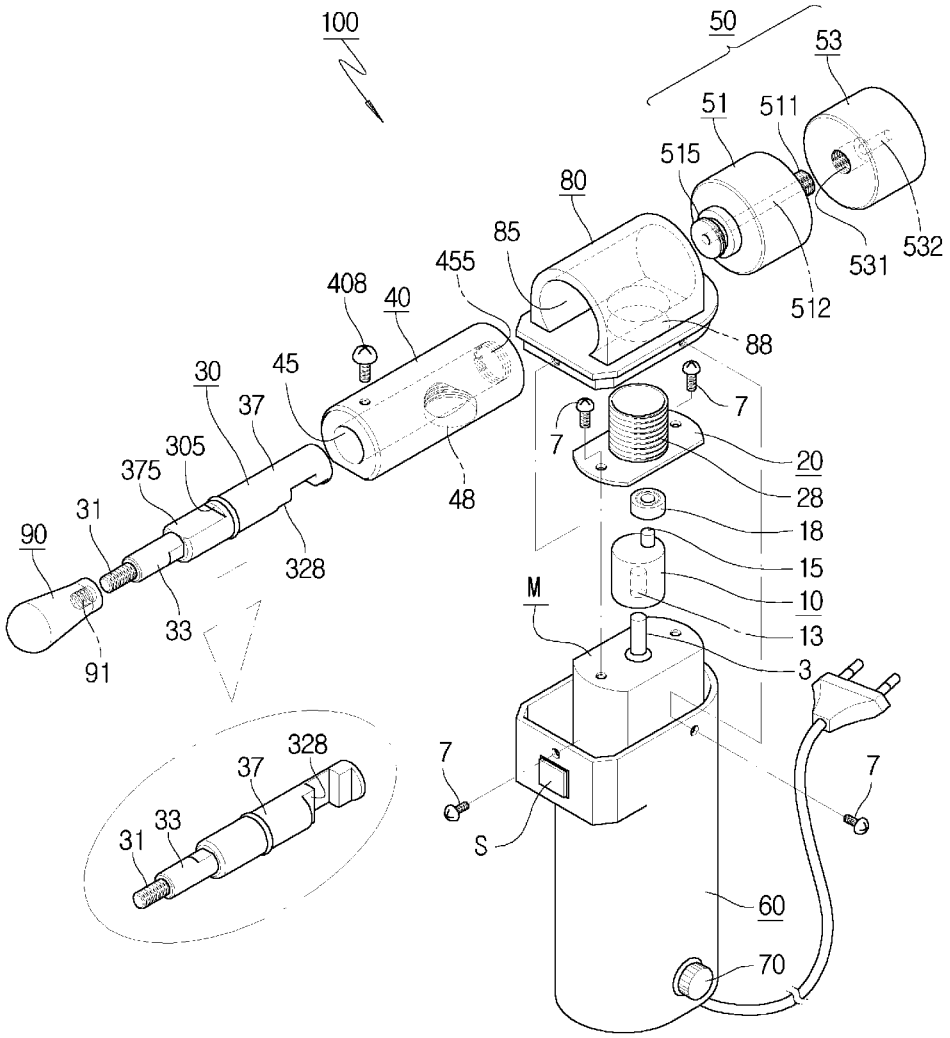
청구항 5.
제4항에 있어서, 상기 모터는

(a) 상기 교류전원 입력단자(AC1) 및 제 1 노드(N1) 간에 접속된 다이오드(D1)와, 상기 교류전원 입력단자(AC1) 및 제 2 노드(N2) 간에 접속된 캐패시터(C1)와, 상기 교류전원 입력단자(AC1) 및 제 3 노드(N3) 간에 접속된 다이오드(D2)와, 출력단자 및 상기 제 1 노드(N1) 간에는 접속된 저항(R1)과, 상기 출력단자 및 상기 제 2 노드(N2) 간에 직렬 접속된 저항(R2), 스위치(SW), 가변저항(VR) 및 저항(R3)과, 상기 출력단자 및 상기 제 3 노드(N3) 간에 접속된 저항(R4)과, 에노드(A) 및 캐소드(K)가 상기 출력단자 및 교류전원 입력단자(AC1)에 각각 접속되며, 게이트(G)가 다이악(DIAC)을 통해 상기 제 2 노드(N2)에 연결된 사이리스터(TYN)로 이루어진 위상제어부와;

(b) 상기 위상 제어부를 통해 위상이 제어된 상기 교류전원을 직류전원으로 변환하는 정류부를 포함하여 이루어지는 모터 구동부에 의하여 구동되는 것을 특징으로 하는 근육자극이완기.

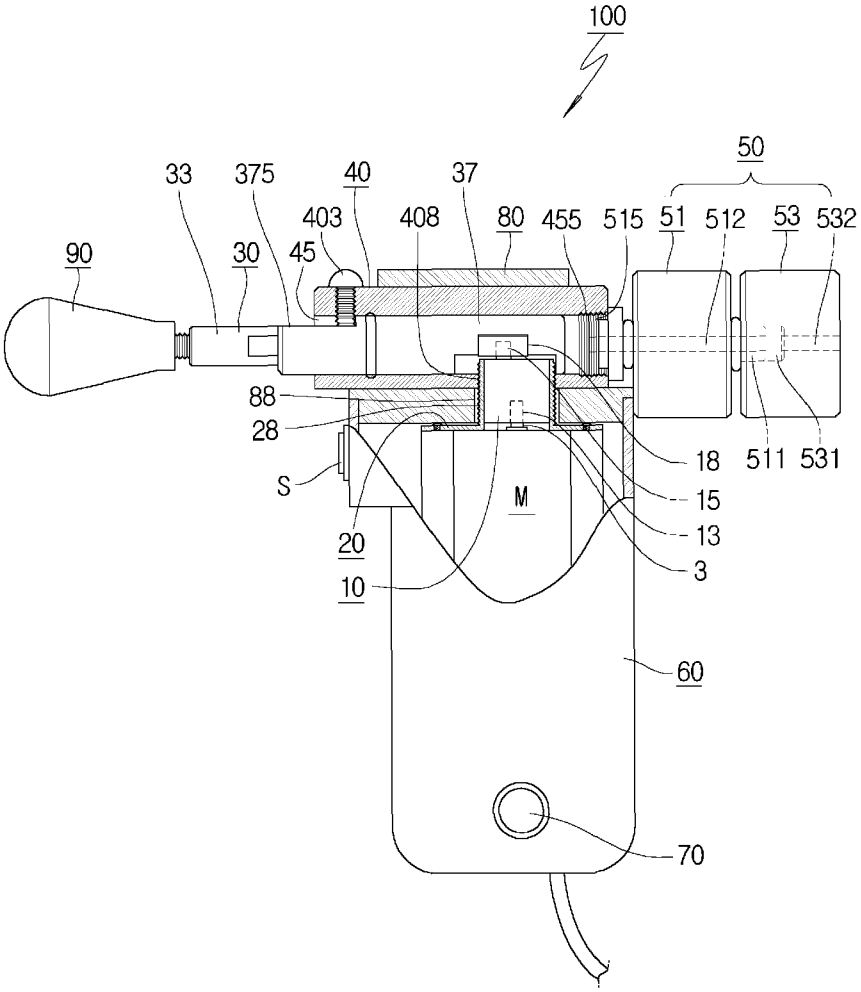
도면

도면1



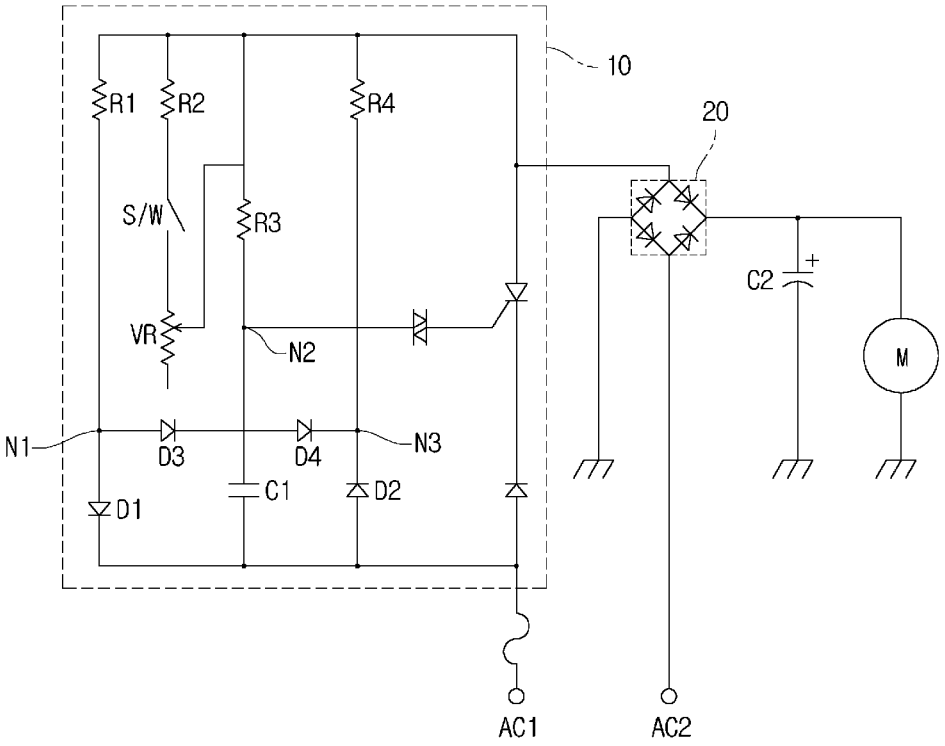
Petitioner Therabody Ex-1004, 1138

도면2

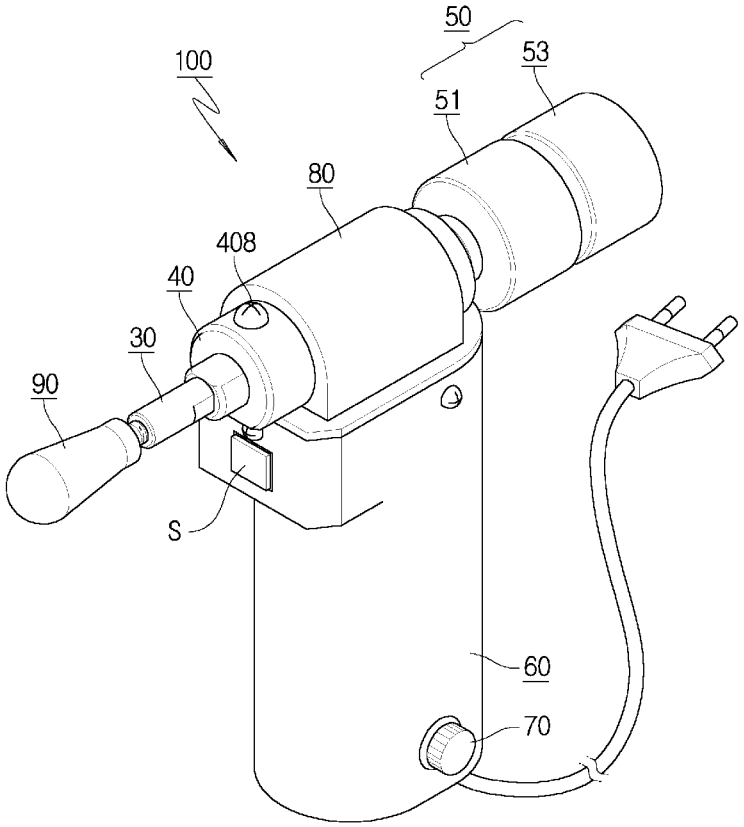


Petitioner Therabody Ex-1004, 1139

도면3



도면4



Petitioner Therabody Ex-1004, 1140

Skin care device having jade and near-infrared ray led

List of publications

Application number	Publication date
KR101504885 B1 Pat...	2015-03-23

Abstract

The present invention relates to a skin care device and, more specifically, to a skin care device which is easily used in each family, can be freely used regardless of place and time since it is easy to carry, provides heat and near-infrared ray to skin by heating jade using a near-infrared ray light emitting diode (LED), and maximizes skin care effects by transferring near-infrared ray into skin as the near-infrared ray LED modulated with a visible ray LED protrudes and is formed to be in contact with skin directly.

English Abstract (Native or MT)

The present invention relates to a skin care device and, more specifically, to a skin care device which is easily used in each family, can be freely used regardless of place and time since it is easy to carry, provides heat and near-infrared ray to skin by heating jade using a near-infrared ray light emitting diode (LED), and maximizes skin care effects by transferring near-infrared ray into skin as the near-infrared ray LED modulated with a visible ray LED protrudes and is formed to be in contact with skin directly.

Other Abstracts

본 발명은 피부 미용기기에 관한 것으로서, 상세하게는 각 가정에서 간편하게 사용이 가능하면서 휴대가 용이하여 장소와 시간에 구애받지 않고 자유롭게 사용할 수 있고, 옥(jade)을 가시광선 LED(Light Emitting Diode)를 이용하여 가열하여 피부에 온열과 원적외선을 동시에 제공하는 한편, 가시광선 LED와 함께 모듈화된 근적외선 LED를 직접 피부에 접촉가능하도록 돌출 구성함으로써 근적외선을 피부 속까지 전달하여 피부 미용효과를 극대화할 수 있는 피부 미용기기에 관한 것이다.

Inventor(s) CHO, SUNG CHAN
LEE, CHANG-HEE

Applicant/Assignee
CHO, SUNG CHAN
LEE, CHANG-HEE

Patent Assignee History CHO, SUNG CHAN; LEE, CHANG-HEE

Application Numbers & Dates KR20140152555 2014-11-05 [2014KR-0152555]

Priority Numbers & Dates KR20140152555 2014-11-05 [2014KR-0152555]

Technology domain Medical technology

IPC codes A61H-023/02* A61N-001/30 A61N-005/06

CPC codes A61H-023/02 A61H-2201/10 A61H-2201/105A61N-001/04/28 A61N-005/06/16* A61N-005/06/25A61N-2005/0644 A61N-2005/0659A61N-2005/0662

Notes Number of Claims: 2

Cited Patents Examiner citations
-JP2005323970 (A) [JP2005323970]; -KR200297648 (Y1) [KR200297648U];
Search Report [Examiner]
-JP2005323970 (A) [JP2005323970] OTIC JAPAN KK;

Claims

1. The handle portion, the handle portion bent from one side of a body comprising a head portion; the body and a head portion of the separation cover detachably coupled, wherein the separation cover attached to a surface (jade) oxy ocap comprising; are provided, wherein the main body, opposed to the OCAP and installed in the inside of the head portion, mounted on the printed circuit board so as to apply heat to the 760nm band 380nm oxy a plurality of visible light (Light Emitting Diode) LED and, mounted on the printed circuit board to emit near infrared line to 780nm oxy 2,500nm band and a plurality of near infrared LED, installed on the printed circuit board to provide a galvanic ion current galvanic skin management module unit;

installed in the interior of the handle portion for charging a battery or power supply receives power from an external operating, in response to the operation of a switch of the plurality of visible light and near infrared LED LED and a plurality of, for controlling operation of the galvanic ion control module; installed within said head portion of the head part to vibrate the vibration module; and the separation between the head portion and a cover coupled to the upper cap; are provided, the plurality of through holes formed in the upper cap of said plurality of visible LED, and a plurality of the galvanic ion LED portion of the near infrared portion of the through hole conductor upwardly protruded and disposed, wherein the oxy comprises a plurality of near infrared rays emitted from the near infrared ray LED 2mm transmitted to the formed with a thickness of from 4mm, and a plurality of the plurality of near infrared LED oxy LED and the distance between the near infrared ray is adjusted so that 5mm to 7mm, wherein the plurality of the plurality of visible light and near infrared LED LED is 0. 1mm to 2mm intervals disposed adjacent each other, the near infrared and jade cosmetic skin device having an LED.

2. AMEND STATUS: Delete

3. AMEND STATUS: delete

4. AMEND STATUS: delete

5. Method according to claim 1, consists of or is convex shape the oxy, the separation between the jade cover a convex lens is further disposed with the LED jade cosmetic skin near infrared device.

Original Claims

1. 손잡이부와, 상기 손잡이부의 일측부로부터 절곡된 헤드부를 포함하는 본체; 및
상기 본체의 헤드부에 착탈가능하게 결합된 분리커버와, 상기 분리커버의 상면에 부착된 옥(jade)을 포함하는 옥캡; 을 포함하되,
상기 본체는,
상기 옥캡과 대향하도록 상기 헤드부의 내부에 설치되되, 인쇄회로기판 상에 실장되어 상기 옥에 열을 가하도록 380nm 내지 760nm 대역의 다수의 가시광선 LED(Light Emitting Diode)와, 상기 인쇄회로기판 상에 실장되어 상기 옥으로 근적외선을 방출하도록 780nm 내지 2,500nm 대역의 다수의 근적외선 LED와, 상기 인쇄회로기판 상에 설치되어 갈바닉 전류를 제공하는 갈바닉 이온부를 포함하는 피부 관리모듈;
상기 손잡이부의 내부에 설치되어 충전용 배터리 또는 외부로부터 전원을 공급받아 동작하고, 스위치의 동작에 응답하여 상기 다수의 가시광선 LED 및 다수의 근적외선 LED와, 상기 갈바닉 이온부의 동작을 제어하는 제어모듈;
상기 헤드부의 내부에 설치되어 상기 헤드부를 진동시키는 진동모듈; 및
상기 헤드부와 상기 분리커버 사이에 결합되는 상부캡; 을 포함하되,
상기 상부캡에는 다수의 관통공이 형성되어 상기 다수의 가시광선 LED, 다수의 근적외선 LED 및 상기 갈바닉 이온부의 전도체의 일부가 상기 관통공을 관통하여 상부로 돌출 배치되고,
상기 옥은 상기 다수의 근적외선 LED로부터 방출된 근적외선이 투과되도록 2mm 내지 4mm의 두께로 형성하고,
상기 다수의 근적외선 LED 및 상기 다수의 근적외선 LED와 상기 옥 사이의 간격은 5mm 내지 7mm가 되도록 하고,
상기 다수의 가시광선 LED와 상기 다수의 근적외선 LED는 0.1mm 내지 2mm 간격으로 서로 근접 배치되는,
것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기.

2. 삭제

3. 삭제

4. 삭제

5. 제 1 항에 있어서,
상기 옥은 볼록 형상으로 이루어지거나, 상기 옥과 상기 분리커버 사이에 볼록렌즈가 더 배치되는 것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기.

Description

Petitioner Therabody Ex-1004, 1142

TECHNICAL FIELD

[0001] The present invention relates to as a skin esthetic apparatus using the same, particularly in each home can be conveniently used in a portable from place and time are facilitated to freely without wishing to be bound can be used and, oxy (jade) LED visible radiation (Light Emitting Diode) heated by using a thermotherapy on the skin as far infrared rays and on the other hand to simultaneously provide the, visible light LED modularized together with the near infrared ray LED directly projected so as to be brought into contact to the skin by configuring the into the skin near infrared rays to transfer the skin esthetic effect to the maximization of the skin esthetic apparatus using the same that can be composition of this invention.

BACKGROUND ART

[0002] In general beautiful skin in order that is being sought is a systematic skin care is more important than anything present. Traditional skin management is primarily to use one hand to promote the circulation of the blood or lymph massage but is becoming the mainstream, in recent years in the middle layer is easily in each home personal skin so as to be able to manage a variety of skin cosmetic devices have been developed and are used for.

[0003] Skin beautification equipment include roller is used as pressing methods, vibration motor are used vibration type, using the ultrasonic wave scheme, loess, charcoal, oxy or the like composed of a mode using a far infrared ray radiator or the like is mainly has been used, such schemes may include the skin esthetic effect there is a limit to maximize thereto can be used.

[0004] In particular a mode using a far infrared radiator and a heat transfer heater to a temperature far infrared radiator that emits far infrared rays by heating to be applied to the facial skin because of the burn risk is not obtained, bed, mat, a cushion or locally limited only for the desired treatment applied to the present invention has been presented.

[0005] Also in the far infrared ray radiator system employed by the electric heater of an electric heater according to the use of the electromagnetic waves generated in the human body due to the occurrence of the adverse effect despite its efficacy because substantially far infrared radiator is applied to the skin beautification equipment still were limits the full bandwidth.

CITATION LIST

PATENT LITERATURE

[0006] KR 10-2006-0084084 A, 2006. 07. 24.
KR 10-1253611 B1, 2013. 04. 05.
KR 10-2014-0059471 A, 2014. 05. 16.
KR 20-0173224 Y1, 1999. 12. 17.

SUMMARY OF INVENTION

TECH PROBLEM

[0007] Accordingly, the present invention relates in order to solve the problems of the prior art proposes, in each home is conveniently used while enabling the portable thereby it is easy to place and time without wishing to be bound freely anytime and can be used, electrothermal heater is not necessary to use safely even in the facial skin may be applied, is deeper into the skin until the line far infrared and the near infrared by transferring the maximization of the skin esthetic effect can be used to provide such a device for skin cosmeticizing action and an object thereof to be used therein.

TECH SOLUTION

[0008] In order to achieve the above object according to one aspect of the present invention concerns a bat with a handle, the handle portion from a side of a part of the head of a body comprising a bent, wherein the main body in a head portion of the separating cover and removably coupling, wherein the separation cover attached to a surface of an oxy (jade) comprising comprising the OcaB, wherein the body has a head portion opposed to the OCAP and

Petitioner Therabody Ex-1004, 1143

installed in the inside of the, wherein the oxy mounted on a printed circuit board which applies heat to a plurality of visible light LED (Light Emitting Diode) and, wherein the printed circuit board mounted on the array substrate wherein the oxy emitting near infrared light into a plurality of near infrared ray LED and, wherein the printed circuit board which is provided on the galvanic providing current for the galvanic ion unit comprising a skin with a management module, installed in the inside of the handle portion for charging a battery or power supply from outside and operates based on the, operation of a switch in response to the visible rays of a plurality of near infrared rays LED and multiple LED and, this galvanic ion controller for controlling operation of a control module characterized in that it comprises a near infrared LED line provided with jade cosmetic skin its extended configuration.

[0009] Preferably, wherein the body has a head portion provided in the interior of said head portion to vibrate the vibration module may be further comprise.

[0010] Preferably, wherein the body has a head portion and the separation between the cylinder head cover further comprises a gate coupled to the upper cap, said upper cap is provided with a plurality of through hole formed in a LED said plurality of visible light, near infrared ray LED and a plurality of the galvanic ion portion of conductors by penetrating through a through hole to allow a part of an upwardly protruded can be disposed.

[0011] Preferably, the oxy comprises a plurality of near infrared rays emitted from the LED allows transmission of near infrared rays to 2mm can be formed with a thickness of 4mm.

[0012] Preferably, the oxy consists of or is convex shape, wherein the jade wherein the separation between the cylinder head cover can be a convex lens is further disposed.

ADVANTAGEOUS EFFECTS

[0013] As in the foregoing description, according to the present invention, the following effects such as can be obtained.

[0014] Firstly, according to the present invention, the head portion of the main body coupled to the upper cap and detachably joined to the OK kap, in the lower part thereof with visible light and near infrared ray LED LED comprising a skin management module is arranged to be restricted to the use of the facial skin as in the conventional electric heater which has been without the use of LED with oxo using visible light on the skin as far infrared heating and simultaneously providing a thermotherapy can be, through which safely even in the facial skin can be applied to effect the can be obtained.

[0015] Secondly, according to the present invention, the skin care module LED visible light and near infrared ray LED and arranged in the vicinity of each other, 2mm to 4mm of the oximes by forming a relatively thin thickness near infrared ray LED without loss of near infrared rays emitted from the outside through the oxy and visualized depending on the by near infrared rays is deeper into the skin until the skin with a far infrared rays by delivering a cosmetic effect can be maximized.

[0016] Thirdly, according to the present invention, the skin care module galvanic ion together with infrared LED parts together to the skin of the conductors by arranging the galvanic ions near infrared simultaneously supplied to the skin of unnecessary waste and is discharged to the outside, skin health benefit to the promotes the absorption of nutritive elements can be included therein.

[0017] Fourthly, if according to the present invention, in an oak cap attached a convex lens which is formed to be in the form of an octanol, or separation between the jade cover by disposing a convex lens in the near infrared ray LED near infrared ray emitted from the emission of carbon monoxide by the convex lens is used for concentrating the skin esthetic effect can be maximized.

[0018] Fifthly, according to the present invention, the interior of the body and the installation vibration module, through which is an oxime to the skin to the

skin in a close contact state vibration that is transferred far infrared and the near infrared line by skin in conjunction with a cosmetic effect and can maximize an, depending upon the properties of the skin of the user to selectively operate the user or can be used to widen the width of a selected volume of air for competitiveness can be ensured.

[0019] Sixth, if according to the present invention, the oxetane ring attached to the top of the OK KAP and removable from the cap coupled to a lower portion, visible light and near infrared ray LED LED upper cap is protruded upward from the contact surface by being disposed in the top cap was detached from the OcaB projected outside the visible light and near infrared ray LED LED directly to contact the skin so that it can be used in a state that by providing a near IR thermotherapy is delivered is deeper into the skin until it is possible to the skin esthetic effect can be maximized.

DESCRIPTION OF DRAWINGS

[0020] Fig. 1 is a block diagram of skin esthetic device according to an exemplary embodiment perspective view as viewed from above. Fig. 2 is shown in Fig. 1 skin esthetic device perspective view from below. Fig. 3 is a schematic view illustrating the body 1 ok KAP with mutually isolated perspective view showing a state in which the. Fig. 4 is a cross shown in the cross section of the skin esthetic device 1 according to the present invention. Fig. 5 is a view illustrating the body 2 of each of the illustrated in order to explain to an exploded perspective view. Fig. 6 is shown in Fig. 5 in order to describe a control module in accordance with the same. Fig. 7 is a OcaB according to the invention shown in a manner to sectional view for explaining the jade.

DESCRIPTION OF EMBODIMENTS

[0021] And other features and advantages of the present invention, a method of achieving is and their reference to the accompanying drawings in the accompanying drawings and described in detail later in referring to the entities will be apparent. However, the present invention is not limited to the embodiments disclosed below rather than being implemented in a variety of different forms of the invention will be.

[0022] In the present specification in the present embodiment is the complete disclosure of the present invention and in such a way, the present the present invention relates to one of ordinary skill in the art for the person who has to complete the scope of the invention in order to inform when the mold assembly is provided. And the invention is only defined by the scope of the claims of the present invention. Thus, in some embodiments, components known as well, the operation and well known in a well known technique of the present invention relate broadly interpreted as referring to obscure the present in order to avoid that does not specifically described.

[0023] Also, the same reference numerals throughout the specification to refer to the same constituent elements. And, as used in the present specification (mentioned) terms are embodiments for descriptive purposes and are intended to be limiting of the present invention is not. In the present specification, unless stated otherwise specifically in the singular phrase does not include the plural forms as well. Further, comprising>"(or, provided with) a is referred to as elements and the operation of one or more other elements and the operation of does not exclude the presence or addition.

[0024] If there is no other definitions, used in the present specification all terms (including technical and scientific terms) shows a cross section of the present invention relates to one of ordinary skill in the art for the person who has can be understood in common can be used in a meaning of this disclosure. Also generally defined in the dictionary used the terms are defined for the pressure is not ideally or excessively not to be construed as.

[0025] Hereinafter referred to as, with reference to the accompanying drawings in which the technical features of the present invention will be specifically described for the sake of conciseness.

[0026] Fig. 1 is a schematic according to an embodiment of the present invention provided with a near infrared ray LED jade beautification equipment to the skin of a perspective view as viewed from above, Fig. 2 is shown in Fig. 1 skin esthetic device perspective view from below, Fig. 3 is shown in Fig. 1 between the body and the OK kap mutually separated perspective view illustrating a state, Fig. 4 shows a skin esthetic device 1 shown in a cross section of the cross sectional view and, Fig. 5 is a view illustrating the body 2 for explaining the configuration of each of the protector according to an exploded perspective view thereof.

[0027] Fig. 1 referring to Fig. 5 to, according to an embodiment of the present invention with skin beautification equipment (100) and (10), in the head portion of the main (10) body (10a) detachably joined to the including OCAP (20).

[0028] The head portion (10a) and the body is arranged (10), from the head portion (10a) at approximately right angles to the handle portion (10b) extending and includes, head portion (10a) and the handle part (10b) is a bottom cover (11) and the upper cover (12) via the coupling of the formed therein.

[0029] Fig. 4 and Fig. 5 the body is arranged (10) such as shown in, and the lower cover (11), the upper cover (12) and, with upper (13) and, skin with a management module (14), control module (15), including rechargeable batteries (16). In addition, according to the present invention the body is arranged to (20) be vibration further comprising a control module (17).

[0030] As shown in Fig. 5 is a lower cover (11), the upper cover (12) in the inside thereof in combination with a skin care module (14), control module (15), rechargeable battery (16) and vibration module (17) is received form a receiving space.

[0031] Such a lower cover (11) is combined with the upper cover (12) in a state where the moisture or biting is introduced into the accommodation space so as not to consist of a material which has a waterproof function. For example, a lower cover (11) is a synthetic resin material, rubber material or any one of the fiber material can be composed of a material. Preferably made from a plastic material having a constant intensity can be made.

[0032] In Fig. 4 and Fig. 5 lower cover (11) as shown in the following, mounted on the bottom of a printed circuit board of the control module (15) of the plurality of switch (151) and the indicating (152) lamp is exposed to the outside (11a, 11b) a plurality of exposures so that the ball is formed therein. Also, the upper cover (12) and the skin care module (14) in coupled condition, control module (15), rechargeable battery (16) and vibration module (17) depending on the operation of said receiving space to generated heat in order to emit the heat outside a plurality of ventilation (11c) is further formed may also be present.

[0033] The upper cover (12) is in the same manner as the lower cover (11) can be made of a material. And, a lower cover (11) and the upper cover (12) has a central portion are screwed group that has been, in male and female bonded to each other in order to enhance bonding shown in Fig. 5 as can be seen, the plurality of binding protrusion or coupling groove formed therein.

[0034] Fig. 4 and Fig. 5 the upper cover (12) is a as shown in the upper cap (13) attached as a head portion which is open in section (12a) to each other is provided, opening (12a) include a skin management module (14) is accepted.

[0035] The upper (13) cap shown in Fig. 5 and as indicated above, the opening of the upper cover (12) (12a) of the upper cover (12) so as to cover coupled to the head portion, and a plurality of LED (142) skin management module (14) of, galvanic ion unit (143, see Fig. 6) of conductors (143a) is a through hole which projects from the (13a) is a plurality of through holes formed therein. This top cap (13) may include a (12) top cover detachably to a coupling element may also be present.

[0036] As shown in Fig. 4 skin management module (14) may, ocap (20) so as to oppose the head portion of the interior of the main (10) body (10a)

installed onto the. Such skin management module (14) with the printed circuit board (141), the top of the printed circuit board (141) to be mounted on a thermotherapy emitting near infrared light with a plurality of LED (142) and, comprises the galvanic ion unit (143).

[0037] A plurality of LED (142) shows a number of visible light and near infrared ray LED LED include. In the present invention shown in Fig. 3 as can be seen, the visible light of multiple LED and near infrared ray LED is formed on the upper cap (13) in a through hole (13a) through the semiconductor substrate and is protruded into the upper part of the upper cap (13) mounted so.

[0038] Fig. 3 as described above, the present invention relates to the top cap (13) in a state where the OCAP (20) was separated from the plurality of visible light and near infrared ray LED LED is a through hole of the upper cap (13) (13a) through the contact surface (the surface contacting directly to the skin) and protruding into the, through which the visible light and near infrared ray LED LED is directly over the skin over the visible light so as to allow contact through the line and the near infrared thermotherapy LED LED near infrared ray emitted through the effectively into the skin is permeated deep into the skin esthetic effect can be maximized.

[0039] In other words, and in the near infrared in the near infrared ray released LED of skin penetration depth is about 6mm with approximately known under the designation, LED near infrared light is a near infrared rays is emitted from the wavelength of the epidermis of the skin and able to pierce, delivered to the dermis in order to beautification equipment (100) skin of the present invention as shown in, visible light and near infrared ray LED LED are (13a) passes through the through hole of the upper cap (13) through protruding into the upper part of the surface and thereby directly contact must be contacts the human body. Through this, the visible light having a thermotherapy LED LED through a near IR through the near infrared ray released effectively inside of human body is permeated deep into the skin cosmetic effect can be maximized.

[0040] At this time, the contact surface of the upper cover (12) and which project a plurality of LED (142) based on the height of the contact surface of the upper cover (12) approximately 1mm to 3mm so that the concentration of protruding to the preferred over the others. In addition, according to the present invention constituting a plurality of LED (142) LED is approximately 380nm to 760nm band such as visible light, preferably of 630nm band LED was used and, is approximately 780nm to 2,500nm band for the near infrared ray LED, preferably LED of 830nm band used for the same purpose are preferred over the others.

[0041] According to the present invention cosmetic and skin device (100) constituting a plurality of LED (142) may be visible light and near infrared ray LED LED is arranged in the proximity to each other on the printed (141) circuit board are preferably as follows. In other words, skin esthetic device (100) according to the present invention have a plurality of visible light and a multitude of near infrared rays having respectively LED LED on a printed circuit board (141) are grouped into a circular or polygonal in being arranged with respect to the, for each LED 0. 1mm to 2mm is arranged in proximity to each other into the unit area by ($1cm^2$) sugar visible light LED is provided from a hyperthermia unit area at the same time that concentrate ($1cm^2$) near infrared ray LED per near infrared ray emission amount emitted from a skin for concentrating the cosmetic effect can be maximized.

[0042] Galvanic ion unit (143) (143a) is a conductor of Fig. 3 and as shown in Fig. 5, in the same manner as a plurality of LED (142) mounted on the top of the printed circuit board (141), in the same manner as a plurality of LED (142) consist of the shape and height. Galvanic ion unit (143a) of such conductors is a conductive metal, for example being made up of a copper material, as shown in a plurality of LED (142) through hole of the upper cap (13) (13a) and wherein a portion of the cap (13) through the through holes of the through (13a) protruding out of contact with a surface.

Petitioner Therabody Ex-1004, 1147

[0043] Galvanic ion portion is connected to the (143) fine direct current of a galvanic current (ion) is supplied to the skin. This galvanic current is contains moisture in an amount of skin when passing through the cathode and the anode (+) (-) used to create a chemical action of the by, this chemistry is galvanic current cell tissue of the human body passes between the first and subculturing and occurs even when the, through which unnecessary waste is discharged to the outside of the skin and, skin health benefit in which aids the absorption of the nutrient role.

[0044] Fig. 6 is shown in Fig. 5 a control module in accordance with the same in order to explain the present invention.

[0045] Referring to Fig. 5 and Fig. 6, the control module (15) has a main body (10) (10b) installed onto the knob portion of the.

[0046] This control module includes a (15) rechargeable battery (16) or external power supply receives power from and, in response to the operation (151) of a switch of the skin with a management module (14), vibrating module (17) to control the operation of the. At this time, the switch is configured in (151) operation and a power switch including a switch, control module is configured to (15) switch operation in response to the skin with a management module (14), vibrating module (17) to control the operation of the.

[0047] The control module is (15) as shown in Fig. 6, a predetermined motion according to the order in skin care module and a (14) vibration module (17) and to operate at the same time, operate independently or can be included therein.

[0048] For example, a control module according (15) to the present invention is that the user presses the operating switch of the switch (151), of the skin management module (14) operates and the plurality of LED (142), operating switch again presses in non operates and the plurality of LED (142), galvanic ion unit (143) is operated. Thereafter, operating switch again presses with a plurality of LED (142) galvanic ion unit (143) operates and the ratio, the vibration module (17) is operated. In addition, the control module (15) is used where the user presses the operating switch 1 times, operates and the plurality of LED (142), presses the operating switch 2 times, and a plurality of LED (142) and galvanic ion unit (143) operated at the same time, presses the operating switch 3 times, a plurality of LED (142), galvanic ion portion (143) and to simultaneously operate the vibration module (17) may also be present.

[0049] The control module is (15) shown in Fig. 6 as described above, via the input section (155) to form an interface with a user may also be present. The user via the input section (155) control module (15) is controlled so that the operating switch is controlled via a by changing the order of operation may also be present. In other words, the user input unit (155), through a plurality of LED (142) galvanic ion portion (143) and change the order of the vibration module (17) may also be present.

[0050] According to the present invention as shown in Fig. 6 skin beautification equipment (100) is, in close proximity to the skin can be photographed can be further comprising a camera (154). Camera (154) is a main (10) body of the lower cover and (111) upper cover (112) installed on any of the skin as a by photographing the transmitted to the control module (15).

[0051] The control module is (15) from images photographed by the camera (154) skin image is provided by a display portion (153). The user through the display unit (153) in real time the current skin condition can be confirmed.

[0052] Display unit (153) starts a timer (not shown) indicating a time provided through may also be present. That is, display parts (153), a plurality of LED (142) galvanic ion portion or the (143) vibration module (17) of the operating time can be displayed in real time.

[0053] Wherein the (15) control module is provided through a timer, it is determined based on a plurality of LED (142) galvanic ion portion or the (143)

Petitioner Therabody Ex-1004, 1148

vibration module (17) to control the operating time of the gas may also be present.

[0054] In addition, according to the present invention in Fig. 6 skin esthetic equipment (100) is as described above, further comprises a temperature sensor (156) elements may be present. The control module (15) is a temperature sensor (156) through a plurality of LED (142) and detect the temperature of the heat generation, if the sensed temperature is at a set temperature value is higher than the operation of the plurality of LED (142) is blocked.

[0055] As shown in Fig. 5 lights (152) may, when two of which 4 can be installed, which has a color different from each other with LED can be made. 4 A plurality of LED (142) two lights (152) may constituting LED visible light and near infrared ray LED, and, galvanic ion irradiation unit (143), an operating state of the vibration module (17) is displayed. This user according to the operating state of the indicators (152) on the basis of LED radiation in the visible, near infrared line LED, galvanic ion unit (143), vibration module (17) can be confirmed state of operation of the present invention.

[0056] On the other hand, according to the present invention in Fig. 4 and Fig. 5 the body is arranged (10) as shown in, vibration module and a (17) skin member (18) is further provided a buffer between the management module (14) may also be present. The buffer member (18) is a vibration module and a (17) skin care between a module (14) and provide insulation, vibration of the (17) vibration module of direct skin management module (14) may be transferred into the skin management module (14) and prevents it from being damaged.

[0057] Fig. 3 and Fig. 4 as shown in the following, according to the present invention OCAP (20) is detachably joined to the upper cap (13) to cover (21) and separated, separation cover (21) attached to the top of the oximes include (jade) (22).

[0058] The cover (21) is in the separation of the upper cap (13) protrudes through the through hole (13a) is a plurality of LED (142) so as to be exposed and opened to the upper and lower portions consist of the structure. According to this plurality of LED (142) LED of heat emitted from the visible light provided in an upper portion as it is delivered to the heating and oxy (22) oximes (22), LED near infrared rays emitted from a near infrared rays are released to the outside through the oxy (22).

[0059] Oxy (22) is a transparent or semitransparent and purgatory jadeite with, attached to the upper surface of the separation cover (21). In such an oxetane compound (22) may include a visible light LED heated by the far infrared rays and provides it to the skin.

[0060] The oxetane ring (22) is disposed in a bottom of near infrared rays emitted from a plurality of LED (142) LED near infrared ray for passing a relatively thin thickness in order to form are preferred over the others. For example, 2mm to 4mm, more preferably formed with a thickness of 3mm is preferred over the others. In addition, even at a low temperature selected from corn (22) has been heated to emit far infrared rays from corn (22) and of a plurality of LED (142) is approximately 10mm or less in the intervals between, preferably 5mm to 7mm are placed so as to have.

[0061] Fig. 7 is a jade structure according to the present invention for explaining the sectional view shown in a manner to Jade.

[0062] Fig. 7 of referring to (a), the oxidoreductase 22) the present invention drives a liquid composed of a structure in a flat top or, as shown in Fig. 7 (b) or of the, still another embodiment of the present invention (22a) - benzoxazin - has a unit area ($1cm^2$) near infrared ray LED per near infrared ray emission amount emitted from the bottom so as to converge at the upper portion is very flat and essentially consisting of a convex lens having a convex shape. In addition, as shown in Fig. 7 (c) of, by way of another example of the present invention (22b) is oxo the top and the bottom is composed of a flat structure, oxy (22b) and a separation between the cylinder head cover (21) can be

Petitioner Therabody Ex-1004, 1149

further provided with a convex lens (23). Through which the near infrared line LED near infrared emission amount emitted from a cosmetic effect for concentrating the skin can be maximized.

[0063] On the other hand, Fig. 5 unexplained"is a knob portion of the main (10) body 19 (10b) of both side parts as a cover combined to a side surface, a lower cover (111) and the upper cover (112) is coupled to the between. (10b) Such a side cover as a handle member when the user grasps and designed to ensure good tactile sensation in consideration of the form of a metal material with.

[0064] Or less, according to an embodiment of the present invention and the effects of skin esthetic device (100) description for the sake of conciseness.

[0065] First of all, in accordance with an embodiment of the present invention skin beautification equipment (100) is a main (10) body of the head portion (10a) coupled to the upper cap (13) is detachably joined to the OCAP (20) and, in the lower part thereof LED visible light and near infrared ray LED comprising a skin management module (14) is arranged to be oximes as in the prior art for heating the electric heater used without the use of oximes LED visible light by the use of an effective heating of the thermotherapy and far infrared rays on the skin as can be simultaneously provide, through which safely even in the facial skin can be applied to effect the can be obtained.

[0066] In addition, according to an embodiment of the present invention skin esthetic device (100) is a skin care module (14) LED visible light and near infrared ray LED is arranged close to each other and a visible ray LED and near infrared ray LED and less than or equal to 10mm oxalic acid and a (22) gap between the relatively closely arranged 2mm to 4mm of the oxetane ring (22) at the same time a relatively thin thickness easily heated by forming and oxalic acid and a (22), the near infrared ray is emitted from the near infrared ray LED without loss to the outside through the oxy (22) and visualized depending on the by near infrared rays is deeper into the skin until the skin with a far infrared rays by delivering a cosmetic effect can be maximized.

[0067] In addition, a skin esthetic agent according to embodiments of the present invention device (100) is a skin care module (14) galvanic ion together with infrared LED parts (143) of conductors (143a) together provide near infrared rays to the skin by placing the galvanic ions together at the same time by supplying an unnecessary waste of the skin and is discharged to the outside, skin health benefit to the promotes the absorption of nutritive elements can be included therein.

[0068] In addition, according to an embodiment of the present invention skin esthetic equipment (100) is attached to the OCAP (20) that can have a convex shape is formed to be a (22a), or (22b) between the oxetane ring and separating from the cover (21) by the arrangement of the convex lens in (23) the near infrared ray LED near infrared ray emission amount emitted from the oxetane ring (22a) was used to or concentrating, the convex lens is used (23) for concentrating the cosmetic effect to the skin can be maximized.

[0069] Also, according to embodiments of the present invention skin beautification equipment (100) is a vibration module for (17) the interior of the body (10) by installing an of skin treatment according to far infrared and the near infrared line is provided at the same time by transferring the vibration to the skin of the far infrared and the near infrared line and skin esthetic - tentiating effects by binding agents may be present.

[0070] In addition, according to an exemplary embodiment of the present invention skin beautification equipment (100) is removable from the top cap (13) and OCAP (20) coupled to a lower portion, LED visible light, near infrared ray LED galvanic ion unit (143a) and the conductor of the contact surface of the upper cap (13) is disposed protruding upwards, through which the OCAP (20) was detached from the upper cap (13) projecting to the outside of the visible laser LED, the near infrared ray LED and a galvanic ion portion of conductors (143a) is directly over the skin by so as to allow contact

Petitioner Therabody Ex-1004, 1150

with the hyperthermia treatment of near infrared rays is deeper into the skin until it is possible to delivered to the skin esthetic effect can be maximized.

[0071] As described above the present invention and the technical features of the preferred embodiments specifically although described, wherein the preferred embodiments are for the purpose of illustration and, is not intended to be a limitation thereof. As such those skilled in the art will appreciate that the invention within the scope of the technical idea of the present embodiment of the present invention through the combination of the various embodiments are enabled and it will be understood by one.

REFERENCE SIGNS LIST

[0072] 100: Skin beautification equipment 10: body 10a: head portion 10b: handle part 11: a lower cover 12: upper cover 13: upper cap 14: skin management module 15: control module 16: rechargeable battery 17: vibration module 18: buffer member 19: side cover 141: a printed circuit board 142: a number of LED 143: 143a parts galvanic ion: conductor 151: switch 152: indicating lamp 153: display unit 154: camera 155: input unit 156: temperature sensor 20: ocap 21: separation cover 22, 22a, 22b: oxy

Petitioner Therabody Ex-1004, 1151

(19) 대한민국특허청(KR)
(12) 등록특허공보(B1)

(45) 공고일자 2015년03월23일
(11) 등록번호 10-1504885
(24) 등록일자 2015년03월17일

(51) 국제특허분류(Int. Cl.)
A61N 5/06 (2006.01) *A61N 1/30* (2006.01)
A61H 23/02 (2006.01)
(21) 출원번호 10-2014-0152555
(22) 출원일자 2014년11월05일
심사청구일자 2014년11월05일
(56) 선행기술조사문헌
KR200297648 Y1*
JP2005323970 A
*는 심사관에 의하여 인용된 문헌

(73) 특허권자
조성찬
인천광역시 부평구 부평북로 407 ,101동1607호 (삼산동,현대아파트)
이창희
인천광역시 남구 미추홀대로586번길 58, B01호 (주안동)
(72) 발명자
조성찬
인천광역시 부평구 부평북로 407 ,101동1607호 (삼산동,현대아파트)
이창희
인천광역시 남구 미추홀대로586번길 58, B01호 (주안동)
(74) 대리인
이환권

전체 청구항 수 : 총 2 항 심사관 : 유창용

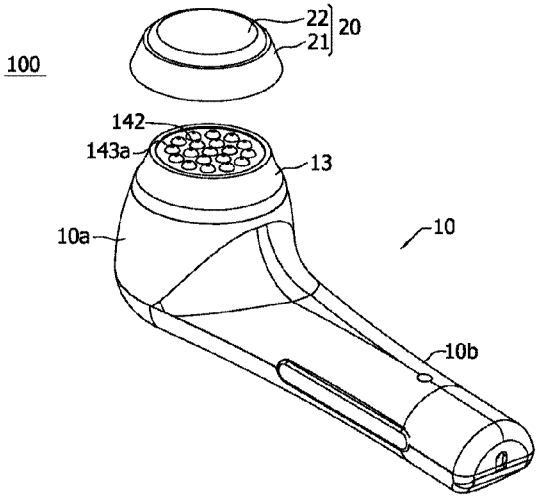
(54) 발명의 명칭 **옥과 근적외선 엘이디를 구비한 피부 미용기기**

(57) 요 약

본 발명은 피부 미용기기에 관한 것으로서, 상세하게는 각 가정에서 간편하게 사용이 가능하면서 휴대가 용이하여 장소와 시간에 구애받지 않고 자유롭게 사용할 수 있고, 옥(jade)을 가시광선 LED(Light Emitting Diode)를 이용하여 가열하여 피부에 온열과 원적외선을 동시에 제공하는 한편, 가시광선 LED와 함께 모듈화된 근적외선

(뒷면에 계속)

대 표 도 - 도3



MassagerPriorArt0000564

Petitioner Therabody Ex-1004, 1152

LED를 직접 피부에 접촉가능하도록 돌출 구성함으로써 근적외선을 피부 속까지 전달하여 피부 미용효과를 극대화 할 수 있는 피부 미용기기에 관한 것이다.

이를 위해 본 발명은 손잡이부와, 상기 손잡이부의 일측부로부터 절곡된 헤드부를 포함하는 본체와, 상기 본체의 헤드부에 착탈가능하게 결합된 분리커버와, 상기 분리커버의 상면에 부착된 옥(jade)을 포함하는 옥캡을 포함하되, 상기 본체는 상기 옥캡과 대향하도록 상기 헤드부의 내부에 설치되되, 인쇄회로기판 상에 실장되어 상기 옥에 열을 가하는 다수의 가시광선 LED(Light Emitting Diode)와, 상기 인쇄회로기판 상에 실장되어 상기 옥으로 근적외선을 방출하는 다수의 근적외선 LED와, 상기 인쇄회로기판 상에 실치되어 갈바닉 전류를 제공하는 갈바닉 이온부를 포함하는 피부 관리모듈과, 상기 손잡이부의 내부에 설치되어 충전용 배터리 또는 외부로부터 전원을 공급받아 동작하고, 스위치의 동작에 응답하여 상기 다수의 가시광선 LED 및 다수의 근적외선 LED와, 상기 갈바닉 이온부의 동작을 제어하는 제어모듈을 포함하는 것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기를 제공한다.

MassagerPriorArt0000565

Petitioner Therabody Ex-1004, 1153

Petitioner Therabody Ex-1004, 1154

특허청구의 범위

청구항 1

손잡이부와, 상기 손잡이부의 일측부로부터 절곡된 헤드부를 포함하는 본체; 및

상기 본체의 헤드부에 착탈가능하게 결합된 분리커버와, 상기 분리커버의 상면에 부착된 옥(jade)을 포함하는 옥캡; 을 포함하되,

상기 본체는,

상기 옥캡과 대향하도록 상기 헤드부의 내부에 설치되되, 인쇄회로기판 상에 실장되어 상기 옥에 열을 가하도록 380nm 내지 760nm 대역의 다수의 가시광선 LED(Light Emitting Diode)와, 상기 인쇄회로기판 상에 실장되어 상기 옥으로 근적외선을 방출하도록 780nm 내지 2,500nm 대역의 다수의 근적외선 LED와, 상기 인쇄회로기판 상에 설치되어 갈바닉 전류를 제공하는 갈바닉 이온부를 포함하는 피부 관리모듈;

상기 손잡이부의 내부에 설치되어 충전용 배터리 또는 외부로부터 전원을 공급받아 동작하고, 스위치의 동작에 응답하여 상기 다수의 가시광선 LED 및 다수의 근적외선 LED와, 상기 갈바닉 이온부의 동작을 제어하는 제어모듈;

상기 헤드부의 내부에 설치되어 상기 헤드부를 진동시키는 진동모듈; 및

상기 헤드부와 상기 분리커버 사이에 결합되는 상부캡; 을 포함하되,

상기 상부캡에는 다수의 관통공이 형성되어 상기 다수의 가시광선 LED, 다수의 근적외선 LED 및 상기 갈바닉 이온부의 전도체의 일부가 상기 관통공을 관통하여 상부로 돌출 배치되고,

상기 옥은 상기 다수의 근적외선 LED로부터 방출된 근적외선이 투과되도록 2mm 내지 4mm의 두께로 형성하고,

상기 다수의 근적외선 LED 및 상기 다수의 근적외선 LED와 상기 옥 사이의 간격은 5mm 내지 7mm가 되도록 하고,

상기 다수의 가시광선 LED와 상기 다수의 근적외선 LED는 0.1mm 내지 2mm 간격으로 서로 근접 배치되는,

것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기.

청구항 2

삭제

청구항 3

삭제

청구항 4

삭제

청구항 5

제 1 항에 있어서,

상기 옥은 볼록 형상으로 이루어지거나, 상기 옥과 상기 분리커버 사이에 볼록렌즈가 더 배치되는 것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기.

명 세 서

기 술 분 야

[0001] 본 발명은 피부 미용기기에 관한 것으로서, 상세하게는 각 가정에서 간편하게 사용이 가능하면서 휴대가 용이하여 장소와 시간에 구애받지 않고 자유롭게 사용할 수 있고, 옥(jade)을 가시광선 LED(Light Emitting Diode)를

MassagerPriorArt0000566

Petitioner Therabody Ex-1004, 1155

이용하여 가열하여 피부에 온열과 원적외선을 동시에 제공하는 한편, 가시광선 LED와 함께 모듈화된 근적외선 LED를 직접 피부에 접촉가능하도록 돌출 구성함으로써 근적외선을 피부 속까지 전달하여 피부 미용효과를 극대화할 수 있는 피부 미용기기에 관한 것이다.

배 경 기 술

[0002] 일반적으로 아름다운 피부를 추구하기 위해서는 체계적인 피부관리가 무엇보다 중요하다. 전통적인 피부관리는 주로 손을 사용하여 혈액이나 림프의 순환을 촉진하는 마사지(massage)가 주류를 이루었으나, 근래에 들어서는 각 가정에서 개인이 손쉽게 피부를 관리할 수 있도록 다양한 피부 미용기기들이 개발되어 사용되고 있다.

[0003] 피부 미용기기로는 롤러를 이용한 가압방식, 진동모터를 이용한 진동방식, 초음파를 이용한 방식, 황토, 숯, 옥 등으로 이루어진 원적외선 방사체를 이용한 방식 등이 주로 사용되고 있으나, 이러한 방식들은 피부 미용효과를 극대화하는데 한계가 있다.

[0004] 특히 원적외선 방사체를 이용한 방식은 전열히터를 이용하여 원적외선 방사체를 가열하여 원적외선을 방출하는 것으로 화상 위험때문에 안면 피부에는 적용하지 못하고, 침대, 매트, 방석 또는 국부적 치료기에만 한정적으로 적용되고 있는 실정이다.

[0005] 또한 원적외선 방사체를 이용한 방식에서는 전열히터를 사용함에 따라 전기히터에서 발생되는 전자파로 인한 인체 부작용이 발생하기 때문에 그 효능에도 불구하고 실질적으로 원적외선 방사체를 피부 미용기기에 적용하는데에는 여전히 한계가 있었다.

선행기술문헌

특허문헌

[0006] (특허문헌 0001) KR 10-2006-0084084 A, 2006. 07. 24.

(특허문헌 0002) KR 10-1253611 B1, 2013. 04. 05.

(특허문헌 0003) KR 10-2014-0059471 A, 2014. 05. 16.

(특허문헌 0004) KR 20-0173224 Y1, 1999. 12. 17.

발명의 내용

해결하려는 과제

[0007] 따라서, 본 발명은 종래기술의 문제점을 해결하기 위하여 제안된 것으로서, 각 가정에서 간편하게 사용이 가능하면서 휴대가 용이하여 장소와 시간에 구애받지 않고 언제 어디서나 자유롭게 사용할 수 있고, 전열히터을 사용하지 않아 안면 피부에도 안전하게 적용할 수 있으며, 피부 속 깊은 곳까지 원적외선과 근적외선을 전달하여 피부 미용효과를 극대화할 수 있는 피부 미용기기를 제공하는데 그 목적이 있다.

과제의 해결 수단

[0008] 상기한 목적을 달성하기 위한 일 측면에 따른 본 발명은 손잡이부와, 상기 손잡이부의 일측부로부터 절곡된 헤드부를 포함하는 본체와, 상기 본체의 헤드부에 착탈가능하게 결합된 분리커버와, 상기 분리커버의 상면에 부착된 옥(jade)을 포함하는 옥캡을 포함하되, 상기 본체는 상기 옥캡과 대향하도록 상기 헤드부의 내부에 설치되되, 인쇄회로기판 상에 실장되어 상기 옥에 열을 가하는 다수의 가시광선 LED(Light Emitting Diode)와, 상기 인쇄회로기판 상에 실장되어 상기 옥으로 근적외선을 방출하는 다수의 근적외선 LED와, 상기 인쇄회로기판 상에 설치되어 갈바닉 전류를 제공하는 갈바닉 이온부를 포함하는 피부 관리모듈과, 상기 손잡이부의 내부에 설치되어 충전용 배터리 또는 외부로부터 전원을 공급받아 동작하고, 스위치의 동작에 응답하여 상기 다수의 가시

MassagerPriorArt0000567

Petitioner Therabody Ex-1004, 1156

광선 LED 및 다수의 근적외선 LED와, 상기 갈바닉 이온부의 동작을 제어하는 제어모듈을 포함하는 것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기를 제공한다.

[0009] 바람직하게, 상기 본체는 상기 헤드부의 내부에 설치되어 상기 헤드부를 진동시키는 진동모듈을 더 포함할 수 있다.

[0010] 바람직하게, 상기 본체는 상기 헤드부와 상기 분리커버 사이에 결합되는 상부캡을 더 포함하되, 상기 상부캡에는 다수의 관통공이 형성되어 상기 다수의 가시광선 LED, 다수의 근적외선 LED 및 상기 갈바닉 이온부의 전도체의 일부가 상기 관통공을 관통하여 상부로 돌출 배치될 수 있다.

[0011] 바람직하게, 상기 옥은 상기 다수의 근적외선 LED로부터 방출된 근적외선이 투과되도록 2㎜ 내지 4㎜의 두께로 형성할 수 있다.

[0012] 바람직하게, 상기 옥은 볼록 형상으로 이루어지거나, 상기 옥과 상기 분리커버 사이에 볼록렌즈가 더 배치될 수 있다.

발명의 효과

[0013] 이상에서 설명한 바와 같이, 본 발명에 따르면, 다음과 같은 효과들을 얻을 수 있다.

[0014] 첫째, 본 발명에 따르면, 본체의 헤드부에 결합된 상부캡에 옥캡이 착탈가능하게 결합되고, 그 하부에 가시광선 LED와 근적외선 LED를 포함하는 피부 관리모듈이 배치됨으로써 종래와 같이 안면 피부 사용에 제한적이었던 전열히터를 사용하지 않고도 가시광선 LED를 이용하여 옥을 가열하여 피부에 온열과 원적외선을 동시에 제공할 수 있으며, 이를 통해 안면 피부에도 안전하게 적용할 수 있는 효과를 얻을 수 있다.

[0015] 둘째, 본 발명에 따르면, 피부 관리모듈에 가시광선 LED와 근적외선 LED를 서로 근접 배치하고, 옥을 2㎜ 내지 4㎜의 비교적 얇은 두께로 형성함으로써 근적외선 LED로부터 방출된 근적외선이 손실없이 옥을 통해 외부로 투시됨에 따라 근적외선을 피부 속 깊은 곳까지 전달하여 원적외선과 함께 피부 미용효과를 극대화할 수 있다.

[0016] 셋째, 본 발명에 따르면, 피부 관리모듈에 근적외선 LED와 함께 갈바닉 이온부의 전도체를 함께 배치함으로써 피부에 근적외선과 갈바닉 이온을 동시에 공급하여 피부의 불필요한 노폐물은 외부로 배출하고, 피부 건강에 이로운 영양성분의 흡수를 촉진시킬 수 있다.

[0017] 넷째, 본 발명에 따르면, 옥캡에 부착되는 옥을 볼록렌즈 형태로 형성하거나, 혹은 옥과 분리커버 사이에 볼록렌즈를 배치함으로써 근적외선 LED로부터 방출되는 근적외선 방출량을 볼록렌즈를 이용하여 집중시켜 피부 미용효과를 극대화할 수 있다.

[0018] 다섯째, 본 발명에 따르면, 본체의 내부에 진동모듈을 설치하고, 이를 통해 옥이 피부에 밀착된 상태에서 피부에 진동이 전달되도록 함으로써 원적외선과 근적외선과 결합하여 피부 미용효과를 극대화시킬 수 있고, 사용자의 피부 특성에 따라 사용자가 선택적으로 동작시켜 사용할 수 있어 선택의 폭을 넓혀 경쟁력을 확보할 수 있다.

[0019] 여섯째, 본 발명에 따르면, 옥이 부착된 옥캡이 상부캡으로부터 착탈가능하도록 결합되고, 가시광선 LED와 근적외선 LED가 상부캡의 접촉면 상부로 돌출 배치됨으로써 옥캡을 상부캡으로부터 분리시킨 후 외부로 돌출된 가시광선 LED와 근적외선 LED가 직접 피부에 접촉된 상태로 사용할 수 있도록 제공함으로써 온열과 근적외선이 피부 속 깊은 곳까지 전달되는 것이 가능하여 피부 미용효과를 극대화할 수 있다.

도면의 간단한 설명

[0020] 도 1은 본 발명의 실시예에 따른 피부 미용기기를 위에서 바라본 사시도.

도 2는 도 1에 도시된 피부 미용기기를 아래에서 바라본 사시도.

도 3은 도 1에 도시된 본체와 옥캡이 상호 분리된 상태를 도시한 사시도.

도 4는 도 1에 도시된 피부 미용기기의 단면을 도시한 단면도.

MassagerPriorArt0000568

Petitioner Therabody Ex-1004, 1157

도 5는 도 2에 도시된 본체의 각 구성을 설명하기 위하여 도시한 분해 사시도.

도 6은 도 5에 도시된 제어모듈을 설명하기 위하여 도시한 블럭도.

도 7은 본 발명에 따른 옥캡을 설명하기 위하여 도시한 옥캡의 단면도.

발명을 실시하기 위한 구체적인 내용

[0021] 본 발명의 이점 및 특징, 그리고 그것들을 달성하는 방법은 첨부되는 도면과 함께 상세하게 후술되는 실시예를 참조하면 명확해질 것이다. 그러나, 본 발명은 이하에서 개시되는 실시예로 한정되는 것이 아니라 서로 다른 다양한 형태로 구현될 것이다.

[0022] 본 명세서에서 본 실시예는 본 발명의 개시가 완전하도록 하며, 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자에게 발명의 범주를 완전하게 알려주기 위해 제공되는 것이다. 그리고 본 발명은 청구항의 범주에 의해 정의될 뿐이다. 따라서, 몇몇 실시예에서, 잘 알려진 구성 요소, 잘 알려진 동작 및 잘 알려진 기술들은 본 발명이 모호하게 해석되는 것을 피하기 위하여 구체적으로 설명되지 않는다.

[0023] 또한, 명세서 전체에 걸쳐 동일 참조 부호는 동일 구성 요소를 지칭한다. 그리고, 본 명세서에서 사용된(언급된) 용어들은 실시예를 설명하기 위한 것이며 본 발명을 제한하고자 하는 것은 아니다. 본 명세서에서, 단수형은 문구에서 특별히 언급하지 않는 한 복수형도 포함한다. 또한, '포함(또는, 구비)한다'로 언급된 구성 요소 및 동작은 하나 이상의 다른 구성요소 및 동작의 존재 또는 추가를 배제하지 않는다.

[0024] 다른 정의가 없다면, 본 명세서에서 사용되는 모든 용어(기술 및 과학적 용어를 포함)는 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자에게 공통적으로 이해될 수 있는 의미로 사용될 수 있을 것이다. 또한 일반적으로 사용되는 사전에 정의되어 있는 용어들은 정의되어 있지 않은 한 이상적으로 또는 과도하게 해석되지 않는다.

[0025] 이하, 첨부된 도면들을 참조하여 본 발명의 기술적 특징을 구체적으로 설명하기로 한다.

[0026] 도 1은 본 발명의 실시예에 따른 옥과 근적외선 엘이디를 구비한 피부 미용기기를 위에서 바라본 사시도이고, 도 2는 도 1에 도시된 피부 미용기기를 아래에서 바라본 사시도이고, 도 3은 도 1에 도시된 본체와 옥캡이 상호 분리된 상태를 도시한 사시도이고, 도 4는 도 1에 도시된 피부 미용기기의 단면을 도시한 단면도이며, 도 5는 도 2에 도시된 본체의 각 구성을 설명하기 위하여 도시한 분해 사시도이다.

[0027] 도 1 내지 도 5를 참조하면, 본 발명의 실시예에 따른 피부 미용기기(100)는본체(10)와, 본체(10)의 헤드부(10a)에 착탈가능하게 결합되는 옥캡(20)을 포함한다.

[0028] 본체(10)는 헤드부(10a)와, 헤드부(10a)로부터 대략 직각으로 연장된 손잡이부(10b)를 포함하고, 헤드부(10a)와 손잡이부(10b)는 하부커버(11)와 상부커버(12)의 결합을 통해 형성된다.

[0029] 이러한 본체(10)는 도 4 및 도 5에 도시된 바와 같이, 하부커버(11)와, 상부커버(12)와, 상부캡(13)과, 피부 관리모듈(14)과, 제어모듈(15)과, 충전용 배터리(16)를 포함한다. 또한, 본 발명에 따른 본체(20)는 진동모듈(17)을 더 포함할 수 있다.

[0030] 하부커버(11)는 도 5와 같이, 상부커버(12)와 결합되어 그 내부에 피부 관리모듈(14), 제어모듈(15), 충전용 배터리(16) 및 진동모듈(17)이 수용되는 수용공간을 형성한다.

[0031] 이러한 하부커버(11)는 상부커버(12)와 결합된 상태에서 상기 수용공간으로 습기 또는 불기가 유입되지 않도록 방수 기능을 갖는 재질로 이루어진다. 예를 들어, 하부커버(11)는 합성수지재, 고무재 또는 섬유재 중 어느 하나의 재질로 이루어질 수 있다. 바람직하게는 일정한 강도를 갖는 플라스틱 재질로 이루어질 수 있다.

[0032] 하부커버(11)에는 도 4 및 도 5와 같이, 제어모듈(15)의 인쇄회로기판의 저면에 실장된 다수의 스위치(151)와 표시등(152)이 외부로 노출되도록 다수의 노출공(11a, 11b)이 형성되어 있다. 또한, 상부커버(12)와 결합된 상태에서 피부 관리모듈(14), 제어모듈(15), 충전용 배터리(16) 및 진동모듈(17)의 동작에 따라 상기 수용공간에 발생하는 열을 외부로 방출하기 위하여 다수의 환기공(11c)이 더 형성될 수도 있다.

[0033] 상부커버(12)는 하부커버(11)와 동일 재질로 이루어질 수 있다. 그리고, 하부커버(11)와 상부커버(12)는 중앙부

MassagerPriorArt0000569

가 나사 결합되되, 서로 암수 결합되어 결합력을 향상시키기 위하여 도 5에 도시된 바와 같이, 다수의 결합돌기 또는 결합홈이 형성되어 있다.

[0034] 상부커버(12)는 도 4 및 도 5에 도시된 바와 같이 상부캡(13)이 결합되는 헤드부가 개방된 개방부(12a)를 구비하고, 개방부(12a)에는 피부 관리모듈(14)이 수용된다.

[0035] 상부캡(13)은 도 5에 도시된 바와 같이, 상부커버(12)의 개방부(12a)를 덮도록 상부커버(12)의 헤드부에 결합되고, 피부 관리모듈(14)의 다수의 LED(142)와, 갈바닉 이온부(143, 도 6참조)의 전도체(143a)가 관통하여 돌출되는 다수의 관통공(13a)이 형성되어 있다. 이러한 상부캡(13)은 상부커버(12)에 착탈가능하게 결합될 수 있다.

[0036] 피부 관리모듈(14)은 도 4와 같이, 옥캡(20)과 대향하도록 본체(10)의 헤드부(10a)의 내부에 실치된다. 이러한 피부 관리모듈(14)은 인쇄회로기판(141)과, 인쇄회로기판(141)의 상부에 실장되어 온열과 근적외선을 방출하는 다수의 LED(142)와, 갈바닉 이온부(143)를 포함한다.

[0037] 다수의 LED(142)는 다수의 가시광선 LED 및 근직외선 LED를 포함한다. 본 발명에서는 도 3에 도시된 바와 같이, 다수의 가시광선 LED 및 근적외선 LED가 상부캡(13)에 형성된 관통공(13a)을 관통하여 상부캡(13)의 상부로 일부가 돌출되도록 설치된다.

[0038] 도 3과 같이, 본 발명은 옥캡(20)을 상부캡(13)으로부터 분리시킨 상태에서 다수의 가시광선 LED 및 근적외선 LED가 상부캡(13)의 관통공(13a)을 통해 접촉면(피부에 직접 접촉되는 면)으로 돌출되고, 이를 통해 가시광선 LED 및 근적외선 LED가 직접 피부에 접촉되도록 함으로써 가시광선 LED를 통한 온열과 근적외선 LED를 통해 방출된 근적외선을 효과적으로 피부 속 깊숙이 투과시켜 피부 미용효과를 극대화할 수 있다.

[0039] 즉, 근적외선 LED에서 방출된 근적외선의 피부 투과 깊이는 대략 6㎜ 정도로 알려져 있음으로, 근적외선 LED로부터 방출된 근직외선의 파장이 피부의 표피를 뚫고, 진피까지 전달되기 위해서는 본 발명의 피부 미용기기(100)와 같이, 가시광선 LED와 근적외선 LED들이 상부캡(13)의 관통공(13a)을 통해 접촉면 상부로 돌출되어 직접 인체에 접촉되어야 한다. 이를 통해, 가시광선 LED를 통한 온열과 근적외선 LED를 통해 방출된 근적외선을 효과적으로 인체 내부 깊숙이 투과시켜 피부 미용효과를 극대화할 수 있다.

[0040] 이때, 상부커버(12)의 접촉면으로 돌출되는 다수의 LED(142)의 높이가 상부커버(12)의 접촉면을 기준으로 대략 1㎜ 내지 3㎜ 정도가 되도록 돌출되는 것이 바람직하다. 또한, 본 발명에 따른 다수의 LED(142)를 구성하는 가시광선 LED들은 대략 380㎚ 내지 760㎚ 대역, 바람직하게는 630㎚ 대역의 LED를 사용하고, 근적외선 LED들은 대략 780㎚ 내지 2,500㎚ 대역, 바람직하게는 830㎚ 대역의 LED를 사용하는 것이 바람직하다.

[0041] 본 발명에 따른 피부 미용기기(100)는 다수의 LED(142)를 구성하는 가시광선 LED 및 근직외선 LED가 인쇄회로기판(141) 상에 서로 근접배치되는 것이 바람직하다. 즉, 본 발명에 따른 피부 미용기기(100)는 다수의 가시광선 LED와 다수의 근적외선 LED를 각각 인쇄회로기판(141) 상에서 원형 또는 다각형으로 그룹화하여 배치하되, 각각의 LED를 0.1㎜ 내지 2㎜ 내로 서로 근접배치함으로써 단위면적($1㎠$)당 가시광선 LED로부터 제공되는 온열을 집중시키는 동시에 단위면적($1㎠$)당 근적외선 LED로부터 방출되는 근적외선 방출량을 집중시켜 피부 미용 효과를 극대화할 수 있다.

[0042] 갈바닉 이온부(143)의 전도체(143a)는 도 3 및 도 5와 같이, 다수의 LED(142)와 마찬가지로 인쇄회로기판(141)의 상부에 실장되되, 다수의 LED(142)와 동일한 형상 및 높이로 이루어진다. 이러한 갈바닉 이온부의 전도체(143a)는 전도성 금속, 예를 들면 구리재질로 이루어지며, 다수의 LED(142)와 같이 상부캡(13)의 관통공(13a)을 통해 일부가 상부캡(13)의 관통공(13a)을 통해 접촉면으로 돌출된다.

[0043] 갈바닉 이온부(143)는 미세한 직류 전류인 갈바닉 전류(이온)를 피부에 공급한다. 상기 갈바닉 전류가 수분을 함유하고 있는 피부를 통과할 때 양극(+)과 음극(-)에 의해 화학작용을 일으키는데, 이러한 화학작용은 갈바닉 전류가 인체의 세포조직과 세포액 사이를 통과할 때에도 발생하고, 이를 통해 피부의 불필요한 노폐물은 외부로 배출하고, 피부 건강에 이로운 영양성분의 흡수를 도와주는 역할을 한다.

[0044] 도 6은 도 5에 도시된 제어모듈을 설명하기 위하여 도시한 블럭도이다.

[0045] 도 5 및 도 6을 참조하면, 제어모듈(15)은 본체(10)의 손잡이부(10b)에 설치된다.

[0046] 이러한 제어모듈(15)은 충전용 배터리(16) 또는 외부로부터 전원을 공급받고, 스위치(151)의 동작에 응답하여 피부 관리모듈(14)과, 진동모듈(17)의 동작을 제어한다. 이때, 스위치(151)는 전원 스위치와 동작 스위치를 포

MassagerPriorArt0000570

Petitioner Therabody Ex-1004, 1158

함하며, 제어모듈(15)은 상기 동작 스위치에 응답하여 피부 관리모듈(14)과, 진동모듈(17)의 동작을 제어한다.

[0047] 제어모듈(15)은 도 6과 같이, 미리 설정된 동작 순서에 따라 피부 관리모듈(14)과 진동모듈(17)을 동시에 동작시키거나, 혹은 독립적으로 동작시킬 수 있다.

[0048] 예를 들어, 본 발명에 따른 제어모듈(15)은 사용자가 스위치(151)의 동작 스위치를 누르면, 피부 관리모듈(14)의 다수의 LED(142)를 동작시키고, 다시 동작 스위치를 누르면 다수의 LED(142)를 비동작시키고, 갈바닉 이온부(143)를 동작시킨다. 이후, 다시 동작 스위치를 누르면 다수의 LED(142)와 갈바닉 이온부(143)를 비동작시키고, 진동모듈(17)을 동작시킨다. 또한, 제어모듈(15)은 사용자가 동작 스위치를 1회 누르면, 다수의 LED(142)를 동작시키고, 동작 스위치를 2회 누르면, 다수의 LED(142)와 갈바닉 이온부(143)를 동시에 동작시키고, 동작 스위치를 3회 누르면, 다수의 LED(142), 갈바닉 이온부(143) 및 진동모듈(17)을 동시에 동작시킬 수도 있다.

[0049] 제어모듈(15)은 도 6에 도시된 바와 같이, 입력부(155)를 통해 사용자와 인터페이스를 형성할 수도 있다. 사용자는 입력부(155)를 통해 제어모듈(15)을 제어하여 동작 스위치를 통해 제어되는 동작순서를 변경할 수도 있다. 즉, 사용자는 입력부(155)를 통해 다수의 LED(142), 갈바닉 이온부(143) 및 진동모듈(17)의 순서를 변경할 수도 있다.

[0050] 본 발명에 따른 피부 미용기기(100)는 도 6과 같이, 피부를 근접 촬영할 수 있는 카메라(154)를 더 포함할 수 있다. 카메라(154)는 본체(10)의 하부커버(111) 또는 상부커버(112) 중 어느 하나에 설치되어 피부를 촬영하여 제어모듈(15)로 전송한다.

[0051] 제어모듈(15)은 카메라(154)로부터 촬영된 피부 이미지를 표시부(153)를 통해 제공한다. 사용자는 표시부(153)를 통해 현재 피부 상태를 실시간으로 확인할 수 있다.

[0052] 표시부(153)는 타이머(도시되지 않음)를 통해 제공되는 시간을 표시할 수도 있다. 즉, 표시부(153)는 다수의 LED(142), 갈바닉 이온부(143) 또는 진동모듈(17)의 동작 시간을 실시간으로 표시할 수 있다.

[0053] 제어모듈(15)은 상기 타이머를 통해 제공되는 시간을 도대로 다수의 LED(142), 갈바닉 이온부(143) 또는 진동모듈(17)의 동작 시간을 제어할 수도 있다.

[0054] 또한, 본 발명에 따른 피부 미용기기(100)는 도 6과 같이, 온도센서(156)를 더 포함할 수 있다. 제어모듈(15)는 온도센서(156)를 통해 다수의 LED(142)의 발열 온도를 감지하고, 감지된 온도가 설정된 온도값보다 높으면 다수의 LED(142)의 동작을 차단한다.

[0055] 표시등(152)은 도 5와 같이, 4개가 설치될 수 있는데, 서로 다른 색상을 갖는 LED로 이루어질 수 있다. 4개의 표시등(152)은 다수의 LED(142)를 구성하는 가시광선 LED와 근적외선 LED, 그리고, 갈바닉 이온부(143)와, 진동모듈(17)의 동작 상태를 표시한다. 이에 따라 사용자는 표시등(152)의 동작 상태를 토대로 가시광선 LED, 근적외선 LED, 갈바닉 이온부(143), 진동모듈(17)의 동작 상태를 확인할 수 있다.

[0056] 한편, 본 발명에 따른 본체(10)는 도 4 및 도 5에 도시된 바와 같이, 진동모듈(17)과 피부 관리모듈(14) 사이에 완충부재(18)가 더 설치될 수도 있다. 완충부재(18)는 진동모듈(17)과 피부 관리모듈(14) 간의 절연을 제공하고, 진동모듈(17)의 진동이 직접 피부 관리모듈(14)로 전달되어 피부 관리모듈(14)이 파손되는 것을 방지한다.

[0057] 도 3 및 도 4와 같이, 본 발명에 따른 옥캡(20)은 상부캡(13)에 착탈가능하게 결합되는 분리커버(21)와, 분리커버(21)의 상부에 부착된 옥(jade)(22)을 포함한다.

[0058] 분리커버(21)는 상부캡(13)의 관통공(13a)을 통해 돌출되는 다수의 LED(142)가 노출되도록 상하부로 개방된 구조로 이루어진다. 이에 따라 다수의 LED(142)의 가시광선 LED로부터 발산된 열은 그대로 상부에 설치된 옥(22)으로 전달되어 옥(22)을 가열하고, 근적외선 LED로부터 방출된 근적외선은 옥(22)을 통해 외부로 방출된다.

[0059] 옥(22)은 투명 또는 반투명의 연옥과 경옥을 포함하고, 분리커버(21)의 상면에 부착된다. 이러한 옥(22)은 가시광선 LED에 의해 가열되어 원적외선을 피부로 제공한다.

[0060] 옥(22)은 하부에 배치된 다수의 LED(142)의 근적외선 LED로부터 방출된 근적외선을 외부로 투과시키기 위하여 비교적 얇은 두께로 형성하는 것이 바람직하다. 예를 들면, 2㎜ 내지 4㎜, 더욱 바람직하게는 3㎜의 두께로 형성하는 것이 바람직하다. 또한, 낮은 온도에서도 옥(22)이 가열되어 원적외선을 방출하도록 옥(22)과 다수의 LED(142) 간의 간격은 대략 10㎜ 이하, 바람직하게는 5㎜ 내지 7㎜가 되도록 설치한다.

MassagerPriorArt0000571

Petitioner Therabody Ex-1004, 1159

Petitioner Therabody Ex-1004, 1160

[0061] 도 7은 본 발명에 따른 옥캡의 구조를 설명하기 위하여 도시한 옥캡의 단면도이다.

[0062] 도 7의 (a)를 참조하면, 본 발명에 따른 옥(22)은 상하부가 평탄한 구조로 이루어지거나, 혹은 도 7의 (b)와 같이, 본 발명의 다른 예로 옥(22a)은 단위면적($1cm^2$)당 근적외선 LED로부터 방출되는 근적외선 방출량을 집중시키기 위하여 하부가 평탄하고 상부는 볼록한 볼록렌즈 형상으로 이루어진다. 또한, 도 7의 (c)와 같이, 본 발명의 또 다른 예로 옥(22b)은 상부와 하부가 평탄한 구조로 이루어지고, 옥(22b)과 분리커버(21) 사이에 볼록렌즈(23)가 더 설치될 수 있다. 이를 통해 근적외선 LED로부터 방출되는 근적외선 방출량을 집중시켜 피부 미용효과를 극대화할 수 있다.

[0063] 한편, 도 5에서 미설명된 '19'는 본체(10)의 손잡이부(10b)의 양측부에 결합되는 측면커버로서, 하부커버(111)와 상부커버(112) 사이에 결합된다. 이러한 측면커버는 손잡이부(10b) 파지시 촉감을 좋게 하고 디자인성을 고려하여 금속재질로 형성한다.

[0064] 이하, 본 발명의 실시예에 따른 피부 미용기기(100)의 작용 효과를 설명하기로 한다.

[0065] 먼저, 본 발명의 실시예에 따른 피부 미용기기(100)는 본체(10)의 헤드부(10a)에 결합된 상부캡(13)에 옥캡(20)이 착탈가능하게 결합되고, 그 하부에 가시광선 LED와 근적외선 LED를 포함하는 피부 관리모듈(14)이 배치됨으로써 종래기술에서와 같이 옥을 가열하기 위하여 사용된 전열히터를 사용하지 않고도 가시광선 LED를 이용하여 옥을 효과적으로 가열하여 피부에 온열과 원적외선을 동시에 제공할 수 있으며, 이를 통해 안면 피부에도 안전하게 적용할 수 있는 효과를 얻을 수 있다.

[0066] 또한, 본 발명의 실시예에 따른 피부 미용기기(100)는 피부 관리모듈(14)에 가시광선 LED와 근적외선 LED를 서로 근접 배치하면서 가시광선 LED 및 근적외선 LED와 옥(22) 간의 간격을 10㎜ 이하로 비교적 근접시켜 배치하는 동시에 옥(22)을 2㎜ 내지 4㎜의 비교적 얇은 두께로 형성함으로써 옥(22)을 용이하게 가열하고, 근적외선 LED로부터 방출된 근적외선이 손실없이 옥(22)을 통해 외부로 투시됨에 따라 근적외선을 피부 속 깊은 곳까지 전달하여 원적외선과 함께 피부 미용효과를 극대화할 수 있다.

[0067] 또한, 본 발명의 실시예에 따른 피부 미용기기(100)는 피부 관리모듈(14)에 근적외선 LED와 함께 갈바닉 이온부(143)의 전도체(143a)를 함께 배치함으로써 피부에 근적외선을 제공하는 동시에 갈바닉 이온을 함께 공급하여 피부의 불필요한 노폐물은 외부로 배출하고, 피부 건강에 이로운 영양성분의 흡수를 촉진시킬 수 있다.

[0068] 또한, 본 발명의 실시예에 따른 피부 미용기기(100)는 옥캡(20)에 부착되는 옥(22a)을 볼록 형상으로 형성하거나, 혹은 옥(22b)과 분리커버(21) 사이에 볼록렌즈(23)를 배치함으로써 근적외선 LED로부터 방출되는 근적외선 방출량을 옥(22a)을 이용하여 집중시키거나, 볼록렌즈(23)를 이용하여 집중시켜 피부 미용효과를 극대화할 수 있다.

[0069] 또한, 본 발명의 실시예에 따른 피부 미용기기(100)는 본체(10)의 내부에 진동모듈(17)을 설치함에 따라 피부로 원적외선과 근적외선이 제공되는 동시에 피부에 진동을 선달함으로써 원적외선과 근적외선과 결합하여 피부 미용효과를 극대화시킬 수 있다.

[0070] 또한, 본 발명의 실시예에 따른 피부 미용기기(100)는 옥캡(20)이 상부캡(13)으로부터 착탈가능하도록 결합되고, 가시광선 LED, 근적외선 LED 및 갈바닉 이온부의 전도체(143a)가 상부캡(13)의 접촉면 상부로 돌출 배치되고, 이를 통해 옥캡(20)을 상부캡(13)으로부터 분리시킨 후 외부로 돌출된 가시광선 LED, 근적외선 LED 및 갈바닉 이온부의 전도체(143a)가 직접 피부에 접촉되도록 함으로써 온열과 근적외선이 피부 속 깊은 곳까지 전달되는 것이 가능하여 피부 미용효과를 극대화할 수 있다.

[0071] 이상에서와 같이 본 발명의 기술적 사상은 바람직한 실시예들에서 구체적으로 기술되었으나, 상기한 바람직한 실시예들은 그 설명을 위한 것이며, 그 제한을 위한 것이 아니다. 이처럼 이 기술 분야의 통상의 전문가라면 본 발명의 기술 사상의 범위 내에서 본 발명의 실시예들의 결합을 통해 다양한 실시예들이 가능함을 이해할 수 있을 것이다.

부호의 설명

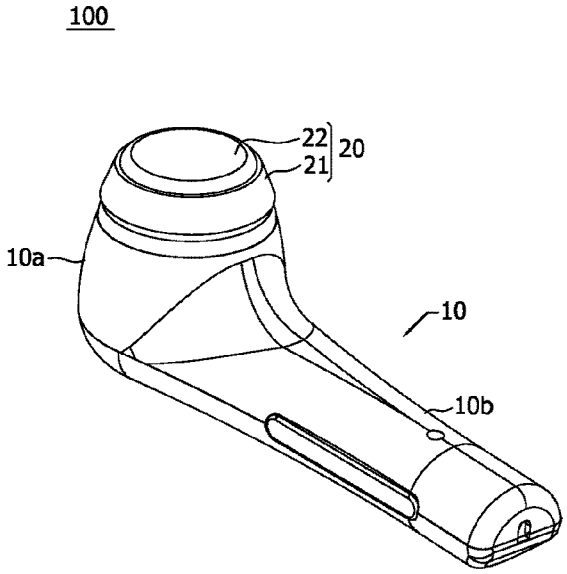
[0072] 100 : 피부 미용기기 10 : 본체

MassagerPriorArt0000572

10a : 헤드부 | 10b : 손잡이부
11 : 하부커버 | 12 : 상부커버
13 : 상부캡 | 14 : 피부 관리모듈
15 : 제어모듈 | 16 : 충전용 배터리
17 : 진동모듈 | 18 : 완충부재
19 : 측면커버 | 141 : 인쇄회로기판
142 : 다수의 LED | 143 : 갈바닉 이온부
143a : 전도체 | 151 : 스위치
152 : 표시등 | 153 : 표시부
154 : 카메라 | 155 : 입력부
156 : 온도센서 | 20 : 옥캡
21 : 분리커버 | 22, 22a, 22b : 옥

도면

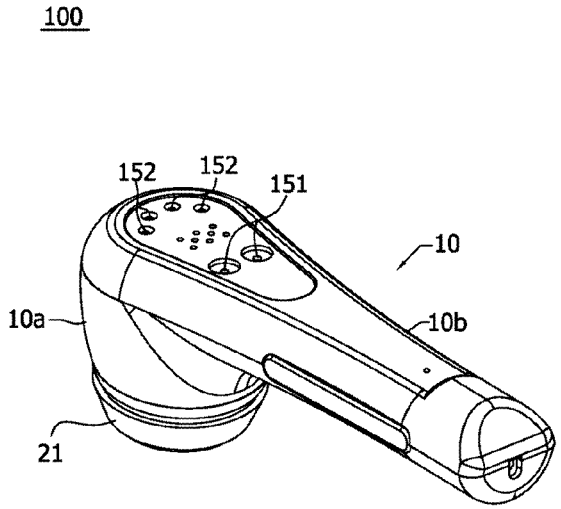
도면1



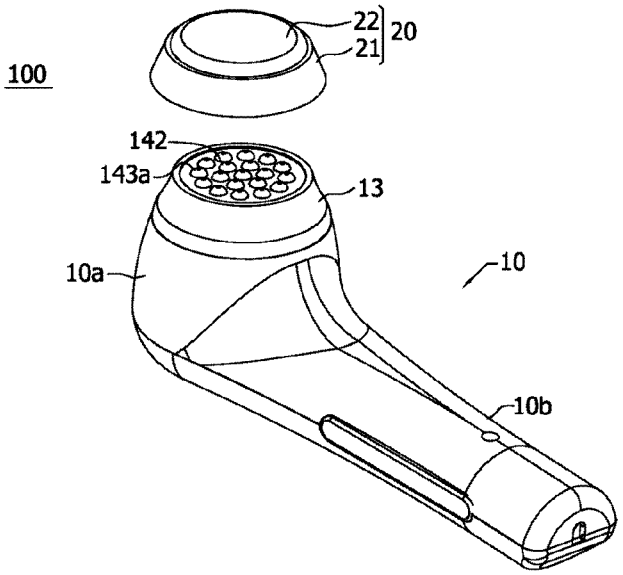
MassagerPriorArt0000573

Petitioner Therabody Ex-1004, 1161

도면2



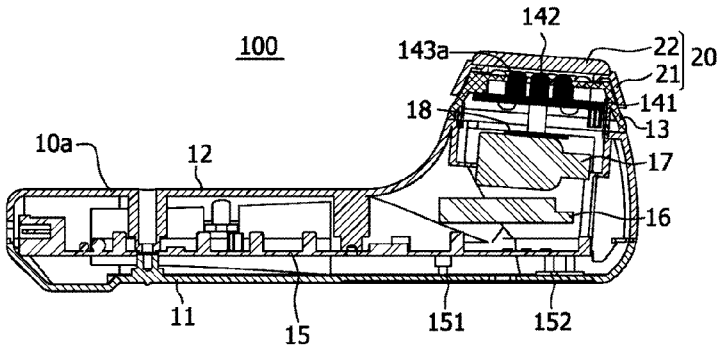
도면3



MassagerPriorArt0000574

Petitioner Therabody Ex-1004, 1162

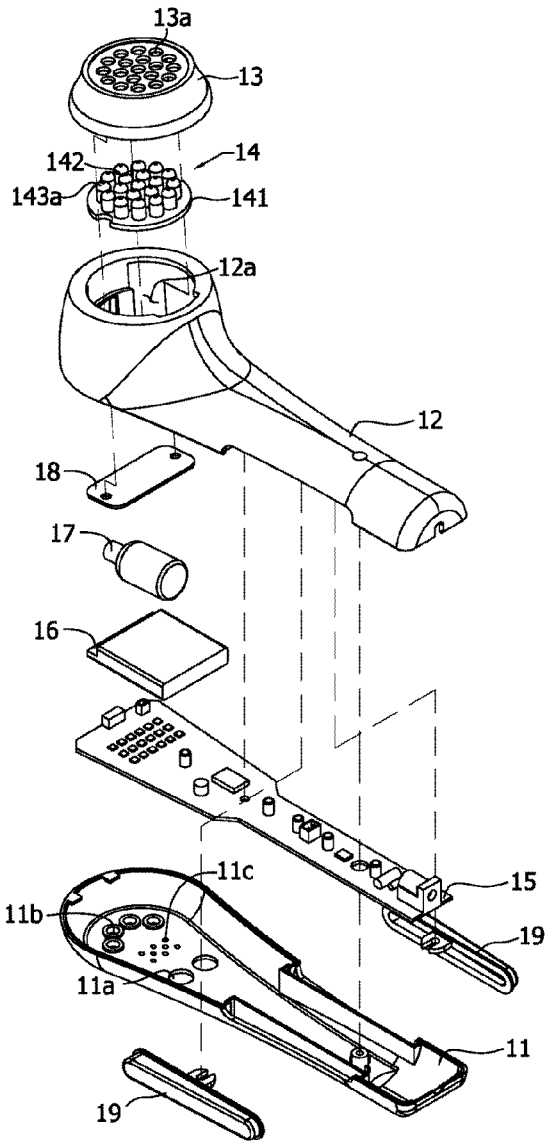
도면4



MassagerPriorArt0000575

Petitioner Therabody Ex-1004, 1163

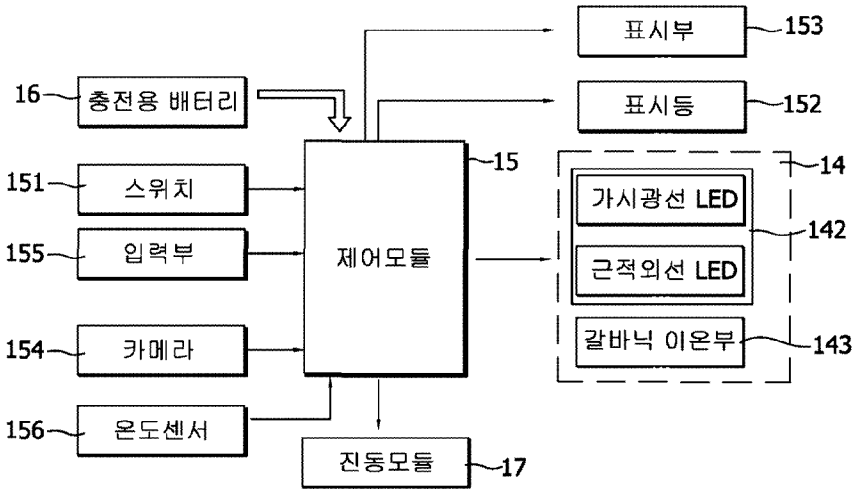
도면5



MassagerPriorArt0000576

Petitioner Therabody Ex-1004, 1164

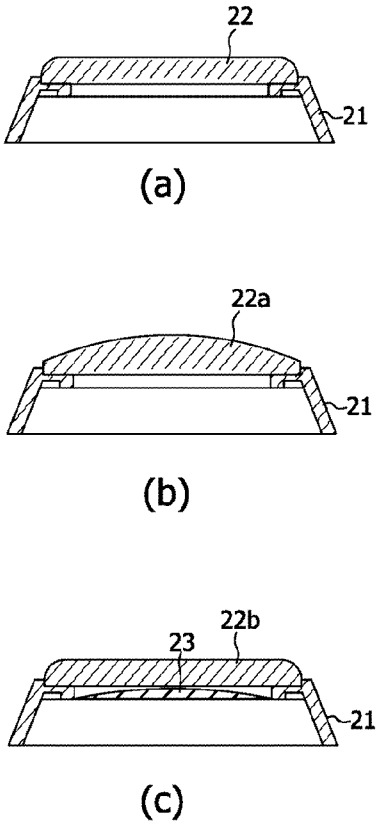
도면6



MassagerPriorArt0000577

Petitioner Therabody Ex-1004, 1165

도면7



MassagerPriorArt0000578

Petitioner Therabody Ex-1004, 1166

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A1	US-784024	03-07-1905	Barrett et al.	
	A2	US-799881	09-19-1905	Wells	
	A3	US-873123	12-10-1907	Gardy	
	A4	US-1,339,179	05-04-1920	Elmen	
	A5	US-1,594,636	08-03-1926	Smith	
	A6	US-1,612,981	01-04-1927	Mraula	
	A7	US-1,657,765	01-31-1928	Pasque	
	A8	US-1,784,301	12-09-1930	Mekler	
	A9	US-1,978,223	10-23-1934	Parker	
	A10	US-3,030,647	04-24-1962	Peyron	
	A11	US-3,494,353	02-10-1970	Marich	
	A12	US-3,626,934	12-14-1971	Andis	
	A13	US-3,699,952	10-24-1972	Waters et al.	
	A14	US-3,705,578	12-12-1972	Cutler et al.	
	A15	US-3,710,785	01-16-1973	Hilger	
	A16	US-3,841,321	10-15-1974	Albach et al.	
	A17	US-3,845,758	11-05-1974	Anderson	
	A18	US-3,920,291	11-18-1975	Wendel et al.	
	A19	US-3,968,789	07-13-1976	Simoncini	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B1**	CA-1042745-A	11-21-1978	Kovach, Leslie J		
	B2	CA-2440783-A1	03-13-2004	Conair		
	B3	CN-101958410-B	01-16-2013	Li, Jun		√
	B4	CN-106806103-A	06-09-2017	Guangdong Tanjin Electronic Tech Co Ltd		√
	B5	CN-107157741-A	09-15-2017	Ji, Qingshuai		√
	B6**	CN-1149446-A	05-14-1997	Feifan Science And Technology Co., Ltd.		√

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 2 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A20	US-3,993,052	11-23-1976	Miyahara	
	A21	US-4,088,128	05-09-1978	Mabuchi	
	A22	US-4,149,530	04-17-1979	Gow	
	A23	US-4,150,668	04-24-1979	Johnston	
	A24	US-4,162,675	07-31-1979	Kawada	
	A25	US-4,173,217	11-06-1979	Johnston	
	A26	US-4,412,535	11-01-1983	Teren	
	A27	US-4,505,267	03-19-1985	Inada	
	A28	US-4,513,737	04-30-1985	Mabuchi	
	A29	US-4,523,580	06-18-1985	Tureaud	
	A30	US-4,549,535	10-29-1985	Wing	
	A31	US-4,566,442	01-28-1986	Mabuchi et al.	
	A32	US-4,691,693	09-08-1987	Sato	
	A33	US-4,709,201	11-24-1987	Schaefer et al.	
	A34	US-4,730,605	03-15-1988	Noble et al.	
	A35	US-4,751,452	06-14-1988	Kilmer et al.	
	A36	US-4,790,296	12-13-1988	Segal	
	A37	US-4,827,914	05-09-1989	Kamazawa	
	A38	US-4,841,955	06-27-1989	Evans et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B7**	CN-1228299-A	09-15-1999	Zhang, Shuxin		√
	B8	CN-201478387-U	05-19-2010	Hua Xue		√
	B9	CN-202478137-U	10-10-2012	Univ Pla 3rd Military Medical		√
	B10	CN-202536467-U	11-21-2012	Xiaolin, Guo		√
	B11	CN-203195947-U	09-18-2013	Lin, Zongyao		√
	B12	CN-204208018-U	03-18-2015	Wu, Zaimin		√

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 3 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A39	US-4,858,600	08-22-1989	Gross et al.	
	A40	US-4,880,713	11-14-1989	Levine	
	A41	US-4,989,613	02-05-1991	Finkenberg	
	A42	US-5,063,911	11-12-1991	Teranishi	
	A43	US-5,065,743	11-19-1991	Sutherland	
	A44	US-5,085,207	02-04-1992	Fiore	
	A45	US-5,140,979	08-25-1992	Nakagawa	
	A46	US-5,159,922	11-03-1992	Mabuchi et al.	
	A47	US-5,215,078	06-01-1993	Fulop	
	A48	US-5,305,738	04-26-1994	Shimizu	
	A49	US-5,311,860	05-17-1994	Doria	
	A50	US-5,364,223	11-15-1994	Bissex	
	A51	US-5,415,621	05-16-1995	Campbell	
	A52	US-5,417,644	05-23-1995	Lee	
	A53	US-5,447,491	09-05-1995	Bellandi et al.	
	A54	US-5,469,860	11-28-1995	De Santis	
	A55	US-5,489,280	02-06-1996	Russell	
	A56	US-5,569,168	10-29-1996	Hartwig	
	A57	US-5,573,500	11-12-1996	Katsunuma et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B13	CN-204246459-U	04-08-2015	Chen, Jingwen		√
	B14	CN-204814773-U	12-02-2015	Guangzhou Longest Science & Technology Co., Ltd		√
	B15	CN-2049126-U	12-13-1989	Wan Renquan		√
	B16	CN-205251993-U	05-25-2016	Shaanxi Dongfang Aviation Instrument Co., Ltd		√
	B17	CN-205458346-U	08-17-2016	Guangzhou Keying Cosmetic Co Ltd		√
	B18	CN-206183628-U	05-24-2017	Shandong Jialin Electronic Tech Co Ltd		√

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet	4	of	18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A58	US-5,602,432	02-11-1997	Mizutani	
	A59	US-5,632,720	05-27-1997	Kleitz	
	A60	US-5,656,017	08-12-1997	Keller et al.	
	A61	US-5,656,018	08-12-1997	Tseng	
	A62	US-5,725,483	03-10-1998	Podolsky	
	A63	US-5,733,029	03-31-1998	Monroe	
	A64	US-5,797,462	08-25-1998	Rahm	
	A65	US-5,803,916	09-08-1998	Kuznets et al.	
	A66	US-5,843,006	12-01-1998	Phillips et al.	
	A67	US-5,925,002	07-20-1999	Wollman	
	A68	US-5,951,501	09-14-1999	Griner	
	A69	US-6,051,957	04-18-2000	Klein	
	A70	US-6,102,875	08-15-2000	Jones	
	A71	US-6,123,657	09-26-2000	Ishikawa et al.	
	A72	US-6,165,145	12-26-2000	Noble	
	A73	US-6,170,108	01-09-2001	Knight	
	A74	US-6,228,042	05-08-2001	Dungan	
	A75	US-6,231,497	05-15-2001	Souder	
	A76	US-6,375,609	04-23-2002	Hastings et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B19	CN-206333979-U	07-18-2017	Guangzhou Coretech Electric Products Ltd		√
	B20	CN-206381373-U	08-08-2017	Zhao, Jinfang		√
	B21	CN-206675699-U	11-28-2017	Esino Tech Co Ltd		√
	B22	CN-208130157-U	11-23-2018	Dongguan Esino Electronic Tech Co Ltd		√
	B23	CN-210872953-U	06-30-2020	Chen, Ke		√
	B24	CN-2207816-Y	09-20-1995	Lin Jiechang		√

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 5 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A77	US-6,401,289	06-11-2002	Herbert	
	A78	US-6,402,710	06-11-2002	Hsu	
	A79	US-6,432,072	08-13-2002	Harris et al.	
	A80	US-6,440,091	08-27-2002	Hirosawa	
	A81	US-6,461,377	10-08-2002	An	
	A82	US-6,478,755	11-12-2002	Young	
	A83	US-6,494,849	12-17-2002	Kuo	
	A84	US-6,503,211	01-07-2003	Frye	
	A85	US-6,537,236	03-25-2003	Tucek et al.	
	A86	US-6,577,287	06-10-2003	Havel	
	A87	US-6,581,596	06-24-2003	Truitt et al.	
	A88	US-6,585,667	07-01-2003	Muller	
	A89	US-6,616,621	09-09-2003	Kohr	
	A90	US-6,656,140	12-02-2003	Oguma et al.	
	A91	US-6,663,657	12-16-2003	Miller	
	A92	US-6,682,496	01-27-2004	Pivaroff	
	A93	US-6,758,826	07-06-2004	Luettgen et al.	
	A94	US-6,805,700	10-19-2004	Miller	
	A95	US-6,832,991	12-21-2004	Inada et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B25**	CN-2412567-Y	01-03-2001	Zhang, Shudong		√
	B26	CN-2540948-Y	03-26-2003	Dong, Jun		√
	B27	CN-2694966-Y	04-27-2005	Zhang, Lu		√
	B28	CN-304486625	02-02-2018	Ningbo Gemay Ind CO LTD		√
	B29	DE-102012212256-A1	01-16-2014	Bosch GmbH Robert		√
	B30	DE-202013012621-U1	12-19-2017	Novoluto, Gmbh		√

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 6 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A96	US-6,866,776	03-15-2005	Leason et al.	
	A97	US-6,979,300	12-27-2005	Julian et al.	
	A98	US-6,994,679	02-07-2006	Lee	
	A99	US-7,033,329	04-25-2006	Liao	
	A100	US-7,041,072	05-09-2006	Calvert	
	A101	US-7,083,581	08-01-2006	Tsai	
	A102	US-7,125,390	10-24-2006	Ferber et al.	
	A103	US-7,128,722	10-31-2006	Lev et al.	
	A104	US-7,211,057	05-01-2007	Gleason et al.	
	A105	US-7,229,424	06-12-2007	Jones et al.	
	A106	US-7,238,162	07-03-2007	Dehli	
	A107	US-7,264,598	09-04-2007	Shin	
	A108	US-7,270,641	09-18-2007	Glucksman et al.	
	A109	US-7,282,036	10-16-2007	Masuda	
	A110	US-7,282,037	10-16-2007	Cho	
	A111	US-7,306,569	12-11-2007	LaJoie et al.	
	A112	US-7,322,946	01-29-2008	Lev et al.	
	A113	US-7,335,170	02-26-2008	Milne et al.	
	A114	US-7,354,408	04-08-2008	Muchisky	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B31**	EP-0040053-A1	11-18-1981	Inoue Japax Res		
	B32**	EP-0572506-B1	01-08-1997	Jacobi, Jacob		
	B33**	EP-0666071-A1	08-09-1995	Seb SA		√
	B34	EP-1620233-B1	02-21-2007	Bosch GmbH Robert		√
	B35	EP-2510891-B1	06-01-2016	Covidien AG		
	B36	EP-3062383-A2	08-31-2016	Ethicon Endo-surgery, LLC		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 7 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A115	US-7,470,242	12-30-2008	Ferber et al.	
	A116	US-7,507,198	03-24-2009	Ardizzone et al.	
	A117	US-7,517,327	04-14-2009	Knight	
	A118	US-7,597,669	10-06-2009	Huang	
	A119	US-7,629,766	12-08-2009	Sadow	
	A120	US-7,634,314	12-15-2009	Applebaum et al.	
	A121	US-7,927,294	04-19-2011	Kamimura et al.	
	A122	US-7,976,485	07-12-2011	Huang	
	A123	US-8,052,625	11-08-2011	Tsai et al.	
	A124	US-8,083,699	12-27-2011	Colloca et al.	
	A125	US-8,092,407	01-10-2012	Tsukada et al.	
	A126	US-8,192,379	06-05-2012	Huang	
	A127	US-8,282,583	10-09-2012	Tsai	
	A128	US-8,317,733	11-27-2012	Chen et al.	
	A129	US-8,342,187	01-01-2013	Kalman et al.	
	A130	US-8,475,362	07-02-2013	Sohn et al.	
	A131	US-8,632,525	01-21-2014	Kerr et al.	
	A132	US-8,673,487	03-18-2014	Churchill	
	A133	US-8,951,216	02-10-2015	Yoo et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B37	EU-004377638-0002	10-25-2017	Einhell Germany AG		
	B38**	FI-903376-A	12-31-1991	Mirfakhraei, Kaveh	Engl. Abstract	
	B39	GB-1293876-A	10-25-1972	Sunbeam, Corporation		
	B40**	GB-188946-A	11-23-1922	James, Charles Hillman		
	B41**	GB-191209026-A	03-06-1913	Johansen, Johannes Christian		
	B42**	GB-191509508-A	06-29-1916	Begonin, Paul		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 8 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A134	US-9,017,355	04-28-2015	Smith et al.	
	A135	US-9,107,690	08-18-2015	Bales, Jr. et al.	
	A136	US-9,272,141	03-01-2016	Nichols	
	A137	US-9,333,371	05-10-2016	Bean et al.	
	A138	US-9,756,402	09-05-2017	Stampfl et al.	
	A139	US-9,889,066	02-13-2018	Danby et al.	
	A140	US-10,162,106	12-25-2018	Grillo et al.	
	A141	US-10,245,033	04-02-2019	Overmyer et al.	
	A142	US-10,314,762	06-11-2019	Marton et al.	
	A143	US-10,357,425	07-23-2019	Wersland et al.	
	A144	US-10,743,650	08-18-2020	Katano et al.	
	A145	US-2002/0058892-A1	05-16-2002	YOUNG	
	A146	US-2002/0161315-A1	10-31-2002	Harris et al.	
	A147	US-2003/0060741-A1	03-27-2003	Park	
	A148	US-2003/0114781-A1	06-19-2003	Beaty et al.	
	A149	US-2003/0130602-A1	07-10-2003	Chang	
	A150	US-2003/0144615-A1	07-31-2003	Lin	
	A151	US-2003/0195438-A1	10-16-2003	Petillo	
	A152	US-2003/0195443-A1	10-16-2003	Miller	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B43**	GB-213117-A	03-27-1924	Frank, Fearn		
	B44**	JP-2002218780-A	08-02-2002	Nidec Shibaura Corp	Engl. Abstract	
	B45**	JP-2003230613-A	08-19-2003	Og Giken Co Ltd	Engl. Abstract	
	B46**	JP-2004024523-A	01-29-2004	Matsushita Electric Works Ltd	Engl. Abstract	
	B47**	JP-2004141568-A	05-20-2004	Matsushita Electric Works Ltd	Engl. Abstract	
	B48**	JP-2007044319-A	02-22-2007	Kumagawa KK	Engl. Abstract	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 9 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A153	US-2003/0218045-A1	11-27-2003	Shkolnikov	
	A154	US-2004/0010268-A1	01-15-2004	Gabehart	
	A155	US-2004/0144553-A1	07-29-2004	Ashbaugh	
	A156	US-2005/0015030-A1	01-20-2005	Bousfield et al.	
	A157	US-2005/0096571-A1	05-05-2005	Miki	
	A158	US-2005/0096682-A1	05-05-2005	Daffer	
	A159	US-2005/0192519-A1	09-01-2005	Crunick	
	A160	US-2005/0203448-A1	09-15-2005	Harris et al.	
	A161	US-2006/0025710-A1	02-02-2006	Schulz et al.	
	A162	US-2006/0058714-A1	03-16-2006	Rhoades	
	A163	US-2006/0074360-A1	04-06-2006	Yu	
	A164	US-2006/0178040-A1	08-10-2006	Kurosawa	
	A165	US-2006/0178715-A1	08-10-2006	Ahn et al.	
	A166	US-2007/0144310-A1	06-28-2007	Pozgay et al.	
	A167	US-2007/0150004-A1	06-28-2007	Colloca et al.	
	A168	US-2007/0154783-A1	07-05-2007	Jeon	
	A169	US-2007/0179414-A1	08-02-2007	Imboden et al.	
	A170	US-2008/0196553-A1	08-21-2008	Hoffmann et al.	
	A171	US-2008/0214968-A1	09-04-2008	Milne et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] Number[4] Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B49**	JP-2009291451-A	12-17-2009	Watanabe, Hideaki	Engl. Abstract	
	B50**	JP-2010075288-A	04-08-2010	Panasonic Elec Works Co Ltd	Engl. Abstract	
	B51	JP-5859905-B2	02-16-2016	Covidien AG	Engl. Abstract	
	B52**	JP-H04250161-A	09-07-1992	Matsushita Electric Works Ltd	Engl. Abstract	
	B53**	JP-H053903-A	01-14-1993	Sanyo Electric Co	Engl. Abstract	
	B54	JP-H07153440-A	06-16-1995	Minolta Co Ltd	Engl. Abstract	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 10 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A172	US-2008/0234611-A1	09-25-2008	Sakai et al.	
	A173	US-2008/0262397-A1	10-23-2008	HABATJOU	
	A174	US-2008/0306417-A1	12-11-2008	Imboden et al.	
	A175	US-2009/0000039-A1	01-01-2009	St. John et al.	
	A176	US-2009/0005812-A1	01-01-2009	Fuhr	
	A177	US-2009/0182249-A1	07-16-2009	Sakai et al.	
	A178	US-2009/0270915-A1	10-29-2009	Tsai et al.	
	A179	US-2009/0286145-A1	11-19-2009	Wan et al.	
	A180	US-2009/0306577-A1	12-10-2009	Akridge et al.	
	A181	US-2010/0116517-A1	05-13-2010	Katzenberger et al.	
	A182	US-2010/0164434-A1	07-01-2010	Cacioppo et al.	
	A183	US-2010/0185127-A1	07-22-2010	Nilsson et al.	
	A184	US-2010/0228168-A1	09-09-2010	Xu et al.	
	A185	US-2010/0252294-A1	10-07-2010	Kondo et al.	
	A186	US-2010/0274162-A1	10-28-2010	Evans	
	A187	US-2010/0331745-A1	12-30-2010	YAO	
	A188	US-2011/0087141-A1	04-14-2011	Wagy et al.	
	A189	US-2011/0106067-A1	05-05-2011	GEVA et al.	
	A190	US-2011/0169481-A1	07-14-2011	Nguyen et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B55**	JP-H0751393-A	02-28-1995	Hitachi Metals Ltd	Engl. Abstract	
	B56**	JP-H08131500-A	05-28-1996	Brother Ind Ltd	Engl. Abstract	
	B57**	JP-H0866448-A	03-12-1996	Koei Tsusho KK	Engl. Abstract	
	B58	JP-H0992246-A	04-04-1997	Fujitsu Denso	Engl. Abstract	
	B59**	JP-S54110058-A	08-29-1979	Matsushita Electric Works Ltd	Engl. Abstract	
	B60	JP-S6389158-A	04-20-1988	Anmin KK	Engl. Abstract	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 11 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A191	US-2012/0038483-A1	02-16-2012	DU et al.	
	A192	US-2012/0120573-A1	05-17-2012	BENTLEY	
	A193	US-2012/0253245-A1	10-04-2012	Stanbridge	
	A194	US-2012/0259255-A1	10-11-2012	TOMLINSON et al.	
	A195	US-2012/0281392-A1	11-08-2012	Workman et al.	
	A196	US-2013/0006040-A1	01-03-2013	Lee	
	A197	US-2013/0076271-A1	03-28-2013	SUDA et al.	
	A198	US-2013/0112451-A1	05-09-2013	KONDO et al.	
	A199	US-2013/0138023-A1	05-30-2013	Lerro	
	A200	US-2013/0261516-A1	10-03-2013	Cilea et al.	
	A201	US-2013/0281897-A1	10-24-2013	Hoffmann et al.	
	A202	US-2013/0294019-A1	11-07-2013	LaSota et al.	
	A203	US-2014/0014384-A1	01-16-2014	HORIE et al.	
	A204	US-2014/0094724-A1	04-03-2014	Freeman	
	A205	US-2014/0159507-A1	06-12-2014	Johnson et al.	
	A206	US-2015/0005682-A1	01-01-2015	Danby et al.	
	A207	US-2015/0148592-A1	05-28-2015	Kanbar et al.	
	A208	US-2016/0151238-A1	06-02-2016	Crunick et al.	
	A209	US-2016/0271009-A1	09-22-2016	Giraud et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B61**	KR-100785097-B1	12-12-2007	Korea Ind Tech Inst	Engl. Abstract	
	B62**	KR-101007827-B1	01-13-2011	Shin, In Sung	Engl. Abstract	
	B63	KR-101162978-B1	07-09-2012	At System Co., Ltd	Engl. Abstract	
	B64	KR-101315314-B1	10-14-2013	Jung, Bong Ok	Engl. Abstract	
	B65	KR-101504885-B1	03-23-2015	Jo, Sung Chan	Engl. Abstract	
	B66	KR-101649522-B1	08-19-2016	Samjin Comp & It	Engl. Abstract	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 12 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A210	US-2016/0354277-A1	12-08-2016	Fima	
	A211	US-2016/0367425-A1	12-22-2016	Wersland	
	A212	US-2017/0012257-A1	01-12-2017	Wackwitz et al.	
	A213	US-2017/0027798-A1	02-02-2017	Wersland	
	A214	US-2017/0028160-A1	02-02-2017	OLIVER	
	A215	US-2017/0304145-A1	10-26-2017	Pepe	
	A216	US-2018/0008512-A1	01-11-2018	Goldstein	
	A217	US-2018/0200141-A1	07-19-2018	Wersland et al.	
	A218	US-2019/0125972-A1	05-02-2019	Srinivasan et al.	
	A219	US-2019/0198828-A1	06-27-2019	Zanon et al.	
	A220	US-2020/0093945-A1	03-26-2020	JEONG	
	A221	US-2020/0128935-A1	04-30-2020	Turner	
	A222	US-2020/0261306-A1	08-20-2020	Pepe	
	A223	US-2020/0261307-A1	08-20-2020	Wersland et al.	
	A224	US-2020/0329858-A1	10-22-2020	KATANO et al.	
	A225	US-D323034	01-07-1992	Reinstein	
	A226	US-D323606	02-04-1992	Chang	
	A227	US-D329292	09-08-1992	Wollman	
	A228	US-D331467	12-01-1992	Wollman	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B67**	KR-20000043488-A	07-15-2000	Maxstar Industrial Co., Ltd	Engl. Abstract	
	B68**	KR-20030008342-A	01-25-2003	Kim, Sa Ung	Engl. Abstract	
	B69	KR-200311328-Y1	05-01-2003	Jong Tae Park	Engl. Abstract	
	B70	KR-200422971-Y1	08-01-2006	Hye-jung Sun	Engl. Abstract	
	B71	KR-20060074625-A	07-03-2006	Shin, Dae Chul	Engl. Abstract	
	B72**	KR-20090128807-A	12-16-2009	Shell Line	Engl. Abstract	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 13 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A229	US-D335073	04-27-1993	Anthony et al.	
	A230	US-D367712	03-05-1996	Young	
	A231	US-D373640	09-10-1996	Young	
	A232	US-D378338	03-11-1997	Acciville et al.	
	A233	US-D388175	12-23-1997	Lie	
	A234	US-D403220	12-29-1998	Kimata et al.	
	A235	US-D407498	03-30-1999	Cooper	
	A236	US-D408241	04-20-1999	Jansson	
	A237	US-D437713	02-20-2001	Young	
	A238	US-D438309	02-27-2001	Young	
	A239	US-D455837	04-16-2002	Kim	
	A240	US-D460675	07-23-2002	Morgan	
	A241	US-D467148	12-17-2002	Flickinger	
	A242	US-D474089	05-06-2003	Huang	
	A243	US-D487219	03-02-2004	Chudy et al.	
	A244	US-D498128	11-09-2004	Sterling	
	A245	US-D536591	02-13-2007	Ghode et al.	
	A246	US-D544102	06-05-2007	Pivaroff	
	A247	US-D555255	11-13-2007	Masuda	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B73	KR-2010-0023508-A	03-04-2010	Lg Innotek Co., Ltd	Engl. Abstract	
	B74**	RU-2053754-C1	02-10-1996	Solomin, Vladimir A		√
	B75**	RU-2464005-C1	10-20-2012	Potapov, Nikolaj Antonovich		√
	B76	TW-M272528-U	08-11-2005	Chiun Jung Co., Ltd		√
	B77	TW-M379178-U	04-21-2010	Phoenix Silicon Int Corp		√
	B78	TW-M402573-U	04-21-2011	Taiwan Electric Voice Co., Ltd		√

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 14 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	A248	US-D625164	10-12-2010	Aglassinger	
	A249	US-D703337	04-22-2014	Fuhr et al.	
	A250	US-D706433	06-03-2014	Fuhr et al.	
	A251	US-D725978	04-07-2015	Uematsu et al.	
	A252	US-D738516	09-08-2015	Karim	
	A253	US-D752936	04-05-2016	King et al.	
	A254	US-D757953	05-31-2016	Philips	
	A255	US-D759831	06-21-2016	Levi et al.	
	A256	US-D823478	07-17-2018	Park	
	A257	US-D825073	08-07-2018	Lenke	
	A258	US-D827842	09-04-2018	Bainton et al.	
	A259	US-D827843	09-04-2018	Bainton et al.	
	A260	US-D840032	02-05-2019	Clifford et al.	
	A261	US-D842491	03-05-2019	Fleming et al.	
	A262	US-D869928	12-17-2019	Hsiao	
	A263	US-D879290	03-24-2020	Harman et al.	
	A264	US-RE30500	02-03-1981	Springer et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B79	TW-M433702-U	07-11-2012	Shin Chuan Computer Co., Ltd	Engl. Abstract	
	B80	TW-M493379-U	01-11-2015	Chen, Jing-wen		√
	B81	TW-M543692-U	06-21-2017	Wang, Gui-yuan		√
	B82**	WO-03006102-A2	01-23-2003	Phymag Ltd		
	B83	WO-2008/113139-A1	09-25-2008	Cypro Ssage Pty Ltd		
	B84	WO-2009/014727-A1	01-29-2009	Activator Methods International, Limited		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 15 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B85**	WO-2011122812-A2	10-06-2011	Small'lab Co., Ltd	Engl. Abstract	
	B86	WO-2012/134469-A1	10-04-2012	Ingersoll Rand Co		
	B87	WO-2013/141359-A1	09-26-2013	Lion Corporation		√
	B88**	WO-2014118596-A1	08-07-2014	Telefield Ltd		
	B89**	WO-2015038005-A2	03-19-2015	Nevroflex As		
	B90	WO-2017/123841-A2	07-20-2017	Ethicon LLC		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08a (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 16 of 18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]
	B91	WO-2017/184505-A2	10-26-2017	Ethicon LLC		
	B92**	WO-9214435-A1	09-03-1992	Jacobi, Jacob		
	B93**	WO-9625908-A1	08-29-1996	Niagara Manufacturing Ltd		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08b (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet	17	of	18		

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	C1	Campbell, D., "Jolt Therapy Tool," https://www.youtube.com/watch?v=-1nLjD-xRgI, July 28, 2017, 3 pages.	
	C2	Centech 4 in 1 Portable Power Pack Owner's Manual & Safety Instructions, 2014, 12 pages.	
	C3	Christiana, A., "Porter-Cable PCL212ICC-2 12V Compact Lithium Two Tool Kit," December 5, 2014, 5 pages.	
	C4	DePuy Synthes Power Tools, "Battery Power Line II, User's Manual," for Battery-driven power tool system for orthopedics and traumatology, December 2012, 83 pages.	
	C5	DIY Jigsaw "Drill" Massager - Percussion Massager, February 9, 2018, 19 pages.	
	C6	Knopp, B., "How to Change Jolt Attachments," https://www.youtube.com/watch?v=pl-vHxRtXUQ, April 5, 2017, 6 pages.	
	C7	NutriKlick Deep Tissue Massage Gun, Date Unknown.	
	C8	PERFOMAX 8 Volt Li-Ion Cordless Driver Owner's Manual, www.manualslib.com, July 27, 2012, 19 pages.	
	C9**	Rachel [family name unknown], "Jigsaw Massager," August 28, 2007, 8 pages. Information available online from http://www.instructables.com/id/jigsaw-massager/.	
	C10	Synthes Battery Power Line, June 2009, 6 pages.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

PTO/SB/08b (07-09)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet	18	of	18

Complete if Known	
Application Number	17/681,367-Conf. #8567
Filing Date	February 25, 2022
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C3

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]
	C11	Theragun Owners Manual G2PRO, 16 pages.	
	C12	TIMTAM Power Massage 1.5, August 7, 2020, 4 pages.	
	C13	TOPiando Multifunctional Massage Gun, 19 pages, date unknown.	
	C14	Yu-Chung, C., "Electrolux Power Drill," www.design-inspiration.net/inspiration/yu-chung-chang-electrolux-power-drill/, August 20, 2017, 4 pages.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] Applicant's unique citation designation number (optional). [2] Applicant is to place a check mark here if English language Translation is attached.

Skin care device having jade and near-infrared ray led

List of publications

Application number	Publication date
KR101504885 B1 Pat...	2015-03-23

Abstract

The present invention relates to a skin care device and, more specifically, to a skin care device which is easily used in each family, can be freely used regardless of place and time since it is easy to carry, provides heat and near-infrared ray to skin by heating jade using a near-infrared ray light emitting diode (LED), and maximizes skin care effects by transferring near-infrared ray into skin as the near-infrared ray LED modulated with a visible ray LED protrudes and is formed to be in contact with skin directly.

English Abstract (Native or MT)

The present invention relates to a skin care device and, more specifically, to a skin care device which is easily used in each family, can be freely used regardless of place and time since it is easy to carry, provides heat and near-infrared ray to skin by heating jade using a near-infrared ray light emitting diode (LED), and maximizes skin care effects by transferring near-infrared ray into skin as the near-infrared ray LED modulated with a visible ray LED protrudes and is formed to be in contact with skin directly.

Other Abstracts

본 발명은 피부 미용기기에 관한 것으로서, 상세하게는 각 가정에서 간편하게 사용이 가능하면서 휴대가 용이하여 장소와 시간에 구애받지 않고 자유롭게 사용할 수 있고, 옥(jade)을 가시광선 LED(Light Emitting Diode)를 이용하여 가열하여 피부에 온열과 원적외선을 동시에 제공하는 한편, 가시광선 LED와 함께 모듈화된 근적외선 LED를 직접 피부에 접촉가능하도록 돌출 구성함으로써 근적외선을 피부 속까지 전달하여 피부 미용효과를 극대화할 수 있는 피부 미용기기에 관한 것이다.

Inventor(s) CHO, SUNG CHAN
LEE, CHANG-HEE

Applicant/Assignee
CHO, SUNG CHAN
LEE, CHANG-HEE

Patent Assignee History CHO, SUNG CHAN; LEE, CHANG-HEE

Application Numbers & Dates KR20140152555 2014-11-05 [2014KR-0152555]

Priority Numbers & Dates KR20140152555 2014-11-05 [2014KR-0152555]

Technology domain Medical technology

IPC codes A61H-023/02* A61N-001/30 A61N-005/06

CPC codes A61H-023/02 A61H-2201/10 A61H-2201/105A61N-001/04/28 A61N-005/06/16* A61N-005/06/25A61N-2005/0644 A61N-2005/0659A61N-2005/0662

Notes Number of Claims: 2

Cited Patents Examiner citations
-JP2005323970 (A) [JP2005323970]; -KR200297648 (Y1) [KR200297648U];
Search Report [Examiner]
-JP2005323970 (A) [JP2005323970] OTIC JAPAN KK;

Claims

1. The handle portion, the handle portion bent from one side of a body comprising a head portion; the body and a head portion of the separation cover detachably coupled, wherein the separation cover attached to a surface (jade) oxy ocap comprising; are provided, wherein the main body, opposed to the OCAP and installed in the inside of the head portion, mounted on the printed circuit board so as to apply heat to the 760nm band 380nm oxy a plurality of visible light (Light Emitting Diode) LED and, mounted on the printed circuit board to emit near infrared line to 780nm oxy 2,500nm band and a plurality of near infrared LED, installed on the printed circuit board to provide a galvanic ion current galvanic skin management module unit;

installed in the interior of the handle portion for charging a battery or power supply receives power from an external operating, in response to the operation of a switch of the plurality of visible light and near infrared LED LED and a plurality of, for controlling operation of the galvanic ion control module; installed within said head portion of the head part to vibrate the vibration module; and the separation between the head portion and a cover coupled to the upper cap; are provided, the plurality of through holes formed in the upper cap of said plurality of visible LED, and a plurality of the galvanic ion LED portion of the near infrared portion of the through hole conductor upwardly protruded and disposed, wherein the oxy comprises a plurality of near infrared rays emitted from the near infrared ray LED 2mm transmitted to the formed with a thickness of from 4mm, and a plurality of the plurality of near infrared LED oxy LED and the distance between the near infrared ray is adjusted so that 5mm to 7mm, wherein the plurality of the plurality of visible light and near infrared LED LED is 0. 1mm to 2mm intervals disposed adjacent each other, the near infrared and jade cosmetic skin device having an LED.

2. AMEND STATUS: Delete

3. AMEND STATUS: delete

4. AMEND STATUS: delete

5. Method according to claim 1, consists of or is convex shape the oxy, the separation between the jade cover a convex lens is further disposed with the LED jade cosmetic skin near infrared device.

Original Claims

1. 손잡이부와, 상기 손잡이부의 일측부로부터 절곡된 헤드부를 포함하는 본체; 및
상기 본체의 헤드부에 착탈가능하게 결합된 분리커버와, 상기 분리커버의 상면에 부착된 옥(jade)을 포함하는 옥캡; 을 포함하되,
상기 본체는,
상기 옥캡과 대향하도록 상기 헤드부의 내부에 설치되되, 인쇄회로기판 상에 실장되어 상기 옥에 열을 가하도록 380nm 내지 760nm 대역의 다수의 가시광선 LED(Light Emitting Diode)와, 상기 인쇄회로기판 상에 실장되어 상기 옥으로 근적외선을 방출하도록 780nm 내지 2,500nm 대역의 다수의 근적외선 LED와, 상기 인쇄회로기판 상에 설치되어 갈바닉 전류를 제공하는 갈바닉 이온부를 포함하는 피부 관리모듈;
상기 손잡이부의 내부에 설치되어 충전용 배터리 또는 외부로부터 전원을 공급받아 동작하고, 스위치의 동작에 응답하여 상기 다수의 가시광선 LED 및 다수의 근적외선 LED와, 상기 갈바닉 이온부의 동작을 제어하는 제어모듈;
상기 헤드부의 내부에 설치되어 상기 헤드부를 진동시키는 진동모듈; 및
상기 헤드부와 상기 분리커버 사이에 결합되는 상부캡; 을 포함하되,
상기 상부캡에는 다수의 관통공이 형성되어 상기 다수의 가시광선 LED, 다수의 근적외선 LED 및 상기 갈바닉 이온부의 전도체의 일부가 상기 관통공을 관통하여 상부로 돌출 배치되고,
상기 옥은 상기 다수의 근적외선 LED로부터 방출된 근적외선이 투과되도록 2mm 내지 4mm의 두께로 형성하고,
상기 다수의 근적외선 LED 및 상기 다수의 근적외선 LED와 상기 옥 사이의 간격은 5mm 내지 7mm가 되도록 하고,
상기 다수의 가시광선 LED와 상기 다수의 근적외선 LED는 0.1mm 내지 2mm 간격으로 서로 근접 배치되는,
것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기.

2. 삭제

3. 삭제

4. 삭제

5. 제 1 항에 있어서,
상기 옥은 볼록 형상으로 이루어지거나, 상기 옥과 상기 분리커버 사이에 볼록렌즈가 더 배치되는 것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기.

Description

TECHNICAL FIELD

[0001] The present invention relates to as a skin esthetic apparatus using the same, particularly in each home can be conveniently used in a portable from place and time are facilitated to freely without wishing to be bound can be used and, oxy (jade) LED visible radiation (Light Emitting Diode) heated by using a thermotherapy on the skin as far infrared rays and on the other hand to simultaneously provide the, visible light LED modularized together with the near infrared ray LED directly projected so as to be brought into contact to the skin by configuring the into the skin near infrared rays to transfer the skin esthetic effect to the maximization of the skin esthetic apparatus using the same that can be composition of this invention.

BACKGROUND ART

[0002] In general beautiful skin in order that is being sought is a systematic skin care is more important than anything present. Traditional skin management is primarily to use one hand to promote the circulation of the blood or lymph massage but is becoming the mainstream, in recent years in the middle layer is easily in each home personal skin so as to be able to manage a variety of skin cosmetic devices have been developed and are used for.

[0003] Skin beautification equipment include roller is used as pressing methods, vibration motor are used vibration type, using the ultrasonic wave scheme, loess, charcoal, oxy or the like composed of a mode using a far infrared ray radiator or the like is mainly has been used, such schemes may include the skin esthetic effect there is a limit to maximize thereto can be used.

[0004] In particular a mode using a far infrared radiator and a heat transfer heater to a temperature far infrared radiator that emits far infrared rays by heating to be applied to the facial skin because of the burn risk is not obtained, bed, mat, a cushion or locally limited only for the desired treatment applied to the present invention has been presented.

[0005] Also in the far infrared ray radiator system employed by the electric heater of an electric heater according to the use of the electromagnetic waves generated in the human body due to the occurrence of the adverse effect despite its efficacy because substantially far infrared radiator is applied to the skin beautification equipment still were limits the full bandwidth.

CITATION LIST

PATENT LITERATURE

[0006] KR 10-2006-0084084 A, 2006. 07. 24.
KR 10-1253611 B1, 2013. 04. 05.
KR 10-2014-0059471 A, 2014. 05. 16.
KR 20-0173224 Y1, 1999. 12. 17.

SUMMARY OF INVENTION

TECH PROBLEM

[0007] Accordingly, the present invention relates in order to solve the problems of the prior art proposes, in each home is conveniently used while enabling the portable thereby it is easy to place and time without wishing to be bound freely anytime and can be used, electrothermal heater is not necessary to use safely even in the facial skin may be applied, is deeper into the skin until the line far infrared and the near infrared by transferring the maximization of the skin esthetic effect can be used to provide such a device for skin cosmeticizing action and an object thereof to be used therein.

TECH SOLUTION

[0008] In order to achieve the above object according to one aspect of the present invention concerns a bat with a handle, the handle portion from a side of a part of the head of a body comprising a bent, wherein the main body in a head portion of the separating cover and removably coupling, wherein the separation cover attached to a surface of an oxy (jade) comprising comprising the OcaB, wherein the body has a head portion opposed to the OCAP and

Petitioner Therabody Ex-1004, 1187

installed in the inside of the, wherein the oxy mounted on a printed circuit board which applies heat to a plurality of visible light LED (Light Emitting Diode) and, wherein the printed circuit board mounted on the array substrate wherein the oxy emitting near infrared light into a plurality of near infrared ray LED and, wherein the printed circuit board which is provided on the galvanic providing current for the galvanic ion unit comprising a skin with a management module, installed in the inside of the handle portion for charging a battery or power supply from outside and operates based on the, operation of a switch in response to the visible rays of a plurality of near infrared rays LED and multiple LED and, this galvanic ion controller for controlling operation of a control module characterized in that it comprises a near infrared LED line provided with jade cosmetic skin its extended configuration.

[0009] Preferably, wherein the body has a head portion provided in the interior of said head portion to vibrate the vibration module may be further comprise.

[0010] Preferably, wherein the body has a head portion and the separation between the cylinder head cover further comprises a gate coupled to the upper cap, said upper cap is provided with a plurality of through hole formed in a LED said plurality of visible light, near infrared ray LED and a plurality of the galvanic ion portion of conductors by penetrating through a through hole to allow a part of an upwardly protruded can be disposed.

[0011] Preferably, the oxy comprises a plurality of near infrared rays emitted from the LED allows transmission of near infrared rays to 2mm can be formed with a thickness of 4mm.

[0012] Preferably, the oxy consists of or is convex shape, wherein the jade wherein the separation between the cylinder head cover can be a convex lens is further disposed.

ADVANTAGEOUS EFFECTS

[0013] As in the foregoing description, according to the present invention, the following effects such as can be obtained.

[0014] Firstly, according to the present invention, the head portion of the main body coupled to the upper cap and detachably joined to the OK kap, in the lower part thereof with visible light and near infrared ray LED LED comprising a skin management module is arranged to be restricted to the use of the facial skin as in the conventional electric heater which has been without the use of LED with oxo using visible light on the skin as far infrared heating and simultaneously providing a thermotherapy can be, through which safely even in the facial skin can be applied to effect the can be obtained.

[0015] Secondly, according to the present invention, the skin care module LED visible light and near infrared ray LED and arranged in the vicinity of each other, 2mm to 4mm of the oximes by forming a relatively thin thickness near infrared ray LED without loss of near infrared rays emitted from the outside through the oxy and visualized depending on the by near infrared rays is deeper into the skin until the skin with a far infrared rays by delivering a cosmetic effect can be maximized.

[0016] Thirdly, according to the present invention, the skin care module galvanic ion together with infrared LED parts together to the skin of the conductors by arranging the galvanic ions near infrared simultaneously supplied to the skin of unnecessary waste and is discharged to the outside, skin health benefit to the promotes the absorption of nutritive elements can be included therein.

[0017] Fourthly, if according to the present invention, in an oak cap attached a convex lens which is formed to be in the form of an octanol, or separation between the jade cover by disposing a convex lens in the near infrared ray LED near infrared ray emitted from the emission of carbon monoxide by the convex lens is used for concentrating the skin esthetic effect can be maximized.

[0018] Fifthly, according to the present invention, the interior of the body and the installation vibration module, through which is an oxime to the skin to the

skin in a close contact state vibration that is transferred far infrared and the near infrared line by skin in conjunction with a cosmetic effect and can maximize an, depending upon the properties of the skin of the user to selectively operate the user or can be used to widen the width of a selected volume of air for competitiveness can be ensured.

[0019] Sixth, if according to the present invention, the oxetane ring attached to the top of the OK KAP and removable from the cap coupled to a lower portion, visible light and near infrared ray LED LED upper cap is protruded upward from the contact surface by being disposed in the top cap was detached from the OcaB projected outside the visible light and near infrared ray LED LED directly to contact the skin so that it can be used in a state that by providing a near IR thermotherapy is delivered is deeper into the skin until it is possible to the skin esthetic effect can be maximized.

DESCRIPTION OF DRAWINGS

[0020] Fig. 1 is a block diagram of skin esthetic device according to an exemplary embodiment perspective view as viewed from above. Fig. 2 is shown in Fig. 1 skin esthetic device perspective view from below. Fig. 3 is a schematic view illustrating the body 1 ok KAP with mutually isolated perspective view showing a state in which the. Fig. 4 is a cross shown in the cross section of the skin esthetic device 1 according to the present invention. Fig. 5 is a view illustrating the body 2 of each of the illustrated in order to explain to an exploded perspective view. Fig. 6 is shown in Fig. 5 in order to describe a control module in accordance with the same. Fig. 7 is a OcaB according to the invention shown in a manner to sectional view for explaining the jade.

DESCRIPTION OF EMBODIMENTS

[0021] And other features and advantages of the present invention, a method of achieving is and their reference to the accompanying drawings in the accompanying drawings and described in detail later in referring to the entities will be apparent. However, the present invention is not limited to the embodiments disclosed below rather than being implemented in a variety of different forms of the invention will be.

[0022] In the present specification in the present embodiment is the complete disclosure of the present invention and in such a way, the present the present invention relates to one of ordinary skill in the art for the person who has to complete the scope of the invention in order to inform when the mold assembly is provided. And the invention is only defined by the scope of the claims of the present invention. Thus, in some embodiments, components known as well, the operation and well known in a well known technique of the present invention relate broadly interpreted as referring to obscure the present in order to avoid that does not specifically described.

[0023] Also, the same reference numerals throughout the specification to refer to the same constituent elements. And, as used in the present specification (mentioned) terms are embodiments for descriptive purposes and are intended to be limiting of the present invention is not. In the present specification, unless stated otherwise specifically in the singular phrase does not include the plural forms as well. Further, comprising>"(or, provided with) a is referred to as elements and the operation of one or more other elements and the operation of does not exclude the presence or addition.

[0024] If there is no other definitions, used in the present specification all terms (including technical and scientific terms) shows a cross section of the present invention relates to one of ordinary skill in the art for the person who has can be understood in common can be used in a meaning of this disclosure. Also generally defined in the dictionary used the terms are defined for the pressure is not ideally or excessively not to be construed as.

[0025] Hereinafter referred to as, with reference to the accompanying drawings in which the technical features of the present invention will be specifically described for the sake of conciseness.

[0026] Fig. 1 is a schematic according to an embodiment of the present invention provided with a near infrared ray LED jade beautification equipment to the skin of a perspective view as viewed from above, Fig. 2 is shown in Fig. 1 skin esthetic device perspective view from below, Fig. 3 is shown in Fig. 1 between the body and the OK kap mutually separated perspective view illustrating a state, Fig. 4 shows a skin esthetic device 1 shown in a cross section of the cross sectional view and, Fig. 5 is a view illustrating the body 2 for explaining the configuration of each of the protector according to an exploded perspective view thereof.

[0027] Fig. 1 referring to Fig. 5 to, according to an embodiment of the present invention with skin beautification equipment (100) and (10), in the head portion of the main (10) body (10a) detachably joined to the including OCAP (20).

[0028] The head portion (10a) and the body is arranged (10), from the head portion (10a) at approximately right angles to the handle portion (10b) extending and includes, head portion (10a) and the handle part (10b) is a bottom cover (11) and the upper cover (12) via the coupling of the formed therein.

[0029] Fig. 4 and Fig. 5 the body is arranged (10) such as shown in, and the lower cover (11), the upper cover (12) and, with upper (13) and, skin with a management module (14), control module (15), including rechargeable batteries (16). In addition, according to the present invention the body is arranged to (20) be vibration further comprising a control module (17).

[0030] As shown in Fig. 5 is a lower cover (11), the upper cover (12) in the inside thereof in combination with a skin care module (14), control module (15), rechargeable battery (16) and vibration module (17) is received form a receiving space.

[0031] Such a lower cover (11) is combined with the upper cover (12) in a state where the moisture or biting is introduced into the accommodation space so as not to consist of a material which has a waterproof function. For example, a lower cover (11) is a synthetic resin material, rubber material or any one of the fiber material can be composed of a material. Preferably made from a plastic material having a constant intensity can be made.

[0032] In Fig. 4 and Fig. 5 lower cover (11) as shown in the following, mounted on the bottom of a printed circuit board of the control module (15) of the plurality of switch (151) and the indicating (152) lamp is exposed to the outside (11a, 11b) a plurality of exposures so that the ball is formed therein. Also, the upper cover (12) and the skin care module (14) in coupled condition, control module (15), rechargeable battery (16) and vibration module (17) depending on the operation of said receiving space to generated heat in order to emit the heat outside a plurality of ventilation (11c) is further formed may also be present.

[0033] The upper cover (12) is in the same manner as the lower cover (11) can be made of a material. And, a lower cover (11) and the upper cover (12) has a central portion are screwed group that has been, in male and female bonded to each other in order to enhance bonding shown in Fig. 5 as can be seen, the plurality of binding protrusion or coupling groove formed therein.

[0034] Fig. 4 and Fig. 5 the upper cover (12) is a as shown in the upper cap (13) attached as a head portion which is open in section (12a) to each other is provided, opening (12a) include a skin management module (14) is accepted.

[0035] The upper (13) cap shown in Fig. 5 and as indicated above, the opening of the upper cover (12) (12a) of the upper cover (12) so as to cover coupled to the head portion, and a plurality of LED (142) skin management module (14) of, galvanic ion unit (143, see Fig. 6) of conductors (143a) is a through hole which projects from the (13a) is a plurality of through holes formed therein. This top cap (13) may include a (12) top cover detachably to a coupling element may also be present.

[0036] As shown in Fig. 4 skin management module (14) may, ocap (20) so as to oppose the head portion of the interior of the main (10) body (10a)

installed onto the. Such skin management module (14) with the printed circuit board (141), the top of the printed circuit board (141) to be mounted on a thermotherapy emitting near infrared light with a plurality of LED (142) and, comprises the galvanic ion unit (143).

[0037] A plurality of LED (142) shows a number of visible light and near infrared ray LED LED include. In the present invention shown in Fig. 3 as can be seen, the visible light of multiple LED and near infrared ray LED is formed on the upper cap (13) in a through hole (13a) through the semiconductor substrate and is protruded into the upper part of the upper cap (13) mounted so.

[0038] Fig. 3 as described above, the present invention relates to the top cap (13) in a state where the OCAP (20) was separated from the plurality of visible light and near infrared ray LED LED is a through hole of the upper cap (13) (13a) through the contact surface (the surface contacting directly to the skin) and protruding into the, through which the visible light and near infrared ray LED LED is directly over the skin over the visible light so as to allow contact through the line and the near infrared thermotherapy LED LED near infrared ray emitted through the effectively into the skin is permeated deep into the skin esthetic effect can be maximized.

[0039] In other words, and in the near infrared in the near infrared ray released LED of skin penetration depth is about 6mm with approximately known under the designation, LED near infrared light is a near infrared rays is emitted from the wavelength of the epidermis of the skin and able to pierce, delivered to the dermis in order to beautification equipment (100) skin of the present invention as shown in, visible light and near infrared ray LED LED are (13a) passes through the through hole of the upper cap (13) through protruding into the upper part of the surface and thereby directly contact must be contacts the human body. Through this, the visible light having a thermotherapy LED LED through a near IR through the near infrared ray released effectively inside of human body is permeated deep into the skin cosmetic effect can be maximized.

[0040] At this time, the contact surface of the upper cover (12) and which project a plurality of LED (142) based on the height of the contact surface of the upper cover (12) approximately 1mm to 3mm so that the concentration of protruding to the preferred over the others. In addition, according to the present invention constituting a plurality of LED (142) LED is approximately 380nm to 760nm band such as visible light, preferably of 630nm band LED was used and, is approximately 780nm to 2,500nm band for the near infrared ray LED, preferably LED of 830nm band used for the same purpose are preferred over the others.

[0041] According to the present invention cosmetic and skin device (100) constituting a plurality of LED (142) may be visible light and near infrared ray LED LED is arranged in the proximity to each other on the printed (141) circuit board are preferably as follows. In other words, skin esthetic device (100) according to the present invention have a plurality of visible light and a multitude of near infrared rays having respectively LED LED on a printed circuit board (141) are grouped into a circular or polygonal in being arranged with respect to the, for each LED 0. 1mm to 2mm is arranged in proximity to each other into the unit area by ($1cm^2$) sugar visible light LED is provided from a hyperthermia unit area at the same time that concentrate ($1cm^2$) near infrared ray LED per near infrared ray emission amount emitted from a skin for concentrating the cosmetic effect can be maximized.

[0042] Galvanic ion unit (143) (143a) is a conductor of Fig. 3 and as shown in Fig. 5, in the same manner as a plurality of LED (142) mounted on the top of the printed circuit board (141), in the same manner as a plurality of LED (142) consist of the shape and height. Galvanic ion unit (143a) of such conductors is a conductive metal, for example being made up of a copper material, as shown in a plurality of LED (142) through hole of the upper cap (13) (13a) and wherein a portion of the cap (13) through the through holes of the through (13a) protruding out of contact with a surface.

Petitioner Therabody Ex-1004, 1191

[0043] Galvanic ion portion is connected to the (143) fine direct current of a galvanic current (ion) is supplied to the skin. This galvanic current is contains moisture in an amount of skin when passing through the cathode and the anode (+) (-) used to create a chemical action of the by, this chemistry is galvanic current cell tissue of the human body passes between the first and subculturing and occurs even when the, through which unnecessary waste is discharged to the outside of the skin and, skin health benefit in which aids the absorption of the nutrient role.

[0044] Fig. 6 is shown in Fig. 5 a control module in accordance with the same in order to explain the present invention.

[0045] Referring to Fig. 5 and Fig. 6, the control module (15) has a main body (10) (10b) installed onto the knob portion of the.

[0046] This control module includes a (15) rechargeable battery (16) or external power supply receives power from and, in response to the operation (151) of a switch of the skin with a management module (14), vibrating module (17) to control the operation of the. At this time, the switch is configured in (151) operation and a power switch including a switch, control module is configured to (15) switch operation in response to the skin with a management module (14), vibrating module (17) to control the operation of the.

[0047] The control module is (15) as shown in Fig. 6, a predetermined motion according to the order in skin care module and a (14) vibration module (17) and to operate at the same time, operate independently or can be included therein.

[0048] For example, a control module according (15) to the present invention is that the user presses the operating switch of the switch (151), of the skin management module (14) operates and the plurality of LED (142), operating switch again presses in non operates and the plurality of LED (142), galvanic ion unit (143) is operated. Thereafter, operating switch again presses with a plurality of LED (142) galvanic ion unit (143) operates and the ratio, the vibration module (17) is operated. In addition, the control module (15) is used where the user presses the operating switch 1 times, operates and the plurality of LED (142), presses the operating switch 2 times, and a plurality of LED (142) and galvanic ion unit (143) operated at the same time, presses the operating switch 3 times, a plurality of LED (142), galvanic ion portion (143) and to simultaneously operate the vibration module (17) may also be present.

[0049] The control module is (15) shown in Fig. 6 as described above, via the input section (155) to form an interface with a user may also be present. The user via the input section (155) control module (15) is controlled so that the operating switch is controlled via a by changing the order of operation may also be present. In other words, the user input unit (155), through a plurality of LED (142) galvanic ion portion (143) and change the order of the vibration module (17) may also be present.

[0050] According to the present invention as shown in Fig. 6 skin beautification equipment (100) is, in close proximity to the skin can be photographed can be further comprising a camera (154). Camera (154) is a main (10) body of the lower cover and (111) upper cover (112) installed on any of the skin as a by photographing the transmitted to the control module (15).

[0051] The control module is (15) from images photographed by the camera (154) skin image is provided by a display portion (153). The user through the display unit (153) in real time the current skin condition can be confirmed.

[0052] Display unit (153) starts a timer (not shown) indicating a time provided through may also be present. That is, display parts (153), a plurality of LED (142) galvanic ion portion or the (143) vibration module (17) of the operating time can be displayed in real time.

[0053] Wherein the (15) control module is provided through a timer, it is determined based on a plurality of LED (142) galvanic ion portion or the (143)

Petitioner Therabody Ex-1004, 1192

vibration module (17) to control the operating time of the gas may also be present.

[0054] In addition, according to the present invention in Fig. 6 skin esthetic equipment (100) is as described above, further comprises a temperature sensor (156) elements may be present. The control module (15) is a temperature sensor (156) through a plurality of LED (142) and detect the temperature of the heat generation, if the sensed temperature is at a set temperature value is higher than the operation of the plurality of LED (142) is blocked.

[0055] As shown in Fig. 5 lights (152) may, when two of which 4 can be installed, which has a color different from each other with LED can be made. 4 A plurality of LED (142) two lights (152) may constituting LED visible light and near infrared ray LED, and, galvanic ion irradiation unit (143), an operating state of the vibration module (17) is displayed. This user according to the operating state of the indicators (152) on the basis of LED radiation in the visible, near infrared line LED, galvanic ion unit (143), vibration module (17) can be confirmed state of operation of the present invention.

[0056] On the other hand, according to the present invention in Fig. 4 and Fig. 5 the body is arranged (10) as shown in, vibration module and a (17) skin member (18) is further provided a buffer between the management module (14) may also be present. The buffer member (18) is a vibration module and a (17) skin care between a module (14) and provide insulation, vibration of the (17) vibration module of direct skin management module (14) may be transferred into the skin management module (14) and prevents it from being damaged.

[0057] Fig. 3 and Fig. 4 as shown in the following, according to the present invention OCAP (20) is detachably joined to the upper cap (13) to cover (21) and separated, separation cover (21) attached to the top of the oximes include (jade) (22).

[0058] The cover (21) is in the separation of the upper cap (13) protrudes through the through hole (13a) is a plurality of LED (142) so as to be exposed and opened to the upper and lower portions consist of the structure. According to this plurality of LED (142) LED of heat emitted from the visible light provided in an upper portion as it is delivered to the heating and oxy (22) oximes (22), LED near infrared rays emitted from a near infrared rays are released to the outside through the oxy (22).

[0059] Oxy (22) is a transparent or semitransparent and purgatory jadeite with, attached to the upper surface of the separation cover (21). In such an oxetane compound (22) may include a visible light LED heated by the far infrared rays and provides it to the skin.

[0060] The oxetane ring (22) is disposed in a bottom of near infrared rays emitted from a plurality of LED (142) LED near infrared ray for passing a relatively thin thickness in order to form are preferred over the others. For example, 2mm to 4mm, more preferably formed with a thickness of 3mm is preferred over the others. In addition, even at a low temperature selected from corn (22) has been heated to emit far infrared rays from corn (22) and of a plurality of LED (142) is approximately 10mm or less in the intervals between, preferably 5mm to 7mm are placed so as to have.

[0061] Fig. 7 is a jade structure according to the present invention for explaining the sectional view shown in a manner to Jade.

[0062] Fig. 7 of referring to (a), the oxidoreductase 22) the present invention drives a liquid composed of a structure in a flat top or, as shown in Fig. 7 (b) or of the, still another embodiment of the present invention (22a) - benzoxazin - has a unit area ($1cm^2$) near infrared ray LED per near infrared ray emission amount emitted from the bottom so as to converge at the upper portion is very flat and essentially consisting of a convex lens having a convex shape. In addition, as shown in Fig. 7 (c) of, by way of another example of the present invention (22b) is oxo the top and the bottom is composed of a flat structure, oxy (22b) and a separation between the cylinder head cover (21) can be

Petitioner Therabody Ex-1004, 1193

further provided with a convex lens (23). Through which the near infrared line LED near infrared emission amount emitted from a cosmetic effect for concentrating the skin can be maximized.

[0063] On the other hand, Fig. 5 unexplained"is a knob portion of the main (10) body 19 (10b) of both side parts as a cover combined to a side surface, a lower cover (111) and the upper cover (112) is coupled to the between. (10b) Such a side cover as a handle member when the user grasps and designed to ensure good tactile sensation in consideration of the form of a metal material with.

[0064] Or less, according to an embodiment of the present invention and the effects of skin esthetic device (100) description for the sake of conciseness.

[0065] First of all, in accordance with an embodiment of the present invention skin beautification equipment (100) is a main (10) body of the head portion (10a) coupled to the upper cap (13) is detachably joined to the OCAP (20) and, in the lower part thereof LED visible light and near infrared ray LED comprising a skin management module (14) is arranged to be oximes as in the prior art for heating the electric heater used without the use of oximes LED visible light by the use of an effective heating of the thermotherapy and far infrared rays on the skin as can be simultaneously provide, through which safely even in the facial skin can be applied to effect the can be obtained.

[0066] In addition, according to an embodiment of the present invention skin esthetic device (100) is a skin care module (14) LED visible light and near infrared ray LED is arranged close to each other and a visible ray LED and near infrared ray LED and less than or equal to 10mm oxalic acid and a (22) gap between the relatively closely arranged 2mm to 4mm of the oxetane ring (22) at the same time a relatively thin thickness easily heated by forming and oxalic acid and a (22), the near infrared ray is emitted from the near infrared ray LED without loss to the outside through the oxy (22) and visualized depending on the by near infrared rays is deeper into the skin until the skin with a far infrared rays by delivering a cosmetic effect can be maximized.

[0067] In addition, a skin esthetic agent according to embodiments of the present invention device (100) is a skin care module (14) galvanic ion together with infrared LED parts (143) of conductors (143a) together provide near infrared rays to the skin by placing the galvanic ions together at the same time by supplying an unnecessary waste of the skin and is discharged to the outside, skin health benefit to the promotes the absorption of nutritive elements can be included therein.

[0068] In addition, according to an embodiment of the present invention skin esthetic equipment (100) is attached to the OCAP (20) that can have a convex shape is formed to be a (22a), or (22b) between the oxetane ring and separating from the cover (21) by the arrangement of the convex lens in (23) the near infrared ray LED near infrared ray emission amount emitted from the oxetane ring (22a) was used to or concentrating, the convex lens is used (23) for concentrating the cosmetic effect to the skin can be maximized.

[0069] Also, according to embodiments of the present invention skin beautification equipment (100) is a vibration module for (17) the interior of the body (10) by installing an of skin treatment according to far infrared and the near infrared line is provided at the same time by transferring the vibration to the skin of the far infrared and the near infrared line and skin esthetic - tentiating effects by binding agents may be present.

[0070] In addition, according to an exemplary embodiment of the present invention skin beautification equipment (100) is removable from the top cap (13) and OCAP (20) coupled to a lower portion, LED visible light, near infrared ray LED galvanic ion unit (143a) and the conductor of the contact surface of the upper cap (13) is disposed protruding upwards, through which the OCAP (20) was detached from the upper cap (13) projecting to the outside of the visible laser LED, the near infrared ray LED and a galvanic ion portion of conductors (143a) is directly over the skin by so as to allow contact

Petitioner Therabody Ex-1004, 1194

with the hyperthermia treatment of near infrared rays is deeper into the skin until it is possible to delivered to the skin esthetic effect can be maximized.

[0071] As described above the present invention and the technical features of the preferred embodiments specifically although described, wherein the preferred embodiments are for the purpose of illustration and, is not intended to be a limitation thereof. As such those skilled in the art will appreciate that the invention within the scope of the technical idea of the present embodiment of the present invention through the combination of the various embodiments are enabled and it will be understood by one.

REFERENCE SIGNS LIST

[0072] 100: Skin beautification equipment 10: body 10a: head portion 10b: handle part 11: a lower cover 12: upper cover 13: upper cap 14: skin management module 15: control module 16: rechargeable battery 17: vibration module 18: buffer member 19: side cover 141: a printed circuit board 142: a number of LED 143: 143a parts galvanic ion: conductor 151: switch 152: indicating lamp 153: display unit 154: camera 155: input unit 156: temperature sensor 20: ocap 21: separation cover 22, 22a, 22b: oxy

Petitioner Therabody Ex-1004, 1195

(19) 대한민국특허청(KR)
(12) 등록특허공보(B1)

(45) 공고일자 2015년03월23일
(11) 등록번호 10-1504885
(24) 등록일자 2015년03월17일

(51) 국제특허분류(Int. Cl.)
A61N 5/06 (2006.01) *A61N 1/30* (2006.01)
A61H 23/02 (2006.01)
(21) 출원번호 10-2014-0152555
(22) 출원일자 2014년11월05일
심사청구일자 2014년11월05일
(56) 선행기술조사문헌
KR200297648 Y1*
JP2005323970 A
*는 심사관에 의하여 인용된 문헌

(73) 특허권자
조성찬
인천광역시 부평구 부평북로 407 ,101동1607호 (삼산동,현대아파트)
이창희
인천광역시 남구 미추홀대로586번길 58, B01호 (주안동)
(72) 발명자
조성찬
인천광역시 부평구 부평북로 407 ,101동1607호 (삼산동,현대아파트)
이창희
인천광역시 남구 미추홀대로586번길 58, B01호 (주안동)
(74) 대리인
이환권

전체 청구항 수 : 총 2 항 심사관 : 유창용

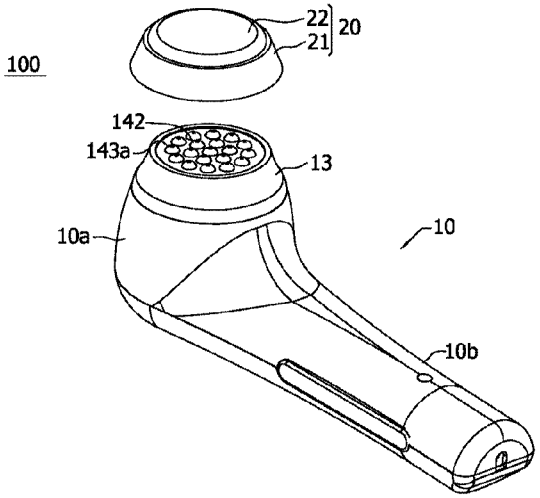
(54) 발명의 명칭 **옥과 근적외선 엘이디를 구비한 피부 미용기기**

(57) 요 약

본 발명은 피부 미용기기에 관한 것으로서, 상세하게는 각 가정에서 간편하게 사용이 가능하면서 휴대가 용이하여 장소와 시간에 구애받지 않고 자유롭게 사용할 수 있고, 옥(jade)을 가시광선 LED(Light Emitting Diode)를 이용하여 가열하여 피부에 온열과 원적외선을 동시에 제공하는 한편, 가시광선 LED와 함께 모듈화된 근적외선

(뒷면에 계속)

대 표 도 - 도3



MassagerPriorArt0000564

Petitioner Therabody Ex-1004, 1196

LED를 직접 피부에 접촉가능하도록 돌출 구성함으로써 근적외선을 피부 속까지 전달하여 피부 미용효과를 극대화 할 수 있는 피부 미용기기에 관한 것이다.

이를 위해 본 발명은 손잡이부와, 상기 손잡이부의 일측부로부터 절곡된 헤드부를 포함하는 본체와, 상기 본체의 헤드부에 착탈가능하게 결합된 분리커버와, 상기 분리커버의 상면에 부착된 옥(jade)을 포함하는 옥캡을 포함하되, 상기 본체는 상기 옥캡과 대향하도록 상기 헤드부의 내부에 설치되되, 인쇄회로기판 상에 실장되어 상기 옥에 열을 가하는 다수의 가시광선 LED(Light Emitting Diode)와, 상기 인쇄회로기판 상에 실장되어 상기 옥으로 근적외선을 방출하는 다수의 근적외선 LED와, 상기 인쇄회로기판 상에 실치되어 갈바닉 전류를 제공하는 갈바닉 이온부를 포함하는 피부 관리모듈과, 상기 손잡이부의 내부에 설치되어 충전용 배터리 또는 외부로부터 전원을 공급받아 동작하고, 스위치의 동작에 응답하여 상기 다수의 가시광선 LED 및 다수의 근적외선 LED와, 상기 갈바닉 이온부의 동작을 제어하는 제어모듈을 포함하는 것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기를 제공한다.

MassagerPriorArt0000565

Petitioner Therabody Ex-1004, 1197

Petitioner Therabody Ex-1004, 1198

특허청구의 범위

청구항 1

손잡이부와, 상기 손잡이부의 일측부로부터 절곡된 헤드부를 포함하는 본체; 및

상기 본체의 헤드부에 착탈가능하게 결합된 분리커버와, 상기 분리커버의 상면에 부착된 옥(jade)을 포함하는 옥캡; 을 포함하되,

상기 본체는,

상기 옥캡과 대향하도록 상기 헤드부의 내부에 설치되되, 인쇄회로기판 상에 실장되어 상기 옥에 열을 가하도록 380nm 내지 760nm 대역의 다수의 가시광선 LED(Light Emitting Diode)와, 상기 인쇄회로기판 상에 실장되어 상기 옥으로 근적외선을 방출하도록 780nm 내지 2,500nm 대역의 다수의 근적외선 LED와, 상기 인쇄회로기판 상에 설치되어 갈바닉 전류를 제공하는 갈바닉 이온부를 포함하는 피부 관리모듈;

상기 손잡이부의 내부에 설치되어 충전용 배터리 또는 외부로부터 전원을 공급받아 동작하고, 스위치의 동작에 응답하여 상기 다수의 가시광선 LED 및 다수의 근적외선 LED와, 상기 갈바닉 이온부의 동작을 제어하는 제어모듈;

상기 헤드부의 내부에 설치되어 상기 헤드부를 진동시키는 진동모듈; 및

상기 헤드부와 상기 분리커버 사이에 결합되는 상부캡; 을 포함하되,

상기 상부캡에는 다수의 관통공이 형성되어 상기 다수의 가시광선 LED, 다수의 근적외선 LED 및 상기 갈바닉 이온부의 전도체의 일부가 상기 관통공을 관통하여 상부로 돌출 배치되고,

상기 옥은 상기 다수의 근적외선 LED로부터 방출된 근적외선이 투과되도록 2mm 내지 4mm의 두께로 형성하고,

상기 다수의 근적외선 LED 및 상기 다수의 근적외선 LED와 상기 옥 사이의 간격은 5mm 내지 7mm가 되도록 하고,

상기 다수의 가시광선 LED와 상기 다수의 근적외선 LED는 0.1mm 내지 2mm 간격으로 서로 근접 배치되는,

것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기.

청구항 2

삭제

청구항 3

삭제

청구항 4

삭제

청구항 5

제 1 항에 있어서,

상기 옥은 볼록 형상으로 이루어지거나, 상기 옥과 상기 분리커버 사이에 볼록렌즈가 더 배치되는 것을 특징으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기.

명 세 서

기 술 분 야

[0001] 본 발명은 피부 미용기기에 관한 것으로서, 상세하게는 각 가정에서 간편하게 사용이 가능하면서 휴대가 용이하여 장소와 시간에 구애받지 않고 자유롭게 사용할 수 있고, 옥(jade)을 가시광선 LED(Light Emitting Diode)를

MassagerPriorArt0000566

Petitioner Therabody Ex-1004, 1199

이용하여 가열하여 피부에 온열과 원적외선을 동시에 제공하는 한편, 가시광선 LED와 함께 모듈화된 근적외선 LED를 직접 피부에 접촉가능하도록 돌출 구성함으로써 근적외선을 피부 속까지 전달하여 피부 미용효과를 극대화할 수 있는 피부 미용기기에 관한 것이다.

배 경 기 술

[0002] 일반적으로 아름다운 피부를 추구하기 위해서는 체계적인 피부관리가 무엇보다 중요하다. 전통적인 피부관리는 주로 손을 사용하여 혈액이나 림프의 순환을 촉진하는 마사지(massage)가 주류를 이루었으나, 근래에 들어서는 각 가정에서 개인이 손쉽게 피부를 관리할 수 있도록 다양한 피부 미용기기들이 개발되어 사용되고 있다.

[0003] 피부 미용기기로는 롤러를 이용한 가압방식, 진동모터를 이용한 진동방식, 초음파를 이용한 방식, 황토, 숯, 옥 등으로 이루어진 원적외선 방사체를 이용한 방식 등이 주로 사용되고 있으나, 이러한 방식들은 피부 미용효과를 극대화하는데 한계가 있다.

[0004] 특히 원적외선 방사체를 이용한 방식은 전열히터를 이용하여 원적외선 방사체를 가열하여 원적외선을 방출하는 것으로 화상 위험때문에 안면 피부에는 적용하지 못하고, 침대, 매트, 방석 또는 국부적 처료기에만 한정적으로 적용되고 있는 실정이다.

[0005] 또한 원적외선 방사체를 이용한 방식에서는 전열히터를 사용함에 따라 전기히터에서 발생되는 전자파로 인한 인체 부작용이 발생하기 때문에 그 효능에도 불구하고 실질적으로 원적외선 방사체를 피부 미용기기에 적용하는데에는 여전히 한계가 있었다.

선행기술문헌

특허문헌

[0006] (특허문헌 0001) KR 10-2006-0084084 A, 2006. 07. 24.

(특허문헌 0002) KR 10-1253611 B1, 2013. 04. 05.

(특허문헌 0003) KR 10-2014-0059471 A, 2014. 05. 16.

(특허문헌 0004) KR 20-0173224 Y1, 1999. 12. 17.

발명의 내용

해결하려는 과제

[0007] 따라서, 본 발명은 종래기술의 문제점을 해결하기 위하여 제안된 것으로서, 각 가정에서 간편하게 사용이 가능하면서 휴대가 용이하여 장소와 시간에 구애받지 않고 언제 어디서나 자유롭게 사용할 수 있고, 전열히터을 사용하지 않아 안면 피부에도 안전하게 적용할 수 있으며, 피부 속 깊은 곳까지 원적외선과 근적외선을 전달하여 피부 미용효과를 극대화할 수 있는 피부 미용기기를 제공하는데 그 목적이 있다.

과제의 해결 수단

[0008] 상기한 목적을 달성하기 위한 일 측면에 따른 본 발명은 손잡이부와, 상기 손잡이부의 일측부로부터 절곡된 헤드부를 포함하는 본체와, 상기 본체의 헤드부에 착탈가능하게 결합된 분리커버와, 상기 분리커버의 상면에 부착된 옥(jade)을 포함하는 옥캡을 포함하되, 상기 본체는 상기 옥캡과 대향하도록 상기 헤드부의 내부에 설치되되, 인쇄회로기판 상에 실장되어 상기 옥에 열을 가하는 다수의 가시광선 LED(Light Emitting Diode)와, 상기 인쇄회로기판 상에 실장되어 상기 옥으로 근적외선을 방출하는 다수의 근적외선 LED와, 상기 인쇄회로기판 상에 설치되어 갈바닉 전류를 제공하는 갈바닉 이온부를 포함하는 피부 관리모듈과, 상기 손잡이부의 내부에 설치되어 충전용 배터리 또는 외부로부터 전원을 공급받아 동작하고, 스위치의 동작에 응답하여 상기 다수의 가시

MassagerPriorArt0000567

광선 LED 및 다수의 근적외선 LED와, 상기 샅바넛 이온부의 동작을 제어하는 제어모듈을 포함하는 것을 특성으로 하는 옥과 근적외선 엘이디를 구비한 피부 미용기기를 제공한다.

[0009] 바람직하게, 상기 본체는 상기 헤드부의 내부에 설치되어 상기 헤드부를 진동시키는 진동모듈을 더 포함할 수 있다.

[0010] 바람직하게, 상기 본체는 상기 헤드부와 상기 분리커버 사이에 결합되는 상부캡을 더 포함하되, 상기 상부캡에는 다수의 관통공이 형성되어 상기 다수의 가시광선 LED, 다수의 근적외선 LED 및 상기 샅바넛 이온부의 전도체의 일부가 상기 관통공을 관통하여 상부로 돌출 배치될 수 있다.

[0011] 바람직하게, 상기 옥은 상기 다수의 근적외선 LED로부터 발출된 근적외선이 투과되도록 2mm 내지 4mm의 두께로 형성할 수 있다.

[0012] 바람직하게, 상기 옥은 볼록 형상으로 이루어지거나, 상기 옥과 상기 분리커버 사이에 볼록렌즈가 더 배치될 수 있다.

발명의 효과

[0013] 이상에서 설명한 바와 같이, 본 발명에 따르면, 다음과 같은 효과들을 얻을 수 있다.

[0014] 첫째, 본 발명에 따르면, 본체의 헤드부에 결합된 상부캡에 옥캡이 착탈가능하게 결합되고, 그 하부에 가시광선 LED와 근적외선 LED를 포함하는 피부 관리모듈이 배치됨으로써 종래와 같이 안면 피부 사용에 제한적이었던 전열히터를 사용하지 않고도 가시광선 LED를 이용하여 옥을 가열하여 피부에 온열과 원적외선을 동시에 제공할 수 있으며, 이를 통해 안면 피부에도 안전하게 적용할 수 있는 효과를 얻을 수 있다.

[0015] 둘째, 본 발명에 따르면, 피부 관리모듈에 가시광선 LED와 근적외선 LED를 서로 근접 배치하고, 옥을 2mm 내지 4mm의 비교적 얇은 두께로 형성함으로써 근적외선 LED로부터 발출된 근적외선이 손실없이 옥을 통해 외부로 투시됨에 따라 근적외선을 피부 속 깊은 곳까지 진달하여 원적외선과 함께 피부 미용효과를 극대화할 수 있다.

[0016] 셋째, 본 발명에 따르면, 피부 관리모듈에 근적외선 LED와 함께 갈바닉 이온부의 전도체를 함께 배치함으로써 피부에 근적외선과 갈바닉 이온을 동시에 공급하여 피부의 불필요한 노폐물은 외부로 배출하고, 피부 건강에 이로운 영양성분의 흡수를 촉진시킬 수 있다.

[0017] 넷째, 본 발명에 따르면, 옥캡에 부착되는 옥을 볼록렌즈 형태로 형성하거나, 혹은 옥과 분리커버 사이에 볼록렌즈를 배치함으로써 근적외선 LED로부터 발출되는 근적외선 발출량을 볼록렌즈를 이용하여 집중시켜 피부 미용효과를 극대화할 수 있다.

[0018] 다섯째, 본 발명에 따르면, 본체의 내부에 진동모듈을 설치하고, 이를 통해 옥이 피부에 밀착된 상태에서 피부에 전달되도록 함으로써 원적외선과 근적외선의 결합하여 피부 미용효과를 극대화시킬 수 있고, 사용자의 피부 특성에 따라 사용자가 선택적으로 농작시켜 사용할 수 있어 선택의 폭을 넓혀 경쟁력을 확보할 수 있다.

[0019] 여섯째, 본 발명에 따르면, 옥이 부착된 옥캡이 상부캡으로부터 착탈가능하도록 결합되고, 가시광선 LED와 근적외선 LED가 상부캡의 접촉면 상부로 돌출 배치됨으로써 옥캡을 상부캡으로부터 분리시킨 후 외부로 돌출된 가시광선 LED와 근적외선 LED가 직접 피부에 접촉된 상태로 사용할 수 있도록 제공함으로써 온열과 근적외선이 피부 속 깊은 곳까지 전달되는 것이 가능하여 피부 미용효과를 극대화할 수 있다.

도면의 간단한 설명

[0020] 도 1은 본 발명의 실시예에 따른 피부 미용기기를 위에서 바라본 사시도.

도 2는 도 1에 도시된 피부 미용기기를 아래에서 바라본 사시도.

도 3은 도 1에 도시된 본체와 옥캡이 상호 분리된 상태를 도시한 사시도.

도 4는 도 1에 도시된 피부 미용기기의 단면을 도시한 단면도.

MassagerPriorArt0000568

Petitioner Therabody Ex-1004, 1200

Petitioner Therabody Ex-1004, 1201

도 5는 도 2에 도시된 본체의 각 구성을 설명하기 위하여 도시한 분해 사시도.

도 6은 도 5에 도시된 제어모듈을 설명하기 위하여 도시한 블럭도.

도 7은 본 발명에 따른 옥캡을 설명하기 위하여 도시한 옥캡의 단면도.

발명을 실시하기 위한 구체적인 내용

[0021] 본 발명의 이점 및 특징, 그리고 그것들을 달성하는 방법은 첨부되는 도면과 함께 상세하게 후술되는 실시예를 참조하면 명확해질 것이다. 그러나, 본 발명은 이하에서 개시되는 실시예로 한정되는 것이 아니라 서로 다른 다양한 형태로 구현될 것이다.

[0022] 본 명세서에서 본 실시예는 본 발명의 개시가 완전하도록 하며, 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자에게 발명의 범주를 완전하게 알려주기 위해 제공되는 것이다. 그리고 본 발명은 청구항의 범주에 의해 정의될 뿐이다. 따라서, 몇몇 실시예에서, 잘 알려진 구성 요소, 잘 알려진 동작 및 잘 알려진 기술들은 본 발명이 모호하게 해석되는 것을 피하기 위하여 구체적으로 설명되지 않는다.

[0023] 또한, 명세서 전체에 걸쳐 동일 참조 부호는 동일 구성 요소를 지칭한다. 그리고, 본 명세서에서 사용된(언급된) 용어들은 실시예를 설명하기 위한 것이며 본 발명을 제한하고자 하는 것은 아니다. 본 명세서에서, 단수형은 문구에서 특별히 언급하지 않는 한 복수형도 포함한다. 또한, '포함(또는, 구비)한다'로 언급된 구성 요소 및 동작은 하나 이상의 다른 구성요소 및 동작의 존재 또는 추가를 배제하지 않는다.

[0024] 다른 정의가 없다면, 본 명세서에서 사용되는 모든 용어(기술 및 과학적 용어를 포함)는 본 발명이 속하는 기술 분야에서 통상의 지식을 가진 자에게 공통적으로 이해될 수 있는 의미로 사용될 수 있을 것이다. 또한 일반적으로 사용되는 사전에 정의되어 있는 용어들은 정의되어 있지 않은 한 이상적으로 또는 과도하게 해석되지 않는다.

[0025] 이하, 첨부된 도면들을 참조하여 본 발명의 기술적 특징을 구체적으로 설명하기로 한다.

[0026] 도 1은 본 발명의 실시예에 따른 옥과 근적외선 엘이디를 구비한 피부 미용기기를 위에서 바라본 사시도이고, 도 2는 도 1에 도시된 피부 미용기기를 아래에서 바라본 사시도이고, 도 3은 도 1에 도시된 본체와 옥캡이 상호 분리된 상태를 도시한 사시도이고, 도 4는 도 1에 도시된 피부 미용기기의 단면을 도시한 단면도이며, 도 5는 도 2에 도시된 본체의 각 구성을 설명하기 위하여 도시한 분해 사시도이다.

[0027] 도 1 내지 도 5를 참조하면, 본 발명의 실시예에 따른 피부 미용기기(100)는본체(10)와, 본체(10)의 헤드부(10a)에 착탈가능하게 결합되는 옥캡(20)을 포함한다.

[0028] 본체(10)는 헤드부(10a)와, 헤드부(10a)로부터 대략 직각으로 연장된 손잡이부(10b)를 포함하고, 헤드부(10a)와 손잡이부(10b)는 하부커버(11)와 상부커버(12)의 결합을 통해 형성된다.

[0029] 이러한 본체(10)는 도 4 및 도 5에 도시된 바와 같이, 하부커버(11)와, 상부커버(12)와, 상부캡(13)과, 피부 관리모듈(14)과, 제어모듈(15)과, 충전용 배터리(16)를 포함한다. 또한, 본 발명에 따른 본체(20)는 진동모듈(17)을 더 포함할 수 있다.

[0030] 하부커버(11)는 도 5와 같이, 상부커버(12)와 결합되어 그 내부에 피부 관리모듈(14), 제어모듈(15), 충전용 배터리(16) 및 진동모듈(17)이 수용되는 수용공간을 형성한다.

[0031] 이러한 하부커버(11)는 상부커버(12)와 결합된 상태에서 상기 수용공간으로 습기 또는 불기가 유입되지 않도록 방수 기능을 갖는 재질로 이루어진다. 예를 들어, 하부커버(11)는 합성수지재, 고무재 또는 섬유재 중 어느 하나의 재질로 이루어질 수 있다. 바람직하게는 일정한 강도를 갖는 플라스틱 재질로 이루어질 수 있다.

[0032] 하부커버(11)에는 도 4 및 도 5와 같이, 제어모듈(15)의 인쇄회로기판의 저면에 실장된 다수의 스위치(151)와 표시등(152)이 외부로 노출되도록 다수의 노출공(11a, 11b)이 형성되어 있다. 또한, 상부커버(12)와 결합된 상태에서 피부 관리모듈(14), 제어모듈(15), 충전용 배터리(16) 및 진동모듈(17)의 동작에 따라 상기 수용공간에 발생하는 열을 외부로 방출하기 위하여 다수의 환기공(11c)이 더 형성될 수도 있다.

[0033] 상부커버(12)는 하부커버(11)와 동일 재질로 이루어질 수 있다. 그리고, 하부커버(11)와 상부커버(12)는 중앙부

MassagerPriorArt0000569

가 나사 결합되되, 서로 암수 결합되어 결합력을 향상시키기 위하여 도 5에 도시된 바와 같이, 다수의 결합돌기 또는 결합홈이 형성되어 있다.

[0034] 상부커버(12)는 도 4 및 도 5에 도시된 바와 같이 상부캡(13)이 결합되는 헤드부가 개방된 개방부(12a)를 구비하고, 개방부(12a)에는 피부 관리모듈(14)이 수용된다.

[0035] 상부캡(13)은 도 5에 도시된 바와 같이, 상부커버(12)의 개방부(12a)를 덮도록 상부커버(12)의 헤드부에 결합되고, 피부 관리모듈(14)의 다수의 LED(142)와, 갈바닉 이온부(143, 도 6참조)의 전도체(143a)가 관통하여 돌출되는 다수의 관통공(13a)이 형성되어 있다. 이러한 상부캡(13)은 상부커버(12)에 착탈가능하게 결합될 수 있다.

[0036] 피부 관리모듈(14)은 도 4와 같이, 옥캡(20)과 대향하도록 본체(10)의 헤드부(10a)의 내부에 실치된다. 이러한 피부 관리모듈(14)은 인쇄회로기판(141)과, 인쇄회로기판(141)의 상부에 실장되어 온열과 근적외선을 방출하는 다수의 LED(142)와, 갈바닉 이온부(143)를 포함한다.

[0037] 다수의 LED(142)는 다수의 가시광선 LED 및 근직외선 LED를 포함한다. 본 발명에서는 도 3에 도시된 바와 같이, 다수의 가시광선 LED 및 근적외선 LED가 상부캡(13)에 형성된 관통공(13a)을 관통하여 상부캡(13)의 상부로 일부가 돌출되도록 설치된다.

[0038] 도 3과 같이, 본 발명은 옥캡(20)을 상부캡(13)으로부터 분리시킨 상태에서 다수의 가시광선 LED 및 근적외선 LED가 상부캡(13)의 관통공(13a)을 통해 접촉면(피부에 직접 접촉되는 면)으로 돌출되고, 이를 통해 가시광선 LED 및 근적외선 LED가 직접 피부에 접촉되도록 함으로써 가시광선 LED를 통한 온열과 근적외선 LED를 통해 방출된 근적외선을 효과적으로 피부 속 깊숙이 투과시켜 피부 미용효과를 극대화할 수 있다.

[0039] 즉, 근적외선 LED에서 방출된 근적외선의 피부 투과 깊이는 대략 6mm 정도로 알려져 있음으로, 근적외선 LED로부터 방출된 근직외선의 파장이 피부의 표피를 뚫고, 진피까지 전달되기 위해서는 본 발명의 피부 미용기기(100)와 같이, 가시광선 LED와 근적외선 LED들이 상부캡(13)의 관통공(13a)을 통해 접촉면 상부로 돌출되어 직접 인체에 접촉되어야 한다. 이를 통해, 가시광선 LED를 통한 온열과 근적외선 LED를 통해 방출된 근적외선을 효과적으로 인체 내부 깊숙이 투과시켜 피부 미용효과를 극대화할 수 있다.

[0040] 이때, 상부커버(12)의 접촉면으로 돌출되는 다수의 LED(142)의 높이가 상부커버(12)의 접촉면을 기준으로 대략 1mm 내지 3mm 정도가 되도록 돌출되는 것이 바람직하다. 또한, 본 발명에 따른 다수의 LED(142)를 구성하는 가시광선 LED들은 대략 380nm 내지 760nm 대역, 바람직하게는 630nm 대역의 LED를 사용하고, 근적외선 LED들은 대략 780nm 내지 2,500nm 대역, 바람직하게는 830nm 대역의 LED를 사용하는 것이 바람직하다.

[0041] 본 발명에 따른 피부 미용기기(100)는 다수의 LED(142)를 구성하는 가시광선 LED 및 근직외선 LED가 인쇄회로기판(141) 상에 서로 근접배치되는 것이 바람직하다. 즉, 본 발명에 따른 피부 미용기기(100)는 다수의 가시광선 LED와 다수의 근적외선 LED를 각각 인쇄회로기판(141) 상에서 원형 또는 다각형으로 그룹화하여 배치하되, 각각의 LED를 0.1mm 내지 2mm 내로 서로 근접배치함으로써 단위면적($1cm^2$)당 가시광선 LED로부터 제공되는 온열을 집중시키는 동시에 단위면적($1cm^2$)당 근적외선 LED로부터 방출되는 근적외선 방출량을 집중시켜 피부 미용 효과를 극대화할 수 있다.

[0042] 갈바닉 이온부(143)의 전도체(143a)는 도 3 및 도 5와 같이, 다수의 LED(142)와 마찬가지로 인쇄회로기판(141)의 상부에 실장되되, 다수의 LED(142)와 동일한 형상 및 높이로 이루어진다. 이러한 갈바닉 이온부의 전도체(143a)는 전도성 금속, 예를 들면 구리재질로 이루어지며, 다수의 LED(142)와 같이 상부캡(13)의 관통공(13a)을 통해 일부가 상부캡(13)의 관통공(13a)을 통해 접촉면으로 돌출된다.

[0043] 갈바닉 이온부(143)는 미세한 직류 전류인 갈바닉 전류(이온)를 피부에 공급한다. 상기 갈바닉 전류가 수분을 함유하고 있는 피부를 통과할 때 양극(+)과 음극(-)에 의해 화학작용을 일으키는데, 이러한 화학작용은 갈바닉 전류가 인체의 세포조직과 세포액 사이를 통과할 때에도 발생하고, 이를 통해 피부의 불필요한 노폐물은 외부로 배출하고, 피부 건강에 이로운 영양성분의 흡수를 도와주는 역할을 한다.

[0044] 도 6은 도 5에 도시된 제어모듈을 설명하기 위하여 도시한 블럭도이다.

[0045] 도 5 및 도 6을 참조하면, 제어모듈(15)은 본체(10)의 손잡이부(10b)에 설치된다.

[0046] 이러한 제어모듈(15)은 충전용 배터리(16) 또는 외부로부터 전원을 공급받고, 스위치(151)의 동작에 응답하여 피부 관리모듈(14)과, 진동모듈(17)의 동작을 제어한다. 이때, 스위치(151)는 전원 스위치와 동작 스위치를 포

MassagerPriorArt0000570

Petitioner Therabody Ex-1004, 1202

함하며, 제어모듈(15)은 상기 동작 스위치에 응답하여 피부 관리모듈(14)과, 진동모듈(17)의 동작을 제어한다.

[0047] 제어모듈(15)은 도 6과 같이, 미리 설정된 동작 순서에 따라 피부 관리모듈(14)과 진동모듈(17)을 동시에 동작시키거나, 혹은 독립적으로 동작시킬 수 있다.

[0048] 예를 들어, 본 발명에 따른 제어모듈(15)은 사용자가 스위치(151)의 동작 스위치를 누르면, 피부 관리모듈(14)의 다수의 LED(142)를 동작시키고, 다시 동작 스위치를 누르면 다수의 LED(142)를 비동작시키고, 갈바닉 이온부(143)를 동작시킨다. 이후, 다시 동작 스위치를 누르면 다수의 LED(142)와 갈바닉 이온부(143)를 비동작시키고, 진동모듈(17)을 동작시킨다. 또한, 제어모듈(15)은 사용자가 동작 스위치를 1회 누르면, 다수의 LED(142)를 동작시키고, 동작 스위치를 2회 누르면, 다수의 LED(142)와 갈바닉 이온부(143)를 동시에 동작시키고, 동작 스위치를 3회 누르면, 다수의 LED(142), 갈바닉 이온부(143) 및 진동모듈(17)을 동시에 동작시킬 수도 있다.

[0049] 제어모듈(15)은 도 6에 도시된 바와 같이, 입력부(155)를 통해 사용자와 인터페이스를 형성할 수도 있다. 사용자는 입력부(155)를 통해 제어모듈(15)을 제어하여 동작 스위치를 통해 제어되는 동작순서를 변경할 수도 있다. 즉, 사용자는 입력부(155)를 통해 다수의 LED(142), 갈바닉 이온부(143) 및 진동모듈(17)의 순서를 변경할 수도 있다.

[0050] 본 발명에 따른 피부 미용기기(100)는 도 6과 같이, 피부를 근접 촬영할 수 있는 카메라(154)를 더 포함할 수 있다. 카메라(154)는 본체(10)의 하부커버(111) 또는 상부커버(112) 중 어느 하나에 설치되어 피부를 촬영하여 제어모듈(15)로 전송한다.

[0051] 제어모듈(15)은 카메라(154)로부터 촬영된 피부 이미지를 표시부(153)를 통해 제공한다. 사용자는 표시부(153)를 통해 현재 피부 상태를 실시간으로 확인할 수 있다.

[0052] 표시부(153)는 타이머(도시되지 않음)를 통해 제공되는 시간을 표시할 수도 있다. 즉, 표시부(153)는 다수의 LED(142), 갈바닉 이온부(143) 또는 진동모듈(17)의 동작 시간을 실시간으로 표시할 수 있다.

[0053] 제어모듈(15)은 상기 타이머를 통해 제공되는 시간을 도대로 다수의 LED(142), 갈바닉 이온부(143) 또는 진동모듈(17)의 동작 시간을 제어할 수도 있다.

[0054] 또한, 본 발명에 따른 피부 미용기기(100)는 도 6과 같이, 온도센서(156)를 더 포함할 수 있다. 제어모듈(15)는 온도센서(156)를 통해 다수의 LED(142)의 발열 온도를 감지하고, 감지된 온도가 설정된 온도값보다 높으면 다수의 LED(142)의 동작을 차단한다.

[0055] 표시등(152)은 도 5와 같이, 4개가 설치될 수 있는데, 서로 다른 색상을 갖는 LED로 이루어질 수 있다. 4개의 표시등(152)은 다수의 LED(142)를 구성하는 가시광선 LED와 근적외선 LED, 그리고, 갈바닉 이온부(143)와, 진동모듈(17)의 동작 상태를 표시한다. 이에 따라 사용자는 표시등(152)의 동작 상태를 토대로 가시광선 LED, 근적외선 LED, 갈바닉 이온부(143), 진동모듈(17)의 동작 상태를 확인할 수 있다.

[0056] 한편, 본 발명에 따른 본체(10)는 도 4 및 도 5에 도시된 바와 같이, 진동모듈(17)과 피부 관리모듈(14) 사이에 완충부재(18)가 더 설치될 수도 있다. 완충부재(18)는 진동모듈(17)과 피부 관리모듈(14) 간의 절연을 제공하고, 진동모듈(17)의 진동이 직접 피부 관리모듈(14)로 전달되어 피부 관리모듈(14)이 파손되는 것을 방지한다.

[0057] 도 3 및 도 4와 같이, 본 발명에 따른 옥캡(20)은 상부캡(13)에 착탈가능하게 결합되는 분리커버(21)와, 분리커버(21)의 상부에 부착된 옥(jade)(22)을 포함한다.

[0058] 분리커버(21)는 상부캡(13)의 관통공(13a)을 통해 돌출되는 다수의 LED(142)가 노출되도록 상하부로 개방된 구조로 이루어진다. 이에 따라 다수의 LED(142)의 가시광선 LED로부터 발산된 열은 그대로 상부에 설치된 옥(22)으로 전달되어 옥(22)을 가열하고, 근적외선 LED로부터 방출된 근적외선은 옥(22)을 통해 외부로 방출된다.

[0059] 옥(22)은 투명 또는 반투명의 연옥과 경옥을 포함하고, 분리커버(21)의 상면에 부착된다. 이러한 옥(22)은 가시광선 LED에 의해 가열되어 원적외선을 피부로 제공한다.

[0060] 옥(22)은 하부에 배치된 다수의 LED(142)의 근적외선 LED로부터 방출된 근적외선을 외부로 투과시키기 위하여 비교적 얇은 두께로 형성하는 것이 바람직하다. 예를 들면, 2㎜ 내지 4㎜, 더욱 바람직하게는 3㎜의 두께로 형성하는 것이 바람직하다. 또한, 낮은 온도에서도 옥(22)이 가열되어 원적외선을 방출하도록 옥(22)과 다수의 LED(142) 간의 간격은 대략 10㎜ 이하, 바람직하게는 5㎜ 내지 7㎜가 되도록 설치한다.

MassagerPriorArt0000571

Petitioner Therabody Ex-1004, 1203

Petitioner Therabody Ex-1004, 1204

[0061] 도 7은 본 발명에 따른 옥캡의 구조를 설명하기 위하여 도시한 옥캡의 단면도이다.

[0062] 도 7의 (a)를 참조하면, 본 발명에 따른 옥(22)은 상하부가 평탄한 구조로 이루어지거나, 혹은 도 7의 (b)와 같이, 본 발명의 다른 예로 옥(22a)은 단위면적($1cm^2$)당 근적외선 LED로부터 방출되는 근적외선 방출량을 집중시키기 위하여 하부가 평탄하고 상부는 볼록한 볼록렌즈 형상으로 이루어진다. 또한, 도 7의 (c)와 같이, 본 발명의 또 다른 예로 옥(22b)은 상부와 하부가 평탄한 구조로 이루어지고, 옥(22b)과 분리커버(21) 사이에 볼록렌즈(23)가 더 설치될 수 있다. 이를 통해 근적외선 LED로부터 방출되는 근적외선 방출량을 집중시켜 피부 미용효과를 극대화할 수 있다.

[0063] 한편, 도 5에서 미설명된 '19'는 본체(10)의 손잡이부(10b)의 양측부에 결합되는 측면커버로서, 하부커버(111)와 상부커버(112) 사이에 결합된다. 이러한 측면커버는 손잡이부(10b) 파지시 촉감을 좋게 하고 디자인성을 고려하여 금속재질로 형성한다.

[0064] 이하, 본 발명의 실시예에 따른 피부 미용기기(100)의 작용 효과를 설명하기로 한다.

[0065] 먼저, 본 발명의 실시예에 따른 피부 미용기기(100)는 본체(10)의 헤드부(10a)에 결합된 상부캡(13)에 옥캡(20)이 착탈가능하게 결합되고, 그 하부에 가시광선 LED와 근적외선 LED를 포함하는 피부 관리모듈(14)이 배치됨으로써 종래기술에서와 같이 옥을 가열하기 위하여 사용된 전열히터를 사용하지 않고도 가시광선 LED를 이용하여 옥을 효과적으로 가열하여 피부에 온열과 원적외선을 동시에 제공할 수 있으며, 이를 통해 안면 피부에도 안전하게 적용할 수 있는 효과를 얻을 수 있다.

[0066] 또한, 본 발명의 실시예에 따른 피부 미용기기(100)는 피부 관리모듈(14)에 가시광선 LED와 근적외선 LED를 서로 근접 배치하면서 가시광선 LED 및 근적외선 LED와 옥(22) 간의 간격을 10㎜ 이하로 비교적 근접시켜 배치하는 동시에 옥(22)을 2㎜ 내지 4㎜의 비교적 얇은 두께로 형성함으로써 옥(22)을 용이하게 가열하고, 근적외선 LED로부터 방출된 근적외선이 손실없이 옥(22)을 통해 외부로 투시됨에 따라 근적외선을 피부 속 깊은 곳까지 전달하여 원적외선과 함께 피부 미용효과를 극대화할 수 있다.

[0067] 또한, 본 발명의 실시예에 따른 피부 미용기기(100)는 피부 관리모듈(14)에 근적외선 LED와 함께 갈바닉 이온부(143)의 전도체(143a)를 함께 배치함으로써 피부에 근적외선을 제공하는 동시에 갈바닉 이온을 함께 공급하여 피부의 불필요한 노폐물은 외부로 배출하고, 피부 건강에 이로운 영양성분의 흡수를 촉진시킬 수 있다.

[0068] 또한, 본 발명의 실시예에 따른 피부 미용기기(100)는 옥캡(20)에 부착되는 옥(22a)을 볼록 형상으로 형성하거나, 혹은 옥(22b)과 분리커버(21) 사이에 볼록렌즈(23)를 배치함으로써 근적외선 LED로부터 방출되는 근적외선 방출량을 옥(22a)을 이용하여 집중시키거나, 볼록렌즈(23)를 이용하여 집중시켜 피부 미용효과를 극대화할 수 있다.

[0069] 또한, 본 발명의 실시예에 따른 피부 미용기기(100)는 본체(10)의 내부에 진동모듈(17)을 설치함에 따라 피부로 원적외선과 근적외선이 제공되는 동시에 피부에 진동을 선달함으로써 원적외선과 근적외선과 결합하여 피부 미용효과를 극대화시킬 수 있다.

[0070] 또한, 본 발명의 실시예에 따른 피부 미용기기(100)는 옥캡(20)이 상부캡(13)으로부터 착탈가능하도록 결합되고, 가시광선 LED, 근적외선 LED 및 갈바닉 이온부의 전도체(143a)가 상부캡(13)의 접촉면 상부로 돌출 배치되고, 이를 통해 옥캡(20)을 상부캡(13)으로부터 분리시킨 후 외부로 돌출된 가시광선 LED, 근적외선 LED 및 갈바닉 이온부의 전도체(143a)가 직접 피부에 접촉되도록 함으로써 온열과 근적외선이 피부 속 깊은 곳까지 전달되는 것이 가능하여 피부 미용효과를 극대화할 수 있다.

[0071] 이상에서와 같이 본 발명의 기술적 사상은 바람직한 실시예들에서 구체적으로 기술되었으나, 상기한 바람직한 실시예들은 그 설명을 위한 것이며, 그 제한을 위한 것이 아니다. 이처럼 이 기술 분야의 통상의 전문가라면 본 발명의 기술 사상의 범위 내에서 본 발명의 실시예들의 결합을 통해 다양한 실시예들이 가능함을 이해할 수 있을 것이다.

부호의 설명

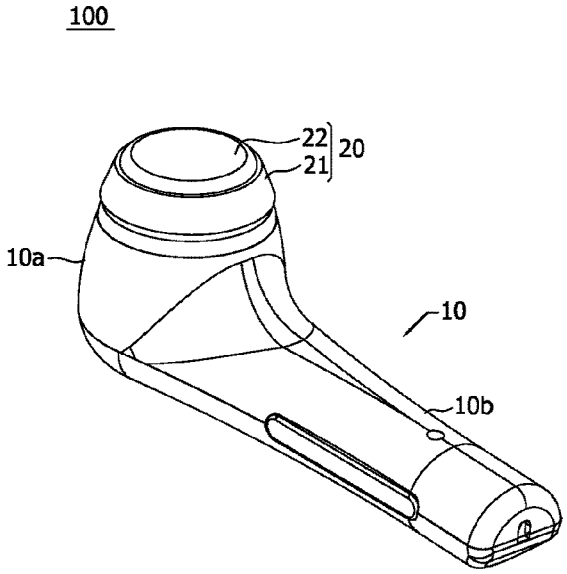
[0072] 100 : 피부 미용기기 10 : 본체

MassagerPriorArt0000572

10a : 헤드부 | 10b : 손잡이부
11 : 하부커버 | 12 : 상부커버
13 : 상부캡 | 14 : 피부 관리모듈
15 : 제어모듈 | 16 : 충전용 배터리
17 : 진동모듈 | 18 : 완충부재
19 : 측면커버 | 141 : 인쇄회로기판
142 : 다수의 LED | 143 : 갈바닉 이온부
143a : 전도체 | 151 : 스위치
152 : 표시등 | 153 : 표시부
154 : 카메라 | 155 : 입력부
156 : 온도센서 | 20 : 옥캡
21 : 분리커버 | 22, 22a, 22b : 옥

도면

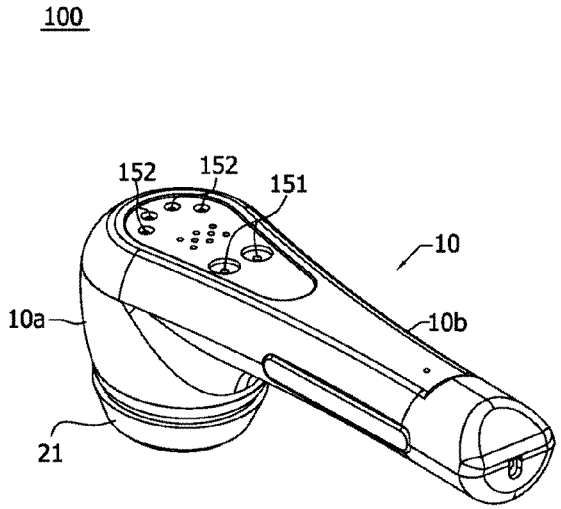
도면1



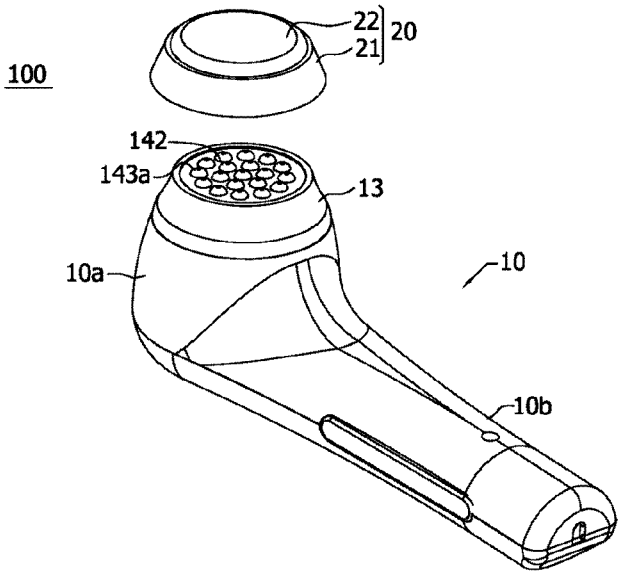
MassagerPriorArt0000573

Petitioner Therabody Ex-1004, 1205

도면2



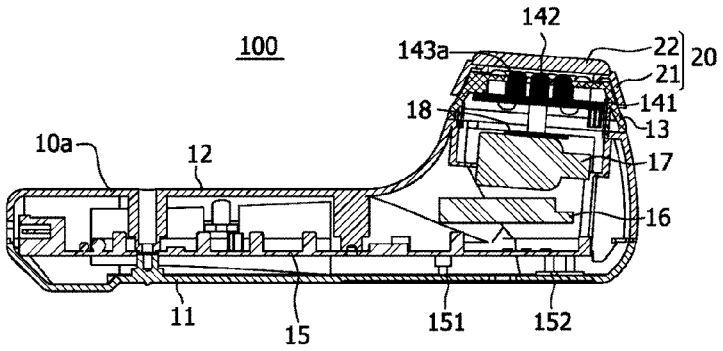
도면3



MassagerPriorArt0000574

Petitioner Therabody Ex-1004, 1206

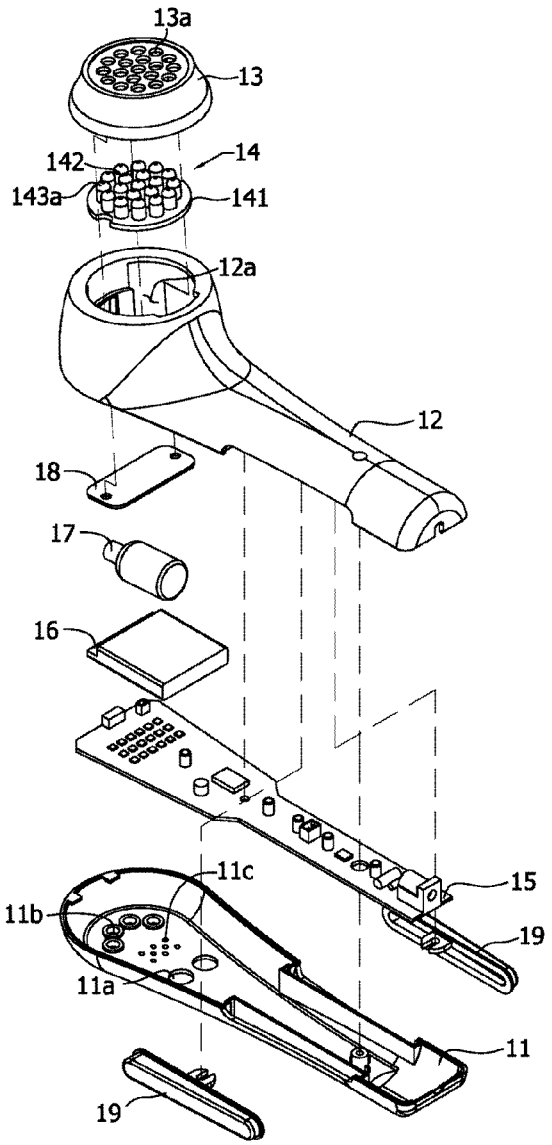
도면4



MassagerPriorArt0000575

Petitioner Therabody Ex-1004, 1207

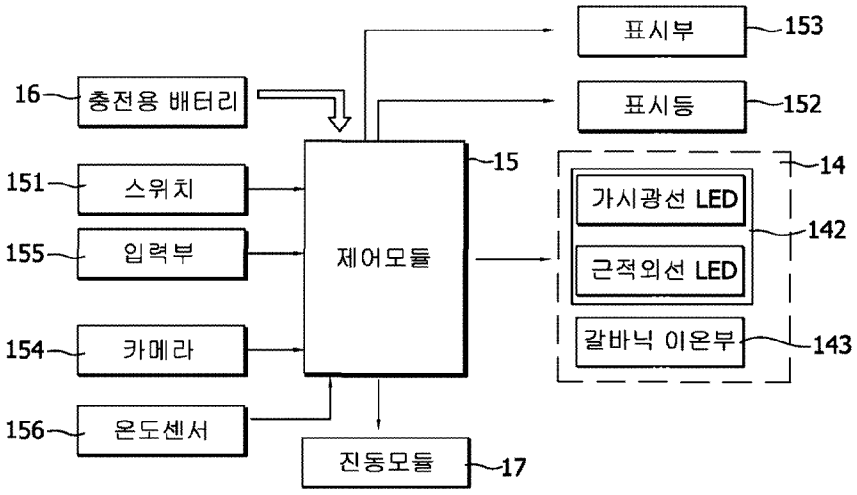
도면5



MassagerPriorArt0000576

Petitioner Therabody Ex-1004, 1208

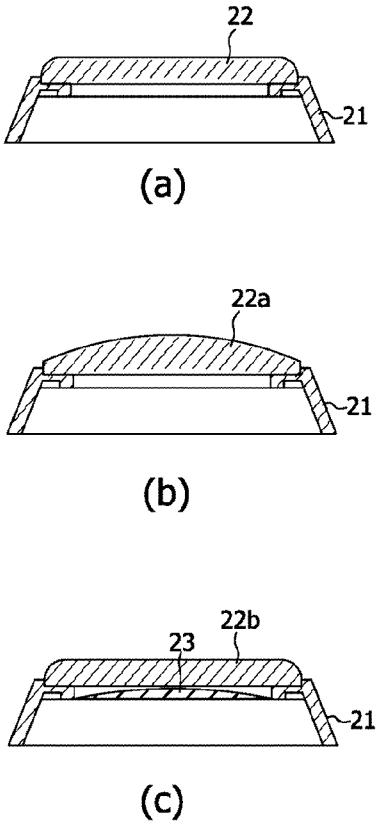
도면6



MassagerPriorArt0000577

Petitioner Therabody Ex-1004, 1209

도면7



MassagerPriorArt0000578

Petitioner Therabody Ex-1004, 1210

Multi-function cosmetic device

List of publications

Application number 2016K..	Publication date
KR101649522 B1 Pat…	2016-08-19

Abstract

The present invention relates to a multi-function cosmetic device using the light of a light-emitting diode having various colors (R,G,B) instead of an electric heater and, more specifically, to a multi-function cosmetic device comprising: a main body; a rechargeable battery; a main printed circuit board; a motor for generating vibration; a head; a light-transmissive cap; a printed circuit board; and a plurality of functional caps.

English Abstract (Native or MT)

The present invention relates to a multi-function cosmetic device using the light of a light-emitting diode having various colors (R,G,B) instead of an electric heater and, more specifically, to a multi-function cosmetic device comprising: a main body; a rechargeable battery; a main printed circuit board; a motor for generating vibration; a head; a light-transmissive cap; a printed circuit board; and a plurality of functional caps.

Other Abstracts

본 발명은 다기능 미용기기에 관한 것으로, 특히 타원형의 속이 빈 통체 형상을 갖는 본체와; 메인 인쇄회로기판을 포함하여 진동 발생용 모터 및 각종 발광다이오드의 구동에 필요한 전압을 공급시켜 주는 충전식 배터리와; 전원스위치가 "온"되면 각종 기능 제어키의 조작에 대응하여 정해진 프로그램에 맞춰 진동 발생용 모터 및 각종 발광다이오드의 구동을 포함하여 스피커의 구동을 제어하는 메인 인쇄회로기판과; 헤드가 진동 작동하도록 하는 진동 발생용 모터와; 상기 본체의 헤드 설치부에 착탈 가능하게 결합되는 원뿔 형상의 헤드와; 반투명의 합성수지로 형성된 형태를 갖는 원판형의 투광캡과; 각종 컬러의 빛을 포함한 적외선(IR)을 상기 투광캡을 통해 외부로 발생시켜 주는 발광다이오드 설치용 인쇄회로기판과; 사용자가 마사지하고자 인체의 각 부위에 대응하여 서로 다른 형상을 갖는 복수의 기능성 캡;으로 구성한 것을 특징으로 한다. 따라서, 각 가정이나 사무실 등에서 간편하게 사용이 가능하면서 휴대가 용이하고 장소와 시간에 구애받지 않으며 자유롭게 사용할 수 있고, 또 전열히터를 전혀 사용하지 않고 각종 컬러(R, G, B)의 발광다이오드의 빛을 이용하여 인체의 각 부위의 피부를 가열하여 온열과 원적외선을 동시에 제공할 수 있는 한편, 적외선(IR) 발광다이오드에서 발생하는 근적외선을 인체의 피부 깊숙이(약 40mm)까지 침투시켜 표피층은 물론 진피층까지 온도를 상승시켜 미세혈관의 확장과 혈액순환을 촉진하여 혈액량과 산소량을 충분히 공급시켜 줄 수 있음은 물론, 안면 등과 같이 민감한 피부에도 안전하게 적용할 수 있으며, 또한 다양한 주파수의 진동을 통해 피부질 개선은 물론 근육 마사지 효과를 증대시킬 수 있는 효과가 있다.

Inventor(s)	SONG YUNSOO
Applicant/Assignee	SAMJIN COMPUTER owned by SAMJIN WOOD
Applicant/Assignee Address	SAMJIN COMPUTER & IT , 120140697111
Patent Assignee History	SAMJIN COMPUTER & IT
Representative Address	CHOI, YUNG KYU , 920000000187 CHANG, SOON-BOO ET AL. , 920030001377 HEO, JO YOUNG , 920120003511
Application Numbers & Dates	KR20160002162 2016-01-07 [2016KR-0002162]
Priority Numbers & Dates	KR20160002162 2016-01-07 [2016KR-0002162]
Technology domain	Electrical machinery, apparatus, energy Audio-visual technology Medical technology

IPC codes A61H-023/02* A61H-039/04 A61N-005/06H01M-002/10 H04R-001/02

CPC codes A61H-023/02/54* A61H-039/04 A61N-005/06/25H01M-002/10/22 H04R-001/02/8 A61H-2201/5023A61H-2201/5043 A61H-2201/5082A61N-2005/0659 A61N-2005/066

Notes Number of Claims: 4

Cited Patents Examiner citations
-KR101504885 (B1) [KR101504885]; -KR101522730 (B1) [KR101522730]; -KR101470281 (B1) [KR101470281]; -KR100809633 (B1) [KR100809633];
Search Report [Examiner]
-KR101504885 (B1) [KR101504885] JO SUNG CHAN, et al; -KR101522730 (B1) [KR101522730] DOTECH; -KR101470281 (B1) [KR101470281] CHOI JAE YOUNG;
Applicant citations
-KR101504885 (B1) [KR101504885] JO SUNG CHAN, et al; -KR200462094 (Y1) [KR200462094U]; -KR20140059471 (A) [KR20140059471] SEO HYUN SEUNG; -KF

Claims

1. A hollow cylindrical shape of an elliptical shape and has, in the inside of the battery and the main printed circuit board, a motor for generating vibration and a speaker housed, in the center of the front power switch of the control key as well as various functions installed in a front upper portion and the bottom head mounting portion is formed in the battery charger provided for coupling the connector body; connector for coupling the battery charger in the connected state installed in the inside of the main body including a printed circuit board and various light emitting diode for generating the vibration motor needed to drive the supply voltage of the rechargeable battery and to; installed in the main body when the power switch is one of the control key""various functions corresponding to an operation in accordance with a predetermined program and various driving motor for generating vibration of the light emitting diode including a main speaker to control the operation of a printed circuit board; eccentric weights on the axis and within the body into proximity with the head provided at the main printed circuit board and corresponding to an output signal of the operating head so as to operate the vibration motor for generating vibration and; head mounting portions of the body and detachably connected with the head of a cone shape; translucent formed of a synthetic resin lens having a front face of the head opening and removably coupled in various light emitting diode comprises a light transmitting cap to evenly zoom functionality as well as the binding function of a cylindrical shape of the light to perform cap; R, G, the color of the light in the infrared B (IR) various light emitting diodes generating mounted thereon wherein the head has been installed into the main printed circuit board corresponding to the output signal of the infrared radiation includes light of various color (IR) coupled to the head to the outside through the transparent cap has generates light emitting diode printed circuit board for installation; massage to the user corresponding to their respective sites of the human body to a different molded with the shape of the head cap coupled to the plurality of transmitting and detachably connected with the functionality of the cap; power supply comprises a light emitting diode display to a user by operating the operation state of the control key corresponding to the function selected for each operating state of the skin care mode display period of the main body to a front center part installed at the bottom with a plurality of light emitting diode for a display mode of operation; are composed, the main printed circuit board, a power switch for function control key input to the input signal and a control program itself corresponding to the overall control function beautification equipment carried out with a microcomputer; under control of the microcomputer and controlling the charging of rechargeable batteries and battery charge and discharge control unit; is selected by a user in the operating state of the skin care mode including various synat guidance control of the microcomputer or the like are output through a speaker signal corresponding to a negative control unit; signal corresponding to the control of the microcomputer to control driving of a motor for generating vibration motor control unit; corresponding to a control signal from the microcomputer to control the drive of the various types of light emission diode emitting diode controller; is provided, installed within the head and include a temperature sensor, wherein the main printed circuit board via a temperature sensor to the microcomputer in the detected temperature rises above a predetermined temperature of the head when the power supply voltage supplied to the various types of light emission diode blocks rise above a temperature at a predetermined temperature at the head of that block and so as to be performed, the functional cap is cap and cap and lifting scalp massage comprises massaging the sore cap multifunctional beautification equipment.

2. Method according to claim 1, wherein the lifting cap is functional in the cap, the shape of a heart dimension of said head having a bottom surface outside the cap surrounding the light transmitting elastically resilient coupling and which are combined into a plate, a plurality of protrusions and recesses in the upper side crossed""V shaped to form the subsequent stages, wherein the plurality of shaped projections"V"from inside to outside of the end portion is tapered from top to bottom height and also gradually increases in size is formed to a multifunctional device characterized in that the cosmetic.

3. Method according to claim 1, wherein the cap is in functional scalp massage cap, having an elliptical shape dimension of the head outside the cap bottom surface surrounding the light transmitting elastically resilient coupling and which are combined into a plate, a plurality of scalp massaging rod on an upper surface forming a radially protruding, the height of the plurality of scalp massaging from outside to inside the rod gradually lowered by making the, a plurality of massaging the scalp of the human body shape

Petitioner Therabody Ex-1004, 1212

rod end portion in a direction opposite to the head so that the concavely formed round the multifunctional beautification equipment.

4. Method according to claim 1, wherein the cap is in functional muscle massage cap, having a rounded shape of a disk is the entire top surface of the head dimension outside the cap bottom surface surrounding the light transmitting elastically resilient coupling and which are combined into a plate, a plurality of semicircular protrusions for pressing an upper surface of the skin a predetermined interval so as to be arranged in a radial form a multifunctional device characterized in that the cosmetic.

5. AMEND STATUS: Delete

6. AMEND STATUS: delete

7. AMEND STATUS: delete

Petitioner Therabody Ex-1004, 1213

(19) 대한민국특허청(KR)
(12) 등록특허공보(B1)

(45) 공고일자 2016년08월19일
(11) 등록번호 10-1649522
(24) 등록일자 2016년08월12일

(51) 국제특허분류(Int. Cl.)
A61H 23/02 (2006.01) *A61H 39/04* (2006.01)
A61N 5/06 (2006.01) *H01M 2/10* (2006.01)
H04R 1/02 (2006.01)
(52) CPC특허분류
A61H 23/0254 (2013.01)
A61H 39/04 (2013.01)
(21) 출원번호 10-2016-0002162
(22) 출원일자 2016년01월07일
심사청구일자 2016년01월07일
(56) 선행기술조사문헌
KR101504885 B1*
KR101522730 B1
KR101470281 B1
KR100809633 B1
*는 심사관에 의하여 인용된 문헌

(73) 특허권자
주식회사 삼진컴퓨터앤아이티
서울특별시 금천구 가산디지털2로 115 ,906-1호(가산동,대륭테크노타운3차)
송윤수
서울특별시 양천구 목동동로 50 ,1217동302호(신정동,목동신시가지아파트12단지)
(72) 발명자
송윤수
서울특별시 양천구 목동동로 50 ,1217동302호(신정동,목동신시가지아파트12단지)
(74) 대리인
허조영, 최영규, 장순부

선체 청구항 수 : 총 4 항 심사관 : 한재균

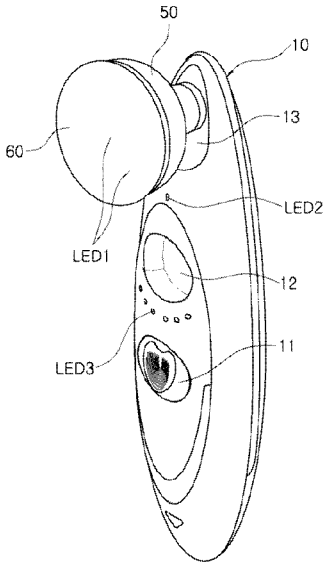
(54) 발명의 명칭 **다기능 미용기기**

(57) 요 약

본 발명은 다기능 미용기기에 관한 것으로, 특히 타원형의 속이 빈 통체 형상을 갖는 본체와; 메인 인쇄회로기판을 포함하여 진동 발생용 모터 및 각종 발광다이오드의 구동에 필요한 전압을 공급시켜 주는 충전식 배터리와; 전원스위치가 "온"되면 각종 기능 제이키의 조작에 대응하여 정해진 프로그램에 맞춰 진동 발생용 모터 및 각종

(뒷면에 계속)

대 표 도 - 도1



MassagerPriorArt0002280

Petitioner Therabody Ex-1004, 1214

발광다이오드의 구동을 포함하여 스피커의 구동을 제어하는 메인 인쇄회로기판과; 헤드가 진동 작동하도록 하는 진동 발생용 모터와; 상기 본체의 헤드 설치부에 착탈 가능하게 결합되는 원뿔 형상의 헤드와; 반투명의 합성수지로 형성된 형태를 갖는 원판형의 투광캡과; 각종 컬러의 빛을 포함한 적외선(IR)을 상기 투광캡을 통해 외부로 발생시켜 주는 발광다이오드 설치용 인쇄회로기판과; 사용자가 마사지하고자 인체의 각 부위에 대응하여 서로 다른 형상을 갖는 복수의 기능성 캡;으로 구성한 것을 특징으로 한다.

따라서, 각 가정이나 사무실 등에서 간편하게 사용이 가능하면서 휴대가 용이하고 장소와 시간에 구애받지 않으며 자유롭게 사용할 수 있고, 또 전열히터를 전혀 사용하지 않고 각종 컬러(R, G, B)의 발광다이오드의 빛을 이용하여 인체의 각 부위의 피부를 가열하여 온열과 원적외선을 동시에 제공할 수 있는 한편, 적외선(IR) 발광다이오드에서 발생하는 근적외선을 인체의 피부 깊숙이(약 40㎜)까지 침투시켜 표피층은 물론 진피층까지 온도를 상승시켜 미세혈관의 확장과 혈액순환을 촉진하여 혈액량과 산소량을 충분히 공급시켜 줄 수 있음은 물론, 안면 등과 같이 민감한 피부에도 안전하게 적용할 수 있으며, 또한 다양한 주파수의 진동을 통해 피부질 개선은 물론 근육 마사지 효과를 증대시킬 수 있는 효과가 있다.

(52) CPC특허분류
A61N 5/0625 (2013.01)
H01M 2/1022 (2013.01)
H04R 1/028 (2013.01)
A61H 2201/5023 (2013.01)
A61H 2201/5043 (2013.01)
A61H 2201/5082 (2013.01)
A61N 2005/0659 (2013.01)
A61N 2005/066 (2013.01)

MassagerPriorArt0002281

Petitioner Therabody Ex-1004, 1215

명 세 서

청구범위

청구항 1

타원형의 속이 빈 통체 형상을 갖고, 내부에는 배터리와 메인 인쇄회로기판, 진동 발생용 모터 및 스피커가 내장되며, 전면 중앙에는 전원스위치를 포함한 각종 기능 제어키가 설치됨은 물론 전면 상부에는 헤드 설치부가 형성되고 저부에는 배터리 충전기 결합용 콘넥터가 설치된 본체와;

상기 배터리 충전기 결합용 콘넥터와 연결된 상태에서 본체의 내부에 설치되어 메인 인쇄회로기판을 포함하여 진동 발생용 모터 및 각종 발광다이오드의 구동에 필요한 전압을 공급시켜 주는 충전식 배터리와;

상기 본체 내에 설치되어 전원스위치가 "온"되면 각종 기능 제어키의 조작에 대응하여 정해진 프로그램에 맞춰 진동 발생용 모터 및 각종 발광다이오드의 구동을 포함하여 스피커의 구동을 제어하는 메인 인쇄회로기판과;

축 상에 편심형 중량추를 구비하고 상기 본체 내에서 헤드에 근접되게 설치되어 상기 메인 인쇄회로기판의 출력신호에 대응하여 작동하며 헤드가 진동 작동하도록 하는 진동 발생용 모터와;

상기 본체의 헤드 설치부에 착탈 가능하게 결합되는 원뿔 형상의 헤드와;

반투명의 합성수지로 형성된 형태를 갖고 상기 헤드의 전면 개구부에 착탈 가능하게 결합되어 각종 발광다이오드에서 발생되는 빛을 고르게 투광시켜 줌은 물론 기능성 캡의 결합기능을 수행하는 원판형의 투광캡과;

R, G, B 컬러의 빛을 포함하여 적외선(IR)을 발생하는 각종 발광다이오드들을 실장한 상태에서 상기 헤드 내에 설치되어 메인 인쇄회로기판의 출력신호에 대응하는 각종 컬러의 빛을 포함한 적외선(IR)을 상기 헤드에 결합된 투광캡을 통해 외부로 발생시켜 주는 발광다이오드 설치용 인쇄회로기판과;

사용자가 마사지하고자 인체의 각 부위에 대응하여 서로 다른 형상을 갖게 성형되어 상기 헤드에 결합되는 투광캡에 착탈 가능하게 결합되는 복수의 기능성 캡와;

전원 공급 표시용 발광다이오드를 포함하여 사용자가 조작한 기능 제어키의 조작상태에 대응하여 선택되는 각 피부관리 모드에 대한 작동 상태를 표시해 주기 위해 상기 본체의 전면 중앙부와 저부에 설치되는 복수의 작동 모드 표시용 발광다이오드;로 구성하되,

상기 메인 인쇄회로기판에는,

전원스위치를 포함하여 기능 제어키의 입력신호 및 자체에 입력되어 있는 제어프로그램에 대응하여 미용기기의 전반적인 제어기능을 수행하는 마이컴과;

상기 마이컴의 제어를 받아 충전식 배터리의 충방전을 제어하는 배터리 충방전 제어부와;

사용자가 선택한 피부관리 모드에서의 각종 작동 상태 멘트를 포함하여 안내 멘트 등을 상기 마이컴의 제어신호에 대응하여 스피커를 통해 출력해 주는 음성 제어부와;

상기 마이컴의 제어신호에 대응하여 진동 발생용 모터의 구동을 제어하는 모터 제어부와;

상기 마이컴의 제어신호에 대응하여 각종 발광다이오드의 구동을 제어하는 발광다이오드 제어부;를 구비하고,

상기 헤드 내에는 온도센서를 설치하고, 상기 메인 인쇄회로기판 내 마이컴으로 하여금 상기 온도센서를 통해 검출되는 헤드의 온도가 정해진 온도이상 상승할 경우 각종 발광다이오드에 공급되는 전원전압을 차단하여 헤드의 온도가 정해진 온도이상으로 상승하는 것을 차단할 수 있도록 하며,

상기 기능성 캡은 리프팅 캡과 두피 마사지 캡 및 근육통 마사지 캡을 포함하는 것을 특징으로 하는 다기능 미용기기.

청구항 2

MassagerPriorArt0002282

Petitioner Therabody Ex-1004, 1216

청구항 1에 있어서,

상기 기능성 캡 중 리프팅 캡은,

하트 형상을 갖는 판체의 저면에 상기 헤드의 투광캡 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판을 구비하고, 상면에는 복수의 "V"자형 돌기와 홈을 교차되게 다단으로 연이어 형성하되, 상기 복수의 "V"자형 돌기의 끝단부는 내측에서 외측으로 또한 상부에서 하부로 갈수록 높이와 크기가 점차 커지도록 형성한 것을 특징으로 하는 다기능 미용기기.

청구항 3

청구항 1에 있어서,

상기 기능성 캡 중 두피 마사지 캡은,

타원 형상을 갖는 판체의 저면에 상기 헤드의 투광캡 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판을 구비하고, 상면에는 복수의 두피 마사지용 봉을 방사형으로 돌출 형성하되, 상기 복수의 두피 마사지용 봉의 높이는 외측에서 내측으로 갈수록 점차 낮아지게 형성하여, 복수의 두피 마사지용 봉 끝단부가 인체의 머리 형상과 반대방향으로 오목하게 라운드지도록 형성한 것을 특징으로 하는 다기능 미용기기.

청구항 4

청구항 1에 있어서,

상기 기능성 캡 중 근육통 마사지 캡은,

상면 전체가 라운드진 원판 형상을 갖는 판체의 저면에 상기 헤드의 투광캡 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판을 구비하고, 상면에는 복수의 피부 압박용 반원형 돌기가 정해진 간격을 두고 방사형으로 배치되도록 형성한 것을 특징으로 하는 다기능 미용기기.

청구항 5

삭제

청구항 6

삭제

청구항 7

삭제

발명의 설명

기 술 분 야

[0001] 본 발명은 다기능 미용기기에 관한 것으로 보다 구체적으로는 각 가정이나 사무실 등에서 간편하게 사용이 가능하면서 휴대가 용이하여 장소와 시간에 구애받지 않고 자유롭게 사용할 수 있고, 각종 컬러(R, G, B)의 발광다이오드(LED ; Liggh-Emitting-Diode)의 빛을 이용하여 인체의 각 부위의 피부를 가열하여 온열과 원적외선을 동시에 제공하는 한편, 적외선(IR; Infra-red) 발광다이오드에서 발생하는 근적외선을 인체의 피부 깊숙이(약 40㎜)까지 침투시켜 표피층은 물론 진피층까지 온도를 상승시켜 미세혈관의 확장과 혈액순환을 촉진하여 혈액량과 산소량을 충분히 공급시켜 줄 수 있도록 하고, 또 진동을 통해 피부질 개선은 물론 근육 마사지 효과를 증대시킬 수 있으며, 또한 서로 다른 형상을 갖는 각종 기능성 캡(예를 들어 리프팅 캡, 두피 마사지 캡, 근육통 마사지 캡 등)을 각종 발광다이오드가 설치되어 있는 헤드에 선택적으로 장착시켜 안면 등의 피부 마사지 및 미용효과와, 두피에 대한 건강 증진 및 탈모 예방 효과는 물론 무릎 등과 같은 각 부위의 근육 마사지 효과를 대폭 증대시킬 수 있도록 발명한 다기능 미용기기에 관한 것이다.

MassagerPriorArt0002283

Petitioner Therabody Ex-1004, 1217

배 경 기 술

[0002] 일반적으로 아름다운 피부를 추구하기 위해서는 체계적인 피부관리가 무엇보다 중요하다.

[0003] 전통적인 피부관리는 주로 손을 사용하여 혈액이나 림프의 순환을 촉진하는 마사지(massage)가 주류를 이루었으나, 근래 들어서는 각 가정 등에서 개인이 손쉽게 피부를 관리할 수 있도록 다양한 피부 미용기기들이 개발되어 사용되고 있다.

[0004] 이와 같은 피부 미용기기로는 롤러를 이용한 가압방식, 진동모터를 이용한 진동방식, 초음파를 이용한 방식, 황토, 숯, 옥 등으로 이루어진 원적외선 방사체를 이용한 방식 등이 주로 사용되고 있으나, 이러한 방식들은 피부 미용 효과를 극대화하는데 한계가 있다.

[0005] 특히 원적외선 방사체를 이용한 방식은 진열히터를 이용하여 원적외선 방사체를 가열하여 원적외선을 방출하는 것으로 화상 위험 때문에 안면 피부에는 적용하지 못하고, 침대, 매트, 방식 또는 국부적 치료기에만 한정적으로 적용되고 있는 실정이다.

[0006] 또한, 원적외선 방사체를 이용한 방식에서는 전열히터를 사용함에 따라 전기히터에서 발생되는 전자파로 인한 인체 부작용이 발생하기 때문에 그 효능에도 불구하고 실질적으로 원적외선 방사체를 피부 미용기기에 적용하는데 에는 여전히 한계가 있었다.

[0007] 한편, 피부를 구성하는 기본적인 구조는 표피층, 진피층, 피하조직 등 3층으로 구성되는데, 표피층은 피부의 상층부에 있는 부분이고, 진피층은 표피층의 안쪽에 있으며 단백질의 일종인 콜라겐과 엘라스틴으로 구성되어 있다.

[0008] 피하조직은 곡선미를 형성하고 외부의 충격으로부터 보호와 체온을 유지하는 기능을 하게 된다.

[0009] 표피층은 피부의 제일 상층부에 위치하여 외부의 자극으로부터 피부를 보호하는 역할을 하며 각화 및 각질 현상이 나타난다.

[0010] 진피층은 표피층의 아래층에 있으며, 표피층보다 약 7배 이상 두껍고, 단백질의 일종인 교원섬유(콜라겐/Collagen)와 탄력섬유(엘라스틴/Elastin)를 보유하고 있다.

[0011] 그리고, 진피층은 피부의 영양 보급, 분비, 감각 등의 중요한 기능을 담당한다.

[0012] 이러한 표피층과 진피층을 자극하여 피부 미용 효과를 가지도록 하기 위해 일반적으로 초음파 진동을 이용한 미용 기구를 이용하게 되는데, 초음파는 실질적으로 많은 진동을 하게 되지만 사용자는 이를 느끼지 못함으로 인하여 진동이 주는 시원함과 상쾌함을 직접 느낄 수 없으며, 제대로 작동되고 있는지도 알 수 없다.

[0013] 이로 인해 사용자는 감성적으로 초음파 미용 기구에 대한 만족감을 느끼지 못하는 문제점이 있다.

[0014] 그리고, 사용자가 작동상태를 느끼기 위해 전력을 높게 하면, 따끔거림과 함께 불필요한 부분까지 초음파가 침투하여 오히려 피부를 손상시키는 문제점이 발생한다.

[0015] 따라서, 최근에는 발광다이오드 및 진동을 이용한 미용기기들이 제시되고 있는 실정인데, 이와 같은 미용기기에서는 단순히 발광다이오드에서 발생되는 빛과 편심 모터의 진동을 이용하여 피부 미용 효과를 얻고 있으므로 그 효과를 기대할 수 없는데, 특히 이와 같은 구성을 갖는 미용기기는 평면적인 렌즈만 사용하고 있어서 피부에 대한 미용 효과 및 근육 운동에 따른 마사지 효과가 저하되는 문제점이 있다.

선행기술문헌

특허문헌

[0016] (특허문헌 0001) 대한민국 등록특허공보 10-1504885호(2015년 03월 17일)

(특허문헌 0002) 대한민국 등록실용신안공보 20-0462094호(2012년 08월 18일)

(특허문헌 0003) 대한민국 공개특허공보 10-2014-0059471호(2014년 05월 16일)

(특허문헌 0004) 대한민국 등록특허공보 10-1253611호(2013년 04월 05일)

MassagerPriorArt0002284

Petitioner Therabody Ex-1004, 1218

Petitioner Therabody Ex-1004, 1219

발명의 내용

해결하려는 과제

[0017] 본 발명은 이와 같은 종래의 제반 문제점을 해결하기 위해 안출한 것으로서, 각 가정이나 사무실 등에서 간편하게 사용이 가능하면서 휴대가 용이하여 장소와 시간에 구애받지 않고 자유롭게 사용할 수 있고, 또 전열히터를 전혀 사용하지 않고 각종 컬러(R, G, B)의 발광다이오드의 빛을 이용하여 인체의 각 부위의 피부를 가열하여 온열과 원적외선을 동시에 제공하는 한편, 적외선(IR) 발광다이오드에서 발생하는 근적외선을 인체의 피부 깊숙이(약 40㎜)까지 침투시켜 표피층은 물론 진피층까지 온도를 상승시켜 미세혈관의 확장과 혈액순환을 촉진하여 혈액량과 산소량을 충분히 공급시켜 줄 수 있을 뿐만 아니라 안면 등과 같이 민감한 피부에도 안전하게 적용할 수 있으며, 또한 다양한 주파수의 진동을 통해 피부질 개선은 물론 근육 마사지 효과를 증대시킬 수 있는 다기능 미용기기를 제공하는데 그 목적이 있다.

[0018] 본 발명의 다른 목적은, 리프팅 캡과 두피 마사지 캡 및 근육통 마사지 캡 등과 같이 서로 다른 형상을 갖는 각종 기능성 캡을 각종 발광다이오드가 설치되어 있는 헤드에 선택적으로 장착하여 사용할 수 있도록 하는 방식을 통해 안면 등의 피부 마사지 및 미용 효과의 극대화를 포함하여 두피에 대한 건강 증진과 탈모 예방 효과 및 무릎 등과 같은 각 부위에 대한 근육 마사지 효과를 대폭 증대시킬 수 있는 다기능 미용기기를 제공하는데 있다.

과제의 해결 수단

[0019] 상기한 목적을 달성하기 위한 본 발명은, 타원형의 속이 빈 통체 형상을 갖고, 내부에는 배터리와 메인 인쇄회로기판(PCB), 진동 발생용 모터 및 스피커가 내장되며, 전면 중앙에는 전원스위치를 포함한 각종 기능 제어키가 설치됨은 물론 전면 상부에는 헤드 설치부가 형성되고 저부에는 배터리 충전기 결합용 콘넥터가 설치된 본체와; 상기 배터리 충전기 결합용 콘넥터와 연결된 상태에서 본체의 내부에 설치되어 메인 인쇄회로기판을 포함하여 진동 발생용 모터 및 각종 발광다이오드의 구동에 필요한 전압을 공급시켜 주는 충전식 배터리와; 상기 본체 내에 설치되어 전원스위치가 "온"되면 각종 기능 제어키의 조작에 대응하여 정해진 프로그램에 맞춰 진동 발생용 모터 및 각종 발광다이오드의 구동을 포함하여 스피커의 구동을 제어하는 메인 인쇄회로기판과; 축 상에 편심형 중량추를 구비하고 상기 본체 내에서 헤드에 근접되게 설치되어 상기 메인 인쇄회로기판의 출력신호에 대응하여 작동하며 헤드가 진동 작동하도록 하는 진동 발생용 모터와; 상기 본체의 헤드 설치부에 착탈 가능하게 결합되는 원뿔 형상의 헤드와; 반투명의 합성수지로 형성된 형태를 갖고 상기 헤드의 전면 개구부에 착탈 가능하게 결합되어 각종 발광다이오드에서 발생되는 빛을 고르게 투광시켜 줌은 물론 기능성 캡의 결합기능을 수행하는 원판형의 투광캡과; R, G, B 컬러의 빛을 포함하여 적외선(IR)을 발생하는 각종 발광다이오드들을 실장한 상태에서 상기 헤드 내에 설치되어 메인 인쇄회로기판의 출력신호에 대응하는 각종 컬러의 빛을 포함한 적외선(IR)을 상기 헤드에 결합된 투광캡을 통해 외부로 발생시켜 주는 발광다이오드 설치용 인쇄회로기판과; 사용자가 마사지하고자 인체의 각 부위에 대응하여 서로 다른 형상을 갖게 성형되어 상기 헤드에 결합되는 투광캡에 착탈 가능하게 결합되는 복수의 기능성 캡;으로 구성한 것을 특징으로 한다.

[0020] 이때, 상기 기능성 캡의 일 실시 예는, 하트 형상을 갖는 판체의 저면에 상기 헤드의 투광캡 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판을 구비하고, 상면에는 복수의 "V"자형 돌기와 홈을 교차되게 다단으로 연이어 형성하되, 상기 복수의 "V"자형 돌기의 끝단부는 덕신과 볼 및 광대뼈 부위에 맞게 내측에서 외측으로 또한 상부에서 하부로 갈수록 높이와 크기가 점차 커지도록 형성한 리프팅 캡을 포함하는 것을 특징으로 한다.

[0021] 또, 상기 기능성 캡의 다른 실시 예는, 타원 형상을 갖는 판체의 저면에 상기 헤드의 투광캡 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판을 구비하고, 상면에는 복수의 두피 마사지용 봉을 방사형으로 돌출 형성하되, 상기 복수의 두피 마사지용 봉의 높이는 외측에서 내측으로 갈수록 점차 낮아지게 형성하여, 복수의 두피 마사지용 봉 끝단부가 인체의 머리 형상과 반대방향으로 라운드지게 형성되도록 한 두피 마사지 캡을 포함하는 것을 특징으로 한다.

[0022] 또한, 상기 기능성 캡의 또 다른 실시 예는, 상면 전체가 라운드진 원판 형상을 갖는 판체의 저면에 상기 헤드의 투광캡 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판을 구비하고, 상면에는 복수의 피부 압박용 반원형 돌기가 방사형으로 배치되도록 형성한 근육통 마사지 캡을 포함하는 것을 특징으로 한다.

[0023] 또, 상기 본체의 전면 중앙부와 저부에는 전원 공급 표시용 발광다이오드를 포함하여 사용자가 조작한 기능 제어키의 조작상태에 대응하여 선택되는 각 피부관리 모드에 대한 작동 상태를 표시해 주는 복수의 작동모드 표시용 발광다이오드를 더 설치한 것을 특징으로 한다.

MassagerPriorArt0002285

Petitioner Therabody Ex-1004, 1220

[0024] 또한, 상기 메인 인쇄회로기판에는 전원스위치를 포함하여 기능 제어키의 입력신호 및 자체에 입력되어 있는 제어프로그램에 대응하여 미용기기의 전반적인 제어기능을 수행하는 마이컴과; 상기 마이컴의 제어를 받아 충전식 배터리의 충방전을 제어하는 배터리 충방전 제어부와; 사용자가 선택한 피부관리 모드에서의 각종 작동 상태 멘트를 포함하여 안내 멘트 등을 상기 마이컴의 제어신호에 대응하여 스피커를 통해 출력해 주는 음성 제어부와; 상기 마이컴의 제어신호에 대응하여 진동 발생용 모터의 구동을 제어하는 모터 제어부와; 상기 마이컴의 제어신호에 대응하여 각종 발광다이오드의 구동을 제어하는 발광다이오드 제어부;를 구비시킨 것을 특징으로 한다.

[0025] 또, 상기 헤드 내에는 온도센서를 더 설치하고, 상기 마이컴에는 상기 온도센서를 통해 검출되는 헤드의 온도가 정해진 온도이상 상승할 경우 각종 발광다이오드에 공급되는 전원전압을 차단하여 헤드의 온도가 정해진 온도이상으로 상승하는 것을 차단할 수 있도록 한 것을 특징으로 한다.

발명의 효과

[0026] 이상에서 설명한 바와 같이 본 발명의 다기능 미용기기에 의하면, 각 가정이나 사무실 등에서 간편하게 사용이 가능하면서 휴대가 용이하고 장소와 시간에 구애받지 않으며 자유롭게 사용할 수 있고, 또 전열히터를 전혀 사용하지 않고 각종 컬러(R, G, B)의 발광다이오드의 빛을 이용하여 인체의 각 부위의 피부를 가열하여 온열과 원적외선을 동시에 제공할 수 있는 한편, 적외선(IR) 발광다이오드에서 발생하는 근적외선을 인체의 피부 깊숙이(약 40㎜)까지 침투시켜 표피층은 물론 진피층까지 온도를 상승시켜 미세혈관의 확장과 혈액순환을 촉진하여 혈액량과 산소량을 충분히 공급시켜 줄 수 있음은 물론, 안면 등과 같이 민감한 피부에도 안전하게 적용할 수 있으며, 또한 다양한 주파수의 진동을 통해 피부질 개선은 물론 근육 마사지 효과를 증대시킬 수 있는 효과가 있다.

[0027] 또, 본 발명에 의하면 리프팅 캡과 두피 마사지 캡 및 근육통 마사지 캡 등과 같이 서로 다른 형상을 갖는 각종 기능성 캡을 각종 발광다이오드가 실치되어 있는 헤드에 선택적으로 장착하여 사용할 수 있도록 함으로써 안면 등의 피부 마사지 및 미용 효과의 극대화를 포함하여 두피에 대한 건강 증진과 탈모 예방 효과 및 무릎 등과 같은 각 부위에 대한 근육 마사지 효과를 대폭 증대시킬 수 있다.

[0028] 뿐만 아니라, 본 발명에 의하면 헤드 내에 온도센서를 설치하여 헤드의 온도가 정해진 온도이상으로 상승할 경우 각종 발광다이오드에 공급되는 전원전압을 차단할 수 있도록 함으로써 마사지 중 피부의 일부에 화상을 입히게 되거나 피부가 손상되는 것을 미연에 방지할 수 있어 제품 자체의 신뢰도는 물론 안전성을 대폭 확보할 수 있는 등 매우 유용한 발명인 것이다.

도면의 간단한 설명

[0029] 도 1은 본 발명이 적용된 미용기기의 사시도.

도 2는 본 발명이 적용된 미용기기의 개략적인 측 단면도.

도 3의 (a)~(c)는 본 발명에서 적용한 기능형 캡 중 리프팅 캡의 정면과 배면 사시도 및 측 단면도.

도 4는 본 발명이 적용된 미용기기의 헤드에 기능형 캡 중 리프팅 캡을 설치한 상태의 사시도.

도 5의 (a)~(c)는 본 발명에서 적용한 기능형 캡 중 두피 마사지 캡의 정면과 배면 사시도 및 측 단면도.

도 6은 본 발명이 적용된 미용기기의 헤드에 기능형 캡 중 두피 마사지 캡을 설치한 상태의 사시도.

도 7의 (a)(b)는 본 발명에서 적용한 기능형 캡 중 근육통 마사지 캡의 정면 및 배면 사시도.

도 8은 본 발명이 적용된 미용기기의 헤드에 기능형 캡 중 근육통 마사지 캡을 설치한 상태의 사시도.

도 9는 본 발명이 적용된 미용기기 내 메인 인쇄회로기판에 설치된 회로에 대한 블록 구성도.

발명을 실시하기 위한 구체적인 내용

[0030] 이하, 첨부된 도면을 참조하여 본 발명에 따른 바람직한 실시 예 및 작동상태를 상세히 설명하면 다음과 같다.

[0031] 본 발명을 설명함에 있어서, 관련된 공지기능 혹은 구성에 대한 구체적인 설명이 본 발명의 요지를 불필요하게 흐릴 수 있다고 판단되는 경우 그 상세한 설명은 생략한다.

[0032] 도 1은 본 발명이 적용된 미용기기의 사시도를 나타낸 것이고, 도 2는 본 발명이 적용된 미용기기의 개략적인

MassagerPriorArt0002286

측 단면도를 나타낸 것이다.

[0033] 또, 도 3의 (a)~(c)는 본 발명에서 적용한 기능형 캡 중 리프팅 캡의 정면과 배면 사시도 및 측 단면도를 나타낸 것이고, 도 4는 본 발명이 적용된 미용기기의 헤드에 기능형 캡 중 리프팅 캡을 설치한 상태의 사시도를 나타낸 것이다.

[0034] 또한, 도 5의 (a)~(c)는 본 발명에서 적용한 기능형 캡 중 두피 마사지 캡의 정면과 배면 사시도 및 측 단면도를 나타낸 것이고 도 6은 본 발명이 적용된 미용기기의 헤드에 기능형 캡 중 두피 마사지 캡을 설치한 상태의 사시도를 나타낸 것이다.

[0035] 또, 도 7의 (a)(b)는 본 발명에서 적용한 기능형 캡 중 근육통 마사지 캡의 정면 및 배면 사시도를 나타낸 것이고, 도 8은 본 발명이 적용된 미용기기의 헤드에 기능형 캡 중 근육통 마사지 캡을 설치한 상태의 사시도를 나타낸 것이며, 도 9는 본 발명이 적용된 미용기기 내 메인 인쇄회로기판에 설치된 회로에 대한 블록 구성도를 나타낸 것이다.

[0036] 이에 따르면 본 발명은,

[0037] 타원형의 속이 빈 통체 형상을 갖고, 내부에는 `배터리(20)와 메인 인쇄회로기판(30), 진동 발생용 모터(40) 및 스피커(15)가 내장되며, 전면 중앙에는 전원스위치(11)를 포함한 각종 기능 제어키(12)가 설치됨은 물론 전면 상부에는 헤드 설치부(13)가 형성되고 저부에는 배터리 충전기 결합용 콘넥터(14)가 설치된 본체(10)와;

[0038] 상기 배터리 충전기 결합용 콘넥터(14)와 연결된 상태에서 본체(10)의 내부에 설치되어 메인 인쇄회로기판(30)을 포함하여 진동 발생용 모터(40) 및 각종 발광다이오드(LED1)의 구동에 필요한 전압을 공급시켜 주는 충전식 `배터리(20)와;

[0039] 상기 본체(10) 내에 실치되어 전원스위치(11)가 "온"되면 각종 기능 제어키(12)의 조작에 대응하여 정해진 프로그램에 맞춰 상기 진동 발생용 모터(40) 및 각종 발광다이오드(LED1)의 구동을 포함하여 스피커(15) 등의 구동을 제어하는 메인 인쇄회로기판(30)과;

[0040] 축 상에 편심형 중량추를 구비하고 상기 본체(10) 내에서 헤드(50)에 근접되게 설치되어 상기 메인 인쇄회로기판(30)의 출력신호에 대응하여 작동하며 헤드(50)가 진동 작동하도록 하는 진동 발생용 모터(40)와;

[0041] 상기 본체(10)의 헤드 설치부(13)에 착탈 가능하게 결합되는 원뿔 형상의 헤드(50)와;

[0042] 반투명의 합성수지로 형성된 형태를 갖고 상기 헤드(50)의 전면 개구부에 착탈 가능하게 결합되어 각종 발광다이오드(LED1)에서 발생되는 빛을 고르게 투광시켜 줌은 물론 기능성 캡(80)의 결합기능을 수행하는 원관형의 투광캡(60)과;

[0043] R, G, B 컬러의 빛을 포함하여 적외신(IR)을 발생하는 등 각종 발광다이오드(LED1)들을 실장한 상태에서 상기 헤드(50) 내에 설치되어 메인 인쇄회로기판(30)의 출력신호에 대응하는 각종 컬러의 빛을 포함한 적외선(IR)을 상기 헤드(50)에 결합된 투광캡(60)을 통해 외부로 발생시켜 주는 발광다이오드 설치용 인쇄회로기판(70)과;

[0044] 사용자가 마사지하고자 인체의 각 부위에 대응하여 서로 다른 형상을 갖게 성형되어 상기 헤드(50)에 결합되는 투광캡(60)에 착탈 가능하게 결합되는 복수의 기능성 캡(80);으로 구성한 것을 특징으로 한다.

[0045] 이때, 상기 기능성 캡(80)의 일 실시 예는,

[0046] 하트 형상을 갖는 판체(811)의 저면에 상기 헤드(50)의 투광캡(60) 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판(812)을 구비하고, 상면에는 복수의 "V"자형 돌기(813)와 홈(814)을 교차되게 다단으로 연이어 형성하되, 상기 복수의 "V"자형 돌기(813)의 끝단부는 턱선과 볼 및 광대뼈 부위에 맞게 내측에서 외측으로 또한 상부에서 하부로 갈수록 높이와 크기가 점차 커지도록 형성하여, 안면에 접촉시켜 밀어주는 형태로 마사지를 실시할 때 피부가 복수의 "V"자형 돌기(813)와 홈(814) 사이로 밀려들어 갔다 나오는 형태가 반복 작동되며 피부에 탄력을 줄 수 있도록 함과 동시에 진동 발생용 모터(40)에서 발생하는 진동에 의해 피부 리프팅 효과를 얻을 수 있는 리프딩 캡(81)을 포함하는 것을 특징으로 한다.

[0047] 또, 상기 기능성 캡(80)의 다른 실시 예는,

[0048] 타원 형상을 갖는 판체(821)의 저면에 상기 헤드(50)의 투광캡(60) 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판(822)을 구비하고, 상면에는 복수의 두피 마사지용 봉(823)을 방사형으로 돌출 형성하되, 상기 복수의 두피 마사지용 봉(823)의 높이는 외측에서 내측으로 갈수록 점차 낮아지게 형성하여, 복수의 두피 마사지용

MassagerPriorArt0002287

Petitioner Therabody Ex-1004, 1221

봉(823) 끝단부가 인체의 머리 형상과 반대방향으로 라운드지게 형성되도록 한 두피 마사지 캡(82)을 포함하는 것을 특징으로 한다.

[0049] 또한, 상기 기능성 캡(80)의 또 다른 실시 예는,

[0050] 상면 전체가 라운드진 원판 형상을 갖는 판체(831)의 저면에 상기 헤드(50)의 투광캡(60) 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판(832)을 구비하고, 상면에는 복수의 피부 압박용 반원형 돌기(833)가 방사형으로 배치되도록 형성한 근육통 마사지 캡(83)을 포함하는 것을 특징으로 한다.

[0051] 또, 상기 본체(10)의 전면 중앙부와 저부에는 전원 공급 표시용 발광다이오드(LED2)를 포함하여 사용자가 조작한 기능 제어키(12)의 조작상태에 대응하여 선택되는 각 피부관리 모드에 대한 작동 상태를 표시해 주는 복수의 작동모드 표시용 발광다이오드(LED3)를 더 설치한 것을 특징으로 한다.

[0052] 또한, 상기 메인 인쇄회로기판(30)에는 전원스위치(11)를 포함하여 기능 제어키(12)의 입력신호 및 자체에 입력되어 있는 제어프로그램에 대응하여 미용기기의 전반적인 제어기능을 수행하는 마이컴(31)과;

[0053] 상기 마이컴(31)의 제어를 받아 충전식 `배터리(20)의 충방전을 제어하는 배터리 충방전 제어부(32)와;

[0054] 사용자가 선택한 피부관리 모드에서의 각종 작동 상태 멘트를 포함하여 안내 멘트 등을 상기 마이컴(31)의 제어신호에 대응하여 스피커(15)를 통해 출력해 주는 음성 제어부(33)와;

[0055] 상기 마이컴(31)의 제어신호에 대응하여 진동 발생용 모터(40)의 구동을 제어하는 모터 제어부(34)와;

[0056] 상기 마이컴(31)의 제어신호에 대응하여 각종 발광다이오드(LED1)의 구동을 제어하는 발광다이오드 제어부(35);를 구비시킨 것을 특징으로 한다.

[0057] 또, 상기 헤드(50) 내에는 온도센서(90)를 더 설치하고, 상기 마이컴(31)에는 상기 온도센서(90)를 통해 검출되는 헤드(50)의 온도가 정해진 온도이상 상승할 경우 각종 발광다이오드(LED1)에 공급되는 전원전압을 차단하여 헤드(50)의 온도가 정해진 온도이상으로 상승하는 것을 차단할 수 있도록 한 것을 특징으로 한다.

[0058] 이와 같이 구성된 본 발명의 다기능 미용기기에 대한 작용효과를 설명하면 다음과 같다.

[0059] 먼저, 본 발명의 다기능 미용기기는 도 1 내지 도 9에 도시한 바와 같이, 본체(10)와 충전식 `배터리(20), 메인 인쇄회로기판(30), 진동 발생용 모터(40), 원뿔 형상의 헤드(50), 원판형의 투광캡(60), 발광다이오드 설치용 인쇄회로기판(70) 및 복수의 기능성 캡(80)으로 형성시켜 휴대가 용이하고 장소와 시간에 구애받지 않으며 각 가정이나 사무실 등에서 간편하면서도 자유롭게 사용하여 인체의 각 부위를 자유롭게 마사지할 수 있도록 한 것을 주요기술 구성요소로 한다.

[0060] 이때, 상기 본체(10)는 도 1 및 도 2에 도시한 바와 같이, 사용자가 손으로 쉽게 잡고 사용할 수 있도록 타원형으로 된 속이 빈 통체 형상으로 성형한 것으로, 내부에는 `배터리(20)와 메인 인쇄회로기판(30), 진동 발생용 모터(40) 및 스피커(15) 등이 내장되고, 전면 중앙에는 전원스위치(11)를 포함한 각종 기능 제어키(12)가 실치됨은 물론 전면 상부 및 저부에는 헤드 설치부(13) 및 배터리 충전기 결합용 콘넥터(14)가 형성 및 설치된 형태를 갖는다.

[0061] 뿐만 아니라, 상기 본체(10)의 전면 중앙부와 저부에는 전원 공급 표시용 발광다이오드(LED2)를 포함하여 사용자가 조작한 기능 제어키(12)의 조작상태에 대응하여 선택되는 각 피부관리 모드에 대한 작동 상태를 표시해 주는 복수의 작동모드 표시용 발광다이오드(LED3)를 더 구비한 형태를 갖는다.

[0062] 또, 상기 `배터리(20)는 충전식으로 상기 배터리 충전기 결합용 콘넥터(14)와 연결된 상태에서 상기 본체(10)의 내부에 설치된 상태에서, 후술하는 메인 인쇄회로기판(30)을 포함하여 진동 발생용 모터(40) 및 각종 발광다이오드(LED1)의 구동에 필요한 전압을 배터리 충방전 제어부(32)를 통해 공급시켜 주는 기능을 수행한다.

[0063] 또한, 상기 메인 인쇄회로기판(30)은 도 9에 도시한 바와 같이, 마이컴(31)과 배터리 충방전 제어부(32), 음성 제어부(33), 모터 제어부(34) 및 발광다이오드 제어부(35) 등을 구비하고, 상기 본체(10) 내에 설치되어 사용자에 의해 전원스위치(11)가 "온"되면 각종 기능 제어키(12)의 조작에 대응하여 정해진 프로그램에 맞춰 진동 발생용 모터(40) 및 각종 발광다이오드(LED1)의 구동을 포함하여 스피커(15) 등의 구동을 제어하는 기능을 수행한다.

[0064] 이때, 상기 메인 인쇄회로기판(30)에 구비된 구성요소 중 상기 마이컴(31)은 전원스위치(11)를 포함하여 기능 제어키(12)의 입력신호 및 자체에 입력되어 있는 제어프로그램에 대응하여 미용기기의 각 구성요소에 대한 전반

MassagerPriorArt0002288

Petitioner Therabody Ex-1004, 1222

Petitioner Therabody Ex-1004, 1223

적인 제어기능을 수행하게 된다.

[0065] 또, 상기 배터리 충방전 제어부(32)는 상기 마이컴(31)의 제어를 받아 상기 배터리 충전기 결합용 콘넥터(14)와 연결된 상태에서 상기 본체(10)의 내부에 설치된 충전식 `배터리(20)의 충전 및 방전에 대한 제어기능을 수행한다.

[0066] 또한, 상기 음성 제어부(33)는 사용자가 기능 제어키(12)를 통해 선택한 각종 피부관리 모드에서의 각종 작동 상태 멘트(예를 들어 "동안 피부 관리모드입니다" 또는 "V 라인 관리모드입니다" 또는 피부 관리모드입니다" 등)를 포함하여 주위사항 멘트(예를 들어 발광다이오드 빛을 눈에 오래 비추지 마십시요" 등) 및 안내 멘트(예를 들어 "기능 제어기를 어떻게 또는 몇 번 조작하라는 등의 메시지 등) 등을 상기 마이컴(31)의 제어신호에 대응하여 스피커(15)를 통해 출력시켜 주는 기능을 수행한다.

[0067] 또, 상기 모터 제어부(34)는 상기 마이컴(31)의 제어신호에 대응하여 진동 발생용 모터(40)의 구동을 제어하는 기능을 수행하고, 상기 발광다이오드 제어부(35)는 상기 마이컴(31)의 제어신호에 대응하여 각종 발광다이오드(LED1)의 구동을 포함하여 전원 공급 표시용 발광다이오드(LED2) 및 복수의 작동모드 표시용 발광다이오드(LED3)의 구동을 제어하는 기능을 수행한다.

[0068] 한편, 상기 진동 발생용 모터(40)는 축 상에 편심형 중량추를 구비한 형태를 갖고 상기 본체(10) 내에서 헤드(50)에 근접되게 설치된 상태에서 상기 메인 인쇄회로기판(30)의 마이컴(31) 제어를 받는 상기 모터 제어부(34)의 출력신호에 대응하여 작동하며 헤드(50)가 각 부위를 마사지하는데 필요한 진동력을 발생시키도록 작동하는 기능을 수행한다.

[0069] 또, 상기 헤드(50)는 합성수지를 이용하여 원뿔 형상으로 제작된 것으로, 상기 본체(10)의 헤드 설치부(13)에 착탈 가능하게 결합되어 각종 발광다이오드(LED1)와 투광캡(60) 등이 설치될 수 있도록 함은 물론 상기 진동 발생용 모터(40)에서 발생되는 진동을 투광캡(60) 등을 통해 인체의 각 부위 피부에 전달시켜 주는 기능을 수행한다.

[0070] 또한, 상기 투광캡(60)은 반투명의 합성수지를 이용하여 원판형으로 성형된 것으로, 상기 헤드(50)의 전면 개구부에 착탈 가능하게 결합된 상태에서 각종 발광다이오드(LED1)에서 발생되는 빛을 고르게 투광시켜 줌은 물론 기능성 캡(80)의 결합기능과 상기 진동 발생용 모터(40)에서 발생되는 진동을 인체의 각 부위 피부에 직접 또는 각종 기능성 캡(80)을 통해 전달시켜 주는 기능을 수행한다.

[0071] 또, 상기 발광다이오드 설치용 인쇄회로기판(70)은 R, G, B 컬러 빛을 포함하여 적외선(IR) 발생시켜 주는 각종 발광다이오드(LED1)를 실장한 상태에서, 상기 헤드(50) 내에 착탈 가능하게 설치되어, 메인 인쇄회로기판(30)의 출력신호에 대응하는 각종 컬러의 빛을 포함한 적외선(IR)이 마이컴(31) 내 제어프로그램에 맞춰 출력될 수 있도록 하는 기능을 수행한다.

[0072] 이때, 상기 발광다이오드 설치용 인쇄회로기판(70)에 실장되어 있는 복수의 R, G, B 발광다이오드들을 포함한 적외선(IR)을 발생하는 각종 발광다이오드들은 사용자가 기능 제어키(12)를 통해 선택한 각 피부관리 모드에 대응하여 마이컴(31)에 별도로 각각 기 입력시켜 놓은 시간 간격을 두고 점등과 소등 및 점멸 작동이 이루어지게 된다.

[0073] 또한, 상기 복수의 기능성 캡(80)은 내화학성이 강하고 인체에 무해한 합성수지 재질을 이용하여 사용자가 마사지하고자 인체의 각종 부위에 특성에 맞게 서로 다른 형상을 갖도록 각각 사출 성형된 상태에서 상기 헤드(50)에 결합되는 투광캡(60)의 외부를 감싸는 형태로 착탈 가능하게 결합되어 사용된다.

[0074] 이때, 상기 기능성 캡(80)으로는 리프팅 캡(81)과 두피 마사지 캡(82) 및 근육통 마사지 캡(83)을 포함하게 된다.

[0075] 상기한 복수의 기능성 캡(80) 중 상기 리프팅 캡(81)은 도 3의 (a)~(c)에 도시한 바와 같이, 평면이 대략 하트 형상을 갖는 판체(811)의 저면에 상기 헤드(50)의 투광캡(60) 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판(812)을 구비시켜 주고, 또한 상기 판체(811)의 상면에는 복수의 "V"자형 돌기(813)와 홈(814)을 교차되게 다단으로 연이어 형성하되, 피부 운동 마사지의 극대화를 위해 상기 복수의 "V"자형 돌기(813)의 끝단부는 턱선과 볼 및 광대뼈 부위에 맞게 내측에서 외측으로 또한 상부에서 하부로 갈수록 높이와 크기가 점차 커지도록 형성(예를 들어 최소 높이 1㎜, 최대 높이 2㎜가 되도록 하되, 내측에서 외측으로 또한 상부에서 하부로 갈수록 0.1~0.2㎜씩 점차 커지도록 형성)한 형태를 갖는다.

[0076] 이와 같은 형태를 갖는 리프팅 캡(81)을 도 4와 같이 헤드(50)의 투광캡(60)에 결합한 상태에서 안면의 소정부

MassagerPriorArt0002289

Petitioner Therabody Ex-1004, 1224

위(예를 들어 턱, 볼, 광대 등)에 집촉시켜 밀어주는 형태로 마사지를 실시하게 되면, 각종 발광다이오드(LED1)에서 발생되는 빛들이 안면의 피부에 조사됨은 물론 안면 피부의 일부가 복수의 "V"자형 돌기(813)와 홈(814) 사이로 밀려들어 갔다 나오는 형태가 반복 작동되므로 피부에 탄력을 줄 수 있을 뿐만 아니라 진동 발생용 모터(40)에서 발생하는 진동(예를 들어 10,000번의 진동)에 의해 피부를 자극시켜 줄 수 있으므로 안면 피부에 대한 리프팅 효과까지 얻을 수 있다.

[0077] 또, 상기한 기능성 캡(80) 중 두피 마사지 캡(82)은 도 5의 (a)~(c)에 도시한 바와 같이, 평면이 타원 형상을 갖는 판체(821)의 저면에 상기 헤드(50)의 투광캡(60) 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판(822)을 구비시켜 주고, 또 상면에는 복수의 두피 마사지용 봉(823)을 방사형으로 돌출 형성하되, 상기 복수의 두피 마사지용 봉(823)의 높이는 외측에서 내측으로 갈수록 점차 낮아지게 형성한 형태 즉, 복수의 두피 마사지용 봉(823) 끝단부가 인체의 머리 형상과 반대방향으로 오목하게 라운드진 형태를 갖는다.

[0078] 이와 같은 형태를 갖는 두피 마사지 캡(82)을 도 6에 도시한 바와 같이 헤드(50)의 투광캡(60)에 결합시킨 상태에서 본 발명이 적용된 미용기기를 작동시키며 상기 두피 마사지 캡(82)을 머리에 대어 이동시켜 주게 되면 각종 발광다이오드(LED1)에서 발생되는 빛들이 인체의 두피에 조사됨은 물론 상기 두피 마사지 캡(82)의 상면에 돌출 형성된 복수의 두피 마사지용 봉(823) 끝단부가 인체의 두피 및 모공을 자극하게 되므로 탈모예방은 물론 두피건강에 큰 도움을 줄 수 있다.

[0079] 또한, 상기한 기능성 캡(80) 중 근육통 마사지 캡(83)은 도 7의 (a)(b)에 도시한 바와 같이, 상면 전체가 라운드진 원판 형상을 갖도록 사출 성형되는 판체(831)의 저면에 상기 헤드(50)의 투광캡(60) 외부에 탄력적으로 감싸는 형태로 결합되는 탄성 결합판(832)을 구비시켜 주고, 또 상면에는 복수의 피부 압박용 반원형 돌기(833)가 방사형으로 정해진 간격을 두고 돌출 형성한 형태를 갖는다.

[0080] 이와 같은 형태를 갖는 근육통 마사지 캡(83)을 도 8에 도시한 바와 같이 헤드(50)의 투광캡(60)에 결합시킨 상태에서 본 발명이 적용된 미용기기를 작동시키며 상기 근육통 마사지 캡(83)을 근육이 많은 부위의 피부나 근육통이 있는 피부에 대어 이동시켜 주게 되면, 각종 발광다이오드(LED1)에서 발생되는 빛들이 해당 부위에 조사됨은 물론 상기 근육통 마사지 캡(83)의 상면에 돌출 형성된 복수의 피부 압박용 반원형 돌기(833)가 해당 부위를 강하게 자극하게 되므로 마사지 효과의 극대화를 통한 근육통을 대폭 완화시켜 줄 수 있다.

[0081] 상기와 같은 근육통 마사지 캡(83)을 헤드(50)에 결합시켜 근육이 많은 부위나 근육통이 있는 부위를 마사지하고자 할 때에는, 해당 부위의 피부에 근육통 개선 크림 등을 바르고 마사지를 실행하는 것이 바람직하다.

[0082] 물론, 본 발명이 적용된 미용기기를 이용하여 마사지를 실시함에 있어서, 상기한 기능성 캡(80)들을 결합하지 않고, 상기 헤드(50)에 결합되어 있는 투광캡(60)의 외면을 안면의 각 부위(예를 들어 턱, 볼, 광대 등)에 직접 접촉시킨 상태에서 마사지를 실시해도 각종 발광다이오드(LED1)에서 발생되는 빛들이 안면의 피부에 조사됨은 물론 진동 발생용 모터(40)에서 발생하는 진동(예를 들어 10,000번의 진동)에 의해 피부를 자극시켜 줄 수 있으므로 안면 피부에 대한 마사지 효과를 얻을 수 있다.

[0083] 한편, 본 발명에서는 상기 헤드(50) 내에 도 2와 같이 온도센서(90)를 더 설치하고, 미용기기를 통해 특정 부위에 대한 마사지를 실시할 때 상기 마이컴(31)으로 하여금 상기 온도센서(90)를 통해 실시간으로 검출되는 헤드(50)의 온도가 설정된 온도이상 상승할 경우 각종 발광다이오드(LED1)에 공급되는 전원전압을 차단하도록 함으로써 헤드(50)의 온도가 정해진 온도이상으로 상승하게 되므로 인한 화상 등과 같은 안전사고의 발생을 미연에 방지할 수 있어 제품 자체의 안전성과 작동에 따른 신뢰도를 대폭 향상시킬 수 있다.

[0084] 상술한 실시 예는 본 발명의 가장 바람직한 예에 대하여 설명한 것이지만, 상기한 실시 예 및 특허청구범위에 기재된 내용만으로 한정하는 것은 아니며, 본 발명의 기술사상을 벗어나지 않는 범위 내에서 다양한 변형이 가능하다는 것은 당업자에게 있어서 명백한 것이다.

부호의 설명

[0085] 10 : 본체 11 : 전원스위치

12 : 기능 제어키 13 : 헤드 설치부

14 : 배터리 충전기 결합용 콘넥터 15 : 스피커

20 : 충전식 배터리

MassagerPriorArt0002290

30 : 메인 인쇄회로기판　　31 : 마이컴

32 : 배터리 충방전 제어부　　33 : 음성 제어부

34 : 모터 제어부　　35 : 발광다이오드 제어부

40 : 진동 발생용 모터

50 : 헤드

60 : 투광캡

70 : 발광다이오드 설치용 인쇄회로기판

80 : 기능성 캡

81 : 리프팅 캡　　811 : 판체

812 :탄성 결합판　　813 : "V"자형 돌기(813)

814 : "V"자형 홈

82 : 두피 마사지 캡　　821 : 판체

822 :탄성 결합판　　823 : 두피 마사지용 봉

83 : 근육통 마사지 캡　　831 : 판체

832 :탄성 결합판　　833 : 피부 압박용 반원형 돌기

90 : 온도센서

LED1 : R, G, B 컬러의 빛 및 적외선(IR) 발생용 발광다이오드

LED2 : 전원 공급 표시용 발광다이오드

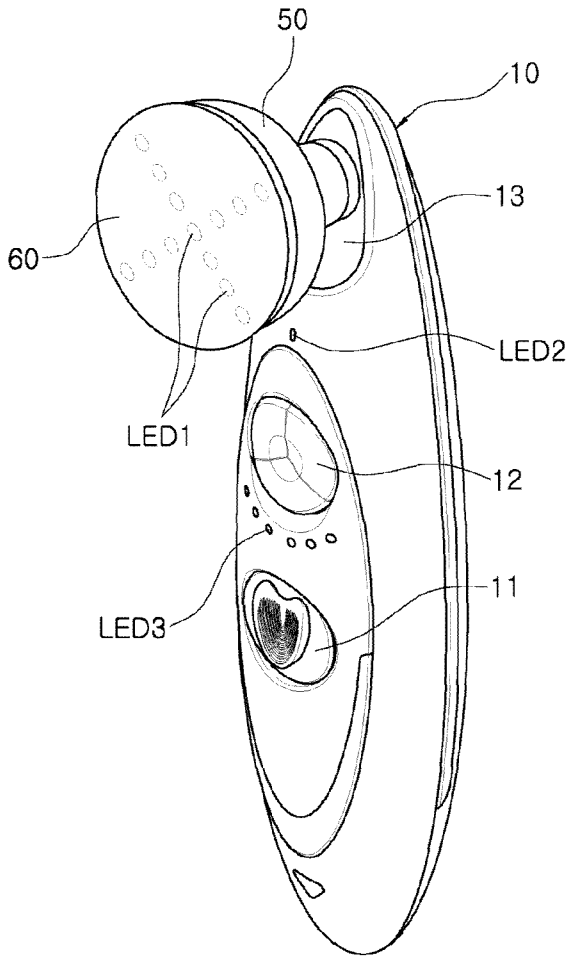
LED3 : 작동모드 표시용 발광다이오드

MassagerPriorArt0002291

Petitioner Therabody Ex-1004, 1225

도면

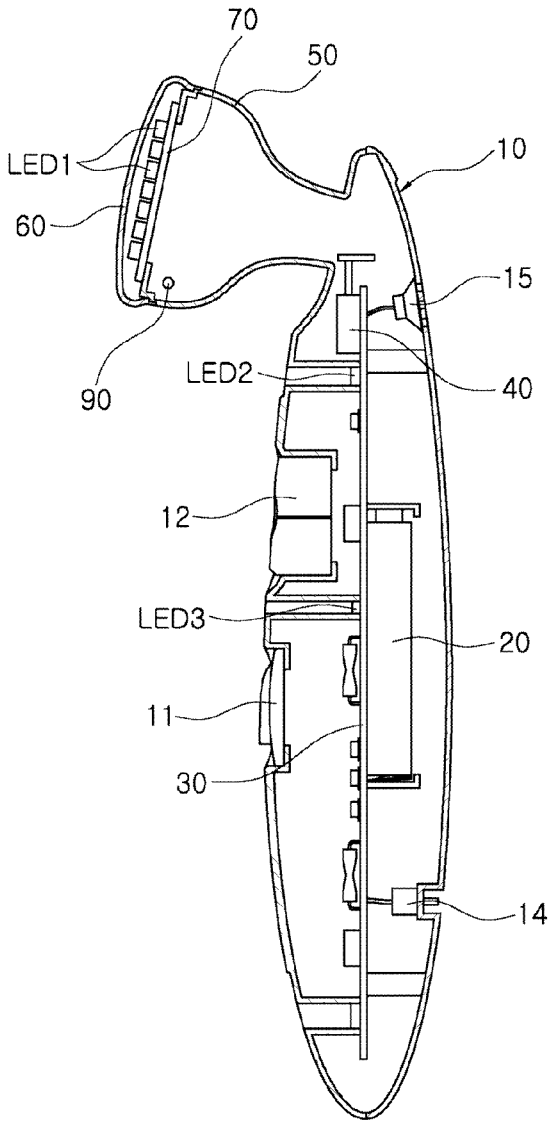
도면1



MassagerPriorArt0002292

Petitioner Therabody Ex-1004, 1226

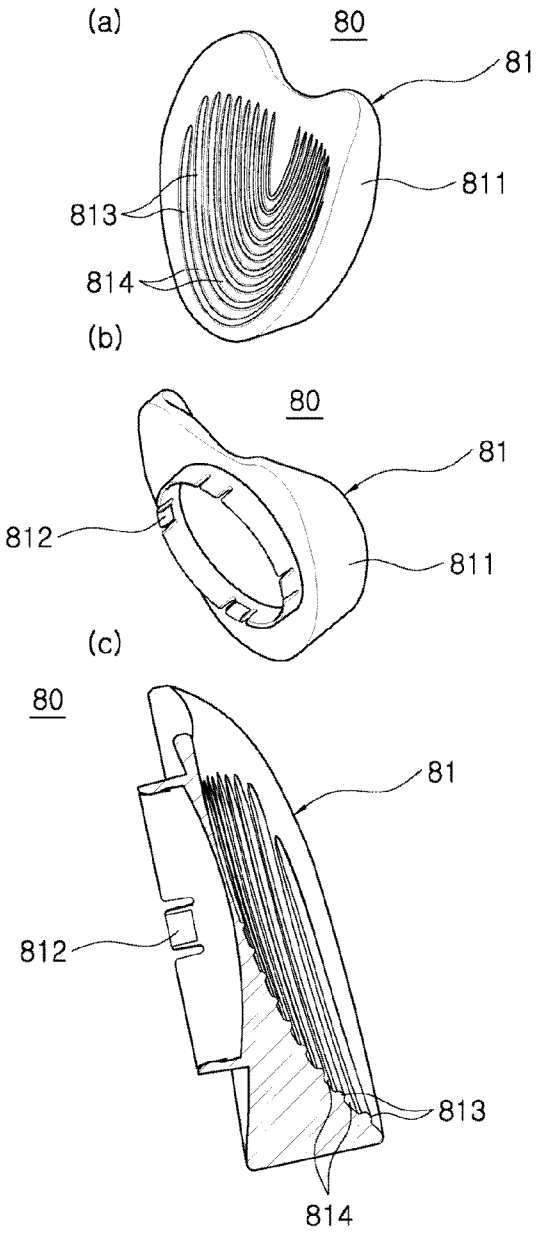
도면2



MassagerPriorArt0002293

Petitioner Therabody Ex-1004, 1227

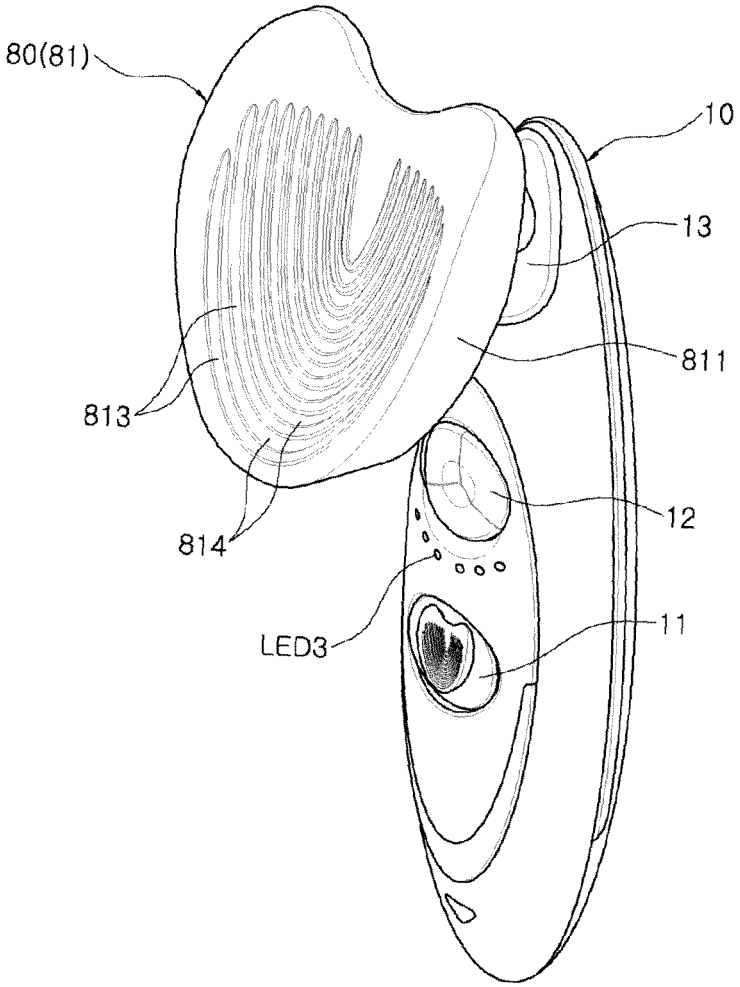
도면3



MassagerPriorArt0002294

Petitioner Therabody Ex-1004, 1228

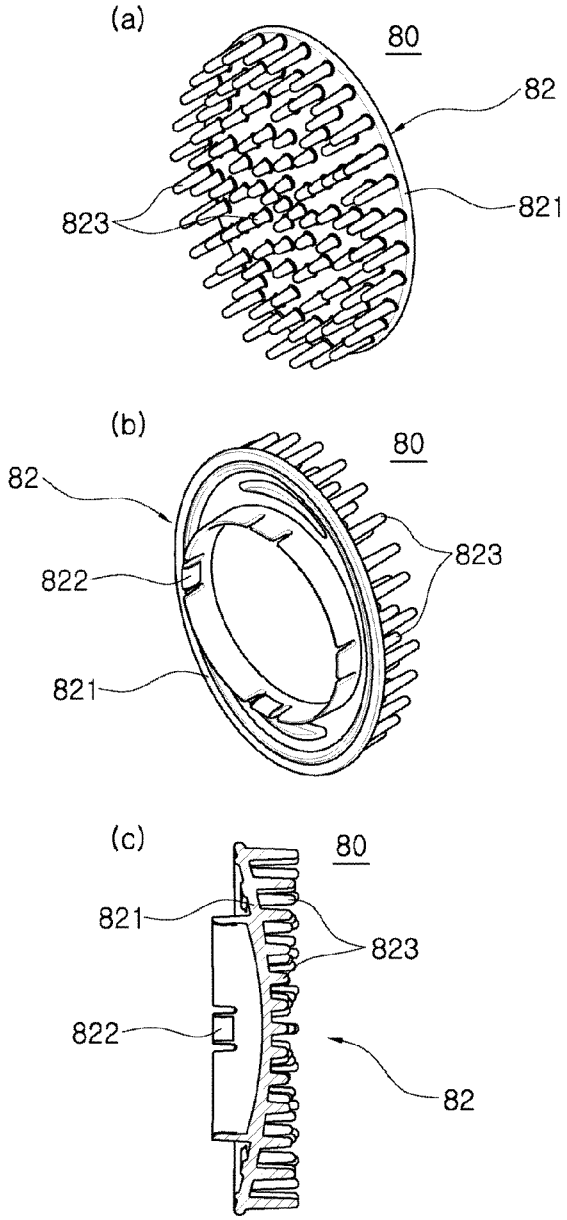
도면4



MassagerPriorArt0002295

Petitioner Therabody Ex-1004, 1229

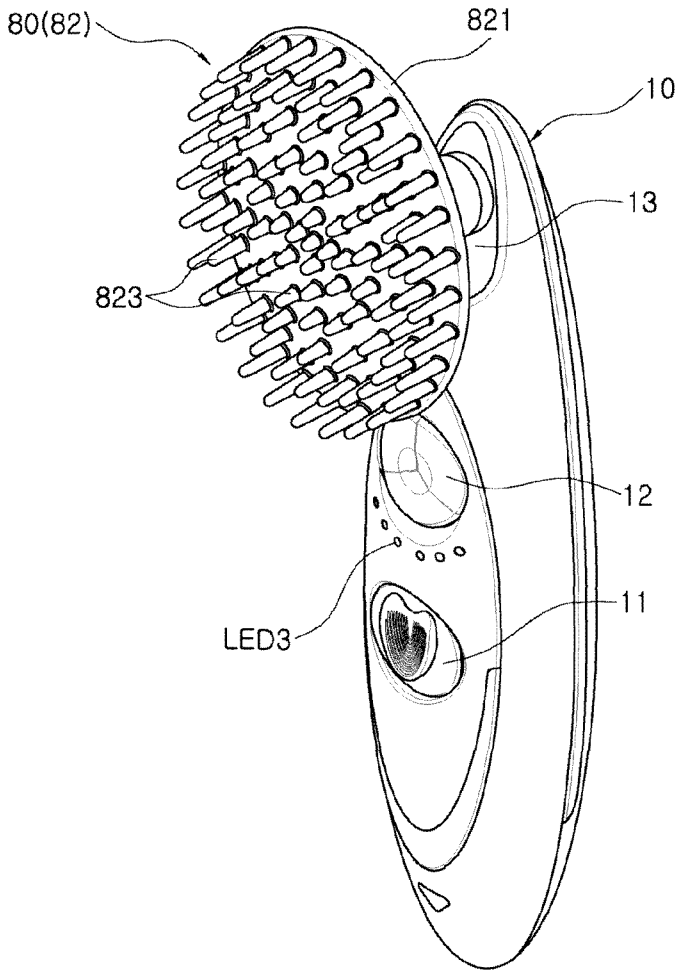
도면5



MassagerPriorArt0002296

Petitioner Therabody Ex-1004, 1230

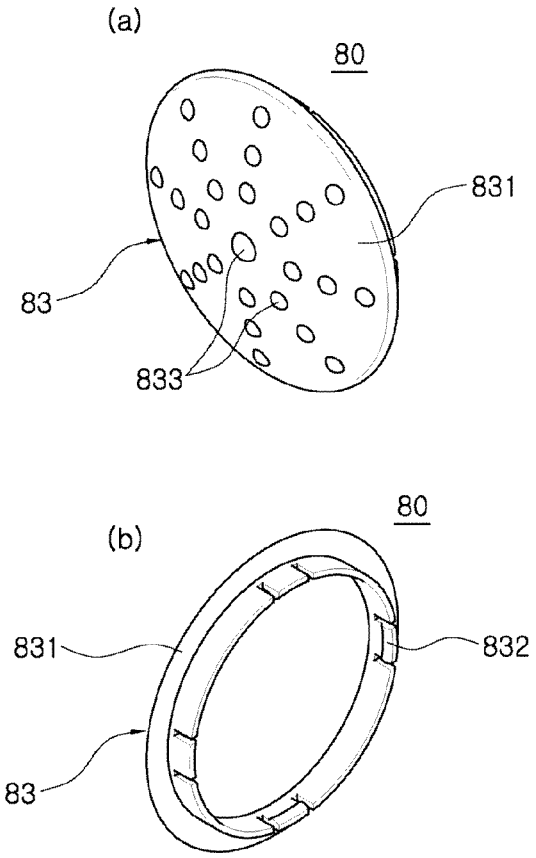
도면6



MassagerPriorArt0002297

Petitioner Therabody Ex-1004, 1231

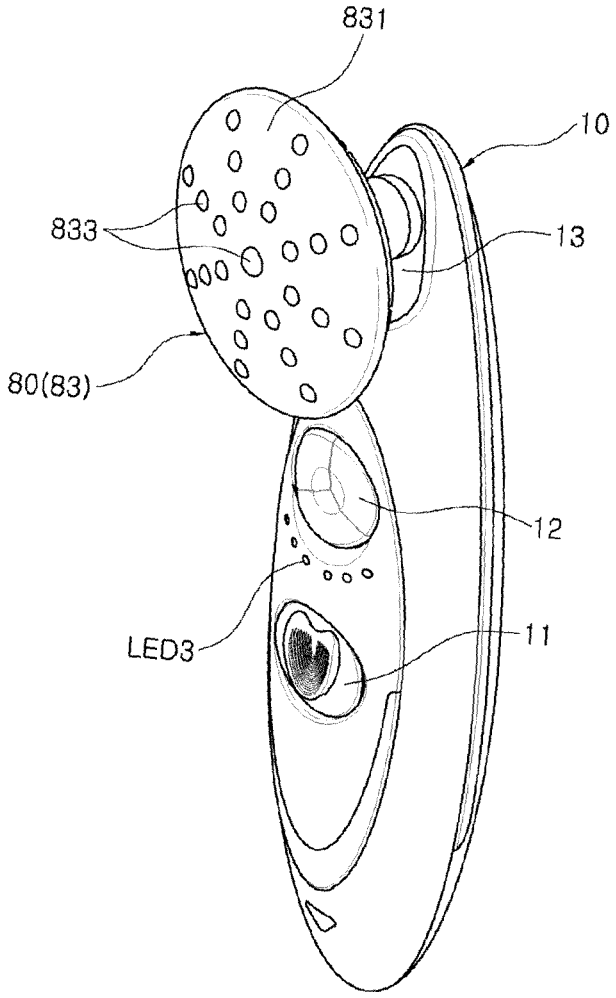
도면7



MassagerPriorArt0002298

Petitioner Therabody Ex-1004, 1232

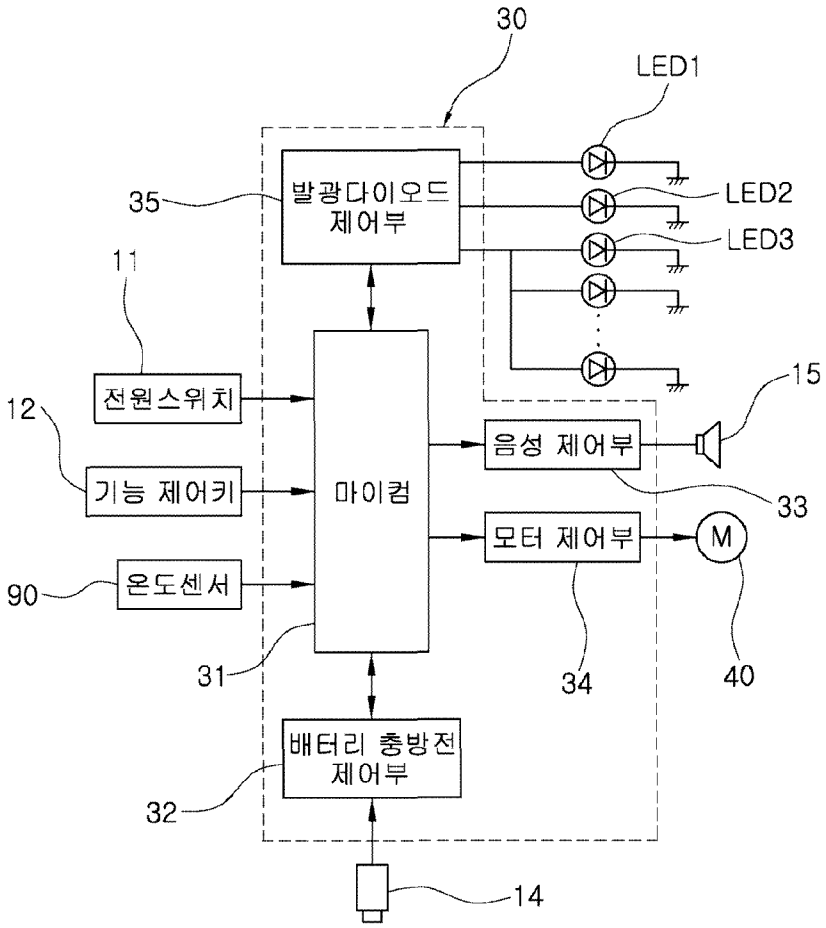
도면8



MassagerPriorArt0002299

Petitioner Therabody Ex-1004, 1233

도면9



MassagerPriorArt0002300

Petitioner Therabody Ex-1004, 1234

Espacenet

Bibliographic data: JP2012223582 (A) — 2012-11-15

BATTERY-POWERED HAND-HELD ULTRASONIC SURGICAL CAUTERY CUTTING DEVICE

Inventor(s): BALES THOMAS O; DEVILLE DEREK DEE; SMITH KEVIN W; PALMER MATTHEW A ± (BALES THOMAS O, ; DEVILLE DEREK DEE, ; SMITH KEVIN W, ; PALMER MATTHEW A, ; トーマス オー．ベイルズ, ; デレック ディー デヴィル, ; ケヴィン ダブリュー．スミス, ; マシュー エー．パルマー)

Applicant(s): COVIDIEN AG ± (COVIDIEN AG, ; コヴィディエン・アクチェンゲゼルシャフト)

Classification: **- international:** ***A61B18/00***
- cooperative: **H01M10/4257 (EP); H01M10/44 (EP); H01M10/448 (EP); H01M10/48 (EP); H01M50/209 (EP); H01M50/247 (EP); H01M50/262 (EP);** A61B2017/00477 (EP); A61B2017/00734 (EP); A61B2017/320094 (EP, US); A61B2017/320095 (EP, US); A61B2017/320097 (EP, US); A61B2090/0803 (EP); A61B90/90 (EP); H01M2010/4271 (EP); H01M2010/4278 (EP); Y02E60/10 (EP)

Application number: JP20120093321 20120416 Global Dossier

Priority number(s): US201161476022P 20110415 ; US201113307750 20111130

Also published as: CA2774751 (A1) CA2774751 (C) CA3022252 (A1) CA3022252 (C) CA3022254 (A1) more

Abstract of JP2012223582 (A)

PROBLEM TO BE SOLVED: To provide a surgical battery assembly having a battery terminal and operation parameters.SOLUTION: The battery assembly includes a housing shaped to be detachably connected to the battery terminal. The housing includes a module battery, which is operable to supply power to a surgical device in the terminal. The housing has a control circuit with a microprocessor, a memory and a real time clock. The control unit is communicatively connected to the battery and can operate to execute: detecting identification information of the surgical device;

Petitioner Therabody Ex-1004, 1235

determining at least one piece of information on one of the operation parameters of the surgical devices based on the detected identification information; storing the information in at least the memory; and selectively allowing or disallowing the power to be supplied from the battery to surgical device based on the information.

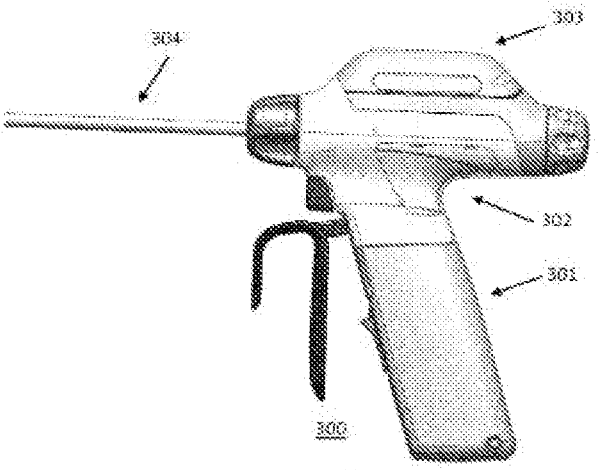


FIG. 3

Petitioner Therabody Ex-1004, 1236

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

DESCRIPTION JP2012223582A

Battery-powered handheld ultrasonic surgical cautery cutting device

[0001]

This application is based on US Provisional Patent Application Serial No. 61 / 476,022 (Filing date: April 15, 2010), 35U. S. C. Claiming priority under §119, it is a partial continuation application of US Patent Application Serial Number 13 / 215,971 (Filing Date: August 23, 2011) and US Patent Application Serial Number 13/215. , 971 is the 35 U.S. of the US provisional patent application serial number 61 / 376,983 (filed date: August 25, 2010). S. C. Claim priority under §119. This application is a partial continuation application of US patent application serial numbers 13 / 022, 707 and 13 / 022, 743 (filed on February 8, 2011). This application is a partial continuation application of US Patent Application Serial Numbers 12 / 868,505 and 12 / 868,545 (Filing Date: August 25, 2010), and is a partial continuation application of US Patent Application Serial Number 12/868. , 505 and 12 / 868, 545 claim priority over US provisional application serial numbers 61/236, 934 (filed on August 26, 2009). This application is a partial continuation application of US patent application serial numbers 12/547, 898, 12 / 547, 975 and 12 / 547,999 (all filing dates are August 26, 2009). This application applies to US patent application serial numbers 13/072, 187, 13/072, 247, 13/072, 273, 13/072, 221 and 13/072, 309, 13. This is a partial continuation application of Nos. / 072,345 and 13/072,373 (all filing dates are August 25, 2011). This application applies to US Patent Application Serial Nos. 12 / 266,101, 12 / 266,146, 12 / 266,226, 12 / 266,252 and 12 / 266,320 (Filing Date). All on November 6, 2008), US Patent Application Serial Numbers 12 / 266,664 (Filing Date: November 7, 2008), US Patent Application Serial Numbers 12 / 269,544 and 12 / It is a partial continuation application of Nos. 269, 629 (Filing date: November 12, 2008) and US patent application serial number 12 / 270, 146 (Filing date: November 13, 2008), and the above applications are the respective applications. , US Provisional Serial Numbers 60/991,829 (Filing Date: December 3, 2007), 60 / 992,496 (Filing Date: December 5, 2007), 61 / 019,888. (Filing Date: January 9, 2008), Nos. 61 / 045,475 (Filing Date: April 16, 2008), Nos. 61 / 048,809 (Filing Date: April 29, 2008) and Claims priority over No. 61 / 081,885 (Filing Date: July 18, 2008).

All of these disclosures are incorporated herein by reference in their entirety.

[0002]

The present invention relates generally to ultrasonic cutting devices, and in particular to battery-powered handheld ultrasonic surgical ablation cutting devices.

[0003]

Ultrasound instruments are effectively used to treat many medical conditions, such as tissue removal and cauterization of blood vessels. A cutting instrument using ultrasonic waves uses an ultrasonic vibrator to generate vibration along the longitudinal axis of the cutting blade. By arranging the resonant wave along the length of the blade, a high speed longitudinal mechanical motion is generated at the end of the blade. These are because the mechanical vibrations transmitted to the ends of the blade are very efficient in cutting organic tissue and at the same time coagulating the tissue using the thermal energy generated by the

Petitioner Therabody Ex-1004, 1237

ultrasonic frequency. The equipment is advantageous. Such instruments are particularly well suited for minimally invasive procedures, such as endoscopic and laparoscopic procedures, where the blade reaches the surgical site through the trocar.

[0004]

For various cutting blades (eg, length, material, size), there is one or more (periodic) drive signals that generate resonance along the length of the blade.

Resonance causes movement of the tip of the blade and can be optimized for improved performance during the surgical procedure. However, generating an effective drive signal for the cutting edge is not a trivial task. For example, the frequency, current, and voltage applied to the cutting tool will vary depending on the variable load acting on the blade and the temperature difference resulting from the use of the tool, so all of these parameters must be dynamically controlled. It doesn't become.

[0005]

FIG. 1 shows a schematic block diagram of a prior art circuit used to exert a mechanical motion of ultrasonic waves on an end effector.

The circuit includes a power supply 102, a control circuit 104, a drive circuit 106, a matching circuit 108, and an oscillator 110, and is fixed to the handpiece 112 and the handpiece 112 by a cannula 120. It has a supported waveguide 114 (shown by a dotted line). The waveguide 114 is terminated by a blade 116 at its distal end. The clamp mechanism 118 is a part of the entire end effector and can expose the blade portion 116 of the waveguide 114 to bring the tissue and other substances into contact with the blade portion 116. Generally, the clamping mechanism 118 is a swivel arm, which acts to grip or clamp the tissue between the arm and the blade 116. However, some devices do not have a clamp mechanism 118.

[0006]

The drive circuit 106 produces a high voltage self-excited vibration signal.

The high voltage output of the drive circuit 106 is supplied to the matching circuit 108, which includes a signal smoothing component that next generates a driving signal (waveform) supplied to the oscillator 110. The vibration input to the oscillator 110 moves the mechanical portion of the oscillator 110 back and forth along the waveguide 114 with an amplitude and frequency that causes resonance. For optimum resonance and service life of the resonator and its components, the drive signal applied to the oscillator 110 should be a sine wave as smooth as possible in practice. For this reason, the matching circuit 108, oscillator 110 and waveguide 114 are selected to cooperate with each other and they are all frequency sensitive to each other. This can be called matched or tuned.

[0007]

Since a relatively high voltage (eg 100V or higher) is required to drive a typical piezoelectric oscillator 110, the power supplies available and used in all prior art ultrasonic cutting devices are generally is a main pipe of electricity up to 15A, 120VAC (eg, a wall outlet).

Thus, all known ultrasonic surgical cutting devices are similar to those shown in FIGS. 1 and 2 and are countertop boxes 202 with an electrical cord 204 plugged into an electrical main 206 for power supply. To use. Resonance is maintained by a phase-locked loop (PLL), which creates a closed loop between the outputs of the matching circuit 108 and the drive circuit 106. For this reason, in the device of the prior art, the countertop box 202 has always included all of the drive and control electronics 104, 106, as well as the matching circuit 108. The typical retail price for these boxes is in the thousands of dollars.

[0008]

The supply code 208 transmits a sinusoidal waveform from the box 202 to the oscillator 110 and thereby the waveguide 114 within the handpiece 112.

The device of the prior art has great inconvenience because the operator / surgeon's mobility is limited due to the length, size and weight of the cord 208. Code 208 creates a movement limit for the operator during any surgical procedure using the handpiece 112 and is an obstacle for the operator and those around him / her. In addition, the cord is shielded and requires

Petitioner Therabody Ex-1004, 1238

durability and is therefore very expensive. Finally, since the box 202 is not sterilized, both the box 202 and the feed code 208 need to be cleaned and kept sterile for the surgical environment.

[0009]

The prior art has another inconvenience due to the frequency of the matching circuit 108, oscillator 110 and waveguide 114 being affected.

By having a phase lock loop feedback circuit between the outputs of the matching circuit 108 and the drive circuit 106, the matching circuit 108 is always located in the box 202 near the drive circuit 106 and by the length of the supply code 208. It was separated from the oscillator 110. This architecture induces transmission loss and electrical parasitism, which are common consequences of ultrasonic frequency transmission.

[0010]

In addition, prior art devices attempt to maintain resonance under changing waveguide 114 load conditions by monitoring and maintaining a constant current applied to the oscillator (when actuated by series resonance).

However, without recognizing a particular load condition, the only predictable relationship between the current and amplitude applied to the oscillator 110 is that it is in a resonant state (in the present specification, the term is used. When related to mechanical output, the amplitude is sometimes referred to as displacement). Therefore, the amplitude of the waveform along the waveguide 114 may not be constant over all frequencies, despite the addition of a constant current. Therefore, when a load is applied to the device of the prior art, the operation of the waveguide 114 is not guaranteed to be in resonance, and only the current is monitored and kept constant, so that it is on the waveguide 114. Momentum can fluctuate significantly. For this reason, maintaining a constant current is not an effective way to maintain constant motion of the waveguide 114.

[0011]

Further, in the prior art, the handpiece 112 and the oscillator 110 are replaced after a finite number of uses, but the box 202, which is much more expensive than the handpiece 112, is not replaced.

Therefore, the introduction of new replacement handpieces 112 and oscillators 110 often causes inconsistencies between frequency sensitive components (108, 110, and 112), thereby being introduced into the waveguide 114. Inconveniently change the frequency. For prior art circuits, the only way to avoid such inconsistencies is to limit them to the correct frequency. This accuracy results in a significant increase in cost.

[0012]

Therefore, it is necessary to overcome the above-mentioned problems related to the prior art.

[0013]

Briefly, according to an exemplary embodiment, the invention is a high frequency machine at the end of a waveguide to perform useful work, especially to cut and seal tissue during surgery. Includes battery-powered devices that generate motion.

Piezoelectric oscillators are used to convert electrical energy into mechanical energy that produces motion at the ends of the waveguide.

In particular, when oscillators and waveguides are driven at their combined resonant frequency, a large amount of mechanical motion is generated.

The circuit components of the present invention include, among others, a battery power supply, a control circuit, a drive circuit, a matching circuit, all of which are located within the handpiece of the ultrasonic cutting device. All are generated by managing the waveform from the battery voltage.

The components are selected to convert the electrical energy from the battery power source into a high voltage AC waveform that drives the oscillator.

Ideally, the frequency of this waveform is substantially identical to the resonant frequency of the waveguide and oscillator.

Petitioner Therabody Ex-1004, 1239

The magnitude of the waveform is chosen to be a value that produces the desired amount of mechanical motion.

[0014]

Conveniently, according to some embodiments, the invention allows components of the device to be removed, replaced, repaired, and / or replaced.

Some components, as used herein, are "disposable", meaning that the components are used for only one treatment and then discarded.

Yet another component, when used herein, is "reusable", meaning that the component can be sterilized by standard medical procedures and then used at least a second time.

As described, other components have information processing capabilities that allow them to recognize the device to which they are mounted and change their function or performance depending on multiple factors. ..

[0015]

The present invention eliminates the disadvantages of the conventionally known devices and methods of this general type described above herein, and also allows the disposal of inexpensive elements, much more than the reusable elements of the prior art. Provided is a cordless handheld ultrasonic ablation cutting device that enables the reuse of inexpensive and higher cost elements in an advantageous manner.

[0016]

The present invention is shown and described herein as embodied as a cordless, battery-powered, handheld ultrasonic surgical ablation cutting device, but without departing from the spirit of the invention. It is not intended to be limited to the details shown, as various modifications and structural changes may be made within the scope of and within the scope of the equivalent.

Moreover, well-known elements of the exemplary embodiments of the invention are not described in detail or are omitted in order not to obscure the relevant details of the invention.

[0017]

Although this specification concludes with claims that define the features of the invention that are considered novel, the invention will be better understood in light of the following description as well as the drawings.

In the drawings, similar reference numbers are carried over to subsequent drawings and used.

Accordingly, the components of the device and the steps of the method are represented, if necessary, by the usual symbols of the drawings, the drawings being readily apparent to those skilled in the art having the benefit of the description herein. In order not to obscure the present disclosure by the present invention, specific details thereof which are directly related to understanding the embodiments of the present invention are shown.

The drawings are not drawn to scale.

[0018]

Other features considered as features of the present invention are described in the appended claims.

Where appropriate, although detailed embodiments of the invention are disclosed herein, it should be understood that the disclosed embodiments are merely exemplary of the invention, which vary. It is possible to embody it in various forms.

Accordingly, the particular structural and functional details disclosed herein should not be construed as limiting, but merely as a basis for the claims and substantially any suitable detail. It is simply construed as a representative basis for teaching those skilled in the art to adopt the present invention in various structures.

Moreover, the terms and expressions used herein are not intended to be limiting, but rather are used to provide an understandable description of the invention.

[0019]

Petitioner Therabody Ex-1004, 1240

The same or functionally similar elements through separate figures are numbered similarly, and the accompanying drawings incorporated herein by them, together with the detailed description below, form part of this specification. It is useful to further explain the various embodiments and to explain the various principles and advantages of the present invention.

[0020]

FIG. 6 is a block diagram schematically showing components of a prior art ultrasonic cutting device with separate power, control, drive and matching components.

It is a figure which shows the ultrasonic cutting apparatus of the prior art of FIG.

FIG. 3 is a left elevation view of a cautery assembly for ultrasonic surgery according to an exemplary embodiment of the present invention.

It is a perspective view from above the corner of the battery assembly which concerns on an exemplary embodiment of this invention.

FIG. 3 is a left elevation view of an oscillator and oscillator assembly according to an exemplary embodiment of the present invention.

FIG. 3 is a block diagram schematically showing a cordless battery-powered handheld ultrasonic surgical cautery cutting device according to an exemplary embodiment of the present invention.

FIG. 3 is a block diagram schematically showing a battery assembly of the devices of FIGS. 3 and 4 according to an exemplary embodiment of the present invention.

FIG. 3 is a block diagram schematically showing a handle assembly of the devices of FIGS. 3 and 4 according to an exemplary embodiment of the present invention.

FIG. 3 is a block diagram schematically showing an oscillator and oscillator assembly of the apparatus of FIGS. 3 to 5 according to an exemplary embodiment of the present invention.

FIG. 3 is a block diagram schematically showing an oscillator of FIG. 9 according to an exemplary embodiment of the present invention.

FIG. 3 is a block diagram schematically showing a battery controller of FIGS. 3 and 4 according to an exemplary embodiment of the present invention.

FIG. 3 is a block diagram schematically showing an electrical communication relationship between a battery assembly of the apparatus of FIGS. 3 to 5 and an oscillator and an oscillator assembly according to an exemplary embodiment of the present invention.

It is a graph which shows the input of the square waveform to the matching circuit which concerns on embodiment of this invention.

It is a graph which shows the output of the sine and cosine waveform from the matching circuit which concerns on embodiment of this invention.

The action illustrated on the waveguide of the ultrasonic cutting device according to the exemplary embodiment of the present invention in which the resonant sine wave input has a sine pattern causes the amplitude of axial motion along the length of the waveguide. It is a figure shown to represent.

It is a circuit diagram which shows the basic series circuit model of the oscillator which concerns on the example embodiment of this invention fragmentarily and roughly.

It is a circuit diagram which shows the circuit of this invention which has the circuit of FIG.

It is a circuit diagram which shows the basic parallel circuit model of the oscillator which concerns on the example embodiment of this invention fragmentarily and roughly.

It is a circuit diagram which shows the circuit of this invention which has the circuit of FIG.

It is a circuit diagram which shows the circuit of this invention which has the circuit of FIG.

It is a circuit diagram which shows the circuit of this invention which has the circuit of FIG.

Petitioner Therabody Ex-1004, 1241

It is a schematic block diagram which makes the model of the implemented direct digital synthesis technique which concerns on embodiment of this invention.

FIG. 5 is a graph showing an exemplary direct output of a DAC located above the filtered output of a digital-to-analog converter (DAC) according to an exemplary embodiment of the invention.

A wavelength tuning word shorter than the wavelength tuning word used to generate the graph of FIG. 23 located above the filtered output of the DAC using the same short wavelength tuning word according to an exemplary embodiment of the invention. It is a graph which shows the example direct output of the digital-to-analog converter (DAC) which has.

It has a longer wavelength tuning word than the wavelength tuning word used to generate the graph of FIG. 23 located above the filtered output of the DAC with the longer wavelength tuning word according to the exemplary embodiment of the invention. FIG. 6 is a graph showing an exemplary direct output of a digital-to-analog converter (DAC).

FIG. 3 is a block circuit diagram of an exemplary component comprising a current control loop according to an exemplary embodiment of the invention.

It is a block circuit diagram of the apparatus of FIG. 3 which concerns on an exemplary embodiment of this invention.

FIG. 6 is a perspective view from above of the front of the battery assembly of FIG. 4 according to an exemplary embodiment of the present invention.

A fragmentary perspective view from the left side of the battery assembly of FIG. 4 with the shell half removed, exposing the top of the multi-lead battery terminal and the inside of the remaining half of the shell according to an exemplary embodiment of the invention. be.

FIG. 4 is a fragmentary perspective view from the right side of the battery assembly of FIG. 4 with half of the shell removed, exposing the circuit board connected to the multi-lead battery terminal according to the exemplary embodiment of the invention.

In the top perspective view of the battery assembly of FIG. 4 with both halves of the shell removed, exposing the battery cell connected to the composite circuit board connected to the multi-lead battery terminal according to the exemplary embodiment of the invention. be.

FIG. 3 is a top perspective view of the battery assembly shown in FIG. 31 in which one half of the shell according to an exemplary embodiment of the invention is in place.

FIG. 6 is a top perspective view of the handle assembly of FIG. 4, showing a catch located behind the battery assembly according to an exemplary embodiment of the invention.

FIG. 3 is a bottom perspective view of the handle assembly of FIG. 3 that exposes the multi-reed handle terminal assembly according to an exemplary embodiment of the invention and the receiver that meshes with the battery assembly of FIG.

FIG. 3 is an enlarged bottom perspective view of the handle assembly of FIG. 3 that exposes the multi-reed handle terminal assembly according to an exemplary embodiment of the invention and the receiver that meshes with the battery assembly of FIG.

It is a bottom perspective view which shows the first meshing connection between a handle assembly and a battery assembly which concerns on an exemplary embodiment of the invention.

FIG. 3 is a perspective view of a battery assembly fully connected to a handle assembly according to an exemplary embodiment of the invention.

It is an enlarged perspective view of the outer surface of the battery assembly of FIG. 4 which shows the detachment mechanism which connects the battery assembly to the handle assembly which concerns on the Embodiment of this invention.

FIG. 3 is an enlarged perspective view of a multi-lead battery terminal assembly according to an exemplary embodiment of the present invention.

Ultrasound surgery of FIG. 1 with half of the shell of the handle assembly removed, which provides a detailed view of the meshing position between the multilead battery terminal assembly and the multilead handle battery assembly according to an exemplary embodiment of the invention. It is an enlarged perspective view of the ablation assembly.

FIG. 3 is a fragmentary cross-sectional perspective view of a pressure valve in the battery assembly of FIG. 3 according to an exemplary embodiment of the invention as viewed from the inside of the battery assembly.

It is a fragmentary sectional view of the pressure valve of FIG. 41 seen from the side surface of the valve.

Petitioner Therabody Ex-1004, 1242

FIG. 4 is a perspective view of the pressure valve of FIG. 41 separated from the battery assembly.

It is a graph which shows the pressure state of the pressure valve of FIG. 41 which concerns on an exemplary embodiment of this invention.

Left elevation disassembly of the ultrasonic surgical ablation assembly of FIG. 3, showing a half portion of the left shell removed from the battery assembly and a half portion of the left shell removed from the handle assembly according to an exemplary embodiment of the invention. It is a figure.

FIG. 3 is a right elevation view of the handle assembly of FIG. 3 with a half portion of the right shell showing a control mechanism according to an exemplary embodiment of the invention removed.

FIG. 3 is an enlarged elevation view of the handle assembly of FIG. 3 with a half portion of the left shell showing the trigger mechanism of FIG. 46 according to an exemplary embodiment of the invention removed.

FIG. 6 is an enlarged elevation view of a two-stage switch in a handle assembly activated by the button of FIG. 46 according to an exemplary embodiment of the invention.

It is an elevation view which shows the specific example of the two-step switch of FIG. 48 which concerns on embodiment of this invention.

FIG. 3 is an elevation view of the TAG of FIG. 3 according to an exemplary embodiment of the present invention.

FIG. 5 is a bottom elevation view of the TAG of FIG. 50 according to an exemplary embodiment of the present invention.

FIG. 5 is a top elevation view of the TAG of FIG. 50 according to an exemplary embodiment of the present invention.

FIG. 5 is an elevational view of the TAG of FIG. 50 with the top cover removed, showing an oscillator circuit according to an exemplary embodiment of the present invention.

FIG. 5 is a bottom elevation view of the TAG of FIG. 50 with the lower cover removed, showing the electrical connection between the oscillator and the oscillator according to an exemplary embodiment of the invention.

FIG. 5 is a bottom perspective view of the TAG of FIG. 50 with the lower cover of the TAG and the cover of the oscillator removed, showing the components of the oscillator according to the exemplary embodiment of the present invention.

FIG. 3 is a left elevation view of a handle assembly and a TAG showing a connection alignment between the handle assembly and the TAG according to an exemplary embodiment of the invention.

On the left side of the ultrasonic surgical ablation assembly of FIG. It is an elevation decomposition view.

FIG. 3 is an enlarged perspective view of an oscillator from which the outer shell according to the embodiment of the present invention has been removed.

FIG. 3 is an enlarged perspective view of a coupling relationship between a catch and a receiver of a handle assembly on a battery assembly according to an exemplary embodiment of the invention, and a sealing relationship between a multilead battery terminal assembly and a multilead handle terminal assembly.

FIG. 5 is an enlarged perspective perspective view of the sealing gasket of FIG. 59 according to an exemplary embodiment of the present invention.

FIG. 3 is a partial perspective view of a handle assembly with a half portion of the right cover removed, exposing the near overcenter trigger mechanism according to an exemplary embodiment of the invention.

It is a partial perspective view of the trigger mechanism of the near overcenter of FIG. 61 in the state where the trigger which concerns on the Embodiment of this invention is slightly pushed.

It is a partial perspective view of the trigger mechanism of the near overcenter of FIG. 61 in the state where the trigger which concerns on the Embodiment of this invention is further pushed.

FIG. 6 is a partial perspective view of the trigger mechanism of the near overcenter of FIG. 61 in a state where the trigger according to the embodiment of the present invention is completely pushed in.

FIG. 3 is a fragmentary perspective view of a rotating lockout member and blade adjacent to but not engaged in a waveguide assembly anti-rotation wheel according to an exemplary embodiment of the invention.

FIG. 6 is a fragmentary perspective view of a rotary lockout member and a blade of FIG. 65 that engages with a waveguide rotation prevention wheel according to an exemplary embodiment of the present invention.

Petitioner Therabody Ex-1004, 1243

FIG. 6 is a fragmentary perspective view of a two-step button that physically communicates with the rotary lockout member of FIG. 65 in a non-pushed state according to an exemplary embodiment of the present invention.

FIG. 6 is a fragmentary perspective view of a two-step button that physically engages with the rotary lockout member of FIG. 65 in the first pushed state according to an exemplary embodiment of the present invention.

Fragment of the two-step button of FIG. 68 in which the rotary lockout member engages the waveguide assembly anti-rotation wheel in the second depressed state according to the exemplary embodiment of the invention. It is a typical perspective view.

FIG. 3 is a fragmentary perspective view of a rotating lockout member and a double-edged blade adjacent to but not engaged with a waveguide assembly anti-rotation wheel according to an exemplary embodiment of the invention.

FIG. 7 is a fragmentary perspective view of a rotary lockout member and a double blade of FIG. 70 that engages a waveguide assembly anti-rotation wheel according to an exemplary embodiment of the present invention.

It is a process flow diagram which shows the start procedure which concerns on embodiment of this invention.

It is a process flow diagram which shows a part of the starting procedure which concerns on embodiment of this invention.

FIG. 3 is a fragmentary enlarged perspective view of an exemplary embodiment of the end effector according to the invention from the distal end with the jaw in the open position.

FIG. 3 is a fragmentary enlarged perspective view of the end effector of FIG. 73 from below with the outer tube removed.

It is a fragmentary enlarged perspective view of the end effector of FIG. 73 from below having a cross section that traverses the jaw working plane through a waveguide.

FIG. 7 is a fragmentary enlarged side view of the end effector of FIG. 73, with the jaw in a partially open position.

FIG. 6 is a fragmentary enlarged side sectional view of the end effector of FIG. 73 having a cross section parallel to the jaw working plane from which the waveguide has been removed.

FIG. 7 is a fragmentary enlarged side elevation view of the end effector of FIG. 73.

It is a fragmentary enlarged side elevation view of the end effector of FIG. 78 in which the jaw is in a substantially closed position.

FIG. 3 is a fragmentary enlarged perspective view of the end effector of FIG. 73 in which the jaw is partially closed.

FIG. 3 is a fragmentary enlarged side sectional view of the end effector of FIG. 73 having a cross section in the jaw working plane.

It is an enlarged perspective view of the connecting spool of the end effector of FIG. 73.

FIG. 3 is a fragmentary enlarged cross section of the end effector of FIG. 73 having a cross section orthogonal to the longitudinal axis of the waveguide at the jaw pivot.

FIG. 3 is an enlarged perspective view of the jaw liner of the end effector of FIG. 73 as viewed from below the distal end.

FIG. 8 is an enlarged cross-sectional view and perspective view of the left side portion of the jaw liner of FIG. 84 located within the left side portion of the jaw portion of FIG. 73 as viewed from below the proximal end.

FIG. 6 is a fragmentary enlarged perspective view of the TAG mounting dock and the waveguide mounting dock of the handle assembly of FIG. 46 from which the right half of the handle body, the anti-rotation wheel, and the jaw force limiting assembly have been removed.

FIG. 6 is a fragmentary enlarged perspective view of the handle assembly of FIG. 86 with the outer tube removed and only the right half of the anti-rotation wheel removed.

It is a perspective view of the torque wrench which concerns on embodiment of this invention.

FIG. 7 is a partially enlarged perspective view of the end effector of FIG. 73, in which the jaw is in the closed position and the liner is worn.

FIG. 3 is a right elevation view of the handle assembly of FIG. 3, according to an exemplary embodiment, in which the right shell half portion is removed, the control mechanism is shown, and the trigger is inactive.

FIG. 90 is a right elevation view of the handle assembly of FIG. 90 in which the trigger is in the partially actuated state.

Petitioner Therabody Ex-1004, 1244

FIG. 90 is a right elevation view of the handle assembly of FIG. 90 with the trigger fully actuated.

FIG. 3 is a partially enlarged perspective view of a tube stop assembly according to an exemplary embodiment of the present invention.

FIG. 9 is a graph showing blade deflection characteristics associated with the tube stop assembly of FIG. 93.

FIG. 3 is a side perspective view of a half of a spindle assembly according to an exemplary embodiment of the present invention.

FIG. 3 is a perspective view of a bobbin portion of a waveguide assembly according to an exemplary embodiment of the present invention.

It is a partial perspective view of the bobbin of FIG. 96 connected to a waveguide.

FIG. 3 is a side perspective view of a yoke of a jaw control assembly according to an exemplary embodiment of the present invention.

FIG. 3 is a partial horizontal cross-sectional view of a proximal portion of a waveguide assembly and a distal portion of a handle according to an exemplary embodiment of the invention.

FIG. 3 is an exploded lower perspective view of another exemplary embodiment of the jaw and liner according to the present invention.

FIG. 3 is a partially disassembled perspective view of a jaw assembly according to the present invention in the first mounting step.

FIG. 3 is a partially disassembled perspective view of a jaw assembly according to the present invention in the second mounting step.

FIG. 3 is a partially disassembled perspective view of a jaw assembly according to the present invention in a third mounting step.

FIG. 3 is a partially disassembled perspective view of a jaw assembly according to the present invention in the fourth mounting step.

FIG. 3 is a partial side perspective view of an alternative exemplary embodiment of a handle spindle rotation avoidance assembly according to the present invention.

FIG. 3 is a partial side perspective view of another alternative exemplary embodiment of a handle spindle rotation avoidance assembly according to the present invention.

FIG. 4 is a partially enlarged cross-sectional view of a portion of the battery assembly of FIG. 4, wherein another exemplary embodiment of the invention exposes the underside of the multilead battery terminal and the interior of the shell half.

In this embodiment, a card edge connector is used to connect the contacts of the multilead battery terminal to one or more circuit boards.

FIG. 3 is a partial perspective view of an exemplary embodiment of a TAG assembly connector according to the present invention.

FIG. 3 is a partial side perspective view of an exemplary embodiment of a battery connection portion of a flexible harness according to the present invention.

It is a partial lower perspective view of the exemplary embodiment of the buzzer portion of the flexible harness according to the present invention.

[0021]

It should be understood that the disclosed embodiments are merely exemplary of the invention which can be embodied in various forms.

Accordingly, the particular structural and functional details disclosed herein should not be construed as limiting, as a basis for the claims and substantially any suitable detail. It should be construed as a representative basis for teaching those skilled in the art to adopt the present invention in various structures.

Petitioner Therabody Ex-1004, 1245

Moreover, the terms and expressions used herein are not intended to be limiting, but rather to provide an understandable explanation of the invention.

[0022]

Prior to the disclosure and description of the present invention, it should be understood that the terms used herein are for purposes of illustration only and are not intended to be limiting.

In this document, as used herein, "a" or "an" is defined as one or more.

As used herein, the term "plurality" is defined as two or more.

As used herein, the term "another" is defined as at least one or more of the second.

As used herein, the terms "include" and / or "have" are defined as provided (ie, an open (unrestricted) expression).

As used herein, the term "concatenated" is defined as being connected, although not necessarily direct and not necessarily mechanical.

Terms such as first and second, upper and lower, etc. refer to one entity or action from another entity or action to any actual such relationship or order between such entities or actions. Not necessarily required or meant, but may be used merely to distinguish.

The terms "equipped", "equipped" or other variants are not explicitly listed or have been explicitly listed, for example, in a process, method, product or appliance comprising a list of elements, not only those elements. It is intended to cover non-exclusive inclusion so that it may include other elements specific to a process, method, product, or appliance.

An element that precedes "with" does not preclude the presence of additional identical elements in the process, method, product, or device that comprises the element, without further limitation.

[0023]

As used herein, the term "about" or "approximately" applies to all numbers, whether explicitly stated or not.

These terms generally refer to a numerical range that one of ordinary skill in the art would consider equivalent to the listed values (ie, having the same function or result).

In many examples, these terms may include numbers that are rounded to the nearest significant digit.

It should be understood herein that the term "longitudinal" means the direction corresponding to the extending direction of the object being described.

[0024]

Embodiments of the invention described herein are some of the ultrasonic cutting devices described herein, most of which, along with one or more conventional processors and predetermined non-processor circuits and other elements. It will be appreciated that, or may be provided with a unique stored program instruction that controls one or more conventional processors performing all functions.

Non-processor circuits may include, but are not limited to, signal drivers, clock circuits, power circuits, and user input / output elements.

Alternatively, an application-specific integration in which some or all functions are performed by a state machine that does not have a stored program directive, or some combination of each function or a given function is performed as custom logic. It can be performed in a circuit (ASIC) or field programmable gate array (FPGA).

Of course, a combination of these approaches can also be used.

Accordingly, methods and means for these functions are described herein.

[0025]

As used herein, the terms "program", "software application", etc. are defined as a sequence of instructions designed to be executed on a computer system.

Petitioner Therabody Ex-1004, 1246

A "program", "computer program" or "software application" is a subroutine, function, procedure, object method, object implementation, executable application, applet, servlet, source code, object code, shared library / dynamic load library and / or it may include other sequences of instructions designed to be executed on a computer system.

[0026]

INDUSTRIAL APPLICABILITY According to one embodiment, the present invention provides a lightweight, handheld, cordless, battery-powered surgical ablation cutting device powered and controlled by a component that fits perfectly within the handle of the device. Overcome the challenges of prior art, set-top boxes and shielded cords are completely eliminated.

This handheld device allows the surgeon to retain the surgeon to a still life without the need for external power, and in particular due to the presence of the cord, or to limit the surgeon's range of movement during the surgical procedure. It makes it possible to perform ultrasonic cutting and / or cauterization in any surgical procedure without fail.

[0027]

Ultrasound surgical equipment

[0028]

Here, an exemplary device according to an embodiment of the present invention will be described.

Referring to FIG. 3, an exemplary cordless ultrasonic surgical ablation assembly 300 is shown.

The assembly 300 of the present invention has three main components: (1) battery assembly 301, (2) ultrasonic cutting blade and waveguide assembly 304 (only its proximal portion is shown in FIG. 3). Can be described as having a handle assembly 302 with, and (3) oscillator and oscillator ("TAG") assembly 303.

The handle assembly 302 and the ultrasonic cutting blade and waveguide assembly 304 are pre-connected but rotatable independently of each other.

According to one embodiment of the example, the battery assembly 301 is a battery pack that is rechargeable, reusable, and has a regulated output.

In some cases, the battery assembly 301 facilitates user interface functionality, as described below.

The handle assembly 302 is a disposable unit having a battery assembly 301, a TAG assembly 303, and a mounting bay or dock for an ultrasonic cutting blade and a waveguide assembly 304.

The handle assembly 302 also houses various indicators including, for example, a speaker / buzzer and a start switch.

[0029]

The TAG assembly 303 is a reusable unit that produces high frequency mechanical action at the distal output.

The TAG assembly 303 is mechanically coupled to the ultrasonic cutting blade and waveguide assembly 304 to generate motion at the distal output or cutting blade of the ultrasonic cutting blade and waveguide assembly 304 during operation of the device. ..

In one embodiment, the TAG assembly 303 also provides a visual user interface, for example through red / green / blue (RGB) LEDs.

As such, the visual indicator of battery status is not located on the battery, as is not seen elsewhere, and is therefore remote from the battery.

[0030]

The ability of the present invention to provide all of the required components of an ultrasonic cutting tool in a handheld package is that almost all of the device components in a very expensive and heavy desktop box 202, as shown in FIG. It provides a great advantage over prior art devices, including the expensive tether 208 between the handpiece 112 and the desktop box 202 of the device that accommodates and most notably is bulky and impedes the movement of the operator.

Petitioner Therabody Ex-1004, 1247

Further, the code 208 needs to move back and forth between the sterile field containing the device and the non-sterile area containing the oscillator.

The presence of such a connection between the sterile and non-sterile parts increases the likelihood that the sterile field will be contaminated and also blurs the boundary between the sterile and non-sterile parts.

[0031]

According to the present invention, the three components of the handheld ultrasonic surgical ablation assembly 300 can be advantageously and quickly separated from one or more of the other.

Each of the three components of the system can be sterilized and completely maintained in the sterilized field during use.

Since each part can be separated from one or more other components, the present invention is one or more parts that are single-use items (ie, disposable) and one that is multiple-use items. (ie, it can be sterilized for use in multiple surgical procedures).

4 and 5 show the components of the battery assembly 301 and the TAG assembly 303 that are separated from the entire composite assembly shown in FIG. 3, respectively.

The details of each of the components are shown and described throughout the rest of the specification.

Those details are, among other things, the physical aspects of each component as part of the individual and handheld ultrasonic surgical ablation assembly 300, the individual, and the electrical function as part of the entire assembly 300. Includes sex and ability, and how to use each component individually and as part of the entire assembly 300, assembling, sterilizing and others.

According to a further embodiment of the invention, each of the components 301, 302/304, 303 is approximately equal to the total weight.

Each of these components 301, 302/304, 303 is balanced so that they have approximately the same weight.

The handle 302 projects so as to support the operator's hand, which allows the user's hand to freely operate the control of the device without the need to apply weight.

This overhang is set very close to the center of gravity.

This, combined with a tripartite assembly configuration, favors a balance center that provides a very natural and comfortable sensation for the user operating the device throughout the handheld ultrasonic surgical ablation assembly 300. Provided.

That is, when held in the user's hand, the entire assembly 300 does not tend to tilt forward or backward or left or right, and the waveguide is held parallel to the ground with very little effort by the user. It remains relatively dynamically balanced.

Of course, the fixtures can be placed very easily at angles that are not parallel to the ground as well.

[0032]

FIG. 6 provides an overall block schematic illustrating the communicative coupling between the battery assembly 301, the handle assembly 302, and the TAG assembly 303.

FIG. 6 also shows various power and communication signal paths 601a-n between the battery assembly 301 and the handle assembly 302.

The handle assembly 302 provides additional power and communication signal paths 602a-n following the TAG assembly 303.

To give a few examples, the paths 601a to n of these power and communication signals are 1.

A buzzer that provides an audible user interface, such as an audible frequency signal.

2. A user interface that operates the ultrasonic output with the minimum amplitude, for example, a minimum button such as an input signal of 0 to 3.3 V and 0 to 25 mA.

A user interface that activates the ultrasonic output at maximum amplitude, eg 0-3.3V and 0-25mA maximum button 4.

A first output voltage that is the output from the battery assembly 301 to the TAG assembly 303 that powers the TAG assembly 303 to generate oscillator drive signals, eg 0-10 volts and 0-6A outputs. Vout) 5.

Earth or system common connection 6.

Petitioner Therabody Ex-1004, 1248

2. Second output voltage (Vbatt), which is the voltage output from the battery to power the system.

1. First communication line (Comm +) that provides differential half-duplex serial communication between battery assembly 301 and TAG assembly 303.

2. Second communication line (Comm-) that provides differential half-duplex serial communication between battery assembly 301 and TAG assembly 303.

When connected to the handle assembly 302, it facilitates the operation of the present wire that initiates power supply to the battery assembly 301 and thereby the entire system.

[0033]

According to embodiments of the present invention, the power and communication signal paths 601a-n described above are the first multilead handle terminal assembly on the handle assembly 302 (the battery assembly 301 is electrically coupled to the handle assembly 302). It is provided through a flex circuit that connects between and a second multilead handle terminal assembly on the handle assembly 302, where the TAG assembly 303 is electrically coupled to the handle assembly 302.

[0034]

Ⅰ.

バッテリアセンブリ

[0035]

FIG. 7 is a block circuit diagram schematically showing the battery assembly 301 and the internal components contained therein.

The battery assembly 301 generally includes one or more batteries 701, a battery protection circuit 702, and a battery controller 703.

Various power and signal paths 704a-n extend between the battery 701 and the battery protection circuit 702.

Power and communication signal paths 706a-n extend between the battery protection circuit 702 and the battery controller 703.

The power and signal paths 704a-n and 706a-n may be simple direct connections between the components or may have other circuit components (not shown).

The power and communication signal paths 706a to n are particularly 1.

2. SMBus clock signal (SCLK) used for communication between the battery controller 703 and the battery fuel gauge / protection circuit 702.

2. SMBus data signal (SDAT) used for communication between the battery controller 703 and the battery fuel gauge / protection circuit 702.

When the battery assembly 301 is in the charger, it has an enable switch that turns off the battery controller 703 by removing power to switch the power supply within the battery controller 703 when it is grounded.

[0036]

a .

battery

[0037]

The battery 701 includes, in one embodiment, a 4-cell lithium ion polymer (LiPoly) battery.

Of course, the number of batteries that can be used is not limited, and the batteries do not have to be LiPoly type.

Conveniently, the manufacturer can manufacture a LiPoly battery of almost any shape required.

Petitioner Therabody Ex-1004, 1249

However, these types of batteries must be carefully controlled during the charging process, as overcharging of LiPoly batteries can quickly damage the batteries.

Therefore, these batteries must be carefully charged.

For this reason, the present invention uses the battery protection circuit 702 of the present invention.

[0038]

b .

Battery protection

[0039]

The battery protection circuit 702 controls the charging and discharging of the battery 701 and provides battery protection and a "fuel gauge" function or battery power monitor.

More specifically, the battery protection circuit 702 provides monitoring and protection for overvoltage, undervoltage, overtemperature and overcurrent during both the charging and discharging stages.

When overcharged, the LiPoly battery can not only be damaged, but can also ignite and / or leak.

The battery protection circuit 702 provides multiple levels of protection.

For example, the battery protection circuit can provide three levels of protection for each of current, voltage and temperature.

This protection is redundant, using the active element for the first and second protection levels and the passive or redundant element for the higher third protection level.

In one example, the multiple levels of protection provided by the battery protection circuit may include battery assembly elements (eg, PTC devices, thermal fuses, current fuses and resettable elements).

[0040]

The "fuel gauge" function of the battery protection circuit 702 limits both continuous and instantaneous voltage and current discharges on the output of the battery assembly 301.

While charging the battery 701, the fuel gauge can limit the level of current supplied to the battery 701.

Alternatively, the battery charging unit can perform this current limiting function.

The fuel gauge also monitors the temperature and shuts down the battery assembly 301 when the temperature of the battery 701 exceeds a predetermined temperature.

The fuel gauge can determine how much total energy remains in the battery 701, how much was charged last time, specify the internal impedance of the battery 701, specify the output current and voltage, and so on.

Using this data, the invention can determine the "state of charge" (SOC) of battery 701 based on some of the chemical attributes of battery 701, in particular, through the use of the algorithms of the invention. , It is possible to identify when sufficient battery capacity is exhausted to safely perform a surgical procedure as described in more detail below.

The system is programmed to contain information about the amount of energy required to safely complete a single cutting and ablation procedure.

With this stored information, the fuel gauge will have this minimum amount of energy and the current battery charge status at startup to initiate cutting / cauterization or at the time of performing a new cutting / cauterization during the procedure. To compare.

If the minimum threshold is not met (eg 1000 joules), the device cannot continue to operate.

[0041]

In addition, it is important to ensure that the charge states of all batteries are equal in order to compensate for maximum energy delivery, efficiency and avoid overcharging of individual batteries in the battery pack.

Petitioner Therabody Ex-1004, 1250

Battery voltage is an index that appropriately indicates SOC.

Therefore, during charging, the voltage of the batteries is monitored, and the amount of current delivered to each battery is adjusted until the voltages of all the batteries become equal.

At this point, the batteries are balanced.

[0042]

In addition, by mounting the thermista inside the battery pack and placing it in the vicinity of the battery (eg, between two batteries, between all adjacent batteries, or next to either side of the battery), the battery. An external device (eg, a battery charger) for measuring or monitoring the battery temperature in the pack can be obtained.

[0043]

c .

バッテリコントローラ

[0044]

11 is a block circuit diagram schematically showing the internal components of the battery controller 703 of FIG. 7. FIG.

As previously shown in FIG. 7, the battery controller 703 is supplied with power and signals through communication signal paths 706a-n.

Further, the battery controller 703 also supplies output power and signals along the power and communication signal paths 601a-n.

According to one embodiment of the present invention, the battery controller 703 includes a power supply 1102, an SMBus separation switch 1104 (s), a microcontroller 1106, an audio driver 1108, a user button interface 1110, and a serial communication transceiver. It has 1112 and a back converter 1114.

[0045]

The power supply 1102 is composed of two subsystems.

That is, the back-switching power supply first reduces the unadjusted battery voltage to a substantially constant DC voltage (eg, 4VDC).

A second linear power supply diminishes the DC voltage to the level required for the low voltage elements used in the device (eg 3.3 VDC).

By performing this two-step voltage reduction, low battery consumption is guaranteed.

The switching power supply is inherently more efficient than a conventional linear power supply, but tends to have higher output voltage ripple (noise) and can be problematic.

Therefore, the voltage is first diminished using a high-efficiency switching regulator and then sent to the linear regulator.

The linear regulator produces a better filtered noise-free voltage into the digital element of the circuit.

The output from the switching regulator is used to supply the output to the audio amplifier.

The voice amplifier requires a higher voltage and tends to generate additional noise, which is not desirable in the digital part of the circuit.

[0046]

The SMBus separation switch 1104 (also called a relay) sends the voltage generated by the operation of the battery protection and charge control circuit, which is ON during the charging process, to other battery circuits that are OFF during the charging process. Is provided as a way to avoid.

Petitioner Therabody Ex-1004, 1251

In an exemplary embodiment, these used switches are optically driven and turned on by a PRESENT circuit (see 601a-n) in the apparatus.

[0047]

The microcontroller 1106 is a highly integrated arithmetic unit that controls the functions of the battery controller 703.

In an exemplary embodiment, the microcontroller 1106 stores and executes software that enables the operation of the device.

Considering the requirements imposed by the operation of the device, the microcontroller 1106 is state-of-the-art, including, for example, two independent microcontroller cores in one package.

In this embodiment, the main core executes a main program that controls the device.

Once the device is activated, sampling of the various parameters required to ensure proper and efficient operation is monitored by the second core shown in FIG. 11 (eg, Control Law Accelerator (CLA) 1116). To.

The CLA can also be used to provide a proportional integral differential ("PID") control loop operation that requires extremely high computational power.

Therefore, using this configuration makes it possible for one core of the device to run state machines at extremely high speeds, maintaining overall and rapid control of the system, while at the same time maintaining a second core. This makes it possible to handle heavy calculations for data acquisition and control loop handling.

Preferably, the microcontroller 1106 itself becomes a low power consumption application, thus making a 3.3 volt unit available.

The internal oscillator allows the device to be started without the need for external (power consuming) elements.

It is also possible to configure the microcontroller 1106 to include an internal non-volatile memory unit for storing programs and diagnostic information.

The battery microcontroller 1106 monitors the input voltage, output voltage, output current, and battery temperature and back temperature to allow overall control of the voltage converter function.

[0048]

The audio driver 1108 produces a signal that ultimately drives the buzzer 802 located within the handle assembly 302.

In an exemplary embodiment, the audio driver 1108 is a simple but powerful two-stage Class A square wave amplifier.

The amplifier is directly output supplied from a back switching power supply (eg, 4VDC), thereby guaranteeing maximum output capacity.

The amplifier can drive a voice speaker (no internal driver).

By supplying the output from the back-switching power supply to the audio driver 1108, the noise generated from the audio amplifier is not sent to the supply rails of the digital and analog elements of the device, which guarantees noise-free operation. ..

If adjustment is required, the ability to change volume is provided by changing a single resistor.

[0049]

The user button interface 1110 adjusts the signals received from the minimum 804 start switch and the maximum 806 start switch housed in the handle assembly 302.

In an exemplary embodiment, the user button interface 1110 can operate to continuously measure the impedance of the start switch in order to avoid erroneous start-up, such as when fluid enters the button.

The battery controller 703 measures the impedance of the switch (s) and does not start the system until the detected impedance falls below a predetermined threshold.

With such a configuration, there is no erroneous start due to fluid intrusion.

This is because fluid intrusion is often detected as a phenomenon in which the impedance in the switch (s) is higher than the impedance in the fully closed switch.

Petitioner Therabody Ex-1004, 1252

The PRESENT line also works on a similar principle, ensuring that the battery is turned on after the PRESENT line is closed through a sufficiently low impedance.

This is done so that the battery pack does not erroneously start when the PRESENTP pin is exposed to any conductive fluid.

In this exemplary embodiment, the user button interface 1110 operates by injecting a known current level through the switch line.

When the button is opened (no activation), the current source maximizes its voltage output and this voltage is measured by the microcontroller 1106.

When the switch is closed, the current source regulates its voltage output to produce the targeted programmed current.

When the button operates optimally at low impedance, the voltage output is low.

However, if fluid enters the button, the impedance seen by the current source will be higher, and a corresponding voltage higher than the voltage for the closed button proportional to it will indicate to microcontroller 1106 that it should not be started. Is done.

[0050]

In an exemplary embodiment of the circuit, a calibration current source is used.

This calibrated current source can be used to calibrate the programmable current source at startup and provide a more rigorous detection window.

Such calibration performed at device startup narrows the window or impedance range that is the range for detecting active startup.

This calibration is performed by switching the circuit of the impedance circuit to an accurate current source, measuring the voltage and calibrating the circuit.

During the device boot procedure, the battery controller can self-calibrate the boot button impedance sensing circuit, thereby accidentally due to true button closure (boot) and fluid contamination of the button (s). The impedance range required to distinguish it from the unexpected start-up signal that occurs is narrowed.

[0051]

The start button impedance is measured by passing a predetermined current level through the button line using a current source.

By measuring the voltage across the contacts, Ohm's law (ie, R = V / I) can be used to determine the resistance in the line.

At the time of calibration, two analog switches are used.

The first switch connects the microcontroller serial communication line to the programmable current source so that the current source can be controlled.

The second switch connects the output of the current source to a set of precision resistors.

The current flow is regulated by the microcontroller until a given voltage measurement (ie, calibration value) is achieved.

After adjustment, the first switch is toggled to connect the microcontroller to the SMBus line, and the second switch connects the current source to the start button (s) to resume normal operation.

[0052]

The microcontroller can switch the SMBus line and connect it to an analog switch or a major SMBus line.

As a result, the switch (non-SMBus) can function and at the same time the microprocessor can be connected to the SMBus line.

[0053]

In an exemplary embodiment, the serial communication transceiver 1112 allows the battery 301 to establish communication with the TAG 303 and an external device.

Petitioner Therabody Ex-1004, 1253

This communication can be used to obtain diagnostic or calibration information from the device.

The serial communication transceiver 1112 transmits and receives differential half-duplex communication between the battery controller 703 and the oscillator 904.

In addition to the software failure detection described above, the transceiver 1112 can detect the loss of hardware connectivity for failure detection.

An exemplary embodiment of the device used is configured to be compatible with USB communication for reliability, and this embodiment can be used in a differential mode for common mode noise rejection.

A full speed device is used (eg, up to 12 Mbit / s), taking into account the amount of data the battery 301 interacts with the TAG 303.

[0054]

It is possible for the system to detect and respond to many possible failure conditions.

The response may take the form of feedback to the user.

For example, if a stack switch state is present, the system may issue a failed state.

These conditions include the high / low boot switch improperly in the boot position when the system boots, or the high boot switch is booted but the low boot switch is not booted, or the usage cycle. There is a state where the high / low start switch is in the start position at the end.

Other failure conditions include inadequate motion feedback or the waveguide tip being stopped.

If low-amplitude and high-amplitude displacements are detected, both can result in shutdown.

Various failures are associated with TAG.

For example, when the output voltage becomes higher than a predetermined voltage upper limit, a failure state occurs.

If the microprocessor temperature rises above a predetermined range (eg, above approximately 100 ° C.), another failure condition occurs.

If the battery controller does not receive an appropriate acknowledgment from the TAG either before, at the start of the ultrasound, or after the start of the ultrasound, another failure occurs.

Some failure conditions are associated with the battery.

For example, a failure may be indicated if the battery charge falls below any of the predefined thresholds or if the load requires power that can be delivered by the system and the amplitude falls below the desired threshold. ..

Other battery failures include battery communication failure, battery microprocessor, fuel gauge, and / or regulator overheating conditions.

Communication system failures are obtained through TAG and / or battery.

There can also be a general system failure.

Failure may be notified if the CLA fails or malfunctions improperly.

Failures can also be signaled if the timers associated with the battery and TAG are not reset.

Failures can also be triggered due to software failures.

[0055]

Finally, in an exemplary embodiment, the back converter 1114 performs step-down voltage control to adjust the amplitude.

The back converter 1114 steps down the battery voltage to reduce the voltage sent to the TAG assembly 303 for ultrasonic output signal generation to the converter 902.

The microcontroller 1106 controls the output of the back regulator by varying or adjusting the pulse width of the input signal to the back converter (ie, pulse width modulation (PWM)).

Petitioner Therabody Ex-1004, 1254

An out-of-phase PWM input is used for minimal output ripple.

The device operates at 300 KHz for high efficiency with small inductors and capacitors.

The back converter 1114 is designed for polyphase synchronization to obtain the maximum efficiency possible.

Highly integrated elements are utilized in this design for small size and power consumption.

The device includes internal current protection, output current sensing, output and input voltage sensing and overtemperature protection.

The back converter 1114 is capable of high speed response and is capable of diminishing the voltage in the range of 2 VDC to 10.5 VDC.

[0056]

At the output of power supply 1102, various voltage levels are generated.

The various voltage levels are used to power the various battery controller elements shown in FIG.

By using the SMBus isolation switch (s) 1104, the connection from the SMBus line to the battery protection printed circuit board is disconnected during charging and when the bus is used for other purposes within the battery controller.

[0057]

As described in detail below, the battery controller 703 facilitates the user interface (eg, buzzer 802 and RGBLED906) and converts the output voltage and current output of the back oscillator 1114.

This output powers the TAG assembly 303 through at least one voltage output path (Vout) 601an.

[0058]

ＩＩ.
ハンドルアセンブリ

[0059]

FIG. 8 is a schematic block diagram of the handle assembly 302 shown in FIG.

The handle assembly 302 receives control and power signals through the attached power and communication signal paths 601a-n.

A second set of power and communication signal paths 602a-n connects to the TAG assembly 303 when attached to the handheld ultrasonic surgical ablation assembly 300.

As described in detail below, the handle assembly 302 contains the ultrasonic waveguide assembly 304, for example, by the operator using a two-step switch (introduced in FIG. 46) with a button 4608 and a trigger 4606. Provided are a portion of a pistol grip that grips and operates the entire handheld ultrasonic surgical ablation assembly 300.

According to one exemplary embodiment, the handle assembly 302 is a speaker / buzzer 802 capable of receiving a buzzer output signal from the battery assembly 301 through signal paths 601a-n, communicating a particular device state to the operator. It is equipped with a speaker / buzzer 802 capable of producing an audible output of, for example, 65db, which is particularly suitable.

These conditions are, for example, successful connection of the assembly components of the battery assembly 301 to the handle assembly 302, high, low, or normal operating modes, failure conditions, low battery, equipment overload, mechanical failure, electrical failure. And so on.

The handles also include a Min button switch 804 and a Max button switch 806, which, when activated, connect each button to (eg) ground, thereby producing ultrasonic output in either low or high displacement mode. Send a signal to the battery controller to start.

Petitioner Therabody Ex-1004, 1255

The handle assembly 302 also provides a pass interconnect for signals between the battery assembly 301 and the TAG assembly 303.

[0060]

The speaker / buzzer 802 and the Min button switch 804 and the Max button switch 806 are all part of the flex circuit of the handle assembly 302.

According to an exemplary embodiment of the invention, the buzzer 802 is held in place within the handle assembly 302 by a flexible material that projects outward beyond the edges of the buzzer 802.

This tab 10802 is shown in FIGS. 108 and 110.

The handle assembly 302 includes slot 11002 configured to accommodate the flexible material tab 10802 during assembly.

A fluid intrusion bya buzzer seal (eg, a structure in which the buzzer is joined into the handle assembly 802 by an adhesive on both sides of an acoustically transparent mesh, allowing sound to be emitted from the buzzer 802 and buzzer. The buzzer 802 is protected from fluid intrusion by the structure that avoids fluid intrusion into 802).

[0061]

I I I. TAG

[0062]

FIG. 9 is a block circuit diagram schematically showing the TAG assembly 303 of FIGS. 3 and 5 that houses the oscillator 902 and the oscillator 904.

The oscillator 904 converts the DC power from the battery controller 703 into a high voltage AC signal that drives the oscillator 902 that converts the electrical signal into mechanical motion.

[0063]

a .

Oscillator

[0064]

FIG. 10 is a block circuit diagram schematically showing the internal components of the oscillator 904.

According to one embodiment of the present invention, the oscillator 904 includes a power supply 1002, a serial communication transceiver 1004, a microcontroller 1006, a numerically controlled oscillator ("NCO") 1008, and a push / pull switching amplifier 1010. It has an output filter / matching network 1012, a motion bridge 1014, a feedback amplifier and a buffer 1016, an LED driver 1018, and, for example, an indicator 906 which is an RGB LED.

The power source 1002 receives power from the battery assembly 301 through the lines Vbatt and GND of the power signal paths 602a-n and outputs various voltages used to power the oscillator 904.

The serial communication transceiver 1004 here provides transmit and receive communication between the battery controller 703 and the oscillator 904 through the serial data link Com + / Com- of the communication signal paths 602a-n, but this communication is single. Can occur in series or in parallel through one line or through multiple lines.

[0065]

The microcontroller 1006 is a highly integrated arithmetic unit that controls the function of the oscillator 904, which is one of the two microcontrollers of the system and the other is part of the battery controller 703.

In an exemplary embodiment, serial data links (Comm + / Comm-) are present between two microcontrollers 1006, 1106 so that their operation can be communicated and coordinated.

Petitioner Therabody Ex-1004, 1256

The microcontroller 1006 of the TAG 303 controls the generation of a high voltage waveform that drives the piezoelectric vibrator 902.

The microcontroller 1006 of the battery assembly 301 controls the conversion of the DC voltage from the battery 701 to the lower DC voltage used by the TAG 303 when generating the high voltage AC for the oscillator 902.

The battery microcontroller 1106 regulates the DC output of the battery assembly 301 to control the amplitude of mechanical motion, and the TAG microcontroller 1006 controls the frequency of the signal driving the oscillator 902.

The battery microcontroller 1106 also processes the user interface and the battery protection circuit 702 monitors the battery 701 while the system is operating.

The microcontroller 1006 in the TAG 303 has a variable speed system clock.

The variable speed system clock is constantly adjusted when the device is operating in a high power state in order to keep the microcontroller 1006 in sync with the ultrasonic motion.

The microcontroller 1106 in the battery assembly 301 operates at a constant frequency in the high output state, regardless of the TAG clock.

Since the frequency of the system clock changes, the magnification in the TAG microcontroller 1006 changes with the change of the system clock, so that the serial communication between the microcontroller 1006 and the microcontroller 1106 is kept within an appropriate operating range. ..

[0066]

Direct digital compositing (DDS) is a technique used to generate periodic waveforms with an accurate output frequency that can be changed digitally using a fixed frequency source.

Numerically Controlled Oscillator ("NCO") 1008 is a signal source that uses DDS technology that can be run through hardware or software.

The fixed frequency input to the DDS is used to generate the clock for NCO1008.

The output is a series of values that generate a time-varying periodic waveform.

New output values are generated during each clock cycle.

[0067]

The DDS2200, which is shown in detail in FIG. 22, operates by calculating the phase component of the output waveform that is subsequently converted into amplitude by generating a new phase value at each clock period.

The phase value is stored in variable register 2202, which register is referred to herein as a "phase accumulator".

During each clock period, a fixed value is added to the number stored in the phase accumulator to generate a new phase value.

This fixed value is often referred to as a frequency control word or frequency tuning word as it determines the output frequency along with the clock frequency.

The value of the phase accumulator spans one cycle of the periodic output waveform from 0 degrees to 360 degrees, and the value rotates over 360 degrees.

[0068]

The value of the phase accumulator is supplied to the phase amplitude converter 2204.

In the case of a sine wave, the amplitude can be calculated using the inverse tangent of the phase value.

For high speed applications, converters typically use a look-up table to generate the amplitude from the phase value.

[0069]

In a DDS hardware implementation, the output of the amplitude converter is an input to a digital-to-analog oscillator (DAC) 2206 for generating an analog output signal fout.

Petitioner Therabody Ex-1004, 1257

The analog signal is usually filtered by a bandpass or lowpass filter to reduce unwanted frequency elements in the output waveform.

[0070]

As a first example, the value of the phase accumulator 2202 may be set to an integer from 0 to 359.

When the frequency tuning word is 1, the value of the phase accumulator 2202 is incremented by 1 for each clock period.

The value returns to zero when it reaches 359.

When the clock frequency is 360 Hz, the frequency of the output waveform is 1 Hz.

Therefore, the output is a series of 360 points during each 1 second interval of the output waveform.

When the frequency tuning word is changed to 10, the value of the phase accumulator is incremented by 10 for each clock period and the output frequency is 10 Hz.

Therefore, the output is 36 points for each period of the output waveform.

When the frequency tuning word is 100, the output frequency is 100 Hz.

In that case, the score is 3.6 for each output cycle.

Also, more precisely, some of the cycles of the output waveform have 3 points and some have 4 points.

The ratio of the number of 4-point cycles to the number of 3-point cycles is 0.6.

[0071]

As a second example, the value of the phase accumulator 2202 can be 10 bits.

The 10-bit number has 1024 possible values.

With 50 frequency tuning words and a clock frequency of 1 MHz, the output frequency is 50 × 1 MHz / 1024 = 48.828 kHz.

FIG. 23 shows what the output 2300 of the DAC 2206 and the output of the filtered DAC look like.

[0072]

If the frequency tuning word is 22, the output frequency is 22 × 1 MHz / 1024 = 21.484 kHz.

In this case, FIG. 24 shows what the output 2400 of the DAC 2206 and the output of the filtered DAC look like.

When power is first supplied to the oscillator, the state of NCO1008 is uncertain (or the output of NCO1008 is not at the proper frequency).

This can lead to improper operation of the microcontroller.

To ensure proper operation of the microcontroller, NCO1008 is not used to drive the clock frequency of the microcontroller when power is first applied.

A separate oscillator is used.

In one embodiment of the example, a separate oscillator is incorporated within the microcontroller.

By using this separate oscillator, the microcontroller initializes various memory arrangements inside the microcontroller and those in NCO1008.

Once the NCO1008 operates at the appropriate frequency, the microcontroller switches its clock source from a separate oscillator to the NCO1008.

[0073]

When the frequency tuning word is 400, the output frequency is 400 × 1 MHz / 1024 = 390.625 kHz.

In this case, FIG. 25 shows the output 2500 of the DAC 2206 and what the output of the filtered DAC looks like.

Petitioner Therabody Ex-1004, 1258

The output sometimes has 2 points, sometimes 3 points, for each cycle.

The waveform in FIG. 25 clearly shows that a filter is needed to obtain a clean sine wave.

[0074]

Referring again to FIG. 10, the push / pull switching amplifier 1010 converts the DC power from the battery controller 703 into a high voltage square wave.

The output filter / matching network is a passive filter that transforms a square wave from the switching amplifier 1010 into a suitable smooth sine wave for feeding the oscillator 902.

The motion bridge 1014 is a circuit that produces a feedback signal that is proportional to and in phase with the mechanical motion of the oscillator 902 and the waveguide assembly 304.

The feedback amplifier and buffer 1016 amplify and buffer the motion feedback signal determined within the motion bridge 1014.

As described in more detail below, the motion bridge 1014 allows the device to operate at a constant displacement / amplitude, changing the voltage as the load changes.

The motion bridge is used to provide amplitude feedback, and by using this type of feedback, ie motion feedback, the system can operate at a constant current.

[0075]

In one embodiment, the TAG assembly 303 includes one or more red / green / blue (RGB) LEDs 906 that can be used for a variety of warning and communication purposes.

For example, green can indicate that the device is functioning normally, while red indicates that the device is not functioning properly.

It should be noted that the arrangement of the LED 906 of the oscillator 904 shown in FIG. 9 is for illustrative purposes only.

In the present invention, it is assumed that the indicator can be placed anywhere in the TAG assembly 303.

[0076]

Through the exchange of communication between the handle assembly 302 and the TAG assembly 303, particularly between the speaker 802 and the LED906, the handheld ultrasonic surgical ablation assembly 300 of the present invention has a plurality of states associated with the ultrasonic surgical ablation assembly 300. To provide complete feedback to the operator during use.

Therefore, the feedback is generated from the handle and does not occur remotely.

For example, as described above, the speaker / buzzer 802 can provide an audible warning and an audible indicator of the working condition of the ultrasonic surgical ablation assembly 300.

A full class A or B amplifier (eg, a full amplifier or an ON / OFF square wave amplifier) can be used to provide a wider frequency range to perform different sound and / or audible messages.

Similarly, the LED 906 can provide a visual warning and visual indicator of the working condition of the ultrasonic surgical ablation assembly 300.

As an example, the LED 906 can provide an indication of the amount of power remaining in the battery 701 or an indication that there is not enough power to safely perform the surgical procedure.

For example, the first color of LED906 indicates a fully charged battery 701, while the second color indicates a partially charged battery 701.

Alternatively, various blinking patterns or constant lighting on the state of the LED 906 can provide a state indicator to the user.

The LED driver 1018 shown in FIG. 10 is an exemplary configuration that provides a constant current when the LED 906 is lit.

Importantly, all of the feedback indicators for the user are uniquely on the handheld device and require the user to stay away from the field of vision or within the range of distant feedback components outside the sterile field. not.

Petitioner Therabody Ex-1004, 1259

This eliminates the need for the physician to pay attention to a remote location from the surgical field to verify the nature of the feedback signal.

[0077]

However, if it finds useful to relay or transmit any of the feedback notifications to a device outside the handheld device, implement the circuit within the oscillator or battery board (s). A radio frequency link (or other form of communication link) can be provided at the device to download, transfer or transmit user interfaces, diagnostics or other related data from the handheld device to the external device.

In this way, the external device allows surgical staff, etc., who are not inside the surgical field or in close proximity to the handheld device, to monitor the procedure, similar to what a physician receives. You will be able to receive notifications or information.

The external device may also serve as a valuable backup source or data log for storing information about the use and diagnosis of the handheld device.

The external device can also be used to provide a variety of data processing or software applications or tools that are more powerful than can reasonably be performed within the handheld device.

For example, the external device can provide an analysis result or a diagnostic result from the information received from the handheld device.

It is also possible to provide bidirectional communication to the handheld device and the external device, which may advantageously reprogram the internal software of the handheld device or command the handheld device. Or the control can be issued in an advantageous manner.

[0078]

b .

Oscillator

[0079]

The oscillator 902 is an electromechanical device that converts an electrical signal into physical motion.

In a broader sense, the oscillator 902 is sometimes defined as any device that transforms a signal from one form to another.

A similar oscillator device is an audio speaker that converts electrical voltage fluctuations representing music or speech into mechanical cone vibrations.

The speaker cone then vibrates air molecules to produce sound energy.

In the present invention, a drive wave 1400 (described below) is input to oscillator 902, which in turn imparts its electrical input to waveguide 1502 (described below). Convert to physical output.

As shown with respect to FIG. 15, this motion establishes a standing wave on the waveguide 1502, resulting in motion at the ends of the waveguide 1502.

For the purposes of the present invention, the oscillator 902 is a piezoelectric device that converts electrical energy into mechanical motion.

[0080]

As is known, the crystal of a piezoelectric oscillator stretches when a voltage is applied.

In the structure of the oscillator according to the present invention, for example, as shown in FIG. 55, the crystal is clamped in the crystal stack 5502.

See also FIGS. 54 and 56-58.

The clamp bolt 5504 in this configuration acts as a spring when set to precompress the crystal stack 5502.

Petitioner Therabody Ex-1004, 1260

Thus, when the crystal stack 5502 is extended by distributing voltage over the stack 5502, the clamp bolt 5504 returns the stack 5502 to the pre-compressed initial position (ie, the stack 5502 retracts).

Alternatively, the clamp bolt 5504 can be rotated on the stack 5502 so that it is not pre-compressed, in which case the bolt is still as a spring to pull the return mass towards its initial position. It works.

The exemplary configuration of the oscillator may be a so-called Langevin oscillator, a bolt clamp Langevin oscillator, or a bolt clamp sandwich type oscillator.

[0081]

When the ultrasonic oscillator vibrates, a standing wave is established at the distal portion of the oscillator.

This standing wave extends along the oscillator 902 and the waveguide 1502 to indicate a node (minimum oscillation point) and antinode (maximum oscillation point).

The placement of these nodes and abdomen is important.

For example, the blade portion 7304 is arranged on the abdomen because it is desired to maximize the vibration characteristics here.

The same applies to the ultrasonic waveguide connecting portion 5004 of the transducer 902 at the most distal end, and it is desired that the maximum vibration characteristic is coupled into the waveguide 1502.

In an exemplary embodiment of the oscillators shown in FIGS. 54-58, there is a node (a point where vibration is minimized) at the point where the oscillator is connected to the TAG assembly 303.

Such a configuration is advantageous because it is not desirable to apply vibration to / inside the TAG assembly 303.

[0082]

In the oscillator 902, gradually reducing the diameter is called a gain step.

This is because the downstream vibration characteristics increase as the circumference diameter decreases.

In the cross-sectional view of FIG. 54, for example, two gain steps can be confirmed between the crystal stack 5502 and the ultrasonic waveguide connecting portion 5004.

Further, in the same drawing, the flange 5450 of the oscillator 902 is also shown.

The flange 5450 is a contact point between the oscillator 902 and its housing.

The contact 5450 is arranged at the node of the oscillator 902.

[0083]

In another exemplary embodiment of the oscillator, 902, the crystal stack 5502 is displaceable, and such displacement allows for a more efficient system.

More specifically, by moving the crystal stack 5502 more proximally, the gain step adjacent to the crystal stack 5502 is moved more proximal to the node, which increases the overall gain of the system.

The required displacement of the crystal decreases with increasing gain.

The farther the crystal is from the node, the less the contribution of the crystal to the output handling capacity.

Therefore, it is desirable to provide the nodes in the crystal stack and as close as possible to the gain step.

If more than one crystal is provided on one side of the node, these crystals will function in series, which will increase the overall displacement.

The farther the crystal is from the node, the less the contribution of the crystal to the displacement due to the distance of the crystal from the node.

When crystals are placed on either side of the node, these crystals work in parallel to increase the power capacity of the system, but not the overall displacement.

Petitioner Therabody Ex-1004, 1261

Therefore, this configuration reduces the degree to which the crystal is driven to obtain the same output.

Since the loss increases with the square of the degree (current) that drives the crystal, the efficiency becomes higher when the current decreases.

The amplitude vs. power curve shows a typical square relationship.

From this, it can be seen that in a system with limited space such as TAG, the maximum gain can be obtained from the system by such a configuration.

Under high driving conditions, the sensitivity to loss in the crystal increases.

However, the gain increase here eliminates the need to drive the crystal close to the maximum output, thus avoiding this sensitivity.

It is known that the higher the output through the dielectric loss, the more heat is generated.

Such heat results in depolarization and frequency shifts that can result in changes in capacitance, resulting in the node moving away from normal support points (s) and resulting in reduced output. However, unwanted heat is generated in other unpredictable locations, which further exacerbates this problem.

Further, with appropriate wiring, it becomes possible to selectively drive only a part of the crystal stack, and the efficiency at a low load is increased.

[0084]

The oscillator 902 of the present invention is housed in a cylindrical casing 5430.

An opening is provided at the distal end of the cylindrical casing 5430, which allows the horn 5002 to project.

The oscillator 902 also has two conductive rings 5406 and 5408.

These conductive rings 5406 and 5408 surround the oscillator and carry the electrical signal from the oscillator 904 to the oscillator 902.

In an exemplary embodiment, the rings 5406 and 5408 are a single mechanical component, configured as a flat portion by either stamping or machining, resulting in a bent leg in the correct form.

Alternatively, the leg may be a second portion pressed or soldered into the flat ring.

These series of rings / legs are integrally molded into the distal housing portion 5434 of the oscillator housing.

This integral molding is insufficient to obtain an airtight seal.

Therefore, a receiving hole is formed at a position where the ring leg portion exits from the plastic, and an airtight seal can be obtained by filling the receiving hole with an embedding material.

Alternatively, the leg may be a round needle.

In such a case, a seal can be obtained by providing an o-ring between the leg and the receiving hole.

The electrodes 5802 and 5804 of the oscillator crystal stack 5502 can be formed in a spade-type or pin-type connector shape, which solders the electrical connection between the oscillator and the leg. It will be possible to do without.

As a result, manufacturing is simplified and there is no need to expose the legs to soldering heat, which can cause imperfect seals.

A part of the connector is shown in FIGS. 54 to 58, but is best shown in FIG.

The oscillator 902 needs to be held by the flange 5450.

The flange 5450 is arranged in a vibration-free node.

The oscillator 902 also needs to be rotationally locked to its housing, such locking can also be achieved by standard key features (eg, those shown in FIG. 55), or by four flat portions. It is also possible to do it.

The use of flats makes it possible to increase the wall thickness of the housing in the contact ring region, so that more portion of this housing structure can be repeatedly fed into the sterility cycle.

Petitioner Therabody Ex-1004, 1262

In an exemplary embodiment, the support flange is compressed against an o-ring 5452 supported by a distal housing portion 5434 to form a seal between the oscillator horn 5002 and the housing 5430.

In order to sufficiently compress this seal, it is necessary to forcibly press the flange 5450 of the oscillator 902 against the o-ring 5452.

A pair of amphoteric pushers 5454 are extended into the distal housing portion 5434 to press on the inner surface of the flange 5450, allowing the assembly to be completed and applying positive pressure through the elastomer grommets.

In an exemplary configuration, a pair of pushers are used to fit into the smaller diameter portion of the horn.

This is because the single part needs to have clearance on the crystals and electrodes, which forces the entire housing diameter to be much larger.

Having these pushers with crash pin features makes it possible to connect the pushers together for easier installation.

The geometry of the pusher locks the pusher rotationally into the keying feature of the housing.

Further keying features on the proximal end of the pusher allow the proximal housing portion 5432 to be keyed onto the assembly of the oscillator 902, whereby the clearance within the proximal housing portion 5432 is reduced to the electrodes 5402 and the oscillator 902 of the oscillator 902. Aligned with 5404.

Engagement of the proximal housing section 5432 with the distal housing section 5434 by either adhesive or welding or other connecting means is performed with sufficient pressure to feed the pusher into the grommet in the positive direction, resulting in. The pusher is pressed onto the flange 5450, the o-ring 5452 is pressed between the flange 5450 and the distal housing portion 5434, and at the same time a seal is formed and the flange 5450 is supported by the elastomers on both sides. The oscillator 902 and the housing 5430 are acoustically coupled.

Alternatively, the proximal housing portion 5432 and the distal housing portion 5434 may be connected by screws, and the fastening of the screws compresses the above-mentioned stack portion.

According to another embodiment, another elastomer seal can be provided between the rings 5406 and 5408 and the housing 5434 to achieve the same result without the need for insert molding of the contact ring.

[0085]

As described in more detail below, the oscillator 902 is held within the TAG assembly 303 by a spiral ring or other holding clip 5442 mounted in a groove within the distalmost portion of the distal housing portion 5434. .

A ring made of a lubricating material (for example, PTFE) is provided between the distal housing portion 5434 of the oscillator 902 and the lower housing portion 5030 of the oscillator 904, and the ring reduces rotational friction.

Friction reduction in this area is important.

This is because it is this force-supporting surface that holds the TAG assembly 303 within the handle 302 and compresses the seal around the electrical connection between the TAG assembly 303 and the handle 302.

[0086]

IV.

Signal path

[0087]

FIG. 12 is a block diagram showing a signal path between the battery assembly 301 and the TAG assembly 303.

Further described below, the design characteristics of the signal path and interconnect circuit elements are said to protect the signal integrity and efficiency of the components in this critical and fragile connection between the power supply and the signal generation circuit. Partially determined by a significant purpose.

[0088]

Petitioner Therabody Ex-1004, 1263

First, the DC-DC diminishing converter 1202 lowers the voltage from the battery 701 from the first voltage to the second lower voltage.

The DC-DC diminishing converter 1202 has a multi or variable phase back converter 1114 and a battery microcontroller 1106 (depending on the amount of power required), both of which are in the battery assembly 301 in FIG.

The battery microcontroller 1106 controls the back converter 1114 to regulate the DC voltage supplied to the TAG assembly 303.

The back converter 1114 and the microcontroller 1106 together perform a DC-DC conversion function within the battery assembly 301.

In an exemplary embodiment of the invention, a two-phase back converter 1114 is used.

Another exemplary embodiment can utilize a back converter with additional phase.

In such cases, phase limitation may be employed.

The number of phases used can vary dynamically to operate the converter with optimal efficiency to be considered for battery-powered devices.

In other words, when smaller output power is required, the power loss into the converter can be reduced by reducing the number of active phases.

[0089]

Originally, the oscillator printed circuit board is a two-sided type in that circuit elements are provided on both sides of the board.

In an exemplary embodiment, the power circuit element is mounted on the upper side of the PCB and the digital element is mounted on the lower side of the substrate.

A solid main plate separates both sides.

Advantageously, by thus isolating the high voltage power circuit from the logic circuit, the logic circuit is effectively cut off from harmful high voltage noise that may exist in the power circuit.

[0090]

The DC output voltage from the battery assembly 301 powers the push / pull switching amplifier 1010 of the TAG assembly 303, which converts the DC signal into a high voltage AC signal.

The TAG microcontroller 1006 controls the amplifier 1010.

The output voltage of the push-pull switching amplifier 1010 is generally a square wave, as in the example shown in FIG. 13, and the waveform 1300 is harmful to a given component, especially to the oscillator 902. So it is not desirable.

Specifically, the sharp ascent and descent edges of the square wave cause the corresponding abrupt start and stop of the ultrasonic waveguide to cause a detrimental "rattle" effect on the waveguide.

The square wave 1300 also creates an interference effect between the components.

For example, the higher frequency of the harmonic vibration of a square wave can result in unwanted electrical interference and undesired operation of the circuit.

This is in contrast to a pure sine wave with only one frequency.

[0091]

To eliminate square waves, a wave forming or matching circuit 1012 (sometimes referred to as a "tank circuit") is introduced.

The tank circuit 1012 contains components such as an inductor, as well as a capacitor related to the capacitance of the oscillator, to drive the oscillator 902 in such a way as to cause undamaged ultrasonic motion in the waveguide. Filter the square wave into a smooth sine wave used for.

An exemplary sine wave 1400 suitable for driving the oscillator 902 is shown in FIG.

Petitioner Therabody Ex-1004, 1264

In one embodiment of the invention, the matching circuit 1012 is a series LC circuit and is controlled by the well-known principles of Kirchhoff's circuit method.

However, any matching circuit can be used to generate a smooth sine wave 1400 suitable for driving the oscillator 902.

Further, the other drive signal may be the output from the matching circuit 1012, which is useful for driving the oscillator 902 in a way that is less harmful than a square wave, rather than a smooth sine wave.

[0092]

Importantly, the power filtering circuit is designed so that the system operation does not deviate from the specifications even if the inductance of the power inductor fluctuates slightly.

With such a configuration, the sensitivity to fluctuations in the adjustment of the LC filter is reduced, and as a result, the use of adjusting screws becomes unnecessary.

[0093]

In practice, the matching network 1012 is tuned to match the particular oscillator it supplies.

Therefore, the oscillators and matching networks are best matched when paired and not arranged in combination with other devices.

Further, if each oscillator 902 has its own matching network, the smart battery 301 can supply different frequencies to different oscillators, the frequencies being matched to a particular blade in the waveguide assembly 304, respectively.

Two commonly used frequencies for ultrasonic surgical instruments are 55 kHz and 40 kHz.

[0094]

In addition, interference can be achieved by mounting ferrite beads (or coils) in the oscillator output line or trace to prevent radio frequency or electromagnetic interference from entering the oscillator circuit from ultrasonic guides and oscillator elements. Blocks reaching the circuit.

[0095]

In addition, the oscillator output traces are configured to be close to each other (eg, triangular double traces) to filter out interference (ie, allow maximum common mode rejection) in parallel as a common mode. Make it work.

[0096]

V.

resonance

[0097]

FIG. 15 is a diagram schematically showing the action of the resonant sine wave input to the transducer 902 on the waveguide 1502 of the ultrasonic cutting device.

According to an exemplary embodiment of the invention, the sine pattern shown by the dotted line in FIG. 15 represents the amplitude of axial motion along the length of the waveguide 1502 connected to the transducer 902.

The stack extends in the first direction 1508 in response to the ascending portion 1402 of the driving sine wave 1400 (shown in FIG. 14).

During the negative portion 1404 of the drive sine wave 1400 (shown in FIG. 14), the stack is precompressed or induced compressed until its steady state, i.e., until the portion 1504 of the oscillator 902 moves in the second direction 1512. To return.

As mentioned above, the smooth sine wave 1400 allows the oscillator 902 and the waveguide 1502 to decelerate before changing direction, unlike the square wave 1300.

Petitioner Therabody Ex-1004, 1265

Smoother movement is less harmful to the components of the device.

[0098]

The alternating motions 1508 and 1512 of the oscillator section 1504 arrange the sine wave 1514 along the length of the waveguide 1502.

The waves 1514 alternately pull the distal end 1520 of the waveguide 1502 towards the transducer 902 and push it away from the transducer 902, thereby causing the distal end 1520 of the waveguide 1502 along the distance 1518. To move vertically.

The tip of the waveguide 1502 is considered to be the "antinode" because it is the moving point of the sine wave 1514.

The resulting motion of the waveguide 1502 causes a "saw" motion along the distance 1518 at the distal end 1520 of the waveguide 1502.

(Linear motion along waves 1514 and distance 1518 is greatly exaggerated in FIG. 15 for simplicity of explanation.

This high speed motion along a distance of 1518 provides a cutting instrument that can be easily cut through many substances, especially tissues and bones, as is known in the prior art.

The rapidly moving distal end 1520 of the waveguide 1502 also produces a large amount of frictional heat when so stimulated, which heat is absorbed by the tissue in which the waveguide 1502 is cut.

This heat is sufficient to cause rapid cauterization of blood vessels within the tissue that has been severed.

[0099]

If the drive wave 1514 moving along the waveguide 1502 is not a resonant wave, then there is no standing wave, which means there is no node or antinode.

This means that there is almost no exercise.

It may also operate the device at an inaccurate resonance frequency.

Actuation at false resonances can produce unwanted motions such as "rattling".

In such a case, the distal end 1520 of the waveguide 1502 moves across the vertical line of the waveguide 1502.

Any inaccurate mode is not ideal and unreliable for proper amputation and surgical ablation.

However, in the present invention, as described below, the motion 1508, 1512 of the waveguide 1502 monitors the phase between the waveforms of the motion current and the motion voltage supplied to the oscillator 902 and corrects the oscillator 904. A phase lock loop (PLL) is utilized in the oscillator 904 to ensure that it remains resonated along the waveguide 1502 by returning the signal.

The TAG microcontroller 1006 controls the frequency and ensures that it is within the proper range so as not to cause an undesired resonant frequency.

As an additional feature, the invention may comprise a piezoelectric crystal stack 1504 that is cut in a fluctuating plane, thereby creating a twisting or twisting motion of the blade as well as a sawing motion.

The present invention may readily adapt to a complete set of uses using the requirements of a drill-type motion in place of or in conjunction with the saw motion just described.

[0100]

Ideally, as just described, the oscillator 902 and the waveguide 1502 are driven at their resonant frequencies.

Resonance is achieved when the current and voltage at the input of oscillator 902 are substantially in phase.

For this reason, the oscillator 904 uses a PLL and a signal drawn from the current and voltage inputs to the oscillator 902 to tune the current and voltage to each other.

However, instead of simply matching the phase of the input current to the phase of the input voltage, the present invention matches the phase of the current to the phase of the "moving" voltage and / or to the phase of the "moving" current. Match the phase of the input voltage.

Petitioner Therabody Ex-1004, 1266

To achieve this, motion bridge circuits are used to measure the mechanical motion of the oscillators and waveguides and to provide feedback on the operation of the oscillators and waveguides.

The motion feedback signal from the bridge is proportional to and in phase with the motion of the oscillator 902 and the waveguide 1502.

[0101]

V I .

Motor control

[0102]

a .

Oscillator circuit model

[0103]

FIG. 16 is a circuit diagram schematically showing a model oscillator 1600 such as an oscillator 902 that includes a piezoelectric material.

Piezoelectric oscillators are well known in the past.

The mass and rigidity of the piezoelectric material creates a mechanical resonant structure within the oscillator.

Due to the piezoelectric effect, these mechanical properties represent themselves as electrically equivalent properties.

In other words, the electrical resonance frequency found in the electrical contacts is equal to the mechanical resonance frequency.

As shown in FIG. 16, the mechanical mass, stiffness and attenuation of the oscillator 902 can all be represented by a series of configurations of the inductor / coil L, the capacitor C2 and the register R in parallel with the other capacitor C1.

The electrically equivalent oscillator model 1700 is very similar to the well-known crystal model.

[0104]

It is the oscillator current iT that flows into the input 1610 of the oscillator model 1600 with the same electrical value.

A portion of the iT iC flows over a parallel capacitor C1 of a type and value that holds a static capacitive value for most of the expected frequency band.

The remainder of iT, defined as iM, is simply iT-iC and is the actual operating current.

This residual current iM is referred to herein as a "kinetic" current.

That is, the kinetic current is the current that actually performs the work to move the waveguide 1502.

[0105]

Known prior art designs include iC and adjust and synchronize the total current iT, which is not an indicator of the amount of current that actually causes the motion of the waveguide 1502 of the transducer 902.

For example, the resistance R increases significantly when the blade of a prior art device moves from a soft tissue to a denser material such as another tissue or bone.

This increase in resistance R causes less current iM to flow through the series-arranged RL-C2 and greater current to flow through the capacitive element C1.

In such a case, the waveguide 1502 slows down and its performance deteriorates.

Those skilled in the art will appreciate that adjusting the overall current is not an effective way to maintain constant waveguide displacement.

Petitioner Therabody Ex-1004, 1267

Therefore, a novel embodiment of the present invention advantageously monitors and adjusts the kinetic current iM flowing through the oscillator 902.

By adjusting the kinetic current iM, it is possible to easily adjust the kinetic distance of the waveguide 1502.

[0106]

b .

Series circuit model

[0107]

FIG. 17 is a circuit diagram schematically showing the circuit 1700 of the present invention, which is useful for understanding how to obtain the kinetic current iM of the oscillator 902.

The circuit 1700 has all the circuit elements of the oscillator model 1600 plus an additional bridging capacitive element CB parallel to the oscillator model 1600 of FIG.

However, the value of CB is selected so that C1 / CB is equal to the predetermined ratio r.

For efficiency, the value chosen for CB should be relatively low.

This limits the current drawn from the iM.

A variable power supply VT is applied over the contacts 1702 and 1704 of the circuit 1700 to the current iB through the capacitive element CB, the current iT flowing into the model oscillator 1600, the current iC flowing through the capacitor C1, and as a result. , With a kinetic current iM.

Therefore, the kinetic current iM flows so that iM = iT-r · iB.

このことは、のためである。

Therefore, by substituting iC = r · iB into iC of the equation iM = iT-iC, iM = iT-r · iB is derived.

[0108]

Here, it is possible to identify and adjust the change in the kinetic current iM of the vibrator by knowing only the total current and measuring the current through the bridge capacitor iB.

The drive circuit represented by block 2708 and transformer 2710 in FIG. 27 is included in the push-pull switching amplifier 1010 in FIG.

Then, the drive circuit operates as a current controller, and is based on a value obtained by subtracting the product of the current flowing through the bridge capacitance CB multiplied by the ratio r from the total current iT flowing in the vibrator 902. The kinetic current iM is adjusted by changing the output.

This adjustment maintains a nearly constant ratio of the motion of the cutting edge portion of the waveguide 1502 over various cutting loads, which was not possible before.

In one exemplary embodiment, the sensing circuit 1014 measures kinetic voltage and / or kinetic current.

Current and voltage measuring devices and voltmeters and circuit configurations for making ammeters are conventionally known.

Current and voltage values are unlimited and can be specified by the present invention in any way now known or subsequently developed.

[0109]

Adjustment of the kinetic current iM is a true way to maintain the integrity of the instrument and to ensure that it operates at its peak performance under almost all conditions expected in the operating environment. ..

Moreover, such adjustments offer these advantages in a package that is small enough and light enough to be easily held with one hand, ie in a configuration never seen before in the field.

Petitioner Therabody Ex-1004, 1268

[0110]

c .

Oscillator circuit model

[0111]

FIG. 18 shows another embodiment of the invention, in which the oscillator 902 is schematically represented as a parallel configuration of a resistance element R, an induction element L and a capacitive element C4.

The additional capacitive element C3 is a series arrangement between the input 1702 and the parallel arrangement of the resistance element R, the inductive element L and the capacitive element C4.

This parallel representative is a model of the operation of the oscillator in the so-called "anti-resonance" mode of operation that occurs at slightly different frequencies.

The oscillator voltage VT is applied between the input terminals 1702 and 1704 of the oscillator 902.

The oscillator voltage VT is divided between the voltage VC through the capacitive element C3 and the kinetic voltage VM through the parallel arrangement of the resistance element R, the inductive element L and the capacitive element C4.

It is the kinetic voltage VM that performs the work and moves the waveguide 1502.

Therefore, in this exemplary embodiment, it is the kinetic voltage that should be carefully adjusted.

[0112]

d .

Parallel circuit model

[0113]

FIG. 19 shows an exemplary embodiment of the circuit configuration 1900 of the present invention according to the present invention having the oscillator model 1800 of FIG.

The circuit configuration 1900 adds three additional capacitive elements C5, C6 and C7 to the oscillator model 1800.

The capacitive element C5 is in series with the oscillator model circuit 1800 of FIG. 18, while the capacitive elements C6 and C7 are in series with each other, in a series combination of the capacitive element C5 and the oscillator circuit model 1800. It is in parallel.

[0114]

This circuit is similar to a Wheatstone bridge measuring instrument.

A Wheatstone bridge circuit is used to measure unknown electrical resistance by balancing two legs of a bridge circuit, one of which has an unknown component.

In the exemplary circuit configuration shown in FIG. 19, the kinetic voltage VM equal to VT-VC is unknown.

By identifying and adjusting the kinetic voltage VM, the configurations of the present invention allow constant waveguide motion to be maintained as described below.

[0115]

Advantageously, the capacitive element C7 is selected such that its value is a ratio A of less than 1 of the capacitive element C3.

Similarly, the capacitive element C6 is selected so that its value is the same ratio A of the capacitive element C5.

The ratio of C5 / C3 is also ratio A.

Petitioner Therabody Ex-1004, 1269

[0116]

Since the ratio of C3 / C7 is A and the ratio of C5 / C6 is also A, the bridge is balanced.

The feedback voltage Vfb divided by the kinetic voltage VM also results in a ratio A.

Therefore, Vm can be simply represented by A · Vfb.

[0117]

If the voltage across the model oscillator 1800 is still VT, the input voltage Vin is equal to the value applied to the VT plus the voltage VB over the capacitive element C5.

The feedback voltage VFB is measured from a first point located between the capacitive elements C6 and C7 and a second point located between the oscillator and the capacitive element C5.

Here, the upstream component of the TAG assembly 303 acts as a voltage controller, varying the power Vin to maintain a constant feedback voltage Vfb, resulting in a nearly constant kinetic voltage and various disconnections. Maintains a substantially constant rate of motion of the cutting edge portion of the waveguide 1502 over the load.

Further, unlike the prior art, the present invention does not simply adjust the input voltage Vin, but changes the input voltage Vin for the purpose of adjusting the kinetic voltage VM.

This is new in the art.

[0118]

e .

Transformer continuous monitoring

[0119]

FIG. 20 shows another exemplary embodiment of the invention in which the oscillator 902 has the circuit configuration shown in FIG.

The configuration of FIG. 20 operates in the same manner as that shown in FIG. 17, and operates as described above in connection with FIG.

However, in this circuit configuration 2000, a pair of transformers 2004 and 2008 are used to identify and monitor the kinetic current IM.

In this exemplary embodiment, the first winding 2002 of the first transformer 2004 is arranged in series with the bridge capacitor CB.

Similarly, the first winding 2006 of the second transformer 2008 is arranged in series with the model oscillator 1600.

The leads 2010, 2012 of the second winding 2014 of the first transformer 2004 are connected through the resistor R2.

The leads 2016, 2018 of the second winding 2020 of the second transformer 2008 are connected through the resistor R1.

Further, the first lead 2010 of the second winding 2014 of the first transformer 2004 is directly connected to the first lead 2016 of the second winding 2020 of the second transformer 2008.

[0120]

The current iB passing through the first winding 2002 of the first transformer 2004 induces the current of the second winding 2014 of the first transformer 2004.

Similarly, the current including iC passing through the capacitive element C1 of the oscillator 1600 and the kinetic current iM of the oscillator 1600 are combined and passed through the first winding 2006 of the second transformer 2008 to find the ground 2022. Flows.

The current in the first winding 2006 induces the current on the second winding 2020.

Petitioner Therabody Ex-1004, 1270

The second windings 2014 and 2020 are opposite to each other with respect to the first windings 2002 and 2006, respectively, as indicated by the dots (".") On the transformers 2004 and 2008, and the resistors R1 and R2, respectively. Induce the voltage Vfb through.

By selecting the values of R1 and R2 so that the ratio of R1 / R2 is equal to the ratio of the values of CB / C1, the feedback voltage Vfb is always proportional to the kinetic current iM.

Here, the upstream component of the oscillator 904 operates as a voltage controller, varying the input powers (Vin and Iin) to maintain a constant feedback voltage Vfb, resulting in a nearly constant kinetic current iM. It is generated and maintains a nearly constant rate of motion of the cutting edge of the waveguide 1502 over various cutting loads.

Further, unlike the prior art, the present invention does not simply adjust the input voltage Vin, but changes the input current Iin for the purpose of adjusting the kinetic current iM.

This is new in the art.

[0121]

In another embodiment not shown, resistors are used instead of transformers 2004 and 2008.

For example, for FIG. 19, resistors can be used instead of the capacitors C6 and C5, which are used to measure the currents Ib and It.

[0122]

f .

Transformer parallel monitoring

[0123]

FIG. 21 shows another exemplary embodiment of the invention in which the model oscillator 1800 is modeled by the circuit configuration shown in FIG.

The configuration of FIG. 21 operates in the same manner as that shown in FIG. 19 and operates as described above in connection with FIG.

However, in this circuit configuration 2100, the transformer 2110 is used to identify and monitor the kinetic voltage VM of the oscillator 1800.

In this embodiment, the first winding 2106 of the transformer 2110 has a circuit configuration in series with the induction element L2 and the capacitive element C1.

The voltage Vin is applied through the input leads 2102 and 2104 of the circuit formed by the transformer 2110, the induction element L2 and the first winding 2106 of the capacitive element C1.

The current through the first winding 2106 induces the corresponding current in the second winding 2108 of the transformer 2110.

The second winding 2108 of the transformer 2110 is arranged in parallel with the combination of the vibrator 1800 and the bridge capacitor CB.

The two components that form the combination are in series.

[0124]

In this embodiment, the second winding 2108 is branched at a point 2112.

By branching the second winding 2108 at a point where the first portion of the second winding 2108 has m windings and the second portion of the second winding 2108 has n windings (n is less than m). , A selectable percentage of the induced voltage on the second winding 2108 appears from point 2112 to ground 2114.

[0125]

Petitioner Therabody Ex-1004, 1271

Again, this circuit is similar to a Wheatstone bridge measuring instrument.

One leg is the first second winding m, the second leg is the second second winding n, the third leg is the oscillator model 1800, and the fourth leg is. It is a capacitor CB.

In this circuit configuration of FIG. 21, the voltage VM is unknown.

By identifying and adjusting the kinetic voltage VM, constant waveguide motion is maintained.

[0126]

By selecting the value of the bridge capacitor CB so that the number of windings n is less than the capacitance C3 of the oscillator at the same rate as the number of windings m (ie, m / n = C3 / CB).), The value of the feedback voltage Vfb reflects the kinetic voltage VM.

The present invention can identify whether the kinetic voltage VM changes by monitoring the feedback voltage Vfb for change.

[0127]

By using the equivalent circuit oscillator model 1800 that models a parallel resonant (or antiresonant) oscillator, the oscillator can be driven in a parallel operating mode in which the motion is proportional to the voltage.

The advantage of this mode of operation is that the required constant voltage mode power supply is designed to be simpler and operate more safely than the constant current mode power supply.

Also, since the oscillator has a higher impedance when unloaded (rather than having a lower impedance when unloaded in series resonance actuation mode), it is more likely when it is not loaded. Naturally, there is a tendency to draw low power.

However, the parallel resonant actuation mode is difficult to maintain because the resonant bandpass is narrower and has a slightly different intrinsic resonance frequency than that of the series resonant mode, and is therefore a mechanical component of the device. Must be specifically configured to operate in either series-resonant or parallel-resonance operating modes.

[0128]

The present invention controls the voltage to change the power Vin in order to maintain a constant feedback voltage Vfb, resulting in a nearly constant kinetic voltage VM, the cutting blade of the waveguide 1502 over various cutting loads. Maintain a nearly constant kinetic ratio of the part.

Further, unlike the prior art, the present invention does not simply adjust the input voltage Vin, but changes the input voltage Vin for the purpose of adjusting the kinetic voltage VM.

This is new in the art.

[0129]

According to the present invention, the microcontroller 1006 of the TAG 303 monitors the feedback signal through the motion bridge 1014 to generate a signal towards the first side of the transformer 1010.

The TAG microcontroller 1006 calculates the phase difference between these signals (within the CLA912) and adjusts the NCO1008 output so that the phase difference is equal to zero.

When the motion feedback signal is in phase with the output of the push-pull switching amplifier 1010, the system operates in series resonance.

The phase and magnitude of the feedback signal is calculated using the Discrete Fourier Transform (DFT).

In one embodiment of the present invention, the phase reference for DFT calculation is the drive signal of the push-pull amplifier 1010.

The frequency can be changed so that the push-pull drive signal is in phase with the motion feedback signal.

[0130]

Petitioner Therabody Ex-1004, 1272

According to one embodiment of the present invention, if the phase of the motion feedback signal is positive, it means that the operating frequency is below the resonance frequency and the operating frequency should be increased, even if the phase is negative. For example, the operating frequency is above the resonance frequency and the operating frequency should be reduced, and if the phase is close to zero, the operating frequency is close to the resonance frequency of the oscillator 902 and the waveguide 1502. ing.

In oscillator 904, NCO1008 (using DDS) is used to properly change the frequency.

[0131]

Importantly, the NCO 1008 outputs a clock to the external clock input of the CPU at a frequency less than 6 times the operating frequency of, for example, the TAG microcontroller 1006.

The external frequency input is fed into the processor's phase-locked loop (PLL) and multiplied by a multiple of 6 to obtain the CPU's SYSCLK.

NCO1008 is controlled by the processor through the SPI interface.

The SPI interface is used to write a 32-bit divisor to NCO1008, which is used to divide a fixed frequency of 25 MHz to obtain the desired output frequency.

By controlling the DDS2200, the TAG provides a hardware tuning operation for the vibration frequency.

In other words, to the main processor 914, it appears as if the frequency is constant, thereby simplifying the sampling and calculation of the motion feedback phase.

[0132]

VII.

Starting operation

[0133]

The starting conditions are different from those in steady-state operation, which are described in detail in the sections following this section.

At start-up, the waveguide 1502 is initially stopped, and therefore the waveguide is not moving.

Therefore, there is no immediately identifiable kinetic feedback signal that can be used to identify the composite resonant frequency of oscillator 902 and waveguide 1502.

As a result, the system of the present invention has the ability to operate in a mode different from that in steady state during the initial start-up period.

[0134]

The starting process according to an exemplary embodiment of the present invention is represented by the process flow diagram of FIG. 72 showing the mutual exchange between the battery controller 703 and the oscillator 904 of the TAG assembly 303.

In this particular embodiment, as described in detail below, the battery controller issues all commands to oscillator 904, and oscillator 904 receives all its commands from battery controller 703, thus with the battery controller. The relationship with the oscillator can be described as a "master and slave" relationship.

Alternatively, the oscillator 904 of the TAG assembly 303 can operate as a "master" and issue all commands to the battery controller 703, or the oscillator 904 and the battery controller 703 of the TAG assembly 303 function as equivalent. Can be.

[0135]

Prior to activation, both the battery controller 703 and the oscillator 904 are in a standby state at steps 7201 and 7202.

In step 7203, the battery controller 703 is activated, for example, by pressing a button / trigger 4606 from the standby state.

Petitioner Therabody Ex-1004, 1273

To initiate the exchange between the battery controller 703 and the oscillator 904, the battery controller 703 sends, for example, the signal of the "ULTRASOUND ON" command 7205 to the oscillator 904 using communication lines 602a-n (ie, Com + / Comm-). Relay to.

When properly operated, the oscillator confirms receipt of command 7205 received from the battery controller 703 and in turn signals a positive response 7204, such as a "ULTRASOUND ON" response, on communication lines 602a-n (ie, communication lines 602a-n). , Comm + / Comm-) to transmit to the battery controller 703.

However, if the oscillator 904 does not respond positively to the first command 7205 from the battery controller 703 before the end of a particular time (eg 10 ms), the battery controller will in step 7207, for example, in the "FAIRURE TO START" state. The defect state is issued and the operation cycle is terminated in step 7209.

At that time, the appropriate indicator may be activated.

[0136]

a .

Current and amplitude control

[0137]

With successful reception confirmation by the oscillator 904 of the "ULTRASOUND ON" command 7205 transmitted from the battery controller 703, the microcontroller 1106 in the battery controller 703 is to advance the current rate of the TAG assembly 303 quickly and safely. The process is initialized to generate a resonant motion output from the TAG assembly 303 to the waveguide 1502.

The advance progresses from the standby state to the level expected to be in the "ballpark window" to generate a recognizable motion feedback signal and achieve the initial resonant frequency state.

As shown in FIG. 11, the microcontroller 1106 of the battery controller 703 has two processing units.

The first processing unit or control law accelerator ("CLA") 1116 processes the first inner current control loop 2601 (see FIG. 26) and the second processing unit or main processor 1118 is the second outer amplification control loop. 2602 (see FIG. 26) is processed.

First, in step 7213, the microcontroller 1106 turns on the back power supply 1114 to initialize the CLA 1116.

The CLA 1116 uses a proportional integral differential ("PID") control algorithm to calculate a new duty cycle value for a pulse width modulator ("PWM") that drives two phase back oscillators 1114.

At step 7215, the battery controller 703 initiates PWM and at step 7211 begins to use the non-linear PID control loop to increase the output voltage of the DC-DC converter 1202.

The increasing output voltage correspondingly increases the input current with respect to the push / pull amplifier 1010 of the oscillator 904.

In step 7217, the output voltage is increased or otherwise modified in step 7219 until the actual measured input voltage reaches the predetermined reference current level referred to herein as "Iref". Will be done.

The Iref is an oscillator 902 that realizes the displacement of the waveguide 1502 and also to produce a drive wave output from the oscillator 902 that arranges the resulting amplitude close to a value close enough to reach the target resonant frequency. This is the expected calibration value.

Iref is initially set by the battery microcontroller 703 in step 7225.

This calibration value for Iref is stored in the TAG assembly 303 and read out by the battery microcontroller 703 when the communication link 7204 is established.

Briefly, Iref is a method to prevent the system from overdriving at startup, which allows for low motion at startup and eliminates excessive response and overshoot by the system.

Iref is the estimated current required to drive the system to the target displacement.

Amplitude control replaces as the system approaches the target displacement.

Petitioner Therabody Ex-1004, 1274

[0138]

Table 1 below shows an example of a non-linear PID control loop or algorithm according to the present invention, whereby the output voltage level is changed until the actual measured input current reaches the reference current Iref.

In this example, a non-linear PID control loop divides the percentage error of the actual measured input current with respect to the reference current Iref into 5% bins, which bins reach the constants G0 to Gn ("n" reach Ireff. The number of last steps before doing) is shown below.

Each bin has its own non-linear tuning factor (eg, Kp, Ki and Kd).

According to the non-linear tuning factor, the output voltage, and the actual input current, first rises rapidly towards the reference current when the input current is far from the reference current point, and then the input current value rises to the reference current point. It is possible to slowly reach the reference current point Iref when it is likely to reach.

As a result, the system is less likely to be disturbed by noise.

In this particular example, the non-linear PID within CLA1116 does not form an overshoot of more than 15% over Iref.

It is desirable to allow the control loop to maintain current, but not tolerate overcurrent for any significant time.

In other words, the loop must quickly disengage the current from the overcurrent condition.

Thus, the CLA1116 non-linear PID loop increases the output voltage and input current in such a way that the input current quickly and accurately increases to the desired reference current level Iref, but avoids stable, dangerous "overcurrent" conditions. Form.

[0139]

Meanwhile, while the input current is steadily increasing under the control of the battery microcontroller 1106, the initial signal from the battery controller 703 received by the oscillator, i.e. the "ULTRASOUND ON" command 7205, is the activation of the battery controller 703. In parallel with this, the TAG microcontroller 1006 is started to perform its own initialization processing.

As mentioned above with respect to FIG. 9, the microcontroller 1006 of the TAG assembly 303 has two independent processing units, namely the CLA 912 and the main processor 914.

Referring again to FIG. 72, in steps 7200 and 7206, upon receiving the initial command 7205 from the battery controller 703, the TAG microcontroller 1006 initializes the CLA 912 and supersounds at frequencies within the operating frequency band of the waveguide and oscillator. The ultrasonic PWM that drives the sound wave frequency is started.

At this early start-up stage, any motion feedback signal present is weak, and therefore the signal level is very small at the beginning, so it is desirable to use a high gain amplifier to provide a higher signal level.

At step 7208, as the input current from the battery assembly increases, the amplitude (ie, the displacement of the mechanical motion) enters the "ball park window" to generate a motion feedback signal to achieve the resonant frequency. The TAG assembly 303 is proportionately incremented until it reaches a set point or level within 20% of the "target amplitude" to which it should be placed.

The "target amplitude" is the default safe threshold level.

It is not desirable to exceed this threshold level, and if it is exceeded (eg, only 10-12%), it is not desirable and indicates a "hyper-amplitude" condition that causes the device to initiate a fault condition and a stop of control.

[0140]

The battery controller 703 closely monitors the amplitude and adjusts the displacement level of the TAG assembly 303.

The battery controller 703 issues commands 7221, such as the "AMPLITUDE RQ" command, to the TAG assembly 303 at short intervals (eg, every 4 ms) using at least one of the communication lines 602a-n (eg, Com + / Comm-). ..

In response, the battery controller 703 receives a signal 7210 from the TAG assembly 303, eg, an "AMPLITUDE RQ" response, through at least one of the communication lines 602a-n (eg, Com + / Comm-), which is the amplitude of the TAG assembly 303. The level measurement is provided to the battery controller 703.

Petitioner Therabody Ex-1004, 1275

At each interval in which the measurement of each amplitude level is determined by the battery controller 703, at step 7223, the battery microcontroller 1106 makes one of a plurality of possible decisions based on the amplitude measurement.

If the amplitude level reaches a level within 20% of the "target amplitude" or effectively within 80% of the "target amplitude", at step 7227, power control will be described in more detail below. The inner current control loop 2601 is switched to the outer amplitude control loop 2602.

If the amplitude level does not reach 80% of the "target amplitude", at step 7229, the current control loop maintains current at the reference current level Iref until the amplitude reaches the point of 80%.

[0141]

However, if the amplitude level still does not reach the 80% point within a series of time intervals (eg 250 ms), this can be due to, for example, a blade stopped at waveguide 1502, a "low amplitude" fault. The state 7231 is shown.

In response, the battery microcontroller 1106 ends the working cycle in step 7209 and issues, for example, the "ULTRASOUND OFF" command 7233 to the oscillator 904.

In response, the oscillator 904 relays a response 7212, for example a "ULTRASOUND OFF" response indicating that the activation has stopped.

In the event of a temporary dangerous condition in which the amplitude level actually exceeds a level within 20% of the "target amplitude", the battery microcontroller 1106 immediately issues a failure condition 7235, and as described above, this "excess". Due to the "amplitude" state, the actuation cycle is terminated in step 7209.

[0142]

b.

Frequency lock

[0143]

Here, referring to FIG. 72A, as described above, at initialization, the TAG microcontroller 1006 controls the frequency of the signal that drives the oscillator 902 based on the detection of the motion feedback signal.

At the beginning of the starting process, in step 7206, the operating frequency is set to a fixed value (eg, 55.2 kHz) within the operating frequency band of the oscillator 902 and the waveguide 1502.

When at that set frequency, the motion feedback signal from the bridge circuit is routed through the high and low gain buffers.

Each of these signals is supplied to an analog-to-digital oscillator ("ADC") 908 of microcontroller 1006 in TAG assembly 303.

First, the high gain buffered feedback signal is selected so that the motion feedback signal is initially small.

The main function of the CLA912 is to take the output from the ADC, perform a discrete Fourier transform ("DFT") operation, and pass the result to the main processor 914.

As shown in step 7218, the result of the DFT operation is the phase and magnitude of the motion feedback ("MF") signal, as well as the real and imaginary terms of the signal.

[0144]

The tuning loop is called once for each ultrasonic cycle.

If it is determined in step 7214 that no valid motion feedback signal is at the set frequency, the system simply waits for a valid feedback signal.

However, if the fixed time interval exceeds that specified by the cycle timeout timer and there is still no valid motion feedback signal, the cycle start limit "timeout" is triggered in step 7216 to turn off oscillator 904. ..

[0145]

Petitioner Therabody Ex-1004, 1276

First, at step 7222, the system employs a high gain buffer AD channel so that the high gain buffer feedback signal is selected.

This allows the system to lock to a lower motion feedback signal level.

Whether or not the motion feedback signal has reached the specified "THRESHOLD" value is determined in step 7220.

When the motion feedback signal reaches the specified "THERST" value, the amplitude of the motion feedback signal increases to the point where a valid motion feedback signal emerges from any obstruction noise so that the CLA912 DFT calculation is reliable.

At this point, at step 7224, the system switches to the low gain channel.

However, if the system falls below this "THRESHOLD" value, the AD channel switches back to the high gain channel as shown in step 7226.

By having the ability to switch to a low gain channel at this point, it advantageously does not require a high resolution A / D oscillator.

[0146]

In step 7228, if the motion feedback signal exceeds the starting threshold, the oscillator 904 locks the frequency set on the resonant frequency of the TAG assembly 303 in parallel with controlling the current amplitude as described above. Enter the frequency adjustment mode.

According to an exemplary embodiment of the invention, the process for achieving the resonant frequency is not a process of sweeping to the optimum frequency, but a process of independently tracking or tuning to lock in to the optimum frequency. Is.

However, the invention may also employ a frequency sweep mode, whereby the initial actuation or set frequency is selected to be at the lower boundaries of the "ballpark window" of the expected resonance frequency and the resonance frequency. It increases steadily until it reaches, and vice versa.

[0147]

Upon entering the frequency tuning mode, the main processor 914 of the TAG microcontroller 1006 uses the result of the DFT operation (ie, the phase and magnitude of the motion feedback signal) to control the operating frequency of the oscillator.

The tuning algorithm is divided into two states, STARTING and LOCKING.

In the STARTING phase of step 7230, it is determined whether the motion feedback signal has reached the specified "STARTUP THRESSHOLD" value.

When the motion signal reaches the specified "STARTUP THRESHOLD", the amplitude of the motion feedback signal reaches the point where the system can actively start moving towards resonance in step 7232.

If the determination in step 7230 is such that the motion feedback signal does not reach the specified "STARTUP THRESHOLD" value, the process proceeds to step 7234.

At step 7234, the STARTING step simply waits for a point to reach a point where the motion feedback signal is large enough to allow locking.

[0148]

In LOCKING step 7236, a sine of phase offset between the motion feedback signal and the drive signal is used with a sine differential that specifies the size and direction of the frequency step to adjust the output frequency to transition the system to resonance. Will be done.

The sine of the phase is constrained by the value ± 1 at a small angle, whereas the tangent function has an undesired and unconstrained range of ± ∞, even though the phase is naturally a tangent function. Since it approaches the phase value closely, a phase sine is used to identify the frequency step.

[0149]

In step 7238, the PID loop is used to calculate the frequency step in either the plus or minus direction.

Petitioner Therabody Ex-1004, 1277

The PID loop is non-linear, so that the value of the sine and cosine is used to determine the bin number.

The bin number is used as an indicator to access the tuning factor used by the PID.

The index table includes proportional gain, integral gain and derivative gain.

In addition, the entry sine value to enter the bin is different from the value to exit the bin.

This introduces a hysteresis that prevents vibration near the transition of the bin.

[0150]

As mentioned above, non-linear PIDs are used to achieve rapid frequency locking.

Table 2 below shows an example of a non-linear asymmetric PID loop or algorithm according to the present invention, whereby the size of the frequency step is staggered until it reaches the target resonant frequency fres.

In this example, the gain constants from PID0 to PIDn (where "n" is any number of the last frequency steps before reaching fres) are separated by a non-linear escalation.

The gain value is selected to move the system quickly towards resonance when the system is far from resonance and slowly towards resonance when the system is near or near resonance.

It is important to step slowly when near or at resonance to prevent inclusion of frequency modulation that would cause unwanted effects on the amplitude.

At start-up, the value of the maximum frequency step size is set to be larger than during steady state operation, eg 8 Hz.

If the phase is positive, the operating frequency is below the resonant frequency of the oscillator and needs to be increased.

If the phase is negative, it indicates that the operating frequency should exceed the resonant frequency and reduce the operating frequency.

When the phase is close to zero, the operating frequency is close to the resonant frequency of the oscillator 902 and the waveguide 1502.

A numerically controlled oscillator ("NCO") 1008 utilizing direct digital synthesis ("DDS") is used to change the frequency in step 7240.

[0151]

The DDS2200 (see FIG. 22) provides the vibration frequency for the tuning operation of the hardware.

In other words, to the main processor 914, it looks as if the frequency is constant.

Here, the clock frequency of the main processor 914 is a multiple of the vibration frequency.

The present invention changes the PWM frequency by a unique and novel method.

According to the present invention, PWM is performed in the main processor 914.

Therefore, the present invention actually increases / decreases the frequency of the main processor 914.

This has never been done before.

The adjustment of the A / D oscillator 908 is also automatic because the A / D oscillator 908 is in the microcontroller 1006.

The technique of the present invention can resemble a singer who adjusts the tempo of the singer to match the speed of the metronome, rather than the singer matching his / her tempo to the metronome, as has been conventionally done.

[0152]

At any time during operation of the device, if the frequency reaches the preset minimum or maximum frequency limits fmin and fmax, respectively, the oscillator 904 is turned off and a fault condition is triggered, as shown in step 7242.

The exemplary low and high frequency limits for the present invention are 54 kHz and 58 kHz, respectively.

Petitioner Therabody Ex-1004, 1278

Many different states bring the frequency to the minimum or maximum limit, in which the component (eg, waveguide 1502) failure, or the waveguide 1502, the device needs to find resonance. It includes situations under heavy load where the amount of power cannot be input.

[0153]

Once frequency locking is achieved, the transition to steady-state operation begins.

[0154]

V I I I .

Steady state operation

[0155]

The purpose of steady-state operation is to keep the oscillator and waveguide at resonant frequency and control the amplitude in response to any drift that occurs as a result of the load on the waveguide 1502 during use of the appliance. Is.

When the oscillator 902 and the waveguide 1502 are driven to their composite resonant frequency, they generate a large amount of mechanical motion.

The electrical energy from the battery is, in this state, converted into a high voltage AC waveform that drives the oscillator 902.

The frequency of this waveform should be the same as the resonant frequency of the waveguide 1502 and the transducer 902, and the magnitude of the waveform should be a value that produces an appropriate amount of mechanical motion.

[0156]

a .

Amplitude control

[0157]

At resonance, the amplitude is approximately proportional to the oscillator current, and the oscillator current is approximately proportional to the input current to the push / pull amplifier 1010.

With a constant current operation to maintain a constant amplitude, the output transformer changes with a changing load.

In other words, the voltage increases with increasing output power requirements and vice versa.

[0158]

As mentioned above with respect to the starting process, FIG. 26 has two control loops, an inner current control loop 2601 and an outer amplitude control loop 2602 that independently adjusts the amplitude of the drive wave input to the oscillator 902. It is shown.

The current control loop 2601 regulates the current entering the push / pull amplifier 1010 from the battery assembly 301.

The amplitude control loop 2602 compensates for load differences or other changes that occur in the oscillator and / or waveguide.

To this end, the amplitude control loop 2602 moves to generate the desired reference current level "Iref" used by the current control loop 2601 to change the output voltage of the DC-DC oscillator described above. Use the feedback signal.

To avoid interference-type interactions between the two loops, the current control loop 2601 operates at a higher frequency than the amplitude control loop 2602, eg, approximately 300 KHz.

The amplitude control loop 2602 generally operates at a frequency of, for example, 250 Hz.

[0159]

Petitioner Therabody Ex-1004, 1279

To determine the desired reference current level Iref, the current amplitude value is subtracted from the desired "target amplitude" to generate an amplitude percent error signal.

This amplitude percent error signal is the PID control of the amplitude control loop 2601 to generate a new desired reference current level "Iref" based on the operating conditions experienced by the oscillator 902 and the waveguide 1502 at that particular time. It is an input to the algorithm.

In other words, the amplitude control loop 2602 changes the target or reference current value of the CLA912 of the current control loop 2601 to reach the desired amplitude based on the percent error calculation.

In this way, the output power is varied based on the variable requirements of the oscillator 902 and the waveguide 1502.

The main processor 1118 of the battery controller 703 validates the new reference current value to ensure that it is not greater than the maximum output current value.

[0160]

Based on the new target or reference current value Iref set by the amplitude control loop 2602, the current control loop 2601 proceeds to the process of varying the output voltage and input current to the push / pull amplifier 1010.

A measurement of the actual current level 2603 of the output of the battery pack is supplied to the ADC 1120 of the battery microcontroller 1106 (shown in FIG. 11).

CLA1116 takes a value from ADC1120 and subtracts it from the target or reference current input level Iref to generate a current error signal.

As mentioned above, the CLA 1116 uses a PID control algorithm to calculate a new duty cycle value for the PWM that drives the two-phase back oscillator 1114.

The CLA1116 also calculates the maximum PWM duty cycle to limit the output voltage.

The algorithm for calculating the maximum duty cycle uses the measured battery voltage and assumes that the back oscillator 1114 operates continuously in inductive mode.

[0161]

By utilizing amplitude control as well as looking at the current to stabilize the amplitude, the present invention allows for finer adjustment of the output of the oscillator based on the motion feedback signal. Note that accurate amplitude control is achieved.

The use of current control loops allows for a rapid initial response that would not be possible with amplitude control alone.

Also, having two loops provides oscillator and oscillator redundancy and individual calibration in manufacturing.

This "amplitude calibration factor" is important in determining electrical and mechanical variation in oscillator / piezoelectric crystals and in adjusting for variation in the electrical elements of the oscillator size feedback system.

In the oscillator, the feedback voltage is converted using this calibration factor through the analog / digital oscillator to obtain the magnitude value directly related to the displacement.

In this calibration process, this calibration value is adjusted while measuring the actual system output displacement.

In this adjustment, the combination of a given oscillator and an oscillator causes the oscillator and oscillator to generate the appropriate displacement for the system.

The default value for this value is deliberately set low as a safety mechanism in case of loss, defects or accidental unprogramming at the adjusted value.

By keeping the default displacement lower than the target in this way, the tissue performance is deteriorated, but it becomes an effective state.

Such a calibration scheme simplifies manufacturing and reduces the burden of control tolerances on oscillators and oscillators.

Moreover, since all this calibration is done by software, no physical component adjustment is required for either the oscillator or the oscillator.

Petitioner Therabody Ex-1004, 1280

In fact, two control loops are used to adjust the amplitude of the drive wave input to the oscillator that provides the vibration frequency for the hardware tuning operation.

Redundancy is useful to ensure that the device operates correctly.

Bad behavior in one loop is usually detectable, as the other loops cannot operate properly and improper behavior in one of the loops is usually detectable.

Improper behavior can be caused by a hardware failure.

Proper operation of both loops requires both current and amplitude measurements.

Different hardware is used to measure amplitude and current.

In one embodiment, the battery microcontroller 1106 measures the current and the TAG microcontroller 1006 measures the amplitude.

When the oscillator becomes hot, the capacitance and coupling coefficient of the oscillator shift and the displacement of the system decreases slightly.

This temperature change occurs in correspondence with the frequency shift.

By monitoring the frequency, it is possible to generate an offset and more closely control the displacement due to frequent use.

This can be achieved by comparison to frequency at start-up or by reference to absolute frequency.

Alternatively, it is possible to control this offset using other measurable oscillator characteristics.

Alternatively, it is also possible to estimate the change using the amount of energy injected into the oscillator and adjust the change accordingly.

[0162]

b .

Frequency control

[0163]

In an operation similar to the first frequency lock performed during the start-up process, the oscillator 904 main processor 914 operates the oscillator 904 based on the phase of the motion feedback signal to maintain the steady operating resonant frequency. The result of the DFT calculation is used to adjust the frequency.

The motion feedback signal from the bridge circuit is proportional to and in phase with the motion of the oscillator 902 and the waveguide 1502.

When the motion feedback signal is in phase with the output of the push / pull switching amplifier 1010, the system operates in continuous resonance.

Also, the phase and magnitude of the motion feedback signal is calculated using the Discrete Fourier Transform ("DFT").

The phase reference for the DFT operation is the drive signal for the push / pull amplifier 1010.

The frequency is then simply modified to make the push / pull drive signal in phase with the motion feedback signal.

[0164]

The DFT calculation is simplified and made more accurate when the ADC sample time interval is an exact integer multiple of the output frequency period.

This technique is referred to herein as "coherent sampling."

In one exemplary embodiment, the signal is sampled 12 times per output cycle, so that the CLA912 samples the motion feedback signal 12 times the ultrasonic frequency.

In coherent sampling, there are exactly 12 samples per cycle, each occurring at the same time point with respect to the phase of the drive signal.

Petitioner Therabody Ex-1004, 1281

As shown in FIG. 9, the ADC sample clock is generated inside the system clock 916 of the TAG microcontroller 1006.

Therefore, coherent sampling requires the system clock 916 to be synchronized to the output.

The PWM signal that drives the oxide film field effect transistor (MOSFET) that generates the output waveform is internally generated from the system clock 916.

An exemplary embodiment of the invention generates a system clock 916 from DDS1008.

Advantageously, as the output frequency changes, so does the system clock 916.

[0165]

It is desirable not to sample immediately after the MOSFET is switched on or off.

This is when there is the maximum amount of noise in the system.

Staggering the sample times to avoid sampling immediately after the MOSFET is turned on or off minimizes the effects of transistor switching noise on the ADC sample.

The outputs of the two PWMs employ a dead zone to ensure that both MOSFETs are never activated at the same time.

[0166]

X .

Concise circuit block diagram

[0167]

FIG. 27 is a concise circuit block diagram showing another exemplary electrical-related embodiment of the invention, which comprises a microprocessor 2702, a clock 2730, a memory 2726, and a power supply 2704 (eg, a battery). , A switch 2706 (eg, MOSFET power switch), a drive circuit 2708 (PLL), a transformer 2710, a signal smoothing circuit 2712 (also referred to as a matching circuit, which may be a tank circuit, for example), and a sensing circuit 2714. It has a transducer 902 and a waveguide 304, which is simply referred to herein as a waveguide 1502 and is terminated by an ultrasonic cutting blade 1520.

[0168]

One feature of the invention that works in response to high voltage (120VAC) input power (characteristics of all prior art ultrasonic cutting devices) is the use of low voltage switching through the wave forming process and the transformation stage. It is the amplification of the drive signal only immediately before.

For this reason, in one exemplary embodiment of the invention, power is drawn only from a battery that is small enough to fit into any of the handle assemblies 302 or from a group of batteries.

The latest battery technology provides a powerful battery with a height and width of a few centimeters and a depth of a few millimeters.

By combining the features of the invention to provide an all-embedded, self-powered ultrasonic device, the capital spending on the countertop box 202 is completely eliminated, resulting in a significant reduction in manufacturing costs. ..

[0169]

The output of the battery 2704 is supplied to the processor 2702 to power the processor 2702.

Processor 2702 receives a signal, outputs a signal, and functions according to custom logic, or according to a computer program executed by processor 2702, as described below.

The device 2700 may also have a main memory 2726, preferably a random access memory (RAM), for storing computer-readable instructions and data.

[0170]

Petitioner Therabody Ex-1004, 1282

The output of battery 2704 is also directed to switch 2706 with a duty cycle controlled by processor 2702.

By controlling the on-time of switch 2706, processor 2702 can determine the total amount of power finally delivered to oscillator 2716.

In one exemplary embodiment, the switch 2706 is a MOSFET, but other switches and switching configurations are similarly applicable.

The output of the switch 2706 is supplied to, for example, a drive circuit 2708 that includes a phase detection PLL and / or a low pass filter and / or a voltage controlled oscillator.

The output of switch 2706 is sampled by processor 2702 to determine the voltage and current of the output signal (coded as AD2 VIN and AD3 IIn, respectively in FIG. 27).

These values are used in the feedback architecture to tune the pulse width modulation of switch 2706.

For example, the duty cycle of switch 2706 can vary from about 20% to about 80%, depending on the desired actual output from switch 2706.

[0171]

The drive circuit 2708 that receives the signal from the switch 2706 has an oscillator circuit that converts the output of the switch 2706 into an electrical signal having a single ultrasonic frequency, eg 55 kHz (referred to as VCO in FIG. 27). There is.

As mentioned above, this smoothed version of this ultrasonic waveform is finally fed to oscillator 902 to generate a resonant sine wave along the waveguide 1502.

[0172]

At the output of the drive circuit 2708, there is a transformer 2710 capable of raising a low voltage signal to a high voltage.

Note that prior to transformer 2710, all upstream switching is performed at low (ie, battery-powered) voltages that were not previously possible with ultrasonic cutting ablation equipment.

This is due, at least in part, to the fact that the device favorably uses low resistance MOSFET switching devices.

Low resistance MOSFET switches are advantageous because they generate less switching loss and heat than conventional MOSFET devices and carry higher currents.

Therefore, the switching stage (pre-transformer) can be characterized as low voltage / high current.

In order to reliably reduce the on-resistance of the amplifier MOSFET (s), the MOSFET (s) is operated at, for example, 10V.

In such a case, by supplying power to the MOSFET gate by separately using a 10VDC power supply, the MOSFET can be completely turned on, and a reasonably low on-resistance is achieved.

In one exemplary embodiment of the invention, the transformer 2710 raises the battery voltage to 120 VRMS.

Transformers are known in the art and are therefore not described in detail herein.

[0173]

In each of the circuit configurations shown in FIGS. 3-12, 16-21 and 27 described, deterioration of the circuit components can adversely affect the performance of the entire circuit.

One factor that directly affects the performance of components is heat.

Known circuits generally monitor switching temperatures (eg MOSFET temperatures).

However, due to technological breakthroughs in MOSFET design and the corresponding reduction in size, MOSFET temperature is no longer a valid indicator of circuit load and temperature.

For this reason, according to an exemplary embodiment, the invention detects the temperature of transformer 2710 by sensing circuit 2714.

Petitioner Therabody Ex-1004, 1283

This temperature detection is advantageous because the transformer 2710 is operated at or near its maximum temperature during use of the appliance.

Additional temperatures can cause, for example, failure of the ferrite core material, resulting in permanent damage.

The present invention, for example, reduces the drive power of the transformer 2710, signals the user, turns off the power completely, pulsates the power, or by other appropriate response of the transformer 2710. Can respond to the highest temperature.

[0174]

In one exemplary embodiment of the invention, the processor 2702 is communicably coupled to the end effector 118, which is physically attached to the blade portion 116 of the waveguide 114, eg, the clamping mechanism shown in FIG. Used to place contacting materials.

The end effector is provided with a sensor to measure the value of the clamping force (within the known range), and the processor 2702 changes the kinetic voltage VM based on the value of the received clamping force.

The temperature sensor 2736 can be communicably connected to the processor 2702 and the processor 2702 is the blade from the temperature sensor 2736, since the high force value combined with the set kinetic rate leads to a high blade temperature. It can be actuated to receive and interpret a signal indicating the current temperature of the blade and to determine the target frequency of blade motion based on the received temperature.

[0175]

According to an exemplary embodiment of the invention, the PLL 2708 coupled to the processor 2702 can determine the frequency of motion of the waveguide and communicate the frequency to the processor 2702.

Processor 2702 stores a value of this frequency in memory 2726 when the device is turned off.

By reading the clock 2730, the processor 2702 determines the elapsed time after the device is shut off and recovers the last frequency of waveguide motion if the elapsed time is less than a predetermined value.

The device then starts at the last frequency, which is probably the optimum frequency for the current load.

[0176]

XI.

Mechanical structure of battery assembly

[0177]

FIG. 28 shows the battery assembly 301 separated from the handle assembly 302.

The battery assembly 301 has, in the exemplary embodiment shown in FIG. 28, an outer shell 2802 having a first half portion 2802a and a second half portion 2802b.

However, the shell 2802 does not have to have two identical halves.

According to one embodiment of the invention, the outer shell 2802 is provided in two halves.

The first half portion 2802a can be ultrasonically welded to the second half portion 2802b in a clamshell configuration.

Ultrasonic welding of the two halves of the shell 2802 provides a "sealed" seal between the components inside the shell 2802 and the outside, but does not require a gasket.

As used herein, a "sealed" seal is a compartment (from the sterile field of the surgical environment in which the device is introduced so that contaminants are not carried from one side of the seal to the other side of the seal. For example, the inside of the shell 2802) and the seals placed therein are shown to be sufficiently isolated.

This seal is at least airtight, thereby preventing the ingress of hydrogen peroxide in the air, water and steam phases.

At the time of the first assembly, all the air in the room including moisture is captured in the housing.

Petitioner Therabody Ex-1004, 1284

This often contains more water than is desired in the electronic device housing.

Therefore, by providing a drying system in the housing, two purposes are achieved.

That is, the first primary purpose is to absorb moisture that may enter during the life of the device.

When properly sized for the drying system, the drying system can absorb all the moisture captured during assembly.

Therefore, the use of a drying system simplifies assembly and eliminates the need to close the housing under any special environment.

[0178]

FIG. 28 also shows a multi-lead battery terminal assembly 2804, which is an interface that electrically connects components within the battery assembly 301 to the electrical interface of the handle assembly 302.

Through the handle assembly 302, the battery assembly 301 can be electrically coupled to the TAG assembly 303 of the present invention.

As mentioned above, the battery assembly 301 powers the ultrasonic surgical ablation assembly 300 of the present invention, as well as other functions described herein, through the multilead battery terminal assembly 2804.

The multi-lead battery terminal assembly 2804 has a plurality of contact pads 2806a-n, each of which has a terminal in the battery assembly 301 to another terminal provided by the docking bay of the handle assembly 302 (see FIG. 34). Can be electrically connected separately.

An example of such an electrical connection coupled to a plurality of contact pads 2806a-n is shown in FIG. 6 as power and communication signal paths 601a-n.

In an exemplary embodiment of the multilead battery terminal assembly 2804, 16 different contact pads 2806a-n are shown.

This number is just an example.

In an exemplary embodiment, a receiving hole is formed on the molded terminal holder inside the battery terminal assembly 2804, and an airtight seal can be formed by filling the receiving hole with an embedding material.

The contact pads 2806a to 2806n are integrally molded on the lid portion and extend into the battery 301 through the embedded receiving hole.

Here, the flex circuit can be used to reconfigure the pin array to provide electrical connectivity to the circuit board.

In the exemplary embodiment shown in FIG. 30, for example a 4x4 array is converted to a 2x8 array.

[0179]

FIG. 29 is a lower view of the multilead battery terminal assembly 2804.

In this figure, it can be seen that the plurality of contact pads 2806a-n of the multilead battery terminal assembly 2804 have a plurality of corresponding inner contact pins 2906a-n.

Each contact pin 2906 provides a direct electrical coupling that is coupled to one of the corresponding contacts pad 2806.

28 and 32 show two hemispherical recesses 2810 in the battery casing.

When these two hemispherical recesses 2810 are combined with the hook feature 3302, it is generally possible to hold the battery 301 inside the charger using longitudinal cavities.

Such geometric features are easy to make and easy to clean, and such geometric features provide a release mechanism commonly used when disconnecting the battery 301 from the handle 302. A simple geometry for capturing the battery 301 in the charger is obtained in an unnecessary manner.

[0180]

In certain embodiments shown in FIGS. 28-33, the multilead battery terminal assembly 2804 is embedded between the clamshell halves 2802a and 2802b of the shell 2802.

Petitioner Therabody Ex-1004, 1285

More specifically, FIG. 29 shows a diagram of a multi-lead battery terminal assembly 2804 located inside the upper portion of the first shell half portion 2802a of the battery assembly 301.

As shown in the figure, the upper portion of the first shell half portion 2802a forms a mouth portion 2902 that receives the outer peripheral edge 2904 of the multilead battery terminal assembly 2804.

[0181]

FIG. 30 shows the inside of the first shell half portion 2802a with the multi-lead battery terminal assembly 2804 inserted in the mouth portion 2902 of the first shell half portion 2802a and coupled to the contact pin 2906 of the multi-lead battery terminal assembly 2804. It is a further figure with the 1st circuit board 3002 which has a plurality of contact pads 3006.

In such an embodiment, each of the contact pins 2906 is soldered to each contact pad 3006 of the circuit board 3002.

According to an exemplary embodiment of the invention, as shown in FIG. 31, the battery assembly 301 further includes circuit boards 3102 and 3104 in addition to the first circuit board 3002.

[0182]

According to an exemplary embodiment of the invention, the multilead battery terminal assembly 2804 is a conductor in which the illustrated 4x4 array of contact pads 2806a-n is coupled to one or more circuit boards 3002, 3102, 3104. It is equipped with a flex circuit that changes into two 1x8 arrays.

[0183]

In another exemplary embodiment, instead of soldering and connecting to one or more circuit boards 3002, 3102 and 3104 using a flex connector, a card edge connector 10701 connects the board to the multilead battery terminal assembly 2804. It is possible to obtain a connection between them as shown in FIG.

FIG. 107 is a cross-sectional view of the shell half portion of the battery assembly 301 below the tilt curvature of the outer surface of the multilead battery terminal assembly 2804.

In this exemplary embodiment, the tilt angle of the multilead terminal assembly 2804 is greater than that shown in FIG.

For illustrative purposes, only one of the plurality of internal contact pins 2906a-2906n is shown.

One end of the contact pin 2906 is embedded in the body of the multilead battery terminal assembly 2804.

The other end of the contact pin 2906 is formed in an "S" -shaped curve, which imparts a certain degree of flexibility to the contact pin, and the internal groove or channel 10702 is the contact pin and the multi-lead battery terminal. Formed between the body of assembly 2804.

Due to the inherent flexibility of the "S" shaped portion of the contact pin 2906, any one or more of the circuit boards 3002, 3102 and 3104 can be easily inserted into the internal groove or channel 10702. It is possible, which establishes a direct electrical connection between the contact pin 2906 and one or more traces of the circuit boards 3002, 3102 and 3104.

To maintain this direct connection, the card edge connector 10704 secures the circuit board in place, eliminating the need to solder the contact pins 2906 to the circuit board altogether.

As a result, the functionality of the card edge connector 10704 is integrated with the underside of the multilead battery terminal assembly 2804.

Therefore, it is easier to remove the board to solve the problem, and since there is no soldering portion, manufacturing is also easy.

[0184]

In addition, more than or less than three circuit boards can provide extended or limited functionality.

As shown in FIG. 31, a plurality of circuit boards 3002, 3012 and 3104 can be arranged in the form of a stack architecture, which provides a plurality of advantages.

Petitioner Therabody Ex-1004, 1286

For example, the smaller layout size reduces the footprint of the circuit board in the battery assembly 301, resulting in a smaller battery.

In addition, in this configuration, it becomes easy to isolate the power board from the digital board, so that adverse effects on the digital board due to noise from the power board are avoided.

The stack configuration also allows for direct connection of features between boards, which reduces the presence of wires.

In addition, the circuit board can be configured as part of a single stiffness / flex / stiffness circuit, allowing the stiffness portions to be placed "fan-shaped" in a smaller volume.

According to an exemplary embodiment of the invention, each circuit board 3002, 3102 and 3104 provides a particular function.

For example, the circuit board 3002 can provide a component that executes the battery protection circuit 702 shown in FIG.

Similarly, the circuit board 3102 can provide components that execute the battery controller 703, as shown in FIG.

The circuit board 3104 can provide, for example, a high power back controller component.

Finally, the battery protection circuit 702 provides a connection path for connecting the batteries 701a-n shown in FIGS. 7 and 31.

By arranging the circuit boards in a stack configuration and separating the boards for each function, the boards can be strategically placed in a specific order to best deal with the noise and heat generation of the individual boards. It will be possible.

For example, in the case of a circuit board with a high power back controller element, most of the heat is generated from the board.

Therefore, such a circuit board can be isolated from other boards and placed in the center of the stack.

By doing so, heat can be isolated from the outer surface of the device so that the doctor or operator of the device does not feel the heat.

In addition, by configuring the battery board grounding in a star topology, it is possible to arrange the center on the back controller board and reduce the noise generated from the grounding loop.

[0185]

These strategically stacked circuit boards, the low thermal conductivity path from the circuit board to the multilead battery terminal assembly, and the flex circuit 3516 are all features that help avoid heat reaching the outer surface of the device. be.

The battery and back element are thermally connected to the flex circuit 3516 (ie, the disposable portion of the device) in the handle 302, whereby the heat generated from the battery and back element travels distally from the physician's hand. ..

The flex circuit 3516 exhibits a relatively high thermal mass due to its large exposed area and high copper conduction characteristics.

The flex circuit 3516 redirects, absorbs and / or diffuses heat over a larger area, which delays heat concentration and limits hot areas on the outer surface of the device.

Other techniques are also feasible (eg, larger heat wells, sinks or insulation, metal connector caps and increased weight of copper in the flex circuit or handle 302 of the device, to name a few).

[0186]

Another advantage of the removable battery assembly 301 is achieved when a lithium ion (Li) battery is used.

As mentioned above, lithium batteries should not be charged in a parallel configuration of multiple batteries.

This is because as the voltage increases in a particular cell, the particular cell begins to accept additional charge faster than other low voltage batteries.

Therefore, each battery must be monitored so that charging to that battery can be controlled individually.

If the lithium battery is formed from a group of batteries 701a-n, a large number of wires extending from the outside of the device to the batteries 701a-n (at least one additional wire for each battery beyond the range of the first wire). Is required.

Petitioner Therabody Ex-1004, 1287

By having the removable battery assembly 301, each battery 701a-n may have an exposed set of sets in one exemplary embodiment, and each if the battery assembly 301 is not inside the handle assembly 302. The set of contacts may be coupled to the corresponding set of contacts on an external non-sterile battery charger.

In another exemplary embodiment, each battery 701a-n may be electrically connected to the battery protection circuit 702 so that the battery protection circuit 702 can control and regulate the charging of each battery 701a-n.

The battery assembly 301 of the present invention is provided with a circuit for preventing the battery assembly 301 from being used beyond the expected life.

Such lifespan is not only determined by the battery, but also by the outer surface (eg, battery casing or shell and upper contact assembly).

Such circuits, for example, the number of uses, the number of recharges, and the absolute time from the production count will be described in more detail below.

[0187]

Here, with reference to FIG. 33, at least one additional novel feature of the invention is clearly shown.

The battery assembly 301 shown in FIG. 33 is a fully assembled battery assembly 301, with two halves 2802a and 2802b, as well as an embedded multilead battery terminal assembly 2804 between the outside and the inside of the battery assembly 301. Welded, for example, ultrasonically to provide a sealed seal.

The space between the terminal assembly 2804 and the shell halves 2802a and 2802b is wide enough to allow automatic distribution of the sealing material (eg, photo-curing adhesive or epoxy).

As shown in the previous figures, FIG. 33 shows the catch 3300 of the present invention, which is provided by an extension of the shell 2802 formed by a substantially vertical void 3302 beneath the catch 3300. It is formed and both are located in the outer upper portion of the shell 2802.

The catch 3300 is shaped to mesh with the receiver 3400 in the lower battery dock 3401 of the handle assembly 302 shown in FIG.

[0188]

FIG. 35 shows the underside of the handle assembly 302 and provides an improved view of the receiver 3400 and the battery dock 3401.

As can be seen from FIG. 35, the receiver 3400 extends from the battery dock 3401 (formed by the handle shell 3500) and is shaped to mesh with, or fit into, the void 3302 of the battery assembly 301.

Further, the receiver 3400 is in close proximity to the multi-lead handle terminal assembly 3502 having a plurality of handle contact pins 3504a-n.

In the exemplary embodiment shown in FIG. 35, each handle contact pin of the multilead handle terminal assembly 3502 is a spring type contact pin that can be compressed while being located in the direction opposite to the compressive force. It exerts a quantitative force, thereby maintaining a positive electrical connection between the handle contact pins 3504a-n and the force-acting object.

Further, the handle connection pins 3504a-n of the multi-lead handle terminal assembly 3502 are such that each of the handle connection pins 3504a-n is physically aligned with one of the contact pads 2806a-n of the multi-lead battery terminal assembly 2804. As you can see, they are spaced apart.

[0189]

In order to connect the battery assembly 301 of the present invention to the handle assembly 302 of the present invention, the catch 3300 contacts the receiver 3400 as shown in FIG. 36, and the battery assembly 301 shows the progress from FIG. 36 to FIG. 37. Is rotated relative to the handle assembly 302.

Not limited to the exemplary embodiments shown in the drawings of this specification, but according to the physical shapes of the catch 3300 and receiver 3400 shown in FIGS. 33-35 (particularly the rounded corners 3305 shown in FIG. 33), the battery

Petitioner Therabody Ex-1004, 1288

assembly 301. Substantially aligns itself with the handle assembly 302, regardless of the angle at which the battery assembly 301 approaches the receiver 3400, as long as the catch 3300 and the receiver 3400 are in physical contact with each other.

Any rotation of the battery assembly 301 between the position shown in FIG. 36 and the position shown in FIG. 37 automatically seats the catch 3300 or rather the void 3302 on the receiver 3400.

This allows the user in the sterile field to easily connect the battery assembly 301 to the handle assembly 302, and in particular, to connect the two parts without actually looking at them during the connection operation.

[0190]

In one exemplary embodiment of the invention, as shown in FIG. 35, the multi-lead handle terminal assembly 3502 surrounds the handle connection pins 3504a-n and seals to a flex circuit board 3514 supporting the handle connection pins 3504a-n. It has a gasket 3512 to be made.

In one embodiment of the example, the gasket 3512 is part of a rigid-flex circuit that includes a flex circuit board 3514, a flex circuit or harness 3516 (connected to the TAG assembly 303), and handle connection pins 3504a-3504n. be.

A portion of the flex circuit board 3514 can be made relatively stiffer or stiffer than the rest of the flexible harness 3516.

If the gasket 3512 is compressed during the connection of the battery assembly 301 to the handle assembly 302, the rigid portion of the flex circuit board 3514 adjacent to the gasket 3512 supports the gasket 3512 and the battery assembly 301 is connected to the handle assembly 302. Allows the gasket 3512 to be compressed, sometimes without significant movement.

When the multi-lead battery terminal assembly 2804 and the multi-lead handle terminal assembly 3502 are placed together, as shown in FIGS. 59 and 60, the outer circumference 3312 of the multi-lead battery terminal assembly 2804 and the gasket of the multi-lead handle terminal assembly 3502. There is a seal between it and the 3512.

The seal prevents moisture from penetrating into the gasket 3512, i.e., moisture reaches the handle connecting pins 3504a-n of the multi-lead handle terminal assembly 3502 or the contact pads 2806a-n of the multi-lead battery terminal assembly 2804. To prevent that.

In such a sealing method, it is only necessary to insulate only the portion of the contact pin extending through the reinforcing material on the opposite side to the gasket.

Such a sealing method is also used on the TAG connector 5010 and on the handle 302 as described in more detail below.

Such a configuration allows the manufacture of equipment that does not require sealing of all possible openings, thereby reducing cost and complexity.

[0191]

According to an exemplary embodiment of the invention, the flex circuit board 3514 is composed of two copper trace layers.

These layers are separated and insulated by polyimide.

As mentioned above, the portion of the flex circuit board 3514 can be configured to be relatively rigid.

For example, a reinforcing material (for example, FR-4 reinforcing material) bonded to the flex circuit board 3514 can be provided in a specific portion of the flex circuit board 3514.

The provision of the stiffener at the portion of the flex circuit board 3514 enables a mechanical method for maintaining the rigidity of the elements in the disposable handle assembly 302.

[0192]

According to another exemplary embodiment of the invention, a rigid portion is held between the handle assemblies 302 under narrow tolerances between the two body halves 4503 and 4603 of the handle assembly 302.

Where the flex circuit board 3514 has a horizontal stiffener 10902 and the flex circuit board 3514 transitions vertically as shown in FIG. 108, the flex circuit board 3514 is damaged (if it cannot be progressively transitioned). obtain.

It is desirable that the rigid portion (eg, 10902) of the flex circuit board 3514 be provided in or inside a slot or track 10804 in the body material.

Petitioner Therabody Ex-1004, 1289

Therefore, in order to firmly hold the rigid portion on all the side portions, the portion 10806 of the flex circuit board 3514 is designed so as to reach the end portion of the flex circuit board 3514 after being peeled from the rigid portion 10902. ..

No adhesive is placed in this area.

According to an exemplary embodiment of the invention, a custom connector is provided on this battery side of the flex circuit board 3514 (ie, a reinforced board on which the battery contact pins 2906a-2906n project).

This custom connector is constructed, for example, from FR-4 material or molded plastic.

This is shown in FIG. 60, for example.

The molded plastic may include insert-molded metal contacts, or the contacts may be inserted after molding and then embedded for sealing purposes.

Then, the FR-4 or the molded plastic is adhered to the flex circuit board 3514 with an adhesive.

In the molded configuration, the connector can be configured to have a rigid material arranged within a few rows.

These rigid materials can be raised between the contacts or even between the grid materials, thereby protecting the contacts from mechanical damage.

[0193]

As shown in FIG. 56 and described in detail below, the stiffness-flex circuit of the handle assembly 302 electrically couples the handle connection pins 3504a-n to the TAG electrical connector 5602 of the handle assembly.

[0194]

With reference to FIG. 35 again briefly, the handle body 3500 of the handle assembly 302 comprises an extended battery fixing portion 3506.

The extended battery fixing portion 3506 is on the side of the multi-lead handle terminal assembly 3502 opposite the receiver 3400.

It should be noted that certain exemplary embodiments of the handle fixing portion shown in FIG. 35 have a pair of voids 3508 and 3510 that do not require termination of the battery handle fixing process.

Referring here to FIG. 38, additional features of the battery assembly 301 are shown.

In this figure, it can be seen that a pair of bosses 3802, 3804 are on the outside of the battery assembly shell 2802.

The bosses 3802, 3804 are spaced apart and positioned to mesh with the voids 3508, 3510 of the extended battery fixing portion 3506 of the handle body 3500.

This meshing position is shown in FIG. 37.

Further referring to FIG. 38, it can be seen that each of the bosses 3802, 3804 comprises an inclined upper portion 3816 and an opposing sharp edge bottom portion 3818.

The tilted upper portion 3816 allows the bosses 3802, 3804 to easily slide into the voids 3508, 3510 of the extended battery fixing portion 3506 of the handle assembly 302 when the battery assembly 301 is secured to the handle assembly 302.

The bottom portion of the sharp edge 3818 secures and allows the bosses 3802, 3804 to remain seated within the extended battery fixing portion 3506 of the handle assembly 302.

[0195]

By combining the engagement between the catch 3300 and the receiver 3400 on one side of the battery assembly 301 with the respective engagements of the bosses 3802, 3804 and voids 3508, 3510 on the other side of the battery assembly 301, the handle assembly 302 A tight and secure attachment of the battery assembly 301 to is provided (see FIGS. 3 and 37).

In an exemplary embodiment, the two bosses 3802, 3804 are actually spaced apart from each other.

This spacing improves the strength and stability of the attachment between the battery assembly 301 and the handle assembly 302.

Petitioner Therabody Ex-1004, 1290

This stability is further enhanced by overlapping the disposable section and the battery on the surfaces 3520 and 3305, respectively (shown in FIGS. 35 and 33).

[0196]

FIG. 38 also shows a detachment mechanism 3806 coupled to the outside of the battery assembly shell 2802.

The detachment mechanism 3806 comprises a peripheral edge 3808 that is secured by a pair of corresponding grooves 3810, 3812 formed within the same outside of the battery assembly shell 2802, such as the bosses 3802, 3804, and slides into the grooves 3810, 3812. There is.

The detachment mechanism 3806 and the battery casings 2802a and 2802b are loosely fastened to allow water to flow between the meshing portions for cleaning prior to sterilization.

Holes can be added to support the washability of the detachment mechanism 3806.

In an exemplary embodiment, two elliptical holes are provided.

Further, the contact surface area is limited by curving the entire edge of the detachment mechanism 3806.

The center of the surface of the detachment mechanism 3806 facing the battery casing is cut in a concave shape, which further reduces the meshing surface area.

The disengagement mechanism 3806 has an inclined nose region 3814 that can be actuated to move back and forth with respect to the bosses 3802 and 3804, and in particular, in the embodiment of FIG. 38, the disengagement mechanism 3806 is slid upward. When struck, it extends between the bosses 3802 and 3804.

The nose 3814 also forcibly lowers and removes the battery latch when the battery assembly 301 is connected.

The release mechanism 3806 is made of a lubricious and tough material.

Such materials allow for low friction and withstand long-term use of the battery assembly 301 (ie, the reusable portion of the device).

For example, materials such as graphite and / or carbon fiber reinforced PTFE are suitable.

[0197]

When the battery assembly 301 is fixedly connected to the handle assembly 302, as shown in FIG. 37, the detachment mechanism 3806 remains in a position in the grooves 3810, 3812 farthest from the handle assembly 302.

When the user wants to remove the battery assembly 301 from the handle assembly 302, the detachment mechanism 3806 is slid in the grooves 3810, 3812 towards the handle assembly 302.

This sliding action causes the tilted nose region 3814 to enter the region between the battery assembly 301 and the lowest position of the extended battery fixing portion 3506.

As the tilted nose region 3814 advances, the extended battery fixing portion 3506 moves up the tilted nose region 3814 and bends away from the battery assembly 301.

Separately, the extended battery fixing portion 3506 bends away from the multi-reed handle terminal assembly 3502 and the receiver 3400.

A trigger 4606 is configured to cover or protect the battery release mechanism 3806 to eliminate the risk of the battery assembly 301 being accidentially released from the handle assembly 302 when the jaw is closed.

Therefore, by keeping the trigger 4606 in a fully pressed state, the battery release mechanism 3806 is completely covered, whereby the user does not activate the release mechanism 3806 to release the battery assembly 301.

[0198]

When the extended battery fixing portion 3506 bends to a certain degree, the bottom edges 3802a-3802b of the bosses 3802 and 3804 are no longer engaged with the voids 3508 and 3510, and the battery assembly 301 is viewed from the direction shown in FIG. 37. It is easily rotated in the direction indicated by 36 and finally separated from the handle assembly 302.

Petitioner Therabody Ex-1004, 1291

The detachment mechanism 3806 is, of course, just one example of a mechanism for fixing the battery assembly 301 to the handle assembly 302 and detaching the battery assembly 301 from the handle assembly 302.

The withdrawal mechanism 3806 is advantageous in that unexpected removal rarely occurs.

In order to disengage the battery assembly 301, the operator needs to move the disengagement mechanism 3806 toward the handle and at the same time rotate the battery assembly 301 away from the handle assembly 302.

These two opposite forces / actions rarely occur at the same time unless they are intentionally performed.

The application of these different forces also requires the user's hand to be in a different position than the position used during surgery.

Such a configuration substantially ensures that the battery assembly 301 and the handle assembly 302 are free from accidental separation.

[0199]

The invention also provides significant advantages over prior art devices in the way electrical connections are formed between the multi-lead handle terminal assembly 3502 and the multi-lead battery terminal assembly 2804.

More specifically, with reference to FIG. 33 again, it can be seen that in the exemplary embodiment of the multilead battery terminal assembly 2804, there are 16 contact pads 2806, where the contact pads 2806a-d are in the first row. 3304 is formed, contact pads 2806e-h form a second row 3306, contact pads 2806i-l form a third row 3308, and contact pads 2806m-p form a fourth row 3310.

[0200]

Similarly, as shown in FIGS. 34 and 35, the multi-reed handle terminal assembly 3502 has a plurality of handle connection pins 3504a-n (only 12 of the 16 pins 3504a-n are shown in FIG. 35). Has been).

The handle contact pins are formed such that each handle connection pin 3504a-n is aligned with an individual one of the contact pads 2806 when the battery assembly 301 is connected to the handle assembly 302.

Therefore, the handle connection pins 3504a-n are also arranged in four rows 3404, 3406, 3408 and 3410 in the particular embodiment shown in the figure.

[0201]

When the battery assembly 301 is attached to the handle assembly 302, the catch 3300 is first placed in contact with the receiver 3400, and the battery assembly 301 is subsequently placed with bosses 3802 and 3804 extending, respectively. It is rotated towards the extended battery fixing part 3506 until it engages with.

One notable result of rotation is that the physical / electrical connection between the multi-lead handle terminal assembly 3502 and the multi-lead battery terminal assembly 2804 begins in battery row 3304 and handle row 3404, one row at a time, continuously. It is to occur.

[0202]

According to an exemplary embodiment of the invention, the first battery row 3304 has a ground contact pad and the last battery row 3310 has at least one power contact pad.

Thus, the first contact between the multi-lead battery terminal assembly 2804 and the multi-lead handle terminal assembly 3502 is the ground connection and the last contact is the power connection.

The installation of the battery assembly 301 does not cause a spark because the ground contact of the battery assembly 301 is at a distance from the last row 3410 of the multi-reed handle terminal assembly 3502 when a power connection is made.

As the battery assembly 301 rotates to the mounting position (shown in FIG. 37), each battery row 3304, 3306, 3308 and 3310 continuously contacts each handle row 3404, 3406, 3408, 3410, respectively, but the power contacts , The row is connected only after at least one ground contact is connected.

Petitioner Therabody Ex-1004, 1292

In other words, when the battery assembly 301 is installed in the handle assembly 302, the battery assembly 301 is conveniently grounded before any power contacts come into contact with any part of the handle assembly 302, as opposed to prior art power connections. Has significant advantages.

In all known devices, the contacts that supply power (eg, the main line of electricity) are simultaneously connected to other connections or randomly connected depending on the approaching direction of the electric plug.

This prior art connection leaves sparks or arcs as a lasting possibility.

However, according to the present invention, the possibility of sparks or arcs in the prior art is completely eliminated.

[0203]

Further, according to an exemplary embodiment of the invention, any one or more of the handle connecting pins 3504a-n in the first row 3404, the second row 3406, the third row 3408 and the last row 3410 it is connected to the battery presence detection circuit 3104.

In particular, one of the contacts in the last row 3410 is used as the presence pad.

The battery presence detection circuit 3104 permits the operation of the ultrasonic surgical assembly 300 after detecting that the ground pin and presence pin of the multi-lead handle terminal assembly 3502 are properly connected to the multi-lead battery terminal assembly 2804.

In embodiments where the battery presence detection pad is only in the last row, i.e. farthest from the receiver 3400, the handle assembly 302 is mounted until the battery assembly 301 is fully fixed and installed, i.e. all. Do not change / change state until the contacts are properly connected.

This advantageous feature prevents improper operation of the entire assembly.

Similarly, when disconnecting the battery assembly 301, the last row 3410 is the first row to disconnect from the handle connection pins 3504a-n.

Therefore, the device responds immediately to the lack of battery assembly 301 from handle assembly 302.

[0204]

In an exemplary embodiment, the battery protection circuit 702 or fuel gauge monitors the presence pad and waits for the presence pad to be connected to ground before powering the microprocessor 1006 within the TAG assembly 303.

To do this, of course, the TAG assembly 303 must also be connected to the handle assembly 302.

More specifically, the TAG assembly 303 must be electrically coupled to the TAG electrical connector 5602 of the handle assembly.

When the TAG assembly 303 is coupled to the TAG electrical connector 5602 of the handle assembly (see, eg, FIGS. 36 and 37) and the battery assembly 301 is properly coupled to the multilead handle terminal assembly 3502 (eg, the configuration shown in FIG. 37). See), communication occurs between the battery assembly 301 and the TAG assembly 302.

After such communication is established, the device is ready for use and the battery controller 703 produces a visual indicator, for example, by generating a display tone on the buzzer 802 in the handle assembly 302 and / or on the LED906. This makes it possible to send a signal in the "ready to use" state to the user.

[0205]

In one exemplary embodiment for establishing this communication, the battery protection circuit 702 periodically pulses a low voltage signal to the presence pad to provide proper connection between the battery assembly 301 and the handle assembly 302. Detect the presence.

The battery protection circuit 702 monitors the presence pad for connection to ground, which is provided by the handle assembly 302 when the battery assembly 301 is properly connected to the handle assembly 302.

However, since the battery assembly 301 can be exposed to body fluids or submerged in a solution such as water during cleaning, if the grounding condition is solely due to the solution that electrically binds the existing pad to ground. It is convenient not to detect a faulty ground condition as if the battery assembly 301 was properly connected to the handle assembly 301.

Petitioner Therabody Ex-1004, 1293

More specifically, the contacts are exposed to an electrolyte having finite resistance while the device is sterilized and washed.

If no protection circuit is provided, the circuit will turn on the battery pack to activate the substrate in the presence of the electrolyte.

High currents can flow from between the voltage enable pins to the battery ground.

This current flow establishes the motion of metal ions, resulting in pitting corrosion or electrical deposition at the contacts.

Such pitting corrosion or electrical deposition is not desirable because short exposures to the electrolyte will cause high corrosion of the contacts and render the contacts unusable.

Another undesired situation exists when installing the battery.

That is, when proper battery handle contact closure is achieved, the resistance of the conductive line sensed by the microcontroller is extremely low.

However, if fluid is present, higher resistance is present.

The sensitivity of the microcontroller is so high that the device is activated due to such high resistance.

[0206]

For this reason, embodiments of the invention provide a comparator that monitors the impedance between the presence pad and ground (ie, the GND line of the TAG assembly shown in FIG. 9).

The comparator compares the impedance of the connection between the existing pad and ground with the reference impedance so that the battery assembly 301 operates only if the impedance is less than the threshold impedance, i.e. less than the impedance of the solution. ..

More specifically, the comparator circuit compares the reference voltage with the voltage generated when the battery presence contact is exposed to either short / ground or the above-mentioned finite resistance electrolyte.

If the generated voltage is a resistance that matches the reference voltage, the battery is turned on.

The reference voltage is adjusted so that the battery pack does not turn on due to the fluid present at the time of contact with the battery handle.

The comparator circuit is configured with high hysteresis to avoid accidental ons due to noise and the high sensitivity of this circuit.

[0207]

The illustrated design of the multi-reed handle terminal assembly 3502 provides additional advantages over the prior art.

In particular, in the handle connection pins 3504a to n of the present invention shown in the enlarged partial perspective view of FIG. 39, the handle connection pins 3504a to n of the multi-lead handle terminal assembly 3502 touch the contact pads 2806a to n of the multi-lead battery terminal assembly 2804. It provides a physical connection in addition to the lateral displacement that guarantees the removal of any foreign material from the contact area.

Specifically, FIG. 39 shows the stationary, non-contact first handle connecting pin 3504a.

That is, the handle connection pin 3504a has a spring force that is positioned and held in the original stationary shape shown in FIG. 39.

However, when the multi-lead battery terminal assembly 2804 is fully meshed with the multi-lead handle terminal assembly 3502, the handle connection pins 3504a-n compress.

This compressed state is shown, for example, by the handle connection pins 3504b and 3504f in FIG.

[0208]

The compressive force acting on the handle connection pins 3504a-n by the contact pad 2806 not only provides a positive pressure to hold the electrical connection, but also the connection surface of each handle connection pin 3504a-n in the longitudinal direction of the pin 3504. It is moved over a distance D with respect to the size of.

Petitioner Therabody Ex-1004, 1294

This distance D is shown in FIG. 39 by a first vertical line 3901 indicating that the top of the connecting surface of the first handle connecting pin 3504e is present when the pin 3504e is in its uncompressed state.

The second vertical line 3902 shows that the top of the connecting surface of the adjacent second handle connecting pin 3504f is when the pin 3504f is compressed.

The distance between the two lines defines a longitudinal distance D in which the connecting surfaces of the pins 3504a-n translate when compressed.

This movement is such that the handle connection pins 3504a-n are first in contact with the respective contact pads 2806 and the battery assembly 301 is between the receiver 3400 and the extended battery fixing portion 3506, as shown in the cut perspective view of FIG. It starts when you keep in contact until you are fully seated.

The translational movement of the handle connection pins 3504a-n produces a tapping motion that efficiently and cleanly wipes the contact pad 2806, thus improving the electrical connection between them.

This tapping effect is, for example, when the battery needs to be replaced in a surgical environment, and when a contaminant, such as blood, comes into contact with the contact pad 2806, or when the pad comes from repeated use or as a cleaning agent. It can prove to be very advantageous when corroded by exposure.

[0209]

FIG. 35 shows yet another advantageous feature of the present invention.

As can be seen from FIG. 35, in the multi-reed handle terminal assembly 3502, the flange side 3520 protects the handle connection pins 3504a-n of the handle assembly 302 from the left and right sides.

This is because the flange side 3520 extends distally from the plane of the pins 3504a-n.

The receiver 3400 also extends distally from the plane of pins 3504a-n, thereby protecting the pins from the rear.

Finally, the battery fixing portion 3506 extends significantly distally from the plane of the pins 3504a-n, thereby protecting the pin from the anterior portion.

Due to the ergonomic shape of the battery pack 301 and handle 302, the user is configured to attach the battery pack 301 to a particular surface of the handle 302 as specified in FIGS. 36 and 37. I understand.

Therefore, the sizes of these four extended sides of the lower battery dock 3401 are sized so that the pins 3504a to n are not damaged when the user attempts to insert the battery 301 into the dock 3401.

To show this in more detail, two faces are defined, one for the battery 301 and the other for the handle 302.

These planes are parallel to the page containing FIG. 3 and are coplanar when the battery 301 is mounted in the handle 302.

The surface associated with the handle 302 is referred to as the distal / proximal central handle surface and the handle is vertically bisected as in the page of FIG.

Similarly, the surface associated with the battery 301 is referred to as the distal / proximal central battery surface and the handle is bisected vertically as shown on the page of FIG.

These defined planes describe the pin safety features.

[0210]

The shape of the receiver 3400 and the battery fixing part 3506 is such that when the distal / proximal central battery surface is within about 30 degrees from the distal / proximal central handle surface, the length causes the front upper corner of the battery to be pinned. The shape is such that it does not come into contact with 3504a to n.

Similarly, the shape of the receiver 3400 and battery fixation 3506 depends on the length of the posterior upper angle of the battery 301 when the distal / proximal central battery surface is within approximately 30 degrees from the distal / proximal central handle surface. The shape is such that the portion (that is, the catch 3300) does not come into contact with the pins 3504a to n.

Such a configuration ensures that the connection from the battery 301 to the handle 302 is safe and easy.

[0211]

Petitioner Therabody Ex-1004, 1295

A further advantage of the present invention is that the entire battery assembly 301 can be sterilized.

The battery assembly can be easily replaced with a new sterile battery assembly if it needs to be replaced during a medical procedure.

The airtight structure of the battery assembly 301 may be, for example, manufactured by Steris Corporation and performed by a sterilizer referred to by trade name V-PRO, or may be carried out by Ethicon, Inc.

) Division, Advanced Stabilization Products ASP, manufactured by Johnson & Johnson, as performed by the sterilizer referred to under the trade name STERRAD®. It can be sterilized using low temperature vapor phase hydrogen peroxide (H2O2).

Since the lithium battery in the battery assembly 301 is damaged when heated above 60 ° C., non-heat sterilization commonly used in hospitals today makes the battery assembly 301 easily reusable in a surgical environment.

[0212]

a .

Battery pressure valve

[0213]

The battery assembly 301 of the present invention has yet another feature of the present invention.

As shown in FIG. 37, the battery assembly 301 avoids the effects of both positive and negative external pressures on the internal pressure of the battery assembly, as described below, while releasing urgent excessive internal pressure, eg, greater than 30 psi. Has a pressure valve 3702 to provide.

The valve 3702 advantageously has an opening large enough to quickly expel any gas accumulated therein.

Also advantageous is that the valves 3702 of the present invention do not open and close simultaneously with small changes in pressure, as some prior art vents do.

Instead, the event of opening and closing the valve 3702 has several prescribed stages.

In the exemplary configuration of valve 3702, during the first stage (<30 psi), valve 3702 remains sealed, as shown in FIGS. 41 and 42, to allow gas flow into and out of the battery compartment. Not allowed.

This exemplary embodiment may be referred to as a so-called poppet valve.

In step 2, when the internal pressure of the battery assembly increases sufficiently to counter the force of the spring 4102 holding the O-ring 4104 surrounding the poppet 4106 with respect to the valve seat 4202 as shown in the cut view of FIG. 42, the fluid / gas Begins to leak between the O-ring 4104 and the sheet 4202.

In step 3, the internal pressure pushes open the valve 3702 enough to allow a significant amount of fluid / gas to pass through the seals 4104 and 4202.

At this point, up to step 4, the internal pressure causes the valve to fully open, i.e. the O-ring 4104 completely moves the seat 4202.

The additional pressure reduces the effect on the flow as the valve cannot be opened further.

[0214]

In step 5, the pressure on the valve 3702 begins to decrease and the poppet 4106 begins to close.

When the poppet 4106 recedes, the poppet 4106 follows the same sequence that occurs during opening through hysteresis (ie, the delay in action when a force acts on the body is changed and a delay command in closing is issued.).

As a result, when the poppet 4106 begins its return, it lags in place with respect to the curve of FIG. 44 that crosses when the poppet 4106 is opened.

In stage 6, the O-ring 4104 just touches the seat 4202.

Petitioner Therabody Ex-1004, 1296

The valve does not seal at this point as there is no force pushing the O-ring 4104 into the seat 4202.

At step 7, the force of the spring 4102 compresses the O-ring 4104 with sufficient force to close and seal the valve.

The valve 3702 now returns to stage 1, as shown in FIGS. 41 and 42.

Since the sealing surface is tapered so that friction can be minimized, the valve 3702 can be sealed multiple times.

[0215]

To facilitate testing of valve 3702, poppet 4106 is formed with a cut handle 4108.

Actuating the handle 4108 allows the poppet 4106 to be moved (manually or automatically), which is used for ultrasonic welding or for the purpose of inspecting the joint shell halves 2802a and 2802b for leaks, the battery. Access to the assembly 301 is possible.

For example, the user or leak inspection instrument can grab the handle 4108 and move the poppet 4106 out of the valve dock 4204 and back into the valve dock 4204.

41 and 42 show how the valve dock 4204 is located within half of the outer shell 2802a or 2802b of the battery assembly 301.

Alternatively, the handle 4108 is used to access the interior of the battery assembly 301 to fill the battery compartment with an inert gas or trace gas (eg, helium) or even evacuate from the interior of the battery assembly 301. is possible.

After the inspection is complete, the user (eg, the manufacturer) cuts or removes the handle 4108 to prevent the poppet 4106 from being further controlled by the user.

The removal of the handle 4108 is made easier by the constriction 4110 formed at the base of the handle 4108.

For example, the narrowed portion 4110 shown in FIGS. 41 to 43 includes an acute angle portion for obtaining a consistent and smooth cut point.

[0216]

In this exemplary embodiment, the handle 4108 has an arrowhead shape and a tabbed configuration.

As shown in FIGS. 41-43, the poppet 4106 includes a clocking tab 4112 on at least one side of the poppet 4106, which allows the arrowhead shape to be oriented in the desired direction (eg, ultrasonic surgical assembly 300). (Horizontal to the ground during use), which facilitates mechanical or automatic access to the interior of the battery assembly 301 during leak inspection.

This arrowhead shape includes a loosely tapered shape, which assists in mounting the O-ring 4104.

That is, the O-ring 4104 can be easily slid on the tapered arrowhead shape without breaking the arrowhead tab.

[0217]

In an exemplary embodiment, the O-ring 4104 is composed of a STERRAD® compliant material having a durometer of approximately 40 to approximately 60 (eg, VITON®).

This is because such materials are more reliably sealed on molded parts with irregular surface finishes.

[0218]

In another exemplary embodiment, the poppet 4106 is made of a different material than the battery shell 2802, thereby avoiding resonance welding of the battery shell halves 2802a and 2802b during ultrasonic welding.

[0219]

As shown in FIG. 37, the valve 3702 is advantageously located at the bottom of the battery assembly 301.

In this exemplary configuration, the valve 3702 remains outside the working area of the handgrip (ie, the battery outer shell 2802), which avoids interference with the user's handling of the ultrasonic surgical assembly 300. ..

Petitioner Therabody Ex-1004, 1297

Further, by arranging the valve 3702 in this way, damage to the user's hand when ventilation is generated through the valve 3702 is avoided, so that safety is increased.

At the same time, the ventilation of the valve 3702 is not obstructed by the user's hand.

[0220]

Also, advantageously, the valve 3702 is easy to clean.

Since the outer surface of the poppet 4106 is smooth, it is possible to directly access the sealed portion of the O-ring 4104.

Similarly, since the functions of the poppet 4106 are smoothly mixed, there is no concealed portion that causes mud and dirt to get stuck.

[0221]

The battery assembly 301 of the present invention may include novel features used as an alternative to the valve 3702 described above.

In one exemplary embodiment, the battery assembly 301 may include a battery access hole in the underside of one of the shell halves 2802a and 2802b or a burst plug (not shown) mounted in the relief port.

In this exemplary configuration, the burst plug is formed from a molded flexible material and can be pressed into the access hole.

Alternatively, the burst plug may be formed inside the battery access hole.

The attached burst plug is flush with the outer surface of the battery shell 2802, thereby avoiding the collection of mud or dirt or interference with the user's hands.

The burst plug enables emergency pressure relief for excessive internal pressure (eg> 30 psi).

With such excessive internal pressure, the burst plug will disengage from the battery relief port and all the accumulated gas inside will be immediately ventilated.

In this exemplary embodiment, the T-tail on the medial end of the molded burst plug eliminates the possibility that the burst plug will come off the battery assembly 301 and be lost or fall into the patient's body during a surgical procedure.

Further, since the burst plug is held in the battery by the T-tail, the suspended burst plug is an advantageous visual indicator for the user to indicate that an adverse condition has occurred in the battery assembly 301.

[0222]

In another exemplary embodiment, the battery assembly 301 may include a burst disk.

The burst disk is mounted on a battery access hole or relief port in the underside of one of the shell halves 2802a and 2802b.

In this exemplary embodiment, the burst disc may include a foil tape disc disposed on the battery relief port or a disc material with known shear properties.

The disc can be ultrasonically welded, joined or otherwise sealed in place on the battery relief port, thereby functioning as a ejection mitigation valve.

Advantageously, the relief port may include an array or grid composed of a large number of small openings.

With such a configuration, the situation where the disk is unexpectedly broken by the external mechanical measuring means is avoided.

[0223]

In yet another exemplary embodiment, one of the shell halves 2802a or 2802b of the battery assembly outer shell 2802 may include a molding ejection or mitigation region, in which molding of the outer shell halves 2802a or 2802b. The material is particularly thinner than the rest of the outer shell 2802.

Petitioner Therabody Ex-1004, 1298

As such, the mitigation area of the outer shell 2801 is designed to collapse when a pre-defined unwanted pressure reaches the interior of the battery assembly 301.

Further, by providing a pattern (for example, a petal pattern) on the molding surface of one of the shell halves 2802a or 2802b, a further stress concentration portion can be obtained and petal loss after pressure relief occurs is avoided. A hinge function for this can also be obtained, thereby avoiding a situation in which fragments of the molded material of the collapsed shell 2802 fall from the battery assembly 301 into the patient's body.

[0224]

In yet another exemplary embodiment, the battery assembly 301 may include a pressure relief configuration similar to a turkey popper valve.

Instead of providing the self-rearrangement valve as described above for the poppet valve 3702, the turkey popper valve is held in the operating position after the excessive internal pressure in the battery assembly 301 is released.

The result is a visual indicator to indicate to the user that adverse conditions are present in the battery.

In this configuration, the turkey popper valve can be selectively rearranged, which allows further utilization of the battery assembly 301.

[0225]

b.

スマートバッテリ

[0226]

In a further exemplary embodiment of the invention, a smart battery is used to power the ultrasonic surgical ablation assembly 300.

However, smart batteries are not limited to the ultrasonic surgical ablation assembly 300 and are used in a variety of devices with or without alternating power requirements (ie, current and voltage), as described. It is possible.

According to an exemplary embodiment of the invention, the smart battery can advantageously identify a particular device that is electrically coupled.

This is done through an encrypted or unencrypted identification method.

For example, the battery assembly 301 shown in FIG. 57 may have a connection portion such as portion 5702.

The handle assembly 302 may be communicably coupled to the multi-reed handle terminal assembly 3502 and may include an actuable device identifier 5704 to communicate at least a portion of the information about the handle assembly 302.

This information includes the number of times the handle assembly 302 was used, the number of times the TAG assembly 303 (now connected to the handle assembly 302) was used, and the waveguide assembly 304 (now connected to the handle assembly 302).) Was used, the type of waveguide assembly 304 currently connected to the handle assembly 302, the type or identity of the TAG assembly 303 currently connected to the handle assembly 302, or many other characteristics. ..

When the smart battery assembly 301 is inserted into the handle assembly 302, the connection portion 5702 in the smart battery assembly 301 communicates with the device identifier 5704 of the handle assembly 302.

The handle assembly 302 transmits information to the smart battery assembly 301 (either by self-starting or upon request from the battery assembly 301) through hardware, software or a combination thereof.

This communicated identifier is received by the connection portion 5702 of the smart battery assembly 301.

In one embodiment of the example, when the smart battery assembly 301 receives the information, the communication portion 5702 can operate to control the output of the battery assembly 301 to meet the specific power requirements of the device.

[0227]

Petitioner Therabody Ex-1004, 1299

In one exemplary embodiment, the communication portion 5702 has a processor, such as processor 1118, and a memory that can be a separate or single component.

The processor 1118 in cooperation with the memory can provide power operation by information processing of the handheld ultrasonic surgical ablation assembly 300.

This embodiment is particularly specific because an ultrasonic device, such as, for example, a handheld ultrasonic surgical ablation assembly 300, has power requirements (frequency, current and voltage) that may be unique to the handheld ultrasonic surgical ablation assembly 300. It is advantageous.

In practice, the handheld ultrasonic surgical ablation assembly 300 is a second waveguide having different dimensions, shapes and / or configurations with specific power requirements or limitations for a given size or type of waveguide 1502. Can have a second different power requirement for the type of.

[0228]

Accordingly, the smart battery 301 according to the present invention makes it possible to use a single battery assembly among a plurality of surgical devices.

Since it is possible to identify which device the smart battery 301 is attached to and thus change its output, operators of various different surgical devices utilizing the smart battery 301 can use the electronics. You don't have to worry about the power supply you are trying to mount in your device.

This is especially useful in surgical environments where the battery assembly is replaced or interchanged with another surgical device in the midst of a complex surgical procedure.

[0229]

In a further exemplary embodiment, the smart battery 301 stores a record for each use of a particular device in memory 5706.

This record is useful for assessing the useful or permissible useful life limits of the device.

For example, after the appliance has been used 20 times, all such batteries 301 connected to the appliance refuse to power it, as the appliance is shown as a "no longer reliable" surgical instrument.

Reliability is determined on the basis of multiple factors.

One factor can be wear and can be estimated in multiple ways (eg, the number of times the device has been used or activated).

After a predetermined number of uses, the components of the device may wear and the tolerance between the components may exceed the limit.

For example, the smart battery 301 can detect the number of button presses received by the handle assembly 302 and can identify when the maximum number of button presses is met or exceeded.

The smart battery 301 can monitor, for example, the impedance of the button mechanism that can change if the handle is contaminated with, for example, salt.

[0230]

This wear can lead to unacceptable failures during the procedure.

In some exemplary embodiments, the smart battery 301 can recognize which components are used together in the device and even the number of times each component has been used.

For example, looking at FIG. 57, if the battery assembly 301 is a smart battery according to the invention, the battery assembly 301 will have the handle assembly 302 and the ultrasonic cutting blade and waveguide long enough before the user attempts to use the composite device. Both tube assemblies 304, as well as a particular TAG assembly 303, can be identified.

The memory 5706 in the smart battery 301 can record, for example, each time the TAG assembly 303 is activated.

If each TAG assembly 303 has a unique identifier, the smart battery 301 can keep track of the use of each TAG assembly 303 and if the handle assembly 302 or TAG assembly 303 exceeds its maximum number of uses. Refuses to power the TAG assembly 303.

Petitioner Therabody Ex-1004, 1300

The TAG assembly 303, handle assembly 302, ultrasonic cutting blade and waveguide assembly 304 or other component may have a memory chip that records this information as well.

In this way, any number of smart batteries 301 can be used with any number of TAG assemblies, staplers, vascular sealers, etc., total number of uses, or total usage time (use of clock 330). Through), or the total number of actuators and the like, each TAG assembly, each stapler, each vascular sealer, etc., or the charge or discharge cycle can still be specified.

[0231]

When counting the number of uses of the TAG assembly 303 to intelligently end the life of the TAG assembly 303, the completion of the actual use of the TAG assembly 303 in the surgical procedure and a temporary delay during, for example, battery change or surgical procedure. It is important to accurately distinguish from the temporary non-use of the TAG assembly 303 due to.

Therefore, a real-time clock (RTC) circuit can be run as an alternative to simply counting the number of boots of the TAG assembly 303, thereby reducing the length of time the TAG assembly 303 is actually shut down. It will be possible to record.

From the length of time measured, through appropriate logic, whether the shutdown is long enough for the end of a single use or whether the shutdown is too short at the end of a single use. It will be possible to decide.

Thus, in some applications, this method makes it possible to determine the life of the TAG assembly 303 more accurately than with a simple "boot-based" algorithm.

This is because, in the case of a simple "activation-based" algorithm, it can be determined that, for example, "activation" has been performed 10 times in a single surgical procedure, so that even 10 activations increments the counter by 1. Because there are times when it should be.

In general, this type of internal clocking system avoids misuse of equipment designed to deceive simple "boot-based" algorithms and is required for good reason. Inaccurate logging of full utilization is avoided if only a simple disassembly of the TAG assembly 303 or battery 301 is performed.

[0232]

Although the battery and TAG assembly of the device are reusable, it is desirable to set the number of uses of the device to a finite number.

Such settings may be necessary as the device may be exposed to harsh conditions during cleaning and sterility.

More specifically, the battery pack is configured to be sterilized.

Regardless of the material used for the outer surface, there is an upper limit to the expected life of the material actually used.

Such lifespan is determined by a variety of properties (eg, the number of times the pack is actually sterilized, the time since the pack was manufactured, and the number of times the pack has been refilled).

In addition, the life of the battery itself has an upper limit.

The software of the present invention checks the number of uses in both the TAG and the battery assembly and incorporates a novel algorithm that disables the device if it reaches or exceeds this number of uses.

An analysis of the external battery pack can be performed for each of these possible sterilization methods.

Based on the strictest sterility procedure, the maximum number of sterility allowed can be determined and this number can be stored in the memory of the battery assembly 301.

If the charger is in a non-sterile state and it is estimated that the battery pack 301 should be used after charging, the charge count can be defined as equal to the number of steriles performed on the pack.

[0233]

Permanently disabling the hardware in the battery pack should minimize or eliminate safety issues due to continuous discharge from the battery after the pack has been disabled by software.

Petitioner Therabody Ex-1004, 1301

Under certain low voltage conditions, there may be situations where the internal hardware of the battery cannot disable the battery.

In such situations, in an exemplary embodiment, a charger can be used to "kill" the battery.

Since the battery microcontroller is off when the battery is inside the charger, a non-volatile SMBus-based EEPROM can be used to exchange information between the battery microcontroller and the charger.

Therefore, the serial EEPROM can be used to store information that can be written and read even when the battery microcontroller is off.

This is extremely useful when attempting to exchange information with a charger or other peripheral device.

This exemplary EEPROM includes at least (a) an upper limit on the number of uses (battery usage count) indicating when the battery should be disabled, (b) the number of treatments performed with the battery (battery treatment count), and. / Or (c) may be configured to include sufficient memory registers to store the number of times the battery has been charged (charge count).

By storing a part of the information stored in the EEPROM (for example, the number of times the register is used and the register charge count) in the write protection unit of the EEPROM, the user cannot change the information.

In an exemplary embodiment, the corresponding bit inverting mirror register is stored with usage information and a counter, thereby detecting data corruption.

[0234]

If there is any residual voltage in the SMBus line, the microcontroller can be damaged and the SMBus signal can be destroyed.

Therefore, a relay is provided between the external SMBus line and the battery microcontroller board so that the SMBus line of the battery controller 703 does not carry the voltage when the microcontroller is off.

[0235]

When charging the battery 301, for example, when the constant current / constant voltage charging scheme is used, if the current flowing into the battery gradually decreases and falls below a given threshold, the "charge end" state of the battery 301 is set. It is determined.

In order to accurately detect this "end of charge" state, the power supply to the battery microcontroller and backboard during battery charging is reduced and turned off, thereby reducing current outflow and current detection that can result from the board. The current outflow that can interfere is reduced.

Further, by reducing the power supply to the microcontroller and the back board during charging, the disruption of the SMBus signal caused by the power supply is avoided.

[0236]

As for the charger, it is desirable to prevent the smart battery 301 from being inserted into the charger in a manner other than the correct insertion position.

Therefore, as shown in FIG. 28, for example, the charger holding feature 2810 is provided outside the battery 301.

By configuring the cup for holding the battery 301 firmly in the charger with a contour matching taper shape, it is possible to prevent the battery pack 301 from being accidentally inserted in a manner other than the correct (intended) manner. ..

It is further contemplated that the presence of the battery assembly 301 can be detected by the charger itself.

For example, the charger may be configured to detect the presence of SMBus transmissions from resistors located within the battery protection circuit and protection board.

In such cases, the charger can be enabled to control the voltage exposed to the pins of the charger until the battery assembly 301 is precisely positioned in the charger.

This is because if there is a voltage exposed to the pin of the charger, there is a risk that an electric short circuit will occur on the pin and the charging of the charger will be started unexpectedly.

[0237]

Petitioner Therabody Ex-1004, 1302

In some exemplary embodiments, the smart battery 301 can communicate with the user through auditory and / or visual feedback.

For example, the smart battery 301 can turn on the LED 906 as preset.

In such a case, although the microcontroller 1006 of the oscillator 904 controls the LED 906, the microcontroller 1006 receives the command to be executed directly from the smart battery 301.

[0238]

In a further exemplary embodiment, the microcontroller 1006 of oscillator 904 goes into sleep mode when not in use for a predetermined time.

Advantageously, in sleep mode, the clock speed of the microcontroller 1006 is reduced, cutting off significant current consumption.

The processor keeps pinging to wait for the input to be detected, so some current continues to be consumed.

Advantageously, the microcontroller 1106 and the battery controller 703 can directly control the LED 906 when the microcontroller 1006 is in this power saving sleep mode.

For example, by constructing a decoder circuit in the oscillator board 5460 and connecting it to a communication line, the LED 906 is independent by the battery microcontroller 1106 while the TAG microcontroller is "off" or "sleep mode". It becomes possible to control the system.

This provides power saving characteristics that eliminate the need to activate the microcontroller 1006.

Power can be saved by turning off the oscillator while the user interface indicator can be actively controlled.

[0239]

In another exemplary embodiment, decelerating one or more of the microcontrollers saves power when not in use.

For example, power can be saved by reducing the clock frequency of both microcontrollers.

To maintain synchronous operation, these microcontrollers adjust each clock frequency to occur at about the same time for reduction, and then increase the frequency when full speed operation is required.

For example, the clock frequency is lowered when the standby mode is entered, and the clock frequency is raised when the standby mode is finished.

[0240]

In a further exemplary embodiment, the smart battery 301 is capable of determining the amount of available power remaining in the battery 701, sufficient to keep the device operating as expected through the expected treatment. It is programmed to activate the attached surgical device only if it determines that it has battery power.

For example, the smart battery 301 can remain inactive if there is not enough power in the battery to operate the surgical device for 20 seconds.

According to an exemplary embodiment, the smart battery 301 determines the amount of power remaining in the battery 701 at the end of its most recent function, such as surgical disconnection.

Thus, in this embodiment, the battery assembly 301 will not allow subsequent performance of the function if the battery 701 does not have sufficient power, for example during the procedure.

Alternatively, the smart battery 301 determines that there is sufficient power for subsequent treatment and, if it falls below that threshold during treatment, does not shut off the ongoing treatment and instead does it. Allow to be terminated to prevent further treatment from occurring.

[0241]

Petitioner Therabody Ex-1004, 1303

Hereinafter, the advantages of the present invention will be described with respect to maximizing the use of the device having the smart battery 301 of the present invention.

Take, for example, a series of different devices with different waveguides.

By definition, each waveguide may have its own maximum permissible power limit, beyond which the power limit overloads the waveguide and eventually crushes the waveguide. Will end up.

One of the series of waveguides inherently has the smallest maximum power capacity.

Since the prior art battery does not have battery power operation with information processing capabilities, the output of the prior art battery is the smallest / thinnest / of the set expected to be used for the device / battery. It must be limited by the value of the smallest allowable operating power input for the weakest waveguide.

This is true, even though a larger, thicker waveguide is subsequently attached to its handle end, allowing, by definition, a greater force to act.

This limit also applies to maximum battery power.

For example, if a battery is designed to be used by multiple devices, its maximum output power is limited to the minimum maximum power rank of any of the devices used.

According to such a configuration, one or more devices or device configurations do not allow maximum use of the battery because the battery is unaware of the particular limitations of the particular device.

[0242]

In comparison, the exemplary embodiment of the invention utilizing the smart battery 301 can be skillfully circumvented by determining the limitations of the prior art ultrasonic device described above.

The smart battery 301 can generate one output for one device or a particular device, and the same battery assembly 301 can subsequently generate different outputs for a second device or device configuration. can.

This versatile smart battery surgical system is well suited for modern operating rooms where space and time are important.

Having one smart battery pack that activates many different devices allows nurses to easily operate the storage, repair, and inventory of those packs.

Advantageously, the smart battery system according to the invention requires only one type of charging station, thus increasing ease of use and efficiency and reducing operating room costs for equipment.

[0243]

In addition, other devices, such as electric staplers, may have power requirements that are completely different from those of the ultrasonic surgical ablation assembly 300.

According to the present invention, a single smart battery 301 can be used with any one of the entire series of surgical devices and is designed to regulate its own output to a particular device to be mounted. Can be.

In one embodiment of the example, this output adjustment is controlled by being integrated with or otherwise coupled with the smart battery 301, eg, a back, back boost, boost or other configuration switch mode power supply. It is performed by controlling the duty cycle.

In another exemplary embodiment, the smart battery 301 can dynamically change its power output during operation of the device.

For example, power operation is very important for container sealing devices.

These devices require a constant large current value.

The total power output needs to be dynamically adjusted as its impedance changes as the tissue is sealed.

Embodiments of the present invention provide a variable maximum current limit to the smart battery 301.

The current limit varies depending on the application (or device), depending on the application or device requirements.

[0244]

Petitioner Therabody Ex-1004, 1304

XII.

Handle assembly-mechanical structure

[0245]

FIG. 45 shows an exemplary embodiment of the left side surface of the handle portion 302 from which the left shell half portion has been removed.

The handle assembly 302 has four basic functions.

(1) The battery assembly 301 is connected to the multi-reed handle terminal assembly 3502.

(2) The TAG assembly 303 is connected to the TAG mounting dock 4502.

(3) The ultrasonic cutting blade and the waveguide assembly 304 are connected to the waveguide mounting dock 4504.

(4) A trigger mechanism 4506 is provided to operate the three components (battery assembly 301, TAG assembly 303, and ultrasonic cutting blade and waveguide assembly 304).

[0246]

a.

TAG mounting dock

[0247]

The TAG mounting dock 4502 is exposed to the outside and is shaped to replaceably secure the TAG assembly 303 to the handle assembly 302.

The waveguide mounting dock 4504 is shaped so that the proximal end of the waveguide 1502 is aligned with the transducer 902.

When the transducer 902 is placed in the TAG mounting dock 4502 and the waveguide assembly 304 is placed in the waveguide mounting dock 4504 and the transducer 902 and waveguide 1502 are mounted to each other, the waveguide 1502 and the converter The vessel 902 is freely rotatable and held by the transducer assembly 302.

[0248]

As can be seen from FIGS. 45 and 46, the handle assembly 302 has two clamshell connection body halves, the right halves 4503 being shown in FIG. 45 while the left halves are shown in FIG. It is shown.

The two halves 4503, 4603 form at least a portion of the waveguide mounting dock 4504, and the waveguide mounting dock 4504 can be considered to be exposed to the outside in the absence of the waveguide rotating spindle 3704.

The first connecting portion 4602 is operable so as to selectively and detachably fix the ultrasonic waveguide assembly 304 to the handle assembly 302.

In the illustrated embodiment, the waveguide rotating spindle 3704 has an intermediate annular groove 4603 shaped to accommodate the annular boss 4605.

When the two halves 4503, 4603 are connected, the groove 4610 and the boss 4605 form a longitudinal connection of the freely rotating waveguide assembly 304.

In an exemplary embodiment, the ultrasonic cutting blade and waveguide assembly 304 cannot be detached from the handle assembly 302 by the user.

[0249]

The TAG mounting dock 4502 faces the waveguide mounting dock 4504.

Petitioner Therabody Ex-1004, 1305

The TAG mounting dock 4502 is exposed to the outside and detachably secures the ultrasonic converter 902 to the ultrasonic waveguide 1502 when the ultrasonic waveguide assembly 304 is connected to the waveguide mounting dock 4504. It has a second connecting portion 4604 that can be operated in such a manner.

The couplings 4602 and 4604 may simply be aligned with a passage or any other structure that arranges the waveguide 1502 so as to be axially aligned with the transducer 902.

Of course, the couplings 4602 and 4604 may provide additional structures such as threads that actually hold the waveguide 1502 and / or the transducer 902 to each other.

To name a few examples of connecting portions 4604, there are rails, dovetails, T-grooves, at least one pin, more than one pin, and an undercut groove.

[0250]

b .

Control mechanism

[0251]

Looking here at FIG. 46, the trigger 4606 and the button 4608 are shown as components of the handle assembly 302.

The trigger 4606 activates the end effector 118, which in turn the waveguide 114 to allow various types of contact with tissue and / or other material between the end effector 118 and the blade portion 116. Cooperate with the blade portion 116.

As shown in FIG. 1, the end effector 118 is usually a swivel jaw (eg, see FIG. 73 et seq.) That acts to grip or clamp the tissue located between the jaw and the blade 116.

In an exemplary embodiment, audible feedback is provided within the trigger and clicks when the trigger is fully pressed.

Noise can be generated by the thin metal part.

At the time of closing, the trigger comes into contact with the thin metal portion.

With such a function, an audible element can be added to the user feedback, and the user can indicate that the jaw is completely pressed against the waveguide and sufficient clamping pressure is applied to seal the blood vessel. Can be notified to.

[0252]

When pushed, the button 4608 puts the ultrasonic surgical assembly 300 into an ultrasonic actuation mode that causes ultrasonic motion in the waveguide 1502.

In the first embodiment of the example, pushing the button 4608 closes the electrical contacts in the switch 4702, thereby powering the converter 902 with the battery assembly 301 and the TAG. Complete the circuit between the assemblies 303.

In another exemplary embodiment, pushing the button 4608 closes an electrical contact to the battery assembly 301.

Of course, the description of the electrical contacts that close in the circuit is merely an exemplary general description of switch operation herein.

It may include opening a contact or processor-controlled power transfer that receives information from switch 4702 and assigns the response of the corresponding circuit based on that information.

[0253]

FIG. 47 shows the switch 4702 from the front on the left side, and FIG. 48 is a cut perspective view of the inside of the right side of the handle body, showing various details of the switch 4800.

In the first exemplary embodiment, the switch 4800 comprises a plurality of contacts 4804a-n.

Pushing in the plunger 4802 of the switch 4702 activates the switch and initiates a change in the state of the switch and a change in the position or correspondence of the contacts between two or more of the plurality of contacts 4804a-n.

Petitioner Therabody Ex-1004, 1306

If the circuit is connected through switch 4702, i.e., switch 4702 controls power transfer to transducer 902, the state change completes or shuts off the circuit, depending on the mode of operation of switch 4702. Either.

[0254]

FIG. 49 shows an exemplary embodiment of a switch 4702 that provides two switching stages.

Switch 4702 has two subswitches 4902 and 4904.

The subswitches 4902 and 4904 advantageously provide two levels of switching within one button 4802.

When the user pushes the plunger 4802 inward to the first degree, the first subsitch 4902 is activated, thereby providing a first switch output on contacts 4804a-n (not shown in this figure).

When the plunger 4802 is pushed further inward to a second degree, the second subswitch 4904 is activated, resulting in different outputs on contacts 4804a-n.

An example of this two-stage switch 4702 in actual use is for a TAG oscillator 904 to make two possible output power levels available, each producing a different range of motion value for the waveguide 4502. ..

The activation of the first subswitch 4902 starts, for example, the first output power level from the oscillator 904, and the activation of the second subswitch 4904 results in the output of the second power level from the oscillator 904.

An exemplary embodiment of this two-stage switch 4702 provides a low power level for the first configuration and a high power level for the second configuration.

Forming the subswitches 4902 and 4904 in the stack, as shown in FIG. 49, simply pushes the plunger 4802 of the button 4702 from the first switch mode or first power level to the second switch mode or second. Make the transition to the power level easy and intuitive for the operator.

[0255]

In one embodiment of the subswitches 4902 and 4904, spring forces may be utilized and each spring has a different spring force level.

When the plunger 4802 is first pushed in, the first spring of the first subswitch 4902 begins to compress.

Since the second spring arranged in the second subswitch 4904 is harder than the first spring, only the first subswitch 4902 can change the switching state.

When the first subswitch 4902 is pushed over a distance sufficient to change the switching state, an additional (greater) force acting on the plunger 4802 pushes in a stiffer second spring to the second subswitch 4904. Change the state.

[0256]

In practice, ultrasonic cutting devices, such as those adopting the present invention, come across various tissue types and sizes and must be tightly controlled for delicate cutting materials that require less control. It is used for various types of surgical procedures that change the movement.

Therefore, it is useful to provide at least two ultrasonic disconnect power levels that allow the operator to choose between a low power disconnect mode and a high power disconnect mode.

For example, in the low power disconnect mode, that is, when only the first subswitch 4902 is pushed in, the tip of the waveguide 1502 moves with a displacement of about 0.002 inches.

In the high power disconnect mode, i.e., when both the first and second subswitches 4902 and 4904 are pushed in, the tip of the waveguide 1502 moves with a displacement of about 0.003 inches, compared to the low power mode. It can move through the tissue at a higher rate, or it can cut tougher and denser substances more quickly.

For example, mesenteric cleavage can be performed at a faster rate and with greater power in general, while vascular sealing can be performed with lower power and for a longer period of time.

[0257]

Petitioner Therabody Ex-1004, 1307

However, the invention is not limited to stacked switches, but may include switches that are independent of each other.

For example, the shape of the button 4608 may have a first portion that contacts the first low power switch and a second portion that contacts the second high power switch due to further movement of the button.

The present invention should be taken into account as having any multi-stage switch that activates different stages by moving one button.

[0258]

In one exemplary embodiment of the invention, the switch 4702, 4800 provides physical resistance similar to a composite bow.

A well-known composite bow for shooting arrows at high speeds has a curve of pulling force that rises to peak force and is delivered to a lower holding force.

By reforming this physical action with the second subswitch 4904, the user of the device finds that it is rather easy to move to the first subswitch 4902 and engage with the first subswitch 4902. So, we discover that moving to a high power mode initiated by pushing the second subswitch 4904, which requires a larger pushing force, is an event that occurs only by the operator who consciously acts the increased force. ..

However, overcoming the greater indentation force reduces the force required to maintain the second subswitch 4904 in the indentation position, allowing the operator to remain in high power mode, ie, the operator. Keep the button pressed without tired fingers.

This composite bow type action can be achieved in a variety of ways.

Examples include offset cams, software controls, dome switches and others that overcome pin forces or other obstacles.

[0259]

In one exemplary embodiment of the invention, the switch 4702 produces an audible sound as the switch 4702 moves from the first mode to the second high power mode.

For example, the audible sound is emitted from the button itself or from the buzzer 802.

The sound notifies the operator that the high power mode has been entered.

The notification can conveniently avoid unintended operation of the ultrasonic device of the present invention.

[0260]

c .

Waveguide node bump

[0261]

According to an exemplary embodiment of the invention, at least one bump 5710 is provided in the section (s) of the ultrasonic guide 1502, as shown in FIG.

In other words, the bump 5710 is placed at a position along the waveguide 1502 where the waveguide 1502 does not exhibit ultrasonic motion at the resonant frequency.

Since these bumps 5710 are radiatively and longitudinally symmetric, the diameter of each bump 5710 and its physical waveguide characteristics change to reduce (larger in the radial direction) and increase vibration transmission. Even when (decreased in the radial direction), there is no adverse effect on the ability of the waveguide to resonate at the ultrasonic frequency and the ability of the waveguide to transmit the desired vibration at the distal edge.

These bumps will be described in more detail with reference to FIG.

[0262]

d .

Petitioner Therabody Ex-1004, 1308

ニアオーバセンタートリガ

[0263]

Here, with reference to FIGS. 61-64, a variable pressure trigger is shown and described.

The components of the variable pressure trigger can be seen in the right partial perspective view of the handle assembly 302 shown in each of FIGS. 61-64.

In this figure, most of the shells of the handle assembly 302 are missing, so some of the inner components can be seen exposed.

In practice, many of the components shown in FIGS. 61-64 are covered by the shell and are protected and invisible.

[0264]

First, with reference to FIG. 61, at least a portion of the trigger swivel assembly 6102 is shown.

The assembly 6102 has a first swivel member 6104 and a second swivel member 6106.

In the following description, comparison between FIGS. 61 and 62 to 64 showing the interaction between the first swivel member 6104 and the second swivel member 6106 when the trigger 4606 is continuously pushed down by the operator. Is explained.

[0265]

The first swivel member 6104 has an elongated structure and has a first end 6112 and a second end 6114.

The first end 6112 of the first swivel member 6104 is rotatably connected to the first swivel pin 6116, while the second end 6114 is rotatably connected to the second swivel pin 6118.

In the front view of FIG. 61, it is found that the exemplary embodiment of the first swivel member 6104 has two separate halves, each halved being connected to a first swivel pin 6116 and a second swivel pin 6118. It is connected to the central section together.

In this embodiment, the central pivot comprises a circular boss on a trigger captured by two links.

These two links are amphoteric parts, and when pressed together, the boss is constrained by the two holes.

Each of these two holes is provided on each link.

With this configuration, a third swivel portion is obtained.

However, the swivel member does not have to have this configuration.

The swivel member is any structure that connects the two swivel pins 6116 and 6118 and provides a force directed in close proximity to the first swivel pin 6116 to translate the actuator for the end effector 118. Often, the end effector 116 is described in more detail below.

As can be seen in FIGS. 61-64, the first swivel pin 6116 rides in a vertically extending guide track 6130 shown in the left body half portion 4603 of the handle assembly 302, the mirror images of which face each other. The same applies to the right half part 4503.

When the trigger 4606 is pushed in, the first swivel pin 6116 is fully from the stop position (indicated by the first swivel pin position in FIG. 61), as shown in the progress of FIGS. 61, 62, 63, 64. Translates a sufficient distance in the proximity direction to move the end effector 118 to the position moved to (indicated by the first swivel pin position in FIG. 64).

[0266]

According to the illustrated embodiment, the second swivel pin 6118 is coupled to the trigger 4606 and is part of the trigger 4606.

In particular, the entire second swivel member 6106, including the swivel pin 6118, actually comprises the furthest range of the trigger 4606.

Petitioner Therabody Ex-1004, 1309

The furthest range of the trigger 4606 (second swivel member 6106) is itself rotatably coupled to a third (fixed) swivel pin 6110 within the handle assembly 302.

The third swivel pin 6110 defines an axis on which the trigger 4606 rotates with respect to the handle assembly 302.

The third swivel pin 6110 is shared by a slide rotary lockout member 6508 that cooperates with the rotary lockout blade.

The purpose and details of the rotary lockout blade are described in the following sections.

[0267]

Since the position of the third swivel pin 6110 is fixed to the handle assembly 302, the first swivel pin 6116 moves away from the third swivel pin 6110 when the trigger 4606 is pushed in by the operator.

Further, as the first swivel pin 6116 moves away from the third swivel pin 6110, the second swivel pin 6118 is well below the virtual line 6120 connecting the first swivel pin 6116 to the third swivel pin 6110. An arc starting at the position shown in FIG. 61, where the second swivel pin 6118 extends to the position shown in FIG. 64, which is even closer to the virtual line 6120, which still connects the first swivel pin 6116 to the third swivel pin 6110. Cross the arc.

[0268]

The movement of the trigger 4606 from the position shown in FIG. 61 through the positions shown in FIGS. 62 to 64 causes the end effector 118 to clamp in the direction toward the waveguide 1502.

In other words, pushing the trigger 4606 moves the end effector 118 from the open position to the closed position (via the movement of the outer tube 7302 described below).

Advantageously, the interaction between the first swivel member 6104 and the second swivel member 6106 changes the pressure required to maintain the indentation of the trigger, as shown in the comparison of FIGS. 61-64. Provides trigger movement by.

This variable pressure link (6110, 6106, 6118, 6104, 6116), when fully pushed, pushes the trigger 4606 into the push position compared to the pressure to partially push the trigger 4606, for example as shown in FIG. It requires much less pressure to hold, which advantageously reduces operator hand fatigue.

[0269]

More specifically, when the operator first applies pressure to the trigger 4606, the first force may move the second swivel pin 6118 (in relation to the orientation shown in FIG. 61) upwards. is necessary.

Since the first swivel pin 6116 must move proximally, the force required to actuate the end effector 118 is actually longitudinal.

This force moves the second swivel pin 6118 along the arc, and as a result, the second swivel pin 6118 moves the first swivel pin 6116 away from the third swivel pin 6110 and along the swivel members 6104, 6106. Two force vectors are specified.

The two force vectors at the positions shown in FIG. 61 are at an angle of about 100 ° 6122, showing a black vector located to the left and a white vector located to the right for clarity.

[0270]

Here, referring to FIG. 62, it can be seen that the trigger 4606 has moved from the stop position shown in FIG.

This partial movement occurs when pushed during a typical medical procedure upon contact with the first tissue.

When the trigger 4606 is pushed down, i.e., when the trigger 4606 moves towards the handle assembly 302, the first swivel pin 6116, the first swivel member 6104, the second swivel member 6106 and the second swivel pin 6118 all change position. Let me.

More specifically, the second swivel member 6106 rotates around a third swivel pin 6110 fixed at that position.

Since the third swivel pin 6110 is fixed, the second swivel pin 6118 begins to swing upward, i.e. towards the virtual line 6120.

When the second swivel pin 6118 swings upward, the force acts on the first swivel member 6104, moves along the first swivel member 6104, and acts on the first swivel pin 6116.

Petitioner Therabody Ex-1004, 1310

Accordingly, the first swivel pin 6116 slides in close proximity to the waveguide assembly 304.

It can be seen that in this first stage of movement shown in FIG. 62, the angle of the force vector 6122 is increased from that shown in FIG.

[0271]

In FIG. 63, the trigger 4606 is further closed.

As a result, further movement of the first swivel member 6104, the second swivel member 6106, the first swivel pin 6116 and the second swivel pin 6118 occurs.

When this movement occurs, the second swivel pin 6118 moves closer to the virtual line 6120, i.e., is approximately on the same line as the first and third swivel pins 6116 and 6110.

As indicated by the force vector 6122, the forces acting on the swivel members 6104, 6106 begin to face significantly opposite to each other.

The exemplary angle between the vectors 6122 is about 150 ° at this position.

[0272]

Finally, in FIG. 64, the trigger 4606 is pushed in until it contacts the battery assembly holding portion of the handle assembly 302.

This is the point of maximum movement of the first swivel member 6104, the second swivel member 6106 and the first swivel pin 6116.

Here, the force vectors are approximately opposite to each other, thereby reducing the amount of force sensed by the trigger 4606.

That is, as is known in the technical field of mechanics, the maximum force is required when the forces of the two vectors are subtractive, that is, when they are in the same direction, and the minimum force is the two vectors. Is needed when the force of is subtractive, that is, when it is in the opposite position.

In the orientation shown in FIG. 64, the vector is more subtractive than additive, which makes it much easier for the user to keep the trigger 4606 depressed compared to the position shown in FIG.

The last closed position shown in FIG. 64 is referred to herein as a "near overcenter" position or a "near overcentering" position.

When the trigger 4606 is in the near overcenter position, the force required to keep the trigger in the pushed position is required for the trigger to be pushed first away from the position shown in approximately FIG. 61. 45% of force or less.

[0273]

e .

Rotation lockout

[0274]

The present invention provides yet another feature of the invention that prevents rotation of the waveguide assembly 304 whenever ultrasonic motion acts on the waveguide 1502.

This rotary lockout feature provides further improved safety by preventing unintended rotational movement of the cutting blade during the surgical procedure.

In addition, the prevention of rotation ensures that a solid electrical connection is maintained during the operation of the device 300.

More specifically, electrical contacts 5402, 5404 to maintain electrical contacts because the electrical connection fixed in one position along the contact ring 5406, 5408 of the oscillator is maintained by a rotary lockout during surgery. It is not necessary for (eg, pogopin) to slide along the contact ring 5406, 5408 between the oscillator and the oscillator.

Petitioner Therabody Ex-1004, 1311

According to an exemplary embodiment of the invention, rotational lockout is achieved through the use of the rotational lockout member 6508 shown in FIGS. 65 and 66.

[0275]

First, with reference to FIG. 65, an enlarged perspective view of the right side of the handle assembly 302 is shown with the right cover removed.

In this figure, it can be seen that the rotation lockout member 6508 is positioned adjacent to the rotation prevention wheel 6502 (the rotation prevention wheel 6502 is rotated and fixed to the waveguide rotating spindle 3704). , Fixed to the waveguide assembly 304).

Therefore, the waveguide assembly 304 can rotate along its vertical axis only if the anti-rotation wheel 6502 can rotate undisturbed on its vertical axis.

[0276]

In order to prevent the rotation of the rotation prevention wheel 6502, the rotation lockout member 6508 has a wheel engagement blade 6504 extending from the rotation lockout member 6508 toward the rotation prevention wheel 6502.

At the position shown in FIG. 65, the rotation lockout member 6508 does not interfere with the rotation prevention wheel 6502 because the wheel engagement blade 6504 is at a predetermined distance from the outer circumference thereof.

In such orientation of the blade 6504, the anti-rotation wheel 6502 rotates freely on the vertical axis of the waveguide assembly 304, similar to the waveguide assembly 304.

[0277]

Here, referring to FIG. 66, the rotation lockout member 6508 is arranged at the rotation block position.

In this position, the wheel engagement blade 6504 enters the space between two adjacent walls 6602 on the outer circumference of the anti-rotation wheel 6502 and engages the sides of the wall 6602 as the anti-rotation wheel 6502 rotates. do.

The rotary lockout member 6508 is secured in its position within the handle assembly 302 and due to this connection the engagement between the wheel engagement blade 6504 and the anti-rotation wheel 6502 is the waveguide assembly 304 of the anti-rotation wheel 6502. Completely prevent rotation around the vertical axis of.

For example, by having 72 walls on the outer circumference 6602, the anti-rotation wheel 6502 has almost no play of rotation when rotation is locked.

67-69 show that the wheel engagement blade 6504 engages the anti-rotation wheel 6502 only when the button 4608 is pushed in, thereby waveguideing when ultrasonic vibrations of the waveguide 1502 occur. Prevents almost all rotational movements of the tube assembly 304.

[0278]

FIG. 67 shows a lower perspective view of the rotary lockout member 6508 in the handle assembly 302.

Again, the cover on the right side of the handle assembly 302 has been removed, thereby exposing some of the internal mechanical components of the handle assembly 302.

These components include a button 4608 shown here in perspective view, a U-shaped member 6702 that slidably engages with the rotary lockout member 6508, and a U-shaped member in a direction away from the button portion of the rotary lockout member 6508. It has a spring 6704 that urges the member 6702.

FIG. 67 shows a rotary lockout member 6508, a U-shaped member 6702, and a spring 6704.

At the position shown in FIG. 67, the spring 6704 is preloaded by the pressure exerted by the U-shaped member 6702.

The rotary lockout member 6508 is rotatably connected to a swivel pin 6706 fixed and connected to the handle assembly 302 and swivels around the swivel pin 6706.

Petitioner Therabody Ex-1004, 1312

[0279]

Further, FIG. 67 shows a twisted screw 6708 that urges the rotary lockout member 6508 in a direction away from the wall 6602 of the anti-rotation wheel 6502.

Strepsiptera 6708 ensures that the natural stop position of the rotary lockout member 6508 is disengaged from the anti-rotation wheel 6502.

The spring force of the twisted spring 6708 is chosen to be less than the spring force of the spring 6704.

Therefore, the movement of the rotary lockout member 6508 can occur before the spring 6704 is fully compressed.

[0280]

When the anti-rotation system is activated, when the button 4608 is pushed over a short distance, the rear side of the button 4608 physically contacts the U-shaped member 6702 so that further proximal button movement occurs. Move 6702.

In other words, when pushed in, the button 4608 applies a proximal force to the U-shaped member 6702 in a direction that opposes the urging force of the spring 6704.

This proximal force compresses the spring 6704 and allows the U-shaped member 6702 to move in the direction towards the rotary lockout member 6508.

This movement is shown in FIG. 68, where the U-shaped member 6702 is closer to the rotary lockout member 6508 than the position shown in FIG.

In the figure of FIG. 68, the spring 6704 is no longer visible as the U-shaped member 6702 moves in close proximity to the rotary lockout member 6508 to the point where the lockout member 6508 completely obscures the spring 6704 in this figure. .

The contact without such a tight connection does not prevent the lockout mechanism from interfering with the release of the activation button 4608.

Such detachment is important for the safe operation of the device.

In addition, such a connection minimizes the force required to disconnect the switch and reduces operator fatigue.

[0281]

When the button 4608 is further pushed in, as shown in FIG. 69, the rotary lockout member 6508 swivels around the swivel pin 6706 and swings upward towards the anti-rotation wheel 6502.

When this upward swing occurs, the wheel engagement blade 6504 engages the wall 6602 of the anti-rotation wheel 6502.

In other words, the position of the rotary lockout member 6508 shown in FIG. 69 corresponds to the position of the rotary lockout member 6508 shown in FIG. 66.

Similarly, the position of the rotary lockout member 6508 shown in FIG. 67 corresponds to the position of the rotary lockout member 6508 shown in FIG. 65.

[0282]

In some situations, when the button 4608 is pushed in, the wheel engagement blade 6504 rides on one wall 6602 and does not fall between the two on the wall 6602.

To ensure this occurrence, the stroke distance, i.e., the distance that the U-shaped member 6702 can move towards the rotary lockout member 6508, requires the actual physical movement of the rotary lockout member 6508. Allows electrical activation of the device without.

That is, the rotary lockout member 6508 may move slightly, but does not need to fit between the two walls 6602 to cause ultrasonic actuation.

Of course, any rotational movement causes the rotational lockout member 6508 to move upward and into the wall 6602, so that rotation is still prevented.

Petitioner Therabody Ex-1004, 1313

[0283]

In a further exemplary embodiment of the invention, as shown in FIGS. 70 and 71, the rotary lockout member 7002 may include one or more blades 7004, 7006 that engage the outer surface 7008 of the anti-rotation wheel 7001.

In this particular embodiment, the anti-rotation wheel 7001 does not have its outer peripheral teeth as in the embodiment of the anti-rotation wheel 6502 of FIGS. 65-69.

In embodiments of FIGS. 70 and 71, the outer surface 7001 of the anti-rotation wheel 7001 allows the teeth 7004, 7006 to engage the outer surface 7008, eg, to actually cut into the outer circumference of the anti-rotation wheel 7001. It is malleable enough.

However, in certain embodiments where razor-type teeth 7004, 7006 are utilized, the anti-rotation wheel 7001 prevents the teeth 7004, 7006 from penetrating beyond a predetermined depth when an expected amount of force is applied. Hard enough to do.

Further, instead of the lockout member 6508 and the U-shaped member 6702, a single stamp / etch or wire type lockout member may be used, in which case at least one of the springs in its geometry. Use flexible features instead of one.

105 and 106 show two exemplary embodiments of this different configuration.

[0284]

As shown in FIG. 71, when the blades 7004 and 7006 bite into the outer surface 7008 of the anti-rotation wheel 7001, the anti-rotation wheel 7001 is prevented from rotating about the vertical axis of the waveguide assembly 304.

Of course, one blade or three or more blades may be used to prevent rotation of the anti-rotation wheel 7001.

By separating and angling the blades 7004 and 7006 from each other, the prevention of rotation is enhanced in either direction of rotation.

In other words, when the blades 7004 and 7006 are angled apart from each other, rotation of the anti-rotation wheel 7001 in either direction causes one of the blades 7004 or 7006 to bite deeper into the anti-rotation wheel 7001. ..

For example, when the pressure is released from the button due to the button return spring, the lockout member 7002 is disengaged from the rotation prevention wheel 7001.

Further, in this particular embodiment of the rotary lockout member 7002, a portion of the rotary lockout member 7002 may grip the third swivel pin 6110.

Other methods using electromechanical and electro-optical techniques are also possible to avoid energy transfer during rotation.

Any combination of sensors (eg, a magnetic position encoder or an optical position sensor) can be used to stop the energy transfer to the waveguide 1502 during rotation detection.

Alternatively, such a combination can be used as a trigger to engage a mechanical lockout (eg, a solenoid or knife switch).

These mechanical means can also be used without sensors and can lock out rotation at any time of energy application.

By arranging the optical encoder inside the oscillator housing and directing it outward through the window, the motion of the oscillator housing can be monitored.

If the magnetic encoder is completely embedded in the housing, the risk of leak paths can be further reduced.

[0285]

XIII. TAG-Mechanical structure

[0286]

Referring to FIG. 50, the reusable TAG assembly 303 is shown separately from the handle assembly 302.

The TAG assembly 303 of the present invention has a converter shaft 5002, which is formed so that the waveguide is firmly attached therein and is attached at startup of the converter shaft 5002. It has an ultrasonic waveguide connecting portion 5004 formed to excite the waveguide, that is, to apply ultrasonic waves along the length of the waveguide.

Petitioner Therabody Ex-1004, 1314

[0287]

In this exemplary embodiment, the waveguide connection 5004 is female and has a female thread, screwing the end of the waveguide 1502 onto the threads of the waveguide connection 5004 with a predetermined amount of torque. Thereby, the TAG assembly 303 is used to secure the waveguide 1502 (see, eg, FIG. 45).

The torque should be sufficient so that the mechanical connections formed by the torque do not unravel during normal operation of the appliance.

At the same time, the torque acting to connect the threads must not exceed the force that causes the threads to be worn or damaged.

During the initial connection between the transducer 902 and the waveguide 1502, all that is required is that one of the transducers 902 and the waveguide 1502 remains fixed relative to the other. be.

The waveguide rotating spindle 3704 is rotated, fixed and connected to the transducer 902, and they are rotated together with the main body 5005 of the TAG assembly 303 and freely connected.

In that way, both the waveguide rotating spindle 3704 and the transducer 902 can rotate freely with respect to the body 5005.

Thus, to establish a waveguide-transformer connection, the waveguide 1502 has a waveguide rotating spindle 3704 with a female thread on the converter shaft 5002 at the proximal end of the waveguide 1502 to the corresponding male thread. It can remain fixed as it is rotated to connect.

Preferably, the waveguide 1502 is coupled to the threads of the waveguide connection 5004 to a point where the mechanical connection is sufficient to transmit the mechanical ultrasonic motion from the TAG assembly 303 to the waveguide 1502. That is, it is screwed in.

[0288]

In one exemplary embodiment of the invention, a torque wrench (see FIG. 88) is coupled to the waveguide rotating spindle 3704, allowing the user to rotate the spindle 3704 to a predetermined amount of torque.

When the rotary coupling pressure of the waveguide connection 5004 and the waveguide 1502 exceeds a predetermined amount of torque, the outer portion of the torque wrench 8810 slides around the inner portion 8820 and thereby around the spindle 3704, causing further rotation of the spindle 3704. Does not occur.

Through the use of the torque wrench 8800 of the present invention, the operator can accurately apply an appropriate amount of tension to the coupling between the TAG assemblies 303 in the waveguide 1502 and the waveguide connection 5004. Prevents damage to either the top or the threads on the waveguide 1502.

[0289]

This embodiment of the torque wrench grips on the spindle 3704 to eliminate the possibility of the wrench slipping off of the TAG assembly 303 without exerting an external force on the TAG assembly 303.

More specifically, with reference to FIG. 50, the spindle 3704 is provided with a wrench grip surface 5014.

The wrench grip surface 5014 is arranged circumferentially around the proximal end of the spindle 3704.

In this exemplary embodiment, the wrench grip surface 5014 is an indentation.

On the other hand, the inner portion 8820 of the torque wrench 8800 is provided with a flexible tooth portion 8822.

Each of these flexible teeth 8822 has an inner distal surface that defines a spindle-grip surface 8824.

In this exemplary embodiment, the spindle grip surface 8824 has a slightly convex hemispherical protrusion.

These protrusions have a concave shape on the wrench grip surface 5014 that corresponds to a hemispherical indentation.

In this way, when the inner portion 8820 is connected to the proximal end of the spindle 3704, each tooth portion 8822 of the inner portion 8820 bends outward and then snaps back, thereby corresponding to the tooth portion 8822. The protruding portion 8824 is arranged at a predetermined position in each indentation 5014.

Petitioner Therabody Ex-1004, 1315

The user can then completely release the outer portion 8820 and the wrench 8800 remains on the spindle 3704 until removal is desired.

[0290]

A ratchet gear 8812 is provided on the outer 8810 and a ratchet 8826 is provided on the inner 8820 so that the inner 8810 and the outer 8820 of the torque wrench 8800 can be rotationally connected to each other until a predetermined amount of torque is applied.

The tilt and inner range of the gear 8812 and the outer circumference and tooth size of the ratchet 8826 are selected so that they slip at a given amount of torque.

By using a material with sufficient elasticity, it is possible to set the torque value at which the two portions 8810 and 8820 slide with each other with high accuracy.

By using the new torque wrench 8800, the operator can apply an appropriate amount of tension to the junction between the TAG assemblies 303 in the waveguide 1502 with high accuracy, and the waveguide connecting portion. It also eliminates damage to the screws on either the 5004 or the waveguide 1502.

To counter the torque of the torque wrench, the operator must hold the rotating wheel as the torque wrench rotates.

Because of this operation, in an exemplary embodiment, the lockout button can be integrated with the handle half.

This lockout button is pressed by the operator and when pressed, engages the anti-rotation wheel, thereby stopping the free rotation of the shaft assembly with minimal applied force.

[0291]

The TAG assembly 303 has a housing configured by an upper housing portion 5020 and a lower housing portion 5030 that protects and seals the internal actuating components from the outside.

See FIGS. 50 and 53.

Since the TAG assembly 303 is in the sterile field of the operating environment, it can be advantageously sterilized, for example, with hydrogen peroxide in the gas phase.

Therefore, the seal between the upper housing 5020 and the lower housing 5030 is sterile and / or sealed.

[0292]

According to one embodiment (not shown) of the present invention, the transducer 902 is completely located within the housing 5006, the housing 5006 being fixed by an operator, for example, when the waveguide assembly 304 is fixed. It is not easily fixed by holding it firmly by hand.

In such an embodiment, the TAG assembly 303 comprises an oscillator rotation lock.

For example, the oscillator rotation lock may be a button that slides into a recess in the housing 5006, or as an alternative, further rotation is not possible and waveguide when reaching maximum rotation, eg 360 degree rotation. By fixing the rotation of the oscillator 902 at maximum rotation so that the tube assembly 304 can be screwed in.

Of course, the maximum rotation in the opposite direction allows the waveguide assembly 304 to be removed as well.

In another exemplary embodiment, a torque wrench is employed on the handle itself.

This exemplary embodiment is not shown, but can be understood with reference to FIGS. 87 and 88.

As can be seen from FIG. 88, one possible torque limiting device is configured with the inner ratchet section 8826 and the ratchet gear 8812.

This ratchet assembly can be built within the anti-rotation wheel 6502.

A part of it is shown in FIG.

The rotation prevention wheel 6502 is composed of an inner radial portion and an outer radial portion.

Petitioner Therabody Ex-1004, 1316

These two parts are rotatable against each other, one of which can be formed with one of the inner ratchet portions 8826 and the other with the ratchet gear 8812.

In this way, the user can hold the proximal knob of the oscillator in a stationary state and utilize the rotation of the spindle 3704 to connect the waveguide and the oscillator together.

When the desired torque is reached, the inner ratchet section 8826 and ratchet gear 8812 slip, thereby avoiding excessive torque.

After the waveguide is connected to the oscillator with the correct amount of torque, the spindle rotation during treatment is unaffected.

This is because the number of pounds required to rotate the spindle 3704 is much lower than the number of pounds required to overcome the torque ratchet type function.

[0293]

The housing 5006 has a fixed connection portion 5012 shaped to be selectively detachably secured to the corresponding connector portion of the handle assembly 302.

See, for example, FIG.

The connection 5012 may be any connection connection where the TAG assembly 303 is, for example, the exemplary "dovetail" design shown in FIGS. 50-53 and 56, where the connection connection is where the TAG assembly 303 is a handle assembly. It can be detachably attached to and fixed to the 302.

In FIG. 56, a TAG holding device 5604 is provided.

The TAG holding device 5604 is a mechanical feature to prevent the TAG assembly 303 from slipping off the handle assembly 302 by its own weight.

The friction applied from the holding device 5604 to the fixed connection portion 5012 makes it difficult to pull the TAG assembly out of the disposable portion without overcoming a force at least greater than the weight of the TAG assembly 303.

The TAG holding device 5604 may have a finger shape as shown in FIGS. 61-64 and 86, or may be one or more bumps that interfere with the slide rail.

The force required to separate these two parts prevents the TAG assembly 303 from accidentally falling during replacement or removal.

It is possible to seal the contact area between the handle assembly 302 and the TAG assembly 303, which results from the handle assembly 302 and the TAG assembly 303 when the surgical fluid comes into contact with the TAG assembly 303. The situation where the fluid enters the TAG mounting dock 4502 is avoided.

[0294]

It is advantageous that the TAG assembly 303 is selectively removable from the handle assembly 302.

As a separate component, the TAG assembly 303 is medically disinfected or sterilized (eg, STERRAD®, V-PRO® autoclave) and can be reused for multiple surgeries. And the less expensive handle assembly 302 itself may be disposable.

In addition, the TAG assembly 303 can be used with multiple handles or the same handle up to the desired maximum number of times before requiring disposal.

In a further embodiment, the oscillator 902 of the TAG assembly 303 can be selectively attached to and detached from the oscillator 904, which improves access during cleaning.

In such embodiments, the benefits provided by the present invention of matching the oscillator to the oscillator can be maintained by configuring the oscillator with a communication system for sending the oscillator calibration coefficients to the oscillator. can.

[0295]

51 and 52 provide two additional perspective views of the TAG assembly 303.

Petitioner Therabody Ex-1004, 1317

FIG. 52 shows an exemplary display window of a user display system (eg RGB LED906) on the outer surface of the housing 5005 of the TAG assembly 303.

As mentioned above, the RGB LED906 provides the user with various signals indicating the status and mode of the surgical assembly 300.

The various conditions and modes displayed to the user indicate that the battery level at the time of installation is inappropriate (ie, there is not enough energy in the battery to confirm the start and start the software, or the battery itself. Notice that is bad) may also be included.

A positive indication may include a proper start (ie, when the battery is connected to the TAG, there is the proper power communicated by the battery / TAG communication and there is probably a TAG lifetime length available. Or, the system is ready and ready for use).

Both low mode and high mode activations may be displayed.

For TAGs, out of life or other TAG-related failures may be displayed.

For the battery, a low state may be displayed after the battery is connected or when the battery is in use.

The content of the instruction by the display is, for example, that the remaining charge amount of the battery is only about 20% at the time of the first installation of the battery.

End of battery charge or other battery failure may also be displayed.

Finally, various system failures (eg, general failures, battery or TAG software non-functionality) may be displayed.

[0296]

FIG. 53 shows a plan view of the TAG assembly 303 with the housing 5020 removed, thereby exposing the oscillator circuit of the TAG assembly 303.

See, for example, FIG.

Further in an exemplary embodiment, the oscillator circuit has at least a memory that is electrically connected to the processor in the TAG assembly 303 or the processor in the battery assembly 301 (or integrated within any circuit thereof). There is.

The memory can be used, for example, to store a record each time the TAG assembly 303 is used.

Other data associated with the TAG assembly 303 and / or the waveguide assembly 304 and / or the housing assembly 302 and / or the battery assembly 301 may be similarly stored for subsequent access and analysis.

This record is useful for assessing the limits of any part of the useful or permissible useful life of the device, in particular the TAG assembly 303 itself.

For example, after the TAG assembly has been used 20 times, the TAG assembly 303 or the battery assembly 301 is programmed not to allow a particular handle or battery to work with its "old" TAG assembly (eg,). Because the TAG assembly 303 is then a "no longer reliable" surgical instrument).

The memory can store the number of times any peripheral device of the device has been used.

For purposes of illustration only, after a given number of uses, one of the components of the device is considered worn because the tolerance between the components can be considered as exceeding the limit. It is possible to obtain.

This wear can lead to unacceptable failures during the procedure.

In some exemplary embodiments, the memory stores a record of the parts combined with the device and the number of times each part has been used.

[0297]

In some cases, it may be desirable to provide feedback to the user even if the TAG assembly 303 is disconnected from the battery assembly 301 (eg, "out of life" or "loss of reliability" of the TAG assembly 303. in the case of).

By such a display, it is notified that the TAG assembly 303 should be removed from the distribution because the effective life of the TAG assembly 303 has expired and it cannot be used.

Petitioner Therabody Ex-1004, 1318

As is usually the case in such cases, the physician may be different from the person responsible for properly assembling the device or removing the TAG assembly 303 from the device.

Thus, the TAG assembly 303 can be usefully configured to include a persistent indicator, and the power supply for this indicator may be provided separately from the battery assembly 301.

This indicator indicates when the TAG assembly 303 and the battery assembly 301 were most recently (or last) connected after an "end of life" warning, thereby disposing of the TAG assembly 303 immediately. Notify that it should be.

This further prevents the used TAG assembly 303 from being wasted energy by connecting the same or different battery assemblies 301.

Alternatively, a warning may be alerted by an indicator shortly after subsequent connection to another battery assembly 301, which allows the assembly to be discarded prior to device startup.

In either execution, a warning is saved to the person responsible for assembling the equipment.

Multiple schemes are conceivable for providing out-of-life notifications to users (eg, primary batteries, supercapacitors or displays that either eliminate or draw power).

For example, supercapacitors and ultra-low power LED drives can be used to provide blinking indicators.

Since the power consumption of these circuits is within the microamper range, it is possible to obtain reliable notifications over multiple hours and even multiple days.

[0298]

In some exemplary embodiments, the memory is in the battery assembly 301, the handle assembly 302 comprises a device identifier, and the device identifier is communicably concatenated to at least the battery assembly 301, eg, the previous paragraph. At least a portion of the information about the ultrasonic surgical assembly 300, such as the usage history, surgical handle identifier, previous usage history, and / or waveguide identifier described in, can be actuated to communicate with the smart battery 301. ..

In this way, one smart battery assembly 301 can record usage information on a plurality of different handle assemblies 302 and TAG assemblies 303.

When the battery assembly 301 is placed in the charging unit, such memory is accessible and data about each part of the system 301, 302/304, 303 is downloaded into the charger and, if necessary, the charging station. Sent to a central facility that is communicably connected (eg via the web).

[0299]

FIG. 54 shows an example of how the oscillator 904 and the transducer 902 are electrically and physically coupled so that the converter 902 can be physically rotated with respect to the oscillator 904.

In this example, the oscillator 904 has a pair of contacts 5402 and 5404 that are adjacent to the transducer 902 and project from below.

The contacts 5402 and 5404 can be connected to the TAG housing in any manner.

In the illustrated exemplary embodiment, contacts 5402 and 5404 are arranged at predetermined positions between the oscillator substrate and a portion of the TAG housing.

As shown, the TAG housing is defined by an upper oscillator housing 5410 and a lower oscillator housing 5430.

The oscillator housing has an upper housing portion 5020 and a lower housing portion 5030.

Therefore, in order to attach the contacts 5402 and 5404, the contacts 5402 and 5404 are placed in the lower housing portion 5030 and then sealed in place with an o-ring (shown) or an adhesive.

The oscillator substrate 5460 is then placed on top of the contacts 5402 and 5404 and connected for electrical contact.

Since the upper housing portion 5020 is located on the TAG assembly, it serves to hold the oscillator substrate 5460 in place, thereby capturing the contacts 5402 and 5404 in a stationary manner.

These features on the upper housing portion 5020 can be, for example, a finger portion.

Petitioner Therabody Ex-1004, 1319

These fingers are pressed against the substrate 5460 itself or onto a larger element on the oscillator substrate 5460.

Further, by using a compression material, a tolerance is provided between the two, which reduces the possibility of starting to move the substrate and causing intermittent contact with the connection portion.

[0300]

Proximal to the transducer 902 to the oscillator 904 is a pair of contact rings 5406, 5408 on the transducer body 902 so that the drive signal can be applied stably and reliably to the transducer 902 when needed. A pair of physically communicating contacts 5402 and 5404 are arranged.

Advantageously, the pair of contacts 5402 and 5404 maintain an electrical connection regardless of the angle of rotation of the transducer 902.

Thus, in this exemplary embodiment, the transducer 902 can rotate without any limitation on the maximum angle or number of rotations.

Further, the rings 5406, 5408 and contacts 5402, 5404 remain in electrical contact with the oscillator circuit regardless of the rotational position that stops the torque wrench from fixing the transducer 902 to the waveguide 1502. To ensure.

In exemplary embodiments that help reduce friction between contact rings, these rings are provided with a highly polished surface.

Further, since the contact is performed by spring urging, the contact spring force is minimized, which reduces the contact force and finally the friction.

The smooth surface and low pin press pressure minimize friction, which minimizes wear between these two rotating parts.

The above and the plating process ensure that there is no interruption in the electrical connection between the meshing portions.

[0301]

The oscillator housing 5430 is also composed of two parts, a proximal housing portion 5432 and a distal housing portion 5434.

As seen in FIG. 50, the lower housing portion 5030 has two housing rings 5416 and 5418.

These housing rings 5416 and 5418 rotatably secure the oscillator housing 5430 to the oscillator housing 5410.

The proximal housing ring 5418 only captures the circular outer diameter proximal oscillator portion 5432 in the radial direction.

It is the distal housing ring 5416 that captures the oscillator 902 in the radial and longitudinal directions.

More specifically, the proximal o-ring 5440 on the proximal side of the distal housing ring 5416 provides a portion of longitudinal capture, and the distal fastening 5442 of the distal housing ring 5416 provides longitudinal capture. Provide other parts.

The fastening portion 5442 may be, for example, one or more snap rings.

With such reliable longitudinal capture, the two oscillator contact rings 5406 and 5408 are longitudinally aligned with the two contacts 5402 and 5404 to ensure electrical connection between oscillator 904 and oscillator 902. Will be done.

[0302]

As shown in FIG. 37, the surgical handle assembly 302 has a spindle 3704 attached to the waveguide assembly 304.

Spindle 3704 has a notch that allows the surgeon to easily rotate the spindle 3704 with one or more fingers, thus connecting to the attached waveguide assembly 304 and waveguide 1502. The converter 902 to be generated can be rotated correspondingly.

Such configurations are useful for obtaining the desired cutting edge angle during surgery.

[0303]

FIG. 55 shows an exemplary embodiment of the TAG assembly 303 with the body 5005 and the transducer shell removed.

Petitioner Therabody Ex-1004, 1320

When a voltage is applied to the piezoelectric crystal stack 1504, the shaft 5002 moves longitudinally with respect to the housings 5020 and 5030.

In this embodiment, the waveguide coupling device 5004 is female and has a female thread (not visible in this figure) by screwing the waveguide 1502 into the screw with an appropriate amount of torque. , Used to secure the TAG assembly 303 to the waveguide 1502 (not shown here).

[0304]

A new feature of the TAG assembly 303 is its ability to connect mechanically and electrically simultaneously.

FIG. 56 shows an exemplary embodiment of the TAG assembly 303 during the docking process to the handle assembly 302.

As the transducer 902 is coupled to the waveguide 1502 (attached to the handle assembly 302), the electrical connector 5010 of the TAG assembly contacts the electrical connector 5602 of the handle assembly.

The connection between the TAG electrical connector 5010 and the handle electrical connector 5602 electrically communicates (directly or indirectly) between the battery assembly 301 docked in the handle assembly 302 and the piezoelectric crystal stack 1504, as shown in FIG. 37, for example. ..

This near-simultaneous linkage can be formed to occur in all embodiments of the invention.

The pins for this connection are unique and are also illustrated on the left side of FIG.

Here, a single right angle pin is integrally molded within the plastic oscillator housing 5030, whereby the pin for the connector 5010 is integrally molded.

Similarly, each of these pins extends upward into the interior of the oscillator housing to provide connectivity with the oscillator circuit board 5460.

Circuit board connections can be achieved by soldering or, in a concise manner, through sockets mounted on the oscillator board 5460.

In this way, the assembly process is simplified by combining the sockets that allow the oscillator 902 to be connected to the electrodes (pogo pins) 5402 and 5404.

Therefore, assembling the oscillator housing 5410 is a simple process of placing the oscillator substrate 5460 on an array of vertical pins and then sealing the housing 5410.

A protrusion extending upward from the lower housing portion 5030 laterally supports the circuit board 5460 and provides a similar protrusion to the upper housing portion 5020.

The oscillator substrate 5460 is completely captured between these protrusions.

The visual output from the oscillator 904 is confirmed through the translucent window 5410 in the upper housing portion 5410.

By strategically arranging the LEDs on the oscillator 904, it is possible to emit light from the window.

The space between the LED and the window allows light to be diffused over a larger area, and by adding a diffusing material to the window, the light emission can be made uniform.

In an exemplary embodiment, these windows surround the upper curved surface of the upper housing portion 5020, which makes it visible over a wide range of viewing and operating angles.

[0305]

According to a further exemplary embodiment of the invention, the TAG assembly 303 provides a mechanical connection prior to establishing an electrical connection.

That is, when attaching the TAG assembly 303 to the handle 302, the waveguide 1502 and the ultrasonic waveguide connection 5004 are made before the electrical connection between the electrical connector 5010 of the TAG assembly and the TAG electrical connector 5602 of the handle assembly is made. A mechanical connection is established with.

Advantageously, the electrical connection is made after the mechanical connection is established, thus preventing electrical "jumping" in this embodiment.

Petitioner Therabody Ex-1004, 1321

More specifically, when the screw 8604 of the waveguide 1502 is connected to the ultrasonic waveguide connection 5004, the electrical connection made after the firm mechanical connection is to the electrical connection 5010 and TAG of the TAG assembly. The handle assembly electrical connector 5602 is guaranteed to be in a fixed positional relationship, at least instantaneously, and no immediate disconnection and reinstatement of the electrical connection occurs.

Similarly, when the assembly 300 is disassembled, the electrical connection is broken prior to the complete separation of the mechanical connection.

[0306]

The electrical connector 5602 of the handle 302 is best shown in FIGS. 86 and 106.

When the TAG assembly 303 is mechanically connected to the handle 302, an electrical connection is obtained.

The electrical connector 5010 of the TAG assembly 303 is shown in FIGS. 50 and 54.

Conductive pins 5470 are provided within the chamfered rectangular blind holes included in the electrical connector 5010 of the TAG assembly 303, and these conductive pins 5470 extend from the bottom of the hole centered along the longitudinal range of the hole. ..

The electrical connector 5602 of the handle 302 is shown in FIGS. 86 and 106.

The electrical connector 5602 of the handle 302 includes a conductor rail 8630, a flexible gasket 8632, and a hard lining 8634.

The rigid lining 8634 is also the rigid portion of the flex circuit harness 3516.

The flex circuit harness 3516 electrically connects the electrical connector 5602 of the handle 302 to the flex circuit board 3514 in the multi-reed handle terminal assembly 3502.

[0307]

First, the electric connector 5010 of the TAG assembly 303 and the flexible gasket 8632 come into contact with each other.

Further coupling compresses the gasket 8632, and this compressive force on the harder portion 8634 of the flexible harness 3516 provides a fluid seal between the connector 5010 and the flexible harness 3516.

This connection completely surrounds the connector rail 8630 and avoids fluid entry into any space between the connector 5010 and the stiffener 8634.

By embedding the pin 5470 itself of the connector 5010 inserted in the conductor rail 8630, fluid contact with the oscillator 904 is avoided.

Using this same configuration, a seal is formed between the handle 302 and the housing of the battery 301.

[0308]

According to another exemplary embodiment of the invention, the ultrasonic surgical apparatus 300 can accept and drive multiple types of waveguides, ie, waveguides with different dimensions.

If the handheld ultrasonic surgical ablation assembly 300 can accept and drive a waveguide 1502 of a different type / dimension, the handheld ultrasonic surgical ablation assembly 300 is a waveguide coupled to an oscillator 904. A detector that can be actuated to detect the type (ie, dimensions or characteristics) of the waveguide 1502 attached to the converter 902 and is a drive wave based on the type of waveguide detected. It comprises a waveguide detector capable of operating the oscillator 904 to vary frequency and / or drive wave power.

The waveguide detector can identify at least one property of the waveguide 1502 connected to the handheld ultrasonic surgical ablation assembly 300, any device, set of components, software, electrical connections. , Or other.

[0309]

XIV.

Waveguide assembly

Petitioner Therabody Ex-1004, 1322

[0310]

73-87 provide detailed views of an exemplary embodiment of the waveguide assembly 304.

The waveguide assembly 304 receives ultrasonic vibrations directly from the transducer 902 when the waveguide 1502 is physically coupled to the TAG assembly 303.

The blade portion 7304 of the waveguide 1502 transfers this ultrasonic energy to the tissue to be treated.

The ultrasonic moving blade portion 7304 facilitates efficient cutting of organic tissue and promotes coagulation of blood vessels at the cut site, i.e., through cauterization.

[0311]

Referring to FIG. 73, a partial perspective view of the distal end 7306 of the waveguide assembly 304 is shown.

The waveguide assembly 304 has an outer tube 7302 that surrounds a portion of the waveguide 1502.

The blade portion 7304 of the waveguide 1502 projects from the distal end 7306 of the outer tube 7302.

It is this blade portion 7304 that contacts the tissue and transfers ultrasonic energy to the tissue during the medical procedure.

The waveguide assembly 304 also has a jaw member 7308 connected to both the outer tube 7302 and the inner tube (not visible in this figure).

The jaw member 7308 can be referred to as an end effector together with the inner tube 7302, the outer tube 7402, and the blade portion 7304.

As described below, the outer tube 7302 and the inner tube (not shown) slide vertically to each other.

When relative movement occurs between the outer tube 7302 and the inner tube (not shown), the jaw 7308 swivels on the swivel point 7310, thereby opening and closing the jaw 7308.

When closed, the jaw 7308 exerts a compressive force on the tissue located between the jaw 7308 and the blade portion 7304 to ensure clear and efficient contact between the blade and the tissue.

[0312]

FIG. 74 is a lower perspective view of the distal end 7306 of the waveguide assembly 304 shown in FIG. 73 with the outer tube 7302 removed.

In this figure, the distal end 7306 of the medial tube 7402 is shown connected to the jaw 7308.

In the exemplary embodiment shown in FIG. 74, this connection is on the jaw 7308 having a boss engagement opening 7414 within each of the paired arms 7418, 7420 that grip the boss 7408 when the jaw 7308 is inserted between them. Provided by a combination of a pair of bosses 7408.

This relationship is better illustrated by the lower cross-sectional perspective view of FIG. 75.

From this figure, it can be seen that the boss engagement openings 7414 of the arms 7418 and 7420 of the inner tube 7402 are formed into a wedge shape 7502.

The wedge-shaped arms 7418, 7420 provide a secure connection between the medial tube 7402 and the jaw 7308.

By wedge-shaped the opening 7414, the inner tube 7402 can engage the boss 7408 on the jaw 7308 without having to be on the outer tube 7302 for structural pressure / support.

[0313]

FIG. 75 also shows that the waveguide 1502 is separated from the jaw 7308 or inner tube 7402, i.e. not attached to the jaw 7308 or inner tube 7402.

In other words, the waveguide 1502 moves with respect to the inner tube 7402 and the jaw 7308 when energized by ultrasonic energy, but does not contact the inner tube 7402, with the jaw 7308 in between. Only in contact with the jaw 7308 when swiveling relative to the blade portion 7304 without tissue.

Petitioner Therabody Ex-1004, 1323

The features of the invention that facilitate this independent movement of the waveguide 1502 are described below.

[0314]

Returning to FIG. 74, the jaw portion 7308 is provided with a pair of flanges 7422, 7424 at its proximal end 7426.

Flange 7422, 7424 extend and surround the waveguide 1502 on the opposite side.

Each one of the flanges 7422, 7424 has a swivel control tab 7411, 7412 at its end, respectively, and the swivel control tabs 7411, 7412 have a boss 7408 on the jaw 7308 and a boss in the arms 7418, 7420. Extends below the waveguide 1502 when anchored in the engagement opening 7414.

The swivel control tabs 7411, 7412 need not extend below the waveguide 1502 as shown in FIG. 74.

This configuration is in an exemplary embodiment.

[0315]

By lubricating the jaws 7308, friction between the swivel control tabs 7411 and 7412 and the outer tube 7302 and friction between the boss 7408 and the inner tube 7402 can be reduced.

Such lubrication enables smooth operation and reduces wear between the meshing portions.

Lubrication also allows the proximal side of the swivel control tabs 7411 and 7412 to be more airtightly attached, and also allows for more accurate profiling of the outer tube 7302, resulting in higher jaw 7308. Backlash is reduced.

One exemplary embodiment of the lubricant is drying of the PTFE lubricant to prevent high speed displacement of the locally applied lubricant.

This exposure of the lubricant on the upper surface of the jaw further assists device insertion through the trocar.

In the illustrated exemplary embodiment, the swivel control tabs 7411 and 7412 are illustrated as two arms, straddling the waveguide 1502.

However, it is possible to achieve the same function when the waveguide 1502 is surrounded by a single arm and this arm interacts with the outer tube 7302 on the lower centerline.

In either case, the bottom (s) 7411 (7412) of the control tab is circular in shape to match the maximum shaft diameter, is insertable into the trocar, and has sharp edges. To reduce.

[0316]

With reference to FIG. 73 again briefly, the end elevations of the waveguide assembly 304 show that the swivel control tabs 7411, 7412 of the flanges 7422, 7424 of the jaws 7308 are a pair of openings in the distal portion 7306 of the outer tube 7302. It is shown to engage with the portions 7311 and 7312.

These features are better illustrated in the fragmentary cross-sectional side view of FIG. 77.

[0317]

Since the figure of FIG. 77 is a cross-sectional view, only one of the two flanges 7422 and 7424, 7424, is shown, and the surface shown is the inner surface of the flange 7424.

Correspondingly, only one of the swivel control tabs 7412 is shown with one of a pair of openings 7312 of the distal portion 7306 of the outer tube 7302.

This figure makes it clear that the opening 7312 surrounds and grips the swivel control tab 7412.

Thus, as the outer tube 7302 moves towards the jaw 7308, the opening 7312 also moves with respect to the jaw 7308.

Conversely, as the lateral tube 7302 moves away from the jaw 7308, the opening 7312 also moves in the opposite direction with respect to the jaw 7308.

A trapped swivel control tab 7412 nested within the opening 7312 causes a corresponding rotational movement of the jaw 7308 around the swivel point 7310.

Petitioner Therabody Ex-1004, 1324

[0318]

FIG. 78 is a partial side view of the end effector of the waveguide assembly 304.

In this figure, the outer tube 7302 substantially covers the flange 7422 of the jaw portion 7308, leaving only the swivel control tab 7411 extending from the opening 7311.

It is clear that when the outer tube 7302 slides in the proximal direction 7702, i.e., away from the jaw 7308, the outer tube 7302 pulls the swivel control tabs 7411, 7412 in the proximal direction 7702.

According to this operation, the jaw portion 7308 swivels clockwise around the swivel point 7310 in FIG. 78 to close or clamp towards the blade portion 7304 of the waveguide 1502.

This closed position of jaw 7308 is shown in FIG. 79.

The configuration of the exemplary embodiment of the waveguide assembly 304 is advantageous because it can be assembled without riveting or welding.

That is, all parts can be mechanically captured (eg, the swivel control tabs 7411 and 7412 are fitted into the opening 7311 to mechanically lock the waveguide without riveting or welding. can).

This assembly procedure will be described in more detail below.

[0319]

FIG. 80 provides another view of the distal end of the jaw 7308 in the closed position, where the jaw 7308 is placed in contact with the blade portion 7304 of the waveguide 1502.

The end effector captures the tissue between the interior of the jaw member 7308 and the opposing surface of the blade 7304.

By capturing the tissue in this manner, the tissue can be advantageously placed at a firm point of contact with the waveguide 1502.

Thus, when the waveguide 1502 is moved by ultrasonic waves, the movement of the waveguide is transmitted directly to the tissue, resulting in cutting, cauterization, or both.

It has been found useful to generate the interference that causes the blade portion 7304 of the waveguide 1502 to bend under the clamping force generated in the end effector.

The deflection of the waveguide 1502 is generated by the combination of the bending force and the compressive force of the distal seal (that is, the connecting spool 8104).

Although the thickness of the elastomeric support is minimized by the configuration of the distal seal of the present invention, the deflection of the waveguide 1502 can be significant.

If the initial contact between the blade 7304 and the liner 7314 of the end effector jaw 7308 is parallel, space will be created at the base of the jaw 7308 with the refraction of the waveguide 1502.

Therefore, in the present invention, the initial contact is configured so as to apply a force at the root of the jaw portion 7308 so that it is parallel to the blade portion 7304 when the full clamping force is applied.

FIG. 80 shows an exemplary embodiment of the cutting profile of the cutting blade 7304.

To achieve the desired tissue or blood vessel cutting and cauterization / sealing (excluding clamping forces, displacements, and frequencies), the cutting blade 7304 is provided between the profile of the blade 7304 and the liner 7314 of the jaw 7308. Includes a composite of high stress concentration and low stress concentration.

Seams for interconnecting the upper and lower parts of the vessel need to be provided in the vessel to achieve the desired vessel closure.

It is necessary to cut the center of the seam, and it is desired to allow the tissue to flow by providing a relief amount for sealing and avoiding charring.

The profile shown in FIG. 80 provides the desired properties of both.

Petitioner Therabody Ex-1004, 1325

First, this blade profile provides a narrow and relatively flat spine portion 8002, which concentrates the pressure from the clamping force on the local seam at a constant level.

This constant level allows the tissue to remain temporarily, which allows for coagulation and final cleavage.

In this residence time (ie, the sealing process), the curved side profile 8004 is provided distally from the cut to displace adjacent tissue.

Incisions (ie, posterior incisions) are assisted by the use of high stress seams on the top and bottom of the blade 7304.

It may be useful to track tissue / vessel integrity during cutting / sealing of tissue or vessel.

In the present invention, the metal waveguide 1502 is used as one pole of a two-pole electrical circuit to measure characteristics (eg, the impedance and / or capacitance of the structure at the blade portion 7304 of the waveguide 1502).

The waveguide 1502, which is a conductive material, is already electrically connected to the TAG.

This connection forms the first of the two pole measuring circuits.

The opposite pole is part of the liner 7314 in the jaw 7308.

In an exemplary embodiment, a separate conductive lead or other conductive element within the handle 302 connects the liner 7314 to the TAG.

[0320]

To facilitate the movement of the outer tube 7302, with reference to FIG. 74 again, one or more corsets 7404 are provided on the inner tube 7402.

The corset 7404 is a region of the inner tube 7402 having a diameter D'smaller than the average outer diameter D of the inner tube 7402.

See FIG. 74.

According to an exemplary embodiment of the invention, the corset 7404 is provided in the section of the ultrasonic waveguide 1502.

In other words, the corset 7404 is placed at a point along the waveguide 1502 where the waveguide 1502 does not exhibit ultrasonic motion at the resonant frequency.

Therefore, the small diameter portion of the inner tube 7402 and its physical connection to the inner surface of the outer tube 7302 do not adversely affect the ability of the waveguide to resonate at the ultrasonic frequency.

As also shown in FIGS. 74 and 75, for example, the seal 7406 is in the corset 7404.

According to an exemplary embodiment, the seal 7406 is an elastomeric O-ring type seal.

Of course, various other substances may be selected as well.

The seal 7406 has an outer diameter sufficiently larger than the outer diameter D of the 7402 so that the outer tube 7302 and the inner tube 7402 do not move to each other without substantial friction when the jaw is activated, although the sealing effect is maintained. have.

[0321]

As also shown in FIGS. 74 and 75, the thickness of the seal 7406 is smaller than the longitudinal length of the corset 7404 with the seal 7406.

This dimensional difference allows the seal 7406 to move along the longitudinal range of the saddle 7426 when formed as a ring with a substantially annular cross section as shown.

In particular, this movement characteristic of the seal 7406 occurs when the outer tube 7302 is translated relative to the inner tube 7402.

More specifically, the seal 7406 has a dimension or annular height that overcomes the gap between the inner surface of the outer tube 7302 and the saddle 7426 of the inner tube 7402, as shown in FIGS. 75 and 77.

Petitioner Therabody Ex-1004, 1326

By completely filling this gap, the seal 7406 at the distal end 7306 of the waveguide assembly 304 prevents moisture and other contaminants from entering the area between the outer tube 7302 and the inner tube 7402. do.

Nevertheless, when the outer tube 7302 translates, the tight fit between the outer tube 7302, the inner tube 7402 and the seal 7406 causes the seal 7406 to move (eg, rotate or slide) within the saddle 7426 while Each time, maintain a watertight seal between the outer tube 7302 and the inner tube 7402.

This translation T is indicated, for example, by the bold arrow in FIG.

[0322]

Referring to FIG. 81, the distal end of the waveguide assembly 304 in saddle 7426 is shown in cross section.

This figure shows the inner tube 7402 and the outer tube 7302 surrounding the seal 7406 placed between them in the saddle 7426 of the corset 7404.

As described, the deformable seal 7406 has an inner wall 8102 and saddle of the outer tube 7302 to prevent moisture and other contaminants from passing from the distal side 8108 of the seal 7406 to the proximal side 8110 of the seal 7406. A watertight connection to the outer surface of the 7426.

FIG. 81 also shows a cross section of a connecting spool or a closed spool 8104.

The connecting spool 8104 surrounds the distal portion of the waveguide 1502 and is located in a longitudinal position approximately identical to the corset 7404.

As mentioned above, the corset 7404 is located in the ultrasonic kinetic node of the waveguide 1502 or close to the ultrasonic kinetic node.

Therefore, the coupling spool 8104 is also located at or near the node of the waveguide 1502 and is also not coupled to the waveguide 1502 to receive ultrasonic motion.

The coupling spool 8104 provides a support structure in which the waveguide 1502 is physically connected to the inner surface 8106 of the corset 7404.

In the cross-sectional view of FIG. 81, the connecting spool 8104 has a barbell-shaped vertical cross section.

This reduced cross section of the elastomeric material reduces the amount of waveguide deflection when clamped.

The barbell end of the seal 8104 has a relatively thick cross section to maintain a watertight seal as the intermediate portion bends during the clamp.

Non-metallic materials (such as, but not limited to, Ultem, PTFE, Lulon and graphite-filled materials) can be used as the rigidly coupled spool 8104.

Since the coupling spool 8104 is rigid, it is possible to limit the amount of deflection of the waveguide 1502 with respect to the jaw portion 7308 while providing support and sealing by the non-metal waveguide.

Under such clamping force, it is important to design the interference in consideration of the deflection of the waveguide 1502.

The deflection of the waveguide 1502 occurs in combination with the bending and compressive forces of the distal seals (7404 and 7406).

This distal seal configuration minimizes the thickness of the elastomeric support, but the deflection of the waveguide 1502 remains substantial.

When the initial contact between the waveguide 1502 and the jaw liner 7314 is parallel, the waveguide 1502 bends and a space is created at the base of the jaw 7308.

Therefore, this clamp assembly constitutes an initial contact that is parallel to the waveguide 1502 when the full clamping force is applied after the force is applied to the root of the jaw portion 7308.

By providing the above rigid material in the connecting spool 8104, parallel deflection and variation are minimized.

In FIG. 81, the inner sleeve 7610 surrounding the waveguide 1502 is also shown.

As detailed below, the sleeve 7610 assists in avoiding metal contact between the waveguide 1502 and the inner tube 7402.

[0323]

Petitioner Therabody Ex-1004, 1327

FIG. 82 shows a perspective view of an embodiment of the connecting spool 8104.

In this figure, the inner surface 8202 of the connecting spool 8104 can be seen.

The inner surface 8202 is in direct physical contact with the waveguide 1502 when the waveguide assembly 304 is assembled, for example, as shown in FIG.

The perspective view of FIG. 82 also represents the outer saddle shape 8204 of the connecting spool 8104, which substantially matches the inner shape of the saddle 7426 also shown in FIG.

[0324]

To help grip and hold the tissue between the jaw member 7308 and the waveguide 1502, the jaw member 7308 has a liner 7314 with a plurality of teeth 7316.

The liner 7314 provides the jaw member 7308 with an improved ability to grip the tissue.

This liner is composed of a non-metallic high temperature lubricating material, such as VESPEL®, RULON®, modified PTFE, and glass-filled and graphite-filled, to name a few. obtain.

An exemplary embodiment of the liner 7314 is shown in the perspective view (from the most distal end of the liner 7314) in FIG. 84 and the perspective view (from the most distal end of the liner 7314) in FIG.

In addition to the plurality of teeth 7316, the liner 7314 is a central smooth path 8404, flat, located between the first column 7316a and the second column 7316b of the plurality of teeth 7316 on the most distal surface 8402, the lower surface 8403. It has a proximal clamp surface 8405 and an upper flange 8406 that secures the liner 7314 to the jaw member 7308.

The central smooth path 8404 may also include a groove 10014.

The groove 10014 starts at the proximal end and extends distally, for example as shown in FIG.

This groove acts as an alignment feature between the liner 7314 and the waveguide 1502, thereby helping to equalize the effect on the tissue during use of the device.

As can be seen in FIG. 73, the most distal surface 8402 is the exposed short inner surface of the distal end of the waveguide assembly 304.

FIG. 73 shows a groove 7318 of the jaw member 7308 in which the liner 7314 is placed when assembled.

The inner surface of the groove 7318 substantially coincides with the outer surface of the upper flange 8406 so that the liner 7314 can be held within the jaw member 7308 so that there is almost no movement.

In an exemplary embodiment of the illustrated groove 7318, the distal end of the groove 7318 is from the middle portion such that the insert 7318 can slide from the proximal end of the jaw member 7308 to just past the distal end of the groove 7318. Is also narrow.

In an exemplary embodiment of FIG. 85, the retention tab 8502 is bent downward (towards the liner 7314) below the top surface of the liner 7314 when the liner 7314 is placed entirely distally within the jaw 7308. It is shown.

In such a bent structure, the distal end of the retaining tab 8502 faces the back 8504 and / or the flange 8406 of the liner 7314 and, if possible, rides on it.

Such opposition prevents the liner 7314 from coming out of the jaw 7308.

Instead of this single retention tab, it is possible to use two smaller tabs on any side of channel 7318.

These tabs are bent downwards on the underside or top surface of the liner 7314.

Alternatively, the jaw liner 7314 can be urged from the distal end of the jaw 7308 by the ability to capture and hold the liner 7314 through a single surgical procedure.

An exemplary embodiment of such a configuration is shown in FIG.

More specifically, the jaw 7308 is formed with a distal approach path or channel 10002.

Within the distal approach path or channel 10002, the distal urging liner 10010 is urged.

Petitioner Therabody Ex-1004, 1328

In order to secure the liner 10010 in the channel 10002, the orifice 1004 defined by the channel is shaped so as to capture the detent 10012 of the liner 10010 internally and hold it removable.

These opposing features can be reversed or modified in any uniform manner that allows the liner 10010 to be removably secured within the jaw 7308.

Since the liner 10010 can be easily replaced, this highly worn portion can be easily modified due to the reprocessing potential of the device, which may allow the handle and / or waveguide assembly to be reprocessed. Come out.

[0325]

The offset between the closest surface 8402 and the flange 8406, shown in FIG. 84, facilitates the placement of the closest surface 8402 on the most distal portion of the jaw member 7308.

That is, the liner 7314 slides into the jaw member 7308 until it is completely seated in the jaw member 7308.

However, it is the flange 8406 that is physically fixed by the jaw member 7308.

More specifically, as shown in FIGS. 84 and 85, the flange 8406 extends beyond the plurality of teeth 7316 on both sides thereof.

However, the flange 8406 does not extend entirely to the most recent surface 8402.

When the liner 7314 slides into the jaw member 7308, the extending side portion of the flange 8402 moves within the groove 7318 formed in the jaw member 7308.

Since the flange 8406 does not extend entirely to the flanking surface 8402, when the flange 8406 reaches the end of the groove 7318, the flanking surface 8402 of the liner 7314 extends beyond the groove 7318 to the position shown in FIG. 73.

[0326]

Focusing on an exemplary embodiment of the tooth 7316, it can be seen in FIGS. 84 and 85 that the tooth 7316 does not extend completely across the lower surface 8408 of the liner 7314.

Instead, in the embodiments of FIGS. 84 and 85, the first row of teeth 7316a and the second row of teeth 7316b facing the first row of teeth 7316a are separated by a central smooth path 8404.

The central smooth path 8404 provides a continuous smooth surface that aligns directly with the waveguide 1502.

It is this smoothing that aids in tissue sealing by contacting the waveguide 1502 that is ultrasonically moving during the procedure and facilitating continuous, unhindered ultrasonic movement of the waveguide 1502 with flat pressure. The surface is 8404.

Since the liner 7314 runs over the entire length of the jaw 7308 (from root to tip), uniform pressure is applied to the contact over the entire length of the treated portion (ie, blade 7304) of the waveguide 1502. Will be done.

[0327]

Moving to FIG. 86, a fragmentary perspective view of the inside of the handle portion 302 is shown.

This figure shows the nearest end 8601 of a waveguide 1502, characterized by a series of threads 8604 used to connect the waveguide 1502 to the TAG assembly 303.

As mentioned above, the illustrated position of the most recent end 8601 of the waveguide 1502 in the handle portion 302 is the substantial position where the waveguide 1502 remains when the waveguide assembly 304 is coupled to the TAG assembly 303. be.

When the TAG assembly 303 is inserted into the handle portion 302, for example with reference to FIG. 45, the oscillator shaft 5002 is aligned, thereby providing a vertical connection of the thread 8604 and the ultrasonic waveguide connection portion 5004. Allows to be fixed.

[0328]

The waveguide 1502 is surrounded by an inner tube 7402 and is surrounded by an outer tube 7302.

Petitioner Therabody Ex-1004, 1329

This figure of the nearest end 8606 of the outer tube 7302 terminates at its nearest end 8608, where the outer tube 7302 has a flared compartment 8608.

The flared compartment 8608 features a pair of grooves 8610 and 8612 (8612 is not fully shown in this figure) that form a keyway.

Although these grooves are shown facing each other, they do not have to have this configuration.

Inside the grooves 8610 and 8612 are torque adapters 8602 fixedly connected to the waveguide 1502.

The connection of the torque adapter 8602 and the waveguide 1502 is shown in more detail in FIG. 87 below.

With reference to FIG. 86, it can be seen that the torque adapter 8602 includes a boss 8616 extending in the groove 8610.

Although not shown in this figure, the torque adapter 8602 also comprises a second boss extending within the second groove 8612.

The engagement between the boss 8616 of the torque adapter 8602 and the grooves 8610, 8612 of the flared compartment 8608 provides a rotational locking relationship between the waveguide 1502, the inner tube 7402 and the outer tube 7302.

That is, since the boss engages the grooves 8610, 8612, any rotation of the waveguide 1502 is shared by both the inner tube 7402 and the outer tube 7302.

The proximal end of the inner tube 7402 does not extend beyond the torque adapter 8602.

The rotational connection between the torque adapter 8602 and the inner tube 7402 occurs through the internal features of the waveguide rotating spindle 3704.

[0329]

Focusing on FIG. 87 here, a perspective view of the inside of the handle portion 302 is shown again.

However, in this figure, the outer tube 7302 (in addition to the right half of the waveguide rotating spindle 3704) was removed.

The removed outer tube 7302 exposes most of the torque adapter 8602.

Although not visible in either FIG. 86 or FIG. 87, the torque adapter 8602 is symmetrical with the second boss extending in the opposite direction to the first boss 8616 in one exemplary embodiment of the invention. Is.

The torque adapter 8602 has such a name in order to resist rotational movement when connecting the waveguide connecting portion 5004 of the vibrator horn 5002 to the waveguide 1502 using a torque wrench 8800. This is because the structure is obtained by the torque adapter 8602.

As described above, when rotating the spindle 3704 of the oscillator 902 using the torque wrench 8800, it is necessary to avoid the rotation of the waveguide 1502.

[0330]

The waveguide 1502 needs to be rotationally adapted in order to obtain an appropriate holding force.

However, in the case of a rotationally fitted waveguide feature, if the fitted feature is not located in the section of the waveguide 1502, the vibration is transmitted like any other support along the waveguide 1502. I cannot escape the defect.

As shown in FIGS. 86 and 87, for example, the fitted features for torque transfer are placed in the nearest node (ie, the node farthest from the blade and closest to the screw).

The torque transfer features of the exemplary embodiment of the invention are a plurality of radial patterned splines or teeth 8702 that are symmetrically arranged around the waveguide 1502.

Each spline 8702 extends radially from the central longitudinal axis 8706 of the waveguide 1502.

[0331]

The torque adapter 8602 comprises a plurality of internal keyways 8704, each keyway 8704 being aligned with one of the extending portions of the spline 8702 and having a shape substantially opposed to each one of the splines 8702. As a result, the torque adapter 8602 is anchored in the indicated longitudinal position on the waveguide 1502 when connected as shown.

Petitioner Therabody Ex-1004, 1330

The longitudinal position on the waveguide 1502 is also located in the ultrasonic oscillating node with minimal / no motion.

This arrangement and fixed engagement between the keyway 8704 and the spline 8702 place the keyway 8704 and the spline 8702 in a fixed rotational relationship.

In other words, as the waveguide 1502 rotates, the torque adapter 8602 must also rotate.

[0332]

Each spline 8702 projects beyond the average diameter of the waveguide 1502.

These splines 8702 can be rectangular rows, but are not limited to this.

That is, the spline 8702 may be provided with an angled surface.

One exemplary embodiment of the spline 8702 has a frustum rectangular pyramid shape as a whole, but the two side edges of the top surface are beveled and the distal and proximal edges of the top surface are quadrangular. It has become.

The maximum spline outer diameter can be maintained within the maximum diameter of the waveguide material, which allows the use of the lowest cost stock material.

The torque transmission spline 8702 on the waveguide 1502 meshes with the torque adapter 8602 by a correspondingly shaped female keyway 8704.

To assemble the torque adapter 8602, the torque adapter 8602 is pressed into the waveguide and the keyway 8704 is provided as a blind hole (here, on the edge of the torque adapter not shown in FIG. 87). Finally, the torque transmission surface of the spline 8702 constrains it concentrically in the longitudinal direction.

In an exemplary embodiment, the torque adapter 8602 is rotationally aligned with the waveguide 1502 and the boss 8616 is always located inside the pocket 9504 of the spindle 3704 (see, eg, FIG. 95). , By selectively removing some of the splines 8702, correct element orientation (ie, symmetric and lockable only at 0 or 180 degrees) is possible in only one direction.

Thus, when connecting the oscillator 902 to the waveguide 1502, the spindle 3704 is grounded (eg, by the user's hand) and torque is generated on the spinner 3704 by the torque wrench 8800.

The boss 8616 is urged and torque is transmitted to the screw 8604 of the waveguide 1502.

The overall shape and mass of the torque adapter 8602 is adjusted to reduce acoustic coupling between the waveguide 1502 and the spindle 3704 through the torque adapter 8602.

Different materials are selected for the material of the spindle 3704 and the torque adapter 8602 so as to further isolate any sound energy coupling.

For example, a hot glass-filled polymer Radel (20% glass-filled polyphenylsulfone PPSU) can be selected to maximize sound energy impedance while allowing torque transfer strength.

Polymers filled with low friction materials (eg nylon or PTFE (polytetrafluoroethylene)) are also advantageous in minimizing acoustic transmission.

In addition, the elastomeric material can also be insert molded into the spindle 3704 on the torque transfer surface, which can further separate the sound energy.

[0333]

Here again, with reference to FIG. 66, it can be seen that the grooves 8610, 8612 of the flared compartment 8608 of the outer tube 7302 have the characteristic of engaging the anti-rotation wheel 6502.

According to this engagement, any rotation imparted by the user onto the waveguide rotating spindle 3704 is direct to the anti-rotation wheel 6502, outer tube 7302, inner tube 7402, torque adapter 8602 and waveguide 1502. Produces a corresponding rotation.

The following is the result of this connection configuration.

When the rotation lock member 6508 engages the anti-rotation wheel 6502, not only the anti-rotation wheel 6502 is prevented from rotating, but all rotations of the waveguide assemblies 304, 3704, 7302, 7402, 8602, 1502 Be prevented.

Petitioner Therabody Ex-1004, 1331

In the same sense, if the anti-rotation wheel 6502 does not engage the rotation lockout member 6508, the user is free to rotate the spindle 3704 physically connected to the anti-rotation wheel 6502 and the vertical axis 8706. Can cause rotation of the waveguide assembly 304 along.

[0334]

As shown in FIG. 95, an elliptical boss 9502 is provided inside the spindle 3704.

These bosses 9502 engage both the inner 7402 and the outer 7302 of the tube, whereby only the inner tube 7402 has a longitudinal displacement while the tubes 7302 and 7402 are both rotationally locked.

Details of the area where the tubes 7302 and 7402 are locked by the boss 9502 are shown in FIG.

With reference to both FIGS. 93 and 95, the protrusion of the boss 9502 passes through the opening of the inner tube 7402 (to contact the inner sleeve 7610 or to press the sleeve 7610 into the waveguide 1502). However, it can be seen that the inner tube 7402 is configured so as not to penetrate.

At the same time, the shape of the boss 9502 allows longitudinal (proximal to distal) movement of the outer tube 7302 for translation of the jaw 7308 while avoiding longitudinal displacement of the inner tube 7402. It is shaped to have sufficient longitudinal length.

By combining such a complex locking function with a pocket 9504 on the proximal end of the spindle 3704 that engages the torque adapter 8602, the tubes 7302 and 7402 and the waveguide 1502 are locked to each other.

In an exemplary embodiment, the crushing function 9506 of the torque adapter pocket 9504 applies a force for centering to the torque adapter 8602 during assembly.

Also, the waveguide 1502 is captured by the boss 9508 in the pocket 9504 to prevent the waveguide 1502 from being pulled out in the proximal direction.

Therefore, the assembly of the spindle 3704 is performed by pressing the two amphoteric spindle halves together.

After pressing, it is desirable to minimize friction between the meshing rotating surfaces (ie, the outside of the intermediate annular groove 4610 of the waveguide rotating spindle 3704 and the annular boss 4605 of the handle halves 4503 and 4603).

As shown in FIGS. 95 and 99, the outer edge of the groove 4610 is chamfered to set back the casting on the proximal size and the finger groove and on the distal side of the spindle 3704 and these contact surfaces. By raising at the center of the groove 4610, the contact area of the meshing rotating surface is minimized.

Similarly, the outer surface of the boss 4605 is also raised at its center.

[0335]

As can be seen from FIGS. 73, 74 and 78 and especially FIG. 84, the lower surface 8403 (including the proximal clamp surface 8405) is flat with respect to the top surface of the blade portion 7304 of the waveguide 1502. It is parallel.

That is, when the jaw portion 7308 is clamped without intervening material, the clamp surface 8405 first contacts the blade portion 7304 at its proximal end, as shown in FIGS. 79 and 80.

Therefore, when the waveguide 1502 is ultrasonically operated, the blade portion 7304 makes it possible to cut into the liner 7314 to a point where at least the two portions are parallel as shown in FIG. 89.

However, in an exemplary configuration of the jaw control device, it is possible to swivel the jaw 7308 beyond a position parallel to the waveguide 1502.

Therefore, the entire liner 7314 can be cut by the blade portion 7304.

In such a case, the metal blade portion 7304 vibrates with respect to the metal jaw portion 7308.

In such a state, either part or both parts collapse in a short time, and such a state should be avoided.

[0336]

An exemplary embodiment of the system according to the invention solves this problem by providing an overstroke avoidance device 9002 and an outer tube stop 9012.

Petitioner Therabody Ex-1004, 1332

The overstroke avoidance device includes a bobbin 9004, a nut 9006, an overstroke spring 9008, and a distal slider 9010.

The bobbin 9004 is longitudinally fixed to the outer tube 7302 so that the outer tube 7302 moves with respect to the inner tube 7402 and the waveguide 1502 and with the outer tube 7302.

The latter of the inner tube 7402 and the waveguide 1502 is fixed in the longitudinal direction at a predetermined position with respect to the handle assembly 302 as described above.

An exemplary embodiment of the bobbin 9004 mounting mechanism is shown, for example, in FIG. 86.

In the figure, two opposing windows 8614 and 8618 are located at the proximal end of the outer tube 8608.

The bobbin 9004 is provided with a mushroom-shaped head 9602 at the distal end and a threaded portion 9604 at the proximal end to accept the nut 9006.

This is shown, for example, in FIGS. 96 and 97.

The nut 9006 and bobbin 9004 are configured to allow the nut to be fastened to the rigid stop 9702.

The rigid stop 9702 works with a consistent spring 9008 to provide a consistent clamping force between the devices.

The spring 9008 has a low rate, which provides a similar clamping force even if the tissue thickness fluctuates.

The lower rate gives a flatter force profile, which allows the user to get the maximum desired force regardless of the spring position on the profile.

As shown in FIG. 97, the mushroom-shaped head 9602 is connected to the outer tube 7302 in the longitudinal direction through two opposing windows in this example.

The slider 9010 can slide longitudinally on the outer surface of the body of the bobbin 9004 between the nut 9006 and the distal head of the bobbin 9004.

Therefore, by arranging the overstroke spring 9008 between the movable slider 9010 and the stationary nut 9006, the compressive force of the spring 9008 is generated due to the arbitrary movement of the slider 9010.

Also, during assembly of the waveguide 1502 and the tubes 7302 and 7402, the proximal portion of the outer tube 7302 may be compressed due to the elongated channels 8610 and 8612 extending to the proximal end of the outer tube 7302.

The compression proximal end of the outer tube 7302 can be fitted within the distal opening 9606 of the bobbin 9004, and such fitting creates a force that separates the lockout finger 9706 (radially outward). do.

After full insertion, the outer tube 7302 returns to its normal full diameter.

At this point, the bobbin 9004 fixation thread 9502 engages the distal window 8620 in the outer tube 7302.

At the same time, the lockout finger 9706 spring inwardly enters the opposing channels 8610 and 8612 at the proximal end of the outer tube 7302, while the two rigid bosses 9608 extending from the inner surface of the bobbin 9004 are close to the outer tube 7302. Engage with two opposing windows 8614 and 8618 at the position end.

Such inward movement of the lockout finger 9706 avoids further compressive forces on the outer tube 7302, thereby locking the bobbin 9004 onto the outer tube 7302.

[0337]

The yoke 9014 connects the slider 9010 to the trigger 4606 as shown in FIGS. 90-92.

A series of FIGS. 90-92 show how the yoke 9014, slider 9010, spring 9008, bobbin 9004 and outer tube 7302 move when the trigger 4606 is pressed to close the jaw 7308.

Since the position where the yoke 9014 interfaces with the bobbin 9004 is the rotational interface, it is desirable to minimize the frictional force at this position so as not to interfere with the rotation of the spindle 3704.

Minimization of such friction is achieved by providing bumps 9802 on the yoke 9014.

These bumps 9802 significantly reduce the contact area for the o-bobbin / slider interface, resulting in point contact.

In the trigger state shown in FIG. 90, the trigger 4606 is inactive and the jaw 7308 is in an open steady state position (see, eg, FIG. 73).

Petitioner Therabody Ex-1004, 1333

In the trigger state shown in FIG. 91, the trigger 4606 is in the partially actuated state and the jaw portion 7308 is in the closed position (eg, shown in FIG. 79).

At this position, the yoke 9014 moves the slider 9010 in the proximal direction, which partially compresses the spring 9008, thereby applying a proximal force to the nut 9006.

When the nut is fixed to the bobbin 9004 in the longitudinal direction and the bobbin 9004 is fixed to the outer tube 7302 in the longitudinal direction, the jaw portion 7308 is closed due to the trigger motion.

[0338]

At this point, further closure of the jaw 7308 (rotation towards the waveguide) is not desired.

To avoid the force that causes further movement of the outer tube 7302, the outer tube stop 9012 is placed on the outer surface of the inner tube 7402, as best shown in FIG.

In such a configuration, the corresponding movement of the inner tube 7402 is required to move the outer tube 7302 further in the proximal direction.

[0339]

However, the jaw 7308 and the blade 7304 are used to cut the tissue between them.

That is, when the jaw 7308 is in the clamped and closed state, the compression of the sealed spool 8104 and the blade 7304 are due to the load transmitted from the tissue clamped by the jaw 7308 or the liner 7314 itself to the blade 730. The blade portion 7304 bends as a function of bending of the cantilever.

When the blade portion 7304 is bent, the ultrasonic motion characteristics of the blade portion 7304 change.

Therefore, it is desirable to avoid bending of the blade portion 7304 as much as possible.

[0340]

When the trigger 4606 is closed, the spring 9008 is compressed.

An exemplary nominal force spring load when nothing is clamped between the jaw 7308 and the blade 7304 is approximately 24 lbs.

This load increases with the spring factor.

This is because when the jaw 7308 is fully pin-supported by the tissue, the tissue thickness within the jaw is maximal (approximately 28 pounds in this exemplary embodiment).

When clamped, the waveguide bends as a function of bending of the distal sealed spool 8104 and bending of the probe cantilever due to the load transmitted from the liner 7314 into the blade 7304.

The compressive force of the distal sealed spool 8104 makes the force vs. flexure curve non-linear at the start of the compressive force.

However, when the load exceeds 10 pounds, the curve becomes linear.

The curve shown in FIG. 94 shows the deflection of the waveguide blade portion 7304 as a function of input.

When the jaw 7308 is fully clamped and does not grip the tissue, the load input through the spring is applied to the clamp to the blade 7304 of the liner 7314 and to the clamp into the outer tube stop 9012.

The stop 9012 is attached (eg, welded) with strength capable of withstanding the maximum load.

The placement of the stops is done within the already assembled system.

The adjustment of the stop portion is performed by arranging the stop portion in a state where the measurement force is applied to the system so as to occupy the entire tolerance and the probe is appropriately bent.

As can be seen from the graph, the blade bends at a force of 10 lbs and continues to bend until the load is approximately 16 lbs.

At this point, the outer tube 7302 comes into contact with the stop 9012.

Petitioner Therabody Ex-1004, 1334

As the load on the spring 9008 increases, the stop 9012 begins to resist further movement of the outer tube 7302.

When the load is further increased thereafter, all the loads are supported by the stop portion 9012, and no further load is applied to the bent blade portion 7304.

After the force on the spring 9008 reaches approximately 22 lbs, the blade 7304 will not bend any further as the load increases further.

However, on the other hand, as shown by the straight line in the graph of FIG. 94, the load transmission to the blade portion 7304 continues linearly without the stop portion 9012, and the deflection of the probe is also the same.

This outer tube stop can be achieved in multiple configurations.

In the illustrated exemplary embodiment, the fixation stop 9012 is placed on the proximal end of the shaft assembly.

This same effect is achieved at the distal end.

For example, a tab (not shown) on the end of the outer tube 7302 or inner tube 7402 is bent in place to serve as a stop to stop further movement of the jaw 7308.

Similarly, a tab (not shown) on the jaw 7308 may face either or both of the tubes 7302 and 7402 bent to interfere with this tube set.

The tabs allow assembly to move the jaw horizontally and avoid horizontal movement of the jaw after assembly.

It is also possible to use welds or punches to form features that act as stops, as opposed to bending tabs.

In addition, more concise stop features can be used within the plastic of the handle.

[0341]

When the present invention is used in a procedure, the liner 7314 can wear out.

That is, the jaw portion 7308 freely rotates toward the blade portion 7304.

Therefore, this wear allows the outer tube 7302 to translate in the proximal direction.

However, when the stop 9012 is placed in place, such movement is avoided and the position of the jaw 7308 with respect to the outer tube 7302 is quickly restricted (ie, the jaw 7308 is proximal to the blade 7304). You will not be able to turn in the direction).

However, since the blade portion 7304 is already bent in the distal direction from the jaw portion 7308, the free movement of the blade portion 7304 from the jaw portion is restricted along with the wear of the liner 7314.

When this occurs, the amount of blade deflection and force required to maintain the deflection is reduced.

Due to such a decrease in force, friction and heat generation in the liner 7314 are reduced, and the life of the liner 7314 is extended.

According to the present invention, the maximum amount of bending of the blade portion 7304 is. It is 030 "to .035".

The available thickness of the liner 7314 is similarly made.

Therefore, the metal jaw may come into contact with the blade 7304 due to the wear of the liner 7314 in the overuse condition where the use in the absence of tissue (ie, the empty jaw) is frequent and prolonged. After such wear, the force between them is minimized or absent.

[0342]

As described herein, the waveguide 1502 is mechanically secured in the handle 302 (in the proximal region of the waveguide 1502) in the torque adapter 8602 to the handle 302 and the waveguide. Concentrically fixed in the assembly 304 in the rotational and longitudinal directions.

8 Further, the waveguide 1502 is concentrically fixed in the distal region of the waveguide 1502 by a connecting spool 8104 that functions as a distal seal.

Petitioner Therabody Ex-1004, 1335

When the blade of the waveguide 1502 is placed under load during cutting and / or sealing, this relatively long waveguide beam (although it is composed of titanium in an exemplary embodiment) bends and is an inner tube. It can come into contact with the 7402, in which case such contact occurs at the acoustically active point along the waveguide 1052.

When the waveguide 1502 is thus bent and active, metal-to-metal contact occurs.

Due to such contact, an audible high frequency sound (for example, a squeak) is generated, and a large power loss is generated due to the heat generated at this contact.

Such contact should be avoided.

Therefore, the present invention provides a contact support in the form of a waveguide bump 5710 in a waveguide 1502.

More specifically, such contact supports are provided at various locations along the waveguide 1502.

[0343]

The ideal position of the contact / support along the length of the active waveguide 1502 is the node position.

The node position is a high stress point and there is no displacement along the steady acoustic wave generated by the transducer 902 in the waveguide 1502.

The node length is an infinitely short portion, the displacement around the nominal (ie, natural) position due to the drift of the resonant frequency of the standing wave.

These bumps 5710 are a larger diameter portion of the waveguide 1502 and substantially extend all the way to the innermost tube in the waveguide assembly 304.

Since these nodes are longitudinally displaced around the note point due to the resonant frequency drift of the standing wave, each bump 5710 is centered around the nominal / natural node position to cause any displacement of the node position. Has a longitudinal length that includes.

Increasing the diameter of the bump 5710 relative to the outer diameter of the waveguide 1502 provides another advantageous feature.

As the ultrasonic vibrations in the waveguide are understood, the waveguide displacement is reduced due to the increased diameter (this is called the anti-gain and node position deactivation step).

Therefore, when the bump 5710 transmits vibration to its former contact, the amplitude of the vibration is reduced relative to the remaining narrower portion of the waveguide 1502.

The number of bumps 5710 is selectively selected, eg, not equal to the number of node positions along the waveguide 1502 in the exemplary embodiment of the invention shown in FIG.

In FIG. 57, there are four bumps 5710.

The minimum number of bumps 5710 is selected to facilitate manufacturing and avoid the adverse contacts described above.

[0344]

The nodal position is low activity at bump 5710, but the metal-to-metal contact described above can still be a problem.

Therefore, in order to further avoid such contact, the present invention provides an inner sleeve 7610 that includes a portion of the waveguide 1502 in the inner tube 7402.

The sleeve 7610 is made of a high temperature material with a low coefficient of friction (eg, Teflon, PTFE, HDPE, polyethylene).

As shown in FIGS. 81 and 99, the sleeve 7610 is naturally concentrically secured around the waveguide 1052 and the torque adapter 8602 at the proximal end of the sleeve 7610 and the sealed spool 8104 at the distal end of the sleeve 7610. It is mechanically fixed so as to face the longitudinal movement due to.

The inner diameter of the sleeve 7610 is selected to contact only the waveguide 1502 at the bump 5710.

The outer diameter of the sleeve 5710 is accessible to the inner diameter of the inner tube 7402, but can be made slightly smaller.

Petitioner Therabody Ex-1004, 1336

In another configuration of the sleeve 7610, the sealed spool 8104 and the sleeve 7610 are integrally provided.

These elements can share materials, which at the same time benefit from a reduced number of parts and a simpler assembly.

In this exemplary embodiment, the integrally formed distal spool 8104 and sleeve 7610 are constrained by a corset on the inner tube 7402.

[0345]

In the assembled state, the cross-sectional diameters of the waveguide 1502, sleeve 7610, inner tube 7402 and outer tube 7302 are configured to provide, for example, voids for ETO sterility.

By providing a gap along the bump 5710, the amount of sound energy that can be transmitted from the waveguide 1502 to the sleeve 7610 is also reduced.

Further, since the sleeve constituent material (eg, Teflon, PTFE) has a low coefficient of friction, the sound energy previously applied to the inner tube 7302 or the outer tube 7402 is substantially eliminated.

As another embodiment for a single smooth tubular sleeve 7610, more complex sleeves can be provided.

This sleeve eliminates the need to provide the bump 5710 on the waveguide 1502 altogether.

For example, the sleeve 7610 may have a longitudinally extending portion (eg, two clamshell halves surrounding the waveguide 1502 between the torque adapter 8602 and the closed spool 8104).

Each half may have an inwardly projecting boss and an outwardly projecting boss.

The outwardly projecting boss partially surrounds the two outer surfaces of the half to form a space at each outer support point.

These spaces allow ETO sterile gas to travel all the way from the distal end to the proximal part of the sleeve on the outer surface adjacent to the inner tube 7402.

The outwardly projecting bosses may be arranged in a staggered manner.

On the other hand, the boss projecting inward is configured to come into contact with the waveguide 1502 only at the node.

The longitudinal length of the bump 5710 is long enough, the inwardly projecting boss may have a shorter longitudinal length, and the overall longitudinal length of the half portion extends far from the torque adapter 8602 and is sealed. The spool 8104 can be reached and one can be integrated with the closed spool 8104 if desired.

In this way, the sleeve is rested in the longitudinal direction by the inwardly projecting bosses arranged on the waveguide node.

In another configuration, the sleeve can be a blow molded part with both an inwardly projecting boss and an outwardly projecting boss, and in yet another configuration, the sealed spool 8104 is integrally blow molded with the sleeve. Will be done.

[0346]

All prior art section supports are more than one and are fixed to the outer diameter of each waveguide by 100% contact (pressing, joining, molding).

As a result, sound energy is always transmitted to such supports, resulting in higher inherent power uptake, higher assembly complexity and higher manufacturing costs.

In contrast, the waveguide supports with bumps 5710 and sleeve 7610 of the present invention are concise and cost effective.

That is, these sleeve restraints and one-piece construction make assembly much easier and more cost effective.

Also, since these bump features are not so different from the average diameter of the waveguide 1502 and smaller than the maximum diameter of the waveguide 1052, additional fabrication is not a problem.

[0347]

The structure of the waveguide assembly 304 will be described with reference to FIGS. 100-105.

First, the liner jaws 7308 and 10010 are inserted and fixed in the jaws 7308 (see, eg, FIGS. 100 and 101).

Petitioner Therabody Ex-1004, 1337

The shape of the inner tube 7402 is such that it extends sufficiently distantly beyond the distal end of the outer tube 7302, thereby allowing the clevis arms 7418 and 7420 as it progresses in FIGS. 101-102. The flexible opening (as indicated by arrow A) of the jaw allows the opposing boss 7408 (arrow B) of the jaw to be accommodated internally.

When the jaw 7308 is assembled in the inner tube 7402, the jaw 7308 swivels below the centerline of the tubes 7302 and 7402, and the inner tube 7402 slides into the outer tube 7402.

As a result, the swivel control tabs 7411 and 7412 of the jaw portion 7308 enter a position within the outer tube 7302.

The jaws swivel and open above the centerline of the tubes 7302 and 7402, as shown in FIG. 104, and swivel control tabs 7411 and 7412 are inserted into the openings 7311 and 7312 of the outer tubes 7302.

[0348]

Then, the waveguide 1502 is inserted through a set of tubes 7302 and 7402 to capture the jaw portion 7308 inside.

This is because, due to the presence of the waveguide 1502, the jaw portion 7380 cannot move any further in the longitudinal direction towards the centerlines of the tubes 7302 and 7402.

The final assembly position is shown in many drawings (eg, FIGS. 73 and 76).

For example, the use of isopropyl alcohol allows the waveguide 1502 to be easily slid through the distal dumbbell seal 8104.

After that, the alcohol evaporates, so that no residue remains on the dumbbell seal 8104.

Obviously, this assembly process is unique because it requires no action other than mechanically arranging the joints.

No welding, crimping or deformation occurs, and no welding, crimping or deformation is required at any part during complete assembly.

[0349]

This assembly process offers great benefits in manufacturing.

Lubrication of the inner tubing 7302 and the outer tubing 7402 can be done by the tubing manufacturer rather than the clean room assembly line to avoid contamination in such joints.

Before mounting the inner tube 7302 and the outer tube 7402 coaxially, the translation o-ring 7406 is placed in the corset 7404 of the inner tube 7402, after which the outer tube 7302 is slid onto the inner tube 7402 to the o-ring 7406. ..

Lubricant is placed on the o-ring 7406 and the outer tube 7302 is moved relative to the inner tube 7402 (or vice versa), thereby rotating the o-ring 7406 and moving it within the corset 7404.

Since the water in the lubricant dries and disappears, the lubricant remains only between the pipes 7302 and 7402 and around the o-ring 7406.

[0350]

A common problem in the development of displacement-dependent ultrasonic systems is the complexity and inaccuracy of waveguide displacement measurements.

The most accurate measurement system is the laser vibrometer, but in the case of the laser vibrometer, calibration by the corresponding high frequency dynamic standard is impossible and expensive.

One rough and simple calibration method is to observe the displacement of the reflected "spots" on the surface of a dynamic high frequency system under magnification.

Peak-to-peak displacements are observed and this displacement can be correlated with known length standards.

The main problem with magnified observation methods is that such "spots" are random and inconsistent.

In an exemplary embodiment of waveguide displacement measurement, the invention presents a deliberately added spot, mark, pattern, machined hole portion to a controlled visual feature (eg, blade portion 7304 of waveguide 1502). , Groove, etc.).

By providing such a feature on the blade 7304, the accuracy of magnified displacement observation and measurement is improved.

Petitioner Therabody Ex-1004, 1338

[0351]

XV.

More safety features

[0352]

In any of the exemplary safety embodiments of the configuration of the present invention, the system may have a safety mechanism to ground the surgeon using the device to the handheld ultrasonic surgical ablation assembly 300.

If the waveguide 1502 accidentally contacts the surgeon, the handheld ultrasonic surgical ablation assembly 300 detects this ground and immediately terminates the movement of the waveguide 1502, whereby the surgeon cuts himself. To prevent that.

Since the handheld instrument 300 is not connected to ground, it is possible to provide a safety circuit that detects contact with the surgeon and cuts off the ultrasonic power supply.

For example, a capacitive contact patch placed on the handle assembly 302 is connected to a capacitive touch detection circuit (eg, used in capacitive switching and known in the art) to detect contact of the working tip with the surgeon. Placed to do.

When such contact is detected, the instrument drive circuit 904 is stopped to avoid applying cutting energy to the surgeon.

Such a detection circuit would not be practical in a prior art system in which the handpiece is connected to a large component of a grounded appliance.

[0353]

In another exemplary embodiment, the oscillator functions in acceptance mode.

In this acceptance mode, by converting the vibration in the waveguide into a signal, the signal can be monitored by the electronic device of the apparatus.

For example, vibrations associated with blood flow through a blood vessel can be detected and used to provide feedback to the user about the type of tissue being clamped.

For example, when the jaw is clamped, this detection can determine whether or not there was a large blood flow immediately before the clamp.

The signal can warn the user that the device is clamping, for example, a heavy vascular system and should use low power, for example when sealing.

Alternatively, if a heavy vasculature is detected, it is possible to prohibit high energy activation as a safety mechanism.

[0354]

In another exemplary embodiment of the invention, after the battery assembly 301 is physically and electrically coupled to the handle assembly 302, the handheld surgical ablation assembly 300 changes the button 4608 from the depressed state to the detached state. It does not work until, i.e., until it is dynamically placed in the non-pushed state.

This feature prevents the handheld ultrasonic surgical ablation assembly 300 from operating immediately when the battery assembly 301 is connected to the handle assembly 302.

This can occur if the operator unintentionally presses the button 4608 when connecting the battery assembly 301 to the handle assembly 302 otherwise.

[0355]

The present invention includes three interconnected and lube-separable components (ie, battery assembly 301, handle assembly 302, and TAG assembly 303), each aspect being uniquely accessible (and selectively exposed). Because of the electrical connection, there is a risk of electrostatic discharge (ESD) occurring between these three separable elements.

Therefore, in another exemplary embodiment, the invention uses an ESD protection strategy to avoid equipment damage and potential failure.

Petitioner Therabody Ex-1004, 1339

To implement this type of protection, a wide range of solutions within the scope and intent of the invention are contemplated.

To give a non-limiting example, there is the use of separate ESD protective elements and spark gaps.

[0356]

In yet another exemplary embodiment for protecting the electrical elements of the device from damage, by arranging the batteries in a certain manner (eg, in an inverted manner), the connector tabs are oriented away from the electrical board. To do so.

This configuration reduces the possibility of accidental short circuits and allows the use of battery interconnect boards, which facilitates the connection of battery tabs to circuits.

[0357]

As described, the present invention provides a cordless handheld ultrasonic cutting device that is self-driving, compact and efficient, and thus completely eliminates the expensive set-top boxes required by prior art devices. do.

Advantageously, according to the device of the present invention, the user can operate completely without a cord or other connecting device.

In addition to the benefits of cost savings, smaller size, elimination of bridging cords that power and transmit signals, and the provision of constant kinetic voltage, the present invention provides sterile conditions in the surgical environment. It offers unique benefits that can be maintained.

As described, the apparatus of the present invention is entirely composed of sterile components that are maintained only in the sterile field.

Moreover, all electronic controls of the system of the invention reside in a sterile field.

Therefore, any and all troubleshooting can occur in sterile fields.

That is, since the device of the present invention is not connected to a desktop box as required by the prior art, the user can use the handheld ultrasonic surgical ablation assembly 300 of the present invention to perform any function (eg, troubleshooting, battery). No need to leave the sterile field to perform (replacement, replacement of waveguide assembly, etc.).

Moreover, the two-step buttons of the present invention allow the operator complete control of any surgical task without the operator focusing on their visual attention to the instrument itself.

In other words, the operator uses only one button and does not need to look to ensure that he or she is ready to press the appropriate button.

[0358]

The present invention also provides a low voltage or battery voltage switching or waveform forming step prior to the rising step of the transformer voltage.

By "tightly coupling" all frequency sensitive components into one location (eg, a handle), the present invention suffers from the disadvantages suffered by all prior art ultrasonic ablation / cutting devices. Eliminate any inductive losses that occur between the set-top box and the handpiece.

Due to the close coupling between the drive circuit and the matching network 1012, all power modulation circuits are tolerant of higher Q factors and larger frequency bands.

[0359]

Having disclosed specific embodiments of the invention, one of ordinary skill in the art will appreciate that modifications can be made to the particular embodiments without departing from the spirit and scope of the invention.

Accordingly, the scope of the invention is not limited to any particular embodiment, and the appended claims are intended to cover any and all such applications, modifications and examples within the scope of the invention. Will be done.

Petitioner Therabody Ex-1004, 1340

Petitioner Therabody Ex-1004, 1341

Patent Translate
Powered by EPO and Google

Notice

This translation is machine-generated. It cannot be guaranteed that it is intelligible, accurate, complete, reliable or fit for specific purposes. Critical decisions, such as commercially relevant or financial decisions, should not be based on machine-translation output.

CLAIMS JP2012223582A

1.

A battery assembly for a surgical device having a battery terminal and operating parameters, comprising a housing, said housing having an outer shape formed to detachably connect to the battery terminal, at said battery terminal. It comprises at least one modular battery capable of operating to power the surgical device and has a control circuit comprising at least one microprocessor, memory and real-time clock, wherein the control circuit is said to be at least one. Communicably coupled to a modular battery and operable to detect the identification information of the surgical device, at least one of the operating parameters of the surgical device based on the detected identification information. It is operable to determine at least one piece of information about the battery, at least to record the at least one piece of information in the memory, and based on the at least one piece of information, said at least one modular form. A battery assembly that can be operated to selectively enable or disable the power supply of the surgical device by the battery.

2.

The surgical device comprises an ultrasonic guide, a cordless ultrasonic motion generating assembly, and a surgical handle, the cordless ultrasonic motion generating assembly in which the waveguide is connected to an output junction. It has an output connecting portion and a fixing connector that can operate so as to apply ultrasonic motion to the ultrasonic guide, and the surgical handle has a battery terminal and the ultrasonic guide rotates. It has a waveguide mounting dock that is possibly connected and an ultrasonic motion generation assembly dock, wherein the fixing connector of the ultrasonic motion generation assembly is removed at the surgical handle. When possibly secured, the battery assembly is electrically connected to the ultrasonic motion generating assembly and the ultrasonic guide is physically connected to the output coupling portion of the ultrasonic motion generating assembly. The battery assembly according to claim 1, which is operable.

3.

The battery assembly according to claim 2, wherein the ultrasonic motion generation assembly includes a drive wave generation circuit having an oscillator output and an oscillator communicably connected to the oscillator output.

4.

The battery assembly according to claim 1, wherein the at least one piece of information is the number of times at least one portion of the surgical device has actually been used.

5.

The battery assembly according to claim 4, wherein the control circuit is capable of operating such that at least one portion of the surgical device records the total number of times it has actually been used.

Petitioner Therabody Ex-1004, 1342

6.

The control circuit avoids powering the surgical device from the at least one modular battery when the recorded actual total usage is at least the predetermined actual maximum usage. 5. The battery assembly according to claim 5, which is capable of operating in such a manner.

7.

The control circuit determines the time elapsed since the at least one part was last actually used by the real-time clock, and when the determined elapsed time length exceeds a predetermined threshold. The battery according to claim 4, wherein the battery can be operated to determine the actual number of uses by incrementing the actual total number of times of use of the at least one portion contained in the memory. assembly.

8.

The at least one piece of information is a transient course of use of at least a portion of the surgical device, the control circuit being the length of time elapsed since the at least one portion was last actually used. By detecting the The battery assembly according to claim 5, which can operate to determine the temporary course in use.

9.

The control circuit detects the length of time that has elapsed since the surgical device was last used and whether the detected time length meets or is predefined. If the threshold is exceeded, it is determined that actual use has occurred, and if the detected time length is shorter than the predetermined threshold, it is determined that a temporary course of use has occurred. The battery assembly according to claim 1, wherein the battery assembly is capable of operating to determine that any of the actual use and temporary course of use of the surgical device has occurred.

10.

The battery assembly of claim 9, wherein the control circuit is capable of operating to record the actual total number of uses of the surgical device.

11.

The control circuit comprises the at least one modular battery if the recorded actual total usage meets or exceeds the predefined actual maximum usage. 10. The battery assembly according to claim 10, which can operate so as to avoid supplying power to the surgical device.

12.

The surgical device further comprises the surgical device, the surgical device being an ultrasonic guide having a proximal end to receive ultrasonic motion in situ, an ultrasonic guide, a cordless ultrasonic motion generation assembly, and surgery. The cordless ultrasonic motion generation assembly is a transducer communicably coupled to a drive wave generator having an oscillator output and the oscillator output. The surgical handle comprises the battery terminal and said If it has a waveguide mounting dock rotatably coupled to an ultrasonic guide and an ultrasonic motion generation assembly dock, the ultrasonic motion generating assembly is detachably secured in the surgical handle. To electrically connect the battery assembly to the ultrasonic motion generating assembly and to physically connect the ultrasonic guide to the ultrasonic motion generating end of the ultrasonic motion generating assembly. The battery assembly according to claim 1, wherein the battery assembly is operational.

13.

12. The battery assembly of claim 12, wherein the at least one piece of information is the actual number of times the at least one portion of the surgical device has been used.

14.

Petitioner Therabody Ex-1004, 1343

13. The battery assembly of claim 13, wherein the control circuit is operable to record the actual total number of uses of said at least one portion of the surgical device.

15.

The control circuit avoids powering the surgical device from the at least one modular battery when the recorded actual total usage is at least the predetermined actual maximum usage. 14. The battery assembly according to claim 14, which is operational.

16.

The control circuit determines the time elapsed since the at least one part was last actually used by the real-time clock, and when the determined elapsed time length exceeds a predetermined threshold. 14. The battery of claim 14, which can operate to determine the actual number of uses by incrementing the actual total number of times of use of the at least one portion of the memory. assembly.

17.

The at least one piece of information is a transient course of use of at least a portion of the surgical device, the control circuit being the length of time elapsed since the at least one portion was last actually used. By detecting and determining that a temporary course has occurred during use of the at least one portion if the detected time length is shorter than a predetermined threshold. 12. The battery assembly according to claim 12, which can operate to determine the temporary course in use.

18.

The control circuit detects the length of time that has elapsed since the surgical device was last used and whether the detected time length meets or is predefined. If the threshold is exceeded, it is determined that actual use has occurred, and if the detected time length is lower than the predetermined threshold, it is determined that a temporary course of use has occurred. The battery assembly according to claim 12, wherein the battery assembly is capable of operating to determine that any of the actual use and temporary course of use of the surgical device has occurred.

19.

18. The battery assembly of claim 18, wherein the control circuit is operable to record the actual total number of uses of the surgical device.

20.

The control circuit comprises the at least one modular battery if the recorded actual total usage meets or exceeds the predefined actual maximum usage. 19. The battery assembly according to claim 19, which can operate so as to avoid power supply to the surgical device.

Petitioner Therabody Ex-1004, 1344

(19)日本国特許庁(JP)　(12)特　許　公　報(B2)　(11)特許番号
特許第5859905号
(P5859905)
(45)発行日　平成28年2月16日(2016.2.16)　(24)登録日　平成27年12月25日(2015.12.25)

(51)Int.Cl.　F I
A61B 18/00 (2006.01)　A61B 17/36 330

請求項の数 18　外国語出願　(全 175 頁)

(21)出願番号　特願2012-93321(P2012-93321)
(22)出願日　平成24年4月16日(2012.4.16)
(65)公開番号　特開2012-223582(P2012-223582A)
(43)公開日　平成24年11月15日(2012.11.15)
審査請求日　平成25年8月27日(2013.8.27)
(31)優先権主張番号　13/307,750
(32)優先日　平成23年11月30日(2011.11.30)
(33)優先権主張国　米国(US)
(31)優先権主張番号　61/476,022
(32)優先日　平成23年4月15日(2011.4.15)
(33)優先権主張国　米国(US)

(73)特許権者　507364377
コヴィディエン・アクチェンゲゼルシャフト
スイス国　８２１２　ノイハオゼン・アム・ラインフォール，ヴィクター・フォン・ブランズ－シュトラーセ　１９
(74)代理人　100107456
弁理士　池田　成人
(74)代理人　100148596
弁理士　山口　和弘
(74)代理人　100123995
弁理士　野田　雅一

最終頁に続く

(54)【発明の名称】バッテリ駆動の手持ち式超音波手術用焼灼切断装置

(57)【特許請求の範囲】
【請求項１】
バッテリアセンブリであって、
ハウジングを備え、
前記ハウジングは、
手術用装置のバッテリ端子に取り外し可能に接続するように形成された外形を有し、
前記バッテリ端子において前記手術用装置に電力を供給するように動作可能なモジュール式バッテリを含み、
少なくとも１つのマイクロプロセッサ、メモリおよびリアルタイムクロックを含む制御回路を有し、
前記制御回路は、
前記モジュール式バッテリに通信可能に連結され、
前記手術用装置の識別情報を検出するように動作可能であり、
前記検出された識別情報に基づいて、前記手術用装置の動作パラメータに関する情報を決定するように動作可能であり、
少なくとも前記メモリ中の前記情報を記録するように動作可能であり、
前記情報に基づいて、前記モジュール式バッテリによる前記手術用装置への電力供給を選択的に可能化または不可能化するように動作可能であり、前記情報は、前記手術用装置の少なくとも１つの部分の実際の使用の回数を含み、前記実際の使用の回数は、前記手術用装置の前記少なくとも１つの部分の作動が最後に停止されてから経過した時間の長さ

Petitioner Therabody Ex-1004, 1345

が事前規定された閾値を越えた場合に前記制御回路によってインクリメントされる、バッテリアセンブリ。

【請求項２】

前記手術用装置は、超音波導波管と、コードレスの超音波運動生成アセンブリと、手術用ハンドルとを備え、

前記コードレスの超音波運動生成アセンブリは、

前記超音波導波管が出力連結部へと接続された際に超音波運動を前記超音波導波管に付与するように動作可能な前記出力連結部と、

固定用コネクタと、を有し、

前記手術用ハンドルは、

前記バッテリ端子と、

前記超音波導波管が回転可能に連結される導波管取付ドックと、

超音波運動生成アセンブリドックとを有し、

前記超音波運動生成アセンブリドックは、前記超音波運動生成アセンブリの前記固定用コネクタが前記手術用ハンドルにおいて取り外し可能に固定された際に、

前記バッテリアセンブリを前記超音波運動生成アセンブリへと電気的に接続させ、かつ、

前記超音波導波管を前記超音波運動生成アセンブリの前記出力連結部へと物理的に接続させる、ように動作可能である、請求項１に記載のバッテリアセンブリ。

【請求項３】

前記超音波運動生成アセンブリは、

発振器出力を有する駆動波生成回路と、

前記発振器出力に通信可能に連結された振動子と、を含む、請求項２に記載のバッテリアセンブリ。

【請求項４】

前記制御回路は、前記手術用装置の前記少なくとも１つの部分が実際に使用された合計回数を記録するように動作可能である、請求項１に記載のバッテリアセンブリ。

【請求項５】

前記制御回路は、前記記録された実際の合計使用回数が少なくとも事前規定された実際の最大使用回数となった場合に、前記モジュール式バッテリから前記手術用装置への電力供給を回避するように動作することが可能である、請求項４に記載のバッテリアセンブリ。

【請求項６】

前記制御回路は、前記少なくとも１つの部分の作動が最後に停止されてから経過した時間を前記リアルタイムクロックによって決定することにより、前記実際の使用回数を決定するように動作可能である、請求項１に記載のバッテリアセンブリ。

【請求項７】

前記情報は、前記手術用装置の少なくとも一部の一時的な作動停止を含み、

前記制御回路は、

前記少なくとも１つの部分の作動が最後に停止されてから経過した時間の長さを検出することと、

前記検出された時間長さが事前規定された閾値よりも短い場合、前記少なくとも１つの部分の一時的な作動停止が発生したと決定するステップと、

を行うことにより、前記一時的な作動停止を決定するように動作可能である、請求項４に記載のバッテリアセンブリ。

【請求項８】

前記制御回路は、

前記手術用装置の作動が最後に停止されてから経過した時間の長さを検出することと、

前記検出された時間長さが事前規定された閾値を満たすかまたは前記事前規定された

Petitioner Therabody Ex-1004, 1346

閾値を越える場合、実際の使用が発生したと決定することと、
前記検出された時間長さが前記事前規定された閾値よりも短い場合、一時的な作動停止が発生したと決定することと、
により、前記手術用装置の実際の使用および使用時における一時的な作動停止のいずれかが発生したことを決定するように動作可能である、請求項１に記載のバッテリアセンブリ。
【請求項９】
前記制御回路は、前記手術用装置の実際の合計使用回数を記録するように動作可能である、請求項８に記載のバッテリアセンブリ。
【請求項１０】
前記制御回路は、前記記録された実際の合計使用回数が事前規定された実際の最大使用回数を満たすかまたは前記事前規定された実際の最大使用回数を越える場合、前記モジュール式バッテリから前記手術用装置への電力供給を回避するように動作可能である、請求項９に記載のバッテリアセンブリ。
【請求項１１】
手術用装置と組み合わせられ、
前記手術用装置は、
超音波導波管であって、超音波運動をその場で受け入れる近位端を有する、超音波導波管と、
コードレスの超音波運動生成アセンブリと、
手術用ハンドルと、を有し、
前記コードレスの超音波運動生成アセンブリは、
発振器出力を有する駆動波生成回路と、
前記発振器出力に通信可能に連結された振動子であって、前記振動子は、超音波運動生成端部を有し、前記超音波導波管の前記近位端へと取り外し可能に動作可能に接続される、振動子と、を有し、
前記手術用ハンドルは、
前記バッテリ端子と、
前記超音波導波管に回転可能に連結された導波管取付ドックと、
超音波運動生成アセンブリドックとを有し、
前記超音波運動生成アセンブリは、が前記手術用ハンドルにおいて取り外し可能に固定されている場合に、
前記バッテリアセンブリを前記超音波運動生成アセンブリへと電気的に接続させるように、および、
前記超音波導波管を前記超音波運動生成アセンブリの前記超音波運動生成端部へと物理的に接続させるように、動作可能である、を含む、請求項１に記載のバッテリアセンブリ。
【請求項１２】
前記制御回路は、前記手術用装置の前記少なくとも１つの部分の実際の合計使用回数を記録するように動作可能である、請求項１１に記載のバッテリアセンブリ。
【請求項１３】
前記制御回路は、前記記録された実際の合計使用回数が少なくとも事前規定された実際の最大使用回数となった場合、前記モジュール式バッテリから前記手術用装置への電力供給を回避するように動作可能である、請求項１２に記載のバッテリアセンブリ。
【請求項１４】
前記制御回路は、前記少なくとも１つの部分の作動が最後に停止されてから経過した時間を前記リアルタイムクロックによって決定することにより、前記実際の使用回数を決定するように動作可能である、請求項１２に記載のバッテリアセンブリ。
【請求項１５】
前記情報は、前記手術用装置の少なくとも一部の一時的な作動停止を含み、

Petitioner Therabody Ex-1004, 1347

前記制御回路は、
前記少なくとも１つの部分の作動が最後に実際に停止されてから経過した時間の長さを検出することと、
前記検出された時間長さが事前規定された閾値よりも短い場合、前記少なくとも１つの部分の一時的な作動停止が発生したと決定することと、を行うことにより、前記一時的な作動停止を決定するように動作可能である、請求項１１に記載のバッテリアセンブリ。
【請求項１６】
前記制御回路は、
前記手術用装置の作動が最後に停止されてから経過した時間の長さを検出することと、
前記検出された時間長さが事前規定された閾値を満たすかまたは前記事前規定された閾値を越える場合、実際の使用が発生したと決定することと、
前記検出された時間長さが前記事前規定された閾値よりも低い場合、一時的な作動停止が発生したと決定することと、
により、前記手術用装置の実際の使用および使用時における一時的な作動停止のいずれかが発生したことを決定するように動作可能である、請求項１１に記載のバッテリアセンブリ。
【請求項１７】
前記制御回路は、前記手術用装置の実際の合計使用回数を記録するように動作可能である、請求項１６に記載のバッテリアセンブリ。
【請求項１８】
前記制御回路は、前記記録された実際の合計使用回数が事前規定された実際の最大使用回数を満たすかまたは前記事前規定された実際の最大使用回数を越える場合、前記モジュール式バッテリから前記手術用装置への電力供給を回避するように動作可能である、請求項１７に記載のバッテリアセンブリ。
【発明の詳細な説明】
【技術分野】
【０００１】
本願は、米国仮特許出願シリアル番号第６１／４７６，０２２号（出願日：２０１０年４月１５日）の３５Ｕ．Ｓ．Ｃ．§１１９の下において優先権を主張し、
米国特許出願シリアル番号第１３／２１５，９７１号（出願日：２０１１年８月２３日）の部分継続出願であり、米国特許出願シリアル番号第１３／２１５，９７１号は、米国仮特許出願シリアル番号第６１／３７６，９８３号（出願日：２０１０年８月２５日）の３５Ｕ．Ｓ．Ｃ．§１１９下において優先権を主張する。
本願は、米国特許出願シリアル番号第１３／０２２，７０７号および第１３／０２２，７４３号（出願日：２０１１年２月８日）の部分継続出願である。
本願は、米国特許出願シリアル番号第１２／８６８，５０５号および第１２／８６８，５４５号（出願日：２０１０年８月２５日）の部分継続出願であり、米国特許出願シリアル番号第１２／８６８，５０５号および第１２／８６８，５４５号は、米国仮出願シリアル番号第６１／２３６，９３４号（出願日：２００９年８月２６日）に対する優先権を主張する。
本願は、米国特許出願シリアル番号第１２／５４７，８９８号、第１２／５４７，９７５号および第１２／５４７，９９９号（出願日は全て２００９年８月２６日）の部分継続出願である。
本願は、米国特許出願シリアル番号第１３／０７２，１８７号、第１３／０７２，２４７号、第１３／０７２，２７３号、第１３／０７２，２２１号、第１３／０７２，３０９号、第１３／０７２，３４５号および第１３／０７２，３７３号（出願日は全て２０１１年８月２５日）の部分継続出願である。
本願は、米国特許出願シリアル番号第１２／２６６，１０１号、第１２／２６６，１４６号、第１２／２６６，２２６号、第１２／２６６，２５２号および第１２／２６６，３２

Petitioner Therabody Ex-1004, 1348

０号（出願日は全て２００８年１１月６日）、米国特許出願シリアル番号第１２／２６６，６６４号（出願日：２００８年１１月７日）、米国特許出願シリアル番号第１２／２６９，５４４号および第１２／２６９，６２９号（出願日：２００８年１１月１２日）および米国特許出願シリアル番号第１２／２７０，１４６号（出願日：２００８年１１月１３日）の部分継続出願であり、上記出願はそれぞれ、米国仮シリアル番号第６０／９９１，８２９号（出願日：２００７年１２月３日）、第６０／９９２，４９８号（出願日：２００７年１２月５日）、第６１／０１９，８８８号（出願日：２００８年1月９日）、第６１／０４５，４７５号（出願日：２００８年4月１６日）、第６１／０４８，８０９号（出願日：２００８年4月２９日）および第６１／０８１，８８５号（出願日：２００８年７月１８日）に対する優先権を主張する。
これらの全開示の全体が参照によってすべて本明細書に組み入れられる。

【０００２】

本発明は、概して、超音波切断装置に関し、特に、バッテリ駆動の手持ち式超音波手術用焼灼切断装置に関する。

【背景技術】

【０００３】

超音波器具は、例えば組織の除去および血管の焼灼などの多くの医療的状態の処置に効果的に使用される。超音波を用いた切断器具は、超音波振動子を用いて切断刃の長手軸線に沿って振動を発生させる。刃の長さに沿って共振波を配置することによって、刃の端部に高速の長手方向の機械的運動が生成される。刃の端部に伝達される機械的振動は、有機的組織の切断すること、および同時に超音波周波数によって生成される熱エネルギーを使用して組織を凝固させることにおいて非常に効率的なので、これらの器具は有利である。こうした器具は、例えば内視鏡や腹腔鏡の処置などの、刃がトロカールを通って手術部位に到達する最小侵襲性処置に特に良く適している。

【０００４】

各種の切断刃（例えば長さ、材質、サイズ）に対して、刃の長さに沿って共振を生成する１以上の（周期的な）駆動信号がある。共振は、刃の先端の運動を生じさせ、手術の処置中の向上した性能に対して最適化されることが可能である。しかしながら、切断刃の有効な駆動信号を生成することは取るに足らない課題ではない。例えば、切断ツールに印加される周波数、電流、および電圧は、刃に作用する変動負荷によって、および、ツールの使用から生じる温度差によって変化するので、これらのパラメータはすべて動的に制御されなければならない。

【０００５】

図１は、エンドエフェクタに超音波の機械的運動を作用させるために使用される従来技術の回路の概略的なブロック図を示している。回路は、電源１０２と、制御回路１０４と、駆動回路１０６と、整合回路１０８と、振動子１１０と、を有しており、また、ハンドピース１１２と、ハンドピース１１２に固定されてカニューラ１２０によって支持される導波管１１４（点線で図示されている）と、を有している。導波管１１４はその遠位端の刃１１６で終端をなしている。クランプ機構１１８は、エンドエフェクタ全体の一部であり、導波管１１４の刃部１１６を露出させて組織および他の物質と刃部１１６とを接触させることができる。一般に、クランプ機構１１８は旋回アームであり、旋回アームは、アームと刃１１６との間の組織を把持するか、又は、組織にクランプするように作用する。しかしながら、いくつかの装置にはクランプ機構１１８がない。

【０００６】

駆動回路１０６は高電圧の自励振動信号を生成する。駆動回路１０６の高電圧出力は整合回路１０８に供給され、整合回路１０８は、振動子１１０に供給される駆動信号（波形）を次に生成する信号平滑化構成要素を包含している。振動子１１０への振動入力は、導波管１１４に沿って共振を引き起こす振幅および周波数で振動子１１０の機械的部分を前後に移動させる。共振器具およびその構成要素の最適な共振および耐用年数のため、振動子１１０に適用される駆動信号は、実際に実現することが可能な限り平滑な正弦波である

Petitioner Therabody Ex-1004, 1349

べきである。この理由のため、整合回路１０８、振動子１１０および導波管１１４が、相互に協働するように選択され、それらはすべて、相互に周波数に敏感である。これを整合されたまたは調整されていると呼ぶことができる。

【０００７】

一般的な圧電振動子１１０を駆動するためには比較的高電圧（例えば１００Ｖ以上）が必要とされるので、利用でき、すべての従来技術の超音波切断装置で使用される電源は一般的には１５Ａ、１２０ＶＡＣまでの電気の主管（例えば壁のコンセント）である。従って、すべての公知の超音波手術用切断装置は、図１および図２に示すものと似ており、電力の供給のための電気の主管２０６に差し込まれる電気コード２０４を有するカウンタートップ用ボックス２０２を利用する。共振は、位相ロックループ（ＰＬＬ）によって維持され、位相ロックループは、整合回路１０８および駆動回路１０６の出力の間に閉ループを作り出す。この理由のため、従来技術の装置では、カウンタートップ用ボックス２０２は、駆動および制御電子機器１０４、１０６、並びに、整合回路１０８のすべてを常に包含していた。こうしたボックスの一般的な小売価格は数千ドルである。

【０００８】

供給コード２０８は、ハンドピース１１２内でボックス２０２から振動子１１０に、そして、それによって導波管１１４に正弦曲線の波形を伝達する。コード２０８の長さ、サイズおよび重量に起因して操作者／外科医の可動性が制限されるため、従来技術の装置は多大な不都合を有している。コード２０８は、ハンドピース１１２を使用する任意の手術処置の間、操作者に移動限界を作り出し、操作者および彼／彼女の周りの人達とって障害物となる。さらに、コードは、シールドされて耐久性を必要とし、従って非常に高価である。最後に、ボックス２０２は滅菌されていないため、ボックス２０２および供給コード２０８の双方を洗浄し、手術環境用に滅菌状態に保持する必要がある。

【０００９】

整合回路１０８、振動子１１０および導波管１１４が周波数に影響を受けることに起因して従来技術には別の不都合がある。整合回路１０８および駆動回路１０６の出力の間に位相ロックループフィードバック回路を有することによって、整合回路１０８は、駆動回路１０６の近くでボックス２０２内に常に配置されており、供給コード２０８の長さによって振動子１１０から切り離されていた。このアーキテクチャは、超音波周波数伝達の一般的な結果である伝達損失と電気的寄生とを誘発する。

【００１０】

さらに、従来技術の装置は、（直列共振によって作動する時に）振動子に適用される定電流をモニタして維持することによって、変化する導波管１１４の負荷状態において共振を維持しようと試みる。しかしながら、特定の負荷状態を認識せずに、振動子１１０に適用される電流と振幅との間の唯一の予測可能な関係は共振状態にあるということである（本明細書中、当該用語が機械的出力に関連する場合、振幅を場合に応じて変位と呼ぶ場合がある）。従って、定電流が付加されているのにもかかわらず、導波管１１４に沿った波形の振幅はすべての周波数にわたって一定ではない場合がある。従って、従来技術の装置に負荷をかけられた時、導波管１１４の作動が共振状態にあることは保証されず、電流だけがモニタされて一定に保持されるので、導波管１１４上の運動量は著しく変動し得る。この理由のため、定電流を維持することは、導波管１１４の一定の運動を維持する有効な方法ではない。

【００１１】

さらに、従来技術では、ハンドピース１１２および振動子１１０は有限回数の使用後に交換されるものの、ハンドピース１１２よりも非常に高価なボックス２０２は交換されない。従って、新しい交換ハンドピース１１２および振動子１１０の導入は、周波数に敏感な構成要素（１０８、１１０、および１１２）同士の間の不整合をたびたび引き起こし、それによって、導波管１１４に導入される周波数を不都合に変化させる。従来技術の回路にとって、そうした不整合を回避するための唯一の方法は、正確な周波数にそれらを制限することである。この正確性はコストの顕著な増大をもたらす。

Petitioner Therabody Ex-1004, 1350

【発明の概要】
【発明が解決しようとする課題】
【００１２】
従って、従来技術に関連した例えば上述のような課題を克服する必要がある。
【課題を解決するための手段】
【００１３】
簡潔に言うと、例示の実施形態によれば、本発明は、有用な作業を実行するため、特に、手術中に組織を切断してシールするために、導波管の端部で高周波の機械的運動を生成するバッテリ駆動の装置を含む。電気エネルギーを導波管の端部で運動を生成する機械的エネルギーに変換するために圧電振動子が使用される。特に、振動子および導波管がそれらの複合共振周波数で駆動される時、大量の機械的運動が生成される。本発明の回路構成要素は、数ある中で特に、バッテリ電源と、制御回路と、駆動回路と、整合回路と、を有しており、すべてが超音波切断装置のハンドピース内に配置されており、すべてがバッテリ電圧から波形を管理して生成する。構成要素は、バッテリ電源からの電気エネルギーを、振動子を駆動する高電圧ＡＣ波形に変換するように選択される。理想的には、この波形の周波数は導波管および振動子の共振周波数と実質的に同一である。波形の大きさは、所望量の機械的運動を生成する値であるように選択される。
【００１４】
好都合には、いくつかの実施形態によれば、本発明は、装置の構成要素が取り外され、交換され、修理され、および／又は、取り換えられることを可能にする。いくつかの構成要素は、本明細書で使用される場合、構成要素が１回の処置のみのために使用されてその後に廃棄されることを意味する「使い捨て」である。さらに他の構成要素は、本明細書で使用される場合、構成要素が標準的な医療処置によって滅菌されてその後に少なくとも２回目に使用され得ることを意味する「再使用可能」である。説明するように、他の構成要素は、それらが、自身が取り付けられる装置を認識して複数の要因に依存してそれらの機能又は性能を変化させることを可能にする情報処理機能を備えている。
【００１５】
本発明は、本明細書中において上記した従来公知の装置およびこの一般的種類の方法の不利点を解消し、また、廉価な要素の廃棄を可能とし、従来技術の再利用可能要素よりもずっと廉価なより高コストの要素の再利用を有利に可能とする、コードレスの手持ち式超音波焼灼切断装置を提供する。
【００１６】
本発明は、コードレスのバッテリ駆動の手持ち式超音波手術用焼灼切断装置として具現化されるように本明細書に示されて説明されるが、本発明の精神から逸脱せずに特許請求の範囲の範囲内および均等物の範囲内で様々な変形および構造的な変更がなされ得るので、示した詳細に限定することを意図していない。さらに、本発明に係る例示の実施形態の周知の要素は、詳細に説明されておらず、又は、本発明の関連する詳細をわかりにくくしないために省略される。
【００１７】
本明細書は、新規なものと考えられる本発明の特徴を規定する特許請求の範囲で結んでいるものの、図面とともに以下の説明を考慮すると本発明はより良好に理解されるであろう。図面において、同様の参照番号が以降の図面に引き継がれて用いられる。従って、装置の構成要素および方法の工程は、必要な場合には図面の通常の記号によって表されており、図面は、本明細書での説明の利益を有する当業者に容易に明らかである詳細によって本開示を分かりにくくしないように、本発明の実施形態を理解することに直接関係のあるそれらの特定の詳細を示している。図面の絵は縮尺通りに描かれていない。
【００１８】
本発明の特徴として考慮される他の特徴は添付の特許請求の範囲で説明される。必要な場合には、本発明の詳細な実施形態が本明細書に開示されているものの、開示される実施形態は、本発明の単なる例示であることが理解されるべきであり、それらは様々な形態で

Petitioner Therabody Ex-1004, 1351

具現化することが可能である。従って、本明細書に開示された特定の構造的および機能的な詳細は、限定するものとして解釈されるべきではなく、単に特許請求の範囲の根拠として、かつ、実質的に任意の適切な詳細な構造に本発明を様々に採用するために当業者に教示するための代表的な根拠として、単に解釈される。さらに、本明細書で使用される用語および表現は、限定するものであることを意図しておらず、むしろ、本発明の理解可能な説明を提供するために用いられる。

【００１９】

別々の図を通じて同一の又は機能的に同様の要素には同様の参照番号が付され、以下の詳細な説明とともに本明細書に組み込まれて本明細書の一部を形成する添付の図面は、様々な実施形態をさらに説明することに役立ち、また、本発明に係る様々な原理および利点を説明するために役立つ。

【図面の簡単な説明】

【００２０】

【図１】分離した電源、制御、駆動および整合の構成要素を有する従来技術の超音波切断装置の構成要素を概略的に示すブロック図である。

【図２】図１の従来技術の超音波切断装置を示す図である。

【図３】本発明の例示の実施形態に係る超音波手術用焼灼アセンブリの左側の立面図である。

【図４】本発明の例示の実施形態に係るバッテリアセンブリの角の上方からの斜視図である。

【図５】本発明の例示の実施形態に係る振動子および発振器アセンブリの左側立面図である。

【図６】本発明の例示の実施形態に係るコードレスのバッテリ駆動の手持ち式超音波手術用焼灼切断装置を概略的に示すブロック図である。

【図７】本発明の例示の実施形態に係る図３および図４の装置のバッテリアセンブリを概略的に示すブロック図である。

【図８】本発明の例示の実施形態に係る図３および図４の装置のハンドルアセンブリを概略的に示すブロック図である。

【図９】本発明の例示の実施形態に係る図３～図５の装置の振動子および発振器アセンブリを概略的に示すブロック図である。

【図１０】本発明の例示の実施形態に係る図９の発振器を概略的に示すブロック図である。

【図１１】本発明の例示の実施形態に係る図３および図４のバッテリコントローラを概略的に示すブロック図である。

【図１２】本発明の例示の実施形態に係る図３～図５の装置のバッテリアセンブリと振動子および発振器アセンブリとの間の電気的な通信関係を概略的に示すブロック図である。

【図１３】本発明の例示の実施形態に係る整合回路への方形波形の入力を示すグラフである。

【図１４】本発明の例示の実施形態に係る整合回路からの正弦波形の出力を示すグラフである。

【図１５】共振正弦波入力が、正弦パターンを有する本発明の例示の実施形態に係る超音波切断装置の導波管上に図示される作用が、導波管の長さに沿った軸方向運動の振幅を表すように示される図である。

【図１６】本発明の例示の実施形態に係る振動子の基本的な直列回路モデルを断片的に概略的に示す回路図である。

【図１７】本発明の例示の実施形態に係る図１６の回路を有する本発明の回路であって振動子の運動電流をモニタするために有用な回路を断片的に概略的に示す回路図である。

【図１８】本発明の例示の実施形態に係る振動子の基本的な並列回路モデルを断片的に概略的に示す回路図である。

【図１９】本発明の例示の実施形態に係る図２０の回路を有する本発明の回路であって振

Petitioner Therabody Ex-1004, 1352

動子の運動電流をモニタするために有用な回路を断片的に概略的に示す回路図である。
【図２０】本発明の例示の実施形態に係る図１６の回路を有する本発明の回路であって振動子の運動電流をモニタするために有用な回路を断片的に概略的に示す回路図である。
【図２１】本発明の例示の実施形態に係る図１８の回路を有する本発明の回路であって振動子の運動電圧をモニタするために有用な回路を断片的に概略的に示す回路図である。
【図２２】本発明の例示の実施形態に係る実装された直接デジタル合成技術のモデルを作る概略的なブロック図である。
【図２３】本発明の例示の実施形態に係るデジタルアナログコンバータ（ＤＡＣ）のフィルタされた出力より上方に位置するＤＡＣの例示の直接出力を示すグラフである。
【図２４】本発明の例示の実施形態に係る同一の短い波長同調ワードを用いたＤＡＣのフィルタされた出力より上方に位置する図２３のグラフを生成するために用いられる波長同調ワードよりも短い波長同調ワードを有するデジタルアナログコンバータ（ＤＡＣ）の例示の直接出力を示すグラフである。
【図２５】本発明の例示の実施形態に係るより長い波長同調ワードを用いたＤＡＣのフィルタされた出力より上方に位置する図２３のグラフを生成するために用いられる波長同調ワードよりも長い波長同調ワードを有するデジタルアナログコンバータ（ＤＡＣ）の例示の直接出力を示すグラフである。
【図２６】本発明の例示の実施形態に係る電流制御ループを備える例示の構成要素のブロック回路図である。
【図２７】本発明の例示の実施形態に係る図３の装置のブロック回路図である。
【図２８】本発明の例示の実施形態に係る図４のバッテリアセンブリの正面の上方からの斜視図である。
【図２９】本発明の例示の実施形態に係るマルチリードバッテリ端子の上側と残りのシェルの半分の内側を露出させる、シェルの半部分が取り外された図４のバッテリアセンブリの左側からの断片的な斜視図である。
【図３０】本発明の例示の実施形態に係るマルチリードバッテリ端子に接続された回路基板を露出させる、シェルの半部分が取り外された図４のバッテリアセンブリの右側からの断片的な斜視図である。
【図３１】本発明の例示の実施形態に係るマルチリードバッテリ端子に連結された複合回路基板に連結されたバッテリセルを露出させる、シェルの両方の半部分が取り外された図４のバッテリアセンブリの上面斜視図である。
【図３２】本発明の例示の実施形態に係るシェルの一方の半部分が定位置にある図３１に示すバッテリアセンブリの上面斜視図である。
【図３３】本発明の例示の実施形態に係るバッテリアセンブリの後側に配置されたキャッチを示す図４のハンドルアセンブリの上面斜視図である。
【図３４】本発明の例示の実施形態に係るマルチリードハンドル端子アセンブリと図４のバッテリアセンブリに噛み合うレシーバとを露出させる図３のハンドルアセンブリの下面斜視図である。
【図３５】本発明の例示の実施形態に係るマルチリードハンドル端子アセンブリと図４のバッテリアセンブリに噛み合うレシーバとを露出させる図３のハンドルアセンブリの拡大下面斜視図である。
【図３６】本発明の例示の実施形態に係るハンドルアセンブリとバッテリアセンブリとの間の最初の噛み合い接続を示す下面斜視図である。
【図３７】本発明の例示の実施形態に係るハンドルアセンブリに完全に接続されたバッテリアセンブリの斜視図である。
【図３８】本発明の例示の実施形態に係るハンドルアセンブリにバッテリアセンブリを連結する離脱機構を示す図４のバッテリアセンブリの外面の拡大斜視図である。
【図３９】本発明の例示の実施形態に係るマルチリードバッテリ端子アセンブリの拡大斜視図である。
【図４０】本発明の例示の実施形態に係るマルチリードバッテリ端子アセンブリとマルチ

Petitioner Therabody Ex-1004, 1353

リードハンドルバッテリアセンブリとの間の噛み合い位置の詳細図を提供する、ハンドルアセンブリのシェルの半部分が取り外された図１の超音波手術用焼灼アセンブリの拡大斜視図である。
【図４１】バッテリアセンブリの内側の方向から見た本発明の例示の実施形態に係る図３のバッテリアセンブリの圧力弁の断片的な断面斜視図である。
【図４２】弁の側面から見た図４１の圧力弁の断片的な断面図である。
【図４３】バッテリアセンブリから分離した図４１の圧力弁の斜視図である。
【図４４】本発明の例示の実施形態に係る図４１の圧力弁の圧力状態を示すグラフである。
【図４５】本発明の例示の実施形態に係るバッテリアセンブリから取り外された左シェルの半部分とハンドルアセンブリから取り外された左シェルの半部分とを示す図３の超音波手術用焼灼アセンブリの左側の立面分解図である。
【図４６】本発明の例示の実施形態に係る制御機構を示す右シェルの半部分が取り外された図３のハンドルアセンブリの右側立面図である。
【図４７】本発明の例示の実施形態に係る図４６のトリガ機構を示す左シェルの半部分が取り外された図３のハンドルアセンブリの拡大立面図である。
【図４８】本発明の例示の実施形態に係る図４６のボタンによって起動されるハンドルアセンブリの２段階スイッチの拡大立面図である。
【図４９】本発明の例示の実施形態に係る図４８の２段階スイッチの具体例を示す立面図である。
【図５０】本発明の例示の実施形態に係る図３のＴＡＧの立面図である。
【図５１】本発明の例示の実施形態に係る図５０のＴＡＧの下面立面図である。
【図５２】本発明の例示の実施形態に係る図５０のＴＡＧの上面立面図である。
【図５３】本発明の例示の実施形態に係る発振器回路を示す、上カバーが取り外された図５０のＴＡＧの立面図である。
【図５４】本発明の例示の実施形態に係る発振器および振動子の間の電気的連結を示す、下側カバーが取り外された図５０のＴＡＧの下面立面図である。
【図５５】本発明の例示の実施形態に係る振動子の構成要素を示す、ＴＡＧの下側カバーおよび振動子のカバーが取り外された図５０のＴＡＧの下面斜視図である。
【図５６】本発明の例示の実施形態に係るハンドルアセンブリおよびＴＡＧの間の連結整列を示すハンドルアセンブリおよびＴＡＧの左側立面図である。
【図５７】本発明の例示の実施形態に係るマルチリードバッテリ端子アセンブリに通信可能に連結された装置識別子を露出させるハンドルアセンブリから左シェルの半部分が取り外された図３の超音波手術用焼灼アセンブリの左側の立面分解図である。
【図５８】本発明の例示の実施形態に係る外側シェルが取り外された振動子の拡大斜視図である。
【図５９】本発明の例示の実施形態に係るバッテリアセンブリ上のキャッチおよびハンドルアセンブリのレシーバの間の連結関係、ならびにマルチリードバッテリ端子アセンブリとマルチリードハンドル端子アセンブリとの間のシーリング関係の拡大斜視図である。
【図６０】本発明の例示の実施形態に係る図５９のシーリングガスケットの拡大透視斜視図である。
【図６１】本発明の例示の実施形態に係るニアオーバーセンタのトリガ機構を露出させる、右側カバーの半部分が取り外されたハンドルアセンブリの部分斜視図である。
【図６２】本発明の例示の実施形態に係るトリガがわずかに押し込まれた状態の図６１のニアオーバーセンタのトリガ機構の部分斜視図である。
【図６３】本発明の例示の実施形態に係るトリガが更に押し込まれた状態の図６１のニアオーバーセンタのトリガ機構の部分斜視図である。
【図６４】本発明の例示の実施形態に係るトリガが完全に押し込まれた状態の図６１のニアオーバーセンタのトリガ機構の部分斜視図である。
【図６５】本発明の例示の実施形態に係る導波管アセンブリ回転防止ホイールに隣接する

Petitioner Therabody Ex-1004, 1354

ものの係合していない回転ロックアウト部材および刃の断片的な斜視図である。
【図６６】本発明の例示の実施形態に係る導波管回転防止ホイールに係合する図６５の回転ロックアウト部材および刃の断片的な斜視図である。
【図６７】本発明の例示の実施形態に係る非押し込み状態で図６５の回転ロックアウト部材に物理的に連通する２段階ボタンの断片的な斜視図である。
【図６８】本発明の例示の実施形態に係る第１押し込み状態で図６５の回転ロックアウト部材に物理的に係合する２段階ボタンの断片的な斜視図である。
【図６９】本発明の例示の実施形態に係る第２押し下げ状態で図６５のに完全に係合し、次いで、回転ロックアウト部材が導波管アセンブリ回転防止ホイールと係合する図６８の２段階ボタンの断片的な斜視図である。
【図７０】本発明の例示の実施形態に係る導波管アセンブリ回転防止ホイールに隣接するものの係合していない回転ロックアウト部材および二重刃の断片的な斜視図である。
【図７１】本発明の例示の実施形態に係る導波管アセンブリ回転防止ホイールに係合する図７０の回転ロックアウト部材および二重刃の断片的な斜視図である。
【図７２】本発明の例示の実施形態に係る始動手順を示す工程フロー図である。
【図７２Ａ】本発明の例示の実施形態に係る始動手順の一部分を示す工程フロー図である。
【図７３】顎部が開き位置にある、遠位端からの本発明に係るエンドエフェクタの例示の実施形態の断片的な拡大斜視図である。
【図７４】外側管が取り外された下方からの図７３のエンドエフェクタの断片的な拡大斜視図である。
【図７５】導波管を通って顎部作動平面を横断する断面を有する下方からの図７３のエンドエフェクタの断片的な拡大斜視図である。
【図７６】顎部が部分的に開いた位置にある、図７３のエンドエフェクタの断片的な拡大側面図である。
【図７７】導波管が取り外された顎部作動平面に平行な断面を有する図７３のエンドエフェクタの断片的な拡大側断面図である。
【図７８】図７３のエンドエフェクタの断片的な拡大側立面図である。
【図７９】顎部がほぼ閉じ位置にある図７８のエンドエフェクタの断片的な拡大側立面図である。
【図８０】顎部が部分的に閉じ位置にある図７３のエンドエフェクタの断片的な拡大斜視図である。
【図８１】顎部作動平面における断面を有する図７３のエンドエフェクタの断片的な拡大側断面図である。
【図８２】図７３のエンドエフェクタの連結スプールの拡大斜視図である。
【図８３】顎部ピボットにおける導波管の長手軸線に直交する断面を有する図７３のエンドエフェクタの断片的な拡大断面図である。
【図８４】遠位端の下方から見た図７３のエンドエフェクタの顎部ライナーの拡大斜視図である。
【図８５】近位端の下方から見た図７３の顎部の左側部分内に位置する図８４の顎部ライナーの左側部分の拡大断面図および斜視図である。
【図８６】ハンドル本体の右側半部分と、回転防止ホイールと、顎部力制限アセンブリとが取り外された図４６のハンドルアセンブリのＴＡＧ取付ドックおよび導波管取付ドックの断片的な拡大斜視図である。
【図８７】外側管が取り外され、回転防止ホイールの右側半部分のみが取り外された図８６のハンドルアセンブリの断片的な拡大斜視図である。
【図８８】本発明の例示の実施形態に係るトルクレンチの斜視図である。
【図８９】顎部が閉位置にあり、ライナーが磨耗している、図７３のエンドエフェクタの部分拡大斜視図である。
【図９０】本発明の例示的実施形態による、右側シェル半部分を取り外し状態で、制御機

Petitioner Therabody Ex-1004, 1355

構を示し、トリガが非作動状態である、図３のハンドルアセンブリの右側立面図である。
【図９１】トリガが部分的作動状態である、図９０のハンドルアセンブリの右側立面図である。
【図９２】トリガが完全作動状態である、図９０のハンドルアセンブリの右側立面図である。
【図９３】本発明の例示的実施形態によるチューブストップアセンブリの部分拡大斜視図である。
【図９４】図９３のチューブストップアセンブリと関連する刃撓み特性を示すグラフである。
【図９５】本発明の例示的実施形態によるスピンドルアセンブリの半分の側面斜視図である。
【図９６】本発明の例示的実施形態による導波管アセンブリのボビン部の斜視図である。
【図９７】導波管に接続された図９６のボビンの部分斜視図である。
【図９８】本発明の例示的実施形態による顎部制御アセンブリのヨークの側面斜視図である。
【図９９】本発明の例示的実施形態による導波管アセンブリの近位部およびハンドルの遠位部の部分水平断面図である。
【図１００】本発明による顎部およびライナーの別の例示的実施形態の分解下部斜視図である。
【図１０１】第１の取り付けステップにおける、本発明による顎部アセンブリの部分解斜視図である。
【図１０２】第２の取り付けステップにおける、本発明による顎部アセンブリの部分解斜視図である。
【図１０３】第３の取り付けステップにおける、本発明による顎部アセンブリの部分解斜視図である。
【図１０４】第４の取り付けステップにおける、本発明による顎部アセンブリの部分解斜視図である。
【図１０５】本発明によるハンドルのスピンドル回転回避アセンブリの代替の例示的実施形態の部分側面斜視図である。
【図１０６】本発明によるハンドルのスピンドル回転回避アセンブリの別の代替の例示的実施形態の部分側面斜視図である。
【図１０７】図４のバッテリアセンブリの一部の部分拡大断面図であり、本発明の別の例示的実施形態により、マルチリードバッテリ端子の下側およびシェル半部分の内部が露出されている。この実施形態において、カード縁部コネクタを用いて、前記マルチリードバッテリ端子の接点を１つ以上の回路基板へと接続する。
【図１０８】本発明によるＴＡＧアセンブリコネクタの例示的実施形態の部分斜視図である。
【図１０９】本発明による可撓ハーネスのバッテリ接続部の例示的実施形態の部分側面斜視図である。
【図１１０】本発明による可撓ハーネスのブザー部の例示的実施形態の部分下部斜視図である。
【発明を実施するための形態】
【００２１】
開示する実施形態は、様々な形態で具現化することが可能な本発明の単なる例示であることが理解されるべきである。従って、本明細書に開示する特定の構造的および機能的な詳細は、限定するものとして解釈されるべきではなく、特許請求の範囲のための根拠として、かつ、実質的に任意の適切な詳細な構造に本発明を様々に採用するために当業者に教示するための代表的な根拠として、解釈されるべきである。さらに、本明細書で使用される用語および表現は、限定するものであることを意図しておらず、むしろ本発明の理解可能な説明を提供するためであることが意図される。

Petitioner Therabody Ex-1004, 1356

【００２２】
本発明の開示および説明に先立って、本明細書で使用する用語は、特定の実施形態を説明するのみの目的のためであり、限定することを意図しないことが理解されるべきである。この書類では、本明細書で使用する際、「ａ」又は「ａｎ」が１又は１以上として定義される。本明細書で使用する際、用語「複数」は２又は２以上として定義される。本明細書で使用する際、用語「もう１つ」は少なくとも２番目の１つ又はそれ以上として定義される。本明細書で使用される際、用語「含む」および／又は「有する」は、備える（すなわち、開かれた（非制限の）表現）として定義される。本明細書で使用する際、用語「連結される」は、必ずしも直接的でなく、必ずしも機械的ではないが、接続されるものとして定義される。例えば第１および第２、上側および下側などの関連を表す用語は、１つの実体又は動作を、別の実体又は動作から、そうした実体同士又は動作同士の間のいかなる実際のそうした関係又は順番を必ずしも必要とせず又は意味せず、単に区別するために使用され得る。用語「備える」、「備えている」又はその他の変形は、例えば要素のリストを備える工程、方法、製品、又は装置がそれらの要素のみを含むのではなく、明示的にリストされていない又はそうした工程、方法、製品、又は装置に固有の他の要素を含んでよいように、非排他的な包含を網羅することが意図されている。「～を備える」の前に置かれる要素は、さらなる制約なしに、要素を備える工程、方法、製品、又は装置に追加の同一の要素の存在を排除しない。

【００２３】
本明細書で使用する際、用語「約」又は「およそ」は、はっきりと示されているかどうかに拘わらず、すべての数値に適用する。これらの用語は概して、当業者が、列挙された値と同等であるとみなすであろう（すなわち、同一の機能又は結果を有する）数値範囲を指す。多くの例では、これらの用語は、最も近い有効数字に丸められる数字を含んでよい。この明細書では、用語「長手方向」は、説明される物体の延在方向に対応する方向を意味することが理解されるべきである。

【００２４】
本明細書で説明される本発明の実施形態は、１以上の従来のプロセッサと、所定の非プロセッサ回路および他の要素とともに、本明細書で説明する超音波切断装置のいくつかの、ほとんどの、又はすべての機能を実行する１以上の通常のプロセッサを制御する固有の記憶されたプログラム指令と、を備えてよいことが理解されよう。非プロセッサ回路は、限定されないが、信号ドライバ、クロック回路、電源回路、およびユーザ入出力要素を含んでよい。代替として、いくつかの又はすべての機能が、格納されたプログラム指令を有していない状態機械によって、又は、各機能若しくは所定の機能のいくつかの組み合わせがカスタム論理として実行される特定用途向け集積回路（ＡＳＩＣ）若しくはフィールドプログラマブルゲートアレイ（ＦＰＧＡ）において、実行されることが可能である。もちろん、これらのアプローチの組み合わせも使用され得る。従って、これらの機能のための方法および手段が本明細書で説明される。

【００２５】
本明細書で使用される際、用語「プログラム」、「ソフトウェアアプリケーション」などは、コンピュータシステム上で実行するために設計された指令のシーケンスとして定義される。「プログラム」、「コンピュータプログラム」又は「ソフトウェアアプリケーション」は、サブルーチン、関数、手順、オブジェクトメソッド、オブジェクト実装、実行可能アプリケーション、アプレット、サーブレット、ソースコード、オブジェクトコード、共有ライブラリ／ダイナミックロードライブラリおよび／又はコンピュータシステム上で実行するために設計される指令の他のシーケンスを含んでよい。

【００２６】
本発明は、一実施形態によれば、装置のハンドル内に完全に適合する構成要素によって電力を供給されて制御される軽量で手持ち式のコードレスのバッテリ駆動手術用焼灼切断装置を提供することによって、従来技術が有する課題を克服し、セットトップボックスおよびシールドされたコードは完全に排除される。この手持ち式装置は、外科医が、外部電

Petitioner Therabody Ex-1004, 1357

力を必要とせずに、また特に、コードがあるために固定物体に対して外科医をつなぎ留めたり、手術処置の実行中に外科医の移動の範囲を制約することなしに、いかなる手術処置においても超音波切断および／又は焼灼を実行することを可能にする。

【００２７】

超音波手術用装置

【００２８】

ここで、本発明の一実施形態に係る例示の装置を説明する。図３を参照すると、例示のコードレスの超音波手術用焼灼アセンブリ３００が示されている。本発明のアセンブリ３００は、３つの主要な構成要素部品、すなわち（１）バッテリアセンブリ３０１、（２）超音波切断刃および導波管アセンブリ３０４（その近位部分のみを図３に示している）を有するハンドルアセンブリ３０２、および、（３）振動子および発振器（「ＴＡＧ」）アセンブリ３０３、を有するものとして説明することができる。ハンドルアセンブリ３０２と超音波切断刃および導波管アセンブリ３０４とは、予め連結されているが、相互に独立して回転可能である。例示の一実施形態によれば、バッテリアセンブリ３０１は、充電可能で再使用可能であり、調節された出力を有するバッテリパックである。ある場合には、以下に説明するように、バッテリアセンブリ３０１はユーザインターフェース機能を容易にする。ハンドルアセンブリ３０２は、バッテリアセンブリ３０１、ＴＡＧアセンブリ３０３、並びに超音波切断刃および導波管アセンブリ３０４への取付用ベイ又はドックを有する使い捨てユニットである。ハンドルアセンブリ３０２はまた、例えばスピーカ／ブザーおよび起動スイッチを含む様々なインジケータを収容している。

【００２９】

ＴＡＧアセンブリ３０３は、遠位出力で高周波の機械的作動を生成する再使用可能ユニットである。ＴＡＧアセンブリ３０３は、超音波切断刃および導波管アセンブリ３０４に機械的に連結されて、装置の作動中に超音波切断刃および導波管アセンブリ３０４の遠位出力すなわち切断刃で運動を生成する。一実施形態では、ＴＡＧアセンブリ３０３はまた、例えば赤／緑／青（ＲＧＢ）のＬＥＤを通じて視覚ユーザインターフェースを提供する。そのようにして、バッテリ状態の視覚インジケータは、他に見られないように、バッテリ上に配置されておらず、および従って、バッテリから遠隔位置にある。

【００３０】

手持ち式パッケージの超音波切断ツールの必要な構成要素のすべてを提供するための本発明の能力は、図２に示すように、非常に高価で重いデスクトップボックス２０２内に装置構成要素のほぼすべてを収容するとともに最も顕著には嵩張って操作者の移動を妨げる装置のハンドピース１１２およびデスクトップボックス２０２の間の高価なつなぎ２０８を含む従来技術の装置に対して、多大な利点を提供する。さらに、コード２０８は、前記装置が含まれる滅菌野と、発振器が含まれる非滅菌領域との間を行き来する必要がある。このように滅菌部分と非滅菌部分との接続部分が存在する場合、滅菌野が汚染される可能性が増加し、また、滅菌部分と非滅菌部分との間の境界も曖昧になる。

【００３１】

本発明によれば、手持ち式超音波手術用焼灼アセンブリ３００の３つの構成要素は、１以上の他方のものから有利に迅速に分離可能である。システムの３つの構成要素の各々は、滅菌されて、使用中に滅菌フィールドに完全に維持されることが可能である。各部分は１以上の他の構成要素から分離されることが可能であるので、本発明は、１回使用のアイテム（すなわち使い捨て）である１以上の部分と、複数回使用のアイテムである他方（すなわち複数回の外科的処置での使用のために滅菌可能）と、を備えている。図４および図５は、図３に示す複合アセンブリの全体からそれぞれ分離しているバッテリアセンブリ３０１およびＴＡＧアセンブリ３０３の構成要素を示している。構成要素の各々の詳細は、本明細書の残りの部分を通じて示して説明する。それらの詳細は、とりわけ、個別の、および手持ち式超音波手術用焼灼アセンブリ３００の一部としての各々の構成要素の物理的態様、個別の、およびアセンブリ３００の全体の一部としての電気的機能性および能力、および、個別の、およびアセンブリ３００の全体の一部としての各構成要素の使用方法、

Petitioner Therabody Ex-1004, 1358

組立て、滅菌および他のもの、を含む。本発明のさらなる実施形態によれば、構成要素３０１、３０２／３０４、３０３の各々は全重量にほぼ等しい。これらの構成要素３０１、３０２／３０４、３０３の各々はそれらがほぼ同じ重量であるようにバランスがとられる。ハンドル３０２は、操作者の手を支持するように張り出しており、これにより、ユーザの手により、重量をかける必要無く装置の制御を自由に操作することが可能になる。この張り出し部は、重心に極めて近接して設定される。これは、三者間のアセンブリ構成と組み合わされて、手持ち式超音波手術用焼灼アセンブリ３００の全体に、装置を操作するユーザに対して非常に自然で快適な感覚を提供するバランス中心が有利に提供される。すなわち、ユーザの手に保持された時、アセンブリ３００の全体は、前方又は後方又は左右に傾く傾向を有さず、導波管がユーザのごくわずかな努力で地面に対して平行に保持されるように相対的に動的にバランスされたままとなる。もちろん、器具は、地面に対して平行でない角度に非常に簡単に配置されることも同様に可能である。

【００３２】

図６は、バッテリアセンブリ３０１、ハンドルアセンブリ３０２、およびＴＡＧアセンブリ３０３の間の通信的結合を概略的に示す全体的なブロック回路図を提供する。図６はまた、バッテリアセンブリ３０１およびハンドルアセンブリ３０２の間の様々な電力および通信信号の経路６０１ａ～ｎを示している。ハンドルアセンブリ３０２は、ＴＡＧアセンブリ３０３に続くさらなる電力および通信信号の経路６０２ａ～ｎを提供する。数例を挙げると、これらの電力および通信信号の経路６０１ａ～ｎは、

１．可聴ユーザインターフェースを提供する例えば可聴周波数信号といったブザー

２．最小振幅で超音波出力を作動させるユーザインターフェースである、例えば０～３．３Ｖおよび０～２５ｍＡの入力信号といった最小ボタン

３．最大振幅で超音波出力を作動させるユーザインターフェースである、例えば０～３．３Ｖおよび０～２５ｍＡの最大ボタン

４．バッテリアセンブリ３０１からＴＡＧアセンブリ３０３への出力であって、振動子駆動信号を生成するためにＴＡＧアセンブリ３０３に電力を供給する、例えば０～１０ボルトおよび０～６Ａの出力である第１出力電圧（Ｖｏｕｔ）

５．アース又はシステム共通接続

６．システムに電力を供給するためのバッテリからの電圧出力である第２出力電圧（Ｖｂａｔｔ）

７．バッテリアセンブリ３０１およびＴＡＧアセンブリ３０３の間の差動半二重シリアル通信を提供する第１通信線（Ｃｏｍｍ＋）

８．バッテリアセンブリ３０１およびＴＡＧアセンブリ３０３の間の差動半二重シリアル通信を提供する第２通信線（Ｃｏｍｍ－）

９．ハンドルアセンブリ３０２に接続された時、バッテリアセンブリ３０１へのおよびそれによってシステム全体への電力供給を起動するプレゼント（ｐｒｅｓｅｎｔ）線の動作を容易にする。

【００３３】

本発明の実施形態によれば、上述の電力および通信信号の経路６０１ａ～ｎは、ハンドルアセンブリ３０２上の第１マルチリードハンドル端子アセンブリ（バッテリアセンブリ３０１はハンドルアセンブリ３０２に電気的に結合される）とハンドルアセンブリ３０２上の第２マルチリードハンドル端子アセンブリ（ＴＡＧアセンブリ３０３はハンドルアセンブリ３０２に電気的に結合される）との間をつなぐフレックス回路を通じて提供される。

【００３４】

Ｉ．バッテリアセンブリ

【００３５】

図７は、バッテリアセンブリ３０１とその内部に含まれる内部構成要素とを概略的に示すブロック回路図である。バッテリアセンブリ３０１は概して、１以上の電池７０１と、バッテリ保護回路７０２と、バッテリコントローラ７０３と、を有している。電池７０１

Petitioner Therabody Ex-1004, 1359

とバッテリ保護回路７０２との間には様々な電力および信号経路７０４ａ～ｎが延びている。電力および通信信号経路７０６ａ～ｎがバッテリ保護回路７０２とバッテリコントローラ７０３との間に延びている。電力および信号経路７０４ａ～ｎおよび７０６ａ～ｎは、構成要素同士の間の単純な直接接続であってよく、又は、図示しない他の回路構成要素を有してよい。電力および通信信号経路７０６ａ～ｎは、特に、

１．バッテリコントローラ７０３とバッテリ燃料ゲージ／保護回路７０２との間の通信に使用されるＳＭＢｕｓクロック信号（ＳＣＬＫ）、

２．バッテリコントローラ７０３とバッテリ燃料ゲージ／保護回路７０２との間の通信に使用されるＳＭＢｕｓデータ信号（ＳＤＡＴ）、

３．バッテリアセンブリ３０１が充電器にある時に、アースされた時点でバッテリコントローラ７０３内で電力供給をスイッチングするために電力を除去することによってバッテリコントローラ７０３をオフにするエネーブルスイッチ、

を有している。

【００３６】

ａ．電池

【００３７】

電池７０１は、一実施形態では、４セルのリチウムイオンポリマー（ＬｉＰｏｌｙ）バッテリを含む。もちろん、使用され得る電池の数に限定はなく、電池がＬｉＰｏｌｙタイプである必要はない。好都合には、製造者は、必要とされるほぼあらゆる形状のＬｉＰｏｌｙバッテリを製造することができる。しかしながら、これらのタイプのバッテリは、ＬｉＰｏｌｙバッテリの過充電が電池をすぐに破損させるので、充電工程中、慎重に制御されなければならない。従って、これらのバッテリは慎重に充電されなければならない。この理由のため、本発明は本発明のバッテリ保護回路７０２を使用する。

【００３８】

ｂ．バッテリ保護

【００３９】

バッテリ保護回路７０２は、電池７０１の充電および放電を制御し、バッテリ保護と「燃料ゲージ」機能すなわちバッテリ電力モニタとを提供する。より具体的には、バッテリ保護回路７０２は、充電段階および放電段階の両方の間、過電圧、過小電圧、過温度および過電流のモニタおよび保護を提供する。過充電されると、ＬｉＰｏｌｙバッテリは、損傷を受けるだけでなく、発火および／又は液漏れし得る。バッテリ保護回路７０２は、複数のレベルの保護を提供する。例えば、前記バッテリ保護回路は、電流、電圧および温度それぞれについて３つのレベルの保護を提供することができる。この保護は冗長的であり、第１の保護レベルおよび第２の保護レベルのためにアクティブ要素を用い、より高い第３の保護レベルのために受動要素または冗長要素を用いる。一例において、前記バッテリ保護回路によって提供される複数の保護レベルは、電池を集合させる要素（例えば、ＰＴＣ装置、温度ヒューズ、電流ヒューズおよびリセット可能な要素）を用い得る。

【００４０】

バッテリ保護回路７０２の「燃料ゲージ」機能は、バッテリアセンブリ３０１の出力上で、継続的なおよび瞬間的な両方の電圧および電流の放電を制限する。電池７０１の充電中、燃料ゲージは、電池７０１に供給される電流レベルを制限することができる。代替として、バッテリ充電ユニットがこの電流制限機能を実行することができる。燃料ゲージはまた、温度をモニタして、電池７０１の温度が所定の温度を超えた時にバッテリアセンブリ３０１を停止させる。燃料ゲージは、総エネルギーがどの程度電池７０１内に残存しているか、前回どの程度充電されたか、電池７０１の内部インピーダンスの特定、出力される電流および電圧の特定など、を決定することができる。このデータを使用することによって、本発明は、発明のアルゴリズムの使用を通じて、電池７０１の化学的属性上の一部に基づいて電池７０１の「充電状態」（ＳＯＣ）を決定することができ、特に、以下にさらに詳細に説明するような手術処置を安全に実行するのに十分なバッテリ容量がなくなる時点を識別することができる。前記システムは、一回分の切断および焼灼処置を安全に完

Petitioner Therabody Ex-1004, 1360

了するのに必要なエネルギー量に関する情報を含むようにプログラムされている。この格納されている情報により、前記燃料ゲージは、切断／焼灼を開始するための起動時または処置中の新規切断／焼灼の実行時において、この必要な最小エネルギー量と、現在のバッテリ充電状態とを比較する。前記最小閾値が満たされない場合（例えば、１０００ジュール）、前記装置の継続動作ができなくなる。

【００４１】

さらに、最大エネルギー送達、効率を補償しかつバッテリパック内の個々の電池の過充電を回避するために、全ての電池の充電状態が等しいことを確認することが重要である。ＳＯＣを適切に示す指標として、電池電圧がある。よって、充電時において、電池の電圧を監視し、全電池の電圧が均等になるまで、各電池へ送達される電流量を調節する。この時点において、前記電池間が均衡される。

【００４２】

加えて、サーミスタをバッテリパック内に取り付け、前記電池の近隣（例えば、２つの電池間、全ての隣接する電池間、または電池のいずれかの側部の隣部）に配置することで、前記バッテリパック内の電池温度を測定または監視するための外部装置（例えば、バッテリ充電器）を得ることができる。

【００４３】

ｃ．バッテリコントローラ

【００４４】

図１１は、図７のバッテリコントローラ７０３の内部構成要素を概略的に示すブロック回路図である。図７で前に示したように、バッテリコントローラ７０３には、電力および通信信号経路７０６ａ～ｎを通じて信号および電力が供給される。さらに、バッテリコントローラ７０３はまた、動力および通信信号経路６０１ａ～ｎに沿って出力電力および信号を供給する。本発明の例示の一実施形態によれば、バッテリコントローラ７０３は、電源１１０２と、ＳＭＢｕｓ分離スイッチ１１０４（複数可）と、マイクロコントローラ１１０６と、オーディオドライバ１１０８と、ユーザボタンインターフェース１１１０と、シリアル通信トランシーバ１１１２と、バックコンバータ１１１４と、を有している。

【００４５】

電源１１０２は、２つのサブシステムによって構成される。すなわち、バックスイッチング電源が、先ず未調整の電池電圧を実質的に一定の直流電圧（例えば、４ＶＤＣへと低下させる。第２の線形電源が直流電圧を逓減し、本装置において用いられる低電圧要素に必要なレベル（例えば、３．３ＶＤＣ）へと調節する。この２段階電圧低減を行うことで、低バッテリ消費が保証される。切り替え電源は、従来の線形電源と比較して本質的に高効率であるが、出力電圧リップル（ノイズ）が高くなる傾向があり、問題となり得る。よって、先ず電圧を高効率のスイッチングレギュレータを用いて逓減させた後、線形レギュレータへと送る。前記線形レギュレータは、より良好なフィルタリングされたノイズフリーの電圧を前記回路のデジタル要素へと生成する。前記スイッチングレギュレータからの出力を用いて、音声増幅器へ出力を供給する。前記音声増幅器は、より高い電圧を必要とし、さらなるノイズを生成する傾向があり、前記回路のデジタル部において望ましくない。

【００４６】

ＳＭＢｕｓ分離スイッチ１１０４（リレーとも呼ぶ）は、充電プロセス時においてＯＮであるバッテリ保護および充電制御回路の作動に起因して発生する電圧が充電プロセス時においてＯＦＦであるその他のバッテリ回路へと送られるのを回避する方法として提供される。例示的実施形態において、これらの用いられるスイッチは、前記装置中のＰＲＥＳＥＮＴ回路（６０１ａ～ｎを参照）によって光学的に駆動され、オンにされる。

【００４７】

マイクロコントローラ１１０６は、バッテリコントローラ７０３の機能を制御する高集積演算ユニットである。例示的実施形態において、マイクロコントローラ１１０６は、前記装置の動作を可能にするソフトウェアを格納および実行する。前記装置の動作によって

Petitioner Therabody Ex-1004, 1361

課される要求を考慮すると、マイクロコントローラ１１０６は、例えば、２つの独立したマイクロコントローラコアを１つのパッケージ内に含む最先端のものとなる。この実施形態において、メインコアは、前記装置を制御する主要プログラムを実行する。前記装置が起動されると、適切かつ効率的な動作を保証するために必要な多様なパラメータのサンプリングが、図１１に示す第２のコア（例えば、制御法則加速器（ＣＬＡ）１１１６）によって監視される。前記ＣＬＡは、極めて高い計算能力を必要とする比例積分微分（「ＰＩＤ」）制御ループ動作を提供するためにも用いることが可能である。そのため、この構成を用いることで、前記装置の１つのコアが極めて高速で状態機械を実行することが有効に可能となり、システムの全体的かつ迅速な制御が維持され、それと同時に、第２のコアにより、データ収集および制御ループ取扱のための負担が多い計算を取り扱うことが可能となる。好適には、マイクロコントローラ１１０６そのものが低電力消費アプリケーションとなり、よって３．３ボルトのユニットが利用可能となる。内部発振器を用いると、外部の（電力を消費する）要素を用いる必要無く装置を起動することが可能となる。また、プログラムおよび診断情報を格納するための内部不揮発性メモリ部を含むようにマイクロコントローラ１１０６を構成することも可能である。バッテリマイクロコントローラ１１０６は、電圧コンバータ機能の全体的制御が可能となるように、入力電圧、出力電圧、出力電流、ならびにバッテリ温度およびバック温度を監視する。

【００４８】

オーディオドライバ１１０８は、ハンドルアセンブリ３０２内に配置されたブザー８０２を最終的に駆動する信号を生成する。例示的実施形態において、オーディオドライバ１１０８は、単純であるが強力な２段階のクラスＡ方形波増幅器である。前記増幅器は、バックスイッチング電源（例えば、４ＶＤＣ）から直接出力供給され、これにより最大出力能力を保証する。前記増幅器は、音声スピーカを駆動することができる（内部ドライバは無し）。バックスイッチング電源からオーディオドライバ１１０８に出力供給することにより、音声増幅器から生成されたノイズが前記装置のデジタル要素およびアナログ要素の供給レールへ送られることが無くなり、これによりノイズの無い動作が保証される。調節が必要な場合、単一の抵抗器の変更によるボリューム変更能力が提供される。

【００４９】

ユーザボタンインターフェース１１１０は、ハンドルアセンブリ３０２内に収容された最小８０４起動スイッチおよび最大８０６起動スイッチから受ける信号を調整する。例示的実施形態において、ユーザボタンインターフェース１１１０は、ボタンへの流体侵入時などにおける誤起動を回避するために、起動スイッチのインピーダンスを連続的に測定するように動作可能である。バッテリコントローラ７０３は、スイッチ（単数または複数）のインピーダンスを測定し、検出されたインピーダンスが所定の閾値を下回るまではシステムを起動させない。このような構成により、流体侵入に起因する誤起動が無くなる。なぜならば、流体侵入は、スイッチ（単数または複数）内のインピーダンスが全閉口スイッチのインピーダンスよりも高くなる現象として検出されることが多いからである。ＰＲＥＳＥＮＴラインも同様の原理に基づいて機能し、十分な低インピーダンスを通じてＰＲＥＳＥＮＴラインが閉鎖された後、バッテリをオンにすることを確実にする。これは、ＰＲＥＳＥＮＴピンがいかなる導電性流体へ露出されてもバッテリパックが誤起動しないように、行われる。この例示的実施形態において、ユーザボタンインターフェース１１１０は、既知の電流レベルをスイッチラインを通して注入することにより、動作する。前記ボタンが開くと（起動なし）、電流源がその電圧出力を最大化し、この電圧はマイクロコントローラ１１０６によって測定される。前記スイッチが閉まると、電流源はその電圧出力を調節して、目標のプログラムされた電流を生成する。前記ボタンが最適に低インピーダンスにおいて動作すると、電圧出力が低くなる。しかし、流体がボタンに侵入した場合、電流源によって確認されるインピーダンスが高くなり、それに比例する閉口ボタン用の電圧よりも高い対応する電圧により、起動すべきではない旨がマイクロコントローラ１１０６へと示される。

【００５０】

Petitioner Therabody Ex-1004, 1362

前記回路の例示的実施形態において、較正電流源が用いられる。この較正電流源を用いて、起動時におけるプログラマブル電流源の較正と、より厳密な検出窓の提供とが可能となる。装置起動時に行われるこのような較正により、アクティブ起動を検出するための範囲となる窓またはインピーダンス範囲が狭められる。この較正は、インピーダンス回路の回路を精度電流源へと切り替え、電圧を測定して前記回路を較正することにより、行われる。装置起動手順の間、バッテリコントローラは、起動ボタンインピーダンス感知回路を自己較正することができ、これにより、真のボタン閉鎖（起動）と、ボタン（単数または複数）の流体汚染に起因して誤って発生する不慮の起動信号と間の区別に必要なインピーダンス範囲が狭くなる。

【００５１】

起動ボタンインピーダンスは、電流源を用いて所定の電流レベルをボタンラインに流すことにより、測定される。接点にわたる電圧を測定することにより、オームの法則（すなわち、Ｒ＝Ｖ／Ｉ）を用いて、前記ライン内の抵抗を決定することができる。較正時において、２つのアナログスイッチが用いられる。第１のスイッチは、電流源の制御が可能なように、マイクロコントローラシリアル通信ラインをプログラマブル電流源へと接続させる。第２のスイッチは、電流源の出力を１組の高精度抵抗器へと接続させる。所与の電圧測定（すなわち、較正値）が達成されるまで、電流の流れがマイクロコントローラによって調節される。調節後、第１のスイッチを切り替えて、マイクロコントローラをＳＭＢｕｓラインへと接続させ、第２のスイッチは、前記電流源を起動ボタン（単数または複数）へと接続させて、通常動作を再開させる。

【００５２】

前記マイクロコントローラは、ＳＭＢｕｓラインを切り替えて、アナログスイッチまたは主要ＳＭＢｕｓラインへと接続させることができる。その結果、スイッチ（非ＳＭＢｕｓ）を機能させることができ、同時に、マイクロプロセッサをＳＭＢｕｓラインへと接続させることができる。

【００５３】

例示的実施形態において、シリアル通信トランシーバ１１１２により、バッテリ３０１は、ＴＡＧ３０３および外部装置との通信を確立することができる。この通信を用いて、前記装置から診断または較正情報を得ることが可能となる。シリアル通信トランシーバ１１１２は、バッテリコントローラ７０３と発振器９０４との間の差動半二重通信の送受信を行う。上記のソフトウェア故障検出に加えて、トランシーバ１１１２は、故障検出のためのハードウェア接続の喪失を検出することができる。用いられる装置の例示的実施形態は、信頼性のためにＵＳＢ通信と適合するように構成され、この実施形態を共通モードノイズ拒否のための差動モードにおいて用いることができる。バッテリ３０１がＴＡＧ３０３とやりとりするデータの量を考慮して、フル速度装置が用いられる（例えば、１２Ｍビット／ｓまで）。

【００５４】

多くの可能な故障状態をシステムによって検出し、当該状態に応答することが可能である。前記応答は、ユーザへのフィードバックの形態をとる場合がある。例えば、スタックスイッチ状態が存在する場合、前記システムは故障状態を発行し得る。このような状態を挙げると、システム起動時において高／低起動スイッチが不適切に起動位置にある状態、または高起動スイッチは起動しているが低起動スイッチは起動していない状態、または使用サイクル終了時において高／低起動スイッチが起動位置にある状態などがある。他の故障状態を挙げると、運動フィードバックが不十分である場合または導波管先端が停止状態である場合などがある。低振幅変位および高振幅変位が検出された場合、両方共シャットダウンが発生し得る。多様な故障が、ＴＡＧと関連する。例えば、出力電圧が所定の電圧上限よりも高くなった場合、故障状態が発生する。マイクロプロセッサ温度が所定の規定範囲を上回った場合（例えば、およそ１００℃を上回った場合）、別の故障状態が発生する。バッテリコントローラが、超音波開始前、超音波開始時または超音波開始後のいずれにおいても、ＴＡＧから適切な肯定応答を受信しない場合、別の故障が発生する。いくつ

Petitioner Therabody Ex-1004, 1363

かの故障状態は、バッテリと関連する。例えば、バッテリ充電量が事前規定された閾値のいずれかを下回った場合または負荷に起因してシステムによる送達が可能な電力を必要となりかつ振幅が所望の閾値を下回った場合、故障が表示され得る。他のバッテリ故障を挙げると、バッテリ通信システムの故障、バッテリのマイクロプロセッサ、燃料ゲージ、および／またはレギュレータの温度過昇状態がある。通信システムの故障は、ＴＡＧおよびバッテリのいずれかまたは双方を通じて得られる。一般的なシステム故障もあり得る。ＣＬＡが機能停止または不適切に機能した場合、故障が通知され得る。バッテリおよびＴＡＧに関連するタイマーがリセットされない場合も、故障が通知され得る。ソフトウェア故障に起因しても、故障がトリガされ得る。

【００５５】

最後に、例示的実施形態において、バックコンバータ１１１４は、ステップダウン電圧制御を行って、振幅調節を行う。バックコンバータ１１１４は、バッテリ電圧をステップダウンして、コンバータ９０２への超音波出力信号生成のためにＴＡＧアセンブリ３０３へと送られる電圧を低下させる。マイクロコントローラ１１０６は、バックコンバータへの入力信号のパルス幅を変化させる又は調節すること（すなわち、パルス幅変調（ＰＷＭ））により、バックレギュレータの出力を制御する。最小の出力リップルのために、異位相ＰＷＭ入力が用いられる。前記装置は、小型のインダクタおよびコンデンサを用いて、高効率のために３００ＫＨｚにおいて動作する。バックコンバータ１１１４は、可能な最大効率を得るために、多相同期設計となっている。この設計においては、小型および電力消費のために高集積要素が利用される。前記装置は、内部電流保護、出力電流感知、出力および入力電圧感知ならびに温度過昇保護を含む。バックコンバータ１１１４は、高速応答が可能であり、かつ、電圧を２ＶＤＣ～１０．５ＶＤＣの範囲で逓減させることが可能である。

【００５６】

電源１１０２の出力においては、多様な電圧レベルが生成される。前記多様な電圧レベルを用いて、図１１に示す多様なバッテリコントローラ要素へ電力が供給される。ＳＭＢｕｓ分離スイッチ（単数または複数）１１０４を用いることにより、ＳＭＢｕｓラインからバッテリ保護印刷回路基板への接続が、充電時およびバッテリコントローラ内における他目的のための前記バスの使用時に切断される。

【００５７】

以下に詳細に説明するように、バッテリコントローラ７０３は、ユーザインターフェース（例えば、ブザー８０２およびＲＧＢＬＥＤ９０６）を容易化し、バック振動子１１１４の出力電圧および電流出力を変換する。この出力により、少なくとも１つの電圧出力経路（Ｖｏｕｔ）６０１ａ－ｎを通じてＴＡＧアセンブリ３０３に電力が供給される。

【００５８】

ＩＩ．ハンドルアセンブリ

【００５９】

図８は、図３に示すハンドルアセンブリ３０２の概略的ブロック図である。ハンドルアセンブリ３０２は、取り付けられた電力および通信信号経路６０１ａ～ｎを通して制御信号および電力信号を受け取る。電力および通信信号経路６０２ａ～ｎの２番目のセットは、手持ち式超音波手術用焼灼アセンブリ３００に取り付けられた時にＴＡＧアセンブリ３０３に接続する。以下に詳細に説明するように、ハンドルアセンブリ３０２は、超音波導波管アセンブリ３０４を収容しており、例えばボタン４６０８およびトリガ４６０６の２段階スイッチ（図４６で紹介する）を用いて操作者が、手持ち式超音波手術用焼灼アセンブリ３００の全体を把持して操作するピストルグリップの一部を提供する。例示の一実施形態によれば、ハンドルアセンブリ３０２は、信号経路６０１ａ～ｎを通じてバッテリアセンブリ３０１からブザー出力信号を受け取ることができるスピーカ／ブザー８０２であって、特定の装置状態を操作者に通信することに適した例えば６５ｄｂの可聴出力を生成することができるスピーカ／ブザー８０２を備えている。これらの状態は、例えばハンドルアセンブリ３０２へのバッテリアセンブリ３０１のアセンブリ構成要素の成功した連結

Petitioner Therabody Ex-1004, 1364

、高、低、又は通常の作動モード、障害状態、低バッテリ、装置過負荷、機械的故障、電気的故障などを含む。ハンドルはまたＭｉｎボタンスイッチ８０４およびＭａｘボタンスイッチ８０６を含み、それらは、作動された時、それぞれのボタンを（例えば）アースに接続し、そのことにより低又は高変位モードのいずれかで超音波出力を開始させるためにバッテリコントローラに信号を送信する。ハンドルアセンブリ３０２はまた、バッテリアセンブリ３０１およびＴＡＧアセンブリ３０３の間の信号のための通過相互接続を提供する。

【００６０】

スピーカ／ブザー８０２およびＭｉｎボタンスイッチ８０４およびＭａｘボタンスイッチ８０６は全て、ハンドルアセンブリ３０２のフレックス回路の一部である。本発明の例示的実施形態によれば、ブザー８０２は、ブザー８０２の縁部を越えて外側に突出する可撓性材料により、ハンドルアセンブリ３０２内の所定位置に保持される。このタブ１０８０２を図１０８および図１１０に示す。ハンドルアセンブリ３０２は、組み立て時に可撓性材料タブ１０８０２を受け入れるように構成されたスロット１１００２を含む。流体侵入ｂｙａブザーシール（例えば、音響学的に透明なメッシュの両側において接着剤により前記ブザーがハンドルアセンブリ８０２内へと接合された構造であって、ブザー８０２からの音の発出を可能にしかつブザー８０２内への流体侵入を回避する構造）により、ブザー８０２が流体侵入から保護される。

【００６１】

ＩＩＩ．ＴＡＧ

【００６２】

図９は、振動子９０２および発振器９０４を収容する図３および図５のＴＡＧアセンブリ３０３を概略的に示すブロック回路図である。発振器９０４は、バッテリコントローラ７０３からのＤＣ電力を、電気信号を機械的運動に変換する振動子９０２を駆動する高電圧ＡＣ信号に変換する。

【００６３】

ａ．発振器

【００６４】

図１０は、発振器９０４の内部構成要素を概略的に示すブロック回路図である。本発明の例示の一実施形態によれば、発振器９０４は、電源１００２と、シリアル通信トランシーバ１００４と、マイクロコントローラ１００６と、数値制御発振器（「ＮＣＯ」）１００８と、プッシュ／プル式スイッチング増幅器１０１０と、出力フィルタ／整合ネットワーク１０１２と、運動ブリッジ１０１４と、フィードバック増幅器およびバッファ１０１６と、ＬＥＤドライバ１０１８と、例えばＲＧＢのＬＥＤであるインジケータ９０６と、を有している。電源１００２は、電力信号経路６０２ａ～ｎの線ＶｂａｔｔおよびＧＮＤを通じてバッテリアセンブリ３０１からの電力を受け取り、発振器９０４に電力を供給するために使用される様々な電圧を出力する。シリアル通信トランシーバ１００４は、ここでは、通信信号経路６０２ａ～ｎのシリアルデータリンクＣｏｍｍ＋／Ｃｏｍｍ－を通じて、バッテリコントローラ７０３および発振器９０４の間の送信および受信の通信を提供するが、この通信は、単一の線を通じて又は複数の線を通じて直列に又は並列に生じ得る。

【００６５】

マイクロコントローラ１００６は、発振器９０４の機能を制御する高集積演算ユニットであり、システムの２つのマイクロコントローラのうちの一方であり、他方はバッテリコントローラ７０３の一部である。例示の実施形態では、シリアルデータリンク（Ｃｏｍｍ＋／Ｃｏｍｍ－）は、それらの動作を通信して調整することができるように２つのマイクロコントローラ１００６、１１０６の間に存在する。ＴＡＧ３０３のマイクロコントローラ１００６は、圧電振動子９０２を駆動する高電圧波形の生成を制御する。バッテリアセンブリ３０１のマイクロコントローラ１００６は、振動子９０２に対する高電圧ＡＣを生成する時、電池７０１からＴＡＧ３０３によって使用される低いＤＣ電圧へのＤＣ電圧の

Petitioner Therabody Ex-1004, 1365

変換を制御する。バッテリマイクロコントローラ１１０６は、機械的運動の振幅を制御するためにバッテリアセンブリ３０１のＤＣ出力を調整し、ＴＡＧマイクロコントローラ１００６は、振動子９０２を駆動する信号の周波数を制御する。バッテリマイクロコントローラ１１０６はまたユーザインターフェースを処理し、バッテリ保護回路７０２はシステムの作動中に電池７０１をモニタする。ＴＡＧ３０３内のマイクロコントローラ１００６は、可変速システムクロックを有する。前記可変速システムクロックは、マイクロコントローラ１００６が超音波運動と同期した状態を保持するために、前記装置が高出力状態で動作している際に一定に調節される。バッテリアセンブリ３０１内のマイクロコントローラ１１０６は、ＴＡＧクロックと無関係に、高出力状態にある状態では一定周波数において動作する。システムクロックの周波数は変化するため、ＴＡＧマイクロコントローラ１００６内の倍率がシステムクロックの変化と共に変化することで、マイクロコントローラ１００６とマイクロコントローラ１１０６との間のシリアル通信が適切な動作範囲内に保持される。

【００６６】

直接デジタル合成（ＤＤＳ）は、固定された周波数源をデジタル的に用いて変更され得る正確な出力周波数によって周期的な波形を生成するために使用される技術である。数値制御発振器（「ＮＣＯ」）１００８は、ハードウェア又はソフトウェアを通じて実行することが可能なＤＤＳ技術を使用する信号源である。ＤＤＳへの固定周波数入力は、ＮＣＯ１００８のためのクロックを生成するために使用される。出力は、時間変動周期的波形を生成する一連の値である。新しい出力値は各クロック周期中に生成される。

【００６７】

図２２に詳細に示すＤＤＳ２２００は、各クロック周期で新しい位相値が生成されることによって、その後に振幅に変換される出力波形の位相構成要素を算出することによって作動する。位相値は、可変レジスタ２２０２に格納され、そのレジスタは「位相アキュムレータ」としてここでは参照される。各クロック周期中、新しい位相値を生成するために位相アキュムレータに格納された数に固定値が追加される。この固定値はしばしば、クロック周波数とともに出力周波数を決定するので、周波数制御ワード又は周波数同調ワードとして参照される。位相アキュムレータの値は、０度～３６０度までの周期的な出力波形の１サイクルに及び、その値は３６０度にわたって回転する。

【００６８】

位相アキュムレータの値は位相振幅コンバータ２２０４に供給される。正弦波の場合、振幅は、位相値の逆正接を用いて算出することが可能である。高速アプリケーションの場合、コンバータは、位相値から振幅を生成するためにルックアップテーブルを通常は使用する。

【００６９】

ＤＤＳのハードウェア実装では、振幅コンバータの出力は、アナログ出力信号f_{out}を生成するためのデジタルアナログ振動子（ＤＡＣ）２２０６への入力である。アナログ信号は、出力波形内の好ましくない周波数要素を低減するためにバンドパスフィルタ又はローパスフィルタによって通常はフィルタリングされる。

【００７０】

第１例として、位相アキュムレータ２２０２の値は０～３５９の整数に設定され得る。周波数同調ワードが１の場合、位相アキュムレータ２２０２の値は各クロック周期ごとに１増大する。値は３５９に到達するとゼロに戻ってくる。クロック周波数が３６０Ｈｚである場合、出力波形の周波数は１Ｈｚである。従って、出力は、出力波形の各１秒間隔の間に一連の３６０点である。周波数同調ワードが１０に変更されると、位相アキュムレータの値は各クロック周期ごとに１０増大し、出力周波数は１０Ｈｚである。従って、出力は、出力波形の各周期ごとに３６点である。周波数同調ワードが１００の場合、出力周波数は１００Ｈｚである。その場合、各出力周期ごとに３．６点である。また、より正確には、出力波形の周期のいくつかは３点を有しており、いくつかは４点を有している。３点の周期の数に対する４点の周期の数の比は０．６である。

Petitioner Therabody Ex-1004, 1366

【００７１】
第２例として、位相アキュムレータ２２０２の値は１０ビット数であり得る。１０ビット数は１０２４の可能な値を有する。５０の周波数同調ワードと１ＭＨｚのクロック周波数とである場合、出力周波数は、５０×１ＭＨｚ／１０２４＝４８．８２８ｋＨｚである。図２３は、ＤＡＣ２２０６の出力２３００とフィルタリングされたＤＡＣの出力がどのように見えるかとを示している。
【００７２】
周波数同調ワードが２２であれば、出力周波数は２２×１ＭＨｚ／１０２４＝２１．４８４ｋＨｚである。この場合、図２４は、ＤＡＣ２２０６の出力２４００とフィルタリングされたＤＡＣの出力がどのように見えるかを示している。電力が最初に発振器に供給される時、ＮＣＯ１００８の状態は確定していない（又は、ＮＣＯ１００８の出力は適切な周波数ではない）。このことは、マイクロコントローラの不適切な動作につながり得る。マイクロコントローラの適切な動作を確保すべく、ＮＣＯ１００８は、電力が最初に供給された時にマイクロコントローラのクロック周波数を駆動させるために使用されない。別個の発振器が使用される。例示の一実施形態では、別個の発振器がマイクロコントローラ内に組み込まれる。この別個の発振器を使用することによって、マイクロコントローラは、マイクロコントローラの内部の様々なメモリ配置とＮＣＯ１００８内のそれらとを初期化する。ＮＣＯ１００８が適切な周波数でひとたび作動すると、マイクロコントローラは、にそのクロックのソースを別個の発振器からＮＣＯ１００８切り替える。
【００７３】
周波数同調ワードが４００である場合、出力周波数は４００×１ＭＨｚ／１０２４＝３９０．６２５ｋＨｚである。この場合、図２５は、ＤＡＣ２２０６の出力２５００と、フィルタリングされたＤＡＣの出力がどのように見えるかとを示している。出力はときどき、各周期ごとに２点、時には３点を有する。図２５の波形は、きれいな正弦波を得るためにフィルタが必要であることを明確に示している。
【００７４】
図１０を再び参照すると、プッシュ／プル式スイッチング増幅器１０１０は、バッテリコントローラ７０３からのＤＣ電力を高電圧方形波に変換する。出力フィルタ／整合ネットワークは、スイッチング増幅器１０１０からの方形波を振動子９０２に供給するための適切で平滑な正弦波に変化させる受動フィルタである。運動ブリッジ１０１４は、振動子９０２および導波管アセンブリ３０４の機械的運動に比例するおよび機械的運動と同じ位相のフィードバック信号を生成する回路である。フィードバック増幅器およびバッファ１０１６は、運動ブリッジ１０１４内で決定される運動フィードバック信号を増幅してバッファする。以下にさらに詳細に説明するように、運動ブリッジ１０１４は、装置が一定の変位／振幅で作動することを可能にし、負荷が変化すると電圧を変化させる。運動ブリッジは、振幅フィードバックを提供するために使用され、このタイプのフィードバック、すなわち運動フィードバックを用いることによって、システムは定電流で作動することができる。
【００７５】
一実施形態では、ＴＡＧアセンブリ３０３は、多様な警告目的および通信目的のために使用され得る１以上の赤／緑／青（ＲＧＢ）のＬＥＤ９０６を含む。例えば緑は、装置が正常に機能していることを示し得る一方で、赤は、装置が正常に機能していないことを示す。図９に示す発振器９０４のＬＥＤ９０６の配置は例示の目的のみであることに留意されたい。本発明では、インジケータをＴＡＧアセンブリ３０３のどこにでも配置することができることが想定される。
【００７６】
ハンドルアセンブリ３０２およびＴＡＧアセンブリ３０３の間、特にスピーカ８０２およびＬＥＤ９０６の間の通信のやりとりを通じて、本発明の手持ち式超音波手術用焼灼アセンブリ３００は、超音波手術用焼灼アセンブリ３００に関連した複数の状態を示すことで、使用中に操作者に完全なフィードバックを提供する。よって、前記フィードバックは

Petitioner Therabody Ex-1004, 1367

前記ハンドルから発生し、遠隔的に発生しない。例えば、上述のように、スピーカ／ブザー８０２は、超音波手術用焼灼アセンブリ３００の作動状態の可聴警告および可聴インジケータを提供することができる。異なる音および／または可聴メッセージを実行するために、フルクラスＡまたはＢの増幅器（例えば、フル増幅器またはＯＮ／ＯＦＦ方形波増幅器）を用いて、より広範な周波数範囲を提供することができる。同様に、ＬＥＤ９０６は、超音波手術用焼灼アセンブリ３００の作動状態の視覚警告および視覚インジケータを提供することができる。一例として、ＬＥＤ９０６は、電池７０１内に残っている電力量の表示を提供する、又は、手術処置を安全に実行するための十分な電力が不足していることの表示を提供することができる。例えば、ＬＥＤ９０６の第１の色は、完全に充電された電池７０１を示す一方で、第２の色は、部分的に充電された電池７０１を示す。代替として、ＬＥＤ９０６の状態上の様々な明滅パターン又は常時点灯はユーザに対して状態インジケータを提供することができる。図１０に示すＬＥＤドライバ１０１８は、ＬＥＤ９０６が点灯している時に定電流を提供する例示の構成である。重要なことは、ユーザに対するフィードバックインジケータのすべては、独自的に手持ち式装置上にあり、視界の術野から遠ざかる又は滅菌フィールドの外側の離れたフィードバック構成要素の範囲内にいることをユーザに求めない。これによって、フィードバック信号の性質を検証するために術野から遠隔位置に対して医者に注意を向けさせる必要がない。

【００７７】

しかし、前記手持ち式装置の外部にある装置に前記フィードバック通知のうちのいずれかを中継または伝送すると有用であることが分かった場合、回路を発振器またはバッテリ基板（単数または複数）内において実装することで無線周波数リンク（または他の形態の通信リンク）を設けて、ユーザインターフェース、診断または他の関連データを前記手持ち式装置から前記外部装置へとダウンロード、転送または送信することが可能となる。このようにして、前記外部装置により、術野内部にいないかまたは当該手持ち式装置のごく近隣にいない手術用スタッフなどが当該処置を監視することが可能になり、医師が受け取るものと同様の関連通知または情報を受けることが可能になる。また、前記外部装置は、前記手持ち式装置の使用および診断に関する情報を格納する貴重なバックアップソースまたはデータログとしても機能し得る。前記外部装置を用いて、前記手持ち式装置内において合理的に実行することが可能なよりもより強力な様々なデータ処理またはソフトウェアアプリケーションまたはツールを提供することもできる。例えば、前記外部装置は、前記手持ち式装置から受信された情報から分析結果または診断結果を提供することができる。前記手持ち式装置および前記外部装置に双方向通信を設けることも可能であり、前記外部装置は、前記手持ち式装置の内部ソフトウェアを有利に再プログラムするか、または、前記手持ち式装置に対してコマンドまたは制御を有利に発行することができる。

【００７８】

ｂ．振動子

【００７９】

振動子９０２は、電気信号を物理的な運動に変換する電気機械装置である。より広い意味では、振動子９０２は、一形態から他の形態に信号を変換する任意の装置として時に定義される。類似の振動子装置は、音楽又はスピーチを表す電気電圧変動を機械的なコーンの振動に変換するオーディオスピーカである。スピーカのコーンは、次に、空気分子を振動させて音響エネルギーを作り出す。本発明では、（以下で説明する）駆動波１４００が振動子９０２に入力されて、振動子９０２は、次に、その電気的入力を、導波管１５０２（以下に説明する）に運動を付与する物理的出力に変換する。図１５に関して示すように、この運動は、導波管１５０２上に定常波を確立し、その結果、導波管１５０２の端部に運動を生じさせる。本発明の目的のため、振動子９０２は、電気エネルギーを機械的運動に変換する圧電装置である。

【００８０】

知られているように、圧電振動子の水晶は、電圧が印加された時に伸展する。本発明に係る振動子の構造では、例えば図５５に示すように、結晶が結晶スタック５５０２内にク

Petitioner Therabody Ex-1004, 1368

ランプされる。図５４および図５６～５８も参照のこと。この構成のクランプボルト５５０４は、結晶スタック５５０２を予め圧縮するために設定される場合にスプリングとして機能する。したがって、スタック５５０２にわたって電圧を分与することによって結晶スタック５５０２が伸展させられる時に、クランプボルト５５０４は、予め圧縮された最初の位置にスタック５５０２を戻す（すなわち、スタック５５０２は引っ込む）。代替として、クランプボルト５５０４は、スタック５５０２上で予め圧縮されないように回転させられることが可能であり、そのような場合、ボルトは、その最初の位置に向かって戻り質量を引っ張るために依然としてスプリングとして作用する。振動子の例示の構成は、いわゆるランジュヴァン（Ｌａｎｇｅｖｉｎ）振動子、ボルトクランプランジュヴァン振動子、又は、ボルトクランプサンドイッチタイプ振動子であってよい。

【００８１】

超音波振動子が振動すると、前記振動子の遠位部において定在波が確立される。この定在波は、振動子９０２および導波管１５０２に沿って延びて、節（最小振動点）および腹（最大振動点）を示す。これらの節および腹の配置は重要である。例えば、刃部７３０４を腹に配置しているのは、ここで振動特性を最大にすることが望まれるからである。最遠位端の振動子９０２の超音波導波管連結部５００４おいても同様であり、最大振動特性が導波管１５０２内へと連結されることが望まれる。図５４～図５８に示す振動子の例示的実施形態において、当該振動子がＴＡＧアセンブリ３０３へと接続される点において、節（振動が最小になる点）が存在する。ＴＡＧアセンブリ３０３上／内への振動付与は望ましくないため、このような構成が有利である。

【００８２】

振動子９０２において、直径を逓減することをゲインステップと呼ぶ。なぜならば、円周直径の低減と共に下流振動特性が増加するからである。図５４の断面図において、例えば、結晶スタック５５０２と超音波導波管連結部５００４との間に２つのゲインステップを確認することができる。また、同図面において、振動子９０２のフランジ５４５０も図示される。フランジ５４５０は、振動子９０２とそのハウジングとの接点である。この接点５４５０は、振動子９０２の節に配置される。

【００８３】

振動子、９０２の別の例示的実施形態において、結晶スタック５５０２は変位可能であり、このような変位により、より効率的なシステムが可能となる。より詳細には、結晶スタック５５０２をより近位に移動させることにより、結晶スタック５５０２に隣接するゲインステップがより節の近位へと移動され、これにより、当該システムの全体的ゲインが増す。前記結晶の必要変位は、ゲインの増加と共に低下する。結晶が節から遠ざかるほど、前記結晶による出力取扱能力への貢献が低減する。よって、節を結晶スタック内に設けかつゲインステップにできるだけ近接させることが望ましい。節の片側に１つよりも多くの結晶を設けた場合、これらの結晶は直列に機能し、これにより、全体的変位が増加する。前記結晶が前記節から遠ざかるほど、前記結晶の前記節からの距離に起因して、前記結晶による変位への貢献が低減する。前記節の両側に結晶が配置された場合、これらの結晶は並列に機能してシステムの電力容量を増加させるが、全体的変位は増加させない。そのため、この構成により、同一出力を得るためにどれほど結晶を駆動するかの程度が低下する。結晶を駆動する程度（電流）の２乗と共に損失も上昇するため、電流が低下するとより高効率となる。振幅対動力曲線は、典型的な２乗関係を示す。ここから、ＴＡＧのような空間が限られたシステムにおいて、このような構成により、システムから最大のゲインが得られることが分かる。高駆動条件において、結晶中の損失に対して感度が上昇する。しかし、ここで上記のゲイン上昇により、前記結晶を最大出力に近接して駆動する必要が無くなり、よってこの感度が回避される。誘電損失を通じた出力が高くなるほど、熱が生成されることが知られている。このような熱により、脱分極がもたらされ、周波数シフトが発生し、その結果、キャパシタンスが変化し得、その結果前記節が通常の支持点（単数または複数）から遠ざかり、その結果出力が低下し、他の予見不可能な位置において不要な熱が発生し、その結果、この問題がさらに悪化する。さらに、適切な配線により、前記

Petitioner Therabody Ex-1004, 1369

結晶スタックの一部のみを選択的に駆動することが可能となり、低負荷時における効率が上昇する。

【００８４】

本発明の振動子９０２は、円筒状ケーシング５４３０内に収容される。円筒状ケーシング５４３０の遠位端には開口部が設けられ、これにより、ホーン５００２が突出可能となる。振動子９０２はまた、２つの導電性リング５４０６および５４０８を有する。これらの導電性リング５４０６および５４０８は、前記振動子を包囲し、発振器９０４からの電気信号を振動子９０２へと搬送する。例示的実施形態において、リング５４０６および５４０８は単一の機械部品であり、スタンピングまたは機械加工のいずれかによって平坦部分として構成され、その結果正確な形態に屈曲された脚部を有する。あるいは、前記脚部を、平坦リング内に押圧または半田付けされた第２の部分としてもよい。これらの一連のリング／脚部は、振動子ハウジングの遠位ハウジング部５４３４へ一体成型される。この一体成形は、気密シールを得るのには不十分である。そのため、前記リング脚部が前記プラスチックから出て行く箇所において受け穴が成形され、この受け穴に埋め込み用材料を充填することで、気密シールを得ることができる。あるいは、前記脚部は丸針であってもよい。このような場合、ｏリングを前記脚部と前記受け穴との間に設けることでシールを得ることができる。振動子結晶スタック５５０２の電極５８０２および５８０４は、スペード型またはピン型のコネクタ形状に形成することが可能であり、このような形状により、振動子と前記脚部との間の電気接続を半田付け無しで行うことが可能になる。その結果、製造が簡潔になり、シールが不完全となる原因となり得る半田付け熱へ前記脚部を露出させる必要が無くなる。前記コネクタの一部を図５４～図５８中に示すが、図５８中に最良に示す。振動子９０２は、フランジ５４５０によって保持する必要がある。フランジ５４５０は、振動の無い節に配置される。また、振動子９０２はそのハウジングに回転ロックする必要もあり、このようなロックは、標準的な鍵型フィーチャ（例えば、図５５に示すもの）によって達成することもできるし、４つの平坦部によって行うことも可能である。平坦部を用いることにより、接触リング領域においてハウジングの壁厚を増やすことが可能になり、その結果、このハウジング構造のうちより多くの部分を滅菌サイクルに繰り返し送ることが可能になる。振動子ホーン５００２とハウジング５４３０との間のシールを形成するために、例示的実施形態において、支持フランジは、遠位ハウジング部５４３４によって支持されたｏリング５４５２に対して圧縮される。このシールを十分に圧縮するために、振動子９０２のフランジ５４５０をｏリング５４５２に対して強制的に押圧する必要がある。フランジ５４５０の内面を押圧するために、一対の両性プッシャー５４５４を遠位ハウジング部５４３４内に延ばすことで、組み立て完了を可能にし、エラストマーグロメットを通じて正圧を付加する。例示的構成において、一対のプッシャー部を用いて、ホーンのより小さな直径部内に嵌めこむ。なぜならば、単一部分が結晶および電極上にクリアランスを持つ必要があるため、ハウジング直径全体がずっと大きくならざるを得ないからである。これらのプッシャーがクラッシュピンフィーチャを持つことで、前記プッシャーを共に連結して、取り付けをより容易にすることが可能になる。前記プッシャーのジオメトリにより、前記プッシャーはハウジングのキーイングフィーチャ内へと回転ロックされる。前記プッシャーの近位端上のさらなるキーイングフィーチャにより、近位ハウジング部５４３２が振動子９０２のアセンブリ上へとキーイングされ得、これにより、近位ハウジング部５４３２内のクリアランスが振動子９０２の電極５４０２および５４０４とアラインされる。接着剤または溶接または他の接続手段のいずれかによる近位ハウジング部５４３２と遠位ハウジング部５４３４とのかみ合わせは、プッシャーを正方向にグロメット内へと送るための十分な圧力によって行われ、その結果、前記プッシャーはフランジ５４５０上へと押圧され、ｏリング５４５２はフランジ５４５０と遠位ハウジング部５４３４との間に押圧され、これと同時にシールが形成され、両側のエラストマーによってフランジ５４５０が支持され、これにより、振動子９０２およびハウジング５４３０が音響的に連結される。あるいは、近位ハウジング部５４３２および遠位ハウジング部５４３４をネジによって接続してもよく、ネジの締結により、上述したスタック部分が圧縮さ

Petitioner Therabody Ex-1004, 1370

れる。別の実施形態により、他のエラストマーシールをリング５４０６および５４０８とハウジング５４３４との間に設けることにより、接触リングを挿入成形する必要無く、同一の結果を達成することが可能である。

【００８５】

以下にさらに詳細に説明するように、振動子９０２は、遠位ハウジング部５４３４の最遠位部内の溝部内に取り付けられたスパイラルリングまたは他の保持クリップ５４４２により、ＴＡＧアセンブリ３０３内に保持される。振動子９０２の遠位ハウジング部５４３４と発振器９０４の下側ハウジング部５０３０との間には、潤滑性材料（例えば、ＰＴＦＥ）製のリングが設けられ、このリングにより回転摩擦が低減される。この領域における摩擦低減が重要である。なぜならＴＡＧアセンブリ３０３をハンドル３０２内に保持しかつＴＡＧアセンブリ３０３とハンドル３０２との間の電気接続部周囲のシールを圧縮するのは、この力支持表面であるからである。

【００８６】

ＩＶ．信号経路

【００８７】

図１２は、バッテリアセンブリ３０１およびＴＡＧアセンブリ３０３の間の信号経路を示すブロック図である。さらに以下に説明するように、前記信号経路および相互接続回路要素の設計特性は、電源と信号生成回路との間のこの重要かつ脆弱な接続部における構成要素の信号完全性および効率を保護するという重大な目的によって部分的に決定される。

【００８８】

最初に、ＤＣ－ＤＣ逓減コンバータ１２０２は、電池７０１からの電圧を下げて、第１電圧から第２の低電圧に下げる。ＤＣ－ＤＣ逓減コンバータ１２０２は、（必要とされる電力量に依存して）マルチ又は可変位相バックコンバータ１１１４およびバッテリマイクロコントローラ１１０６を有しており、図１１では両方がバッテリアセンブリ３０１内にある。バッテリマイクロコントローラ１１０６は、ＴＡＧアセンブリ３０３に供給されるＤＣ電圧を調整するためにバックコンバータ１１１４を制御する。バックコンバータ１１１４およびマイクロコントローラ１１０６は、一緒に、バッテリアセンブリ３０１内でＤＣ－ＤＣ変換機能を実行する。本発明の例示の実施形態では２位相バックコンバータ１１１４が使用される。別の例示の実施形態は、さらなる位相を有するバックコンバータを利用することができる。そのような場合、位相制限が採用され得る。使用される位相の数は、バッテリ駆動装置のために考慮されるべき最適効率でコンバータを作動させるために動的に変化し得る。言い替えれば、より小さな出力電力が必要される時、コンバータ内への電力損失は、アクティブ位相の数を低減させることによって低減され得る。

【００８９】

独自的に、発振器印刷回路基板は、基板の両側上に回路要素が設けられている点において、両側型である。例示的実施形態において、電力回路要素がＰＣＢの上側上に取り付けられ、デジタル要素が基板の下側上に取り付けられる。固体地板により、両側が分離される。有利なことに、高電圧電力回路をこのようにして論理回路から隔離することにより、前記電力回路内に存在し得る有害な高電圧ノイズから前記論理回路が有効に遮断される。

【００９０】

バッテリアセンブリ３０１からのＤＣ出力電圧は、ＴＡＧアセンブリ３０３のプッシュ／プル式スイッチング増幅器１０１０に電力を供給し、アセンブリ３０３はＤＣ信号を高電圧ＡＣ信号に変換する。ＴＡＧマイクロコントローラ１００６は増幅器１０１０を制御する。プッシュプル式スイッチング増幅器１０１０の出力電圧は、一般に、図１３に示す例のように、方形波であり、波形１３００は、所定の構成要素に対して、特に、振動子９０２に対して有害であるので、望ましくない。具体的には、方形波の急な上昇および降下の縁は、超音波導波管の対応した急な開始および停止が導波管上で有害な「ガタガタ」作用を生じさせる。方形波１３００はまた、構成要素同士の間の干渉効果を生じさせる。例えば、方形波のより高いさらなる調和振動の周波数は、望ましくない電気的干渉および回路の望ましくない動作をもたらし得る。このことは、１つの周波数のみを有する純粋な正

Petitioner Therabody Ex-1004, 1371

弦波とは対照的である。

【００９１】

方形波を排除するため、波形成又は整合回路１０１２（時には「タンク回路」として言及される）が導入される。タンク回路１０１２は、振動子の静電容量に関連したコンデンサと共に、例えばインダクタなどの構成要素を含んでおり、導波管で非損傷超音波運動を生じさせるような方法で振動子９０２を駆動させるために使用される平滑な正弦波に方形波をフィルタリングする。振動子９０２の駆動に適した例示の正弦波１４００を図１４に示す。本発明の一実施形態では、整合回路１０１２は、直列Ｌ－Ｃ回路であり、キルヒホフの回路法の周知の原理によって制御される。しかしながら、振動子９０２の駆動に適した平滑な正弦波１４００を生成するために任意の整合回路が使用され得る。さらに、他の駆動信号が、平滑な正弦波ではなく、方形波よりも有害でない方法で振動子９０２を駆動するために有用な整合回路１０１２からの出力であり得る。

【００９２】

重要なことに、電力フィルタリング回路の設計は、電力インダクタのインダクタンスが小さく変動した場合でも、システム動作が仕様から外れないような設計となっている。このような構成により、ＬＣフィルタの調整における変動に対する感度が低下し、その結果、調節ネジの使用が不要となる。

【００９３】

実際には、整合ネットワーク１０１２は、供給する特定の振動子と整合させるために調節される。従って、振動子および整合ネットワークは、対としている場合であって他の装置と組み合わせて配置されない場合に最もよく整合する。さらに、各振動子９０２が自身の整合ネットワークを有する場合、スマートバッテリ３０１が、異なる振動子に異なる周波数を供給することができ、周波数は、導波管アセンブリ３０４に特定の刃にそれぞれ整合する。超音波手術装置のための２つのよく用いられる周波数は５５ｋＨｚおよび４０ｋＨｚである。

【００９４】

加えて、無線周波数または電磁干渉が超音波導波管および振動子要素から発振器回路へと侵入するのを回避するために、フェライトビーズ（またはコイル）を発振器出力ラインまたはトレース内に取り付けることで、干渉が回路へ到達するのを遮断する。

【００９５】

さらに、発振器の出力トレースを相互に近接するように構成し（例えば、三角形のダブルトレース状に構成し）、干渉をフィルタリング除去する（すなわち、最大共通モード拒否を可能にする）共通モードとして並列に機能させる。

【００９６】

Ｖ．共振

【００９７】

図１５は、振動子９０２への共振正弦波入力が超音波切断装置の導波管１５０２上に有する作用を概略的に示す図である。本発明の例示の実施形態によれば、図１５で点線によって示される正弦パターンは、振動子９０２に連結される導波管１５０２の長さに沿った軸線方向運動の振幅を表している。駆動正弦波１４００（図１４に示す）の上昇部分１４０２に応答して、スタックが第１方向１５０８に伸展する。駆動正弦波１４００（図１４に示す）の負部分１４０４の間、スタックの予圧縮又は誘導圧縮が、その定常状態まで、すなわち、振動子９０２の部分１５０４が第２方向１５１２に移動するまで、スタックを復帰させる。上述のように、平滑な正弦波１４００によれば、方形波１３００とは異なり、振動子９０２および導波管１５０２が、方向を変化させる前に減速することが可能である。より平滑な運動は装置の構成要素に対して有害さがより少ない。

【００９８】

振動子部１５０４の交互運動１５０８、１５１２は、導波管１５０２の長さに沿って正弦波１５１４を配置する。波１５１４は交互に、振動子９０２に向かって導波管１５０２の遠位端１５２０を引っ張るとともに振動子９０２から離れるように押し、それによって

Petitioner Therabody Ex-1004, 1372

、距離１５１８に沿って導波管１５０２の遠位端１５２０を縦方向に移動させる。導波管１５０２の先端は、正弦波１５１４の移動点であるので、「腹」とみなされる。導波管１５０２の結果として生じた運動は、導波管１５０２の遠位端１５２０で距離１５１８に沿って「のこぎり」運動を生じさせる。（波１５１４および距離１５１８に沿った直線運動は、説明の簡単さのために図１５で大いに誇張されている。）距離１５１８に沿ったこの高速運動は、従来技術で知られているように、多くの物質、特に、組織および骨を通って簡単に切り取ることが可能な切断器具を提供する。導波管１５０２の急速に移動する遠位端１５２０はまた、そのように刺激された時に大量の摩擦熱を生成し、その熱は、導波管１５０２が切断している組織に吸収される。この熱は、切断されている組織内の血管の急速な焼灼を引き起こすのに十分である。

【００９９】

導波管１５０２に沿って動く駆動波１５１４が共振波でない場合、定常波はなく、そのことは節又は腹がないことを意味している。このことは、ほとんど運動がないことを意味している。また、不正確な共振周波数で装置を作動させる可能性がある。誤った共振での作動は、例えば「ガタピシャ」などの望ましくない運動を生成し得る。そうした場合、導波管１５０２の遠位端１５２０は導波管１５０２の縦軸線を横断して移動する。あらゆる不正確なモードは、理想的ではなく、適切な切断および手術焼灼のために信頼性がない。しかしながら、本発明は、以下で説明するように、導波管１５０２の運動１５０８、１５１２が、振動子９０２に供給される運動電流および運動電圧の波形の間の位相をモニタして発振器９０４に補正信号を返信することによって、導波管１５０２に沿って共振したままであることを保証するために、発振器９０４内に位相ロックループ（ＰＬＬ）を利用する。ＴＡＧマイクロコントローラ１００６は、周波数を制御し、望ましくない共振周波数を起こさないように適切な範囲内にあることを保証する。追加の特徴として、本発明は、変動する平面内で切断される圧電結晶スタック１５０４を備えてよく、それによって、のこぎり運動のみならず、刃のねじれ又はツイスト運動を作り出す。本発明は、いま説明したのこぎり運動に代えて又はのこぎり運動とともに、ドリルタイプの運動の要求を使用する完全な一連の使用に容易に適合し得る。

【０１００】

いま説明したように、理想的には、振動子９０２および導波管１５０２はそれらの共振周波数で駆動される。共振は、振動子９０２の入力時に電流および電圧が実質的に同相の時に達成される。この理由のため、発振器９０４は、ＰＬＬと、電流と電圧とを相互に同調させるために、振動子９０２への電流および電圧の入力から引き出される信号と、を使用する。しかしながら、入力電圧の位相に対して入力電流の位相を単に整合させることに代えて、本発明は、「運動」電圧の位相に電流位相を整合させ、および／又は、「運動」電流の位相に入力電圧の位相を整合させる。これを達成するため、運動ブリッジ回路が、振動子および導波管の機械的運動を測定するために、および、振動子および導波管の作動に関してフィードバックを提供するために、使用される。ブリッジからの運動フィードバック信号は、振動子９０２および導波管１５０２の運動に比例しているとともに同相である。

【０１０１】

ＶＩ．運動制御

【０１０２】

ａ．振動子回路モデル

【０１０３】

図１６は、圧電材料を包含する例えば振動子９０２などのモデル振動子１６００を概略的に示す回路図である。圧電振動子は従来周知である。圧電材料の質量および剛性が、振動子内に機械的な共振構造を作り出す。圧電効果により、これらの機械的特性はそれ自体を電気的に同等な特性として表す。言い替えれば、電気接点に見られる電気的共振周波数は機械的共振周波数に等しい。図１６に示すように、振動子９０２の機械的質量、剛性および減衰は、すべて他のコンデンサＣ１と並列な誘導子／コイルＬ、コンデンサＣ２およ

Petitioner Therabody Ex-1004, 1373

びレジスタＲの一連の構成によって表され得る。電気的に同値の振動子モデル１７００は結晶の周知モデルに極めて似ている。

【０１０４】

電気的に同値の振動子モデル１６００の入力１６１０内に流入するのは振動子電流ｉＴである。ｉＴの一部ｉＣは、予想される周波数帯の大部分に対して、静的容量性の値を保持するタイプおよび値の並列コンデンサＣ１にわたって流れる。ｉＭとして定義されるｉＴの残余部は、単純にｉＴ－ｉＣであり、かつ、実際の作動電流である。この残余電流ｉＭは、本明細書では「運動」電流として言及される。すなわち、運動電流は、導波管１５０２を運動させるために作業を実際に実行する電流である。

【０１０５】

公知の従来技術の設計は、ｉＣを含み、振動子９０２の導波管１５０２の運動を実際に引き起こす電流量のインジケータではない全電流ｉＴを調整して同期する。例えば、従来技術の装置の刃が柔らかい組織から例えば他の組織又は骨などのより緻密な材料へ移動する時、抵抗Ｒは著しく増大する。この抵抗Ｒの増大によって、直列配置Ｒ－Ｌ－Ｃ２を通ってより少ない電流ｉＭが流れ、容量性要素Ｃ１にわたってより大きな電流が流れる。そのような場合、導波管１５０２は減速し、その性能を低下させる。当業者であれば、全体の電流を調整することが、一定の導波管の変位を維持するために有効な方法ではないことを理解し得る。したがって、本発明の新規な一実施形態は、振動子９０２を通って流れる運動電流ｉＭを有利にモニタして調整する。運動電流ｉＭを調整することによって、導波管１５０２の運動距離を容易に調整することが可能である。

【０１０６】

ｂ．直列回路モデル

【０１０７】

図１７は、振動子９０２の運動電流ｉＭをどのようにして得るかを理解するために有用な本発明の回路１７００を概略的に示す回路図である。回路１７００は、振動子モデル１６００のすべての回路要素をに加えて、図１６の振動子モデル１６００に並列な追加のブリッジング容量性要素ＣＢを有している。しかしながら、ＣＢの値は、Ｃ１／ＣＢが所定の比率ｒに等しいように選択される。効率のため、ＣＢのために選択された値は比較的低くあるべきである。このことは、ｉＭから引き出される電流を制限する。可変電源ＶＴが、回路１７００の接点１７０２および１７０４にわたって印加され、容量性要素ＣＢを通じて電流ｉＢと、モデル振動子１６００に流入する電流ｉＴと、コンデンサＣ１を通って流れる電流ｉＣと、および、結果として、運動電流ｉＭと、を作り出す。そこで、運動電流ｉＭは、ｉＭ＝ｉＴ－ｒ・ｉＢであるように流れる。このことは、

【数１】

$$i_B = C_B \cdot \frac{\Delta V_T}{\Delta_t} = \frac{C_1}{r} \cdot \frac{\Delta V_T}{\Delta_t} \text{ および } i_C = C_1 \cdot \frac{\Delta V_T}{\Delta_t}$$

のためである。従って、ｉＣ＝ｒ・ｉＢを、方程式ｉＭ＝ｉＴ－ｉＣのｉＣに代入すると、ｉＭ＝ｉＴ－ｒ・ｉＢが導き出される。

【０１０８】

ここで、全電流のみを知ることによって、かつ、ブリッジコンデンサｉＢを通じた電流を測定することによって、振動子の運動電流ｉＭの変化を識別して調整することが可能である。図２７のブロック２７０８および変圧器２７１０によって表される駆動回路は、図１０のプッシュプル式スイッチング増幅器１０１０に含まれる。そして、駆動回路は、電流制御器として作動し、ブリッジ静電容量ＣＢを通って流れる電流に比率ｒを掛けた積を振動子９０２に流れる全電流ｉＴから減算した値に基づいて、駆動回路の出力を変化させることによって、運動電流ｉＭを調整する。この調整は、様々な切断負荷にわたって導波管１５０２の切断刃部分の運動のほぼ一定の比を維持し、これは、以前は可能ではなかったことである。例示の一実施形態では、感知回路１０１４は運動電圧および／又は運動電

Petitioner Therabody Ex-1004, 1374

流を測定する。電流および電圧測定装置と電圧計および電流計を作り出すための回路構成とは従来公知である。電流値および電圧値は、制限はなく、現在は公知で又はその後に発展した何らかの方法で本発明によって特定されることが可能である。

【０１０９】

運動電流ｉＭの調整は、器具の完全性を維持するための、かつ、作動環境で予想されるほぼすべての状態のもとでそのピーク性能で作動することを保証するための真の方法である。さらに、そうした調整は、片手で簡単に保持するために十分に小型で十分に軽いパッケージにおいて、すなわち、この分野で今までになかった構成でこれらの利点を提供する。

【０１１０】

ｃ．振動子回路モデル

【０１１１】

図１８は、本発明の別の実施形態を示しており、そこでは振動子９０２が、抵抗要素Ｒ、誘導要素Ｌおよび容量要素Ｃ４の並列構成として概略的に表されている。追加の容量要素Ｃ３は、入力１７０２と、抵抗要素Ｒ、誘導要素Ｌおよび容量性要素Ｃ４の並列配置との間の直列配置である。この並列代表例は、わずかに異なる周波数で生じるいわゆる作動の「反共振」モードで振動子の動作のモデルになる。振動子電圧ＶＴは、振動子９０２の入力端子１７０２、１７０４の間に印加される。振動子電圧ＶＴは、容量性要素Ｃ３を通じた電圧ＶＣと、抵抗素子Ｒ、誘導素子Ｌおよび容量性素子Ｃ４の並列配置を通じた運動電圧ＶＭとの間に分割される。作業を実行して導波管１５０２を移動させるのは運動電圧ＶＭである。従って、この例示の実施形態では、慎重に調整されるべきは、運動電圧である。

【０１１２】

ｄ．並列回路モデル

【０１１３】

図１９は、図１８の振動子モデル１８００を有する本発明に係る本発明の回路構成１９００の例示の実施形態を示している。回路構成１９００は、振動子モデル１８００に３つの追加の容量性素子Ｃ５、Ｃ６およびＣ７を追加する。容量性素子Ｃ５は、図１８の振動子モデル回路１８００に直列である一方で、容量性素子Ｃ６およびＣ７は、相互に直列であり、容量性素子Ｃ５および振動子回路モデル１８００の直列の組み合わせに並列である。

【０１１４】

この回路は、ホイートストン（Ｗｈｅａｔｓｔｏｎｅ）のブリッジ測定器具に類似している。ホイートストンのブリッジ回路は、ブリッジ回路の２つの脚をバランスさせることによって不明の電気抵抗を測定するために使用され、その１つの脚は不明の構成要素を有する。図１９に示す例示の回路構成では、ＶＴ－ＶＣに等しい運動電圧ＶＭは不明である。運動電圧ＶＭを特定して調整することによって、本発明の構成は、一定の導波管の運動が以下に説明するように維持されることを可能にする。

【０１１５】

有利なことに、容量性素子Ｃ７は、その値が容量性素子Ｃ３の１未満の比Ａであるように選択される。同様に、容量性素子Ｃ６は、その値が容量性素子Ｃ５の同一の比Ａであるように選択される。Ｃ５／Ｃ３の比もまた比Ａである。

【０１１６】

Ｃ３／Ｃ７の比がＡであるとともにＣ５／Ｃ６の比もまたＡであるので、ブリッジは均衡される。フィードバック電圧Ｖｆｂを運動電圧ＶＭによって除したものもまた比Ａであるという結果になる。従って、Ｖｍは単純にＡ・Ｖｆｂで表され得る。

【０１１７】

モデル振動子１８００にわたる電圧が依然としてＶＴであるなら、入力電圧Ｖｉｎは、ＶＴに容量性素子Ｃ５にわたる電圧ＶＢに加えた値に等しい。フィードバック電圧ＶＦＢは、容量性素子Ｃ６およびＣ７の間に配置された第１点と、振動子および容量性素子Ｃ５

Petitioner Therabody Ex-1004, 1375

の間に配置された第２点とから測定される。ここで、ＴＡＧアセンブリ３０３の上流構成要素は、電圧制御器として作動し、一定のフィードバック電圧Ｖｆｂを維持するために電力Ｖｉｎを変化させ、その結果、ほぼ一定の運動電圧を生じさせ、様々な切断負荷にわたって導波管１５０２の切断刃部分のほぼ一定比の運動を維持する。また、従来技術とは異なり、本発明は、入力電圧Ｖｉｎを単純に調整するのではなく、運動電圧ＶＭを調整する目的のために入力電圧Ｖｉｎを変化させる。これは、当技術分野で新規のものである。

【０１１８】

ｅ．変圧器連続監視

【０１１９】

図２０は、振動子９０２が図１６に示す回路構成である本発明の別の例示の実施形態を示している。図２０の構成は、図１７の示すものと同様に作動し、図１７に関連して上述のように作動する。しかしながら、この回路構成２０００では、１対の変圧器２００４および２００８が、運動電流ＩＭを特定してモニタするために使用される。この例示の実施形態では、第１変圧器２００４の第１巻線２００２がブリッジコンデンサＣＢと直列配置である。同様に、第２変圧器２００８の第１巻線２００６はモデル振動子１６００と直列配置である。第１変圧器２００４の第２巻線２０１４のリード２０１０、２０１２は抵抗Ｒ２を通じて連結される。第２変圧器２００８の第２巻線２０２０のリード２０１６、２０１８は抵抗Ｒ１を通じて連結される。さらに、第１変圧器２００４の第２巻線２０１４の第１リード２０１０は、第２変圧器２００８の第２巻線２０２０の第１リード２０１６に直接連結される。

【０１２０】

第１変圧器２００４の第１巻線２００２を通る電流ｉＢは、第１変圧器２００４の第２巻線２０１４の電流を誘導する。同様に、振動子１６００の容量性素子Ｃ１を通るｉＣを含む電流と振動子１６００の運動電流ｉＭとは複合して、アース２０２２を見つけるために第２変圧器２００８の第１巻線２００６を通って流れる。第１巻線２００６の電流は第２巻線２０２０上の電流を誘導する。変圧器２００４、２００８上のドット（「・」）によって示されるように、第２巻線２０１４、２０２０はそれぞれ、第１巻線２００２、２００６に対して相互に反対向きであり、抵抗Ｒ１およびＲ２を通じて電圧Ｖｆｂを誘導する。Ｒ１／Ｒ２の比がＣＢ／Ｃ１の値の比と等しいようにＲ１およびＲ２の値を選択することによって、フィードバック電圧Ｖｆｂは運動電流ｉＭに常に比例する。ここで、発振器９０４の上流の構成要素は、電圧制御器として作動し、一定のフィードバック電圧Ｖｆｂを維持するように入力電力（ＶｉｎおよびＩｉｎ）を変化させ、その結果、ほぼ一定の運動電流ｉＭを生じさせ、様々な切断負荷にわたって導波管１５０２の切断刃のほぼ一定比の運動を維持する。また、従来技術とは異なり、本発明は、入力電圧Ｖｉｎを単純に調整せず、運動電流ｉＭを調整する目的のために入力電流Ｉｉｎを変化させる。これは、当技術分野で新規のものである。

【０１２１】

図示されていない別の実施形態において、変圧器２００４および２００８の代わりに抵抗器が用いられる。例えば、図１９について、コンデンサＣ６およびＣ５の代わりに、抵抗器が用いられ得、それらは電流ＩｂおよびＩｔの測定に用いられる。

【０１２２】

ｆ．変圧器並列監視

【０１２３】

図２１は、モデル振動子１８００が図１８に示す回路構成によってモデル化された本発明の別の例示の実施形態を示している。図２１の構成は、図１９に示すものと同様に作動し、図１９に関連して上述のように作動する。しかしながら、この回路構成２１００では、変圧器２１１０が、振動子１８００の運動電圧ＶＭを特定してモニタするために使用される。この実施形態では、変圧器２１１０の第１巻線２１０６は誘導素子Ｌ２および容量性素子Ｃ１に直列の回路構成である。電圧Ｖｉｎは、変圧器２１１０、誘導素子Ｌ２および容量性素子Ｃ１の第１巻線２１０６によって形成される回路の入力リード２１０２、２

Petitioner Therabody Ex-1004, 1376

１０４を通じて印加される。第１巻線２１０６を通った電流は、変圧器２１１０の第２巻線２１０８で対応する電流を誘導する。変圧器２１１０の第２巻線２１０８は、振動子１８００およびブリッジコンデンサＣＢの組み合わせと並列配置である。組み合わせを形成する２つの構成要素は直列配置である。

【０１２４】

本実施形態では、第２巻線２１０８は点２１１２で分岐される。第２巻線２１０８の第１部分がｍ巻きを有し、第２巻線２１０８の第２部分がｎ巻きを有する点（ｎはｍ未満である）で第２巻線２１０８を分岐させることによって、第２巻線２１０８上の誘導電圧の選択可能なパーセントが点２１１２からアース２１１４まで現れる。

【０１２５】

ここでも、この回路はホイートストンブリッジ測定器具に類似している。１つの脚が第１の２番目の巻線ｍであり、第２の脚は第２の２番目の巻線ｎであり、第３の脚は振動子モデル１８００であり、第４の脚はコンデンサＣＢである。図２１のこの回路構成では、電圧ＶＭは不明である。運動電圧ＶＭを特定して調整することによって、一定の導波管の運動が維持される。

【０１２６】

巻きｎの数が巻きｍの数未満であるのと同一の割合によって振動子の静電容量Ｃ３未満であるようにブリッジコンデンサＣＢの値を選択することによって（すなわち、ｍ／ｎ＝Ｃ３／ＣＢ）、フィードバック電圧Ｖｆｂの値は運動電圧ＶＭを反映する。本発明は、変化のためにフィードバック電圧Ｖｆｂをモニタすることによって、運動電圧ＶＭが変化するかどうかを特定することができる。

【０１２７】

並列共振（又は反共振）振動子をモデル化した等価回路振動子モデル１８００を使用することによって、振動子は、運動が電圧に比例する並列動作モードで駆動され得る。この作動モードの利点は、要求される一定電圧モードの電源が、一定電流モードの電源よりもより単純に設計してより安全に作動することである。また、振動子が、（直列共振作動モードで負荷を掛けられていない時により低いインピーダンスを有するのではなく）負荷を掛けられていない時により高いインピーダンスを有するので、負荷を掛けられていない時により低電力を引き出す傾向に当然ながらある。しかしながら、並列共振作動モードは、共振バンドパスが、直列共振モードのそれよりも狭くてわずかに異なる固有の共振周波数を有するので、維持することが困難であり、それ故に、装置の機械的構成要素は、直列共振又は並列共振の作動モードのいずれかで作動するように特に構成されていなければならない。

【０１２８】

本発明は、一定のフィードバック電圧Ｖｆｂを維持するために電圧を制御して電力Ｖｉｎを変化させ、その結果、ほぼ一定の運動電圧ＶＭを生じさせ、様々な切断負荷にわたって導波管１５０２の切断刃部分のほぼ一定の運動比を維持する。また、従来技術と異なり、本発明は、入力電圧Ｖｉｎを単純に調整せず、運動電圧ＶＭを調整する目的のために入力電圧Ｖｉｎを変化させる。これは、当技術分野で新規のものである。

【０１２９】

本発明によれば、ＴＡＧ３０３のマイクロコントローラ１００６は、変圧器１０１０の第１側に向かう信号を生成するために運動ブリッジ１０１４を通じてフィードバック信号をモニタする。ＴＡＧマイクロコントローラ１００６は、これらの信号の間の位相差を（ＣＬＡ９１２内で）計算し、位相差をゼロに等しくするようにＮＣＯ１００８出力を調節する。運動フィードバック信号が、プッシュプル式スイッチング増幅器１０１０の出力と同相である時、システムは直列共振で作動する。フィードバック信号の位相および大きさは離散型フーリエ変換（ＤＦＴ）を使用して算出される。本発明の例示の一実施形態では、ＤＦＴ算出のための位相基準は、プッシュプル式増幅器１０１０の駆動信号である。周波数は、プッシュプル式の駆動信号を運動フィードバック信号と同相であるようにするために変更されることが可能である。

Petitioner Therabody Ex-1004, 1377

【０１３０】
本発明の例示の一実施形態によれば、運動フィードバック信号の位相が正であれば、運転周波数が共振周波数を下回っており、運転周波数を増大させるべきであることを表し、位相が負であれば、運転周波数が共振周波数を上回っており、運転周波数を減少させるべきであることを表し、位相がゼロに近ければ、運転周波数は振動子９０２および導波管１５０２の共振周波数に近いことを表している。発振器９０４では、ＮＣＯ１００８（ＤＤＳを利用する）は、適切に周波数を変化させるために使用される。
【０１３１】
重要なことに、ＮＣＯ１００８は、例えばＴＡＧマイクロコントローラ１００６の作動周波数よりも６倍未満の周波数でＣＰＵの外部クロック入力にクロックを出力する。外部周波数入力は、プロセッサの位相ロックループ（ＰＬＬ）に供給されて、ＣＰＵのＳＹＳＣＬＫを得るために６の倍数によって乗算される。ＮＣＯ１００８はＳＰＩインターフェースを通じてプロセッサによって制御される。ＳＰＩインターフェースは、所望の出力周波数を得るために２５ＭＨｚの固定周波数を割るために使用されるＮＣＯ１００８に３２ビットの除数を書き込むために使用される。ＤＤＳ２２００を制御することによって、ＴＡＧは、振動周波数のハードウェアの同調動作を提供する。言い替えれば、主プロセッサ９１４には、まるで周波数が一定であるように見え、それによって、運動フィードバック位相のサンプリングと計算とを単純化する。
【０１３２】
ＶＩＩ．始動動作
【０１３３】
始動条件は、本節に続く節でで詳細に説明する定常状態の動作中のものとは異なる。始動時、導波管１５０２は、最初に停止しており、および従って、導波管は運動していない。従って、振動子９０２および導波管１５０２の複合共振周波数を特定するために使用できる即時に確かめることができる運動フィードバック信号はない。その結果、本発明のシステムは、初期始動期間中、定常状態中とは異なるモードで作動する能力を有している。
【０１３４】
本発明の例示の実施形態に係る始動処理は、バッテリコントローラ７０３とＴＡＧアセンブリ３０３の発振器９０４との間の相互交換を示す図７２の工程フロー図で表されている。この特定の実施形態では、以下に詳細に説明するように、バッテリコントローラは発振器９０４に対してすべてのコマンドを発行し、発振器９０４はバッテリコントローラ７０３からのすべてのその命令を受け取るので、バッテリコントローラと発振器との間の関係は「マスタおよびスレーブ」の関係として説明することができる。代替として、ＴＡＧアセンブリ３０３の発振器９０４は、「マスタ」として作動することができ、バッテリコントローラ７０３に対してすべてのコマンドを発行する、又は、ＴＡＧアセンブリ３０３の発振器９０４およびバッテリコントローラ７０３は同等として機能し得る。
【０１３５】
起動に先立って、バッテリコントローラ７０３および発振器９０４の両方はステップ７２０１および７２０２では待機状態である。ステップ７２０３でバッテリコントローラ７０３は、例えば、ユーザがボタン／トリガ４６０８を押すことによって、待機状態から脱して起動される。バッテリコントローラ７０３および発振器９０４の間の交換を開始するため、バッテリコントローラ７０３は、例えば「ＵＬＴＲＡＳＯＵＮＤ　ＯＮ」コマンド７２０５の信号を、通信線６０２ａ～ｎ（すなわち、Ｃｏｍｍ＋／Ｃｏｍｍ－）を使用して発振器９０４に中継する。適切に作動すれば、発振器は、バッテリコントローラ７０３から受信したコマンド７２０５の受領を確認して、今度は、例えば「ＵＬＴＲＡＳＯＵＮＤ　ＯＮ」応答などのプラスの応答７２０４の信号を、通信線６０２ａ～ｎ（すなわち、Ｃｏｍｍ＋／Ｃｏｍｍ－）を使用してバッテリコントローラ７０３に送信する。しかしながら、発振器９０４は、特定の時間（例えば１０ｍｓ）が終わる前にバッテリコントローラ７０３から最初のコマンド７２０５にプラス方向に応答しなければ、バッテリコントローラは、ステップ７２０７で例えば「ＦＡＩＬＵＲＥ　ＴＯ　ＳＴＡＲＴ」状態などの欠

Petitioner Therabody Ex-1004, 1378

陥状態を発行し、ステップ７２０９で作動サイクルを終了させる。その時、適切なインジケータが起動され得る。

【０１３６】

ａ．電流および振幅制御

【０１３７】

バッテリコントローラ７０３から送信された「ＵＬＴＲＡＳＯＵＮＤ　ＯＮ」コマンド７２０５の発振器９０４による成功した受信確認があれば、バッテリコントローラ７０３内のマイクロコントローラ１１０６は、ＴＡＧアセンブリ３０３の迅速に安全に電流率を前進させるために工程を初期化し、ＴＡＧアセンブリ３０３から導波管１５０２に対する共振運動出力を生じさせる。前進は、待機状態から、確認可能な運動フィードバック信号を生成して初期の共振周波数状態を実現するために「ボールパークウィンドウ」内にあるように予想されるレベルに進行する。図１１に示すように、バッテリコントローラ７０３のマイクロコントローラ１１０６は２つの処理ユニットを有している。第１処理ユニットすなわち制御法則加速器（「ＣＬＡ」）１１１６は第１の内側の電流制御ループ２６０１（図２６参照）を処理し、第２処理ユニットすなわち主プロセッサ１１１８は第２の外側の増幅制御ループ２６０２（図２６参照）を処理する。最初に、ステップ７２１３で、マイクロコントローラ１１０６はバック電源１１１４をオンにして、ＣＬＡ１１１６を初期化する。ＣＬＡ１１１６は、２つの位相バック振動子１１１４を駆動させるパルス幅変調器（「ＰＷＭ」）のための新しいデューティサイクルの値を算出する比例積分微分（「ＰＩＤ」）制御アルゴリズムを使用する。ステップ７２１５で、バッテリコントローラ７０３は、ＰＷＭを始動させて、ステップ７２１１で、ＤＣ－ＤＣコンバータ１２０２の出力電圧を増大させるために非線形ＰＩＤ制御ループを使用し始める。増大する出力電圧は、発振器９０４のプッシュ／プル式増幅器１０１０に対して入力電流を対応して増大させる。ステップ７２１７では、ステップ７２１９で、実際の測定された入力電圧が、「Ｉｒｅｆ」として本明細書で言及される既定の基準電流レベルに到達するまで、出力電圧は増大し、又はそうでなければ変更される。Ｉｒｅｆは、導波管１５０２の変位を実現する振動子９０２であるとともに目標の共振周波数に到達するために十分な値に近い結果としての振幅を配置する振動子９０２からの駆動波出力を作り出すために予想される較正値である。Ｉｒｅｆは、ステップ７２２５でバッテリマイクロコントローラ７０３によって最初に設定される。Ｉｒｅｆのためのこの較正値は、ＴＡＧアセンブリ３０３内に格納されて、通信リンク７２０４の確立時にバッテリマイクロコントローラ７０３によって読み出される。簡潔に述べると、Ｉｒｅｆは、始動時においてシステムがオーバードライブにならないようにするための方法であり、これにより、始動時において低運動が可能になり、システムによる過度の応答およびオーバーシュートが無くなる。Ｉｒｅｆは、目標変位にシステムを駆動するために必要な推定電流である。システムが目標変位に近づくと、振幅制御が取って代わる。

【０１３８】

以下の表１は、本発明に係る非線形ＰＩＤ制御ループ又はアルゴリズムの例を示しており、それにより出力電圧レベルは、実際の測定された入力電流が基準電流Ｉｒｅｆに到達するまで変更される。この例では、非線形ＰＩＤ制御ループが、基準電流Ｉｒｅｆに対する実際の測定された入力電流のパーセント誤差を５％のビンに分割し、そのビンは、定数Ｇ０～Ｇｎ（「ｎ」は、Ｉｒｅｆに到達する前の最後のステップの数である）として以下に示される。各ビンは、その自己の非線形同調係数（例えばＫｐ、ＫｉおよびＫｄ）を有している。非線形同調係数によれば、出力電圧、そして実際の入力電流が、入力電流が基準電流点から遠く外れている時に基準電流に向かって最初に迅速に上昇し、その後、入力電流値が基準電流点に到達しそうな時点で基準電流点Ｉｒｅｆにゆっくりと到達することが可能である。その結果、システムはノイズによって乱されにくくなる。この特定の例では、ＣＬＡ１１１６内の非線形ＰＩＤは、Ｉｒｅｆよりも１５％を超えるオーバーシュートを形作ることはない。制御ループが電流を維持するようにさせるが、いかなる有意な時間にわたっても過電流を許容しないことが望ましい。言い替えれば、ループは、過電流状

Petitioner Therabody Ex-1004, 1379

態から迅速に電流を離脱させなければならない。従って、ＣＬＡ１１１６の非線形ＰＩＤループは、入力電流が迅速かつ正確に所望の基準電流レベルＩｒｅｆまで高まるが、安定した、危険な「過電流」状態を避けるような方法で、出力電圧および入力電流の増大を形作る。

【表１】

ゲイン定数:	G_0	G_1	G_2	G_n		G_n	G_1	G_0
I_{ref}からの差(%):	50%	45%	40% … 5%		I_{ref}	-5%	-10%	-15%

【０１３９】

その間、バッテリマイクロコントローラ１１０６の制御のもとで着実に入力電流が増大していく間、発振器によって受信されたバッテリコントローラ７０３からの初期の信号すなわち「ＵＬＴＲＡＳＯＵＮＤ　ＯＮ」コマンド７２０５は、バッテリコントローラ７０３の作動に並行してその自己の初期化処理をＴＡＧマイクロコントローラ１００６に開始させる。図９に関して上述のように、ＴＡＧアセンブリ３０３のマイクロコントローラ１００６は、２つの独立した処理ユニット、すなわちＣＬＡ９１２および主プロセッサ９１４を有している。再び図７２を参照すると、ステップ７２００および７２０６では、バッテリコントローラ７０３から初期コマンド７２０５を受信すると、ＴＡＧマイクロコントローラ１００６は、ＣＬＡ９１２を初期化し、導波管および振動子の作動周波数帯内の周波数で超音波周波数を駆動する超音波ＰＷＭを開始する。この初期の始動段階では、存在するいかなる運動フィードバック信号も弱く、および従って、信号レベルが最初が非常に小さいので、より高い信号レベルを提供するために高ゲイン増幅器を使用することが望ましい。ステップ７２０８で、バッテリアセンブリからの入力電流が増大していくにつれて、振幅（すなわち、機械的運動の変位）が、運動フィードバック信号を生成して共振周波数を実現するために「ボールパークウィンドウ」内にＴＡＧアセンブリ３０３を配置するべき「目標振幅」の２０％内の設定ポイント又はレベルに到達するまで比例して漸増していく。「目標振幅」は既定の安全な閾値レベルである。この閾値レベルを越えることは望ましくなく、（例えば、１０～１２％だけ）越えた場合、望ましくないとともに装置に障害状態および制御の停止を開始させる「過振幅」状態を示している。

【０１４０】

バッテリコントローラ７０３は、振幅を緊密に監視して、ＴＡＧアセンブリ３０３の変位レベルを調節する。バッテリコントローラ７０３は、短間隔（例えば４ｍｓ毎）で例えば「ＡＭＰＬＩＴＵＤＥ　ＲＥＱ」コマンドといったコマンド７２２１を、通信線６０２ａ～ｎ（例えばＣｏｍｍ＋／Ｃｏｍｍ－）の少なくとも１つを使用してＴＡＧアセンブリ３０３に発行する。応答して、バッテリコントローラ７０３は、ＴＡＧアセンブリ３０３から例えば「ＡＭＰＬＩＴＵＤＥ　ＲＥＱ」応答といった信号７２１０を通信線６０２ａ～ｎ（例えばＣｏｍｍ＋／Ｃｏｍｍ－）の少なくとも１つを通じて受信し、これはＴＡＧアセンブリ３０３の振幅レベルの測定をバッテリコントローラ７０３に提供する。各振幅レベルの測定がバッテリコントローラ７０３によって決定される各間隔において、ステップ７２２３で、バッテリマイクロコントローラ１１０６は、振幅測定に基づいて複数の可能な決定の１つをなす。振幅レベルが、「目標振幅」の２０％以内、又は、事実上「目標振幅」の８０％以内のレベルに到達すれば、ステップ７２２７で、電力制御は、以下にさらに詳細に説明するように、内側の電流制御ループ２６０１から外側の振幅制御ループ２６０２に切り替えられる。振幅レベルが「目標振幅」の８０％に到達しなければ、ステップ７２２９で、電流制御ループは、振幅が８０％のポイントまで到達するまで基準電流レベルＩｒｅｆに電流を維持する。

【０１４１】

しかし、振幅レベルが、一連の時間間隔（例えば２５０ｍｓ）内に８０％の点に依然として到達しなければ、このことは、例えば、導波管１５０２で停止した刃に起因し得る「

Petitioner Therabody Ex-1004, 1380

低振幅」障害状態７２３１を示している。応答して、バッテリマイクロコントローラ１１０６は、ステップ７２０９で作動サイクルを終了させ、発振器９０４に例えば「ＵＬＴＲＡＳＯＵＮＤ　ＯＦＦ」コマンド７２３３を発行する。返答して、発振器９０４は、起動作動を停止したことを示す例えば「ＵＬＴＲＡＳＯＵＮＤ　ＯＦＦ」応答といった応答７２１２を中継する。振幅レベルが「目標振幅」の２０％以内のレベルを実際に越える一時的に危険な状態が発生すると、バッテリマイクロコントローラ１１０６は即時に、障害状態７２３５を発行し、上述のように、この「過振幅」状態に起因してステップ７２０９で作動サイクルを終了させる。

【０１４２】

ｂ．周波数ロック

【０１４３】

ここで、図７２Ａを参照すると、前述のように、初期化時、ＴＡＧマイクロコントローラ１００６は、運動フィードバック信号の検出に基づいて振動子９０２を駆動する信号の周波数を制御する。始動プロセスの開始時、ステップ７２０６で、作動周波数が、振動子９０２および導波管１５０２の作動周波数帯内である固定値（例えば５５．２ｋＨｚ）に設定される。その設定された周波数にある場合、ブリッジ回路からの運動フィードバック信号は、高および低のゲインバッファに経由される。これらの信号の各々は、ＴＡＧアセンブリ３０３のマイクロコントローラ１００６のアナログデジタル振動子（「ＡＤＣ」）９０８に供給される。最初に、高ゲインでバッファされたフィードバック信号が、運動フィードバック信号が最初に小さいものであるように選択される。ＣＬＡ９１２の主機能は、ＡＤＣからの出力をとって、離散型フーリエ変換（「ＤＦＴ」）演算を実行し、そして、主プロセッサ９１４に結果を渡す。ステップ７２１８で示すように、ＤＦＴ演算の結果は、運動フィードバック（「ＭＦ」）信号の位相および大きさ、ならびに信号の実数項および虚数項である。

【０１４４】

超音波サイクルごとに同調ループが一度コールされる。ステップ７２１４で、有効な運動フィードバック信号が設定周波数にないことが特定されると、システムは、有効なフィードバック信号があるまで単純に待つ。しかしながら、固定された時間間隔が、サイクルタイムアウトタイマーによって特定されたものを越え、有効な運動フィードバック信号が依然としてない場合、サイクル起動リミット「タイムアウト」が、ステップ７２１６でトリガされて発振器９０４がオフになる。

【０１４５】

最初に、ステップ７２２２で、システムは、高ゲインバッファフィードバック信号が選択されるように高ゲインバッファＡ－Ｄチャネルを採用する。このことは、より低い運動フィードバック信号レベルにシステムがロックすることを可能にする。運動フィードバック信号が規定の「ＴＨＲＥＳＨＯＬＤ」値に到達したかどうかはステップ７２２０で判定される。運動フィードバック信号が規定の「ＴＨＥＲＳＨＯＬＤ」値に到達した場合、運動フィードバック信号の振幅が、有効な運動フィードバック信号が、ＣＬＡ９１２のＤＦＴ演算が信頼に足るようにあらゆる障害ノイズから現れたポイントまで増大する。この時点では、ステップ７２２４で、システムは低ゲインチャネルに切り替わる。しかしながら、システムがこの「ＴＨＲＥＳＨＯＬＤ」値を下回る場合、Ａ－Ｄチャネルは、ステップ７２２６で示すように高ゲインチャネルに再び切り替わる。この時点で低ゲインチャネルに切り替わる能力を有することによって、有利なことに高解像度のＡ／Ｄ振動子を必要としない。

【０１４６】

ステップ７２２８で、運動フィードバック信号が始動閾値を上回った場合、発振器９０４は、電流振幅が上述のように制御することと並行して、ＴＡＧアセンブリ３０３の共振周波数上に設定された周波数をロックするために周波数調整モードに入る。本発明の例示の実施形態によれば、共振周波数を実現するためのプロセスは、最適な周波数に対してスイープするプロセスではなく、最適な周波数上にロックインするように独自に追跡又は同

Petitioner Therabody Ex-1004, 1381

調するプロセスである。しかしながら、本発明は、周波数スイープモードも採用してよく、それによって、最初の作動又は設定された周波数が、予想された共振周波数の「ボールパークウィンドウ」の低い境界にあるべく選択され、共振周波数に到達するまで着実に増加し、逆もまた同様である。

【０１４７】

周波数同調モードに入ると、ＴＡＧマイクロコントローラ１００６の主プロセッサ９１４は、発振器の運転周波数を制御するためにＤＦＴ演算の結果（すなわち、運動フィードバック信号の位相および大きさ）を使用する。同調アルゴリズムは、２つの状態、ＳＴＡＲＴＩＮＧおよびＬＯＣＫＩＮＧに分割される。ステップ７２３０のＳＴＡＲＴＩＮＧ位相では、運動フィードバック信号が規定の「ＳＴＡＲＴＵＰ　ＴＨＲＥＳＨＯＬＤ」値に到達したどうかを決定する。運動信号が規定の「ＳＴＡＲＴＵＰ　ＴＨＲＥＳＨＯＬＤ」に到達した場合、運動フィードバック信号の振幅は、システムがステップ７２３２で共振に向かってアクティブに動き始めることができるポイントまで到達する。ステップ７２３０の判定が、運動フィードバック信号が規定の「ＳＴＡＲＴＵＰ　ＴＨＲＥＳＨＯＬＤ」値に到達しないものであった場合、プロセスはステップ７２３４に移行する。ステップ７２３４で、ＳＴＡＲＴＩＮＧ段階は、運動フィードバック信号がロッキングを許容するのに十分に大きい点にポイントが到達するまで単に待つ。

【０１４８】

ＬＯＣＫＩＮＧ段階７２３６では、運動フィードバック信号および駆動信号の間の位相オフセットの正弦が、システムを共振に移行させるために出力周波数を調整するために周波数ステップのサイズおよび方向を特定する正弦の差動とともに使用される。位相が当然に正接関数であるにも拘わらず、正接関数が望ましくなく拘束されていない±∞の範囲を有しているのに対して、位相の正弦が値±１だけ拘束されて小さな角度で位相値に密接に近づくので、周波数ステップを特定するために位相の正弦が使用される。

【０１４９】

ステップ７２３８では、ＰＩＤループは、プラス又はマイナスの方向のいずれかに周波数ステップを計算するために使用される。ＰＩＤループは非線形であり、それにより正弦の値はビン番号を決定するために使用される。そのビン番号は、ＰＩＤによって使用される同調係数にアクセスするための指標として使用される。指標テーブルは、比例ゲイン、積分ゲインおよび微分ゲインを包含する。さらに、ビンに入るためのエントリ正弦値は、ビンから出て行くための値と異なる。このことは、ビンの遷移に近い振動を防止するヒステリシスを導入する。

【０１５０】

前述のように、非線形ＰＩＤが、急速周波数ロックを実現するために使用される。以下の表２は、本発明に係る非線形非対称ＰＩＤループ又はアルゴリズムの例を示しており、それにより周波数ステップのサイズが、それが目標共振周波数ｆｒｅｓに到達するまでずらされる。この例では、ＰＩＤ０からＰＩＤｎに至るゲイン定数（「ｎ」は、ｆｒｅｓに到達する前の最後の周波数ステップの任意の数である）が非線形漸増によって分離される。ゲイン値は、システムが共振から遠い時には迅速に、かつ、システムが共振に近い又は共振にある時にはゆっくりと共振に向かってシステムを移動させるように選択される。振幅上で望ましくない作用を引き起こすであろう周波数変調を包含することを防止するために共振に近い又は共振にある時にゆっくりステップすることが重要である。始動時、最大周波数ステップサイズの値は、定常状態の動作中よりも大きく、例えば８Ｈｚに設定される。位相が正である場合、運転周波数は、振動子の共振周波数を下回り、増大することが必要であることを示している。位相が負であれば、運転周波数は共振周波数を上回って運転周波数を減少させるべきであることを示している。位相がゼロに近い場合、運転周波数は、振動子９０２および導波管１５０２の共振周波数に近い。直接デジタル合成（「ＤＤＳ」）を利用する数値制御発振器（「ＮＣＯ」）１００８がステップ７２４０で周波数を変化させるために使用される。

Petitioner Therabody Ex-1004, 1382

【表２】

ゲイン定数:	PID_0	PID_1	PID_2	PID_3‥PID_n	PID_n‥PID_3	PID_2	PID_1	PID_0
駆動周波数:	f_{min}			f_{res}				f_{max}
位相(正弦関数、90°シフト):	+1	+0.6	+0.4	+0.1 +.03 0	-0.2	-0.4	-0.6	-0.8	-1

【０１５１】

ＤＤＳ２２００（図２２参照）は、ハードウェアの同調作動に振動周波数を提供する。言い替えれば、主プロセッサ９１４には、まるで周波数が一定であるかのように見える。ここでは、主プロセッサ９１４のクロック周波数は振動周波数の倍数である。本発明は、独自で新規な方法でＰＷＭ周波数を変化させる。本発明によれば、ＰＷＭは主プロセッサ９１４内で実行される。このため、本発明は、主プロセッサ９１４の周波数を実際に増大／減少させる。これは以前にはなされなかったことである。Ａ／Ｄ振動子９０８の調整は、Ａ／Ｄ振動子９０８がマイクロコントローラ１００６内にあるので、同様に自動的である。本発明の技術は、従来されていたように、歌手が彼／彼女のテンポをメトロノームに調和させるのではなく、歌手のテンポにメトロノームの速度を調和させるために調整する歌手に類似し得る。

【０１５２】

装置の作動中のいつでも、周波数が、予め設定された最小又は最大周波数限界ｆｍｉｎおよびｆｍａｘにそれぞれ到達する場合、発振器９０４はオフになり、ステップ７２４２に示すように、障害状態がトリガされる。本発明のための例示の低および高周波数限界はそれぞれ５４ｋＨｚおよび５８ｋＨｚである。多くの様々な状態が最小限界又は最大限界に周波数を到達させる、それらの状態には構成要素（例えば導波管１５０２）の故障、又は、導波管１５０２が、装置が共振を見つける必要がある電力量を入力することができないような大きな負荷のもとにある状況が含まれる。

【０１５３】

周波数ロックがひとたび実現されると、定常状態の動作への遷移が始まる。

【０１５４】

ＶＩＩＩ．定常状態動作

【０１５５】

定常状態動作時における目的は、振動子および導波管を共振周波数に維持して、装置の使用中に導波管１５０２上の負荷の結果として発生する任意のドリフトに応じて振幅を制御することである。振動子９０２および導波管１５０２が、それらの複合共振周波数に駆動される際、それらは大量の機械的運動を生成する。バッテリからの電気エネルギーは、この状態では、振動子９０２を駆動する高電圧ＡＣ波形に変換される。この波形の周波数は、導波管１５０２および振動子９０２の共振周波数と同一であり、波形の大きさは、機械的運動の適切な量を生成する値であるべきである。

【０１５６】

ａ．振幅制御

【０１５７】

共振時、振幅は振動子電流にほぼ比例し、振動子電流は、プッシュ／プル式増幅器１０１０への入力電流にほぼ比例する。一定の振幅を維持するための一定の電流動作によって、出力変圧は、変化する負荷によって変化する。言い替えれば、電圧は、出力電力要求が増大すれば増大し、その逆もまた同様である。

【０１５８】

始動プロセスに関して上述のように、図２６には、内側の電流制御ループ２６０１と、振動子９０２への駆動波入力の振幅を独自に調整する外側の振幅制御ループ２６０２と、の２つの制御ループが示されている。電流制御ループ２６０１は、バッテリアセンブリ３

Petitioner Therabody Ex-1004, 1383

０１からプッシュ／プル式増幅器１０１０に入る電流を調整する。振幅制御ループ２６０２は、振動子および／又は導波管で生じる負荷差又はその他の変化を補償する。この目的を達成するため、振幅制御ループ２６０２は、上述したＤＣ－ＤＣ振動子の出力電圧を変化させるために電流制御ループ２６０１によって使用される所望の基準電流レベル「Ｉｒｅｆ」を発生させるために運動フィードバック信号を利用する。２つのループの間の干渉タイプの相互作用を避けるため、電流制御ループ２６０１は、振幅制御ループ２６０２よりも高い周波数、例えばおよそ３００ＫＨｚで作動する。振幅制御ループ２６０２は一般的に例えば２５０Ｈｚの周波数で作動する。

【０１５９】

所望の基準電流レベルＩｒｅｆを決定するため、現在の振幅値が、振幅パーセント誤差信号を生成するために所望の「目標振幅」から減算される。この振幅パーセント誤差信号は、その特定の時間に振動子９０２および導波管１５０２によって経験される作動状態に基づいて新しい所望の基準電流レベル「Ｉｒｅｆ」を生成するための振幅制御ループ２６０１のＰＩＤ制御アルゴリズムへの入力である。言い替えれば、振幅制御ループ２６０２は、パーセント誤差演算に基づいて所望の振幅に到達させるために電流制御ループ２６０１のＣＬＡ９１２の目標の又は基準の電流値を変化させる。このようにして、出力電力は、振動子９０２および導波管１５０２の可変の要求に基づいて変化させられる。バッテリコントローラ７０３の主プロセッサ１１１８は、最大出力電流値よりも大きくないかを保証するために新しい基準電流値を検証する。

【０１６０】

振幅制御ループ２６０２によって設定された新しい目標の又は基準の電流値Ｉｒｅｆに基づいて、電流制御ループ２６０１は、プッシュ／プル式増幅器１０１０に対する出力電圧および入力電流を変化させる処理に進む。バッテリパックの出力の実際の電流レベル２６０３の測定はバッテリマイクロコントローラ１１０６のＡＤＣ１１２０に供給される（図１１に示す）。ＣＬＡ１１１６は、ＡＤＣ１１２０からの値をとって、電流誤差信号を生成するために目標の又は基準の電流入力レベルＩｒｅｆからそれを減算する。上述のように、ＣＬＡ１１１６は、２位相バック振動子１１１４を駆動させるＰＷＭの新しいデューティサイクル値を算出するためにＰＩＤ制御アルゴリズムを使用する。ＣＬＡ１１１６はまた、出力電圧を制限するために最大ＰＷＭデューティサイクルを算出する。最大デューティサイクルを算出するためのアルゴリズムは、測定されたバッテリ電圧を使用し、バック振動子１１１４が連続して誘導モードで作動することを想定する。

【０１６１】

振幅を安定させるために電流を見ることのみではなく、振幅制御を利用することによって、本発明は、運動フィードバック信号に基づいて振動子の出力を微細に調節することを独自に可能にして、より正確な振幅制御を達成することに留意されたい。電流制御ループの使用は、振幅制御のみによっては可能とはならないであろう急速な最初の応答を可能にする。また、２つのループを有することによって、製造における振動子および発振器の冗長性および個別の較正を提供する。この「振幅較正係数」は、振動子／圧電結晶における電気的変動および機械的変動の決定と、発振器大きさフィードバックシステムの電気要素の変動の調節とにおいて重要である。発振器内において、アナログ／デジタル振動子を通じて、この較正係数を用いてフィードバック電圧を変換することにより、変位に直接関連する大きさ値が得られる。この較正プロセスにおいて、実際のシステム出力変位を測定しつつ、この較正値を調節する。この調節において、所与の振動子と発振器とを組み合わせることで、前記振動子および発振器がシステムとして適切な変位を発生させる。この値のデフォルト値は、調節された値において損失、欠陥または不慮の未プログラムが有った場合に備えて、安全機構として意図的に低く設定される。このようにして、デフォルト変位を目標よりも低くしておくことで、組織性能は低下するが有効な状態となる。このような較正スキームにより、製造が簡略化され、振動子および発振器の制御公差の負担が低下する。さらに、この較正は全てソフトウェアによって行われるため、振動子または発振器のいずれにおいても、物理的部品の調整は全く不要である。実際、２つの制御ループが、ハ

Petitioner Therabody Ex-1004, 1384

ードウェアの同調動作に振動周波数を提供する振動子への駆動波入力の振幅を調整するために使用される。冗長性は、装置が正確に作動することを保証するために有用である。１つのループの不良動作は、他のループが適切に作動することができずにいずれかのループの不適切な動作が通常は検出可能であるので、通常は検出可能である。不適切な動作はハードウェアの障害によって引き起こされ得る。両ループの適切な動作は電流および振幅の両方の測定を必要とする。異なるハードウェアが振幅および電流を測定するために使用される。一実施形態では、バッテリマイクロコントローラ１１０６が電流を測定し、ＴＡＧマイクロコントローラ１００６が振幅を測定する。振動子が高温になると、前記振動子のキャパシタンスおよび結合係数がシフトし、システムの変位が若干低下する。この温度変化は、周波数シフトと対応して発生する。周波数を監視することにより、オフセットを発生させて、頻繁な使用による変位をより緊密に制御することが可能となる。これは、始動時における周波数との比較または絶対周波数の参照により、達成することができる。あるいは、他の測定可能な振動子特性を用いてこのオフセットを制御することも可能である。あるいは、振動子内に注入されたエネルギー量を用いて、変化を推定し、前記変化を相応に調節することも可能である。

【０１６２】

ｂ．周波数制御

【０１６３】

始動プロセス中に実行される最初の周波数ロックと同様の動作では、発振器９０４の主プロセッサ９１４は、定常状態の動作中の共振周波数を維持するために運動フィードバック信号の位相に基づいて発振器９０４の運転周波数を調整するため、ＤＦＴ計算の結果を使用する。ブリッジ回路からの運動フィードバック信号は、振動子９０２および導波管１５０２の運動に比例するとともに同相である。運動フィードバック信号がプッシュ／プル式スイッチング増幅器１０１０の出力と同相である場合、システムは連続共振で作動する。また、運動フィードバック信号の位相および大きさは、離散型フーリエ変換（「ＤＦＴ」）を使用して演算される。ＤＦＴ演算のための位相基準は、プッシュ／プル式増幅器１０１０のための駆動信号である。周波数は、そこでプッシュ／プル駆動信号を運動フィードバック信号と同相であるようにするために単純に変更される。

【０１６４】

ＤＦＴ計算は、ＡＤＣサンプル時間間隔が出力周波数期間の正確な整数倍である場合に単純化されて、より正確になる。この技術は、本明細書では「コヒーレントサンプリング」として言及される。例示の一実施形態では、信号は出力サイクルごとに１２倍にサンプリングされ、その結果、ＣＬＡ９１２は超音波周波数の１２倍に運動フィードバック信号をサンプリングする。コヒーレントサンプリングでは、駆動信号の位相に対して同一の時間のポイントで発生する各々によってサイクル毎に正確に１２のサンプルがある。図９に示すように、ＡＤＣサンプルクロックは、ＴＡＧマイクロコントローラ１００６のシステムクロック９１６の内部に生成される。従って、コヒーレントサンプリングでは、システムクロック９１６は出力に同期されることが必要である。出力波形を生成する酸化膜電界効果トランジスタ（ＭＯＳＦＥＴ）を駆動するＰＷＭ信号は、システムクロック９１６から内部で生成される。本発明の例示の一実施形態はＤＤＳ１００８からシステムクロック９１６を生成する。有利なことに、出力周波数が変化すると、システムクロック９１６も変化する。

【０１６５】

ＭＯＳＦＥＴがオン又はオフにスイッチされた直後にサンプリングしないことが望ましい。これは、システムにある最大量のノイズがある時である。ＭＯＳＦＥＴがオン又はオフにされた直後のサンプリングを避けるためにサンプル時間をずらすことは、ＡＤＣサンプル上のトランジスタスイッチングノイズの影響を最小限に抑える。２つのＰＷＭの出力は、ＭＯＳＦＥＴの両方が決して同時に起動されないことを保証するために不感帯を採用する。

【０１６６】

Petitioner Therabody Ex-1004, 1385

Ｘ．簡潔な回路ブロック図

【０１６７】

図２７は、本発明の別の例示の電気関係の実施形態を示す簡潔な回路ブロック図であり、当該実施形態は、マイクロプロセッサ２７０２と、クロック２７３０と、メモリ２７２６と、電源２７０４（例えばバッテリ）と、スイッチ２７０６（例えばＭＯＳＦＥＴ電源スイッチ）と、駆動回路２７０８（ＰＬＬ）と、変圧器２７１０と、信号平滑化回路２７１２（整合回路としても言及され、例えばタンク回路であり得る）と、感知回路２７１４と、振動子９０２と、および、導波管１５０２として単純に本明細書で言及されて超音波切断刃１５２０で終端をなす導波管３０４と、を有している。

【０１６８】

高電圧（１２０ＶＡＣ）入力電力（すべての従来技術の超音波切断装置の特性）に応じて機能する本発明の１つの特徴は、波形成プロセスを通じた低電圧スイッチングの利用であり、および、変圧段階の直前のみの駆動信号の増幅である。この理由のため、本発明の例示の一実施形態では、電力は、ハンドルアセンブリ３０２内のいずれかに適合するのに十分に小さいバッテリのみから又はバッテリ群のみから引き出される。最新のバッテリテクノロジーは、高さおよび幅が数センチメートルで奥行き数ミリメートルの強力なバッテリを提供している。すべて組込式の自化動力の超音波装置を提供するために本発明の特徴を組み合わせることによって、カウンタートップボックス２０２の資本的支出は完全に排除され、その結果、製造コストを顕著に減少させる。

【０１６９】

バッテリ２７０４の出力はプロセッサ２７０２に供給されてプロセッサ２７０２に電力を供給する。プロセッサ２７０２は、以下に説明するように、信号を受信して信号を出力し、カスタム論理によって機能し、又は、プロセッサ２７０２によって実行されるコンピュータプログラムに従って機能する。装置２７００はまた、コンピュータ読み取り可能な命令およびデータを格納するメインメモリ２７２６、好適には、ランダムアクセスメモリ（ＲＡＭ）を有し得る。

【０１７０】

バッテリ２７０４の出力はまた、プロセッサ２７０２によって制御されるデューティサイクルを有するスイッチ２７０６に向けられる。スイッチ２７０６のオンタイムを制御することによって、プロセッサ２７０２は、振動子２７１６に最後に引き渡される電力の総量を決定することができる。例示の一実施形態では、スイッチ２７０６はＭＯＳＦＥＴであるが、他のスイッチおよびスイッチング構成が同様に適用可能である。スイッチ２７０６の出力は、例えば、位相検出ＰＬＬおよび／又はローパスフィルタおよび／又は電圧制御発振器を包含する駆動回路２７０８に供給される。スイッチ２７０６の出力は、出力信号の電圧および電流（図２７でＡＤ２　ＶＩｎおよびＡＤ３　ＩＩｎとしてそれぞれ符号を付けられる）を決定するためにプロセッサ２７０２によってサンプリングされる。これらの値は、スイッチ２７０６のパルス幅変調を調節するためにフィードバックアーキテクチャで使用される。例えば、スイッチ２７０６のデューティサイクルは、スイッチ２７０６からの所望の実際の出力に応じて、約２０％～約８０％で変動し得る。

【０１７１】

スイッチ２７０６から信号を受信する駆動回路２７０８は、スイッチ２７０６の出力を、例えば５５ｋＨｚの単一の超音波周波数（図２７でＶＣＯとして言及される）を有する電気信号に変換する発振回路を有している。上述のように、平滑化されたバージョンのこの超音波波形は、導波管１５０２に沿って共振正弦波を生成するために振動子９０２に最後に供給される。

【０１７２】

駆動回路２７０８の出力部には、低電圧信号を高電圧に上昇させることができる変圧器２７１０がある。変圧器２７１０に先立って、すべての上流側スイッチングは、これまで、超音波切断焼灼装置では可能ではなかった低（すなわちバッテリ駆動）電圧で実行されることに留意されたい。このことは、装置が低抵抗ＭＯＳＦＥＴスイッチング装置を有利

Petitioner Therabody Ex-1004, 1386

に使用する事実に少なくとも部分的に起因する。低抵抗ＭＯＳＦＥＴスイッチは、従来のＭＯＳＦＥＴ装置よりも少量のスイッチング損失および熱を生成するとともにより高い電流を通すので、有利である。従って、スイッチング段階（予変圧器）は、低電圧／高電流として特徴付けられ得る。増幅器ＭＯＳＦＥＴ（単数または複数）のオン抵抗を確実に低減するために、前記ＭＯＳＦＥＴ（単数または複数）を例えば１０Ｖで動作させる。このような場合、１０ＶＤＣ電源を別個に用いてＭＯＳＦＥＴゲートへ電力供給を行うことで、前記ＭＯＳＦＥＴを完全にオンにさせることができ、合理的に低いオン抵抗が達成される。本発明の例示の一実施形態では、変圧器２７１０は、バッテリ電圧を１２０ＶＲＭＳまで上昇させる。変圧器は、従来技術で公知であり、および従って、本明細書では詳細に説明しない。

【０１７３】

説明した図３～図１２、図１６～図２１および図２７に示す回路構成の各々では、回路構成要素の劣化は、全体の回路の性能に悪影響を与え得る。構成要素の性能に直接的に影響を与える１つの要因は熱である。公知の回路は一般に、スイッチング温度（例えばＭＯＳＦＥＴ温度）をモニタする。しかしながら、ＭＯＳＦＥＴの設計の技術革新的な進歩のため、および、対応したサイズの減少のため、ＭＯＳＦＥＴ温度はもはや、回路の負荷および温度の有効な指標ではない。この理由のため、例示の実施形態によれば、本発明は、感知回路２７１４によって変圧器２７１０の温度を検出する。この温度の検出は、変圧器２７１０は、装置の使用中にその最高温度で又はその付近で運転されるので有利である。追加の温度は、例えばフェライトのコア材料の故障を引き起こし、恒久的な損傷が発生し得る。本発明は、例えば、変圧器２７１０の駆動電力を減少させて、ユーザに信号を送信し、電源を完全にオフにし、電力をパルスで修正し、又は、他の適切な応答によって変圧器２７１０の最高温度に応答することができる。

【０１７４】

本発明の例示の一実施形態では、プロセッサ２７０２はエンドエフェクタ１１８に通信可能に連結されており、エンドエフェクタ１１８は、導波管１１４の刃部分１１６、例えば図１に示すクランプ機構に物理的に接触する材料を配置するために使用される。エンドエフェクタには、クランプ力の値（公知の範囲内にある）を測定するためにセンサが設けられており、受信したクランプ力の値に基づいてプロセッサ２７０２は運動電圧ＶＭを変化させる。設定された運動率と組み合わせた高い力値は高い刃の温度を招くので、温度センサ２７３６は、プロセッサ２７０２に通信可能に連結されることが可能であり、プロセッサ２７０２は、温度センサ２７３６からの刃の電流温度を示す信号を受信して解釈し、かつ、受信した温度に基づいて刃の運動の目標周波数を決定するように作動可能である。

【０１７５】

本発明の例示の一実施形態によれば、プロセッサ２７０２に連結されたＰＬＬ２７０８は、導波管の運動の周波数を決定して、プロセッサ２７０２に周波数を通信することができる。プロセッサ２７０２は、装置がオフにされる時にメモリ２７２６にこの周波数の値を格納する。クロック２７３０を読み出すことによって、プロセッサ２７０２は、装置がシャットオフされた後の経過時間を決定し、経過時間が既定の値未満である場合に導波管の運動の最後の周波数を回復させる。装置は、最後の周波数でその後始動し、その周波数はおそらく、電流負荷のために最適な周波数である。

【０１７６】

ＸＩ．バッテリアセンブリの機械的構造

【０１７７】

図２８は、ハンドルアセンブリ３０２から分離したバッテリアセンブリ３０１を示している。バッテリアセンブリ３０１は、図２８に示す例示の実施形態では、第１半部分２８０２ａおよび第２半部分２８０２ｂを有する外側シェル２８０２を有している。しかしながら、シェル２８０２は２つの同一の半部分を備える必要はない。本発明の一実施形態によれば、外側シェル２８０２が２つの半部分で提供される場合。第１半部分２８０２ａは、クラムシェル構成で第２半部分２８０２ｂに超音波で溶接されることが可能である。シ

Petitioner Therabody Ex-1004, 1387

ェル２８０２の２つの半部分を超音波で溶接することは、シェル２８０２内の構成要素と外部との間に「密閉」シールを提供する一方で、ガスケットを必要としない。本明細書で使用される場合、「密閉」シールは、汚染物質がシールの一方の側からシールの他方の側に運ばれないように、装置が導入される手術環境の滅菌フィールドから、区画（例えばシェル２８０２の内側）およびそこに配置された構成要素を十分に隔離するシールを示している。このシールは、少なくとも気密の、それによって、空気、水、蒸気相の過酸化水素の侵入を防止する。初回の組み立て時において、水分を含む室内の空気を全て筐体中に捕獲する。これは、電子機器筐体内において望まれる水分量よりも多くの水分が含まれることが多い。そのため、筐体内に乾燥システムを設けることで、２つの目的が達成される。すなわち、第１の主要な目的は、当該装置の寿命中に侵入し得る水分を吸収することである。前記乾燥システムのサイズを適切に設定した場合、前記乾燥システムは、組み立て時に捕獲された水分全てを吸収することができる。よって、乾燥システムを用いることにより、組み立てが簡易化され、いかなる特殊な環境下においても筐体を閉鎖する必要性が無くなる。

【０１７８】

図２８は、マルチリードバッテリ端子アセンブリ２８０４をも示しており、アセンブリ２８０４は、バッテリアセンブリ３０１内の構成要素をハンドルアセンブリ３０２の電気インターフェースに電気的に連結するインターフェースである。ハンドルアセンブリ３０２を通じて、バッテリアセンブリ３０１は、本発明のＴＡＧアセンブリ３０３に電気的に結合することができる。上述のように、バッテリアセンブリ３０１は、マルチリードバッテリ端子アセンブリ２８０４を通じて、本発明の超音波手術用焼灼アセンブリ３００、ならびに本明細書で説明する他の機能に電力を供給する。マルチリードバッテリ端子アセンブリ２８０４は、複数の接点パッド２８０６ａ～ｎを有しており、各々は、ハンドルアセンブリ３０２のドッキングベイ（図３４参照）によって提供される他の端子にバッテリアセンブリ３０１内の端子を別々に電気的に接続することができる。複数の接点パッド２８０６ａ～ｎに結合されるそうした電気的接続の一例は、電力および通信信号経路６０１ａ～ｎとして図６に示されている。マルチリードバッテリ端子アセンブリ２８０４の例示の実施形態では、１６個の異なる接点パッド２８０６ａ～ｎが示されている。この数は単に例示である。例示的実施形態において、バッテリ端子アセンブリ２８０４の内側において、成形端子ホルダ上に受け穴が形成されており、この受け穴中に埋め込み用材料を充填することで、気密シールを形成することができる。接点パッド２８０６ａ～２８０６ｎは、蓋部上に一体成形され、埋め込み受け穴を通じてバッテリ３０１内へと延びる。ここで、フレックス回路を用いてピンアレイを再構成することができ、回路基板への電気接続を提供することができる。図３０に示す例示的実施形態において、例えば４ｘ４アレイを２ｘ８アレイに変換する。

【０１７９】

図２９は、マルチリードバッテリ端子アセンブリ２８０４の下側の図である。この図では、マルチリードバッテリ端子アセンブリ２８０４の複数の接点パッド２８０６ａ～ｎが、対応の複数の内側接点ピン２９０６ａ～ｎを有していることが分かる。各接点ピン２９０６は、接点パッド２８０６の対応の１つに結合される直接電気結合を提供する。図２８および図３２は、バッテリケーシング内の２つの半球型凹部２８１０を示す。これらの２つの半球型凹部２８１０がフックフィーチャ３３０２と組み合わせられると、概して長手方向の空洞を用いてバッテリ３０１を充電器内に保持することが可能となる。このような幾何学的フィーチャは作製するのが容易であり、洗浄するのも容易であり、このような幾何学的フィーチャにより、バッテリ３０１をハンドル３０２から接続切断する際に通常用いられる解放機構が不要な様態で、バッテリ３０１を充電器内に捕獲するための簡単な様態が得られる。

【０１８０】

図２８～図３３に示す特定の実施形態では、マルチリードバッテリ端子アセンブリ２８０４は、シェル２８０２のクラムシェル半部分２８０２ａおよび２８０２ｂの間に埋め込

Petitioner Therabody Ex-1004, 1388

まれている。より具体的には、図２９は、バッテリアセンブリ３０１の第１シェル半部分２８０２ａの上側部分の内側に配置されたマルチリードバッテリ端子アセンブリ２８０４の図を示している。図に示すように、第１シェル半部分２８０２ａの上側部分は、マルチリードバッテリ端子アセンブリ２８０４の外周縁２９０４を受け入れる口部２９０２を形成する。

【０１８１】

図３０は、第１シェル半部分２８０２ａの口部２９０２内にマルチリードバッテリ端子アセンブリ２８０４が挿入された状態の第１シェル半部分２８０２ａの内側と、マルチリードバッテリ端子アセンブリ２８０４の接点ピン２９０６に結合された複数の接点パッド３００６を有する第１回路基板３００２とのさらなる図である。このような実施形態において、接点ピン２９０６はそれぞれ、回路基板３００２の各接点パッド３００６へ半田付けされる。本発明の例示の実施形態によれば、図３１に示すように、バッテリアセンブリ３０１は、第１回路基板３００２に加えてさらに回路基板３１０２および３１０４を有している。

【０１８２】

本発明の例示の一実施形態によれば、マルチリードバッテリ端子アセンブリ２８０４は、接点パッド２８０６ａ～ｎの図示の４×４配列を、１以上の回路基板３００２、３１０２、３１０４に結合される導電体の２つの１×８配列に変化させるフレックス回路を備えている。

【０１８３】

別の例示的実施形態において、フレックスコネクタを用いて１つ以上の回路基板３００２、３１０２および３１０４へ半田付けおよび接続する代わりに、カード縁部コネクタ１０７０１により、基板とマルチリードバッテリ端子アセンブリ２８０４との間の接続を図１０７に示すように得ることが可能である。図１０７は、マルチリードバッテリ端子アセンブリ２８０４の外面の傾斜曲率の下側のバッテリアセンブリ３０１のシェル半部分の断面図である。この例示的実施形態において、マルチリード端子アセンブリ２８０４の傾斜角度は、図４に示すものよりも大きい。例示目的のため、複数の内部接点ピン２９０６ａ～２９０６ｎのうち１つのみを示す。接点ピン２９０６の一端は、マルチリードバッテリ端子アセンブリ２８０４の本体内に埋め込まれる。接点ピン２９０６の他端は、「Ｓ」字形状の曲線状に形成され、これにより、前記接点ピンに対して一定の可撓性が付与され、内部溝部またはチャンネル１０７０２が接点ピンとマルチリードバッテリ端子アセンブリ２８０４の本体との間に形成される。接点ピン２９０６の「Ｓ」字形状部の本来の可撓性により、１つ以上の回路基板３００２、３１０２および３１０４のうち任意のいずれかを前記内部溝部またはチャンネル１０７０２内に容易に挿入することが可能になり、これにより、接点ピン２９０６と回路基板３００２、３１０２および３１０４の１つ以上のトレースとの間の直接的電気接続が確立される。この直接的接続を維持するために、カード縁部コネクタ１０７０４により回路基板を所定位置に固定し、これにより、接点ピン２９０６を回路基板へと半田付けする必要が全く無くなる。その結果、カード縁部コネクタ１０７０４の機能が、マルチリードバッテリ端子アセンブリ２８０４の下側と一体化される。よって、問題解決のために基板を取り外すのがより容易になり、半田付け部が無いため、製造も簡単になる。

【０１８４】

さらに、３つの回路基板以上又は未満が拡張機能又は限定機能を提供することが可能である。図３１に示すように、複数の回路基板３００２、３０１２および３１０４をスタック型アーキテクチャの様態で配置することができ、これにより、複数の利点が得られる。例えば、レイアウトサイズが小さくなるため、バッテリアセンブリ３０１内における回路基板の設置面積が低減し、その結果、より小型のバッテリが可能となる。加えて、この構成においては、電力基板をデジタル基板から隔離することが容易となるため、電力基板からのノイズに起因するデジタル基板への悪影響が回避される。また、スタック型構成により、基板間のフィーチャの直接的接続が可能となり、これにより、ワイヤの存在が低減す

Petitioner Therabody Ex-1004, 1389

る。さらに、回路基板を単一の剛性／フレックス／剛性回路の一部として構成することが可能となるため、剛性部分を「扇状に」より小さな体積内に配置することが可能となる。本発明の例示の実施形態によれば、各回路基板３００２、３１０２および３１０４は特定の機能を提供する。例えば、回路基板３００２は、図７に示すバッテリ保護回路７０２を実行する構成要素を提供することができる。同様に、回路基板３１０２は、図７に示すようにバッテリコントローラ７０３を実行する構成要素を提供することができる。回路基板３１０４は、例えば、高電力バックコントローラ構成要素を提供することができる。最後に、バッテリ保護回路７０２は、図７および図３１に示す電池７０１ａ～ｎを結合する接続経路を提供する。回路基板をスタック型構成において配置し、前記基板を各機能毎に分離することにより、前記基板を個々の基板のノイズおよび発熱に最良に対応するための特定の順序で戦略的に配置することが可能となる。例えば、高電力バックコントローラ要素を有する回路基板の場合、ほとんどの熱が前記基板から発生する。よって、このような回路基板をその他の基板から隔離し、スタック中央部に配置することができる。このようにすることで、前記装置の外面から熱を隔離して、前記装置の医師または操作者が熱を感じないようにすることができる。加えて、バッテリ基板接地をスタートポロジー状に構成することで、中心をバックコントローラ基板に配置して、接地ループから発生するノイズを低減することが可能となる。

【０１８５】

これらの戦略的にスタックされた回路基板と、回路基板からマルチリードバッテリ端子アセンブリへの低熱伝導率経路と、フレックス回路３５１６とは全て、前記装置の外面への熱到達の回避を支援するフィーチャである。電池およびバック要素は、ハンドル３０２内のフレックス回路３５１６（すなわち、前記装置の使い捨て部分）へ熱接続され、これにより、前記電池およびバック要素から発生した熱は、医師の手から遠位方向に進む。フレックス回路３５１６は、露出面積が大きくまた銅の伝導特性も高いため、比較的高い熱質量を示す。フレックス回路３５１６は、より広い面積上の熱を再方向付け、吸収および／または拡散させ、これにより、熱の集中が遅延され、装置外面上の高温部分が制限される。他の技術も実行可能である（例を非限定的に挙げると、より大型の熱ウエル、シンクまたは断熱材、金属コネクタキャップおよび装置のフレックス回路またはハンドル３０２内の銅の重量増加）。

【０１８６】

着脱可能なバッテリアセンブリ３０１の別の利点は、リチウムイオン（Ｌｉ）バッテリが使用された時に達成される。前述のように、リチウムバッテリは、複数の電池の並列構成で充電されるべきではない。このことは、電圧が特定のセルで増大すると、特定のセルは、他の低電圧電池よりも速く追加の充電を受け入れ始めるからである。従って、各電池は、その電池への充電が個別に制御され得るようにモニタされなければならない。リチウムバッテリが一群の電池７０１ａ～ｎから形成される場合、装置の外側から電池７０１ａ～ｎに延びる多数のワイヤ（第１のワイヤの範囲を超えて各電池のために少なくとも１つの追加のワイヤ）が必要とされる。着脱可能なバッテリアセンブリ３０１を有することによって、各電池７０１ａ～ｎは、例示の一実施形態では、露出した一連のセットを有し得るし、バッテリアセンブリ３０１がハンドルアセンブリ３０２の内側にない場合、各一連の接点は、外部の非滅菌のバッテリ充電装置の対応した一連の接点に結合され得る。別の例示の実施形態では、各電池７０１ａ～ｎは、バッテリ保護回路７０２が各電池７０１ａ～ｎの充電を制御して調整することができるようにバッテリ保護回路７０２に電気的に接続され得る。本発明のバッテリアセンブリ３０１には、バッテリアセンブリ３０１が予測寿命を越えて使用されるのを回避するための回路が設けられる。このような寿命期間は、電池のみによって決まるのではなく、外面によっても決まる（例えば、バッテリケーシングまたはシェルおよび上側接点アセンブリ）。このような回路について、例えば、使用回数、リチャージ回数、および製造カウントからの絶対時間について、以下にさらに詳細に説明する。

【０１８７】

Petitioner Therabody Ex-1004, 1390

ここで図３３を参照すると、本発明の少なくとも１つの追加の新規な特徴が明確に示されている。図３３に示すバッテリアセンブリ３０１は完全に組み立てられたバッテリアセンブリ３０１であり、２つの半部分２８０２ａおよび２８０２ｂ、ならびに埋め込まれたマルチリードバッテリ端子アセンブリ２８０４が、外部とバッテリアセンブリ３０１の内部との間の密閉シールを提供するように例えば超音波で溶接されている。密閉材料（例えば、光硬化接着剤またはエポキシ）を自動配分が可能なように、端子アセンブリ２８０４とシェル半分部２８０２ａおよび２８０２ｂとの間の空間は十分に広くなっている。前の複数の図に示されているが、図３３は本発明のキャッチ３３００を示しており、キャッチ３３００は、キャッチ３３００の真下にほぼ縦方向のボイド３３０２によって形作られるシェル２８０２の延在部分によって形成されており、両方がシェル２８０２の外側の上側部分に配置されている。キャッチ３３００は、図３４に示すハンドルアセンブリ３０２の下側バッテリドック３４０１内のレシーバ３４００に噛み合うように形作られている。

【０１８８】

図３５は、ハンドルアセンブリ３０２の下側を示しており、レシーバ３４００およびバッテリドック３４０１の改善された図を提供している。図３５から分かるように、レシーバ３４００は、（ハンドルシェル３５００によって形成される）バッテリドック３４０１から延びており、バッテリアセンブリ３０１のボイド３３０２に噛み合う、すなわち、嵌合するように形作られている。さらに、レシーバ３４００は、複数のハンドル接点ピン３５０４ａ～ｎを有するマルチリードハンドル端子アセンブリ３５０２に近接している。図３５に示す例示の実施形態では、マルチリードハンドル端子アセンブリ３５０２の各ハンドル接点ピンは、ばねタイプの接点ピンであり、圧縮されることが可能である一方で、圧縮力とは反対方向に所定量の力を発揮して、それによって、ハンドル接点ピン３５０４ａ～ｎと力を作用させる物体との間のプラスの電気的接続を維持する。さらに、マルチリードハンドル端子アセンブリ３５０２のハンドル接続ピン３５０４ａ～ｎは、ハンドル接続ピン３５０４ａ～ｎの各々が、マルチリードバッテリ端子アセンブリ２８０４の接点パッド２８０６ａ～ｎのそれぞれ１つに物理的に整列されるように、間隔を空けられている。

【０１８９】

本発明のハンドルアセンブリ３０２に本発明のバッテリアセンブリ３０１を連結するため、キャッチ３３００は、図３６に示すように、レシーバ３４００に接触し、バッテリアセンブリ３０１が、図３６から図３７に経過を示すように、ハンドルアセンブリ３０２に対して回転させられる。この明細書の図面に示す例示の実施形態に限定されないが、図３３～図３５に示すキャッチ３３００およびレシーバ３４００の物理的形状（特に、図３３に示す丸い角３３０５）によれば、バッテリアセンブリ３０１は、キャッチ３３００およびレシーバ３４００が相互に物理的に接触する限り、バッテリアセンブリ３０１がレシーバ３４００に接近していく角度に拘わらず、実質的にハンドルアセンブリ３０２に自身を整列させる。図３６に示す位置と図３７に示す位置との間のバッテリアセンブリ３０１の任意の回転によって、キャッチ３３００又はむしろボイド３３０２がレシーバ３４００上に自動的に着座する。このことは、滅菌野のユーザが、ハンドルアセンブリ３０２にバッテリアセンブリ３０１を容易に接続することができ、特に、接続の作業中に２つの部品を実際に見ずに接続することができる。

【０１９０】

本発明の例示の一実施形態では、図３５に示すように、マルチリードハンドル端子アセンブリ３５０２は、ハンドル接続ピン３５０４ａ～ｎを取り囲んで、ハンドル接続ピン３５０４ａ～ｎを支持するフレックス回路基板３５１４にシールされるガスケット３５１２を有している。例示の一実施形態では、ガスケット３５１２は、フレックス回路基板３５１４、フレックス回路またはハーネス３５１６（ＴＡＧアセンブリ３０３へと接続される）と、ハンドル接続ピン３５０４ａ～３５０４ｎとを含む剛性－フレックス回路の一部である。フレックス回路基板３５１４の一部は、可撓ハーネス３５１６の残余部に比べて相対的に固く又はより硬く作られ得る。ガスケット３５１２が、ハンドルアセンブリ３０２に対するバッテリアセンブリ３０１の接続中に圧縮される場合、ガスケット３５１２に隣

Petitioner Therabody Ex-1004, 1391

接するフレックス回路基板３５１４の剛性部分がガスケット３５１２を支持し、バッテリアセンブリ３０１がハンドルアセンブリ３０２に連結される時に大きな移動を伴わずにガスケット３５１２が圧縮されることを可能にする。マルチリードバッテリ端子アセンブリ２８０４およびマルチリードハンドル端子アセンブリ３５０２が併せて配置されると、図５９および図６０に示すように、マルチリードバッテリ端子アセンブリ２８０４の外周３３１２と、マルチリードハンドル端子アセンブリ３５０２のガスケット３５１２との間にシールが存在する。シールは、ガスケット３５１２の内部に湿気が浸透することを防止し、すなわち、マルチリードハンドル端子アセンブリ３５０２のハンドル接続ピン３５０４ａ～ｎ又はマルチリードバッテリ端子アセンブリ２８０４の接点パッド２８０６ａ～ｎに湿気が到達することを防止する。このような密閉方法の場合、接点ピンのうち補強材を通じて延びる部分のみをガスケットと反対側において絶縁するだけでよい。このような密閉方法は、以下にさらに詳細に説明するようにＴＡＧコネクタ５０１０上およびハンドル３０２上においても用いられる。このような構成により、可能な開口部全てを密閉しなくてもよい装置の製造が可能となり、これにより、コストおよび複雑性が低減する。

【０１９１】

本発明の例示的実施形態によれば、フレックス回路基板３５１４は、２つの銅トレース層によって構成される。これらの層は、ポリイミドによって分離および絶縁される。上述のように、フレックス回路基板３５１４の部分は、比較的より硬質に構成することができる。例えば、フレックス回路基板３５１４の特定の部分内に、フレックス回路基板３５１４に接着された補強材（例えば、ＦＲ－４補強材）を設けることができる。フレックス回路基板３５１４の部分に前記補強材を設けることで、使い捨てハンドルアセンブリ３０２内の要素を剛性保持するための機械的方法が可能となる。

【０１９２】

本発明の別の例示的実施形態によれば、ハンドルアセンブリ３０２の２つの本体半分部４５０３および４６０３の間において、狭い公差下において、ハンドルアセンブリ３０２間に剛性部が保持される。フレックス回路基板３５１４が水平方向に補強材１０９０２を有し、フレックス回路基板３５１４が図１０８に示すように垂直方向に遷移する箇所において、フレックス回路基板３５１４が（漸次的に遷移できない場合）損傷を受け得る。フレックス回路基板３５１４の剛性部（例えば、１０９０２）は、本体材料中のスロットまたはトラック１０８０４に設けるかまたはその内部に設けることが望まれる。よって、前記剛性部を全ての側部上にしっかりと保持するために、フレックス回路基板３５１４の部分１０８０６を、剛性部１０９０２から剥離した後にフレックス回路基板３５１４の端部に到達するように、設計する。この領域内には、接着材は配置されない。本発明の例示的実施形態によれば、フレックス回路基板３５１４のこのバッテリ側上（すなわち、バッテリ接点ピン２９０６ａ～２９０６ｎが突出する補強基板）において、カスタムコネクタが設けられる。このカスタムコネクタは、例えば、ＦＲ－４材料または成型プラスチックによって構成される。これを例えば図６０中に示す。前記成型プラスチックは、インサート成形金属接点を含んでもよいし、あるいは、前記接点を成型後に挿入した後、密閉目的のために埋め込んでもよい。その後、前記ＦＲ－４または成型プラスチックを接着材によりフレックス回路基板３５１４へと接着する。成型構成において、前記コネクタは、数行内に配置された剛性材料を有するように構成することができる。これらの剛性材料は、前記接点間またはさらにはグリッド材料間において隆起させることができ、これにより前記接点を機械的損傷から保護する。

【０１９３】

図５６に示して以下に詳細に説明するように、ハンドルアセンブリ３０２の剛性－フレックス回路は、ハンドルアセンブリのＴＡＧ電気コネクタ５６０２にハンドル接続ピン３５０４ａ～ｎを電気的に結合する。

【０１９４】

図３５をふたたび手短にに参照すると、ハンドルアセンブリ３０２のハンドル本体３５００は延在バッテリ固定部分３５０６を備えている。延在バッテリ固定部分３５０６は、

Petitioner Therabody Ex-1004, 1392

レシーバ３４００とは反対側のマルチリードハンドル端子アセンブリ３５０２の側にある。図３５に示すハンドル固定部分の特定の例示の実施形態は、バッテリハンドル固定プロセスを終了させる必要がない１対のボイド３５０８および３５１０を有していることに留意されたい。ここで図３８を参照すると、バッテリアセンブリ３０１の追加の特徴が示されている。この図では、１対のボス３８０２、３８０４が、バッテリアセンブリシェル２８０２の外側にあることを見ることができる。ボス３８０２、３８０４は、間隔を空けられて、ハンドル本体３５００の延在バッテリ固定部分３５０６のボイド３５０８、３５１０と噛み合うように位置決めされる。この噛み合い位置は図３７に示されている。図３８をさらに参照すると、ボス３８０２、３８０４の各々は、傾斜上側部分３８１６と、対向する鋭利な縁の底部分３８１８と、を備えていることが分かる。傾斜上側部分３８１６は、ボス３８０２、３８０４が、バッテリアセンブリ３０１がハンドルアセンブリ３０２に固定される時にハンドルアセンブリ３０２の延在バッテリ固定部分３５０６のボイド３５０８、３５１０に容易に滑り込むことを可能にする。鋭利な縁の底部分３８１８は、固定して、ボス３８０２、３８０４がハンドルアセンブリ３０２の延在バッテリ固定部分３５０６内に着座したままであることを可能にする。

【０１９５】

バッテリアセンブリ３０１の一方の側でのキャッチ３３００およびレシーバ３４００の間の噛み合いと、バッテリアセンブリ３０１の他方の側でのボス３８０２、３８０４およびボイド３５０８、３５１０のそれぞれの噛み合いとの組み合わせによって、ハンドルアセンブリ３０２に対するバッテリアセンブリ３０１の堅いしっかりとした取り付けが提供される（図３および図３７参照）。例示の実施形態では、２つのボス３８０２、３８０４は、実際には相互に離されて間隔を空けられている。この間隔は、バッテリアセンブリ３０１とハンドルアセンブリ３０２との間の取り付けの強度および安定性を向上させる。使い捨て部およびバッテリを面３５２０および３３０５においてそれぞれ重複させる（図３５および図３３に示す）ことにより、この安定性がさらに向上する。

【０１９６】

図３８はまた、バッテリアセンブリシェル２８０２の外側に連結される離脱機構３８０６を示している。離脱機構３８０６は、ボス３８０２、３８０４のようにバッテリアセンブリシェル２８０２の同じ外側内に形成される対応の１対の溝３８１０、３８１２によって固定されて溝３８１０、３８１２内にスライドする周縁３８０８を備えている。離脱機構３８０６と、バッテリケーシング２８０２ａおよび２８０２ｂとの間が緩く締結されており、これにより、滅菌前の洗浄のために、噛み合い部分間に水が流入できるようになっている。離脱機構３８０６の洗浄可能性を支援するために、穴部を付加することができる。例示的実施形態において、２つの楕円孔が設けられる。さらに、離脱機構３８０６の全縁部を曲線状にすることで、接触表面積を制限する。離脱機構３８０６のうちバッテリケーシングに対向する面の中央は凹状に切断され、これにより、さらに噛み合い表面積を低減する。離脱機構３８０６は、ボス３８０２、３８０４に対して前後移動するように作動可能な傾斜ノーズ領域３８１４を有しており、特に、図３８の実施形態では、離脱機構３８０６が上へ向かう方向にスライドさせられた時、ボス３８０２、３８０４の間に延びる。このノーズ３８１４はまた、バッテリアセンブリ３０１の接続時においてバッテリラッチを強制的に下降させ、様態から取り外す。離脱機構３８０６は、潤滑性を持ちかつ強靭な材料で構成される。このような材料は、低摩擦を可能にし、かつ、バッテリアセンブリ３０１（すなわち、装置の再利用可能部分）の長時間の使用に耐える。例えば、黒鉛および／または炭素繊維補強ＰＴＦＥなどの材料が適している。

【０１９７】

バッテリアセンブリ３０１は、図３７に示すように、ハンドルアセンブリ３０２に固定して連結されている場合、離脱機構３８０６は、ハンドルアセンブリ３０２から最も遠い溝３８１０、３８１２内の位置に残る。ユーザがハンドルアセンブリ３０２からバッテリアセンブリ３０１を取り外したい時、離脱機構３８０６は、ハンドルアセンブリ３０２に向かう方向に溝３８１０、３８１２内をスライドさせられる。このスライド動作は、バッ

Petitioner Therabody Ex-1004, 1393

テリアセンブリ３０１と延在バッテリ固定部分３５０６の最下位置との間の領域に傾斜ノーズ領域３８１４を進入させる。傾斜ノーズ領域３８１４が前進すると、延在バッテリ固定部分３５０６は、傾斜ノーズ領域３８１４を上がっていき、バッテリアセンブリ３０１から離れて曲がる。別様に説明すると、延在バッテリ固定部分３５０６は、マルチリードハンドル端子アセンブリ３５０２およびレシーバ３４００から離れて曲がる。顎部が閉鎖した状態においてバッテリアセンブリ３０１がハンドルアセンブリ３０２から不慮に解放されるリスクを無くすために、バッテリ離脱機構３８０６を被覆または保護するようにトリガ４６０６を構成する。よって、トリガ４６０６を完全に押圧された状態にしておくことで、バッテリ離脱機構３８０６は完全に被覆され、これにより、ユーザが離脱機構３８０６を作動させてバッテリアセンブリ３０１を解放することが無くなる。

【０１９８】

延在バッテリ固定部３５０６が所定の度合いにわたって曲がると、ボス３８０２および３８０４の底縁３８０２ａ～３８０２ｂはボイド３５０８および３５１０ともはや係合しておらず、バッテリアセンブリ３０１は、図３７に示す方向から図３６に示す方向に容易に回転させられ、最後に、ハンドルアセンブリ３０２から分離される。離脱機構３８０６は、もちろん、ハンドルアセンブリ３０２にバッテリアセンブリ３０１を固定するとともにハンドルアセンブリ３０２からバッテリアセンブリ３０１を離脱する機構のほんの一例である。離脱機構３８０６は、予期しない取り外しがめったに起きないという点で有利である。バッテリアセンブリ３０１を離脱するため、操作者は、ハンドルに向かって離脱機構３８０６を動かすと同時に、ハンドルアセンブリ３０２から離れるようにバッテリアセンブリ３０１を回転させる必要がある。これら２つの反対方向の力／作用は、それらが意図的に実行されなければ、同時に発生することはめったに起きない。これらの異なる力の適用はまた、手術中に使用位置と異なる位置にユーザの手があることを必要とする。そうした構成は、バッテリアセンブリ３０１およびハンドルアセンブリ３０２の不測の分離が発生しないことを実質的に保証する。

【０１９９】

本発明はまた、マルチリードハンドル端子アセンブリ３５０２およびマルチリードバッテリ端子アセンブリ２８０４の間に電気接続が形成される方法において従来技術の装置を超える顕著な利点を提供する。より具体的には、図３３を再び参照すると、マルチリードバッテリ端子アセンブリ２８０４の例示の実施形態では、１６個の接点パッド２８０６があることを見ることができ、接点パッド２８０６ａ～ｄは第１列３３０４を形成し、接点パッド２８０６ｅ～ｈは第２列３３０６を形成し、接点パッド２８０６ｉ～ｌは第３列３３０８を形成し、および、接点パッド２８０６ｍ～ｐは第４列３３１０を形成する。

【０２００】

同様に、図３４および図３５に示すように、マルチリードハンドル端子アセンブリ３５０２は、複数のハンドル接続ピン３５０４ａ～ｎ（１６個のピン３５０４ａ～ｎのうちの１２個のみが図３５の図に示されている）を有している。ハンドル接点ピンは、バッテリアセンブリ３０１がハンドルアセンブリ３０２に連結された時に各ハンドル接続ピン３５０４ａ～ｎが接点パッド２８０６の個々の１つと整列されるように形成される。従って、ハンドル接続ピン３５０４ａ～ｎはまた、図に示す特定の実施形態では、４つの列３４０４、３４０６、３４０８および３４１０に配置されている。

【０２０１】

バッテリアセンブリ３０１はハンドルアセンブリ３０２に取り付けられた時、キャッチ３３００はレシーバ３４００に最初に接触して配置され、バッテリアセンブリ３０１はその後、ボス３８０２、３８０４がそれぞれ延在バッテリ固定部３５０６のボイド３５０８、３５１０に係合するまで延在バッテリ固定部３５０６に向かって回転させられる。回転の１つの顕著な結果は、マルチリードハンドル端子アセンブリ３５０２およびマルチリードバッテリ端子アセンブリ２８０４の間の物理的／電気的接続が、バッテリ列３３０４およびハンドル列３４０４で始まって一度に一列、連続的に発生することである。

【０２０２】

Petitioner Therabody Ex-1004, 1394

本発明の例示の実施形態によれば、最初のバッテリ列３３０４はアースの接点パッドを有しており、最後のバッテリ列３３１０は少なくとも１つの電力接点パッドを有している。従って、マルチリードバッテリ端子アセンブリ２８０４およびマルチリードハンドル端子アセンブリ３５０２の間の最初の接触はアース接続であり、最後の接触は電力接続である。バッテリアセンブリ３０１の設置は、バッテリアセンブリ３０１のアース接点が、電力接続がなされた時にマルチリードハンドル端子アセンブリ３５０２の最後の列３４１０から離れた距離にあるので、スパークを引き起こさない。バッテリアセンブリ３０１が取り付け位置（図３７に示す）まで回転すると、各バッテリ列３３０４、３３０６、３３０８および３３１０は、各ハンドル列３４０４、３４０６、３４０８、３４１０にそれぞれ連続して接触するが、電力接点は、列が少なくとも１つのアース接点が接続された後にのみに接続される。言い替えれば、バッテリアセンブリ３０１がハンドルアセンブリ３０２に設置されると、バッテリアセンブリ３０１は、ハンドルアセンブリ３０２の任意の部分に任意の電力接点が接触する前に好都合にアースされ、従来技術の電源連結に対して顕著な利点がある。すべての公知の装置では、電力を供給する接点（例えば電気の本線）は、他の連結部に同時に連結され、又は、電気プラグの接近方向に応じてランダムに連結される。この従来技術の連結部は、スパーク又はアークを永続的な可能性として残している。しかしながら、本発明によれば、従来技術にあるスパーク又はアークの可能性を完全に排除する。

【０２０３】

さらに、本発明の例示の一実施形態によれば、ハンドル接続ピン３５０４ａ～ｎの第１列３４０４、第２列３４０６、第３列３４０８および最後の列３４１０のうちの任意の１以上のピンがバッテリ存在感知回路３１０４に連結される。特に、最後の列３４１０の接点のうちの１つが存在パッドとして使用される。バッテリ存在検出回路３１０４は、マルチリードハンドル端子アセンブリ３５０２のアースピンおよび存在ピンがマルチリードバッテリ端子アセンブリ２８０４に適切に接続されたことを検出した後、超音波手術用アセンブリ３００の作動を許可する。バッテリ存在検出パッドが、最後の列にのみある、すなわち、レシーバ３４００から最も遠い位置にある実施形態では、ハンドルアセンブリ３０２は、バッテリアセンブリ３０１が完全に固定して設置されるまで、すなわち、すべての接点が適切に接続されるまで、状態を変化／変更しない。この有利な特徴はアセンブリ全体の不適切な作動を防止する。同様に、バッテリアセンブリ３０１の接続を解除する時、最後の列３４１０は、ハンドル接続ピン３５０４ａ～ｎとの接続を解除する最初の列である。従って、装置は、ハンドルアセンブリ３０２からのバッテリアセンブリ３０１の欠如にすぐさま応答する。

【０２０４】

例示の実施形態では、バッテリ保護回路７０２すなわち燃料ゲージは、存在パッドをモニタして、ＴＡＧアセンブリ３０３内でマイクロプロセッサ１００６に電力を供給する前にアースに存在パッドが接続されるのを待つ。これをするため、もちろん、ＴＡＧアセンブリ３０３はハンドルアセンブリ３０２にも連結されなければならない。より具体的には、ＴＡＧアセンブリ３０３は、ハンドルアセンブリのＴＡＧ電気コネクタ５６０２に電気的に結合されなければならない。ＴＡＧアセンブリ３０３がハンドルアセンブリのＴＡＧ電気コネクタ５６０２に連結されて（例えば図３６および図３７参照）、バッテリアセンブリ３０１がマルチリードハンドル端子アセンブリ３５０２に適切に連結されると（例えば図３７に示す構成を参照）、バッテリアセンブリ３０１およびＴＡＧアセンブリ３０２の間の通信が発生する。そうした通信が確立された後、装置は使用の準備が整い、バッテリコントローラ７０３は、例えば、ハンドルアセンブリ３０２内のブザー８０２で表示トーンを発生させることによって、および／又は、ＬＥＤ９０６で視覚インジケータを生成することによって、ユーザに「使用準備完了」状態の信号を送信することができる。

【０２０５】

この通信を確立するための例示の一実施形態では、バッテリ保護回路７０２は、存在パッドに低電圧信号を周期的にパルスで送ることによって、バッテリアセンブリ３０１およ

Petitioner Therabody Ex-1004, 1395

びハンドルアセンブリ３０２の間の適切な接続の存在を検出する。バッテリ保護回路７０２は、アースへの接続のために存在パッドをモニタし、アースは、バッテリアセンブリ３０１が適切にハンドルアセンブリ３０２に接続されるとハンドルアセンブリ３０２によって提供される。しかしながら、バッテリアセンブリ３０１は体液にさらされたり、例えば洗浄中に水などの溶液中に浸水させられ得るので、アース状態が、存在パッドをアースに電気的に結合する溶液に起因するのみの場合、バッテリアセンブリ３０１がまるでハンドルアセンブリ３０１に適切に接続されたように、障害アース状態を検出しないことが好都合である。より詳細には、前記装置が殺菌および洗浄されている間、前記接点は、有限抵抗を有する電解質にさらされる。保護回路が設けられていない場合、前記回路がバッテリパックをオンにすることで、前記電解質の存在下において前記基板が起動される。高電流が、電圧エネーブルピン間からバッテリ接地へと流れ得る。この電流流れにより、金属イオンの運動が確立され、その結果、前記接点において孔食または電気的堆積が発生する。このような孔食または電気的堆積があると、電解質への短時間露出は前記接点の高腐食の原因となり、前記接点が使用不能となるため、望ましくない。別の望ましくない状況がバッテリ取り付け時に存在する。すなわち、適切なバッテリハンドル接点閉鎖が達成されると、マイクロコントローラによって感知される導電性ラインの抵抗は極めて低くなる。しかし、流体が存在する場合、より高抵抗が存在する。前記マイクロコントローラの感度は、このような高抵抗に起因して前記装置が起動するくらいの高感度である。

【０２０６】

この理由のため、本発明の実施形態は、存在パッドとアース（すなわち図９に示すＴＡＧアセンブリのＧＮＤ線）との間のインピーダンスをモニタする比較器を提供する。比較器は、インピーダンスが閾値インピーダンス未満である場合、すなわち、溶液のインピーダンス未満である場合のみにバッテリアセンブリ３０１が作動するように、存在パッドおよびアースの間の連結のインピーダンスと基準インピーダンスとを比較する。より詳細には、比較器回路は、基準電圧と、バッテリ存在接点がショート／接地または上記した有限抵抗の電解質のいずれかに晒された場合に発生する電圧とを比較する。前記発生した電圧が前記基準電圧と整合するような抵抗であった場合、バッテリがオンにされる。バッテリハンドル接触時に存在する流体に起因してバッテリパックがオンにならないように、前記基準電圧を調節する。ノイズおよびこの回路の高感受性に起因する不慮のオンを回避するために、前記比較器回路を高ヒステリシスと共に構成する。

【０２０７】

マルチリードハンドル端末アセンブリ３５０２の図示の設計は従来技術に対してさらなる利点を提供する。特に、図３９の拡大部分斜視図に示す本発明のハンドル接続ピン３５０４ａ～ｎは、マルチリードハンドル端末アセンブリ３５０２のハンドル接続ピン３５０４ａ～ｎがマルチリードバッテリ端末アセンブリ２８０４の接点パッド２８０６ａ～ｎに触れる接触領域から任意の異質の物質を除去することを保証する横方向の変位に加えて、物理的な接続を提供する。具体的には、図３９は、その静止して非接触状態の第１ハンドル接続ピン３５０４ａを示している。すなわち、ハンドル接続ピン３５０４ａは、図３９に示す本来の静止した形状に位置して保持するばね力を有している。しかしながら、マルチリードバッテリ端末アセンブリ２８０４がマルチリードハンドル端末アセンブリ３５０２に完全に噛み合った時、ハンドル接続ピン３５０４ａ～ｎは圧縮する。この圧縮状態が、例えば、図３９のハンドル接続ピン３５０４ｂおよび３５０４ｆによって示されている。

【０２０８】

接点パッド２８０６によってハンドル接続ピン３５０４ａ～ｎ上に作用する圧縮力は、電気接続を保持するために正圧を提供するのみならず、各ハンドル接続ピン３５０４ａ～ｎの接続面をピン３５０４の縦方向の大きさに対して距離Ｄにわたって移動させる。この距離Ｄは、第１ハンドル接続ピン３５０４ｅの接続面の頂部が、ピン３５０４ｅがその非圧縮状態にある時に存在するように示す第１垂直線３９０１によって図３９に示されている。第２垂直線３９０２は、隣接する第２ハンドル接続ピン３５０４ｆの接続面の頂部が

Petitioner Therabody Ex-1004, 1396

、ピン３５０４ｆが圧縮された時にあるように示している。２つの線の間の距離は、圧縮された時に各ピン３５０４ａ～ｎの接続面が並進する縦方向距離Ｄを規定している。この移動は、図４０の切断斜視図に示すように、ハンドル接続ピン３５０４ａ～ｎとそれぞれの接点パッド２８０６とが最初に接触して、バッテリアセンブリ３０１がレシーバ３４００および延在バッテリ固定部分３５０６の間に完全に着座するまで接触し続ける時に開始される。ハンドル接続ピン３５０４ａ～ｎの並進移動は、接点パッド２８０６を効率的にきれいに拭うたたく動きを生成し、従って、その間の電気接続を向上させる。このたたく効果は、例えば、バッテリが手術環境において交換される必要がある場合、かつ、例えば血液などの汚染物質が、接点パッド２８０６に接触した場合、又は、パッドが繰り返しの使用から若しくは洗浄剤に曝されることによって腐食した場合、非常に有利であることを証明することができる。

【０２０９】

図３５は、本発明のさらに別の有利な特徴を示している。図３５から分かるように、マルチリードハンドル端子アセンブリ３５０２において、フランジ側３５２０により、ハンドルアセンブリ３０２のハンドル接続ピン３５０４ａ～ｎが左側および右側から保護される。なぜならば、フランジ側３５２０は、ピン３５０４ａ～ｎの面から遠位方向に延びるからである。レシーバ３４００もピン３５０４ａ～ｎの面から遠位方向に延び、これにより前記ピンを後部から保護する。最後に、バッテリ固定部３５０６は、ピン３５０４ａ～ｎの面から遠位方向において大きく延び、これにより、前記ピンを前部から保護する。バッテリパック３０１およびハンドル３０２は人間工学的形状をしているため、ユーザは、図３６および図３７に明示するようにバッテリパック３０１がハンドル３０２の特定の面に取り付けられるように構成されていることが分かる。そのため、下側バッテリドック３４０１のこれら４つの伸長側のサイズを、ユーザがバッテリ３０１をドック３４０１に挿入しようとした際にピン３５０４ａ～ｎに損傷が発生しないようなサイズにする。これをより詳細に示すと、２つの面が規定され、そのうち１つはバッテリ３０１用であり、他方はハンドル３０２用である。これらの面は、図３を含むページに対して平行であり、バッテリ３０１がハンドル３０２中に取り付けられた際に同一平面上に来る。ハンドル３０２に関連する面を遠位／近位中央ハンドル面と呼び、図３のページとのようにハンドルを垂直方向に二等分する。同様に、バッテリ３０１に関連する面を遠位／近位中央バッテリ面と呼び、図３のページのようにハンドルを垂直方向に二等分する。これらの規定された面により、ピン安全フィーチャが説明される。

【０２１０】

レシーバ３４００およびバッテリ固定部３５０６の形状は、遠位／近位中央バッテリ面が遠位／近位中央ハンドル面から約３０度以内にある際、長さにより、バッテリの前方上側角部３００８がピン３５０４ａ～ｎと接触しないような形状である。同様に、レシーバ３４００およびバッテリ固定部３５０６の形状は、遠位／近位中央バッテリ面が遠位／近位中央ハンドル面から約３０度以内にある際、長さにより、バッテリ３０１の後方上側角部（すなわち、キャッチ３３００）がピン３５０４ａ～ｎと接触しないような形状である。このような構成により、バッテリ３０１からハンドル３０２への接続が確実に安全かつ容易となる。

【０２１１】

本発明のさらなる利点は、バッテリアセンブリ３０１の全体が滅菌され得ることである。医療処置中に交換の必要がある場合、バッテリアセンブリは、新しい滅菌されたバッテリアセンブリと容易に交換されることが可能である。バッテリアセンブリ３０１の気密構造は、例えば、ステリスコーポレーション（Ｓｔｅｒｉｓ　Ｃｏｒｐｏｒａｔｉｏｎ）によって製造されて商品名Ｖ－ＰＲＯで参照される滅菌装置によって実行されるような、又は、エティコンインコーポレーテッド（Ｅｔｈｉｃｏｎ，Ｉｎｃ．）のディヴィジョンであるアドバンストスターライゼーションプロダクツ（Ａｄｖａｎｃｅｄ　Ｓｔｅｒｉｌｉｚａｔｉｏｎ　Ｐｒｏｄｕｃｔｓ　ＡＳＰ）、ジョンソンアンドジョンソン（Ｊｏｈｎｓｏｎ　＆　Ｊｏｈｎｓｏｎ）社によって製造されてＳＴＥＲＲＡＤ（登録商標）の商品名

Petitioner Therabody Ex-1004, 1397

で参照される滅菌装置によって実行されるように、低温の気相過酸化水素（H_2O_2）を使用して滅菌されることが可能である。バッテリアセンブリ３０１のリチウム電池は６０℃より高温で加熱されると損傷を受けるので、今日病院で一般的に使用されている非加熱滅菌が手術環境で容易にバッテリアセンブリ３０１を再使用可能にする。

【０２１２】

ａ．バッテリ圧力弁

【０２１３】

本発明のバッテリアセンブリ３０１はさらに別の本発明の特徴を有している。図３７に示すように、バッテリアセンブリ３０１は、以下に説明するように、バッテリアセンブリの内圧に対する正および負の両方の外圧の影響を回避する一方で、例えば３０ｐｓｉより大きく緊急の過度の内圧の解放を提供する、圧力弁３７０２を有している。この弁３７０２は、内部に蓄積したあらゆる気体を迅速に吐き出すために十分に大きな開口を有利に有している。また有利なことには、本発明の弁３７０２は、いくつかの従来技術の通気装置がそうするように、圧力の小さな変化によって同時に開閉しない。代わりに、弁３７０２の開閉の事象はいくつかの規定の段階を有している。弁３７０２の例示の構成では、第１段階（＜３０ｐｓｉ）中、弁３７０２は、図４１および図４２に示すように、シールされたままであり、バッテリ区画内への又は外への気体の流通を許容しない。この例示の実施形態はいわゆるポペット弁として言及され得る。段階２では、図４２の切断図に示す、弁シート４２０２に対してポペット４１０６を取り囲むＯリング４１０４を保持するばね４１０２の力に対抗する程度に十分にバッテリアセンブリの内圧が増大すると、流体／気体が、Ｏリング４１０４およびシート４２０２の間を漏れ出し始める。段階３では、内圧は、流体／気体のかなりの量がシール４１０４、４２０２を通過することができる程度に十分に弁３７０２を押し開く。この時点で、段階４まで、内圧は弁を完全に開かせ、すなわち、Ｏリング４１０４はシート４２０２を完全に移動させる。追加の圧力は、弁がさらに開くことができないので、流れへの影響を減少させる。

【０２１４】

段階５では、弁３７０２上の圧力が減少し始めるとともにポペット４１０６が閉じ始める。ポペット４１０６が後退すると、ポペット４１０６は、ヒステリシスを通じて開く間に生じるものと同じシーケンスを辿る（すなわち、本体上に力が作用する時の作用の遅延が変更され、閉じる際の遅延の命令が発生する）。その結果、ポペット４１０６がその復帰を開始する時、ポペット４１０６が開かれる時に横切る図４４の曲線に対して定位置に遅れていく。段階６では、Ｏリング４１０４はシート４２０２にちょうど触れる。Ｏリング４１０４をシート４２０２内に押す力はないので、弁はこのポイントでシールしない。段階７で、ばね４１０２の力は、弁を閉じてシールするために十分な力でＯリング４１０４を圧縮する。弁３７０２は、図４１および図４２に示すように、ここで段階１に復帰する。摩擦を最小化できるように密閉表面がテーパー状となっているため、弁３７０２を複数回密閉することが可能である。

【０２１５】

弁３７０２の試験を容易にするために、ポペット４１０６は、切り取りハンドル４１０８と共に形成される。ハンドル４１０８を動作させると、（手動でまたは自動で）ポペット４１０６を移動させることができ、これにより、超音波溶接または接合シェル半分部２８０２ａおよび２８０２ｂに漏れが無いか検査する目的のために、バッテリアセンブリ３０１内へのアクセスが可能となる。例えば、ユーザまたは漏れ検査器具がハンドル４１０８を把持し、ポペット４１０６を弁ドック４２０４内から移動させ弁ドック４２０４内へと戻すことができる。弁ドック４２０４がバッテリアセンブリ３０１の外側シェル２８０２ａまたは２８０２ｂの半分内に配置された様子を図４１および図４２に示す。あるいは、ハンドル４１０８を用いて、バッテリアセンブリ３０１内部へアクセスして、バッテリ区画中に不活性ガスまたはトレースガス（例えば、ヘリウム）を充填するかまたはさらにはバッテリアセンブリ３０１の内部から真空引きを行うことが可能である。検査終了後、ユーザ（例えば、製造業者）は、ハンドル４１０８を切り取りかまたは取り外すことで、

Petitioner Therabody Ex-1004, 1398

ポペット４１０６がさらにユーザによって制御されるのを回避する。ハンドル４１０８の取り外しは、ハンドル４１０８の基部に形成された狭窄部４１１０により、より容易になされる。例えば、図４１～図４３に示す狭窄部４１１０は、一貫しかつ円滑な切断点を得るための鋭角部を含む。

【０２１６】

この例示的実施形態において、ハンドル４１０８は、矢じり形およびタブを用いた構成を有する。図４１～図４３に示すように、ポペット４１０６は、ポペット４１０６の少なくとも１つの側部上にクロッキングタブ４１１２を含み、これにより、矢じり形を所望の方向に（例えば、超音波手術用アセンブリ３００の利用時において地面に対して水平方向に）維持し、これにより、漏れ検査時におけるバッテリアセンブリ３０１の内部への機械アクセスまたは自動アクセスが促進される。この矢じり形状は、緩いテーパー形状を含み、これにより、Ｏリング４１０４の取り付けが支援される。すなわち、矢じり形タブを破断させることなく、テーパー状矢じり形状上にＯリング４１０４を容易にスライドさせることが可能になる。

【０２１７】

例示的実施形態において、Ｏリング４１０４は、デュロメータがおよそ４０～およそ６０（例えば、ＶＩＴＯＮ（登録商標））であるＳＴＥＲＲＡＤ（登録商標）適合材料によって構成される。なぜならば、このような材料は、不規則な表面仕上げを有する成形部品上においてより高い信頼性を以て密閉するからである。

【０２１８】

別の例示的実施形態において、ポペット４１０６は、バッテリシェル２８０２と異なる材料で形成されており、これにより、バッテリシェル半分部２８０２ａおよび２８０２ｂの超音波溶接時における共鳴溶接を回避する。

【０２１９】

図３７に示すように、弁３７０２は、バッテリアセンブリ３０１の最下部に有利に配置される。この例示的構成において、ハンドグリップの作業領域（すなわち、バッテリ外側シェル２８０２）の外部において弁３７０２が残留しており、これにより、ユーザによる超音波手術用アセンブリ３００の取扱との干渉が回避される。さらに、このように弁３７０２を配置することにより、弁３７０２を通じた通気発生時におけるユーザの手の損傷が回避されるため、安全性が増す。これと同時に、ユーザの手により弁３７０２の通気が妨げられることが無くなる。

【０２２０】

また、有利なことに、弁３７０２は清浄が容易である。ポペット４１０６の外面が平滑になっているため、Ｏリング４１０４のシール部分へ直接アクセスすることが可能になる。同様に、ポペット４１０６における機能は平滑に混合されているため、どろや汚れがはまり込む原因となる隠蔽部分が無くなる。

【０２２１】

本発明のバッテリアセンブリ３０１は、上述の弁３７０２の代替として用いられる新規なフィーチャを含み得る。１つの例示的実施形態において、バッテリアセンブリ３０１は、シェル半分部２８０２ａおよび２８０２ｂのうちの１つの下側内のバッテリアクセス穴部またはリリーフポート内に取り付けられた図示されないバーストプラグを含み得る。この例示的構成において、前記バーストプラグは、成形可撓性材料から形成され、前記アクセス穴部内へと押圧することが可能である。あるいは、前記バーストプラグを前記バッテリアクセス穴部の内部に成形してもよい。取り付けられたバーストプラグは、バッテリシェル２８０２の外面と同一平面上になり、これにより、泥または汚れの集合またはユーザの手との干渉が回避される。前記バーストプラグにより、過度の内圧（例えば、＞３０ｐｓｉ）に対する緊急圧力除去が可能となる。このような過度の内圧があると、バーストプラグがバッテリリリーフポートから外れ、内部の集積ガスが全てすぐに通気される。この例示的実施形態において、成形バーストプラグの内側端部上のＴテイルにより、手術処置時においてバーストプラグがバッテリアセンブリ３０１から外れて紛失するかまたは患者

Petitioner Therabody Ex-1004, 1399

体内に落下する可能性が無くなる。さらに、前記Ｔテイルによりバーストプラグがバッテリへと保持されているため、懸垂状態のバーストプラグは、バッテリアセンブリ３０１内において悪条件が発生したことを示すユーザにとって有利な視認用インジケータとなる。

【０２２２】

別の例示的実施形態において、バッテリアセンブリ３０１は、バーストディスクを含み得る。前記バーストディスクは、シェル半分部２８０２ａおよび２８０２ｂのうちの１つの下側内のバッテリアクセス穴部またはリリーフポート上に取り付けられる。この例示的実施形態において、前記バーストディスクは、前記バッテリリリーフポート上に配置されたフォイルテープディスクまたは既知のせん断特性を有するディスク材料を含み得る。前記ディスクは、前記バッテリリリーフポート上において所定位置に超音波溶接、接合または他の様態で密封することが可能であり、これにより、噴出軽減弁として機能する。有利なことに、前記リリーフポートは、多数の小型開口部によって構成されたアレイまたはグリッドを含み得る。このような構成により、外部機械的測定手段から不意にディスクが破断する事態が回避される。

【０２２３】

さらに別の例示的実施形態において、バッテリアセンブリ外側シェル２８０２のシェル半分部２８０２ａまたは２８０２ｂのうちの１つは、成形噴出または軽減領域を含み得、この領域において、外側シェル半部分２８０２ａまたは２８０２ｂの成形材料が外側シェル２８０２の残り部分よりも特に肉薄になっている。このように、外側シェル２８０１の軽減領域は、事前規定された望ましくない圧力がバッテリアセンブリ３０１の内部に到達した場合に崩壊するように設計されている。さらに、パターン（例えば、花びらパターン）を、シェル半分部２８０２ａまたは２８０２ｂのうちの１つの成型面上に設けることで、さらなる応力集中部が得られ、また、圧力除去発生後の花びら紛失を回避するためのヒンジ機能も得ることができ、これにより、崩壊したシェル２８０２の成型材料の破片が前記バッテリアセンブリ３０１から患者体内へと落下する事態を回避する。

【０２２４】

さらに別の例示的実施形態において、バッテリアセンブリ３０１は、ターキーポッパー弁に類似する圧力除去構成を含み得る。ポペット弁３７０２に関して上述のような自己再配置弁を設ける代わりに、バッテリアセンブリ３０１内の過度の内圧が放出された後、前記ターキーポッパー弁を作動位置に保持する。その結果、バッテリ内に悪条件が存在することをユーザに示すための視認用インジケータが得られる。この構成において、前記ターキーポッパー弁を選択的に再配置することができ、これにより、バッテリアセンブリ３０１をさらに利用することが可能になる。

【０２２５】

ｂ．スマートバッテリ

【０２２６】

本発明のさらなる例示の実施形態では、超音波手術用焼灼アセンブリ３００に電力を供給するためにスマートバッテリが使用される。しかしながら、スマートバッテリは、超音波手術用焼灼アセンブリ３００に限定されるものではなく、説明したように、相互に変化する電力要求（すなわち、電流および電圧）を有する又は有しない様々な装置に使用されることが可能である。本発明の例示の実施形態によれば、スマートバッテリは、電気的に結合される特定の装置を有利に識別することができる。これは、暗号化された又は非暗号された識別方法を通じてなされる。例えば、図５７に示すバッテリアセンブリ３０１は例えば部分５７０２などの接続部分を有し得る。ハンドルアセンブリ３０２は、マルチリードハンドル端末アセンブリ３５０２に通信可能に連結されるとともにハンドルアセンブリ３０２に関する情報の少なくとも一部分を通信するために作動可能な装置識別子５７０４を備え得る。この情報は、ハンドルアセンブリ３０２が使用された回数、ＴＡＧアセンブリ３０３（現在ではハンドルアセンブリ３０２に接続されている）が使用された回数、導波管アセンブリ３０４（現在ではハンドルアセンブリ３０２に接続されている）が使用された回数、ハンドルアセンブリ３０２に現在接続されている導波管アセンブリ３０４のタ

Petitioner Therabody Ex-1004, 1400

イプ、ハンドルアセンブリ３０２に現在接続されているＴＡＧアセンブリ３０３のタイプ又は同一性、又は多くの他の特性、に関する。スマートバッテリアセンブリ３０１がハンドルアセンブリ３０２に挿入された時、スマートバッテリアセンブリ３０１内の接続部分５７０２は、ハンドルアセンブリ３０２の装置識別子５７０４と通信する。ハンドルアセンブリ３０２は、ハードウェア、ソフトウェア又はその組み合わせを通じて、（自己始動によって、又は、バッテリアセンブリ３０１からのリクエストに応じて）スマートバッテリアセンブリ３０１に情報を伝送する。この通信された識別子は、スマートバッテリアセンブリ３０１の接続部分５７０２によって受信される。例示の一実施形態では、スマートバッテリアセンブリ３０１が情報を受信すると、通信部分５７０２は、装置の特定の電力要求に合致させるためにバッテリアセンブリ３０１の出力を制御するように作動可能である。

【０２２７】

例示の一実施形態では、通信部分５７０２は、例えばプロセッサ１１１８などのプロセッサと、別個の又は単一の構成要素であり得るメモリと、を有している。メモリと協働するプロセッサ１１１８は、手持ち式超音波手術用焼灼アセンブリ３００の情報処理による電力運用を提供することができる。この実施形態は、例えば手持ち式超音波手術用焼灼アセンブリ３００などの超音波装置が、手持ち式超音波手術用焼灼アセンブリ３００に固有であり得る電力要求（周波数、電流および電圧）を有するので、特に有利である。実際には、手持ち式超音波手術用焼灼アセンブリ３００は、導波管１５０２の所定の寸法又はタイプに対する特定の電力要求又は制限と、異なる寸法、形状および／又は構成を有する導波管の第２のタイプに対する第２の異なる電力要求を有し得る。

【０２２８】

従って、本発明に係るスマートバッテリ３０１は、単一のバッテリアセンブリを複数の手術装置の間で使用することを可能にする。スマートバッテリ３０１が、いずれの装置に取り付けられたかを識別することができ、従ってその出力を変化させることができるので、スマートバッテリ３０１を利用する様々な異なる手術装置の操作者が、使用される電子装置内に実装しようとする電源について何ら心配する必要はない。このことは、複雑な手術処置の真っただ中でバッテリアセンブリが別の手術用装置と交換または相互交換される手術環境において、特に有用である。

【０２２９】

さらなる例示の実施形態では、スマートバッテリ３０１は、特定の装置の使用ごとの記録をメモリ５７０６内に格納する。この記録は、装置の有用な又は許容される耐用年数の限度を評価するために有用である。例えば、装置が２０回使用されると、装置に接続されたすべてのそうしたバッテリ３０１は、装置が「もはや頼りにならない」手術器具として示されるので、そこへの電力供給を拒絶する。信頼性は複数の要因に基づいて決定される。１つの要因は摩耗であり得、複数の方法で推定することが可能である（例えば、当該装置が使用または起動された回数）。所定の回数の使用後、装置の部品は摩耗して、部品同士の間の許容差が限度を超え得る。例えば、スマートバッテリ３０１は、ハンドルアセンブリ３０２によって受け入れられたボタンの押し込みの回数を検出することができ、ボタンの押し込みの最大回数が満たされるか又は最大回数を超えた時を特定することができる。スマートバッテリ３０１は、例えば、ハンドルが例えば塩分によって汚染された場合に変化し得るボタン機構のインピーダンスをモニタすることができる。

【０２３０】

この摩耗は、処置中の受け入れがたい失敗につながり得る。いくつかの例示の実施形態では、スマートバッテリ３０１は、装置内に一緒にいずれの部品が併用されたか、および、各部品が経た使用回数さえも認識することができる。例えば、図５７を見ると、バッテリアセンブリ３０１が本発明に係るスマートバッテリである場合、バッテリアセンブリ３０１は、ユーザが複合装置の使用を試みる十分に前にハンドルアセンブリ３０２および超音波切断刃および導波管アセンブリ３０４の両方、ならびに特定のＴＡＧアセンブリ３０３を識別することができる。スマートバッテリ３０１内のメモリ５７０６は、例えばＴＡ

Petitioner Therabody Ex-1004, 1401

ＧアセンブリＳＯＳが作動されるたびに記録することができる。各ＴＡＧアセンブリＳＯＳが個別の識別子を有している場合、スマートバッテリＳＯＬは、各ＴＡＧアセンブリＳＯＳの使用の経過を保持することができ、ハンドルアセンブリＳＯＴ又はＴＡＧアセンブリＳＯＳがその最大使用回数を超えたらそのＴＡＧアセンブリＳＯＳに電力を供給することを拒絶することができる。ＴＡＧアセンブリＳＯＳ、ハンドルアセンブリＳＯＴ、超音波切断刃および導波管アセンブリＳＯＵまたは他の構成要素は、この情報を同様に記録するメモリチップを有し得る。このようにして、任意の数のスマートバッテリＳＯＬが、任意の数のＴＡＧアセンブリ、ステープラー、血管シーラーなどとともに使用されることが可能であり、総使用回数、又は、総使用時間（クロックＳＯＣの使用を通じて）、又は、各ＴＡＧアセンブリ、各ステープラー、各血管シーラーなどの作動等の総回数、又は、充電又は放電周期を依然として特定することができる。

【０２３１】

ＴＡＧアセンブリＳＯＳの寿命を知的に終了させるためにＴＡＧアセンブリＳＯＳの使用回数を計数する際、手術処置におけるＴＡＧアセンブリＳＯＳの実際の使用の完了と、例えばバッテリ変更または手術処置時における一時的遅延に起因するＴＡＧアセンブリＳＯＳの一時的な作動停止とを正確に区別することが重要となる。そのため、ＴＡＧアセンブリＳＯＳの起動回数を単純に計数する方法の代替的方法として、リアルタイムクロック（ＲＴＣ）回路を用いることができ、これにより、ＴＡＧアセンブリＳＯＳが実際にシャットダウンされた時間の長さを記録することが可能になる。測定された時間の長さから、適切な論理を通じて、１回分の実際の使用の終了として当該シャットダウンが十分に長いか否かまたは１回の使用の終了時において当該シャットダウンが短すぎるか否かを決定することが可能になる。よって、いくつかの用途において、この方法により、単純な「起動ベースの」アルゴリズムの場合よりも、ＴＡＧアセンブリＳＯＳの寿命をより正確に決定することが可能になる。なぜならば、単純な「起動ベースの」アルゴリズムの場合、単一の手術処置において例えば「起動」が１０回行われたとの判定が発生し得、そのため、１０回の起動でもカウンターは１だけインクリメントすべきである場合があるからである。一般的に、この種の内部クロッキングシステムにより、単純な「起動ベースの」アルゴリズムを欺くように設計された装置が誤用される事態が回避され、また、合理的理由に起因して必要となったＴＡＧアセンブリＳＯＳまたはバッテリＳＯＬの単純な分解のみが行われた場合において完全な利用の不正確なロギングが回避される。

【０２３２】

当該装置のバッテリおよびＴＡＧアセンブリは再利用可能であるが、当該装置の使用回数を有限に設定することが望ましい。清浄および滅菌時において当該装置が厳しい条件に晒されることがあるため、このような設定が必要になり得る。より詳細には、前記バッテリパックは、滅菌されるように構成される。外面に用いられる材料に関係無く、実際の使用材料の予測寿命には上限がある。このような寿命は、多様な特性（例えば、当該パックが実際に滅菌された回数、当該パックが製造されてからの時間、および当該パックが再充填された回数）によって決定される。また、電池そのものの寿命も上限がある。本発明のソフトウェアは、ＴＡＧおよびバッテリアセンブリ双方における使用回数を確認し、この使用回数に到達した場合またはこの使用回数を越えた場合、前記装置をディセーブルする新規なアルゴリズムを組み入れる。これらの可能な滅菌方法それぞれにおける外部バッテリパックの分析を行うことができる。最も厳しい滅菌処置に基づいて、許容される最大滅菌回数を決定することができ、この回数をバッテリアセンブリＳＯＬのメモリに保存することができる。充電器が非滅菌状態であり、バッテリパックＳＯＬを充電後に使用すべきであると推定された場合、当該パックに行われた滅菌回数と等しいものとして充電カウントを規定することができる。

【０２３３】

バッテリパック内のハードウェアを永久にディセーブルすることで、ソフトウェアによってパックが無効にされた後の電池からの連続的放電に起因する安全性の問題を最小化またはゼロにすることが望ましい。特定の低電圧条件下において、バッテリの内部ハードウ

Petitioner Therabody Ex-1004, 1402

ェアがバッテリを無効にすることができない状況があり得る。このような状況においては、例示的実施形態において、充電器を用いて当該バッテリを「殺す」ことができる。バッテリが充電器内にあるときはバッテリマイクロコントローラはオフとなっているため、不揮発性のＳＭＢｕｓベースのＥＥＰＲＯＭを用いて、バッテリマイクロコントローラと充電器との間で情報のやりとりを行うことができる。よって、シリアルＥＥＰＲＯＭを用いて、バッテリマイクロコントローラがオフであるときも書き込みおよび読み出しが可能な情報を保存することが可能となる。このようにすると、充電器または他の周辺装置との情報のやりとりを試みる際に極めて有用である。この例示的ＥＥＰＲＯＭは、少なくとも例えば（ａ）バッテリをディセーブルすべき時点を示す使用回数上限（バッテリ使用回数）、（ｂ）当該バッテリを用いて行われた処置の回数（バッテリ処置カウント）、および／または（ｃ）当該バッテリが充電された回数（充電カウント）を保存できるだけの十分なメモリレジスタを含むように、構成され得る。ＥＥＰＲＯＭ中に保存される情報のうち一部（例えば、レジスタ使用回数およびレジスタ充電カウント）をＥＥＰＲＯＭの書き込み保護部中に保存することで、ユーザが当該情報を変更できないようにする。例示的実施形態において、使用情報およびカウンタと共に対応するビット反転ミラーレジスタを保存しておき、これによりデータ破壊を検出する。

【０２３４】

ＳＭＢｕｓライン中に残留電圧が少しでもある場合、マイクロコントローラが損傷を受け得、ＳＭＢｕｓ信号が破壊され得る。そのため、マイクロコントローラのオフ時においてバッテリコントローラ７０３のＳＭＢｕｓラインが電圧を搬送しないようにするために、外部ＳＭＢｕｓラインと、バッテリマイクロコントローラ基板との間にリレーを設ける。

【０２３５】

バッテリ３０１の充電時において、例えば定電流／定電圧充電スキームを用いた場合にバッテリ内に流入する電流が徐々に低下して所与の閾値を下回った場合、バッテリ３０１の「充電終了」状態が決定される。この「充電終了」状態を正確に検出するために、バッテリ充電時においてバッテリマイクロコントローラおよびバック基板への電力供給を低減およびオフし、これにより、基板に起因し得る電流流出および電流検出の低減と干渉し得る電流流出が低減する。さらに、充電時においてマイクロコントローラおよびバック基板への電力供給を低減することで、当該電力供給に起因するＳＭＢｕｓ信号の崩壊を回避する。

【０２３６】

充電器については、正確な挿入位置以外の様態でスマートバッテリ３０１を充電器に挿入できないようにすることが望ましい。そのため、図２８に示すように、例えばバッテリ３０１の外部に充電器保持フィーチャ２８１０を設ける。バッテリ３０１を充電器内にしっかりと保持するためのカップを輪郭整合テーパー形状で構成することで、バッテリパック３０１が正確な（意図される）様態以外の様態で不意に挿入される事態を回避する。バッテリアセンブリ３０１の存在は、充電器そのものによって検出することが可能であることがさらに企図される。例えば、充電器は、バッテリ保護回路および保護基板内に配置された抵抗器からのＳＭＢｕｓ送信の存在を検出するように構成され得る。このような場合、バッテリアセンブリ３０１が充電器に正確に所定位置に配置されるまで、前記充電器をエネーブルして、充電器のピンに晒される電圧を制御させることができる。なぜならば、充電器のピンに晒される電圧がある場合、前記ピン上に電気ショートが発生して、前記充電器の充電が不慮に開始される危険性が出てくるからである。

【０２３７】

いくつかの例示の実施形態では、スマートバッテリ３０１は、聴覚のおよび／又は視覚のフィードバックを通じてユーザと通信することができる。例えばスマートバッテリ３０１は、予めセットされたようにＬＥＤ９０６を点灯させることができる。そのような場合、発振器９０４のマイクロコントローラ１００６はＬＥＤ９０６を制御するにも拘わらず、マイクロコントローラ１００６は、実行されるべき指令をスマートバッテリ３０１から

Petitioner Therabody Ex-1004, 1403

直接受信する。

【０２３８】

さらなる例示の実施形態では、発振器９０４のマイクロコントローラ１００６は、既定の時間にわたって使用されない時にスリープモードに入る。有利には、スリープモード時、マイクロコントローラ１００６のクロックスピードは減少し、電流の顕著な消耗を遮断する。プロセッサは入力の検出を待つことをピングし続けるので、いくらかの電流が消費し続けられる。有利には、マイクロコントローラ１００６がこの省電力スリープモードにある時、マイクロコントローラ１１０６およびバッテリコントローラ７０３はＬＥＤ９０６を直接的に制御することができる。例えば、デコーダ回路を発振器基板５４６０内に構築し、通信ラインへと接続することで、ＴＡＧマイクロコントローラが「オフ」であるかまたは「スリープモード」である間に、ＬＥＤ９０６をバッテリマイクロコントローラ１１０６によって独立的に制御することが可能になる。これにより、マイクロコントローラ１００６を起動させる必要性を排除する省電力特性が得られる。ユーザインターフェースインジケータをアクティブ制御できる状態で発振器をオフにすることにより、電力節約が可能となる。

【０２３９】

別の例示的実施形態において、マイクロコントローラのうち１つ以上を減速させることで、非使用時における電力を節約する。例えば、双方のマイクロコントローラのクロック周波数を低減することで、電力を節約することができる。同期動作を維持するために、これらのマイクロコントローラは、各クロック周波数の発生時期が低減のためにほぼ同時になるように調整し、その後、フル速度動作が必要となったときに周波数を増加させる。例えば、待機モードに入ったときにクロック周波数を低下させ、待機モードが終了したときにクロック周波数を上昇させる。

【０２４０】

さらなる例示の実施形態では、スマートバッテリ３０１は、その電池７０１内に残った使用可能な電力の量を決定することができ、予測される処置を通じて装置を予想通りに作動させたままにする十分なバッテリ電力があると判定する場合にのみ、取り付けられた手術装置を作動させるようにプログラムされている。例えば、スマートバッテリ３０１は、２０秒間にわたって手術装置を作動させるために十分な電力が電池内にない場合に非作動状態にしたままにすることができる。例示の実施形態によれば、スマートバッテリ３０１は、例えば外科的な切断などのその最も最近の機能の最後に電池７０１内に残った電力の量を判定する。従って、この実施形態では、バッテリアセンブリ３０１は、例えばその処置中に、電池７０１が十分な電力を有していない場合に、その後の機能の実行を許容しないであろう。代替として、スマートバッテリ３０１は、その後の処置のために十分な電力があることを判定して、処置中にその閾値を下回る場合には、その進行中の処置を遮断せず、代わりに、それを終了させることを許容して、さらなる処置の発生がないようにする。

【０２４１】

以下に、本発明のスマートバッテリ３０１を有する装置の使用を最大限に活用することに関して本発明の利点を説明する。一連の異なる装置が異なる導波管を有するものを例にとる。定義によれば、導波管の各々は、それぞれの最大許容電力限界を有してよく、それを超えると、電力制限が導波管に過度に負荷をかけ、ついには導波管を破砕してしまう。一連の導波管のうちの１つの導波管は最も小さい最大電力容量を本来有している。従来技術のバッテリは、情報処理機能を有するバッテリ電力運用を有していないので、従来技術のバッテリの出力は、装置／バッテリに使用されることが想定される一連のうちの最小／最薄／最弱の導波管のための最も小さい作動許容電力入力の値によって制限されなければならない。このことは、より大きなより厚い導波管がその後にそのハンドル端に取り付けられて、定義によれば、より大きな力が作用することを可能にするにも拘わらず、事実である。この制限は最大バッテリ電力にも当てはまる。例えば、１つのバッテリが複数の装置に使用されるように設計されている場合、その最大出力電力は、使用される装置のいず

Petitioner Therabody Ex-1004, 1404

れかの最小の最大電力ランクに制限される。そのような構成によれば、１以上の装置又は装置構成は、バッテリが特定の装置の特定の制限を知らないので、バッテリの最大使用を可能にしない。

【０２４２】

それと比較して、スマートバッテリ３０１を利用する本発明の例示の実施形態は、上述の従来技術の超音波装置の制限を判断して巧みに回避することができる。スマートバッテリ３０１は、１つの装置又は特定の装置のための１つの出力を生成することができ、同じバッテリアセンブリ３０１が、第２の装置又は装置構成のための異なる出力をその後に生成することができる。この万能なスマートバッテリ手術システムは、空間および時間が重要視される現代の手術室に非常に向いている。多くの異なる装置を作動させる１つのスマートバッテリパックを有することによって、看護師は、それらのパックの保管、修繕、および棚卸しを簡単に運用することができる。有利には、本発明に係るスマートバッテリシステムは、１つのタイプのみの充電ステーションを必要とし、従って、使用の容易さと効率を増大させるとともに設備にかかる手術室の費用を低減する。

【０２４３】

さらに、例えば電気ステープラーなどの他の装置は、超音波手術用焼灼アセンブリ３００のものとは完全に異なる電力要求を有し得る。本発明によれば、単一のスマートバッテリ３０１が、手術装置の全シリーズのうちのいずれか１つとともに使用され得るとともに、実装される特定の装置へのその自身の出力を調節するために作られ得る。例示の一実施形態では、この出力の調節は、スマートバッテリ３０１と一体化されるか又はそうでなければ連結されて制御される、例えばバック、バックブースト、ブースト又は他の構成の切り替えモード電源のデューティサイクルを制御することによって実行される。他の例示の実施形態では、スマートバッテリ３０１は、装置の作動中にその電力出力を動的に変化させることができる。例えば、容器のシーリング装置では電力運用は非常に重要である。これらの装置では、一定の大きな電流値が必要とされる。総電力出力は、組織がシールされる際にそのインピーダンスが変化するので、動的に調節される必要がある。本発明の実施形態は、可変の最大電流制限をスマートバッテリ３０１に提供する。電流制限は、用途又は装置の要求に応じて、用途（又は装置）によって変動する。

【０２４４】

ＸＩＩ．ハンドルアセンブリ－機械的構造

【０２４５】

図４５は、左側のシェル半部分が取り外されたハンドル部分３０２の左側面の例示の実施形態を示している。ハンドルアセンブリ３０２は、基本的な４つの機能を有している。（１）マルチリードハンドル端末アセンブリ３５０２にバッテリアセンブリ３０１を連結する。（２）ＴＡＧ取付ドック４５０２にＴＡＧアセンブリ３０３を連結する。（３）導波管取付ドック４５０４に超音波切断刃および導波管アセンブリ３０４を連結する。（４）３つの構成要素（バッテリアセンブリ３０１、ＴＡＧアセンブリ３０３、並びに、超音波切断刃および導波管アセンブリ３０４）を作動させるためにトリガ機構４５０６を提供する。

【０２４６】

ａ．ＴＡＧ取付ドック

【０２４７】

ＴＡＧ取付ドック４５０２は、外部に曝されており、ＴＡＧアセンブリ３０３をハンドルアセンブリ３０２に交換可能に固定するように形作られている。導波管取付ドック４５０４は、導波管１５０２の近位端を変換器９０２と整列するように形作られている。変換器９０２がＴＡＧ取付ドック４５０２に入れられるとともに導波管アセンブリ３０４が導波管取付ドック４５０４に入れられ、変換器９０２および導波管１５０２が相互に取り付けられた時、導波管１５０２および変換器９０２は自由に回転可能にハンドルアセンブリ３０２に保持される。

【０２４８】

Petitioner Therabody Ex-1004, 1405

図４５および図４６から分かるように、ハンドルアセンブリ３０２は、２つのクラムシェル接続本体半部分を有しており、右側半部分４５０３が図４５に示されている一方で左側半部分が図４６に示されている。２つの半部分４５０３、４６０３は、導波管取付ドック４５０４の少なくとも一部を形成し、導波管取付ドック４５０４は、導波管回転スピンドル３７０４がない時に外部に露出するように考慮され得る。第１連結部４６０２は、ハンドルアセンブリ３０２に超音波導波管アセンブリ３０４を選択的に着脱可能に固定するように作動可能である。図示した例示の実施形態では、導波管回転スピンドル３７０４は、環状ボス４６０５を受け入れるように形作られた中間環状溝４６０３を有している。２つの半部分４５０３、４６０３が接続された時、溝４６１０およびボス４６０５は、自由に回転する導波管アセンブリ３０４の縦方向接続を形成する。例示的実施形態において、超音波切断刃および導波管アセンブリ３０４をユーザがハンドルアセンブリ３０２から着脱することはできない。

【０２４９】

ＴＡＧ取付ドック４５０２は導波管取付ドック４５０４に対向している。ＴＡＧ取付ドック４５０２は、外部に露出しており、超音波導波管アセンブリ３０４が導波管取付ドック４５０４に連結された時に超音波導波管１５０２に超音波変換器９０２を着脱可能に固定するように作動可能な第２連結部４６０４を有している。連結部４６０２および４６０４は、変換器９０２と軸方向に配列するように導波管１５０２を配置する通路又は任意の他の構造と単純に整列され得る。もちろん、連結部４６０２および４６０４は、導波管１５０２および／又は変換器９０２をハンドル又は相互に実際に保持する例えばねじ山などのさらなる構造を提供し得る。連結部４６０４の例をいくつか挙げると、レール、ダブテール、Ｔ字型溝、少なくとも１つのピン、１つよりも多くのピン、およびアンダーカット溝部がある。

【０２５０】

ｂ．制御機構

【０２５１】

ここで図４６を見ると、トリガ４６０６およびボタン４６０８がハンドルアセンブリ３０２の構成要素として示されている。トリガ４６０６はエンドエフェクタ１１８を作動させ、エンドエフェクタ１１８は、エンドエフェクタ１１８および刃部分１１６の間の組織および／又は他の物質との様々な種類の接触を可能にするため、導波管１１４の刃部分１１６と協働する。図１に示すように、エンドエフェクタ１１８は通常、顎および刃１１６の間に配置された組織を把持するか又はクランプするように作動する旋回顎（例えば図７３以下を参照）である。例示的実施形態において、可聴フィードバックがトリガ内に設けられ、トリガが完全に押圧された際にクリックする。肉薄金属部により、ノイズが生成され得る。閉鎖時において、前記肉薄金属部に前記トリガがパチリと接触する。このような機能により、ユーザフィードバックへ可聴要素を追加することができ、顎部が導波管に対して完全押圧状態であり、血管密閉のための十分なクランプ圧力が付与されている旨をユーザへ通知することができる。

【０２５２】

押し込まれた時、ボタン４６０８は、超音波手術アセンブリ３００を、導波管１５０２で超音波運動を引き起こす超音波作動モードにする。例示の第１実施形態では、ボタン４６０８の押し込みは、図４７に示すように、スイッチ４７０２内の電気接点を閉じさせ、それによって、変換器９０２に電力が供給されるようにバッテリアセンブリ３０１およびＴＡＧアセンブリ３０３の間の回路を完成させる。別の例示の実施形態では、ボタン４６０８の押し込みは、バッテリアセンブリ３０１への電気接点を閉じる。もちろん、回路内で閉じる電気接点の説明は、本明細書では、スイッチ作動の単なる例示の一般的な説明である。スイッチ４７０２からの情報を受信して当該情報に基づいて対応の回路の応答を割り当てる接点又はプロセッサ制御の電力受け渡しを開くことを含み得る。

【０２５３】

図４７は、左側の正面からスイッチ４７０２を示しており、図４８は、ハンドル本体の

Petitioner Therabody Ex-1004, 1406

右側の内部の切断斜視図であり、スイッチ４８００の様々な詳細を表している。第１の例示的実施形態では、スイッチ４８００は複数の接点４８０４ａ～ｎを備えている。スイッチ４７０２のプランジャ４８０２の押し込みは、スイッチを起動させ、スイッチの状態変化と、複数の接点４８０４ａ～ｎのうちの２つ以上の間の位置又は接点の対応の変化を開始する。回路がスイッチ４７０２を通じて接続された場合、すなわち、スイッチ４７０２が変換器９０２への電力受け渡しを制御する場合、状態変化は、スイッチ４７０２の作動モードに応じて、回路を完成させるか又は遮断するかのいずれかである。

【０２５４】

図４９は、２つのスイッチング段階を提供するスイッチ４７０２の例示的実施形態を示す。スイッチ４７０２は２つのサブスイッチ４９０２および４９０４を有している。サブスイッチ４９０２および４９０４は、１つのボタン４８０２内で２つのレベルのスイッチングを有利に提供する。ユーザが第１程度に内側にプランジャ４８０２を押し込んだ時、第１サブスッチ４９０２が起動され、それによって、接点４８０４ａ～ｎ（この図では図示せず）上に第１スイッチ出力を提供する。プランジャ４８０２が第２の程度にさらに内側に押し込まれた時、第２サブスイッチ４９０４が起動され、その結果、接点４８０４ａ～ｎ上で異なる出力を生じさせる。実際の使用時のこの２段階スイッチ４７０２の例は、２つの可能な出力電力レベルを利用可能にするためのＴＡＧ発振器９０４用であり、各々は、導波管４５０２の異なる運動範囲値を生じさせる。第１サブスイッチ４９０２の起動は、例えば、発振器９０４からの第１出力電力レベルを開始し、および、第２サブスイッチ４９０４の起動は、発振器９０４から第２電力レベルを出力させる結果を生じさせる。この２段階スイッチ４７０２の例示の実施形態は、第１配置に低電力レベルを提供し、第２配置に高電力レベルを提供する。図４９に示す、スタックにサブスイッチ４９０２および４９０４を形成することは、増大する力によってボタン４７０２のプランジャ４８０２を単に押し込むことによって、第１スイッチモードすなわち第１電力レベルから第２スイッチモードすなわち第２電力レベルに移行させることを、操作者に容易かつ直感的にする。

【０２５５】

サブスイッチ４９０２および４９０４の一実施形態では、ばね力が利用されてよく、各ばねは異なるばね力レベルを有している。プランジャ４８０２が最初に押し込まれた時、第１サブスイッチ４９０２の第１ばねは圧縮し始める。第２サブスイッチ４９０４内に配置された第２ばねは第１ばねより固いので、第１サブスイッチ４９０２のみがスイッチング状態を変化させられる。第１サブスイッチ４９０２が、スイッチング状態を変化させるために十分な距離にわたって押し込まれると、プランジャ４８０２に作用するさらなる（より大きな）力が、より固い第２ばねを押し込んで、第２サブスイッチ４９０４の状態を変化させる。

【０２５６】

実際には、例えば本発明を採用するものなどの超音波切断装置は、様々な組織のタイプおよびサイズに出くわし、制御をあまり必要としない繊細でない切断物質に対してしっかりと制御されなければならない精確な運動を変化させる様々な手術処置のタイプに使用される。従って、操作者に低電力切断モードと高電力切断モードとを選択させることを可能にする少なくとも２つの超音波切断電力レベルを提供することは有用である。例えば、低電力切断モードでは、すなわち、第１サブスイッチ４９０２のみが押し込まれる場合、導波管１５０２の先端は約０．００２インチの変位で運動する。高電力切断モードでは、すなわち、第１および第２サブスイッチ４９０２および４９０４の両方が押し込まれる場合、導波管１５０２の先端は約０．００３インチの変位で運動し、低電力モードに比べて、より大きな速度で組織を通って移動することができ、又は、より強靭でより緻密な物質をより迅速に切断することができる。例えば、腸間膜の切断は、より急速な速度でより大きな電力で概ね実行される一方で、血管シーリングは、より低電力でより長い期間にわたって実行されることが可能である。

【０２５７】

Petitioner Therabody Ex-1004, 1407

しかしながら、本発明は、スタックされたスイッチに限定されるわけではなく、相互に独立したスイッチも含み得る。例えば、ボタン４６０８の形状は、第１低電力スイッチと接触する第１部分と、ボタンのさらなる移動によって、第２高電力スイッチに接触する第２部分と、を有してよい。本発明は、１つのボタンの移動によって異なる段階を作動させる任意の複数段階スイッチを有するものとして考慮に入れられるべきである。

【０２５８】

本発明の例示の一実施形態では、スイッチ４７０２、４８００は、複合弓に類似した物理的抵抗を提供する。高速で矢を射るために周知の複合弓は、ピークの力に上昇してより低い保持力に送り出される引く力のカーブを有している。この物理的作用を第２サブスイッチ４９０４で再形成することによって、装置のユーザは、第１サブスイッチ４９０２に移って第１サブスイッチ４９０２に係合することがむしろ簡単であることを発見する一方で、より大きな押し込み力を必要とする第２サブスイッチ４９０４の押し込みによって開始される高電力モードに移ることが、増大した力を意識的に作用させる操作者によってのみ生じる出来事であることを発見する。しかしながら、より大きな押し込み力を克服すると、押し込み位置の第２サブスイッチ４９０４を維持するために必要な力は減少し、操作者により高電力モードのままであることを可能にし、すなわち、操作者の指を疲れさせることなくボタンを押し込まれたままにしておく。この複合弓タイプの作用は様々な方法で実現することが可能である。例は、ピンの力又は他の障害物に打ち勝つオフセットカム、ソフトウェア制御、ドームスイッチおよびその他を含む。

【０２５９】

本発明の例示の一実施形態では、スイッチ４７０２は、スイッチ４７０２が第１モードから第２高電力モードに移動する時に可聴音を生成する。例えば可聴音は、ボタン自体から、又は、ブザー８０２から発せられる。音は、操作者に高電力モードに入ったことを通知する。通知は、本発明の超音波装置の意図しない作動を好都合に回避することができる。

【０２６０】

ｃ．導波管節バンプ

【０２６１】

本発明の例示的実施形態によれば、図５７に示すように、少なくとも１つのバンプ５７１０が、超音波導波管１５０２の節（単数または複数）に設けられる。換言すれば、導波管１５０２が共振周波数において超音波運動を示さない導波管１５０２に沿った位置において、バンプ５７１０が配置される。これらのバンプ５７１０は放射方向かつ長手方向において対称であるため、各バンプ５７１０の直径およびその物理的導波管特性が変化して振動伝達が低減して（放射方向に大きくなり）そして増加して（放射方向に小さくなった）場合も、超音波周波数において共振する導波管の能力と、遠位刃端部において所望の振動を伝達する導波管の能力とへの悪影響は無い。これらのバンプについて、図７６を参照してさらに詳述する。

【０２６２】

ｄ．ニアオーバセンタートリガ

【０２６３】

ここで図６１～図６４を参照すると、可変圧力トリガが示されて説明される。可変圧力トリガの構成要素は、図６１～図６４の各々に示すハンドルアセンブリ３０２の右側の部分斜視図で見ることができる。この図では、ハンドルアセンブリ３０２の大部分のシェルがないので、内側構成要素のいくつかが露出して見ることができる。実際には、図６１～図６４に示す多くの構成要素は、シェルによってカバーされており、保護されて見えない。

【０２６４】

最初に図６１を参照すると、トリガ旋回アセンブリ６１０２の少なくとも一部が示されている。アセンブリ６１０２は、第１旋回部材６１０４と第２旋回部材６１０６とを有している。以下の説明では、トリガ４６０６が操作者によって連続的に押し下げられる際に

Petitioner Therabody Ex-1004, 1408

第１旋回部材６１０４と第２旋回部材６１０６との間の相互作用を示す図６１と図６２～図６４の各々との比較が説明される。

【０２６５】

第１旋回部材６１０４は、細長構造であり、第１端６１１２および第２端６１１４を有している。第１旋回部材６１０４の第１端６１１２は第１旋回ピン６１１６に回転可能に連結される一方で第２端６１１４は第２旋回ピン６１１８に回転可能に連結される。図６１の正面図では、第１旋回部材６１０４の例示の実施形態は、２つの別個の半部分を有することが分かり、各半部分は、第１旋回ピン６１１６および第２旋回ピン６１１８に連結されており、中央節にともに連結されている。本実施形態において、中央ピボットは、２つのリンクによって捕獲されたトリガ上の円形ボスを含む。これら２つのリンクは両性部品であり、共に押圧されることで、前記ボスが２つの穴部によって拘束される。これらの２つの穴部はそれぞれ、各リンク上に設けられる。この構成により、第３の旋回部が得られる。しかしながら、この旋回部材がこの構成を備えている必要はない。旋回部材は、２つの旋回ピン６１１６および６１１８を連結するとともにエンドエフェクタ１１８のためのアクチュエータを並進させるために第１旋回ピン６１１６に近接して方向付けられた力を提供する任意の構造であってよく、エンドエフェクタ１１８は以下にさらに詳細に説明される。図６１～図６４で分かるように、第１旋回ピン６１１６は、ハンドルアセンブリ３０２の左本体半部分４６０３に示される縦方向に延在する案内トラック６１３０内に乗っており、その鏡像は、対向する右本体半部分４５０３上にも同様にある。トリガ４６０６が押し込まれると、図６１、図６２、図６３、図６４の経過に示されるように、第１旋回ピン６１１６は、停止位置（図６１の第１旋回ピン位置によって示される）から完全に動いた位置（図６４の第１旋回ピン位置によって示される）までエンドエフェクタ１１８を動かすために近接方向に十分な距離を並進する。

【０２６６】

示される例示の実施形態によれば、第２旋回ピン６１１８はトリガ４６０６に連結されてトリガ４６０６の一部である。特に、旋回ピン６１１８を含む第２旋回部材６１０６の全体は、トリガ４６０６の最も遠い範囲を実際に備えている。トリガ４６０６の最も遠い範囲（第２旋回部材６１０６）は、それ自体、ハンドルアセンブリ３０２内で第３（固定された）旋回ピン６１１０に回転可能に連結されている。この第３旋回ピン６１１０は、ハンドルアセンブリ３０２に対してトリガ４６０６が回転する軸線を画定する。第３旋回ピン６１１０は、回転ロックアウト刃と協働するスライド回転ロックアウト部材６５０８によって共有されている。回転ロックアウト刃の目的および詳細は以下の節で説明される。

【０２６７】

第３旋回ピン６１１０の位置はハンドルアセンブリ３０２に対して固定されているので、トリガ４６０６が操作者によって押し込められた時、第１旋回ピン６１１６は第３旋回ピン６１１０から離れて移動する。さらに、第１旋回ピン６１１６が第３旋回ピン６１１０から離れて移動すると、第２旋回ピン６１１８は、第１旋回ピン６１１６を第３旋回ピン６１１０に接続する仮想線６１２０よりも十分に下にある図６１に示す位置で始まる円弧であって、第２旋回ピン６１１８が、第１旋回ピン６１１６を第３旋回ピン６１１０に依然として接続している仮想線６１２０にさらにより近い図６４に示す位置まで延びる円弧を横切る。

【０２６８】

図６１に示す位置から図６２～図６４に示す位置を通るトリガ４６０６の動きは、導波管１５０２に向かう方向におけるエンドエフェクタ１１８のクランプ動作を生じさせる。言い替えれば、トリガ４６０６を押し込むことは、エンドエフェクタ１１８を、開き位置から閉じ位置に（以下に説明する外側管７３０２の動きを介して）移動させる。有利には、第１旋回部材６１０４と第２旋回部材６１０６との間の相互作用は、図６１～図６４の比較に示すように、トリガの押し込みを維持するために必要な圧力を変化させることによってトリガの動きを提供する。この可変圧力リンク（６１１０、６１０６、６１１８、６

Petitioner Therabody Ex-1004, 1409

１０４、６１１６）は、完全に押し込まれると、例えば図６２に示すようなトリガ４６０６を部分的に押し込むための圧力と比較して押し込み位置にトリガ４６０６を保持するためのはるかに小さい圧力しか必要としないので、操作者の手の疲れを有利に低減させる。

【０２６９】

より具体的には、操作者が最初にトリガ４６０６に圧力を作用させた時、第１力は、第２旋回ピン６１１８（図６１に示す方向付けに関連して）を上方に移動させることが必要である。第１旋回ピン６１１６が近位に移動しなければならないので、エンドエフェクタ１１８を作動させるために必要な力は実際には縦方向である。この力は円弧に沿って第２旋回ピン６１１８を移動させ、第２旋回ピン６１１８は、結果として、第１旋回ピン６１１６を第３旋回ピン６１１０から離れて移動させ、旋回部材６１０４、６１０６に沿って２つの力ベクトルを規定する。図６１に示す位置での２つの力ベクトルは、約１００°の角度６１２２であり、左に位置する黒いベクトルと右に位置する白いベクトルとを明確化のために示している。

【０２７０】

ここで図６２を参照すると、トリガ４６０６が図６１に示す停止位置から移動したことが分かる。この部分的な移動は、第１の組織との接触時に一般的な医療処置中に押し込められたときに生じる。トリガ４６０６が押し下げられる際、すなわち、トリガ４６０６がハンドルアセンブリ３０２に向かって移動する際、第１旋回ピン６１１６、第１旋回部材６１０４、第２旋回部材６１０６および第２旋回ピン６１１８はすべて位置を変化させる。より具体的には、第２旋回部材６１０６は、その位置に固定される第３旋回ピン６１１０周りに回転する。第３旋回ピン６１１０は固定されているので、第２旋回ピン６１１８は上方にすなわち仮想線６１２０に向かって揺動し始める。第２旋回ピン６１１８が上方に揺動すると、力は、第１旋回部材６１０４に作用し、第１旋回部材６１０４に沿って移動して第１旋回ピン６１１６に作用する。それに応じて、第１旋回ピン６１１６は、導波管アセンブリ３０４から離れる方向に近接してスライドする。図６２に示す移動のこの第１段階では、力ベクトル６１２２の角度が、図６１に示すものから増大していることが分かる。

【０２７１】

図６３では、トリガ４６０６はさらに閉じられている。その結果、第１旋回部材６１０４、第２旋回部材６１０６、第１旋回ピン６１１６および第２旋回ピン６１１８のさらなる移動が生じる。この移動が生じると、第２旋回ピン６１１８は仮想線６１２０にさらに近づいて移動する、すなわち、第１および第３旋回ピン６１１６および６１１０とほぼ同一線上にある。力ベクトル６１２２によって示されるように、旋回部材６１０４、６１０６に作用する力は相互に顕著に反対に向き始める。ベクトル６１２２の間の例示の角度はこの位置では約１５０°である。

【０２７２】

最後に、図６４では、トリガ４６０６は、ハンドルアセンブリ３０２のバッテリアセンブリ保持部分に接触するまで押し込められている。これは、第１旋回部材６１０４、第２旋回部材６１０６および第１旋回ピン６１１６の最大移動の点である。ここでは、力ベクトルは相互にほぼ反対向きであり、それによって、トリガ４６０６で感知される力の量は減少する。すなわち、力学の技術分野では公知であるように、最大の力は、２つのベクトルの力が加法である時、すなわち、同じ方向の位置である時に必要とされ、最小の力は、２つのベクトルの力が減法である時、すなわち、反対の方向の位置である時に必要とされる。図６４に示す方向付けでは、ベクトルは加法よりもより減法になるので、ユーザにとって、図６１に示す位置に比べてトリガ４６０６を押し込んだまま維持することが非常に簡単になる。図６４に示す最後の閉じ位置は、「ニアオーバーセンタ」位置又は「ニアオーバーセンタリング」位置として本明細書では参照される。トリガ４６０６がニアオーバーセンタ位置にある時、トリガを押し込まれた位置で維持するために必要とされる力は、約図６１に示す位置からトリガが最初に離れて押し込まれるために必要とされる力の４５％、又は、それより小さい。

Petitioner Therabody Ex-1004, 1410

【０２７３】
ｅ．回転ロックアウト
【０２７４】
本発明は、超音波運動が導波管１５０２に作用する時はいつでも導波管アセンブリ３０４の回転を防止する本発明のさらに別の特徴を提供する。この回転ロックアウトの特徴は、手術処置中に切断刃の意図しない回転運動を防止することによってさらに向上した安全性を提供する。さらに、回転を防止することによって、装置３００の作動中、しっかりとした電気接続を維持することを確実にする。より具体的には、振動子の接点リング５４０６、５４０８に沿って１つの位置で固定された電気接続が手術中に回転ロックアウトによって維持されるので、電気接点維持のために電気接点５４０２、５４０４（例えば、ポゴピン）が発振器および振動子の間で接点リング５４０６、５４０８に沿ってスライドする必要はない。本発明の例示の一実施形態によれば、回転ロックアウトは、図６５および図６６に示す回転ロックアウト部材６５０８の使用を通じて実現される。
【０２７５】
最初に図６５を参照すると、ハンドルアセンブリ３０２の右側の拡大斜視図が右側のカバーが取り外されて示されている。この図では、回転ロックアウト部材６５０８は、回転防止ホイール６５０２に隣接して位置決めされていることが分かる（回転防止ホイール６５０２は、導波管回転スピンドル３７０４に回転して固定されており、それによって、導波管アセンブリ３０４に固定されている）。従って、導波管アセンブリ３０４は、回転防止ホイール６５０２が邪魔されずにその縦軸線上で回転することができる場合のみその縦軸線に沿って回転することができる。
【０２７６】
回転防止ホイール６５０２の回転を防止するため、回転ロックアウト部材６５０８は、当該回転ロックアウト部材６５０８から回転防止ホイール６５０２に向かう方向に延びるホイール係合刃６５０４を有している。図６５に示す位置では、回転ロックアウト部材６５０８は、ホイール係合刃６５０４がその外周から所定の距離にあるので、回転防止ホイール６５０２とは干渉しない。そうした刃６５０４の方向付けでは、回転防止ホイール６５０２は、導波管アセンブリ３０４と同様に、導波管アセンブリ３０４の縦軸線上で自由に回転する。
【０２７７】
ここで図６６を参照すると、回転ロックアウト部材６５０８は回転ブロック位置に配置されている。この位置では、ホイール係合刃６５０４が、回転防止ホイール６５０２の外周上の２つの隣接する壁６６０２の間の空間に進入して、回転防止ホイール６５０２が回転する場合に壁６６０２の側面に係合する。回転ロックアウト部材６５０８はハンドルアセンブリ３０２内のその位置に固定され、この接続のため、ホイール係合刃６５０４と回転防止ホイール６５０２との間の係合が、回転防止ホイール６５０２の導波管アセンブリ３０４の縦軸線回りの回転を完全に防止する。例えば、７２個の外周上の壁６６０２を有することによって、回転防止ホイール６５０２は回転がロックされた時に回転の遊びがほぼない。図６７～図６９は、ホイール係合刃６５０４が、ボタン４６０８が押し込まれた時のみに回転防止ホイール６５０２に係合して、それによって、導波管１５０２の超音波振動が生じた時に導波管アセンブリ３０４のほぼすべての回転運動を防止する。
【０２７８】
図６７は、ハンドルアセンブリ３０２内の回転ロックアウト部材６５０８の下側の斜視図を示している。再び、ハンドルアセンブリ３０２の右側のカバーが取り外されており、それによって、ハンドルアセンブリ３０２の内部機械的構成要素のいくつかを露出させている。これらの構成要素は、ここでは透視図で示すボタン４６０８と、回転ロックアウト部材６５０８とスライド可能に係合するＵ字形状部材６７０２と、回転ロックアウト部材６５０８のボタン部分から離れる方向にＵ字形状部材６７０２を付勢するばね６７０４と、を有している。図６７は、回転ロックアウト部材６５０８と、Ｕ字形状部材６７０２と、ばね６７０４と、を示している。図６７に示す位置では、ばね６７０４は、Ｕ字形状部

Petitioner Therabody Ex-1004, 1411

材６７０２によって発揮される圧力によって予め負荷が掛けられている。回転ロックアウト部材６５０８は、ハンドルアセンブリ３０２に固定して連結された旋回ピン６７０６に回転可能に連結されて旋回ピン６７０６周りを旋回する。

【０２７９】

さらに、図６７は、回転防止ホイール６５０２の壁６６０２から離れる方向に回転ロックアウト部材６５０８を付勢するねじればね６７０８を示している。ねじればね６７０８は、回転ロックアウト部材６５０８の自然の停止位置が回転防止ホイール６５０２との係合を解除されることを確実にする。ねじればね６７０８のばね力は、ばね６７０４のばね力よりも小さいように選択される。従って、回転ロックアウト部材６５０８の移動はばね６７０４が完全に圧縮される前に生じ得る。

【０２８０】

回転防止システムの作動時、ボタン４６０８が短距離にわたって押し込まれた時、ボタン４６０８の後側は、Ｕ字形状部材６７０２に物理的に接触し、さらなる近位ボタン移動が生じるようにＵ字形状部材６７０２を移動させる。言い替えれば、押し込まれた時、ボタン４６０８は、ばね６７０４の付勢力に抗う方向にＵ字形状部材６７０２に近位力を付与する。この近位力は、ばね６７０４を圧縮させ、Ｕ字形状部材６７０２を回転ロックアウト部材６５０８に向かう方向に移動させることを可能にする。この移動は図６８に示されており、Ｕ字形状部材６７０２は、図６７に示す位置よりも回転ロックアウト部材６５０８により接近する。図６８の図では、Ｕ字形状部材６７０２が、回転ロックアウト部材６５０８に近接して、ロックアウト部材６５０８がこの図でばね６７０４を完全に覆い隠す点まで移動するので、ばね６７０４はもはや見えない。このような堅い接続を用いない接触により、ロックアウト機構によって起動ボタン４６０８の離脱が妨害されることが無くなる。このような離脱は、装置の安全動作において重要である。さらに、このような接続により、スイッチの離脱に必要な力が最小化され、操作者の疲労も低減する。

【０２８１】

ボタン４６０８がさらに押し込まれた時、図６９に示すように、回転ロックアウト部材６５０８は、旋回ピン６７０６周りに旋回し、回転防止ホイール６５０２に向かって上方に揺動する。この上方への揺動が生じると、ホイール係合刃６５０４は回転防止ホイール６５０２の壁６６０２に係合する。言い替えれば、図６９に示す回転ロックアウト部材６５０８の位置は、図６６に示す回転ロックアウト部材６５０８の位置に対応する。同様に、図６７に示す回転ロックアウト部材６５０８の位置は、図６５に示す回転ロックアウト部材６５０８の位置に対応する。

【０２８２】

いくつかの状況では、ボタン４６０８が押し込まれた時、ホイール係合刃６５０４は、１つの壁６６０２上に乗り、壁６６０２の２つの間に落ちない。この発生を保証するため、ストローク距離が、すなわち、回転ロックアウト部材６５０８に向かってＵ字形状部材６７０２が移動することができる距離が、回転ロックアウト部材６５０８の実際の物理的な移動を必要とせずに装置の電気的起動を可能にする。すなわち、回転ロックアウト部材６５０８は、わずかに移動するかもしれないが、超音波作動を生じさせるために２つの壁６６０２の間に嵌合する必要はない。もちろん、任意の回転移動が回転ロックアウト部材６５０８を上方かつ壁６６０２内に移動させるので、回転は依然として防止される。

【０２８３】

本発明のさらなる例示の実施形態では、図７０および図７１に示すように、回転ロックアウト部材７００２は、回転防止ホイール７００１の外面７００８に係合する１以上の刃７００４、７００６を備え得る。この特定の実施形態では、回転防止ホイール７００１は、図６５～図６９の回転防止ホイール６５０２の実施形態のようなその外周の歯を有していない。図７０および図７１の実施形態では、回転防止ホイール７００１の外面７００８は、歯７００４、７００６が、外面７００８に係合すること、例えば回転防止ホイール７００１の外周に実際に切れ込むこと、を可能にするのに十分に可鍛性がある。しかしながら、かみそりタイプの歯７００４、７００６が利用されるある実施形態では、回転防止ホ

Petitioner Therabody Ex-1004, 1412

イール７００１は、予期される量の力が作用する時に既定の深さ以上に歯７００４、７００６が貫通することを防止する程度に十分に硬い。さらに、ロックアウト部材６５０８およびＵ字型部材６７０２の代わりに単一のスタンプ型／エッチ型またはワイヤ型のロックアウト部材を用いてもよく、その場合、そのジオメトリ内において、前記ばねのうち少なくとも１つの代わりに可撓性フィーチャを用いる。図１０５および図１０６において、この別の構成の２つの例示的実施形態を示す。

【０２８４】

図７１に示すように、回転防止ホイール７００１の外面７００８内に刃７００４、７００６が食い込むと、回転防止ホイール７００１は、導波管アセンブリ３０４の縦軸線回りに回転することができないようにされる。もちろん、１つの刃又は３つ以上の刃が、回転防止ホイール７００１の回転を防止するために使用され得る。刃７００４および７００６を相互に分離して角度を付けることによって、回転の防止はいずれの回転方向にも高められる。言い替えれば、刃７００４および７００６が相互に離れて角度付けられた時、いずれかの方向への回転防止ホイール７００１の回転は、回転防止ホイール７００１内に刃７００４又は７００６の１つをより深く食い込ませる。例えばボタンリターンばねに起因して前記ボタンから圧力が無くなった場合、ロックアウト部材７００２は回転防止ホイール７００１から係合解除される。さらに、回転ロックアウト部材７００２のこの特定の実施形態では、回転ロックアウト部材７００２の一部が第３旋回ピン６１１０を掴んでもよい。回転時におけるエネルギー付与を回避するための、電気機械技術および電子光技術を用いた他の方法も可能である。センサー（例えば、磁気位置エンコーダまたは光位置センサー）の任意の組み合わせを用いて、回転検出時において導波管１５０２へのエネルギー付与を停止させることが可能である。あるいは、このような組み合わせをトリガとして用いて、機械的ロックアウト（例えば、ソレノイドまたはナイフスイッチ）を係合させることも可能である。これらの機械的手段は、センサー無しで用いることも可能であり、任意のエネルギー付与時において回転をロックアウトすることができる。光エンコーダを発振器ハウジング内に配置して、窓を通じて外側方向に方向付けることで、振動子ハウジングの運動を監視することができる。磁気エンコーダを筐体中に完全に埋設すれば、リークパスの危険性をさらに低減することができる。

【０２８５】

ＸＩＩＩ．ＴＡＧ－機械的構造

【０２８６】

図５０を参照すると、再使用可能ＴＡＧアセンブリ３０３がハンドルアセンブリ３０２から分離して示されている。本発明のＴＡＧアセンブリ３０３は、変換器シャフト５００２を有しており、変換器シャフト５００２は、導波管をしっかりとそこに取り付けるように形成されるとともに、変換器シャフト５００２の起動時、取り付けられた導波管を励磁する、すなわち、導波管の長さに沿って超音波を付与するように形成された超音波導波管連結部５００４を有している。

【０２８７】

この例示の実施形態では、導波管連結部５００４は、雌であり、雌ねじを有しており、既定量のトルクで導波管連結部５００４のねじ山上に導波管１５０２の端部をねじ込むことによって、ＴＡＧアセンブリ３０３を導波管１５０２（例えば図４５を参照）を固定するために使用される。トルクは、当該トルクによって形成される機械的連結が装置の通常作動時に解けないように十分なものであるべきである。同時に、ねじ山を連結するために作用するトルクは、ねじ山がすり減らされたり又は損傷させられたりする力を超えてはならない。変換器９０２と導波管１５０２との間の最初の連結中、必要とされるのは、変換器９０２および導波管１５０２の一方が他方に対して相対的に固定されたままであることだけである。導波管回転スピンドル３７０４は、変換器９０２に回転して固定して連結され、それらは、ＴＡＧアセンブリ３０３の本体５００５にともに回転して自由に接続される。そのようにして、導波管回転スピンドル３７０４および変換器９０２は両方とも、本体５００５に対して自由に回転することができる。従って、導波管－変換器の接続を確立

Petitioner Therabody Ex-1004, 1413

するように、導波管１５０２は、導波管回転スピンドル３７０４が、導波管１５０２の近位端で対応の雄ねじに変換器シャフト５００２の雌ねじを連結するために回転させられる際に固定されたままであり得る。好適には、導波管１５０２は、ＴＡＧアセンブリ３０３から導波管１５０２に機械的超音波運動を伝達するために機械的接続が十分であるポイントまで、導波管連結部５００４のねじに連結される、すなわち、ねじ込まれる。

【０２８８】

本発明の例示の一実施形態では、トルクレンチ（図８８参照）が、導波管回転スピンドル３７０４に連結し、ユーザが既定量のトルクまでスピンドル３７０４を回転させることを可能にする。導波管連結部５００４および導波管１５０２の回転連結圧力が既定量のトルクを超えると、トルクレンチ８８１０の外側部分が内側部分８８２０周りおよびそれによってスピンドル３７０４周りにすべり、スピンドル３７０４のさらなる回転は生じない。本発明のトルクレンチ８８００の使用を通じて、操作者は、導波管１５０２内でＴＡＧアセンブリ３０３の間の結合に対して適切な量の張力を精確に作用させることができ、導波管連結部５００４上又は導波管１５０２上のいずれかのねじ山を損傷させることを防止する。

【０２８９】

トルクレンチのこの実施形態は、ＴＡＧアセンブリ３０３に外力を作用させずにＴＡＧアセンブリ３０３のレンチの滑り落ちの可能性を排除するためにスピンドル３７０４上を掴む。より詳細には、図５０を参照して、スピンドル３７０４にレンチグリップ面５０１４を設ける。レンチグリップ面５０１４は、スピンドル３７０４の近位端の周囲に円周方向に配置される。この例示的実施形態において、レンチグリップ面５０１４は圧痕である。一方、トルクレンチ８８００の内側部８８２０には、可撓性歯部８８２２が設けられる。これらの可撓性歯部８８２２はそれぞれ、スピンドルーグリップ面８８２４を規定する内側遠位表面を有する。この例示的実施形態において、スピンドルグリップ面８８２４は、若干凸状に半球型の突起部を有する。これらの突起部は、レンチグリップ面５０１４の凹状に半球型の圧痕に対応する形状を有する。このようにして、内側部８８２０がスピンドル３７０４の近位端へと接続されると、内側部８８２０の各歯部８８２２が外側方向に撓んだ後にパチリと戻り、これにより、歯部８８２２の対応する突起部８８２４を各圧痕５０１４内の所定位置へと配置させる。その後、ユーザは、外側部８８２０を完全に解放することができ、除去が望まれるまでずっとレンチ８８００はスピンドル３７０４上に残留する。

【０２９０】

所定量のトルクが来るまでトルクレンチ８８００の内側部８８１０および外側部８８２０が相互に回転接続できるようにするために、外側部８８１０にラチェットギア８８１２を設け、内側部８８２０にラチェット８８２６を設ける。所定量のトルクにおいてスリップするように、ギア８８１２の傾斜および内側範囲と、ラチェット８８２６の外側円周および歯サイズとを選択する。十分な弾性の材料を用いることで、２つの部分８８１０および８８２０が相互に滑るトルク値を高精度に設定することが可能になる。新規なトルクレンチ８８００を用いることにより、操作者は、導波管１５０２内のＴＡＧアセンブリ３０３間の接合部に適切な量の張力を高精度に付与することができ、また、導波管連結部５００４または導波管１５０２のいずれかの上のネジを損傷することもなくなる。トルクレンチのトルクに対抗するために、操作者は、トルクレンチ回転時において回転ホイールを保持しなくてはならない。この動作のため、例示的実施形態において、ロックアウトボタンをハンドル半分部と一体化させることができる。このロックアウトボタンは、操作者によって押圧され、押圧されると、回転防止ホイールを係合させ、これにより、シャフトアセンブリの自由回転を最小の付与力で停止させる。

【０２９１】

ＴＡＧアセンブリ３０３は、外部から内部作動構成要素を保護してシールする、上側ハウジング部５０２０および下側ハウジング部５０３０によって構成されたハウジングを有している。図５０および図５３を参照されたい。ＴＡＧアセンブリ３０３は作動環境の滅

Petitioner Therabody Ex-1004, 1414

菌野にあるので、例えば気相の過酸化水素によって有利に滅菌可能である。従って、上側ハウジング５０２０および下側ハウジング５０３０の間のシールは無菌でありかつ／又は密閉される。

【０２９２】

本発明の例示の図示しない一実施形態によれば、変換器９０２は、完全にハウジング５００６内に配置されており、ハウジング５００６は、操作者によって、例えば、導波管アセンブリ３０４が固定された時に手でしっかりと保持することによって容易に固定されない。そうした実施形態では、ＴＡＧアセンブリ３０３は振動子回転ロックを備えている。例えば、振動子回転ロックは、ハウジング５００６内の凹部内にスライドするボタンであってよく、又は、代替として、最大回転、例えば３６０度の回転に到達した時にさらなる回転が不可能であるとともに導波管アセンブリ３０４がねじ込まれ得るように最大回転で振動子９０２の回転を固定させることによる。もちろん、反対方向の最大回転は導波管アセンブリ３０４が同様に取り外されることを可能にする。別の例示的実施形態において、トルクレンチがハンドルそのものにおいて採用される。この例示的実施形態は図示されていないが、図８７および図８８を参照すれば理解され得る。図８８から分かるように、１つの可能なトルク制限装置を、内側ラチェット部８８２６およびラチェットギア８８１２と共に構成する。このラチェット式アセンブリは、回転防止ホイール６５０２内に構築することができる。その一部を図８７中に示す。この回転防止ホイール６５０２は、内側ラジアル部および外側ラジアル部によって構成される。これら２つの部分は、相互に回転可能であり、そのうちいずれかを内側ラチェット部８８２６のうちの１つと共に形成することができ、他方をラチェットギア８８１２と共に形成することができる。このようにして、ユーザは、振動子の近位ノブを静止状態で保持することができ、スピンドル３７０４の回転を利用して、導波管および振動子を共に接続することができる。所望のトルクに到達した場合、内側ラチェット部８８２６およびラチェットギア８８１２はスリップして、これにより過度のトルクを回避する。前記導波管が正しい量のトルクによって前記振動子へと接続された後は、処置時におけるスピンドル回転は影響を受けない。なぜならば、スピンドル３７０４を回転させるために必要なポンド数は、トルクラチェット型機能に打ち勝つために必要なポンド数よりもずっと低いからである。

【０２９３】

ハウジング５００６は、ハンドルアセンブリ３０２の対応のコネクタ部分に選択的に着脱可能に固定するように形作られた固定接続部５０１２を有している。例えば図５６を参照されたい。接続部５０１２は、ＴＡＧアセンブリ３０３が、例えば図５０～図５３および図５６に示す例示の「ダブテール」設計などの任意の連結接続部であってよく、連結接続部は、ＴＡＧアセンブリ３０３がハンドルアセンブリ３０２に着脱可能に取り付けられて固定されることを可能にする。図５６において、ＴＡＧ保持装置５６０４が設けられる。ＴＡＧ保持装置５６０４は機械的フィーチャであり、ＴＡＧアセンブリ３０３自重によってハンドルアセンブリ３０２から滑り落ちないようにするためのものである。保持装置５６０４から固定接続部５０１２へと付与される摩擦により、少なくともＴＡＧアセンブリ３０３の重量よりも高い力に打ち勝つことなくＴＡＧアセンブリを使い捨て部から引き抜くことが困難になる。ＴＡＧ保持装置５６０４は、図６１～図６４および図８６に示すような指型形状であってもよいし、あるいは、スライドレールと干渉する１つ以上のバンプであってもよい。これら２つの部分を分離させるために必要な力により、ＴＡＧアセンブリ３０３が交換または取り外し時に不慮に落下する事態が回避される。ハンドルアセンブリ３０２とＴＡＧアセンブリ３０３との間の接触領域を密閉することが可能であり、これにより、手術用流体がＴＡＧアセンブリ３０３と接触した場合に、ハンドルアセンブリ３０２およびＴＡＧアセンブリ３０３に起因して前記流体がＴＡＧ取付ドック４５０２内に侵入する事態が回避される。

【０２９４】

ＴＡＧアセンブリ３０３がハンドルアセンブリ３０２から選択的に着脱可能であることが有利である。分離した構成要素として、ＴＡＧアセンブリ３０３は、医療的に消毒され

Petitioner Therabody Ex-1004, 1415

又は滅菌され（例えば、ＳＴＥＲＲＡＤ（登録商標）、Ｖ－ＰＲＯ（登録商標）のオートクレーブ）、および、複数の手術に再使用され得る一方で、高価でないハンドルアセンブリ３０２自体が使い捨てであってよい。さらに、ＴＡＧアセンブリ３０３は、廃棄を必要とする前に所望の最大回数まで複数のハンドル又は同じハンドルで使用されることが可能である。さらなる実施形態において、ＴＡＧアセンブリ３０３の振動子９０２は、発振器９０４から選択的に着脱することが可能であり、これにより、洗浄時におけるアクセスが向上する。このような実施形態において、振動子を発振器へ整合させる本発明によって提供される恩恵は、振動子の較正係数を発振器へと送るための通信システムと共に振動子を構成することにより、維持することができる。

【０２９５】

図５１および図５２は、ＴＡＧアセンブリ３０３の２つのさらなる斜視図を提供する。図５２は、ＴＡＧアセンブリ３０３のハウジング５００５の外面上にユーザディスプレイシステム（例えばＲＧＢのＬＥＤ９０６）の例示的ディスプレイウィンドウを示している。上述のように、ＲＧＢのＬＥＤ９０６は、手術アセンブリ３００の状態およびモードを示す様々な信号をユーザに提供する。ユーザへと表示される多様な条件およびモードには、取付時におけるバッテリレベルが不適切である通知（すなわち、始動確認およびソフトウェア起動を行うための十分なエネルギーがバッテリ内に無いかまたは当該バッテリ自体が不良である通知）も含まれ得る。正の表示は、適切な始動を含み得る（すなわち、バッテリがＴＡＧへと接続された際に、バッテリ／ＴＡＧ通信によって通信された適切な電力があり、恐らくは利用可能なＴＡＧ寿命長さがある旨、または、システムが準備完了となっており、利用可能なように待機状態である旨）。低モードおよび高モード双方の起動が表示され得る。ＴＡＧについて、寿命切れまたは他のＴＡＧ関連故障が表示され得る。バッテリについて、バッテリの接続後またはバッテリ使用時において、低状態が表示され得る。前記表示による指示内容としては、例えば、バッテリの初回取付時において当該バッテリの残り充電量がわずかおよそ２０％である旨がある。バッテリ充電の終了または他のバッテリ故障も表示され得る。最後に、多様なシステム故障（例えば、一般的故障、バッテリまたはＴＡＧソフトウェアの非機能）が表示され得る。

【０２９６】

図５３は、ハウジング５０20が取り外されたＴＡＧアセンブリ３０３の平面図を示しており、それによって、ＴＡＧアセンブリ３０３の発振器回路が露出している。例えば図９を参照されたい。さらに例示の実施形態では、発振器回路は、少なくともＴＡＧアセンブリ３０３のプロセッサ又はバッテリアセンブリ３０１内のプロセッサ（またはその任意の回路内に一体化されたもの）に電気的に接続されるメモリを有している。メモリは、例えば、ＴＡＧアセンブリ３０３が使用されるごとの記録を格納するために使用されることが可能である。ＴＡＧアセンブリ３０３および／又は導波管アセンブリ３０４および／又はハウジングアセンブリ３０２および／又はバッテリアセンブリ３０１に関連する他のデータはその後のアクセスおよび解析のために同様に格納され得る。この記録は、装置、特にＴＡＧアセンブリ３０３自体の有用な又は許容された耐用年数の任意の部分の限度を評価するために有用である。例えば、ＴＡＧアセンブリが２０回使用されると、ＴＡＧアセンブリ３０３又はバッテリアセンブリ３０１は、特定のハンドル又はバッテリがその「古い」ＴＡＧアセンブリとともに機能することを可能にしないようにプログラムされている（例えば、ＴＡＧアセンブリ３０３はその後「もはや信頼性がない」手術器具であるので）。メモリは、装置のいずれの周辺機器の使用回数をも格納することができる。例示説明の目的のためのみであるが、所定の回数の使用後、装置の部品の１つが、部品同士の間の許容差が限度を越えたものとして考慮され得るため、摩耗したものと考慮され得ることが可能である。この摩耗は、処置中の受け入れられない失敗につながり得る。いくつかの例示の実施形態では、メモリは、装置と組み合わせた部品の記録および各部品が経た使用回数を格納する。

【０２９７】

場合によっては、ＴＡＧアセンブリ３０３がバッテリアセンブリ３０１から接続切断さ

Petitioner Therabody Ex-1004, 1416

れた場合においても、フィードバックをユーザへ提供することが望ましい場合がある（例えば、ＴＡＧアセンブリ３０３の「寿命切れ」または「信頼性の喪失」の場合）。このような表示により、ＴＡＧアセンブリ３０３の有効寿命が切れていて使用不可能となっているため当該ＴＡＧアセンブリ３０３を流通から外すべき旨が通知される。このような場合において通常よくあるように、その医師は、当該装置の適切な組み立てや、当該装置からＴＡＧアセンブリ３０３を取り外す担当者と異なる場合がある。よって、ＴＡＧアセンブリ３０３を持続的インジケータを含むように有用に構成することができ、このインジケータの電源をバッテリアセンブリ３０１と別個に設けるとよい。このインジケータは、「寿命切れ」終了警告を示した後、ＴＡＧアセンブリ３０３とバッテリアセンブリ３０１とが最も最近に（または最後に）接続された時期を示し、これにより、ＴＡＧアセンブリ３０３をすぐに廃棄すべき旨を通知する。これにより、これ以上この使用済ＴＡＧアセンブリ３０３を同一のまたは異なるバッテリアセンブリ３０１を接続してエネルギーが無駄になることを防ぐ。あるいは、その後の別のバッテリアセンブリ３０１への接続後すぐにインジケータによって警告を通知してもよく、これにより、装置起動前に当該アセンブリを廃棄できるようにする。いずれの実行においても、装置組み立ての担当者に向けて警告が保存される。ユーザへ寿命切れ通知を提供するための複数のスキームが考えられる（例えば、電力を不要とするかまたは電力を引き込む一次電池、スーパーコンデンサまたはディスプレイ）。例えば、スーパーコンデンサおよび超低電力ＬＥＤドライブを用いて、点滅インジケータを提供することができる。これらの回路による電力消費はマイクロアンペア範囲内であるため、これらの回路により、複数時間さらには複数日数にわたって信頼性のある通知を得ることが可能である。

【０２９８】

いくつかの例示の実施形態では、メモリはバッテリアセンブリ３０１内にあり、ハンドルアセンブリ３０２は装置識別子を備えており、装置識別子は、少なくともバッテリアセンブリ３０１に通信可能に連結されており、例えば先の段落で説明した使用履歴、手術ハンドル識別子、以前の使用の履歴、および／又は、導波管識別子などの、超音波手術アセンブリ３００に関する情報の少なくとも一部分をスマートバッテリ３０１に通信するように作動可能である。このようにして、１つのスマートバッテリアセンブリ３０１は、複数の異なるハンドルアセンブリ３０２およびＴＡＧアセンブリ３０３上の使用情報を記録することができる。バッテリアセンブリ３０１が充電ユニット内に配置された時、そうしたメモリはアクセス可能であり、システム３０１、３０２／３０４、３０３の各部分に関するデータは、充電器内にダウンロードされ、必要であれば、充電ステーションに（例えウェブを介して）通信可能に連結される中央設備に送信される。

【０２９９】

図５４は、発振器９０４に対する変換器９０２の物理的回転が可能であるように発振器９０４および変換器９０２がどのようにして電気的かつ物理的に結合されているかの一例を示している。この例では、発振器９０４は、変換器９０２に隣接してその下側から突出する１対の接点５４０２、５４０４を有している。接点５４０２および５４０４は、任意の様態でＴＡＧハウジングへ接続することが可能である。図示の例示的実施形態において、発振器基板とＴＡＧハウジングの一部との間の所定位置において、接点５４０２および５４０４が配置される。示されるように、前記ＴＡＧハウジングは、上側発振器ハウジング５４１０と、下側振動子ハウジング５４３０とによって規定される。発振器ハウジングは、上側ハウジング部５０２０と、下側ハウジング部５０３０とを有する。よって、接点５４０２および５４０４を取り付けるためには、接点５４０２および５４０４を下側ハウジング部５０３０内に配置した後、ｏリング（図示）または接着剤によって所定位置に密閉する。その後、発振器基板５４６０を接点５４０２および５４０４の上部上に配置し、電気接触のために接続させる。上側ハウジング部５０２０は、ＴＡＧアセンブリ上に配置されているため、発振器基板５４６０を所定位置に保持する機能を果たし、これにより接点５４０２および５４０４を動かないように捕獲する。上側ハウジング部５０２０上のこれらのフィーチャは、例えば、指部であり得る。これらの指部は、基板５４６０そのもの

Petitioner Therabody Ex-1004, 1417

に押圧されるか、または、発振器基板５４６０上のより大型の要素上に押圧される。さらに、圧縮材料を用いることで両者間に許容差を設け、これにより、基板移動に起動して接続部との断続的接触を発生する可能性が低減される。

【０３００】

発振器９０４に対する変換器９０２の近位には、必要な場合に駆動信号が変換器９０２に安定して信頼高く適用されるように変換器の本体９０２上の接点リング５４０６、５４０８の対応の対に物理的に連通している１対の接点５４０２、５４０４が配置される。有利には、接点５４０２、５４０４の対は、変換器９０２の回転角に拘わらずに電気接続を維持する。従って、この例示的実施形態では、変換器９０２は、回転の最大角又は数に関するなんらの制限なく回転することができる。さらに、リング５４０６、５４０８および接点５４０２、５４０４は、トルクレンチが導波管１５０２に対して変換器９０２を固定することを停止させる回転位置に拘わらず発振器回路に電気的に接触したままであることを確実にする。接触リングと接点との間の摩擦軽減を支援する例示的実施形態において、これらのリングに、高研磨仕上げされた表面を設ける。また、接触をばね付勢によって行うため、接触ばね力が最小化され、これにより接触力が低下し、最終的に摩擦も低減する。平滑な表面および低ピン押圧力により、摩擦が最小に抑えられ、これにより、これら２つの回転部分間の摩耗が最小化される。上記とめっきプロセスとにより、噛み合い部分間の電気接続の中断が確実に無くなる。

【０３０１】

振動子ハウジング５４３０はまた、近位ハウジング部５４３２および遠位ハウジング部５４３４の２つの部分によって構成される。図５０に見られるように、下側ハウジング部５０３０は、２つのハウジングリング５４１６および５４１８を有する。これらのハウジングリング５４１６および５４１８は、振動子ハウジング５４３０を発振器ハウジング５４１０へと回転可能な様態で固定する。近位ハウジングリング５４１８は、円形外側直径近位振動子部５４３２を放射方向に捕獲するだけである。振動子９０２を放射方向かつ長手方向に捕獲するのは、遠位ハウジングリング５４１６である。より詳細には、遠位ハウジングリング５４１６の近位側の近位ｏリング５４４０は、長手方向捕獲の一部を提供し、遠位ハウジングリング５４１６の遠位側の締結部５４４２は、長手方向捕獲の他の部分を提供する。締結部５４４２は、例えば、１つ以上のスナップリングであり得る。このような確実な長手方向捕獲により、発振器９０４と振動子９０２との間の電気接続を確実にするように、２つの振動子接触リング５４０６および５４０８が２つの接点５４０２および５４０４と長手方向に整列される。

【０３０２】

図３７に示すように、手術ハンドルアセンブリ３０２は、導波管アセンブリ３０４に取り付けられたスピンドル３７０４を有している。スピンドル３７０４は刻み目を有しており、刻み目によれば、外科医が１以上の指でスピンドル３７０４を容易に回転させることができ、従って、取り付けられた導波管アセンブリ３０４と導波管１５０２に接続される変換器９０２とを対応して回転させることができる。そうした構成は、手術中に所望の切断刃角を得るために有用である。

【０３０３】

図５５は、本体５００５および変換器のシェルが取り外されたＴＡＧアセンブリ３０３の例示の一実施形態を示している。電圧が圧電結晶スタック１５０４に印加された時、シャフト５００２はハウジング５０２０および５０３０に対して縦方向に移動する。この実施形態では、導波管連結装置５００４は、雌であり、雌ねじ（この図では見えない）を有しており、雌ねじは、導波管１５０２を適切な量のトルクでねじにねじ込むことによって、導波管１５０２（ここでは図示せず）にＴＡＧアセンブリ３０３を固定するために使用される。

【０３０４】

ＴＡＧアセンブリ３０３の新規な特徴は、機械的および電気的に同時に接続するその能力である。図５６は、ハンドルアセンブリ３０２へのドッキング工程時、ＴＡＧアセンブ

Petitioner Therabody Ex-1004, 1418

リ３０３の例示の実施形態を示している。変換器９０２が、（ハンドルアセンブリ３０２に取り付けられた）導波管１５０２に連結されると同時に、ＴＡＧアセンブリの電気コネクタ５０１０は、ハンドルアセンブリの電気コネクタ５６０２に接触する。ＴＡＧの電気コネクタ５０１０とハンドルの電気コネクタ５６０２の連結は、例えば図３７に示すように、ハンドルアセンブリ３０２にドックされたバッテリアセンブリ３０１と圧電結晶スタック１５０４とを電気的に通信させる（直接又は間接）。このほぼ同時の連結は、本発明のすべての実施形態で生じるように形成され得る。この接続のピンは独自のものであり、図５４の左側にも図示される。ここで、単一の右側角度ピンがプラスチック発振器ハウジング５０３０内に一体成形され、これにより、コネクタ５０１０用のピンが一体成形される。同様に、これらのピンはそれぞれ、発振器筐体の内部内に上方に延びて、発振器回路基板５４６０との接続を提供する。回路基板接続は、半田によって達成することもできるし、あるいは、簡潔な様態で発振器基板５４６０に取り付けられたソケットを通じて達成することが可能である。このようにして、振動子９０２の電極（ポゴピン）５４０２および５４０４への接続を可能にするソケット組み合わせることにより、アセンブリプロセスが簡略化される。よって、発振器ハウジング５４１０の組み立ては、垂直ピンのアレイ上に発振器基板５４６０を配置した後にハウジング５４１０を密閉するだけの簡単なプロセスとなる。下側ハウジング部５０３０から上方に延びる突起部は、回路基板５４６０を横方向に支持し、上側ハウジング部５０２０に対して類似の突起部を提供する。これらの突起部の間において、発振器基板５４６０が完全に捕獲される。発振器９０４からの視覚出力は、上側ハウジング部５４１０内の半透明窓５４１０を通じて確認される。ＬＥＤを発振器９０４上に戦略的に配置することで、前記窓からの発光を可能にする。前記ＬＥＤと前記窓との間の空間により、より大きな領域上への光拡散が可能となり、前記窓に拡散材料を付加することにより、発光を均等にすることができる。例示的実施形態において、これらの窓は、上側ハウジング部５０２０の上側曲線状表面の周囲を包囲し、これにより、広範囲の視認角度および動作角度にわたって視認可能となる。

【０３０５】

本発明のさらなる例示の実施形態によれば、ＴＡＧアセンブリ３０３は、電気接続を確立することに先立って機械的接続を提供する。すなわち、ハンドル３０２にＴＡＧアセンブリ３０３を取り付ける際、ＴＡＧアセンブリの電気コネクタ５０１０とハンドルアセンブリのＴＡＧ電気コネクタ５６０２との間の電気接続がなされる前に導波管１５０２と超音波導波管連結部５００４との間に機械的接続が確立される。有利には、機械的接続が確立された後に電気的接続がなされるので、本実施形態では電気的な「跳ね上がり」が防止される。より具体的には、導波管１５０２のねじ８６０４が超音波導波管連結部５００４に連結すると、しっかりとした機械的接続の後になされた電気的接続は、ＴＡＧアセンブリの電気接続５０１０およびＴＡＧへのハンドルアセンブリ電気コネクタ５６０２が固定位置関係にあることを保証し、少なくとも瞬間的に、および、電気的接続の即時の取り外しおよび復帰は生じない。同様に、アセンブリ３００が分解された時、電気的接続は機械的接続の完全な分離に先立って断たれる。

【０３０６】

ハンドル３０２の電気コネクタ５６０２を図８６および図１０８に最良に示す。ＴＡＧアセンブリ３０３がハンドル３０２へと機械的に接続されると、電気接続が得られる。ＴＡＧアセンブリ３０３の電気コネクタ５０１０を図５０および図５４に示す。ＴＡＧアセンブリ３０３の電気コネクタ５０１０に含まれる面取り矩形止まり穴内には導電性ピン５４７０が設けられ、これらの導電性ピン５４７０は、穴部の長手方向範囲に沿ってセンタリングされた穴部の下部から延びる。ハンドル３０２の電気コネクタ５６０２を図８６および図１０８に示す。ハンドル３０２の電気コネクタ５６０２は、導体レール８６３０と、軟性ガスケット８６３２と、硬質裏打ち部８６３４とを含む。硬質裏打ち部８６３４は、フレックス回路ハーネス３５１６の硬質部でもある。フレックス回路ハーネス３５１６は、マルチリードハンドル端子アセンブリ３５０２において、ハンドル３０２の電気コネクタ５６０２をフレックス回路基板３５１４へと電気的に接続させる。

Petitioner Therabody Ex-1004, 1419

【０３０７】
先ず、ＴＡＧアセンブリ３０３の電気コネクタ５０１０と、軟性ガスケット８６３２とが接触する。さらなる連結によりガスケット８６３２が圧縮され、可撓ハーネス３５１６のより硬質な部分８６３４に対するこの圧縮力により、流体密封シールがコネクタ５０１０と可撓ハーネス３５１６との間に得られる。この接続は、コネクタレール８６３０を完全に包囲し、コネクタ５０１０と補強材８６３４との間のいかなる空間内への流体侵入をも回避する。導体レール８６３０内に挿入されたコネクタ５０１０のピン５４７０自体が埋め込まれることにより、発振器９０４との流体接触が回避される。この同一構成を用いて、ハンドル３０２と、バッテリ３０１のハウジングとの間にシールを形成する。

【０３０８】
本発明の他の例示の実施形態によれば、超音波手術装置３００は、複数のタイプの導波管、すなわち異なる寸法を有する導波管を受け入れて駆動させることができる。手持ち式超音波手術用焼灼アセンブリ３００は、異なるタイプ／寸法の導波管１５０２を受け入れて駆動させることができる場合、手持ち式超音波手術用焼灼アセンブリ３００は、発振器９０４に連結された導波管検出器であって、変換器９０２に取り付けられた導波管１５０２のタイプ（すなわち、寸法又は特性）を検出するように作動可能であるとともに、検出された導波管のタイプに基づいて駆動波周波数および／又は駆動波電力を発振器９０４が変化させるように作動可能である導波管検出器を備えている。導波管検出器は、手持ち式超音波手術用焼灼アセンブリ３００に接続された導波管１５０２の少なくとも１つの性質を識別することができる、任意の装置、一連の構成要素、ソフトウェア、電気的接続、又はその他であり得る。

【０３０９】
ＸＩＶ．導波管アセンブリ

【０３１０】
図７３～図８７は、導波管アセンブリ３０４の例示の実施形態の詳細な図を提供する。導波管アセンブリ３０４は、導波管１５０２がＴＡＧアセンブリ３０３に物理的に連結された時に変換器９０２から直接的に超音波振動を受け取る。導波管１５０２の刃部分７３０４は、扱われる組織にこの超音波エネルギーを伝達する。超音波運動刃部分７３０４は、有機組織の効率的な切断を容易にし、切断箇所の血管の凝固、すなわち、焼灼を通じて凝固を促進する。

【０３１１】
図７３を参照すると、導波管アセンブリ３０４の遠位端７３０６の部分的な斜視図が示される。導波管アセンブリ３０４は、導波管１５０２の一部を取り囲む外側管７３０２を有している。導波管１５０２の刃部分７３０４は、外側管７３０２の遠位端７３０６から突出している。医療処置中に組織に接触して組織に超音波エネルギーを伝達するのはこの刃部分７３０４である。導波管アセンブリ３０４はまた、外側管７３０２および内側管（この図では見えない）の両方に連結された顎部材７３０８を有している。顎部材７３０８は、内側管７３０２、外側管７４０２、および刃部分７３０４と共にエンドエフェクタと称することができる。以下に説明するように、外側管７３０２および図示しない内側管は相互に縦方向にスライドする。外側管７３０２と図示しない内側管との間の相対移動が生じると、顎部７３０８は旋回点７３１０上で旋回し、それによって、顎部７３０８を開閉する。閉じられると、顎部７３０８は、顎部７３０８および刃部分７３０４の間に配置された組織上に圧迫力を付与して、刃と組織との明確で効率的な接触を保証する。

【０３１２】
図７４は、外側管７３０２が取り外された図７３に示す導波管アセンブリ３０４の遠位端７３０６の下側の斜視図である。この図では、内側管７４０２の遠位端７３０６が顎部７３０８に連結されて示されている。この連結は、図７４に示す例示の実施形態では、顎部７３０８がその間に挿入された時にボス７４０８を掴む対のアーム７４１８、７４２０の各々内でボス係合開口部７４１４を有する顎部７３０８上の１対のボス７４０８の結合体によって提供される。この関係は、図７５の下側の断面斜視図により良く示されている

Petitioner Therabody Ex-1004, 1420

。この図から、内側管７４０２のアーム７４１８、７４２０のボス係合開口部７４１４がくさび形７５０２にされることが分かる。くさび形のアーム７４１８、７４２０は内側管７４０２と顎部７３０８との間のしっかりとした接続を提供する。開口部７４１４をくさび形にすることによって、内側管７４０２は、構造的圧力／支持のための外側管７３０２上にあるようにすることなく顎部７３０８上のボス７４０８に係合することができる。

【０３１３】

図７５はまた、導波管１５０２が、顎部７３０８又は内側管７４０２から分離している、すなわち、顎部７３０８又は内側管７４０２に取り付けられていないことを示している。言い替えれば、導波管１５０２は、超音波エネルギーによってエネルギーを与えられた時に、内側管７４０２および顎部７３０８に対して移動するものの、内側管７４０２には接触せずに、顎部７３０８がその間に組織なしで刃部分７３０４に対して旋回する場合に顎部７３０８にのみ接触する。導波管１５０２のこの独立した移動を容易にする本発明の特徴を以下に説明する。

【０３１４】

図７４に戻ると、顎部７３０８は、その近位端７４２６に１対のフランジ７４２２、７４２４を備えている。フランジ７４２２、７４２４は延びてその反対側で導波管１５０２を取り囲む。フランジ７４２２、７４２４の各々１つは、その端部に、旋回制御タブ７４１１、７４１２をそれぞれ有しており、旋回制御タブ７４１１、７４１２は、顎部７３０８のボス７４０８がアーム７４１８、７４２０内のボス係合開口部７４１４内に固定された時に導波管１５０２の下方に延びる。旋回制御タブ７４１１、７４１２が、図７４に示すように導波管１５０２の下方に延びる必要はない。この構成は例示の実施形態にある。

【０３１５】

顎部７３０８を潤滑させることにより、旋回制御タブ７４１１および７４１２と、外側管７３０２との間の摩擦およびボス７４０８と内側管７４０２との間の摩擦を低減することができる。このような潤滑により、円滑な作動が可能となり、噛み合い部分間の摩耗が低減する。また、潤滑により、旋回制御タブ７４１１および７４１２の近位側をより気密に取り付けることが可能となり、また、外側管７３０２のプロファイリングをより高精度に行うことも可能となり、その結果、顎部７３０８上のバックラッシュが低減する。局所的に付加された潤滑剤の高速変位を防ぐために、潤滑剤の１つの例示的実施形態として、ＰＴＦＥ潤滑剤の乾燥がある。顎部の上面上にこのように潤滑剤を露出させることにより、トロカールを通じた装置挿入がさらに支援される。図示の例示的実施形態において、旋回制御タブ７４１１および７４１２が２つのアームとして図示されており、導波管１５０２にまたがっている。しかし、単一のアームによって導波管１５０２を包囲し、このアームが下部中心線上の外側管７３０２と相互作用する場合においても、同じ機能を達成することが可能である。どちらの場合においても、制御タブの下部（単数または複数）７４１１（７４１２）は、最大シャフト直径と整合するように円形状になっており、トロカール内へ挿入可能であり、また鋭角縁部の存在を低減させる。

【０３１６】

図７３を再び簡潔に参照すると、導波管アセンブリ３０４の端面立面図は、顎部７３０８のフランジ７４２２、７４２４の旋回制御タブ７４１１、７４１２が外側管７３０２の遠位部分７３０６の１対の開口部７３１１、７３１２に係合することを示している。これらの特徴は、図７７の断片的な断面側面図にさらに良く示されている。

【０３１７】

図７７の図は断面図であるので、２つのフランジ７４２２、７４２４の１つ７４２４のみが示されており、示される表面はフランジ７４２４の内面である。対応して、旋回制御タブ７４１２の１つのみが、外側管７３０２の遠位部分７３０６の１対の開口部７３１２のうちの１つとともに示されている。この図は、開口部７３１２が旋回制御タブ７４１２を取り囲んで掴むことを明確にしている。従って、外側管７３０２が顎部７３０８に向かって移動すると、開口部７３１２もまた顎部７３０８に対して移動する。反対に、外側管７３０２が顎部７３０８から離れて移動すると、開口部７３１２もまた反対方向に顎部７

Petitioner Therabody Ex-1004, 1421

３０８に対して移動する。開口部７３１２内に入れ子状に収まった捕まえられた旋回制御タブ７４１２は、旋回点７３１０周りに顎部７３０８の対応の回転運動を引き起こす。

【０３１８】

図７８は、導波管アセンブリ３０４のエンドエフェクタの部分側面図である。この図は、外側管７３０２が、顎部７３０８のフランジ７４２２をほぼ覆っており、開口部７３１１から伸びる旋回制御タブ７４１１のみを残している。外側管７３０２が近位方向７７０２、すなわち、顎部７３０８から離れる方向にスライドした時、外側管７３０２は近位方向７７０２に旋回制御タブ７４１１、７４１２を引っ張ることは明らかである。この動作によれば、顎部７３０８は、導波管１５０２の刃部分７３０４に向かって閉じるすなわちクランプするために、図７８の時計回りに旋回点７３１０回りに旋回する。顎部７３０８のこの閉じ位置は図７９に示されている。導波管アセンブリ３０４の例示的実施形態の構成が有利であるのは、リベット打ちまたは溶接を用いずに組み立てを行うことが可能であるからである。すなわち、全部品が機械的に捕獲される（例えば、旋回制御タブ７４１１および７４１２が開口部７３１１内に嵌まることにより、リベット打ちまたは溶接を用いずに導波管を機械的にロックすることができる）。この組み立て手順について、さらに以下に詳述する。

【０３１９】

図８０は、閉じ位置にある顎部７３０８の遠位端の別の図を提供し、顎部７３０８は導波管１５０２の刃部分７３０４と接触して配置されている。エンドエフェクタは、顎部材７３０８の内部と、刃部７３０４の対向表面との間の組織を捕獲する。このような様態で組織を捕獲することにより、導波管１５０２とのしっかりとした接点において前記組織を有利に配置することができる。よって、導波管１５０２が超音波により動くと、前記導波管の動きが直接前記組織へと伝達され、その結果、切断、焼灼またはこれら両方が行われる。導波管１５０２の刃部７３０４の撓みを発生させる干渉を、エンドエフェクタにおいて発生したクランプ力下において発生させると有用であることが分かっている。導波管１５０２の撓みは、遠位シール（すなわち、連結スプール８１０４）の屈曲力および圧縮力が組み合わさって発生する。本発明の遠位シールの構成によりエラストマー支持部の厚さは最小化されるものの、導波管１５０２の撓みは大幅なものであり得る。刃部７３０４とエンドエフェクタ顎部７３０８のライナー７３１４との間の初期接触が平行である場合、導波管１５０２の屈折と共に、顎部７３０８の根元において空間が発生するであろう。そのため、本発明において、顎部７３０８の根元において力を付加するように初期接触を構成し、フルクランプ力の付加時に刃部７３０４と平行になるようにする。図８０は、切断刃７３０４の切断プロファイルの例示的実施形態を示す。所望の組織または血管の切断および焼灼／密閉（クランプ力、変位、および周波数を除く）を達成するために、切断刃７３０４は、刃部７３０４のプロファイルと顎部７３０８のライナー７３１４との間において、高応力集中部および低応力集中部の複合物を含む。所望の血管密閉を達成するために、血管の上部および下部を相互接続するためのシームを前記血管に設ける必要がある。前記シームの中央を切断する必要があり、また、密閉のためおよび焦げの回避のために逃げ量を設けることで、組織の流動できるようにすることが望まれる。図８０に示すプロファイルにより、双方の所望の特性が得られる。第１に、この刃プロファイルにより、狭くかつ比較的平坦なスパイン部８００２が得られ、これにより、クランプ力からの圧力が一定レベルにおいて局所的シームへと集中する。この一定レベルにより、組織が一時的に留まることが可能になり、これにより、凝固および最終的切断が可能となる。この滞留時間（すなわち、密閉プロセス）において、曲線状側プロファイル８００４を切断部から遠位方向に設けることにより、隣接組織を変位させる。刃部７３０４の上部および下部上の高応力シームを用いることで、切開（すなわち、後方切れ目入れ）が支援される。組織または血管の切断／密閉時において、組織／血管の完全性を追跡すると有用であり得る。本発明においては、金属導波管１５０２を２極電気回路の１極として用いて、特性（例えば、導波管１５０２の刃部７３０４における組織のインピーダンスおよび／またはキャパシタンス）を測定する。導電性材料の導波管１５０２は、既にＴＡＧへと電気的に接続されてい

Petitioner Therabody Ex-1004, 1422

る。この接続により、２極測定回路のうち第１のものが形成される。反対側の極は、顎部７３０８内のライナー７３１４の一部である。例示的実施形態において、ハンドル３０２内の別個の導電性リードまたは他の導電性要素により、ライナー７３１４がＴＡＧへと接続される。

【０３２０】

外側管７３０２の移動を容易にするため、図７４を再び参照すると、１以上のコルセット７４０４が内側管７４０２上に設けられる。コルセット７４０４は、内側管７４０２の平均的な外径Ｄよりも小さい径Ｄ’を有する内側管７４０２の領域である。図７４を参照されたい。本発明の例示の実施形態によれば、コルセット７４０４は超音波導波管１５０２の節に設けられる。言い替えれば、コルセット７４０４は、導波管１５０２が共振周波数において超音波運動を示さない導波管１５０２に沿ったポイントに配置される。従って、内側管７４０２の小径部および外側管７３０２の内面に対するその物理的連結部とは、超音波周波数で共振する導波管の能力に悪影響を及ぼさない。図７４および図７５にも示すように、例えば、シール７４０６はコルセット７４０４内にある。例示の実施形態によれば、シール７４０６はエラストマーのＯリングタイプのシールである。もちろん、様々な他の物質が同様に選択されてよい。シール７４０６は、シール効果が維持されるものの顎が作動された時に実質的な摩擦なしで外側管７３０２および内側管７４０２が相互に移動しないように、７４０２の外径Ｄよりも十分に大きな外径を有している。

【０３２１】

図７４および図７５にも示すように、シール７４０６の厚さは、シール７４０６があるコルセット７４０４の縦方向長さよりも小さい。この寸法の相違は、図示するようにほぼ環状断面を有する環として形作られた時にサドル７４２６の縦方向範囲に沿ってシール７４０６が移動することを可能にする。特に、シール７４０６のこの移動特性は、外側管７３０２が内側管７４０２に対して並進させられる時に生じる。さらに具体的には、シール７４０６は、図７５および図７７に示すように、外側管７３０２の内面および内側管７４０２のサドル７４２６の間の隙間を乗り越える寸法すなわち環状高さを有している。この隙間を完全に充填することによって、導波管アセンブリ３０４の遠位端７３０６にあるシール７４０６は、外側管７３０２と内側管７４０２との間の領域内に湿気や他の汚染物の侵入を防止する。それにも関わらず、外側管７３０２が並進すると、外側管７３０２、内側管７４０２およびシール７４０６の間の隙間のない嵌合が、シール７４０６をサドル７４２６内で移動（例えば、回転又はスライド）させる一方で、毎回、外側管７３０２と内側管７４０２との間の水密のシールを維持する。この並進Ｔが、例えば、図７７の太字の矢印によって示されている。

【０３２２】

図８１を参照すると、サドル７４２６にある導波管アセンブリ３０４の遠位端が断面で示されている。この図は、コルセット７４０４のサドル７４２６内でその間に配置された内側管７４０２およびシール７４０６を取り囲む外側管７３０２を示している。説明したように、変形可能シール７４０６は、シール７４０６の遠位側８１０８からシール７４０６の近位側８１１０まで湿気や他の汚染物が通過することを防止するために外側管７３０２の内壁８１０２およびサドル７４２６の外面との間の水密接続である。図８１は、連結スプールまたは密閉スプール８１０４の断面も示す。連結スプール８１０４は、導波管１５０２の遠位部分を取り囲んでおり、コルセット７４０４とほぼ同一の縦方向位置に配置されている。上述のように、コルセット７４０４は、導波管１５０２の超音波運動節に配置されているかまたは超音波運動節のほぼ近くに配置されている。従って、連結スプール８１０４も、導波管１５０２の節に又はほぼ近くに配置されており、同様に、超音波運動を受け取るようにに導波管１５０２に連結していない。連結スプール８１０４は、コルセット７４０４の内面８１０６に導波管１５０２を物理的に連接する支持構造を提供する。図８１の断面図では、連結スプール８１０４はバーベル形状の縦方向断面を有している。エラストマー材料のこの減少した断面は、クランプされた時に導波管の撓みの量を減少させる。シール８１０４のバーベル端は比較的厚い断面となってりうため、中間部分がクラ

Petitioner Therabody Ex-1004, 1423

ンプ中に撓む時に水密シールを維持する。非金属材料（例を非限定的に挙げると、Ｕｌｔｅｍ、ＰＴＦＥ、Ｒｕｌｏｎおよび黒鉛充填材料）を剛性連結スプール８１０４として用いることができる。連結スプール８１０４は剛性であるため、非金属導波管による支持および密封を提供しつつ、導波管１５０２が顎部７３０８に対してたわむ量を限定することができる。このようなクランプ力下において、導波管１５０２の撓みを考慮して干渉を設計することが重要である。導波管１５０２の撓みは、遠位シール（７４０４および７４０６）の屈曲力および圧縮力が組み合わさって発生する。この遠位シール構成により、エラストマー支持の厚みは最小化されるが、導波管１５０２の撓みは実質的なままである。導波管１５０２と顎部ライナー７３１４との間の初期接触が平行であった場合、導波管１５０２が屈曲し、顎部７３０８の根元において空間が発生する。よって、このクランプアセンブリにより、顎部７３０８の根元に力を付加した後にフルクランプ力の付加時において導波管１５０２と平行になる初期接触が構成される。上記の硬質材料を連結スプール８１０４中に設けることにより、並列の撓みおよび変動が最小化される。図８１中、導波管１５０２を包囲する内側スリーブ７６１０も図示される。以下に詳述するように、スリーブ７６１０により、導波管１５０２と内側管７４０２との間の金属間接触の回避が支援される。

【０３２３】

図８２は、連結スプール８１０４の実施形態の斜視図を示している。この図では、連結スプール８１０４の内面８２０２を見ることができる。この内面８２０２は、例えば図８１に示すように、導波管アセンブリ３０４が組み立てられた時に導波管１５０２と直接物理的に接触する。図８２の斜視図はまた、図８１にも示すサドル７４２６の内側形状にほぼ一致する連結スプール８１０４の外側サドル形状８２０４を表している。

【０３２４】

顎部材７３０８および導波管１５０２の間に組織を掴んで保持することを助けるために、顎部材７３０８は、複数の歯７３１６を有するライナー７３１４を有している。このライナー７３１４は、組織を把持する向上した能力を顎部材７３０８に提供する。このライナーは、非金属の高温潤滑性材料（例を非限定的に挙げると、ＶＥＳＰＥＬ（登録商標）、ＲＵＬＯＮ（登録商標）、変性ＰＴＦＥ、およびこれらにガラス充填および黒鉛充填したもの）によって構成され得る。ライナー７３１４の例示の実施形態は、図８４の（ライナー７３１４の最遠位端からの）斜視図および図８５の（ライナー７３１４の最近位端からの）斜視図に示されている。複数の歯７３１６に加えて、ライナー７３１４は、最遠位面８４０２、下面８４０３上の複数の歯７３１６のうちの第１縦列７３１６ａおよび第２縦列７３１６ｂの間に配置された中央平滑路８４０４、平坦近位クランプ面８４０５、および、顎部材７３０８にライナー７３１４を固定する上側フランジ８４０６を有している。この中央平滑路８４０４は、溝部１００１４も含み得る。この溝部１００１４は、近位端から始まり、例えば図１００に示すように遠位方向に延びる。この溝部は、ライナー７３１４と導波管１５０２との間の整列フィーチャとして機能し、その結果、前記装置の使用時における組織上への効果の均等化が支援される。図７３で分かるように、最遠位面８４０２は、導波管アセンブリ３０４の遠位端の露出した短い内面である。図７３は、組み立てられた時にライナー７３１４が配置される顎部材７３０８の溝７３１８を示している。溝７３１８の内面は、ライナー７３１４がほぼ動きがないように顎部材７３０８内に保持され得るように上側フランジ８４０６の外面にほぼ一致する。図示される溝７３１８の例示の実施形態では、溝７３１８の遠位端は、インサート７３１８が顎部材７３０８の近位端から溝７３１８の遠位端を過ぎないところまでスライドし得るように中間部分よりも狭い。図８５の例示の実施形態には、ライナー７３１４が顎部７３０８内で全面的に遠位に配置された時に、（ライナー７３１４に向かって）下向きにライナー７３１４の上面の下方に折り曲げられる保持タブ８５０２が示されている。そうした折り曲げ構造では、保持タブ８５０２の遠位端は、ライナー７３１４の背面８５０４および／又はフランジ８４０６に対向しており、また可能であれば乗っている。そうした対向によれば、ライナー７３１４が顎部７３０８から出ることが防止される。この単一の保持タブの代わりに、チャ

Petitioner Therabody Ex-1004, 1424

ンネル７３１８のいずれかの側部上の２つのより小型のタブを用いることが可能である。これらのタブは、ライナー７３１４の下側または上面において下方に屈曲される。あるいは、単一の手術処置を通じてライナー７３１４を捕獲および保持する機能により、顎部７３０８の遠位端部から顎部ライナー７３１４を付勢することも可能である。このような構成の例示的実施形態を図１００中に示す。より詳細には、顎部７３０８は、遠位進入経路またはチャンネル１０００２と共に形成される。遠位進入経路またはチャンネル１０００２内において、遠位付勢ライナー１００１０が付勢される。ライナー１００１０をチャンネル１０００２内に固定するために、前記チャンネルによって規定されたオリフィス１０００４は、ライナー１００１０の戻り止め１００１２を内部において捕獲し取り外し可能に保持するような形状である。これらの対向するフィーチャは、ライナー１００１０を顎部７３０８内に取り外し可能に固定できる任意の均等な様態において、逆向きにすることまたは変更が可能である。ライナー１００１０を容易に交換することが可能であるため、前記装置の再処理可能性のためにこの高摩耗部分を容易に変更できるため、ハンドルおよび／または導波管アセンブリを再処理できる可能性が出てくる。

【０３２５】

図８４に示す、最近位面８４０２とフランジ８４０６との間のオフセットは、顎部材７３０８の最遠位部分への最近位面８４０２の配置を容易にする。すなわち、ライナー７３１４は、顎部材７３０８内に完全に着座されるまで顎部材７３０８内にスライドする。しかしながら、顎部材７３０８によって物理的に固定されるのはフランジ８４０６である。より具体的には、図８４および図８５に示すように、フランジ８４０６はその両面にある複数の歯７３１６を越えて延びる。しかしながら、フランジ８４０６は、最近位面８４０２まで全面的に延びていない。ライナー７３１４が顎部材７３０８内にスライドすると、フランジ８４０２の延在側部分は、顎部材７３０８内に形成された溝７３１８内を移動する。フランジ８４０６は最近位面８４０２に全面的に延びていないので、フランジ８４０６が溝７３１８の端部に到達すると、ライナー７３１４の最近位面８４０２は図７３に示す位置まで溝７３１８を越えて延びる。

【０３２６】

ここで、歯７３１６の例示の実施形態に焦点を当てると、歯７３１６はライナー７３１４の下面８４０８を完全に横切って延びていないことが図８４および図８５で分かる。代わりに、図８４および図８５の実施形態では、第１列の歯７３１６ａおよび第１列の歯７３１６ａに対向する第２列の歯７３１６ｂは、中央平滑路８４０４によって分離されている。中央平滑路８４０４は、導波管１５０２に対して直接的に並ぶ連続した平滑面を提供する。処置中に超音波運動している導波管１５０２に接触して、平坦な圧力によって導波管１５０２の連続した妨げられない超音波運動を促進することによって、組織のシールを助けるのはこの平滑面８４０４である。ライナー７３１４は顎部７３０８の長さ全体にわたって（根元から先端まで）走っているため、導波管１５０２の処置部（すなわち、刃部７３０４）の長さ全体における接触に対して均等な圧力が付加される。

【０３２７】

ここで図８６に移動すると、ハンドル部分３０２の内部の断片的な斜視図が示されている。この図は、導波管１５０２をＴＡＧアセンブリ３０３に連結するために使用される一連のねじ山８６０４を特徴とする、導波管１５０２の最近位端８６０１を示している。上述のように、ハンドル部分３０２内の導波管１５０２の最近位端８６０１の図示した位置は、導波管アセンブリ３０４がＴＡＧアセンブリ３０３に連結された時に導波管１５０２が残る実質的な位置である。ＴＡＧアセンブリ３０３がハンドル部分３０２内に挿入された時、例えば図４５を参照すると、振動子シャフト５００２が配列し、それによって、ねじ山８６０４および超音波導波管連結部５００４の縦方向の連結を固定することを可能にする。

【０３２８】

導波管１５０２は内側管７４０２によって取り囲まれており、そして、外側管７３０２に取り囲まれる。外側管７３０２の最近位端８６０６のこの図は、外側管７３０２がフレ

Petitioner Therabody Ex-1004, 1425

ア状区画８６０８を有するその最近位端８６０６で終端をなす。フレア状区画８６０８は、キー溝を形成する１対の溝８６１０および８６１２（８６１２はこの図では完全に示されていない）を特徴とする。これらの溝は、対向して示されているものの、この構成である必要はない。溝８６１０、８６１２内にあるのは、導波管１５０２に固定して連結されたトルクアダプタ８６０２である。トルクアダプタ８６０２および導波管１５０２の連結は以下の図８７にさらに詳細に示されている。図８６を続けて参照すると、トルクアダプタ８６０２が、溝８６１０内に延在するボス８６１６を備えていることが分かる。この図では示されていないが、トルクアダプタ８６０２は、同様に第２溝８６１２内に延在する第２ボスを備えている。トルクアダプタ８６０２のボス８６１６とフレア状区画８６０８の溝８６１０、８６１２との間の係合は、導波管１５０２、内側管７４０２および外側管７３０２の間の回転ロックの関係を提供する。すなわち、ボスは溝８６１０、８６１２に係合するので、導波管１５０２のあらゆる回転は、内側管７４０２および外側管７３０２の両方によって共有される。内側管７４０２の近位端はトルクアダプタ８６０２を越えて延びていない。トルクアダプタ８６０２および内側管７４０２の間の回転接続は、導波管回転スピンドル３７０４の内部の特徴を通じて生じる。

【０３２９】

ここで図８７に焦点を当てると、ハンドル部分３０２の内部の斜視図が再び示されている。しかしながら、この図では、（導波管回転スピンドル３７０４の右側半分に加えて）外側管７３０２が取り外された。取り外された外側管７３０２は、トルクアダプタ８６０２の大部分を露出させている。図８６又は図８７のいずれか一方で見ることができないものの、トルクアダプタ８６０２は、本発明の例示の一実施形態では、第１ボス８６１６にほぼ直接的に反対の方向に延びる第２ボスと対称である。トルクアダプタ８６０２がこのような名称になっているのは、トルクレンチ８８００を用いて振動子ホーン５００２の導波管連結部５００４を導波管１５０２へと接続する際に回転運動に抵抗するための構造がトルクアダプタ８６０２によって得られるからである。上述のように、トルクレンチ８８００を用いて振動子９０２のスピンドル３７０４を回転させる際に、導波管１５０２の回転を回避する必要がある。

【０３３０】

適切な保持力を得るために、導波管１５０２を回転的に適合させる必要がある。しかし、回転的に適合された導波管フィーチャの場合、適合フィーチャが導波管１５０２の節に配置されていない場合、導波管１５０２に沿った他の支持物と同様、振動が伝達されるという欠陥を免れない。図８６および図８７に示すように、例えば、トルク伝達のための適合フィーチャは、最近位節（すなわち、刃から最も遠くかつネジに最も近い節）に配置される。本発明の例示的実施形態のトルク伝達フィーチャは、ラジアルパターン状の複数のスプラインまたは歯８７０２であり、導波管１５０２の周囲において対称に配置される。各スプライン８７０２は、導波管１５０２の中央長手方向軸８７０６から放射方向に延びる。

【０３３１】

トルクアダプタ８６０２は複数の内部キー溝８７０４を備えており、各キー溝８７０４は、スプライン８７０２の延在部の１つと配列しており、スプライン８７０２のそれぞれ１つにほぼ対向する形状を有しており、その結果、示されるように接続された時に、トルクアダプタ８６０２は導波管１５０２上の示された縦方向位置に固定されてある。導波管１５０２上の縦方向位置はまた、運動が最小／存在しない超音波振動節に配置されている。キー溝８７０４およびスプライン８７０２の間のこの配列および固定係合は、キー溝８７０４およびスプライン８７０２を固定された回転関係に配置する。言い替えれば、導波管１５０２が回転すると、トルクアダプタ８６０２も回転しなければならない。

【０３３２】

スプライン８７０２はそれぞれ、導波管１５０２の平均直径を越えて突出する。これらのスプライン８７０２は矩形列であり得るが、これに限定されない。すなわち、スプライン８７０２に角度付き面を設けてもよい。スプライン８７０２の１つの例示的実施形態は

Petitioner Therabody Ex-1004, 1426

、錐台矩形ピラミッド形状を全体的に有するが、上面の２つの側縁部に傾斜がついており、上面の遠位縁部および近位縁部が四角形になっている。最大スプライン外側直径を導波管材料の最大直径内において保持できるようになっており、これにより、最低コストのストック材料の使用が可能になる。導波管１５０２上のトルク伝達スプライン８７０２は、対応する形状の雌キー溝８７０４により、トルクアダプタ８６０２と噛み合う。トルクアダプタ８６０２の組立を行うには、トルクアダプタ８６０２を導波管内に押圧し、キー溝８７０４を止まり穴として提供する（ここでは、図８７のトルクアダプタの不図示の縁部上）ことにより、最後にスプライン８７０２のトルク伝達面によって長手方向に同心に制約される。トルクアダプタ８６０２を導波管１５０２に対して回転方向にアラインしかつボス８６１６をスピンドル３７０４のポケット９５０４の内部（例えば、図９５を参照）内に常に配置しておくために、例示的実施形態において、スプライン８７０２のうちいくつかを選択的に除去することで、正しい要素方向付け（すなわち、対称でありかつ０度または１８０度のみにおいて鍵付け可能な方向）が１方向のみにおいて可能になる。よって、振動子９０２を導波管１５０２へと接続する際、スピンドル３７０４が（例えば、ユーザの手によって）接地され、トルクがトルクレンチ８８００によってスピナー３７０４上に生成される。ボス８６１６が付勢され、トルクが導波管１５０２のネジ８６０４へと伝達される。トルクアダプタ８６０２の全体的形状および質量は、トルクアダプタ８６０２を通じた導波管１５０２とスピンドル３７０４との音響結合を低減するように、調整される。スピンドル３７０４およびトルクアダプタ８６０２の材料は、任意の音響エネルギー結合をさらに離隔するように、異なる材料が選択される。例えば、トルク伝達強度を可能にしつつ音響エネルギーインピーダンスを最良にするために、高温のガラス充填ポリマーＲａｄｅｌ（２０％ガラス充填ポリフェニルサルホンＰＰＳＵ）を選択することができる。低摩擦材料（例えば、ナイロンまたはＰＴＦＥ（ポリテトラフルオロエチレン）を充填したポリマーも、音響伝達の最小化において有利である。加えて、エラストマー材料をトルク伝達面においてスピンドル３７０４にインサート成形することもでき、これにより、音響エネルギーがさらに離隔できる。

【０３３３】

ここでまた図６６を参照すると、外側管７３０２のフレア状区画８６０８の溝８６１０、８６１２が、回転防止ホイール６５０２に係合する特徴を有することが分かる。この係合によれば、ユーザによって導波管回転スピンドル３７０４上に付与された任意の回転が、回転防止ホイール６５０２、外側管７３０２、内側管７４０２、トルクアダプタ８６０２および導波管１５０２の直接的な対応の回転を生じさせる。以下はこの接続構成の結果である。回転ロック部材６５０８が回転防止ホイール６５０２に係合した時、回転防止ホイール６５０２のみが回転を防止されるだけでなく、導波管アセンブリ３０４、３７０４、７３０２、７４０２、８６０２、１５０２のすべての回転が防止される。同じ意味で、回転防止ホイール６５０２が回転ロックアウト部材６５０８と係合しない場合、ユーザは、回転防止ホイール６５０２に物理的に連結されたスピンドル３７０４を自由に回転させることができるとともに、縦方向軸線８７０６に沿って導波管アセンブリ３０４の回転を引き起こすことができる。

【０３３４】

図９５に示すように、スピンドル３７０４の内部において、楕円形ボス９５０２が設けられる。これらのボス９５０２は、管の内側７４０２および外側７３０２双方と係合し、これにより、内側管７４０２のみが長手方向変位を持ちつつ、管７３０２および７４０２が回転方向に共にロックされる。ボス９５０２により管７３０２および７４０２がロックされる領域の詳細を図９３に示す。図９３および図９５双方を参照して、ボス９５０２の突起部は、（内側スリーブ７６１０と接触するかまたはスリーブ７６１０を導波管１５０２内に押圧するために）内側管７４０２の開口部を通過するが内側管７４０２は貫通しないように構成されることが分かる。これと同時に、ボス９５０２の形状は、内側管７４０２の長手方向変位を回避しつつ顎部７３０８の並進のための外側管７３０２の長手方向の（近位から遠位）の移動を可能にするような十分な長手方向長さを有する形状にされる。

Petitioner Therabody Ex-1004, 1427

このような複雑なロック機能と、トルクアダプタ８６０２と係合するスピンドル３７０４の近位端上のポケット９５０４とを併用することにより、管７３０２および７４０２ならびに導波管１５０２が相互にロックされる。例示的実施形態において、トルクアダプタポケット９５０４の圧壊機能９５０６により、組み立て時においてトルクアダプタ８６０２にセンタリングのための力が付加される。また、ポケット９５０４内のボス９５０８により導波管１５０２が捕獲され、導波管１５０２が近位方向に引き抜かれるのを回避する。よって、スピンドル３７０４の組み立ては、２つの両性スピンドル半分部を共に押圧することにより、行われる。押圧後、噛み合っている回転面（すなわち、導波管回転スピンドル３７０４の中間環状溝部４６１０の外部と、ハンドル半分部４５０３および４６０３の環状ボス４６０５）の間の摩擦を最小にすることが望ましい。図９５および図９９に示すように、溝部４６１０の外側縁部を面取りして近位サイズ上のキャステレーションおよびスピンドル３７０４の遠位側上の指部溝部およびをセットバックしかつこれらの接触面を溝部４６１０の中心において隆起させることにより、噛み合っている回転面の接触領域が最小にされる。同様に、ボス４６０５の外面もその中心において隆起される。

【０３３５】

図７３、図７４および図７８そして特に図８４から理解されるように、下側表面８４０３（近位クランプ面８４０５を含む）は平坦であり、導波管１５０２の刃部７３０４の上面に対して平行である。すなわち、顎部７３０８が介在材料無しでクランプされた場合、図７９および図８０に示すように、クランプ面８４０５は先ずその近位端において刃部７３０４と接触する。そのため、導波管１５０２が超音波作動した場合、刃部７３０４により、少なくとも図８９に示すように２つの部分が平行である点までライナー７３１４に切り込むことが可能になる。しかし、顎部制御装置の例示的構成において、顎部７３０８を導波管１５０２と平行位置を超えて旋回させることが可能である。そのため、刃部７３０４によってライナー７３１４全体を切断することが可能となる。このような場合、金属刃部７３０４が金属顎部７３０８に対して振動する。このような状態になると、いずれかの部分または双方の部分が短時間で崩壊するため、このような状態は回避すべきである。

【０３３６】

本発明によるシステムの例示的実施形態は、オーバーストローク回避装置９００２および外側チューブストップ９０１２を設けることにより、この問題を解決する。前記オーバーストローク回避装置は、ボビン９００４、ナット９００６、オーバーストロークばね９００８、および遠位スライダー９０１０を含む。ボビン９００４は、外側管７３０２に長手方向に固定され、外側管７３０２が内側管７４０２および導波管１５０２に対して移動するのと共に外側管７３０２と共に移動する。内側管７４０２および導波管１５０２のうち後者は、上述のようにハンドルアセンブリ３０２に対して所定位置において長手方向において固定される。ボビン９００４の取付機構の例示的実施形態を例えば図８６に示す。同図において、２つの対向する窓８６１４および８６１８が、外側管８６０８の近位端に存在する。ボビン９００４においては、遠位端にマッシュルーム形状の頭部９６０２が設けられ、近位端においてネジ部９６０４が設けられ、ナット９００６を受け入れる。これを例えば図９６および図９７に示す。ナット９００６およびボビン９００４は、ナットを硬質停止部９７０２に締結できるように構成される。硬質停止部９７０２は、一貫するばね９００８と協働して、一貫したクランプ力を装置間において提供する。ばね９００８は低率になっており、これにより、組織厚さが変動しても、類似のクランプ力が得られる。低率によりより平坦な力プロファイルが得られ、これにより、プロファイル上のばね位置に関係無く、ユーザは、最大限に所望の力を得られる。図９７に示すように、マッシュルーム形状の頭部９６０２は、本例においては対向する２つの窓を通じて、長手方向に外側管７３０２に接続する。スライダー９０１０は、ナット９００６とボビン９００４の遠位頭部との間において、ボビン９００４の本体の外面上において長手方向にスライドすることができる。そのため、オーバーストロークばね９００８を可動スライダー９０１０と静止ナット９００６との間に配置することにより、スライダー９０１０の任意の運動に起因してばね９００８の圧縮力が発生する。また、導波管１５０２ならびに管７３０２および

Petitioner Therabody Ex-1004, 1428

７４０２の組み立て時において、外側管７３０２の近位端へと延びる細長チャンネル８６１０および８６１２に起因して、外側管７３０２の近位部が圧縮し得る。外側管７３０２の圧縮近位端は、ボビン９００４の遠位開口部９６０６内に適合することができ、このような適合により、ロックアウト指部９７０６を（放射方向に外側に）分離させる力が発生する。全体挿入後、外側管７３０２は通常のフル直径へと戻る。この時点において、ボビン９００４の固定ス９５０２は、外側管７３０２内の遠位窓８６２０と係合する。同時に、ロックアウト指部９７０６ばねが外側管７３０２の近位端において対向するチャンネル８６１０および８６１２に内側方向に進人するのと共に、ボビン９００４の内面から延びる２つの剛性ボス９６０８は、外側管７３０２の近位端において２つの対向する窓８６１４および８６１８と係合する。このようなロックアウト指部９７０６の内側への移動により、外側管７３０２のさらなる圧縮力が回避され、これにより、ボビン９００４が外側管７３０２上へとロックされる。

【０３３７】

ヨーク９０１４は、図９０～図９２に示すようにスライダー９０１０をトリガ４６０６へと接続させる。一連の図９０～図９２は、トリガ４６０６が押圧されて顎部７３０８を閉鎖する際に、ヨーク９０１４、スライダー９０１０、ばね９００８、ボビン９００４および外側管７３０２が移動する様態を示す。ヨーク９０１４がボビン９００４とのインターフェースを取る位置は回転インターフェースであるため、この位置においては、スピンドル３７０４の回転を妨げないように摩擦力を最小にすることが望ましい。このような摩擦の最小化は、ヨーク９０１４上にバンプ９８０２を設けることにより、達成される。これらのバンプ９８０２により、ｃボビン／スライダーインターフェースに対する接触領域が大幅に低減して点接触になる。図９０に示すトリガ状態において、トリガ４６０６は非作動であり、顎部７３０８は、開口した定常状態位置にある（例えば、図７３を参照）。図９１に示すトリガ状態において、トリガ４６０６は部分的作動状態であり、顎部７３０８は閉口位置にある（例えば、図７９に示す）。この位置において、ヨーク９０１４によりスライダー９０１０が近位方向に移動し、これによりばね９００８を部分的に圧縮させ、これにより、近位方向の力がナット９００６へ付与される。前記ナットが長手方向にボビン９００４に固定され、ボビン９００４が長手方向に外側管７３０２へと固定されると、トリガ運動に起因して、顎部７３０８が閉鎖される。

【０３３８】

この時点において、顎部７３０８のさらなる閉鎖（導波管に向かう回転）が所望されなくなる。外側管７３０２のさらなる運動を発生させる力を回避するために、図９３中に最良に示すように、外側チューブストップ９０１２を内側管７４０２の外面上に配置する。このような構成においては、外側管７３０２をさらに近位方向に移動させるためには、内側管７４０２の対応する運動が必要になる。

【０３３９】

しかし、顎部７３０８および刃部７３０４を用いて、両者間の組織が切断される。すなわち、顎部７３０８がクランプおよび閉鎖状態である場合、顎部７３０８またはライナー７３１４そのものによってクランプされた組織から刃部７３０へと伝達された負荷に起因して、密閉スプール８１０４の圧縮および刃部７３０４の片持ち梁の屈曲の関数として、刃部７３０４が屈曲する。刃部７３０４が屈曲すると、刃部７３０４の超音波運動特性が変化する。そのため、刃部７３０４の屈曲をできるだけ回避することが望ましい。

【０３４０】

トリガ４６０６が閉鎖されている場合、ばね９００８は圧縮される。顎部７３０８と刃部７３０４との間に何もクランプされていない時の例示的なノミナル力ばね負荷は、およそ２４ポンドである。この負荷は、ばね率と共に増加する。なぜならば、顎部７３０８が組織によって完全にピン支持されている場合、顎部内の組織厚さが最大（この例示的実施形態においておよそ２８ポンド）となるからである。クランプされた場合、ライナー７３１４から刃部７３０４内へと伝達された負荷に起因して、遠位密閉スプール８１０４の屈曲およびプローブの片持ち梁の屈曲の関数として、導波管が屈曲する。遠位密閉スプール

Petitioner Therabody Ex-1004, 1429

８１０４の圧縮力により、圧縮力の開始時において、力対撓み曲線が非線形になる。しかし、負荷が１０ポンドを超えると、前記曲線は直線状になる。図９４に示す曲線は、導波管刃部７３０４の撓みを入力の関数として示す。顎部７３０８が完全にクランプされかつ組織を把持していない場合、ばねを通じた負荷入力は、ライナー７３１４の刃部７３０４へのクランプおよび外側チューブストップ９０１２内へのクランプに付加される。最大負荷に耐えることが可能な強度で停止部９０１２が取り付けられる（例えば、溶接される）。前記停止部の配置は、既に組み立てられたシステム内において行われる。前記停止部の調整は、全公差を占有しかつプローブが適切に屈曲するように測定力をシステムに付加した状態で前記停止部を配置することにより、行われる。グラフから分かるように、１０ポンドの力において前記刃が屈曲し、負荷がおよそ１６ポンドになるまで屈曲し続ける。この時点において、外側管７３０２は停止部９０１２と接触する。ばね９００８における負荷の増加と共に、停止部９０１２は、外側管７３０２のさらなる運動に抵抗し始める。その後さらに負荷が増加した場合、前記負荷は全て停止部９０１２によって支持され、屈曲している刃部７３０４へはこれ以上の負荷はかからない。ばね９００８上の力がおよそ２２ポンドに到達した後は、負荷がさらに増加しても、刃部７３０４はこれ以上撓まない。しかし、一方、図９４のグラフの直線によって示すように、停止部９０１２が無いと刃部７３０４への負荷伝達は線形に継続し、プローブの撓みも同様である。この外側チューブストップは、複数の構成において達成することが可能である。図示の例示的実施形態において、シャフトアセンブリの近位端上に固定停止部９０１２が配置される。この同一の効果は、遠位端において達成される。例えば、外側管７３０２または内側管７４０２の端部上の図示されないタブを所定位置に屈曲させ、顎部７３０８のさらなる運動を停止させる停止部として機能させる。同様に、顎部７３０８上の図示されないタブは、この管セットと干渉するように屈曲された管７３０２および７４０２のいずれかまたは双方に対向し得る。前記タブにより、顎部を水平方向に移動させかつ組み立て後の顎部の水平運動を回避するような組み立てが可能になる。また、屈曲タブとは対照的に、溶接またはパンチを用いて、停止部として機能するフィーチャを形成することが可能である。さらに、より簡潔な停止フィーチャをハンドルのプラスチック内に用いることが可能である。

【０３４１】

本発明が処置において用いられると、ライナー７３１４が摩耗し得る。すなわち、顎部７３０８は、刃部７３０４に向かって自由に旋回する。そのため、この摩耗により、外側管７３０２が近位方向に並進することが可能となる。しかし、停止部９０１２を所定位置に配置した場合、このような運動は回避され、顎部７３０８の外側管７３０２に対する位置が迅速に制限される（すなわち、顎部７３０８は、刃部７３０４に近位方向において旋回することができなくなる）。しかし、刃部７３０４は既に顎部７３０８から遠位方向に屈曲されているため、ライナー７３１４の摩耗と共に、刃部７３０４の顎部からの自由移動が制限される。これが発生すると、撓みを維持するために必要な刃撓みおよび力の量が低下する。このような力の低下に起因して、ライナー７３１４内における摩擦および熱発生が低下し、ライナー７３１４の寿命が長くなる。本発明により、刃部７３０４の最大撓み量は、．０３０”～．０３５”である。ライナー７３１４の利用可能な厚さも同様にされる。よって、組織が無い状態での使用（すなわち、顎部が空の状態）が頻繁に長引いた酷使状態において、ライナー７３１４の摩耗に起因して金属顎部が刃部７３０４と接触し得るが、このような摩耗の後、両者間の力は最小になるかまたは存在しなくなる。

【０３４２】

本明細書中に既述したように、導波管１５０２は、トルクアダプタ８６０２において（導波管１５０２の近位領域において）ハンドル部３０２中に機械的に固定され、ハンドル部３０２および導波管アセンブリ３０４内において同心に回転方向かつ長手方向に固定される。Ｂまた、導波管１５０２は、遠位シールとして機能する連結スプール８１０４により、導波管１５０２の遠位領域において同心状に固定される。切断および／または密閉時において導波管１５０２の刃が負荷下に配置された場合、この比較的長い導波管梁は（例示的実施形態においてチタンで構成されているが）屈曲し、内側管７４０２と接触し得、

Petitioner Therabody Ex-1004, 1430

このような場合、導波管１０５２に沿った音響的活性点においてこのような接触が発生する。導波管１５０２がこのように屈曲され活性である場合、金属間接触が発生する。このような接触に起因して、可聴高周波数音（例えば、キーッという音）が発生し、この接点において発生した熱に起因して大きな電力損失が発生する。このような接触は回避すべきである。そのため、本発明は、導波管１５０２における導波管バンプ５７１０の形態をした接触支持部を提供する。より詳細には、導波管１５０２に沿った多様な位置において、このような接触支持部を提供する。

【０３４３】

アクティブ導波管１５０２の長さに沿った接点／支持部の理想的位置は、節位置である。節位置は、高応力点であり、導波管１５０２中の振動子９０２によって発生した定常音響波に沿った変位は無い。節長さは、無限に短い部分であり、定在波の共振周波数のドリフトに起因するノミナル（すなわち、自然の）位置の周囲における変位である。これらのバンプ５７１０は、導波管１５０２のより大きな直径部分であり、導波管アセンブリ３０４内の最内側管までずっと実質的に延びる。これらの節は、定在波の共振周波数ドリフトに起因してノートポイント周囲において長手方向に変位するため、各バンプ５７１０は、ノミナル／自然節位置の周囲においてセンタリングされ、節位置の任意の変位を包含する長手方向長さを有する。導波管１５０２の外直径に対してバンプ５７１０の直径が大きくなると、別の有利なフィーチャが得られる。導波管内における超音波振動について理解されるように、直径の増加に起因して、導波管変位が低減する（これを、アンチゲインおよび節位置の低活性化の工程と呼ぶ）。そのため、バンプ５７１０がかつての接触先へ振動を伝達した場合、前記振動の振幅は、導波管１５０２の残りのより幅狭部に対して低減する。バンプ５７１０の数は、選択的に選択され、例えば図５７中に示す本発明の例示的実施形態において導波管１５０２に沿った節位置数と等しくならないようにされる。図５７において、４つのバンプ５７１０が存在している。製造を容易にしかつ上記した不利な接触を回避するために、最小数のバンプ５７１０を選択する。

【０３４４】

節位置はバンプ５７１０において低活性となっているが、上記の金属間接触がそれでも問題となり得る。そのため、このような接触をさらに回避するために、本発明は、内側管７４０２内の導波管１５０２の部分を包含する内側スリーブ７６１０を提供する。スリーブ７６１０は、低摩擦係数の高温材料（例えば、Ｔｅｆｌｏｎ、ＰＴＦＥ、ＨＤＰＥ、ポリエチレン）によって構成される。図８１および図９９にそれぞれ示すように、スリーブ７６１０は、導波管１０５２の周囲において自然に同心に固定され、スリーブ７６１０の近位端におけるトルクアダプタ８６０２およびスリーブ７６１０の遠位端における密閉スプール８１０４による長手方向移動に対向するように機械的に固定される。スリーブ７６１０の内径は、バンプ５７１０における導波管１５０２のみと接触するように、選択される。スリーブ５７１０の外径は、内側管７４０２の内径と接触可能であるが、若干より小型にされ得る。スリーブ７６１０の別の構成においては、密閉スプール８１０４およびスリーブ７６１０が一体に設けられる。これらの要素は材料を共用することができ、これにより、部品数低減およびより簡潔な組み立てという恩恵が同時に得られる。この例示的実施形態において、一体形成された遠位スプール８１０４およびスリーブ７６１０は、内側管７４０２上のコルセットによって拘束される。

【０３４５】

組み立て状態において、導波管１５０２、スリーブ７６１０、内側管７４０２および外側管７３０２の断面直径は、例えばＥＴＯ滅菌のための空隙が得られるように構成される。バンプ５７１０に沿って空隙を設けることにより、導波管１５０２からスリーブ７６１０に伝わり得る音エネルギー量も低減する。さらに、スリーブ構成材料（例えば、Ｔｅｆｌｏｎ、ＰＴＦＥ）は低摩擦係数であるため、内側管７３０２または外側管７４０２に今まで付与された音エネルギーが実質的に存在しなくなる。単一の平滑な管状スリーブ７６１０に対する別の実施形態として、より複雑なスリーブを設けることができる。このスリーブにより、バンプ５７１０を導波管１５０２上に設ける必要性が全く無くなる。例えば

Petitioner Therabody Ex-1004, 1431

、スリーブ７６１０は、長手方向に延びる部分（例えば、トルクアダプタ８６０２と密閉スプール８１０４との間の導波管１５０２を包囲する２つのクラムシェル状半分部）を有し得る。各半分部は、内側方向に突出するボスと、外側方向に突出するボスとを持ち得る。前記外側方向に突出するボスは、半分部の２つの外面を部分的に包囲することで、各外側支持点において空間を形成する。これらの空間により、ＥＴＯ滅菌ガスが遠位端からずっと移動して内側管７４０２に隣接する外面上のスリーブの近位部まで移動することが可能となる。前記外側方向に突出するボスは、スタガー状に配置され得る。一方前記内側方向に突出するボスは、節のみにおいて導波管１５０２と接触するように構成される。バンプ５７１０の長手方向長さは十分に長く、前記内側方向に突出するボスはより短い長手方向長さを持ち得、前記半分部の全体的長手方向長さは、トルクアダプタ８６０２からずっと延びて密閉スプール８１０４へ到達し得、所望ならば、１つを密閉スプール８１０４と一体化させることが可能である。このようにして、導波管節上に配置された内側方向に突出するボスにより、スリーブが長手方向において静止状態となる。別の構成において、スリーブを内側方向に突出するボスおよび外側方向に突出するボス双方と共にブロー成型部とすることができ、さらに別の構成において、密閉スプール８１０４は、このスリーブと共に一体的にブロー成型される。

【０３４６】

全ての従来技術節支持部は、数が１つよりも多く、１００％接触（押圧、接合、成型）により各導波管の外径に固定される。そのため、音エネルギーが常にこのような支持部に伝わり、その結果、固有の電力取り込みが高くなり、組み立て複雑性および製造コストも高くなる。これとは対照的に、本発明のバンプ５７１０およびスリーブ７６１０による導波管支持部は、簡潔でありかつコスト効率が高い。すなわち、これらのスリーブによる拘束およびワンピース構成により、組み立てがずっと簡単かつ高コスト効率となる。また、これらのバンプフィーチャは、導波管１５０２の平均直径とそれほど異ならず、また導波管１０５２の最大直径よりも小さいため、追加の作製も問題とならない。

【０３４７】

導波管アセンブリ３０４の構造について、図１００～図１０５を参照して説明する。先ず、ライナー顎部７３０８および１００１０を顎部７３０８に挿入および固定する（例えば、図１００および図１０１を参照されたい）。内側管７４０２の形状は、外側管７３０２の遠位端を越えて十分に離隔方向に延在するような形状になっており、これにより、図１０１～図１０２の進行と共に、クレビスアーム７４１８および７４２０の（矢印Ａによって示すような）可撓性開口が、顎部の対向するボス７４０８の（矢印Ｂ）を内部に受け入れることが可能になる。顎部７３０８が内側管７４０２内に組み立てられると、図１３に示すように、顎部７３０８は管７３０２および７４０２の中心線の下側において旋回し、内側管７４０２は外側管７４０２内にスライドする。その結果、顎部７３０８の旋回制御タブ７４１１および７４１２は、外側管７３０２内の位置へと進入する。前記顎部は、図１０４に示すように、管７３０２および７４０２の中心線の上方において旋回して開口し、旋回制御タブ７４１１および７４１２は、外側管７３０２の開口部７３１１および７３１２に挿入される。

【０３４８】

その後、導波管１５０２を１組の管７３０２および７４０２を通じて挿入することで、顎部７３０８を内部に捕獲する。なぜならば、導波管１５０２の存在に起因して、顎部７３８０はこれ以上長手方向において管７３０２および７４０２の中心線に向かって移動することができないからである。最終組み立て位置を多くの図面（例えば、図７３および図７６）中に示す。例えばイソプロピルアルコールを用いることにより、導波管１５０２を遠位ダンベルシール８１０４を通じて容易にスライドさせることが可能になる。その後、前記アルコールは蒸発するため、ダンベルシール８１０４に残留物は残らない。明らかなように、このアセンブリプロセスは、接合部を機械的に配置する以外の動作は不要であるため、独自である。溶接、クリンプまたは変形が発生せず、また、完全組み立て時においていかなる部分においても溶接、クリンプまたは変形は不要である。

Petitioner Therabody Ex-1004, 1432

【０３４９】
この組み立てプロセスは、製造において大きな恩恵を提供する。内側管７３０２および外側管７４０２の潤滑を、このような接合における汚染を回避するためのクリーンルームのアセンブリラインではなく、管製造業者において行うことが可能である。内側管７３０２および外側管７４０２を同軸方向に取り付ける前に、平行移動用ｏリング７４０６を内側管７４０２のコルセット７４０４内に配置し、その後、外側管７３０２を内側管７４０２上にｏリング７４０６までスライドさせる。潤滑剤をｏリング７４０６上に配置し、外側管７３０２を内側管７４０２に対して移動させる（かまたはこの逆を行い）、これによりｏリング７４０６を回転させ、コルセット７４０４内において移動させる。前記潤滑剤中の水分は乾燥して無くなるため、管７３０２および７４０２間およびｏリング７４０６の周囲のみに潤滑剤が残る。

【０３５０】
変位依存型の超音波システムの開発における共通問題として、導波管変位の測定が複雑かつ不正確である点がある。最も高精度な測定システムとしてレーザー振動計があるが、レーザー振動計の場合、相当する高周波数動的標準による較正が不可能であり、高価でもある。１つの粗いかつ簡単な較正方法として、動的高周波数システムの表面上の反射「スポット」の変位を拡大下において観測する方法がある。ピークツーピーク変位が観測され、この変位を既知の長さ標準と相関付けることができる。拡大観測方法に関連する主な問題として、このような「スポット」がランダムでありかつ一貫していない点がある。導波管変位測定の例示的実施形態において、本発明は、制御された視覚フィーチャ（例えば、導波管１５０２の刃部７３０４に対する、意図的に付加されたスポット、マーク、図柄、機械加工穴部、溝部など）を用いる。このようなフィーチャを刃７３０４上に設けることで、拡大変位観測および測定の精度が向上する。

【０３５１】
ＸＶ．さらなる安全フィーチャ

【０３５２】
本発明の構成のいずれかの例示の安全性の実施形態でも、システムは、手持ち式超音波手術用焼灼アセンブリ３００に対して装置を使用する外科医をアースする安全機構を有してよい。導波管１５０２が偶然に外科医に接触した場合、手持ち式超音波手術用焼灼アセンブリ３００は、このアースを検出して導波管１５０２の運動をすぐさま終了させ、それによって外科医が自分自身を切断することを防止する。手持ち式器具３００はアースに接続されていないので、外科医との接触を検出して超音波電力供給を遮断する安全回路を提供することが可能である。例えば、ハンドルアセンブリ３０２上に配置された容量性接点パッチが、（例えば容量性スイッチングで使用されるおよび従来技術で公知の）容量性タッチ検出回路に接続され、外科医との作動チップの接触を検出するために配置される。そうした接触が検出された時、器具の駆動回路９０４は、外科医に切断エネルギーを作用させることを回避するために停止される。そうした検出回路は、ハンドピースが、接地アースされた電気器具の大きな部品に接続される従来技術のシステムは実用的ではないであろう。

【０３５３】
別の例示的実施形態においては、振動子は、受け入れモードにおいて機能する。この受け入れモードにおいて、導波管中の振動を信号に変換することで、前記信号を装置の電子機器によって監視することが可能となる。例えば、血管内を流れる血流と関連する振動を検出し、この振動を用いて、クランプされている組織の種類についてのフィードバックをユーザに提供することができる。例えば、顎部のクランプ時において、この検出により、クランプ直前に大きな血流が有ったか否かを決定することができる。信号により、当該装置が例えば高重量血管系をクランプしており、例えば密閉時に低電力を用いるべきである旨をユーザに警告することができる。あるいは、高重量血管系が検出された場合、安全機構として高エネルギー起動を禁止することも可能である。

【０３５４】

Petitioner Therabody Ex-1004, 1433

本発明の別の例示の実施形態では、バッテリアセンブリ３０１がハンドルアセンブリ３０２に物理的かつ電気的に連結された後、手持ち式手術用焼灼アセンブリ３００は、ボタン４６０８が押し込み状態から離脱状態に変化するまで、すなわち、非押し込み状態に動的に配置されるまで、作動しない。この特徴は、バッテリアセンブリ３０１がハンドルアセンブリ３０２に接続された時にすぐさま手持ち式超音波手術用焼灼アセンブリ３００が作動することを防止しする。これは、そうしなければ、操作者が、バッテリアセンブリ３０１をハンドルアセンブリ３０２に接続した時に意図せずボタン４６０８を押し込んだ場合に生じ得る。

【０３５５】

本発明は、相互接続されルカ゛分離可能な３つの構成要素（すなわち、バッテリアセンブリ３０１、ハンドルアセンブリ３０２、およびＴＡＧアセンブリ３０３）を含み、各様子が固有にアクセス可能である（かつ選択的に露出される）電気接続を有するため、これら３つの分離可能な要素間において静電放電（ＥＳＤ）が発生する危険性がある。そのため、別の例示的実施形態において、本発明は、ＥＳＤ保護戦略を用いて、装置の損傷および潜在故障可能性を回避する。この種の保護を実行するために、本発明の範囲および意図内に収まる広範囲の解法が企図される。例を非限定的に挙げると、別個のＥＳＤ保護要素および火花間隙の使用がある。

【０３５６】

装置の電気要素を損傷から保護するためのさらに別の例示的実施形態において、一定の様態で（例えば、逆転した様態で）電池を配置することで、そのコネクタタブが電気基板から離隔方向を向くようにする。この構成により、不慮の短絡の可能性が低下し、電池相互接続基板の使用も可能となり、これにより、電池タブの回路への接続が容易化される。

【０３５７】

説明したように、本発明は、自己駆動式の小型で効率的な、従って、従来技術の装置で必要とされる高価なセットトップボックスを完全に排除するコードレスの手持ち式超音波切断装置を提供する。有利には、本発明の装置によれば、ユーザは、完全にコードや他のつなぐ装置なしで作動させることができる。コスト削減、サイズの小型化、電力を供給して信号を伝達するつなぎのコードの排除、および、一定の運動電圧を提供することの利点に加えて、本発明は、手術環境内で滅菌状態を維持することができる独自の利点を提供する。説明したように、本発明の装置は、滅菌野内のみで維持される滅菌可能な構成要素から完全に構成されている。さらに、本発明のシステムのすべての電子制御は滅菌野内に存在する。従って、任意のおよびすべてのトラブルシューティングは滅菌野内で生じ得る。すなわち、従来技術で必要とされるように、本発明の装置はデスクトップボックスにつながれていないので、ユーザは、本発明の手持ち式超音波手術用焼灼アセンブリ３００によって任意の機能（例えばトラブルシューティング、バッテリの交換、導波管アセンブリの交換など）を実行するために滅菌フィールドから出ることを全く必要としない。さらに、本発明の二段階ボタンは、操作者が器具自体のそれらの視覚的な注意に集中することなしに、任意の手術の仕事の完全な制御を操作者に可能にする。言い替えれば、操作者は、１つのみのボタンが使用されるので、適切なボタンを押す準備を保証するために見る必要がない。

【０３５８】

本発明はまた、変圧器電圧の上昇段階に先立って、低電圧又はバッテリ電圧スイッチング又は波形形成段階を提供する。周波数に感度の高いすべての構成要素を１箇所（例えばハンドル）内に「固く結合させる」ことによって、本発明は、従来技術のすべての超音波焼灼／切断装置が被る不利益である、従来技術のセットトップボックスとハンドピースとの間で生じるあらゆる誘導損失を排除する。駆動回路と整合ネットワーク１０１２の間の密接な連結のため、すべての電力変調回路は、より高いＱ要因およびより大きな周波数帯に寛容である。

【０３５９】

本発明の特定の実施形態を開示したが、当業者は、本発明の精神および範囲から逸脱せ

Petitioner Therabody Ex-1004, 1434

ずに特定の実施形態に変更がなされ得ることを理解する。従って、本発明の範囲は特定の実施形態に限定されず、添付の特許請求の範囲は、本発明の範囲内で任意のかつすべてのそうした応用例、変形例および実施例を網羅することが意図される。

【図１】

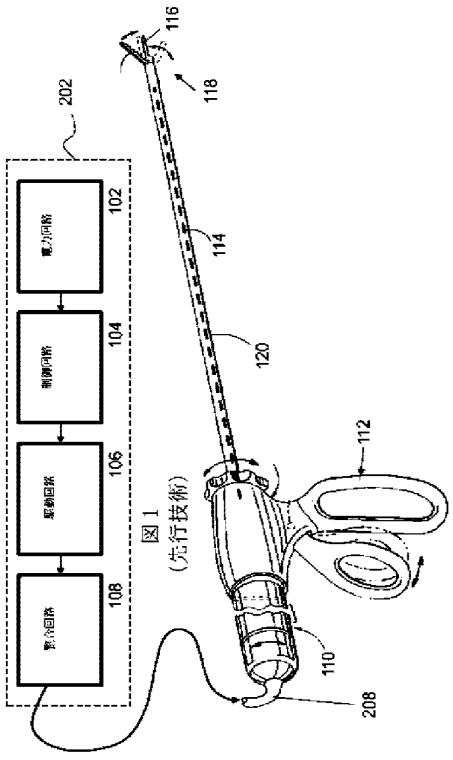
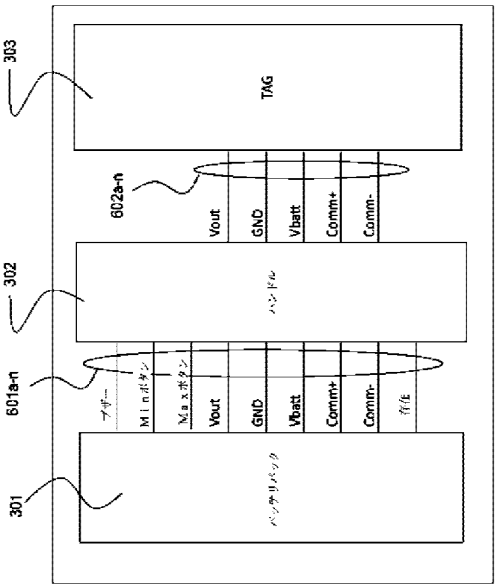


図１
（先行技術）

【図６】



300
図６

【図７】

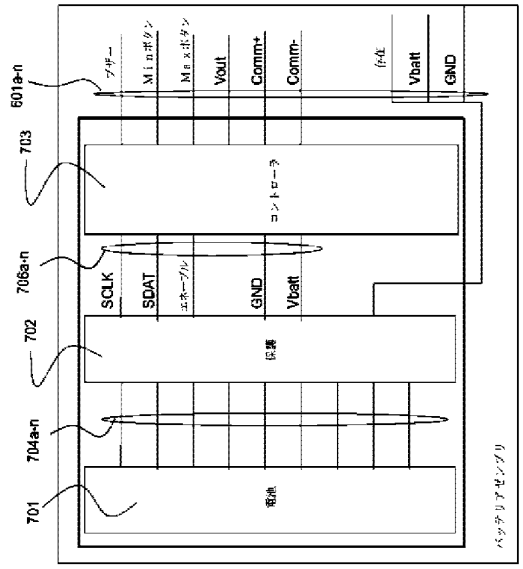


図７

【図８】

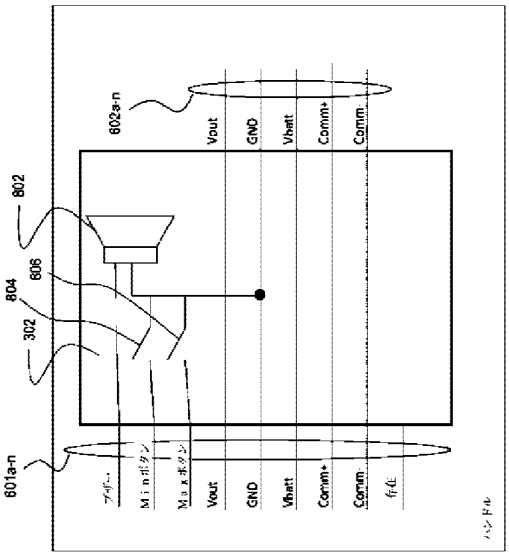


図８

【図９】

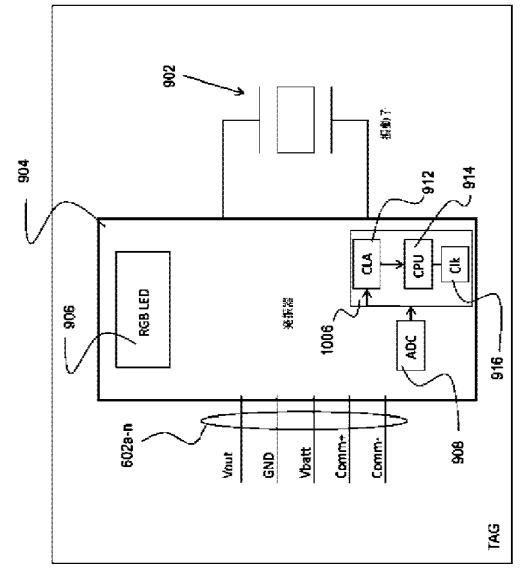


図９

【図１０】

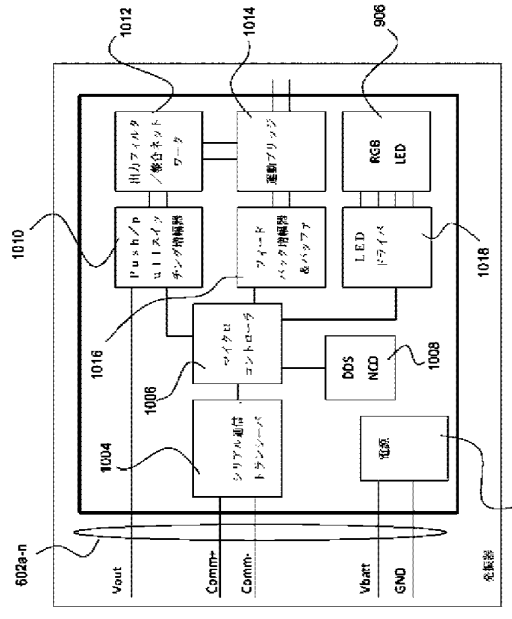


図１０

【図１１】

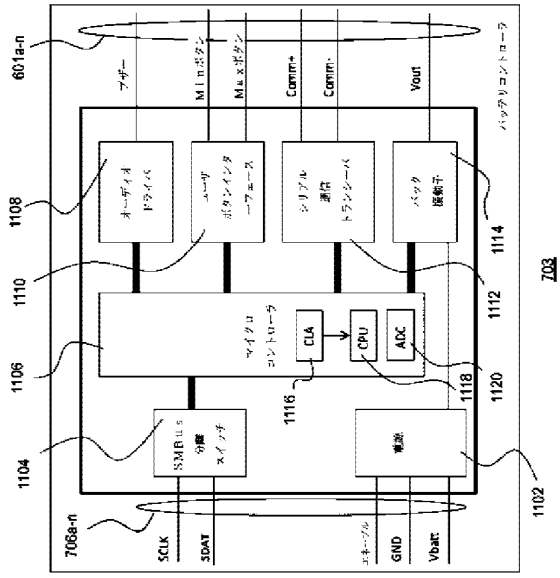


図１１

【図１２】

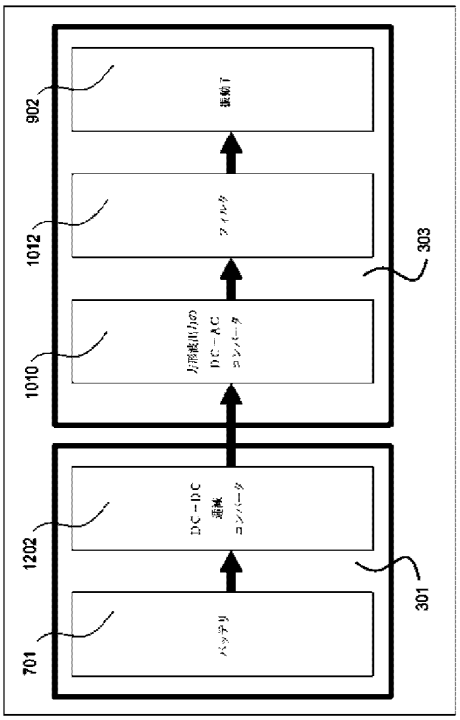


図１２

【図１３】

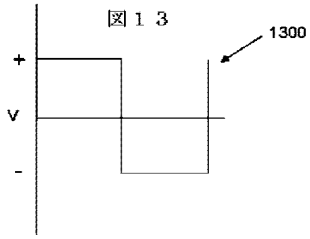


図１３

【図１４】

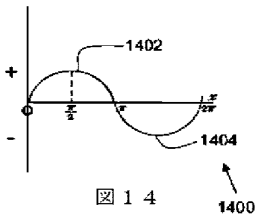


図１４

【図１５】

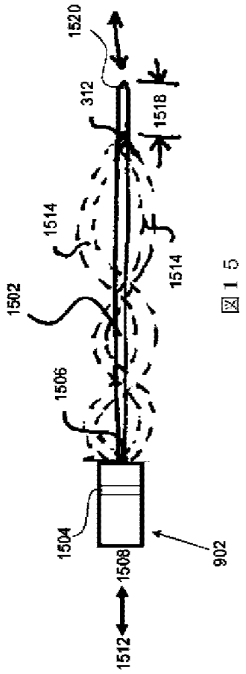


図１５

【図１６】

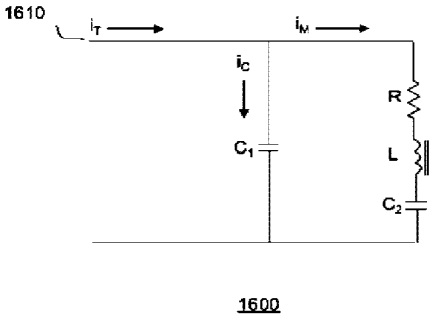


図１６

【図１７】

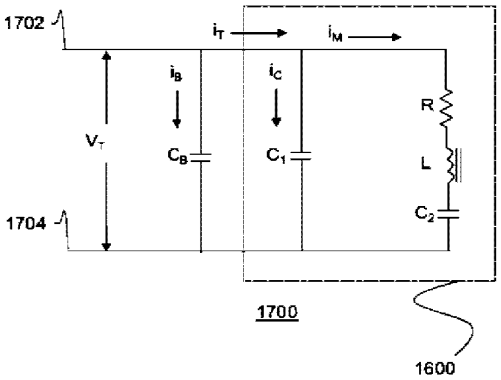


図１７

【図１８】

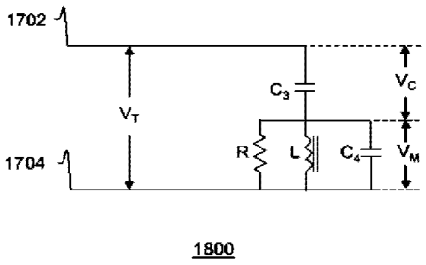


図１８

【図１９】

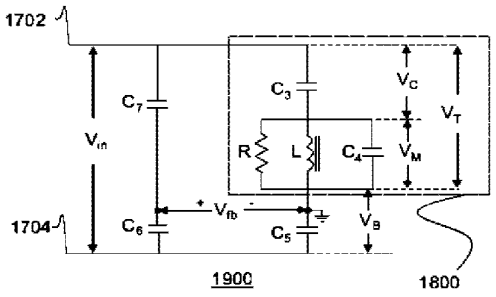


図１９

【図２０】

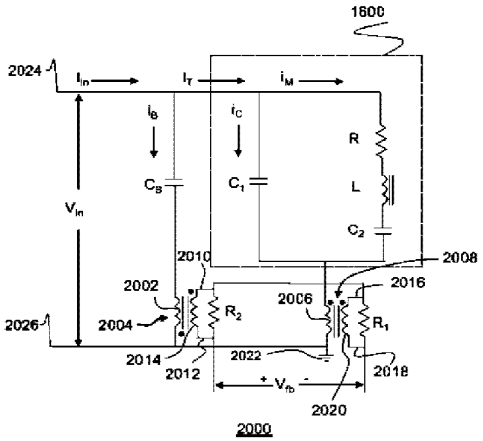


図２０

【図２１】

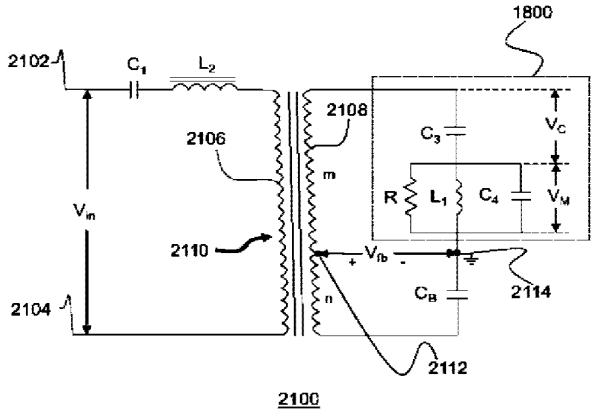


図２１

【図２７】

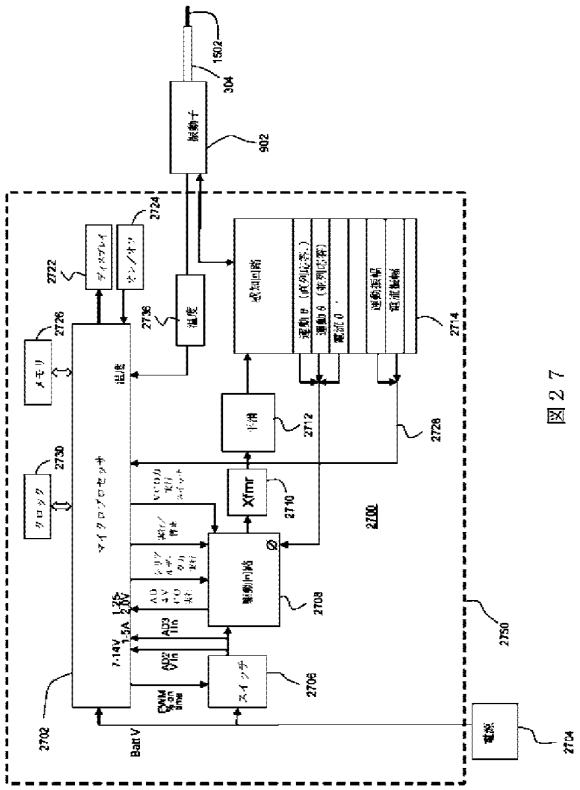


図２７

Petitioner Therabody Ex-1004, 1439

【図７２】

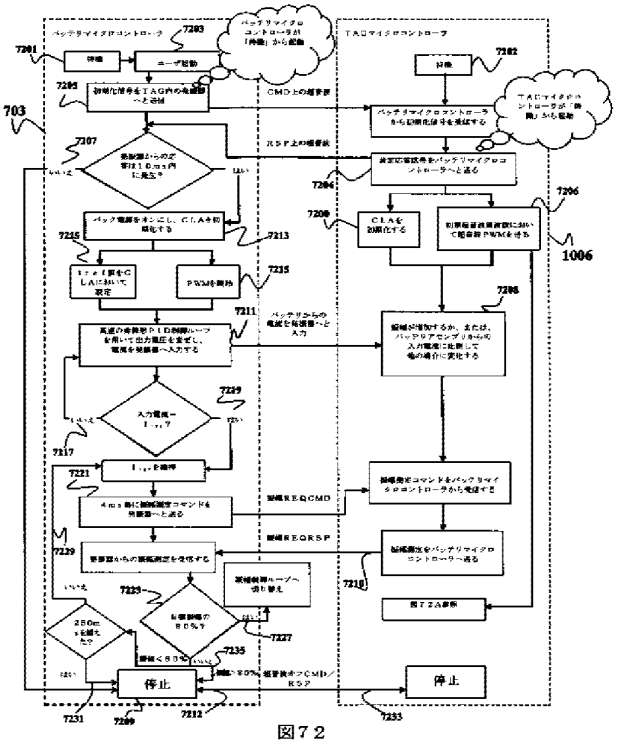


図７２

【図７２Ａ】

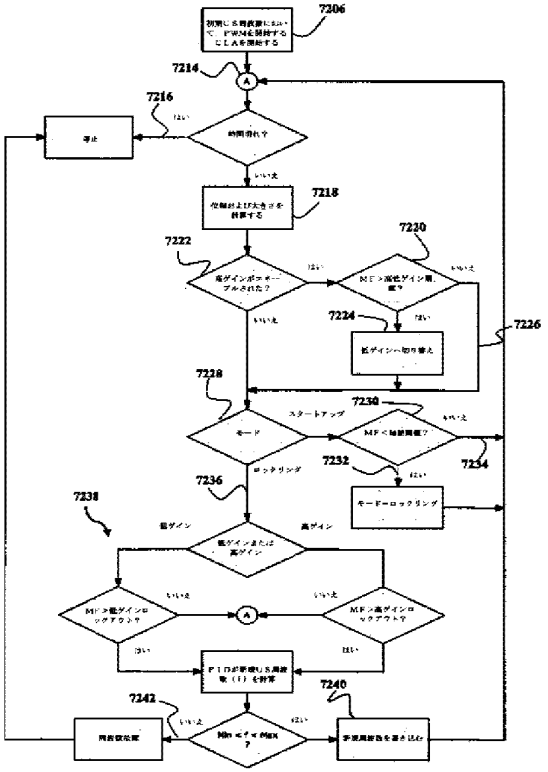


図７２Ａ

【図７３】

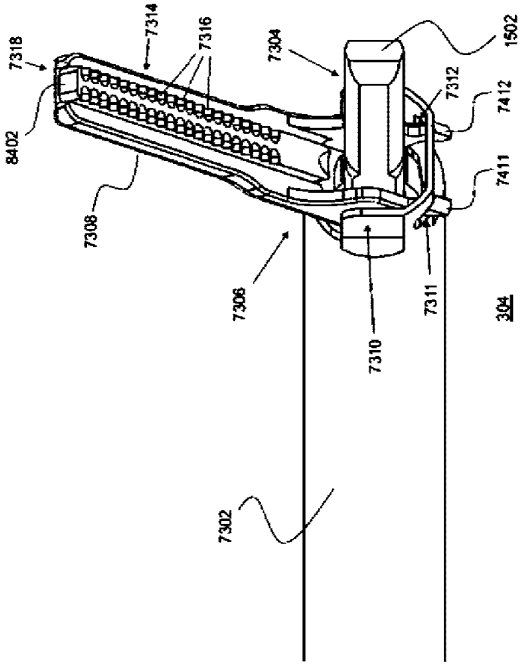


図７３

【図７４】

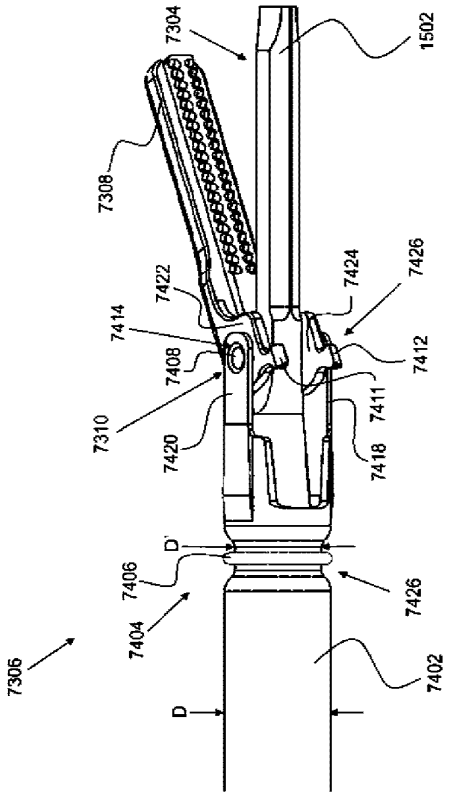


図７４

【図７５】

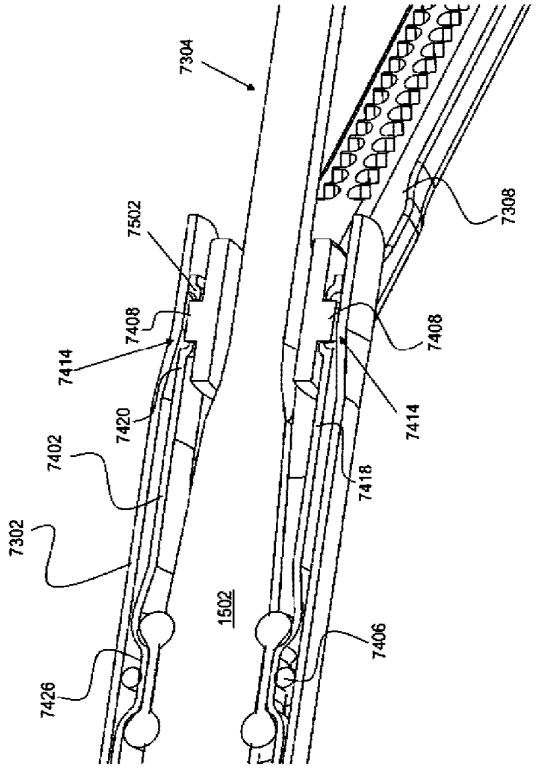


図７５

【図７７】

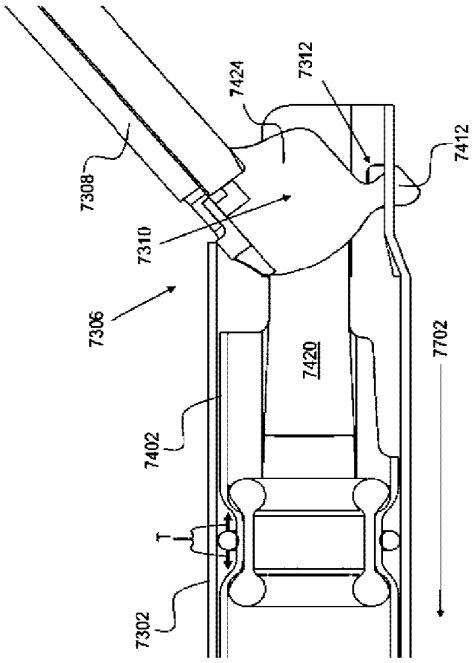


図７７

【図７８】

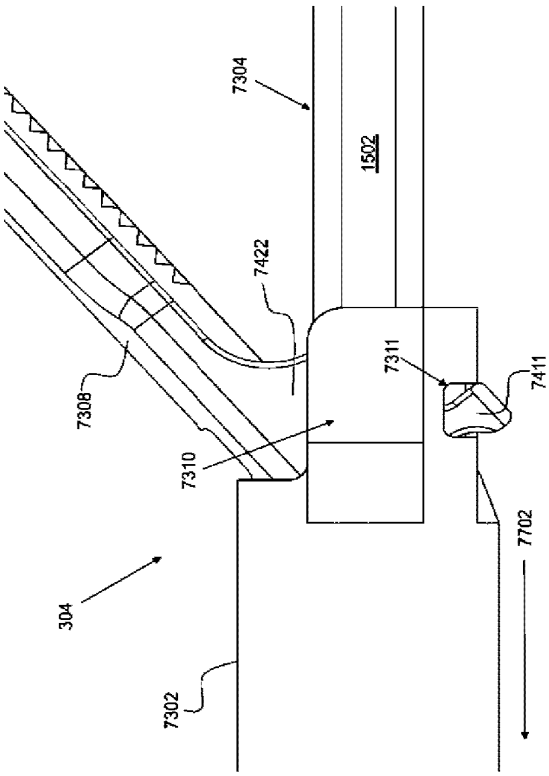


図７８

【図７９】

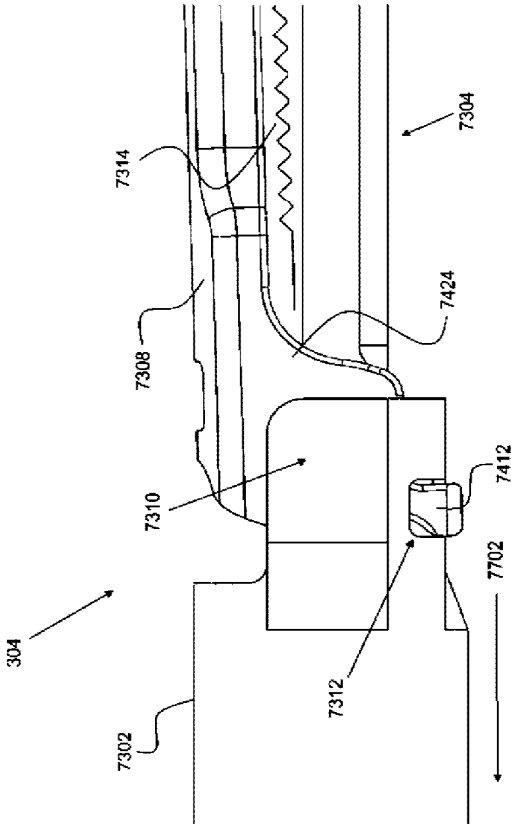


図７９

Petitioner Therabody Ex-1004, 1441

【図８０】

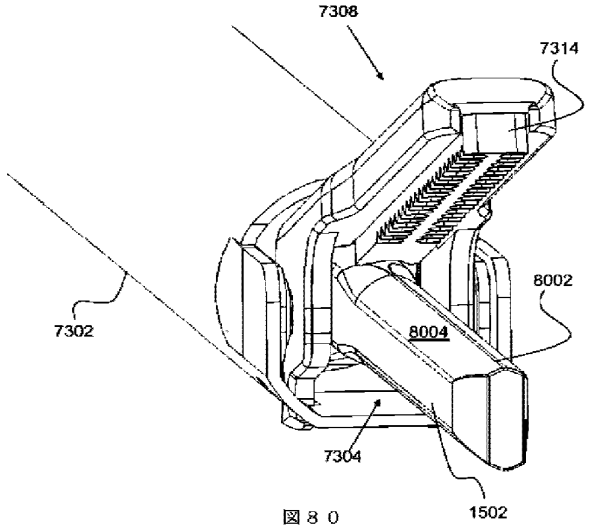


図８０

【図８１】

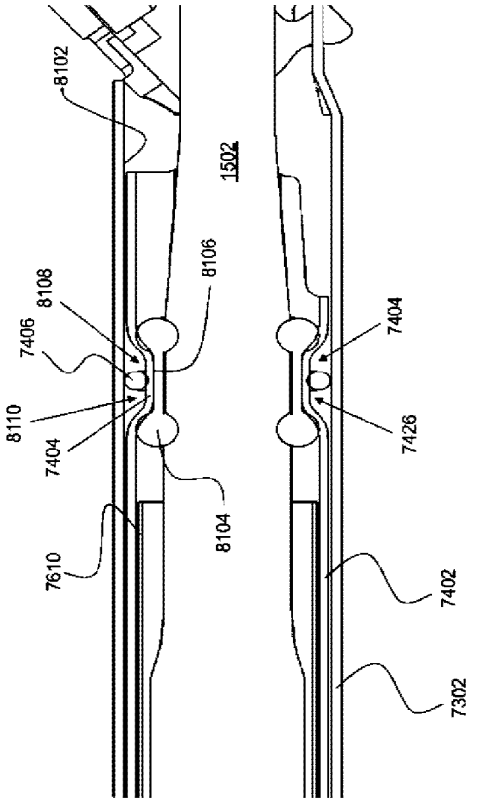


図８１

【図８２】

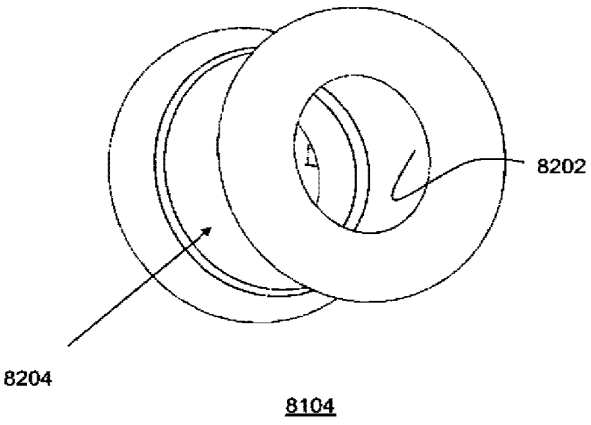


図８２

【図８３】

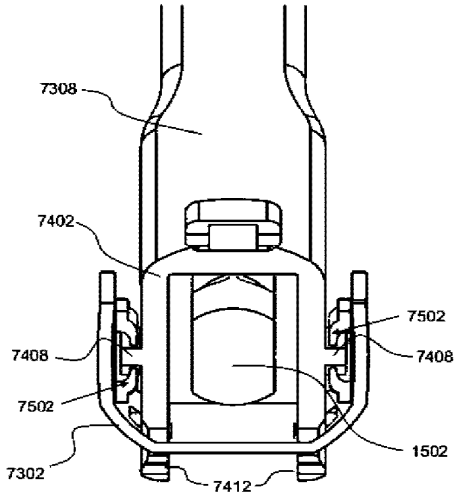


図８３

Petitioner Therabody Ex-1004, 1442

【図８４】

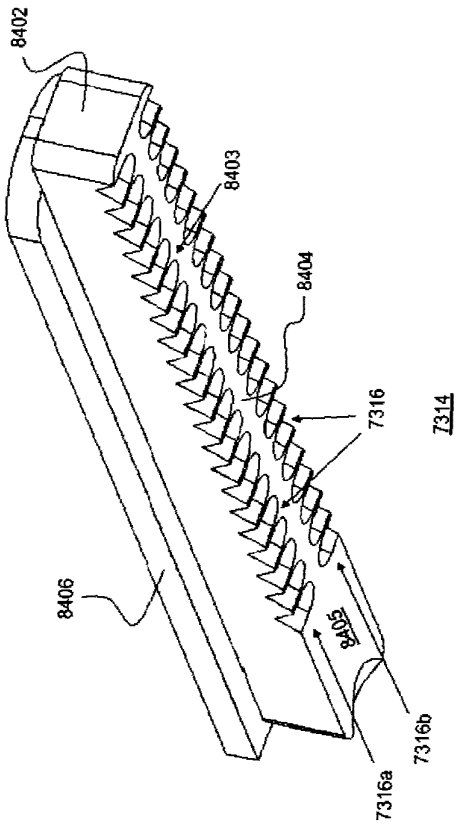


図８４

【図８５】

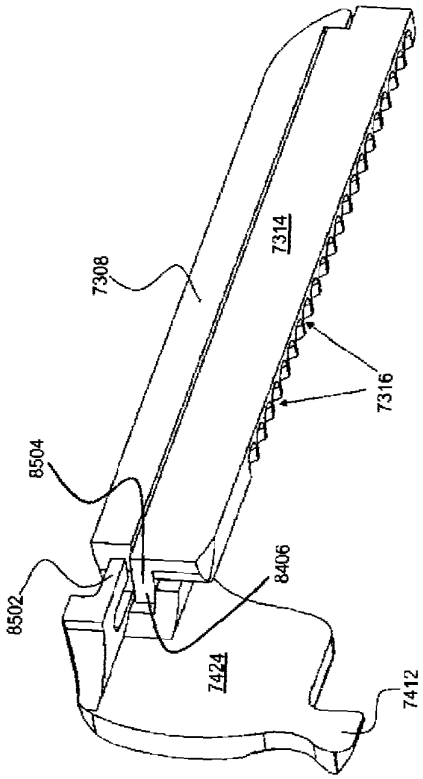


図８５

【図８６】

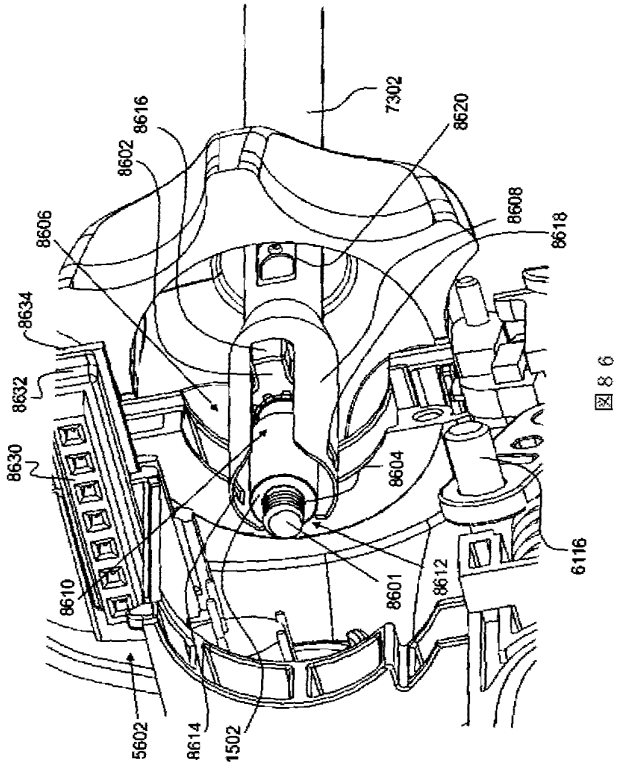


図８６

【図８７】

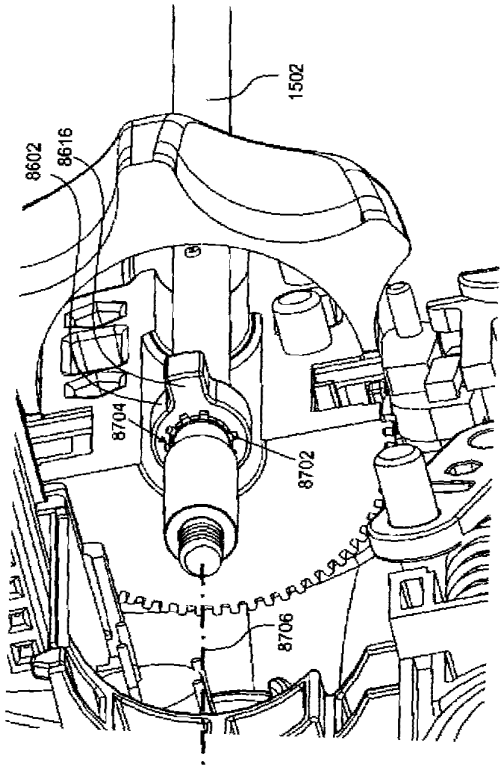


図８７

Petitioner Therabody Ex-1004, 1443

【図８８】

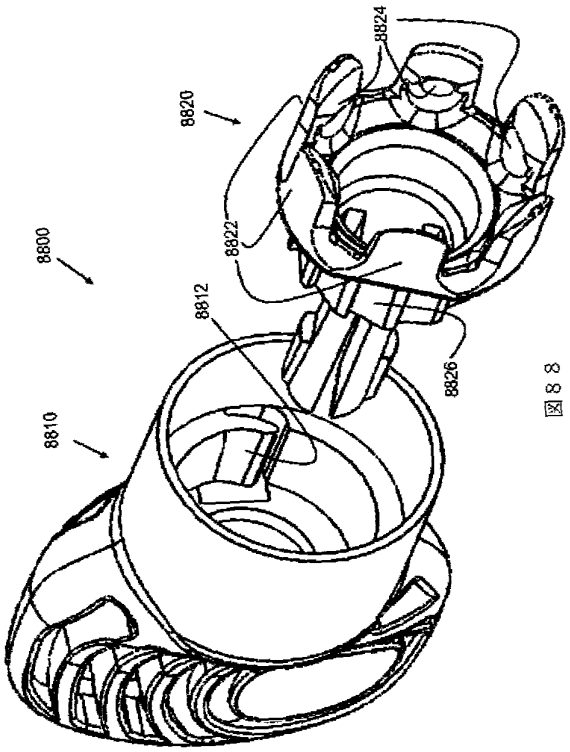


図８８

【図１０７】

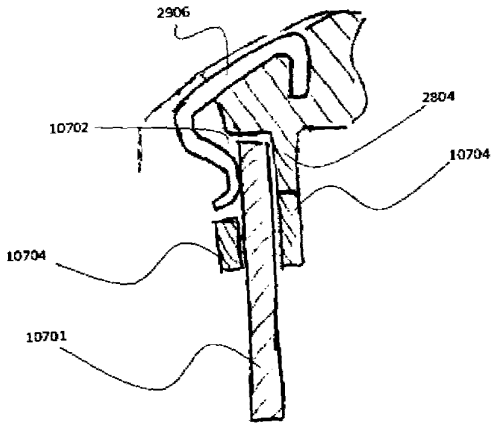


図１０７

【図１０８】

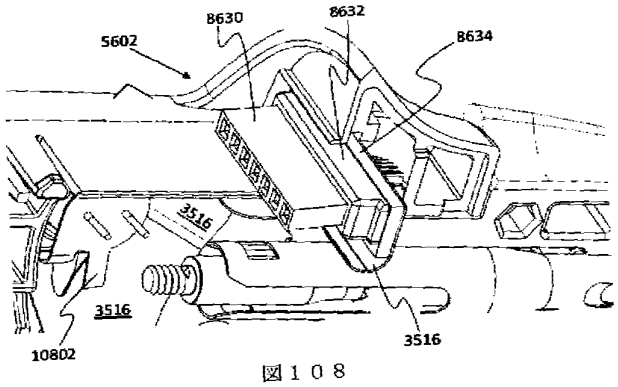


図１０８

Petitioner Therabody Ex-1004, 1444

【図２】

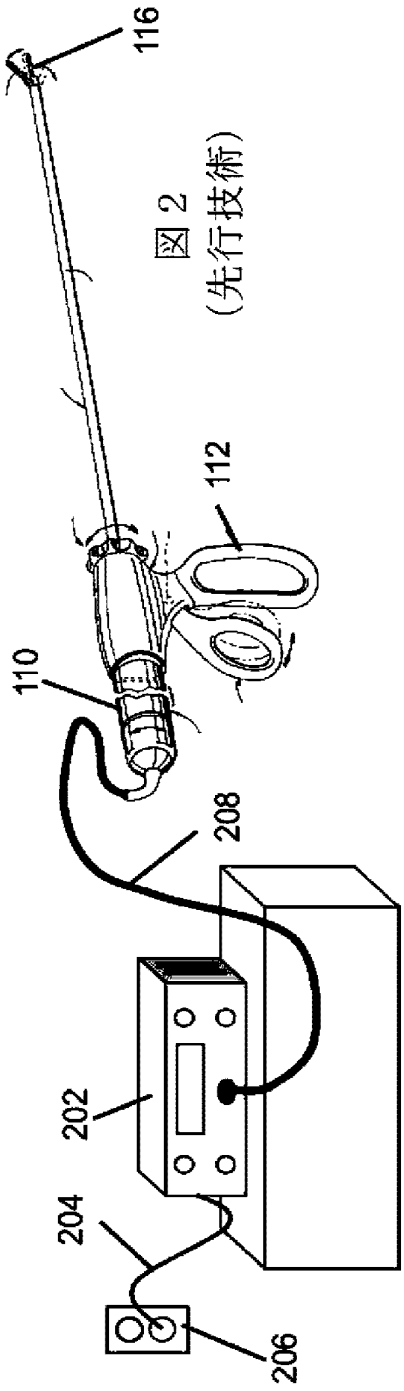


図２
（先行技術）

Petitioner Therabody Ex-1004, 1445

【図３】

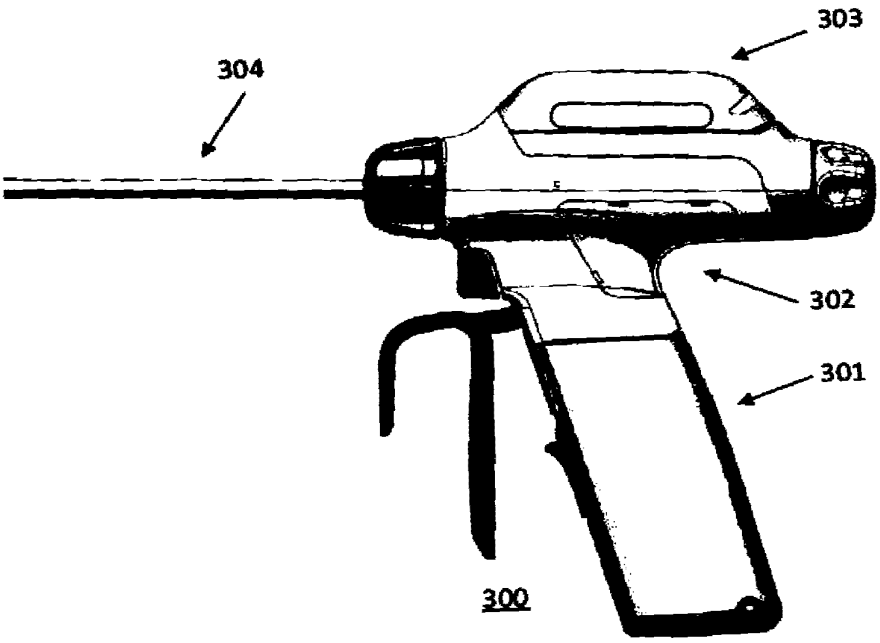


図３

Petitioner Therabody Ex-1004, 1446

【図４】

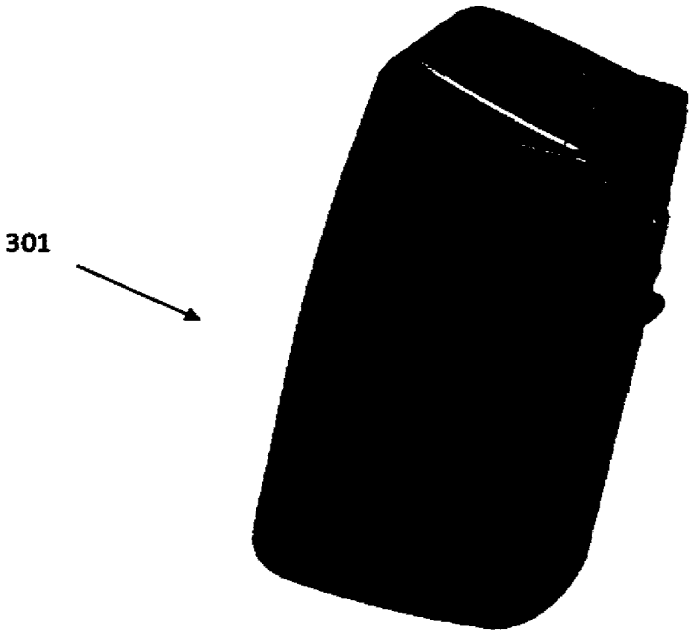


図４

【図５】

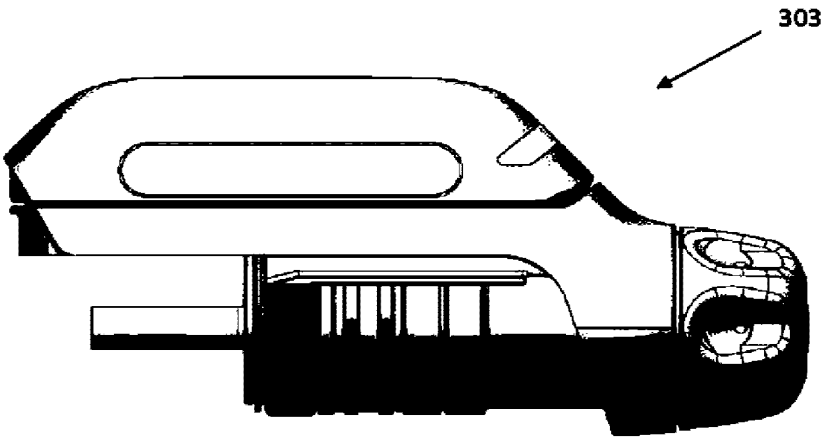
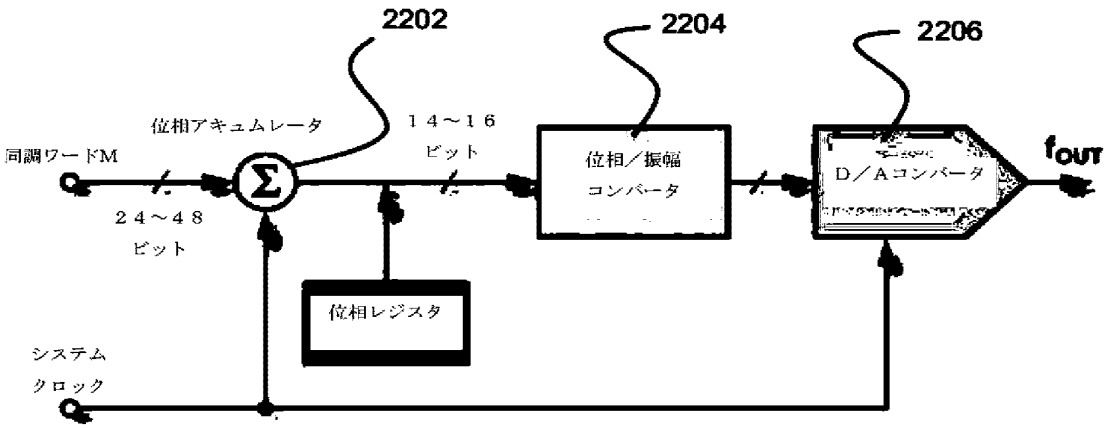


図５

Petitioner Therabody Ex-1004, 1448

【図２２】


2202
2204
2206
位相アキュムレータ
同調ワードM
２４～４８
ビット
１４～１６
ビット
位相／振幅
コンバータ
D／Aコンバータ
fOUT
位相レジスタ
システム
クロック

2200

図２２

【図２３】

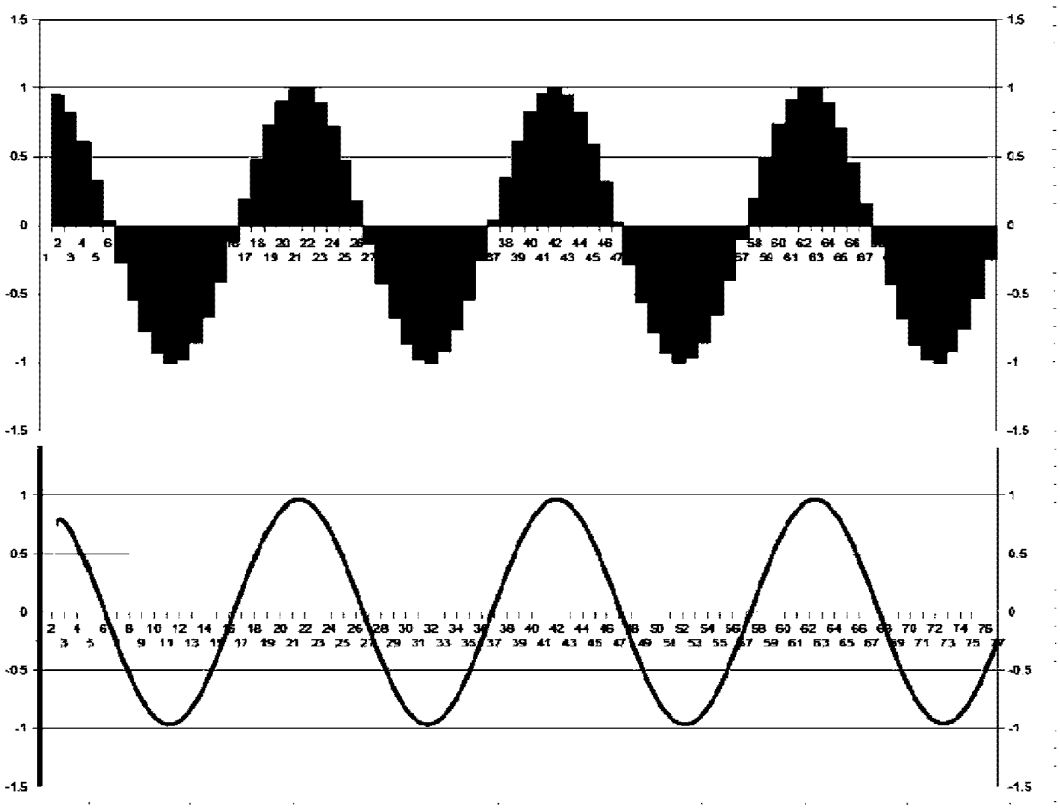
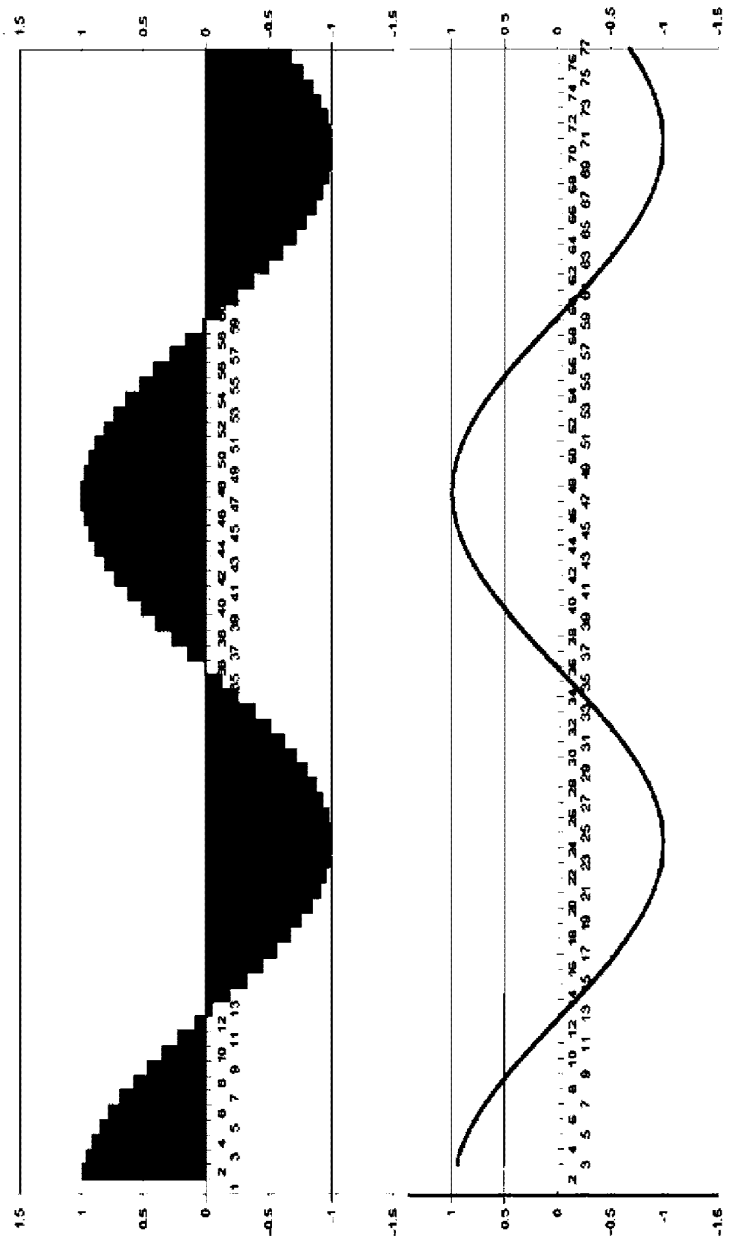


図２３

Petitioner Therabody Ex-1004, 1450

【図２４】

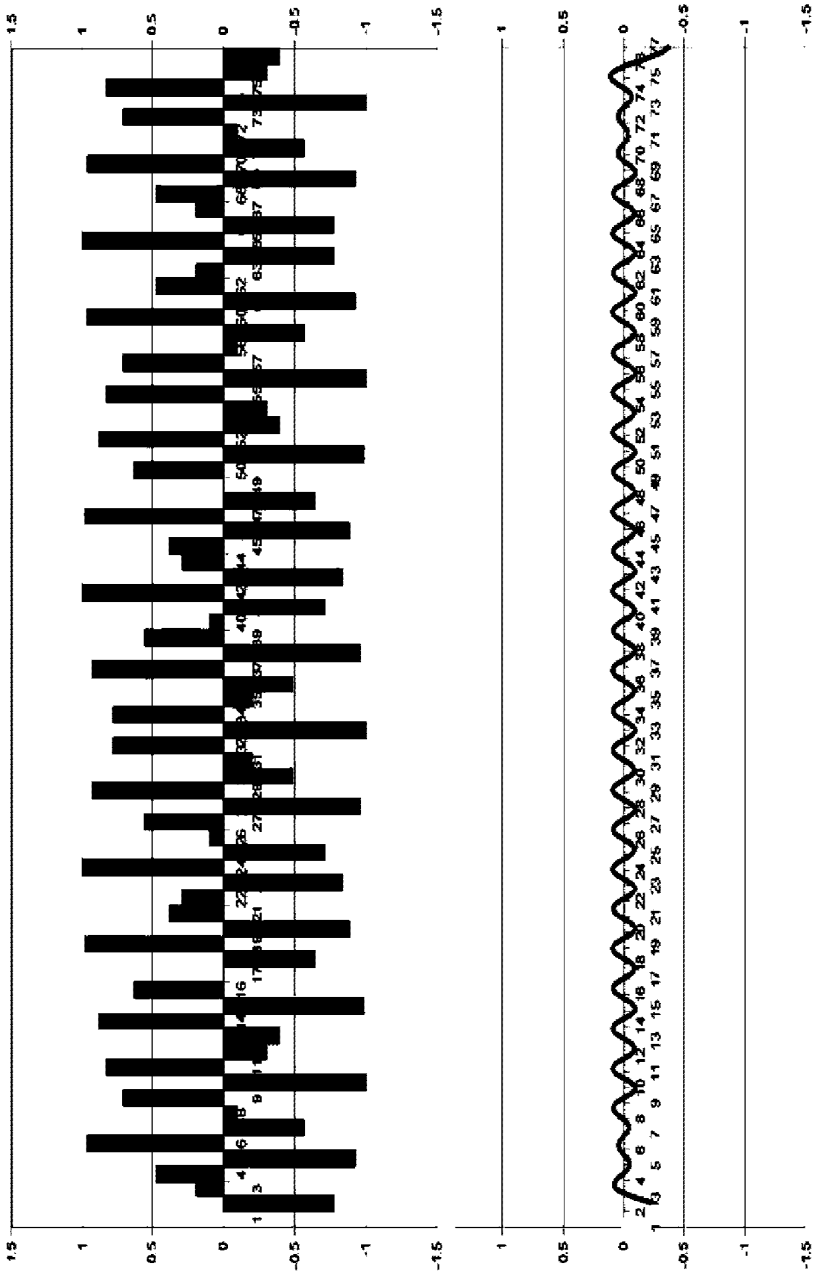


2400

図２４

Petitioner Therabody Ex-1004, 1451

【図２５】



2500

図２５

【図２６】

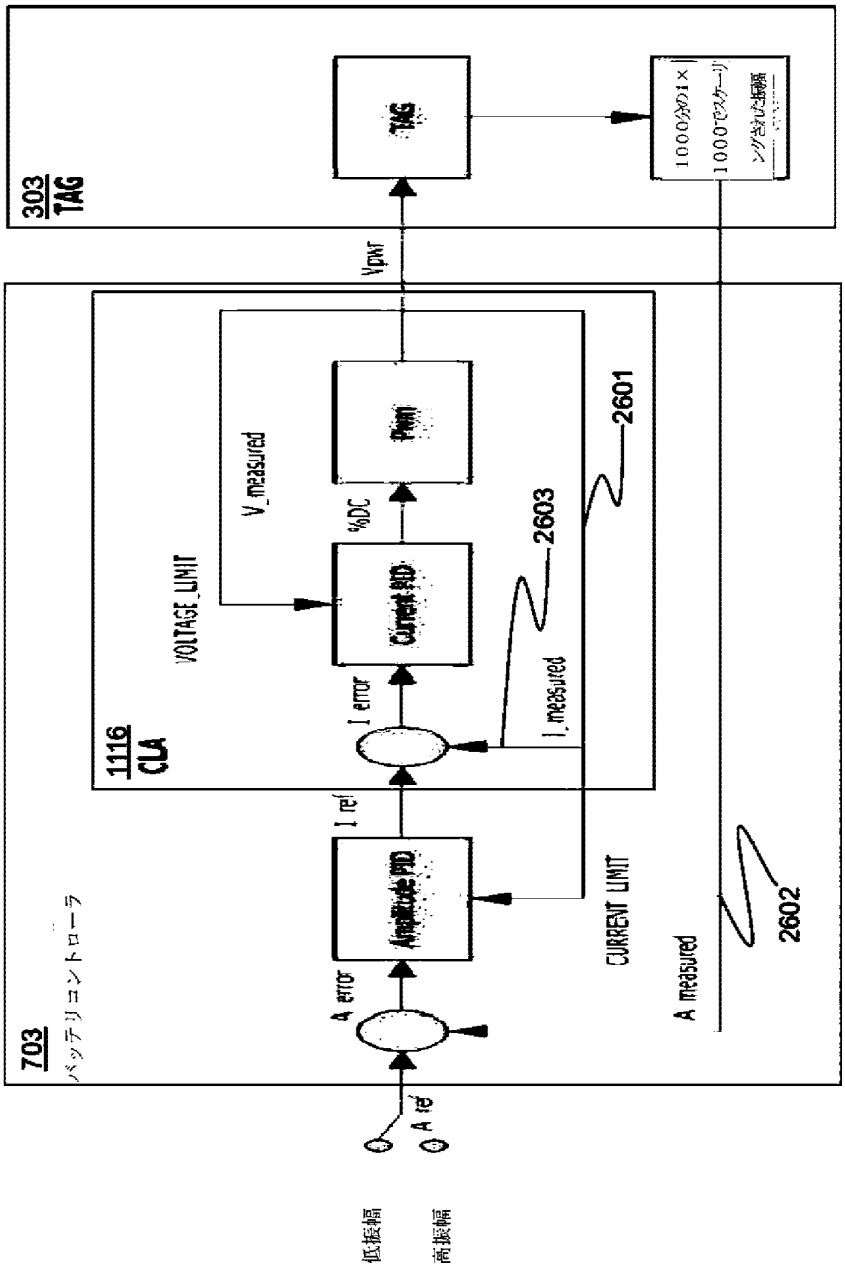

303
TAG
TAG
1000分の1×
1000でスケーリング
Vpwr
703
バッテリコントローラ
1116
CLA
VOLTAGE_LIMIT
V_measured
Power
%DC
Current PID
2603
2601
I error
I_measured
I ref
Amplitude PID
A error
CURRENT LIMIT
A measured
2602
A ref
低振幅
高振幅

図２６

【図２８】

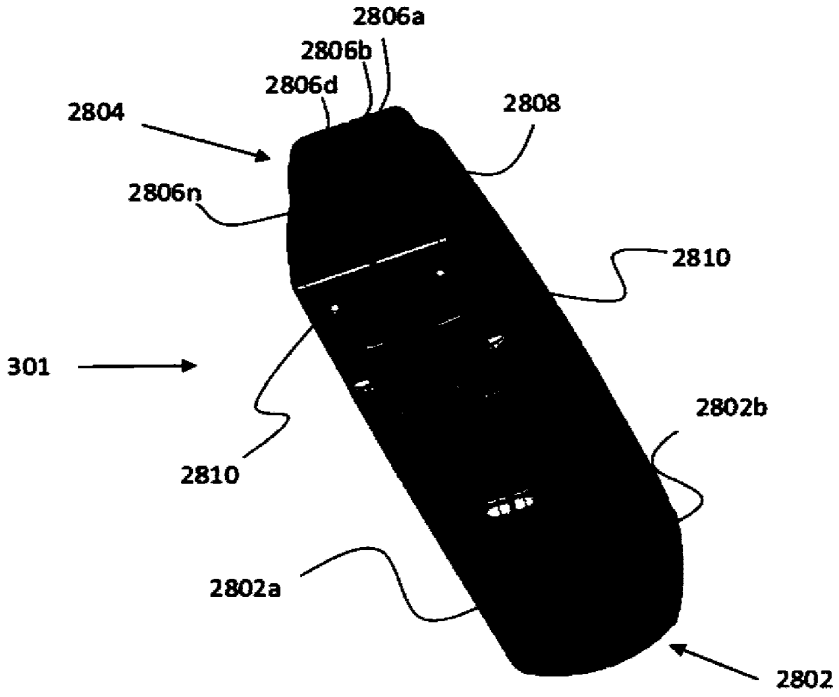

2806a
2806b
2806d
2804
2808
2806n
2810
301
2802b
2810
2802a
2802

図２８

【図２９】

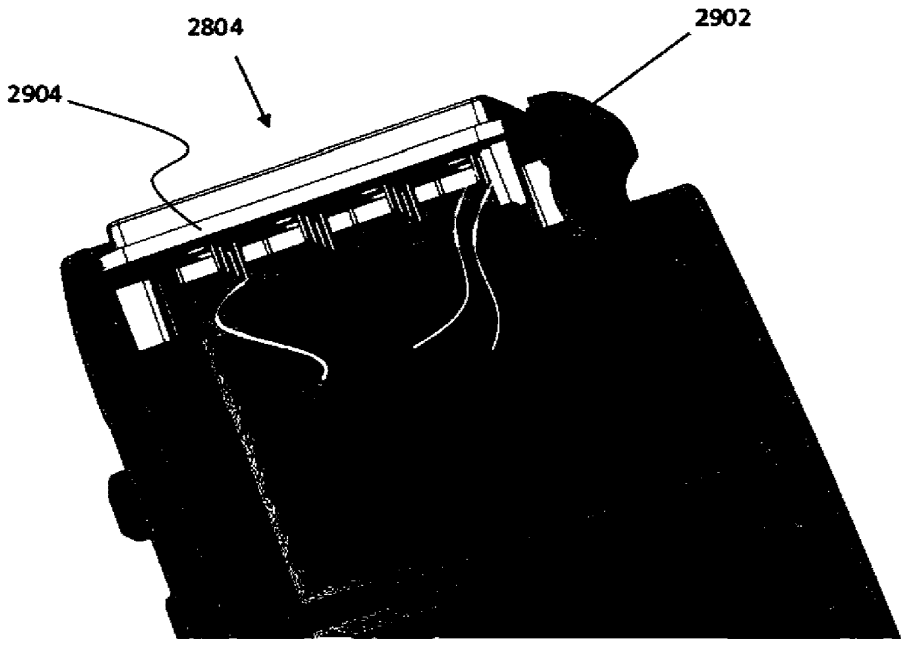


図２９

【図３０】

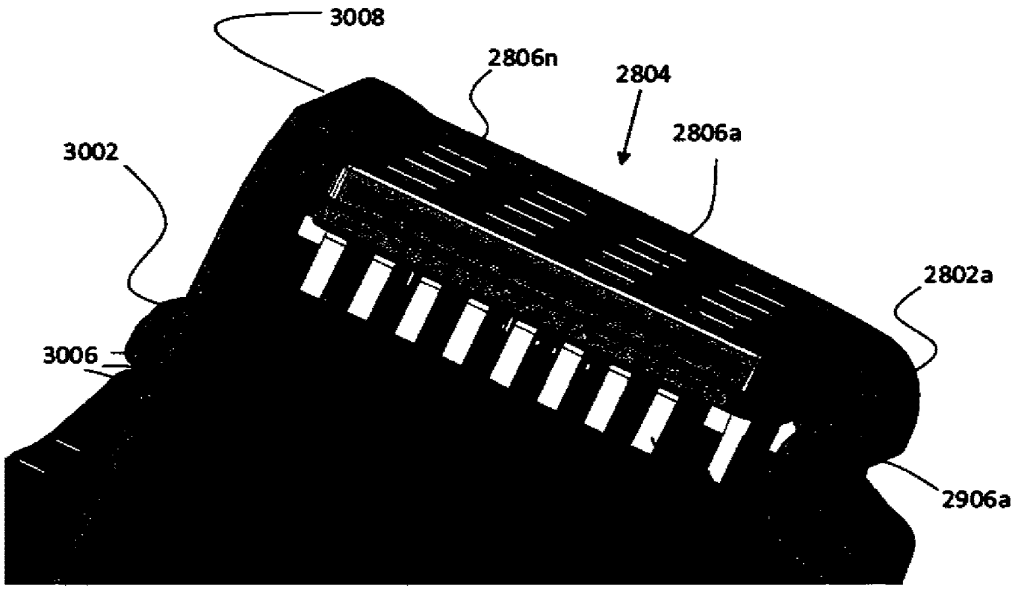


図３０

【図３１】

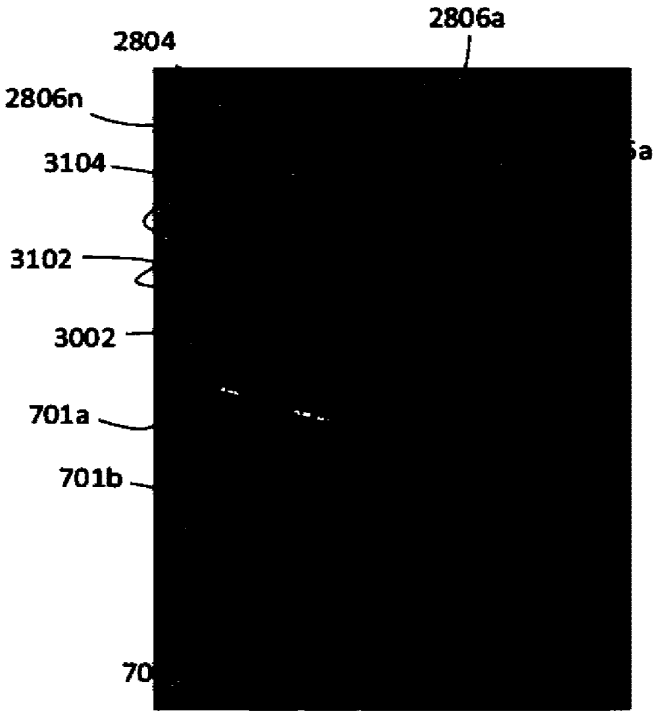


図３１

【図３２】

図３２

Petitioner Therabody Ex-1004, 1458

【図３３】

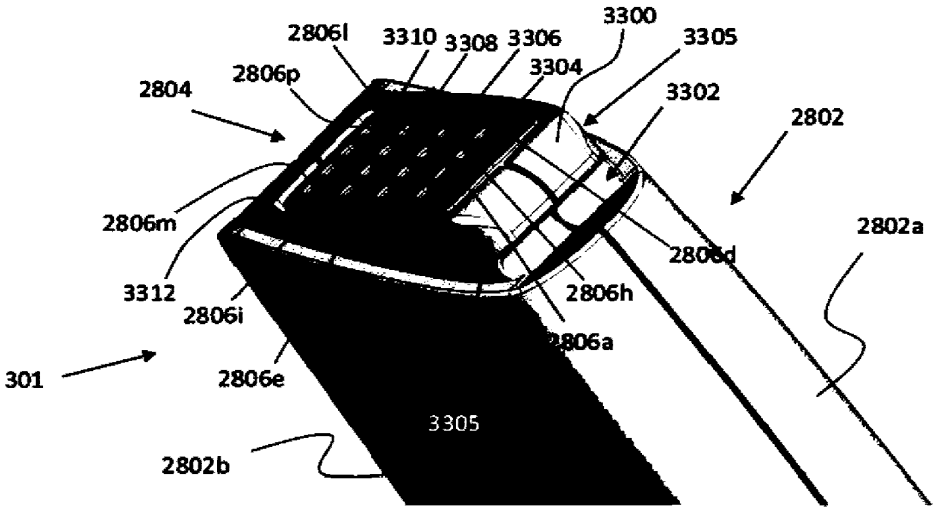

2806l
3310
3308
3306
3300
3305
2806p
3304
2804
3302
2802
2806m
2802a
2806d
3312
2806h
2806i
2806a
301
2806e
3305
2802b

図３３

【図３４】

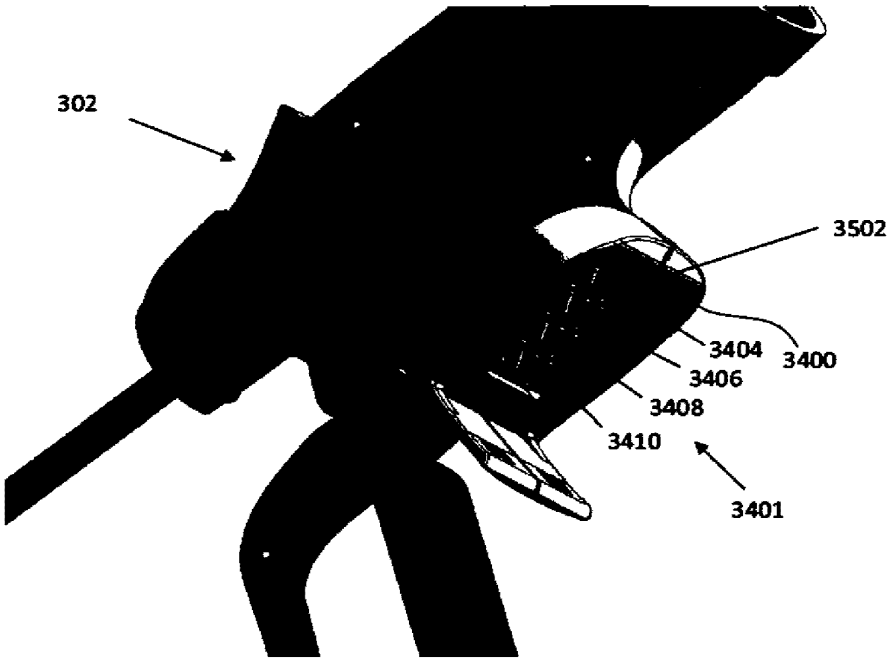


図３４

【図３５】

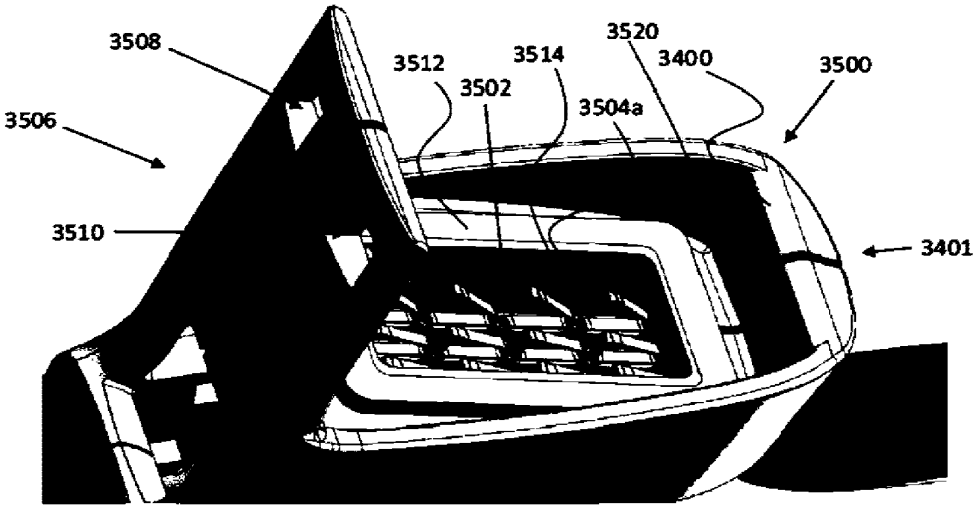


図３５

Petitioner Therabody Ex-1004, 1461

【図３６】

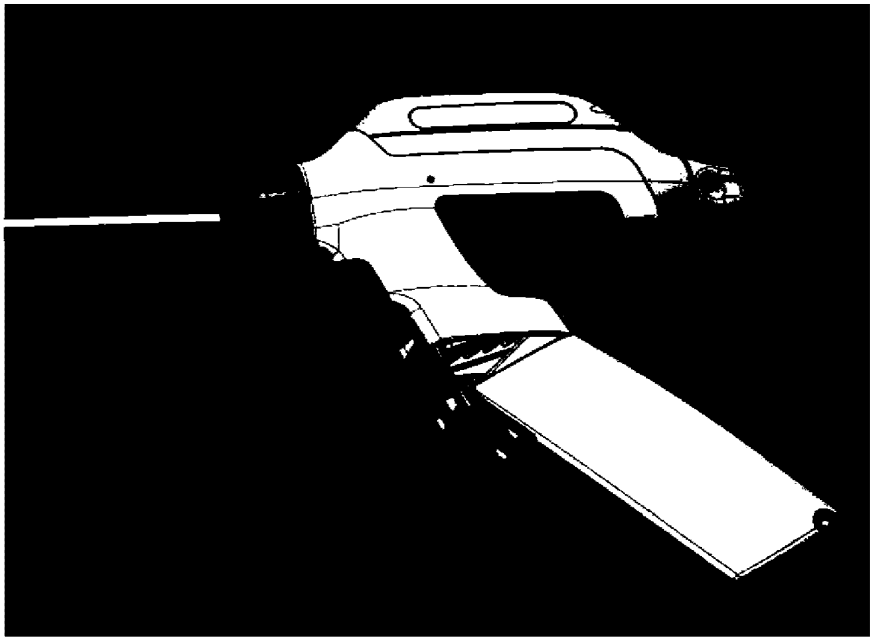


図３６

【図３７】

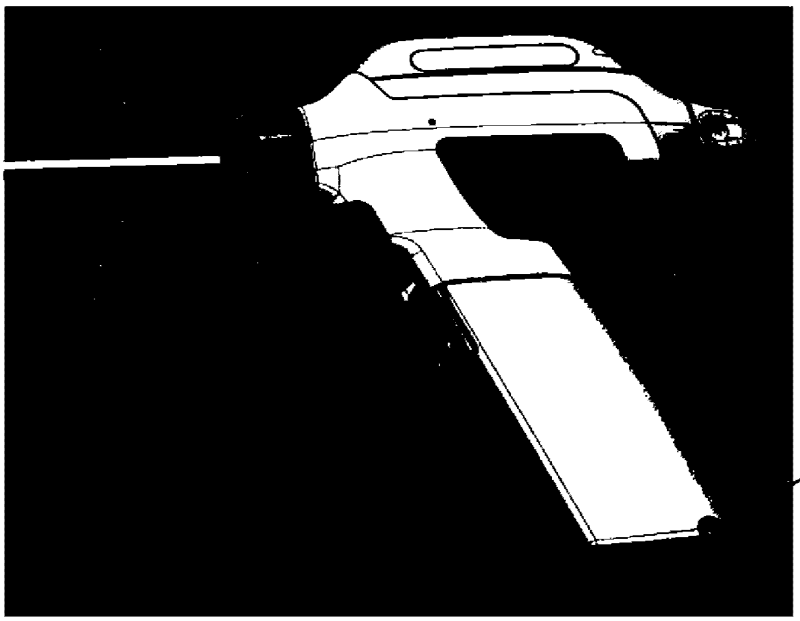


図３７

【図３８】

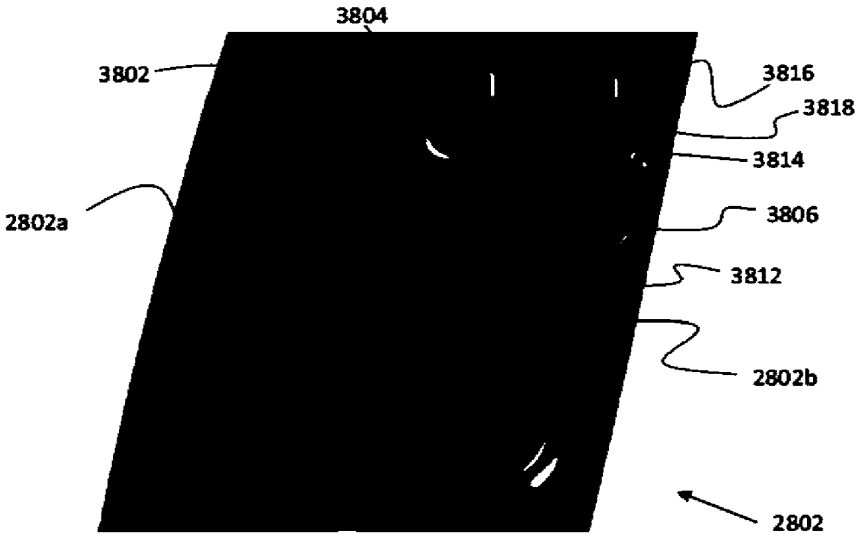


図３８

Petitioner Therabody Ex-1004, 1464

【図３９】

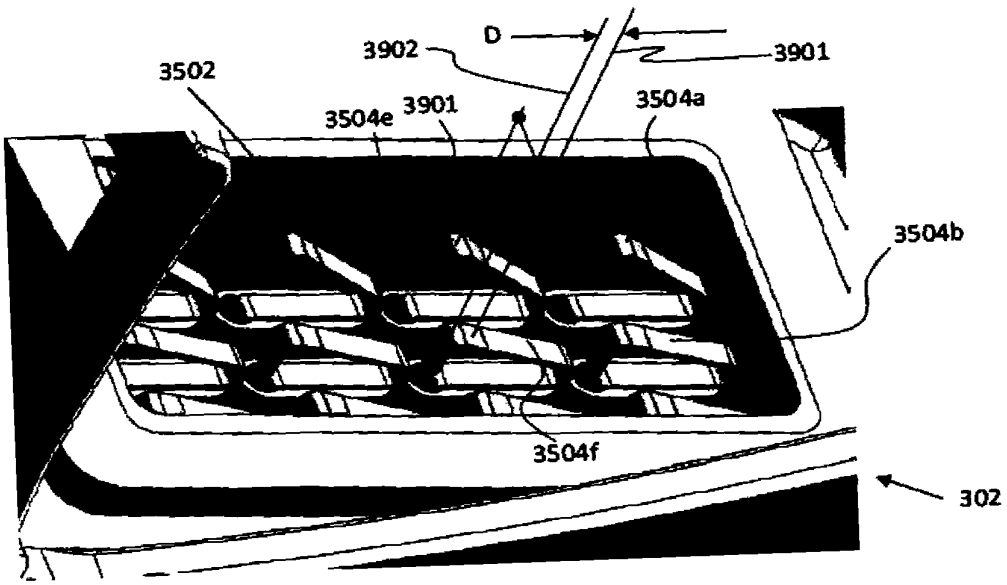


図３９

【図４０】

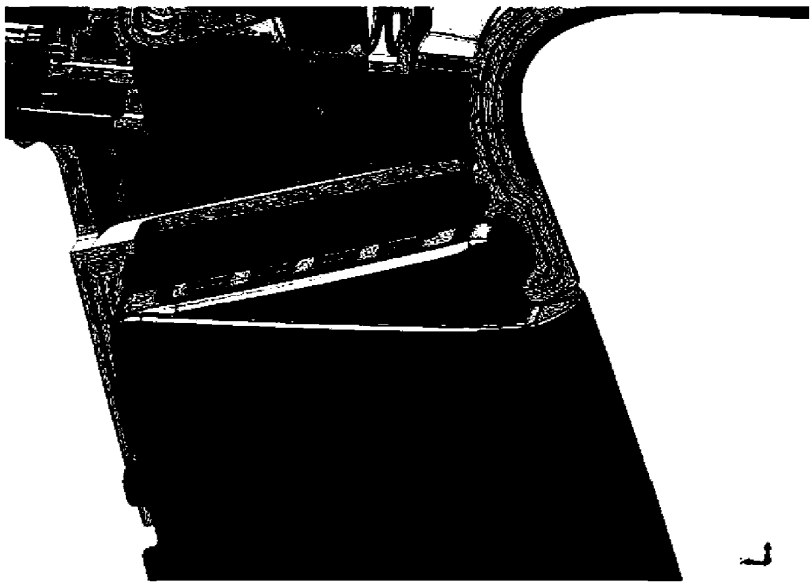


図４０

Petitioner Therabody Ex-1004, 1466

【図４１】

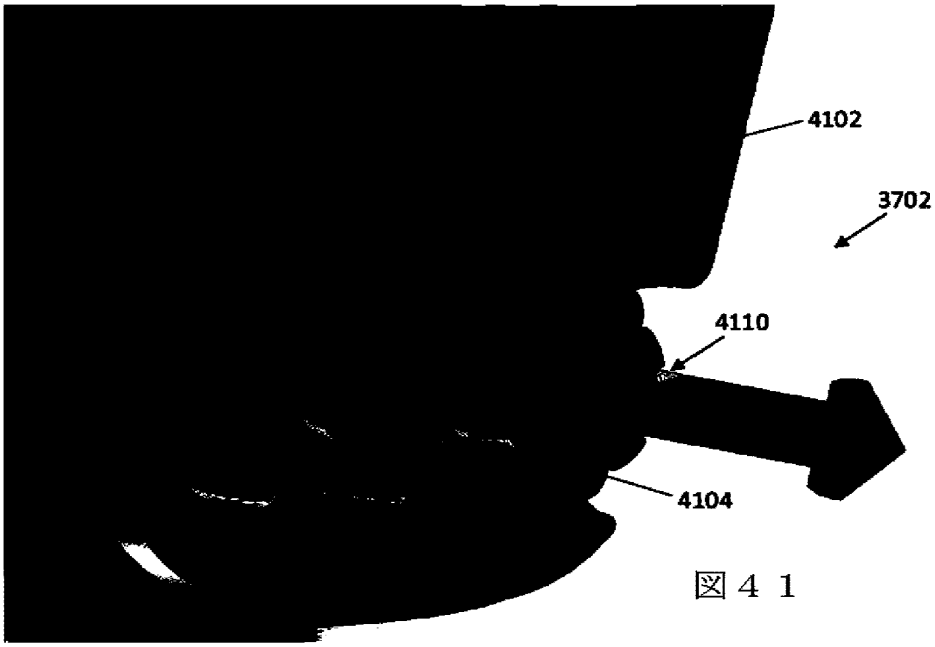


図４１

【図４２】

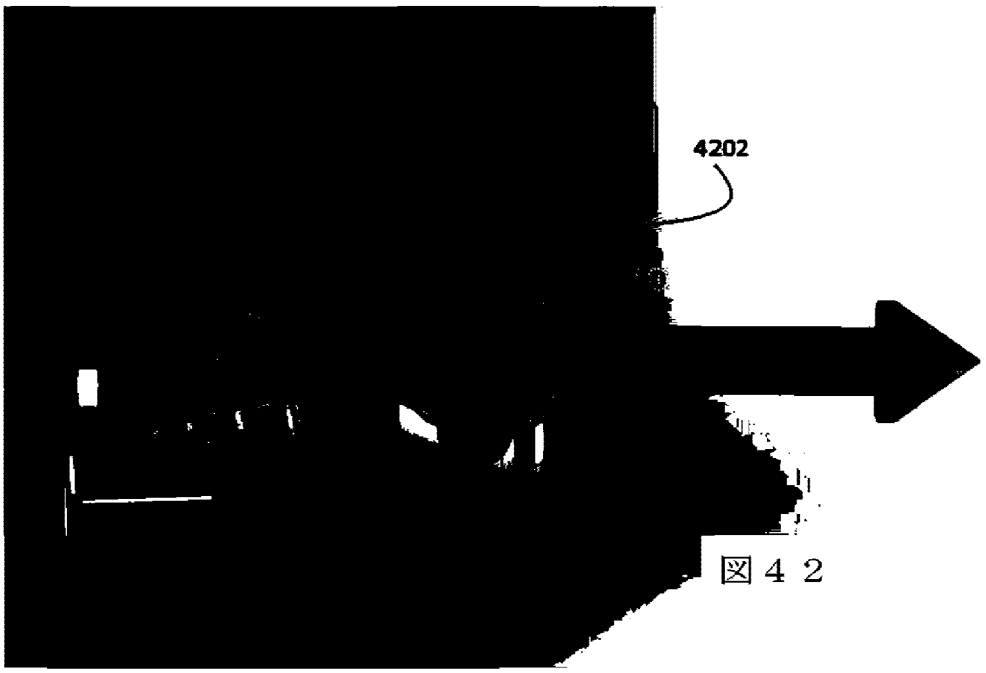


図４２

Petitioner Therabody Ex-1004, 1468

【図４３】

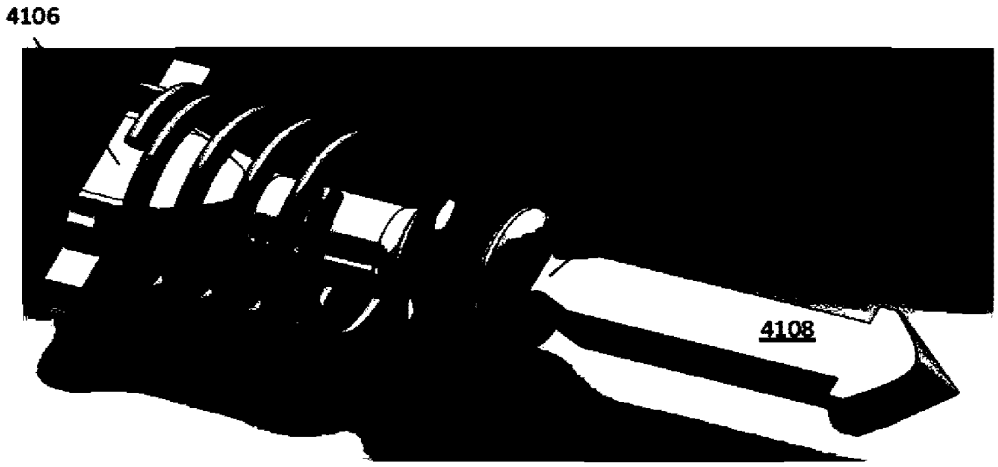


図４３

Petitioner Therabody Ex-1004, 1469

【図４４】

図４４

【図４５】

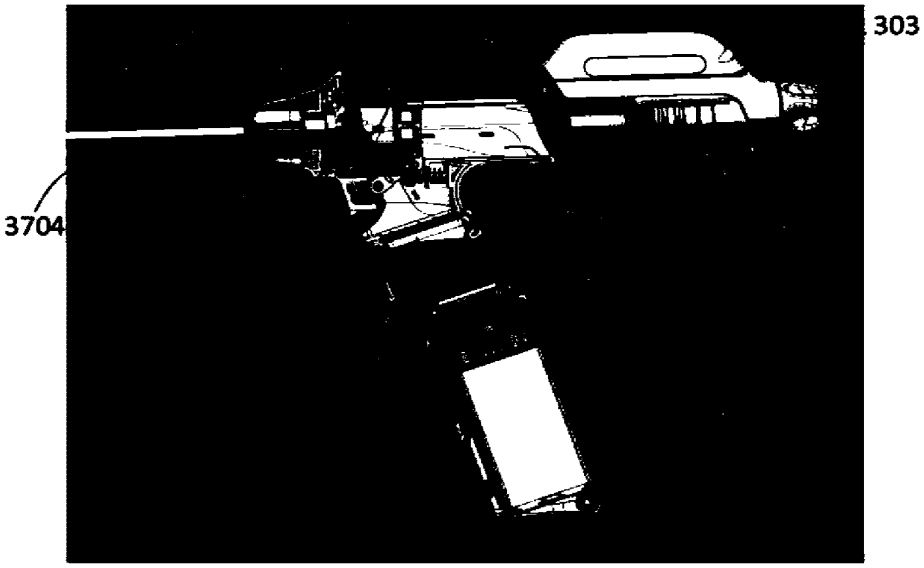


図４５

【図４６】

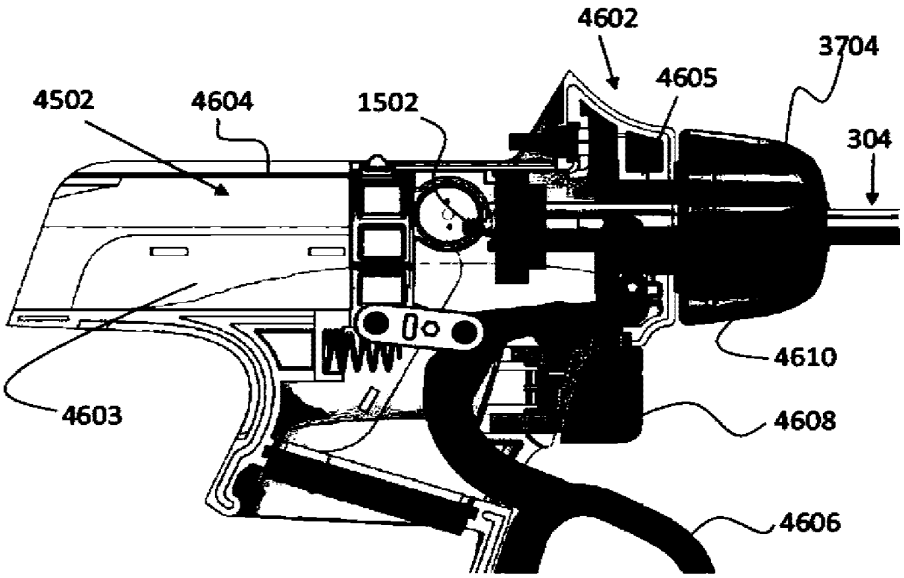


図４６

【図４７】

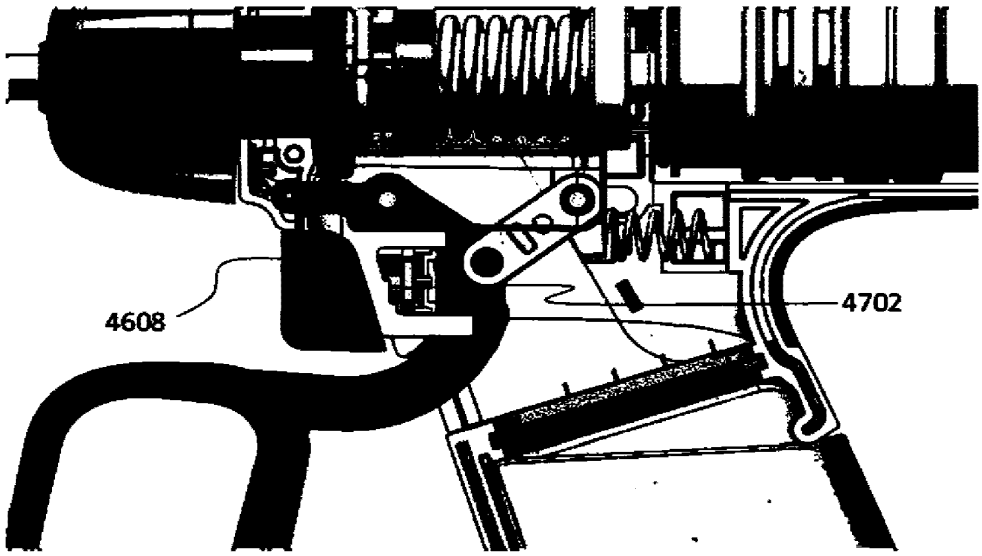


図４７

Petitioner Therabody Ex-1004, 1473

【図４８】

図４８

【図４９】

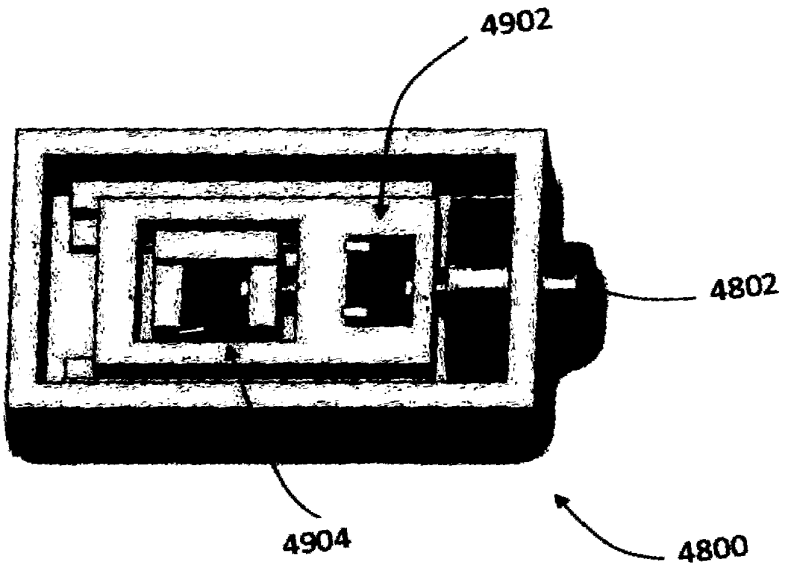


図４９

【図５０】

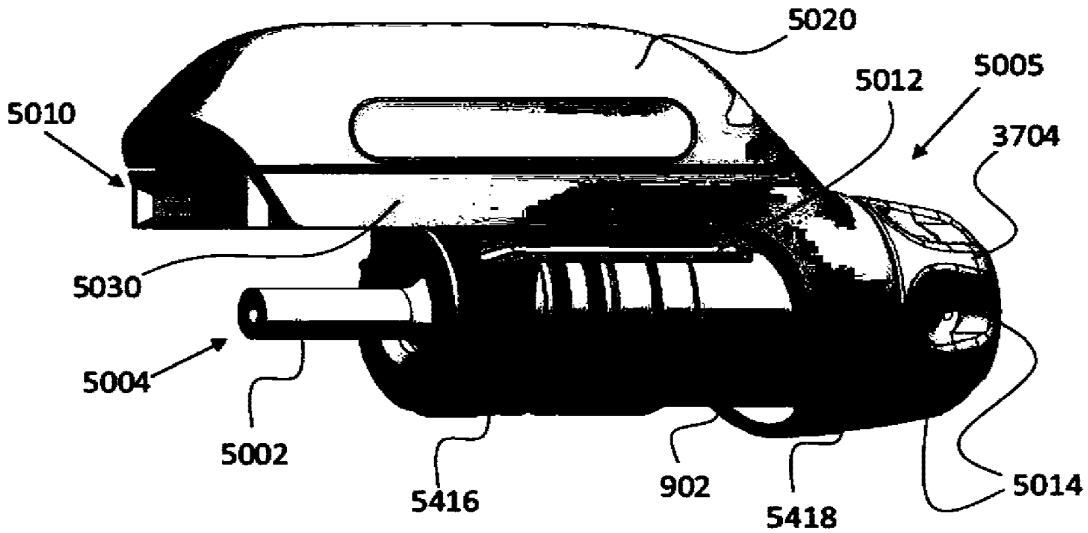

5020
5012
5005
5010
3704
5030
5004
5002
5416
902
5418
5014
303

図５０

【図５１】

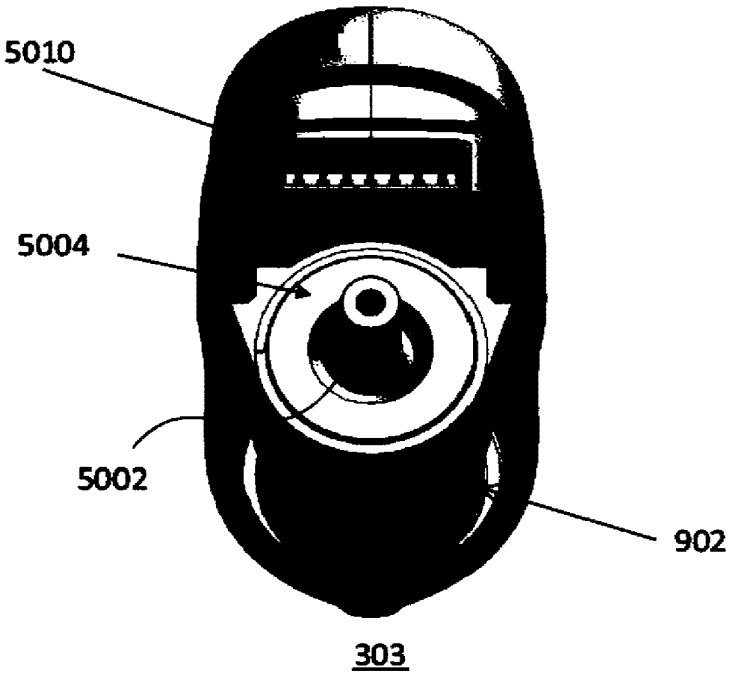


図５１

【図５２】

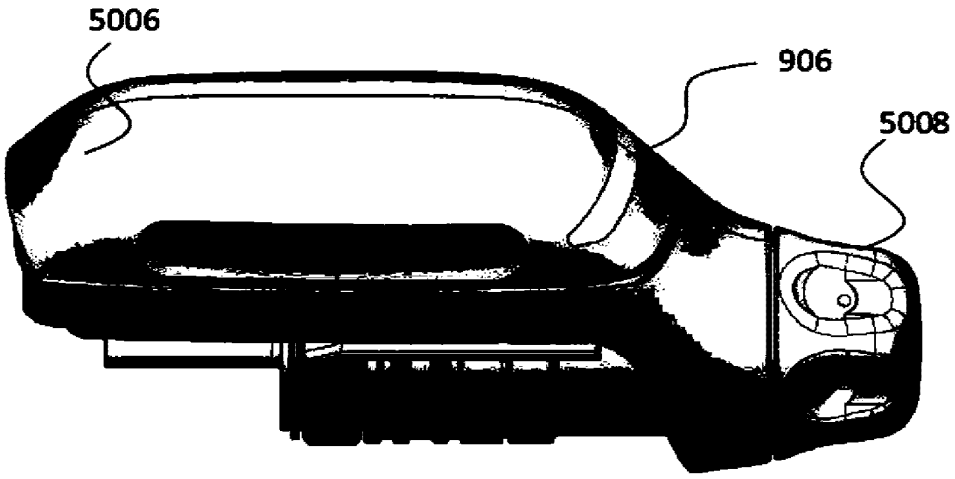


図５２

【図５３】

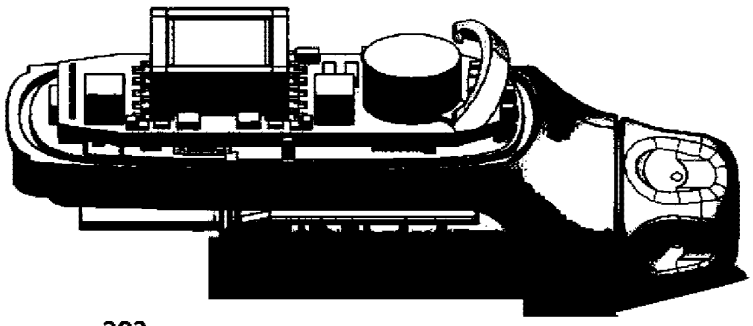


図５３

Petitioner Therabody Ex-1004, 1479

【図５４】

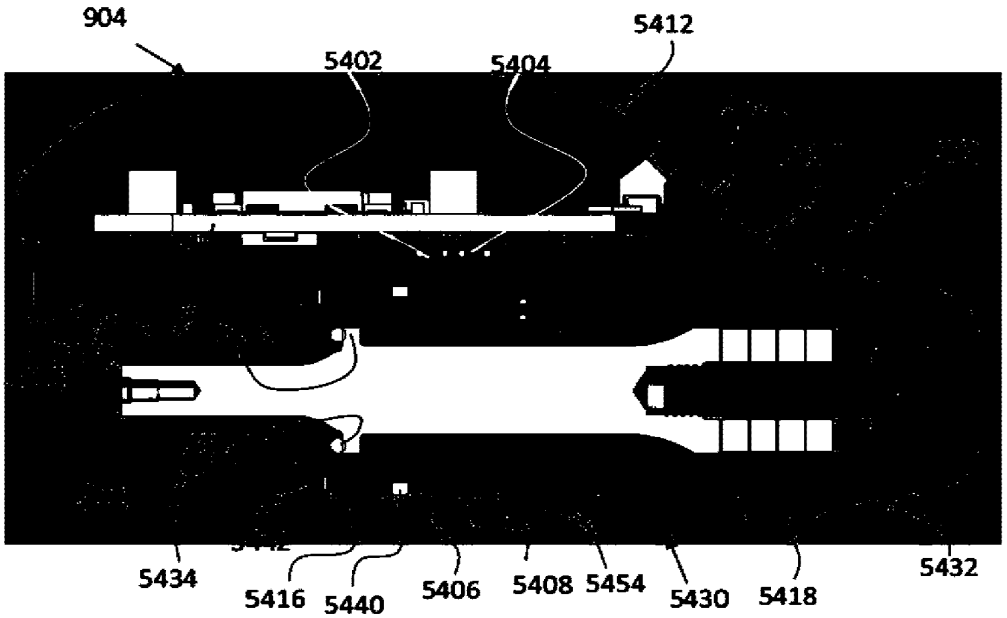

904
5402
5404
5412
5434
5416
5440
5406
5408
5454
5430
5418
5432

図５４

【図５５】

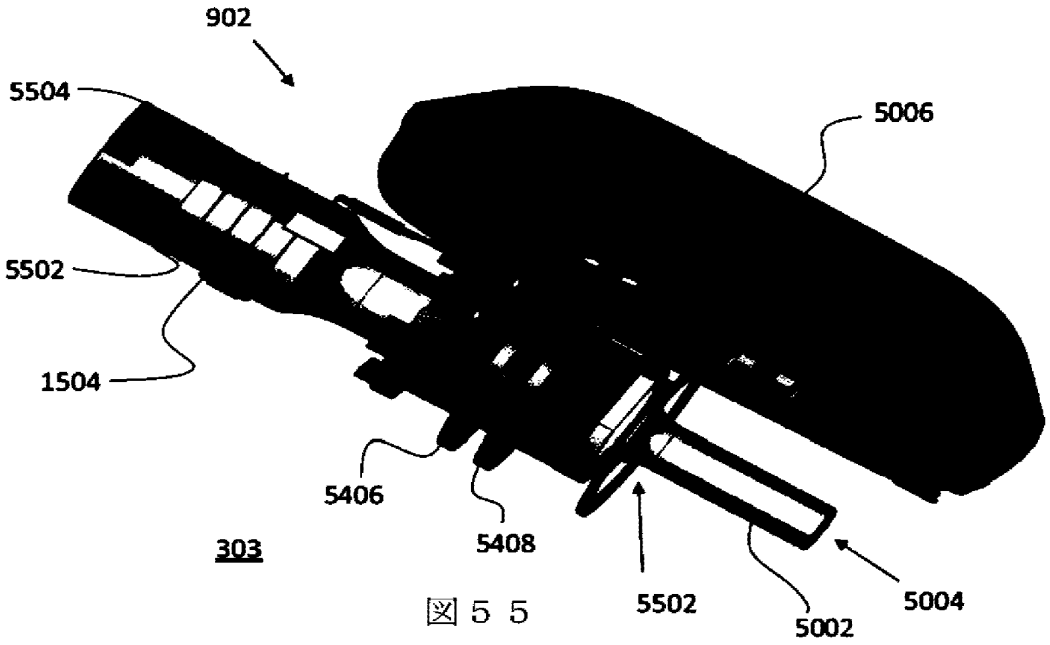


図５５

【図５６】

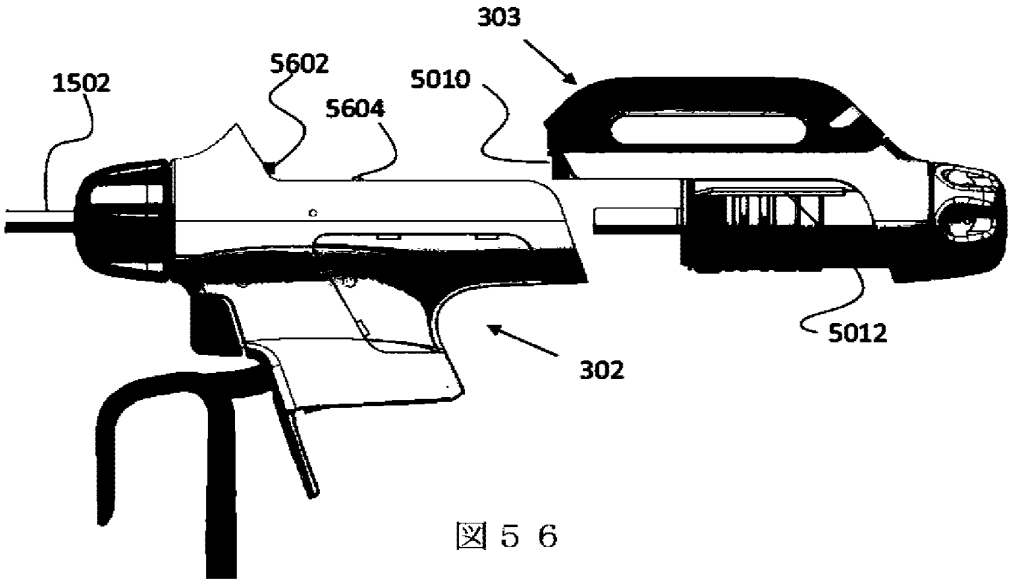


図５６

【図５７】

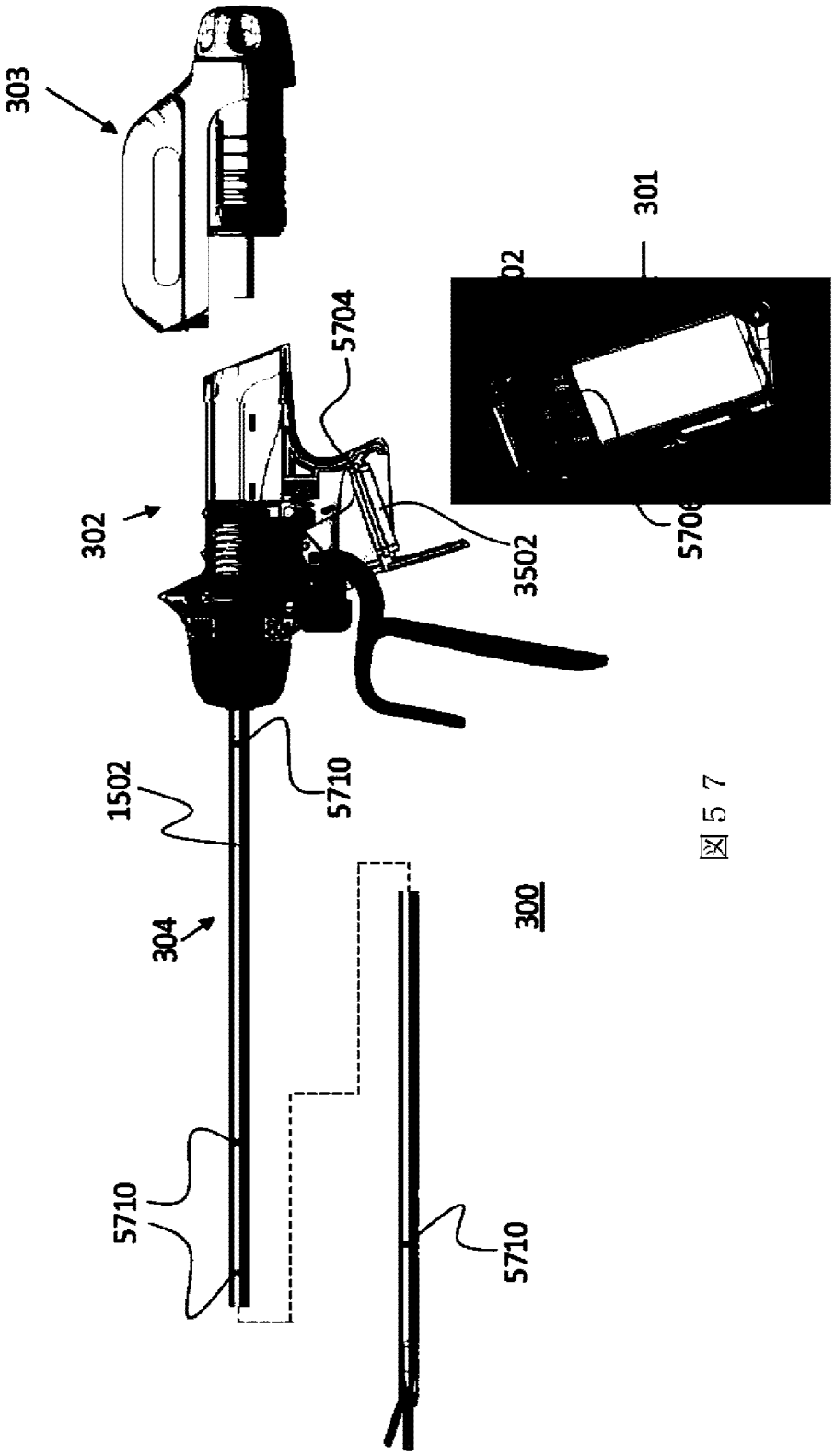


図５７

【図５８】

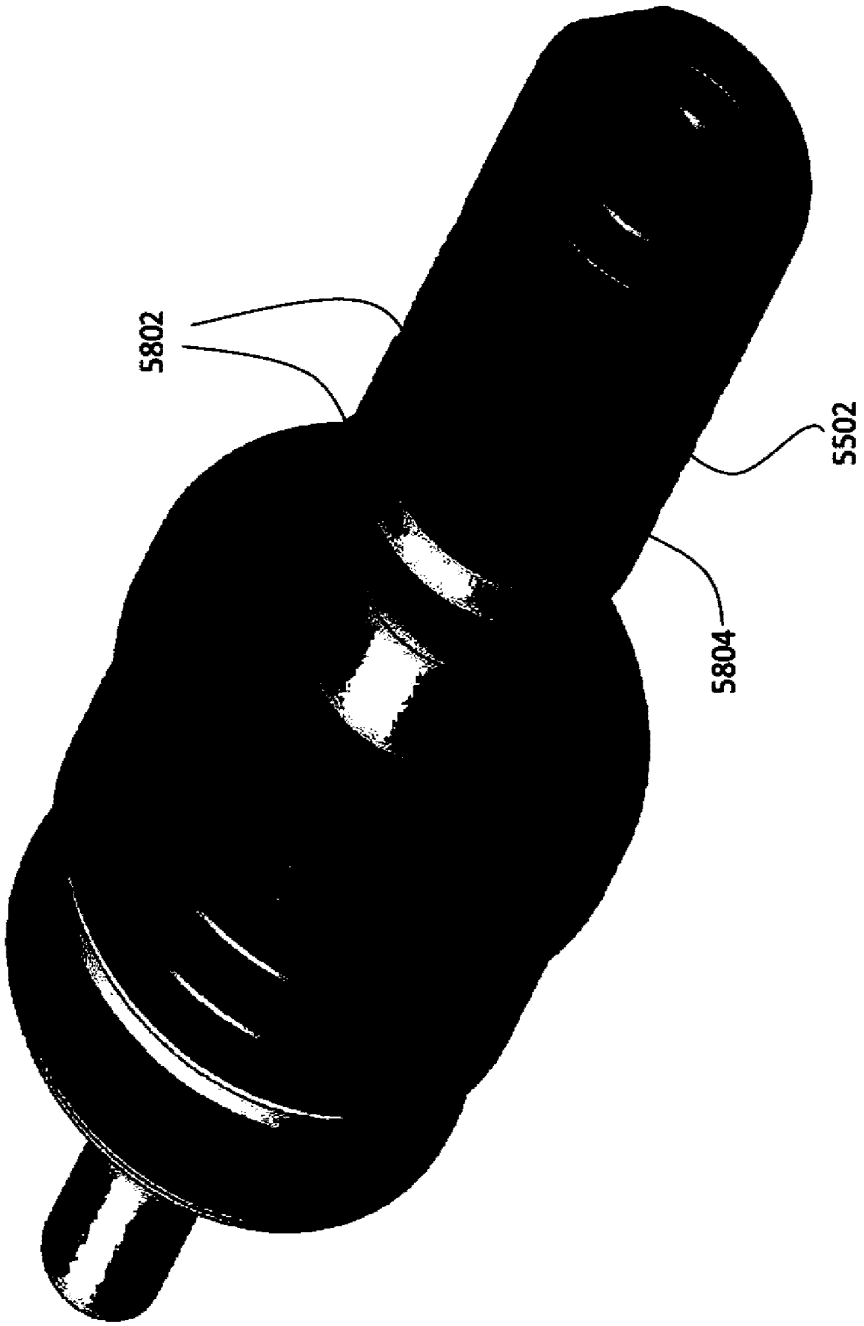


図５８

【図５９】

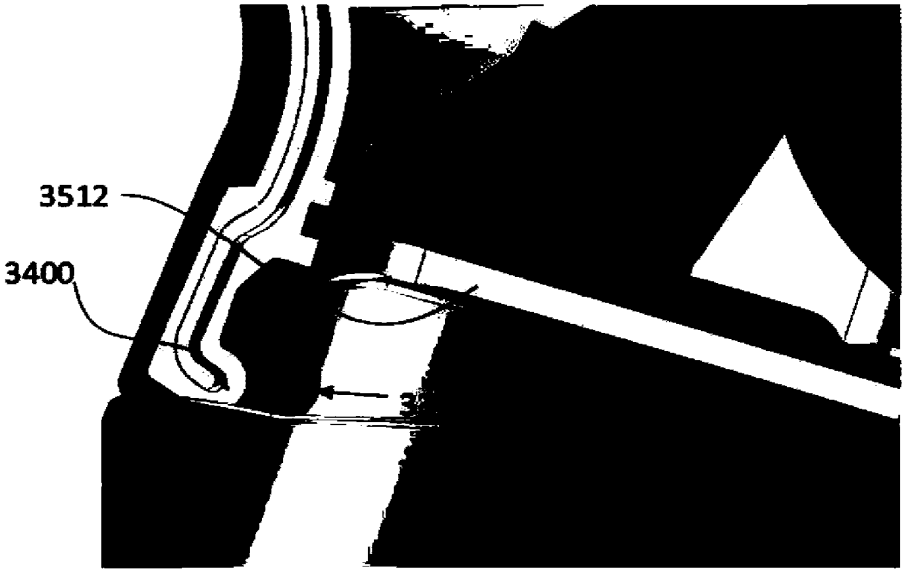


図５９

【図６０】

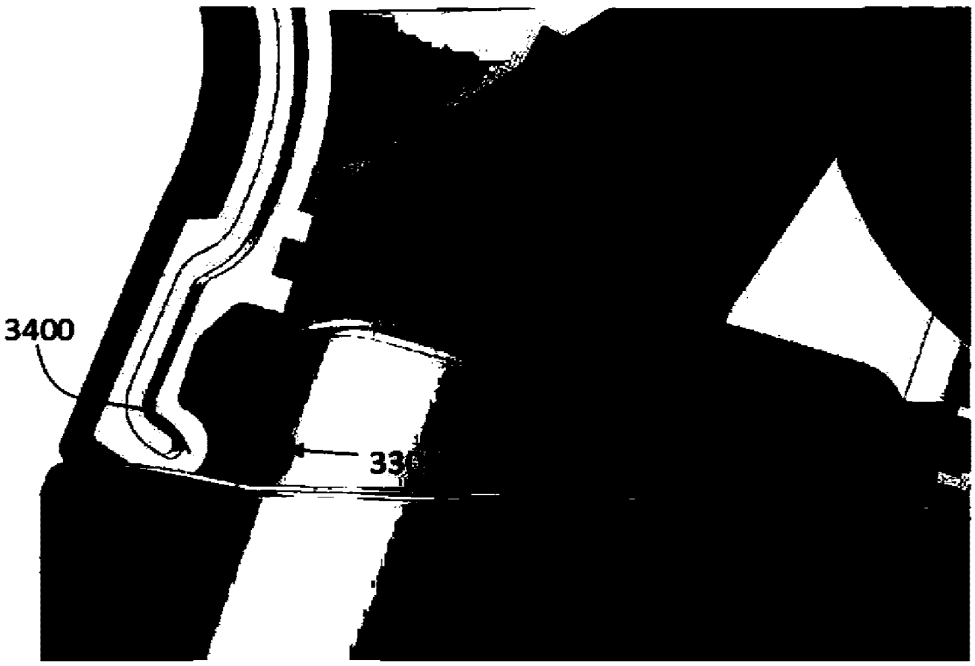


図６０

Petitioner Therabody Ex-1004, 1486

【図６１】

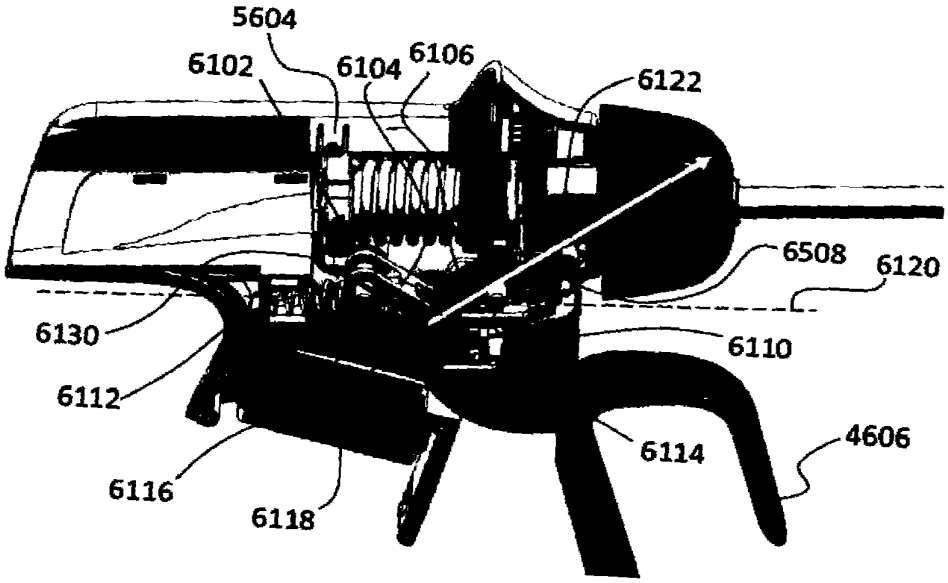

5604
6102
6104
6106
6122
6508
6120
6130
6110
6112
6114
4606
6116
6118

図６１

【図６２】

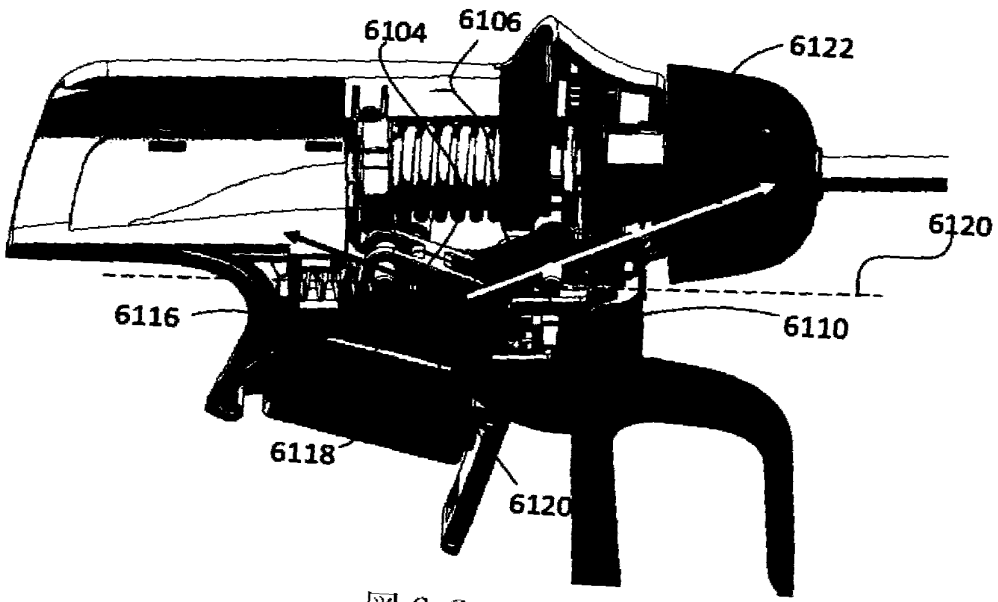


図６２

【図６３】

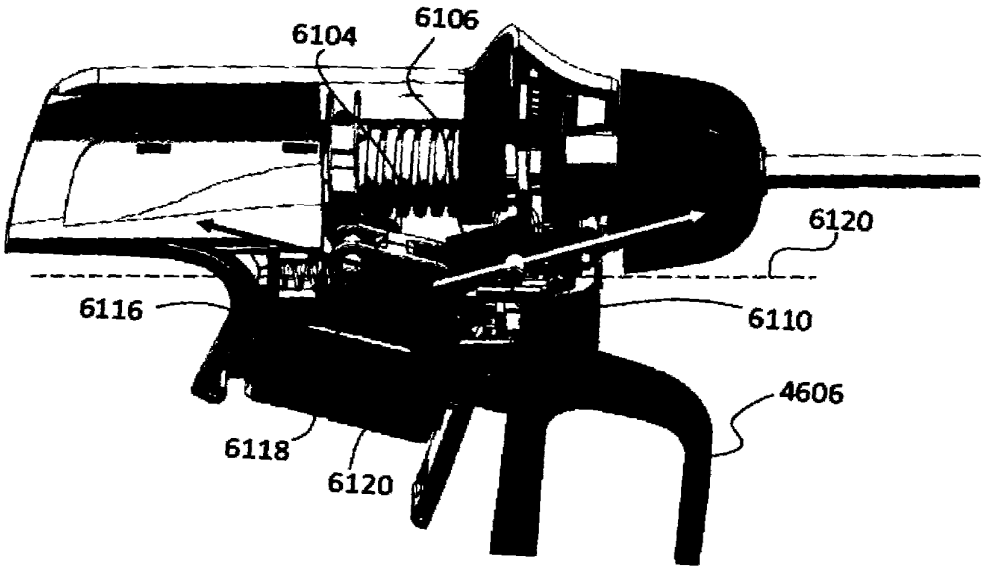


図６３

【図６４】

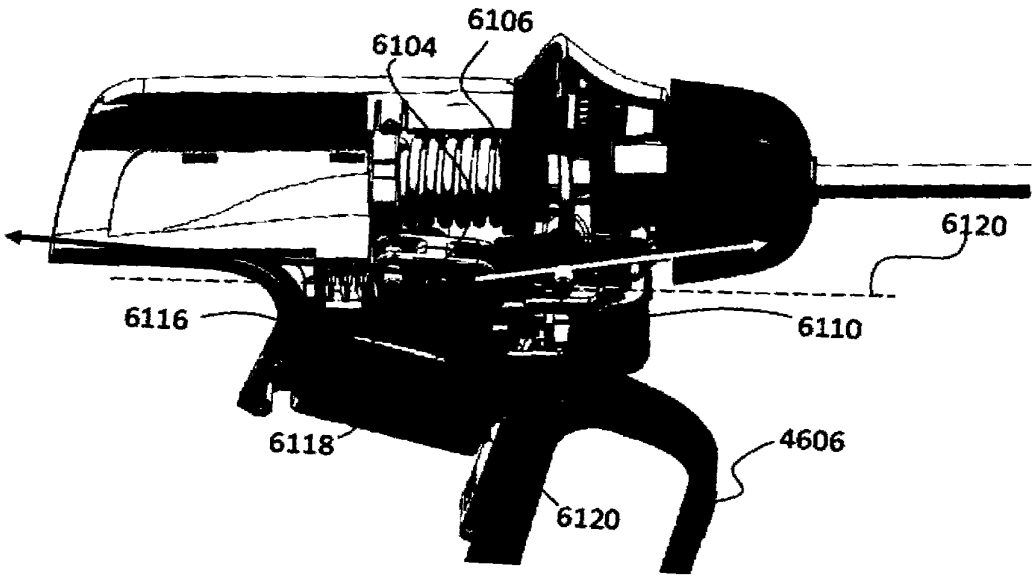


図６４

Petitioner Therabody Ex-1004, 1490

【図６５】

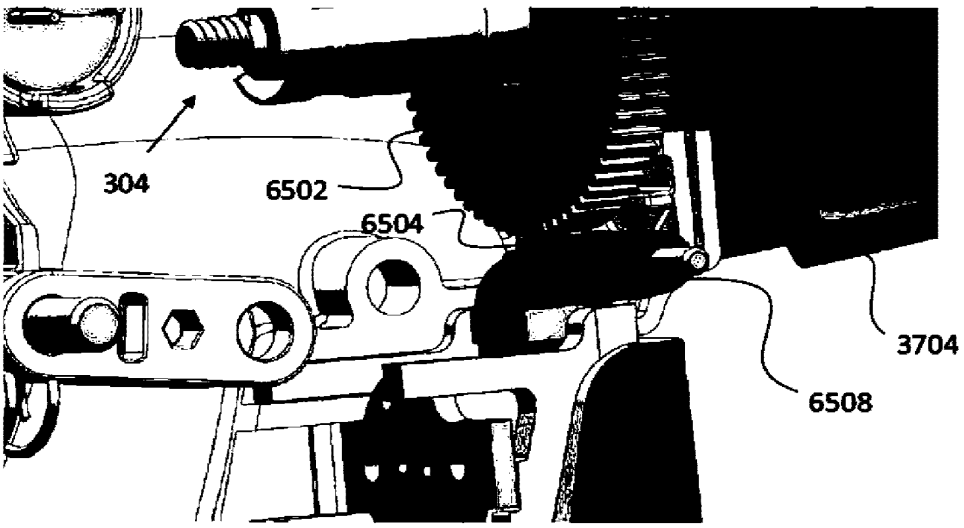


図６５

Petitioner Therabody Ex-1004, 1491

【図６６】

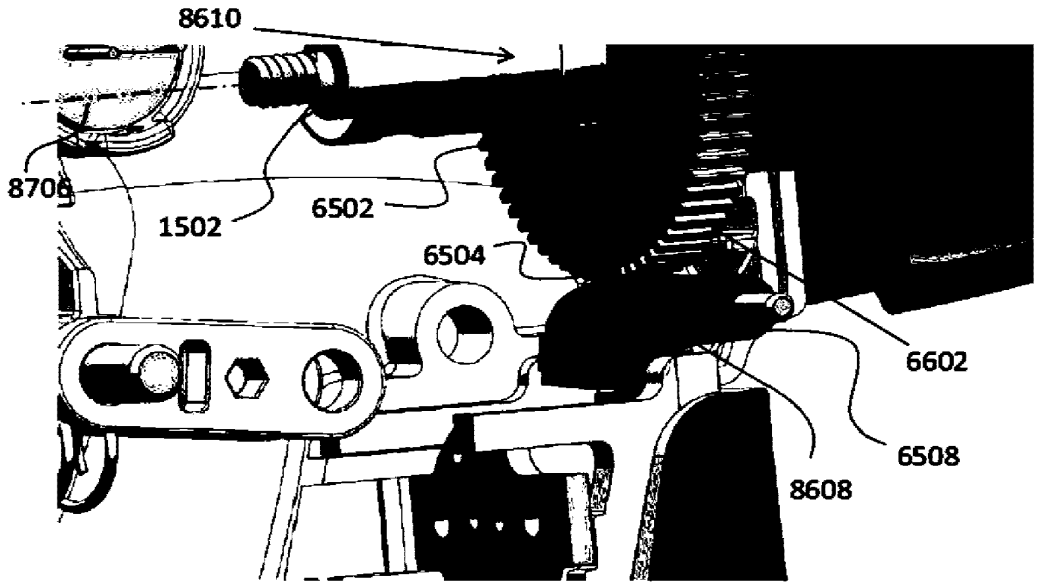


図６６

Petitioner Therabody Ex-1004, 1492

【図６７】

図６７

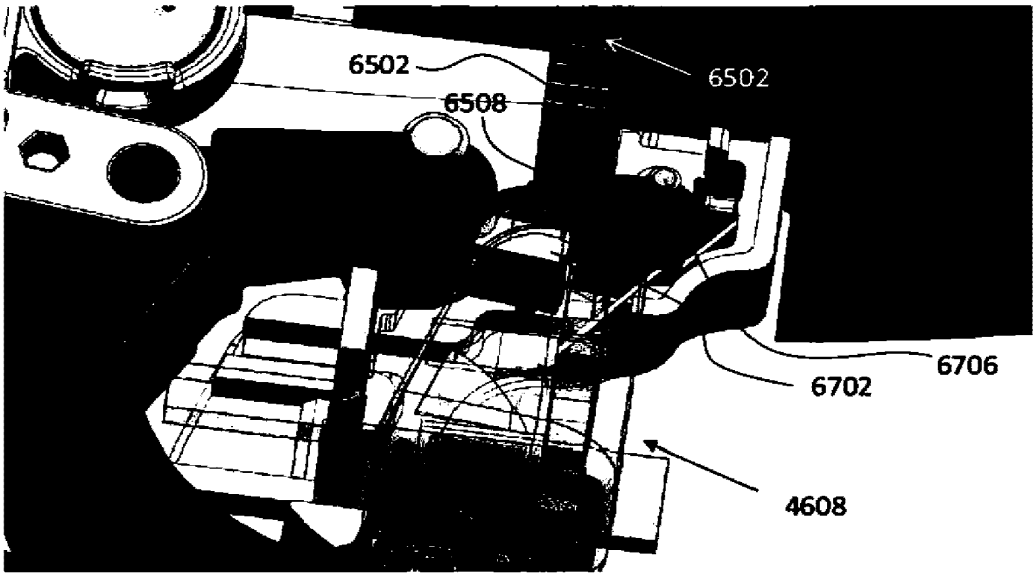
Petitioner Therabody Ex-1004, 1493

【図６８】

図６８

Petitioner Therabody Ex-1004, 1494

【図６９】



６９図

【図７０】

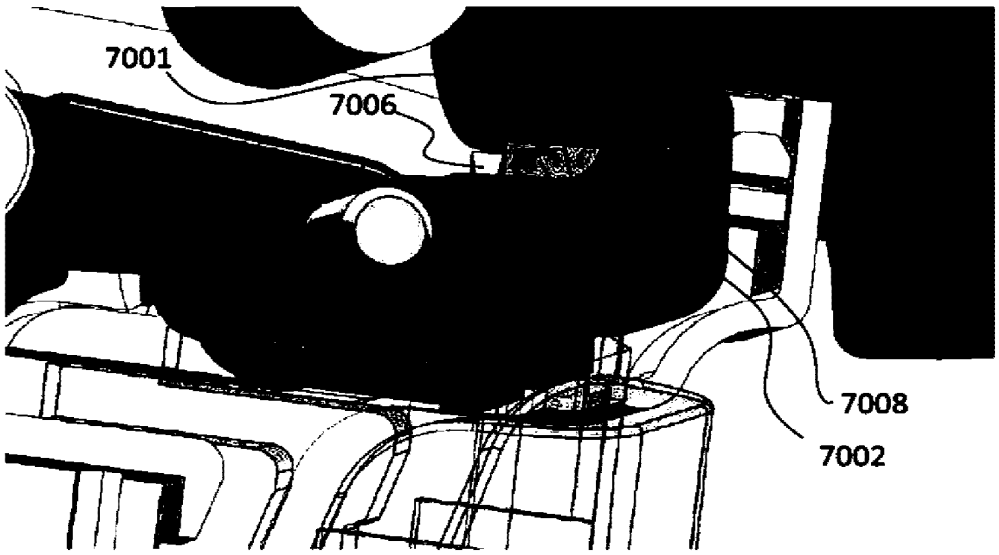


図７０

Petitioner Therabody Ex-1004, 1496

【図７１】

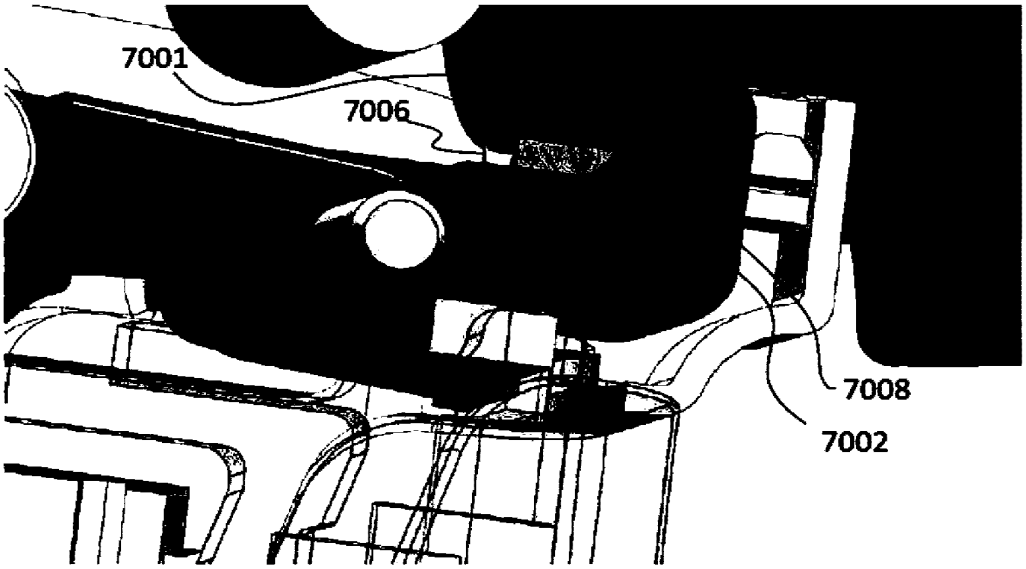


図７１

Petitioner Therabody Ex-1004, 1497

【図７６】

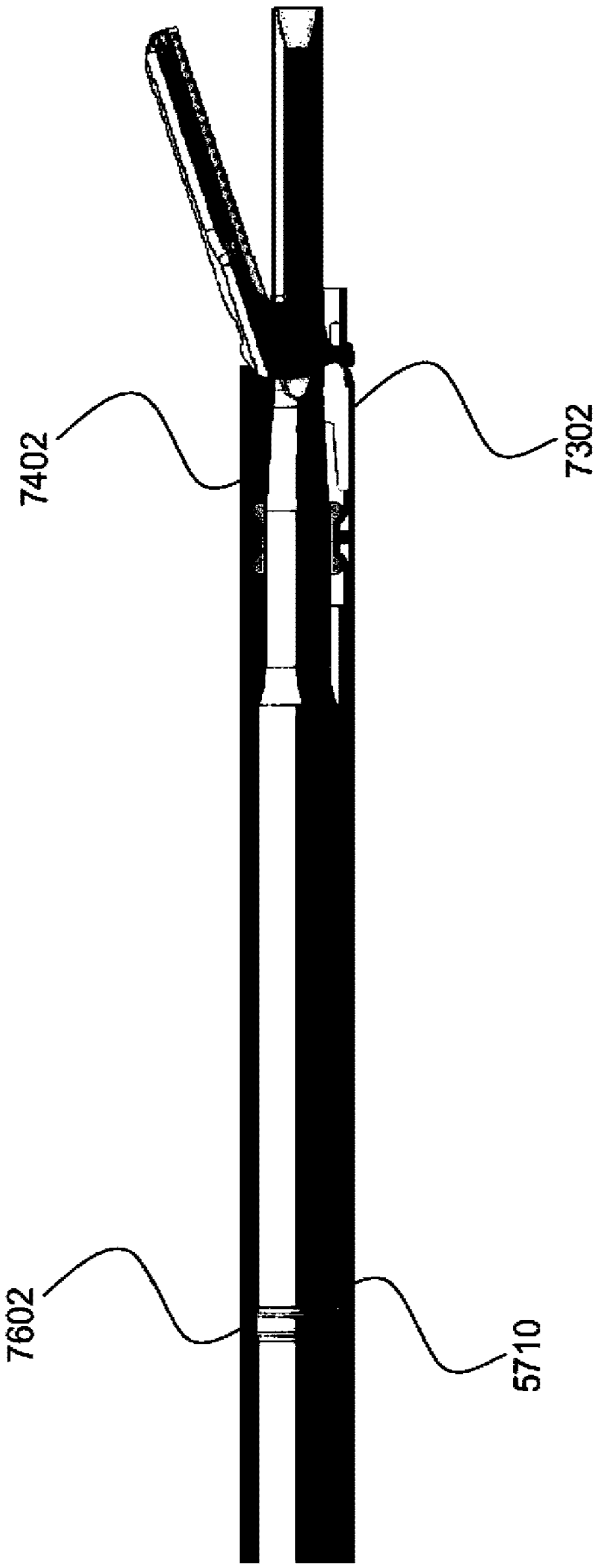


図７６

【図８９】

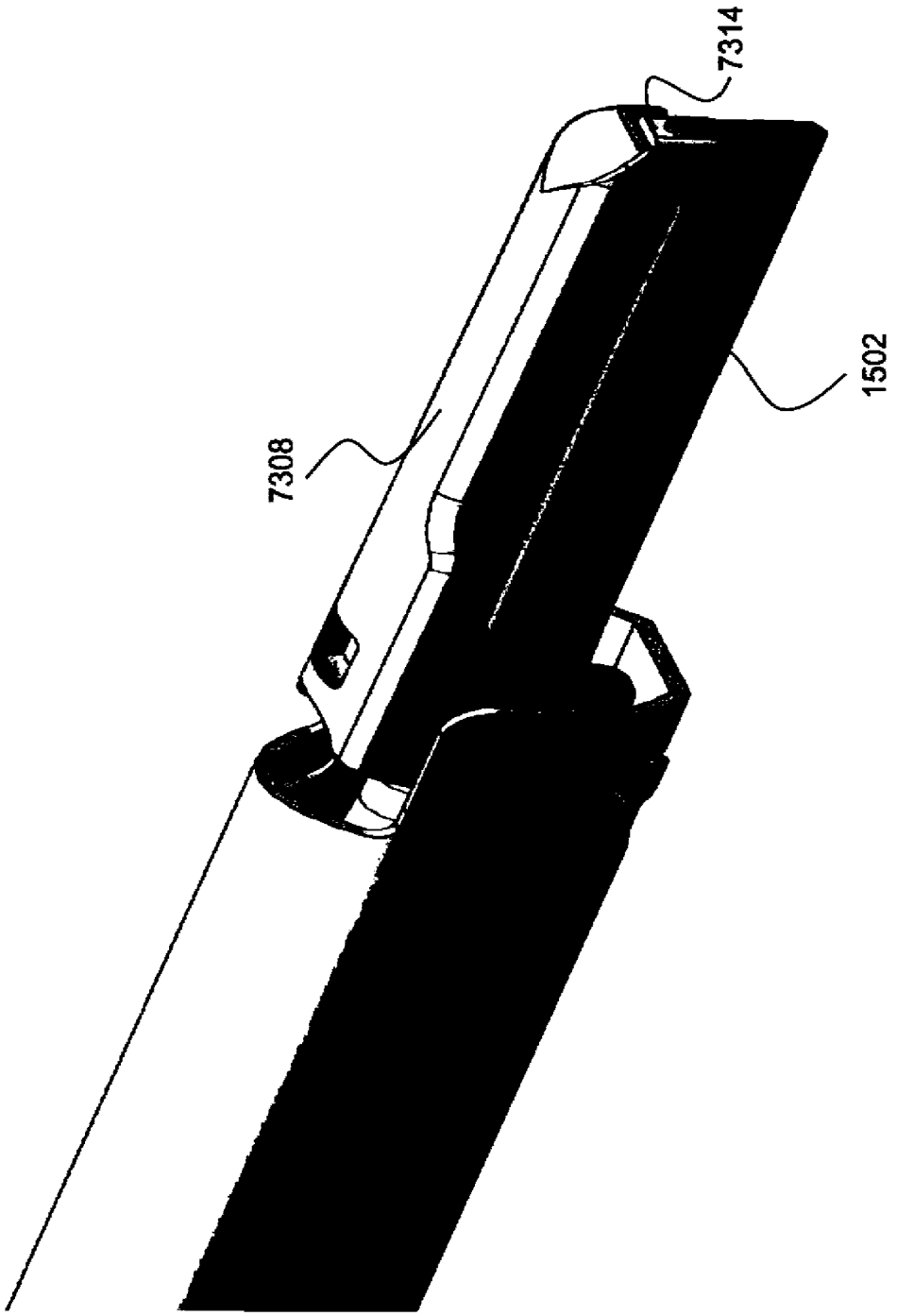


図８９

Petitioner Therabody Ex-1004, 1499

【図９０】

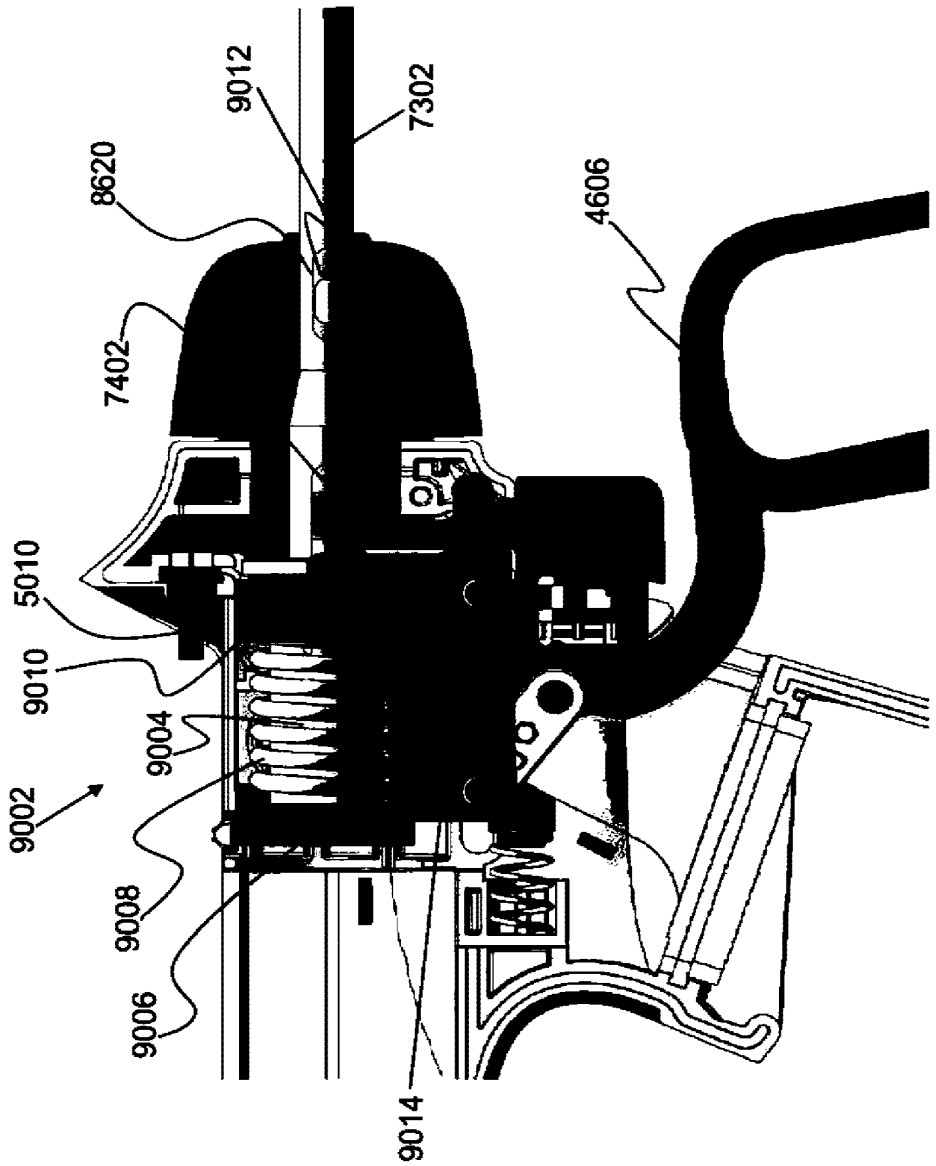


図９０

【図９１】

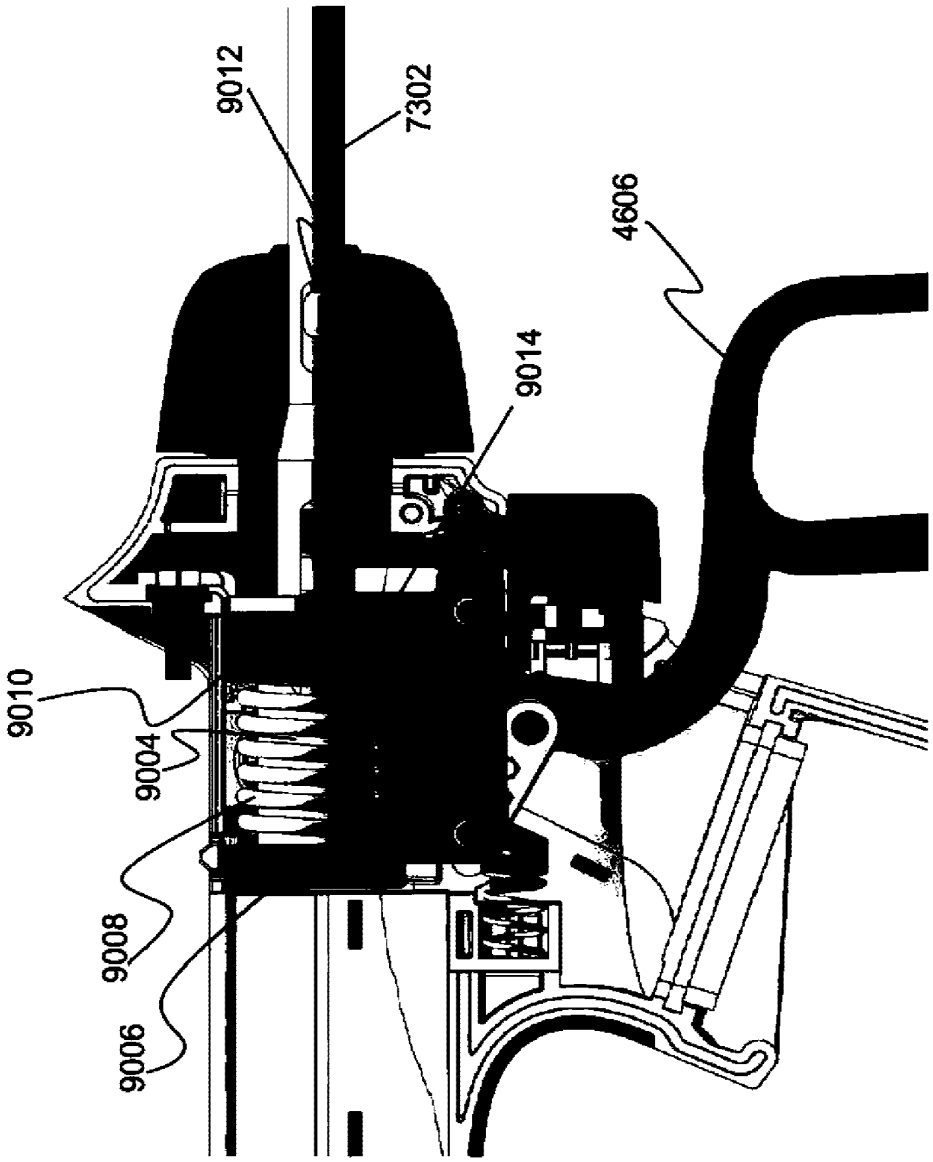


図９１

Petitioner Therabody Ex-1004, 1501

【図９２】

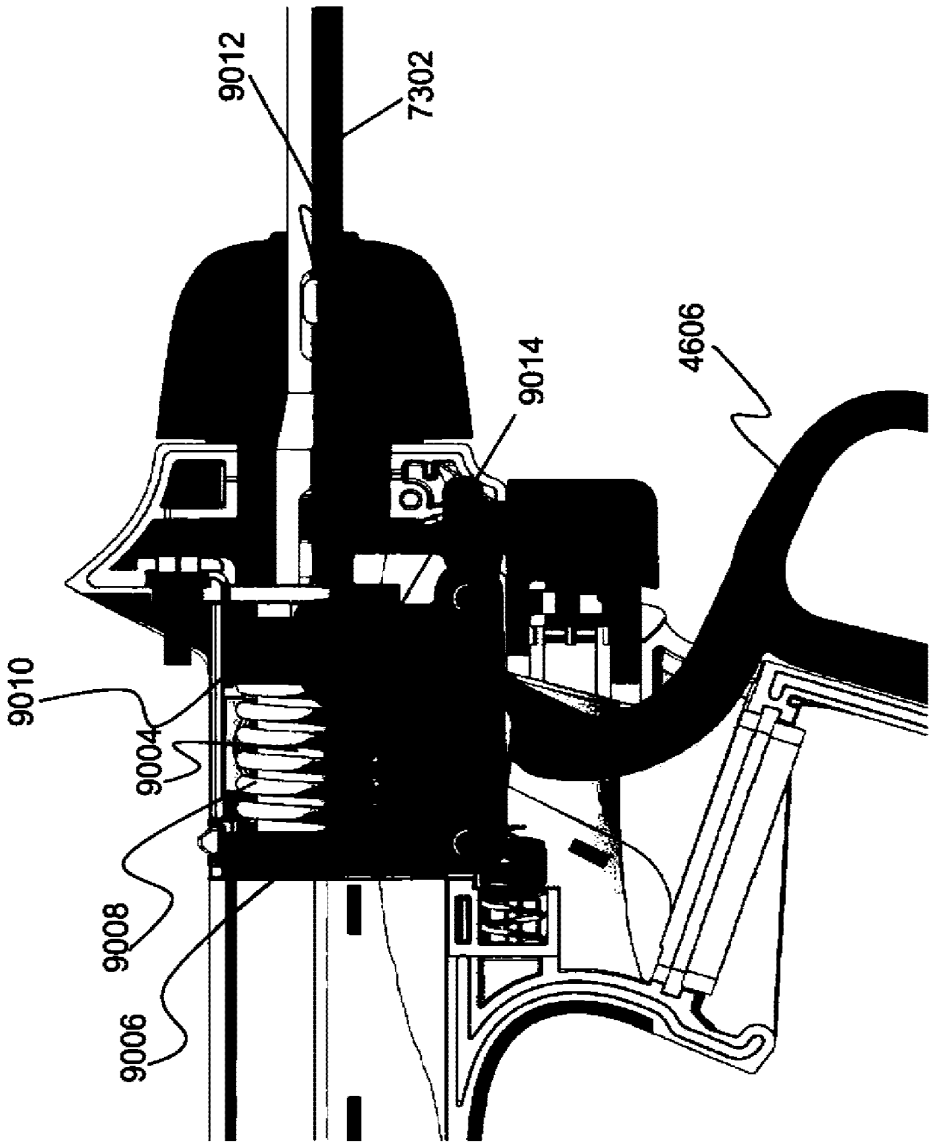


図９２

Petitioner Therabody Ex-1004, 1502

【図９３】

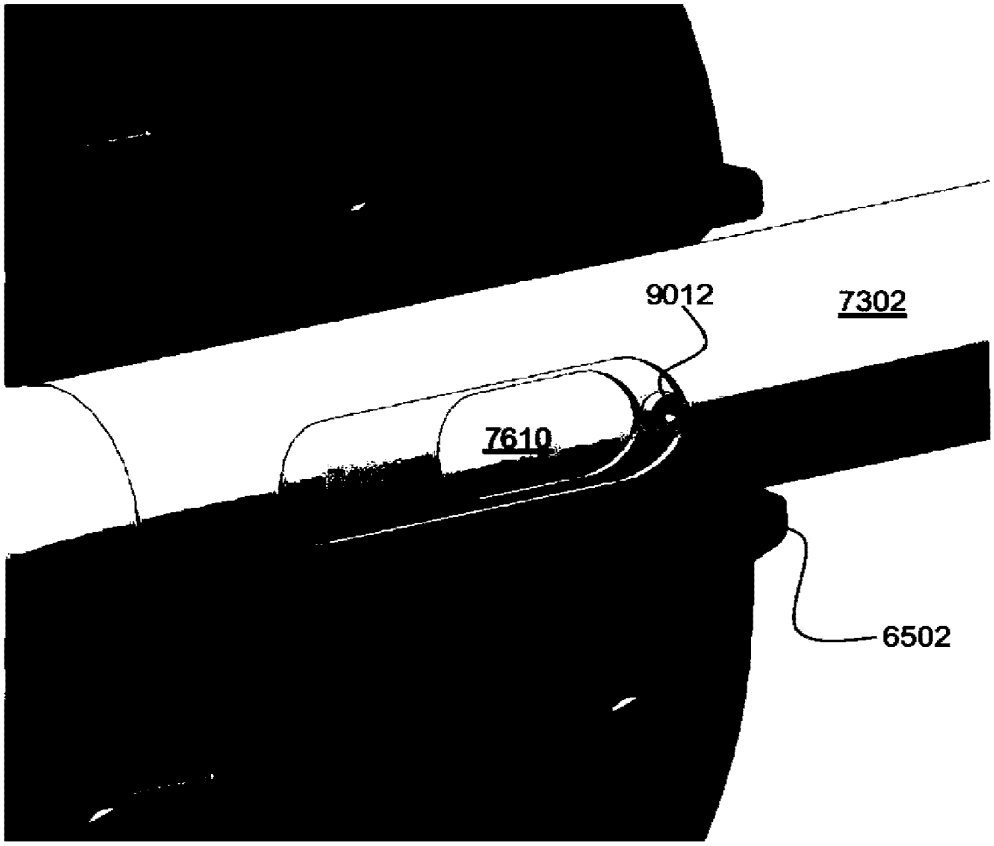


図９３

Petitioner Therabody Ex-1004, 1503

【図９４】

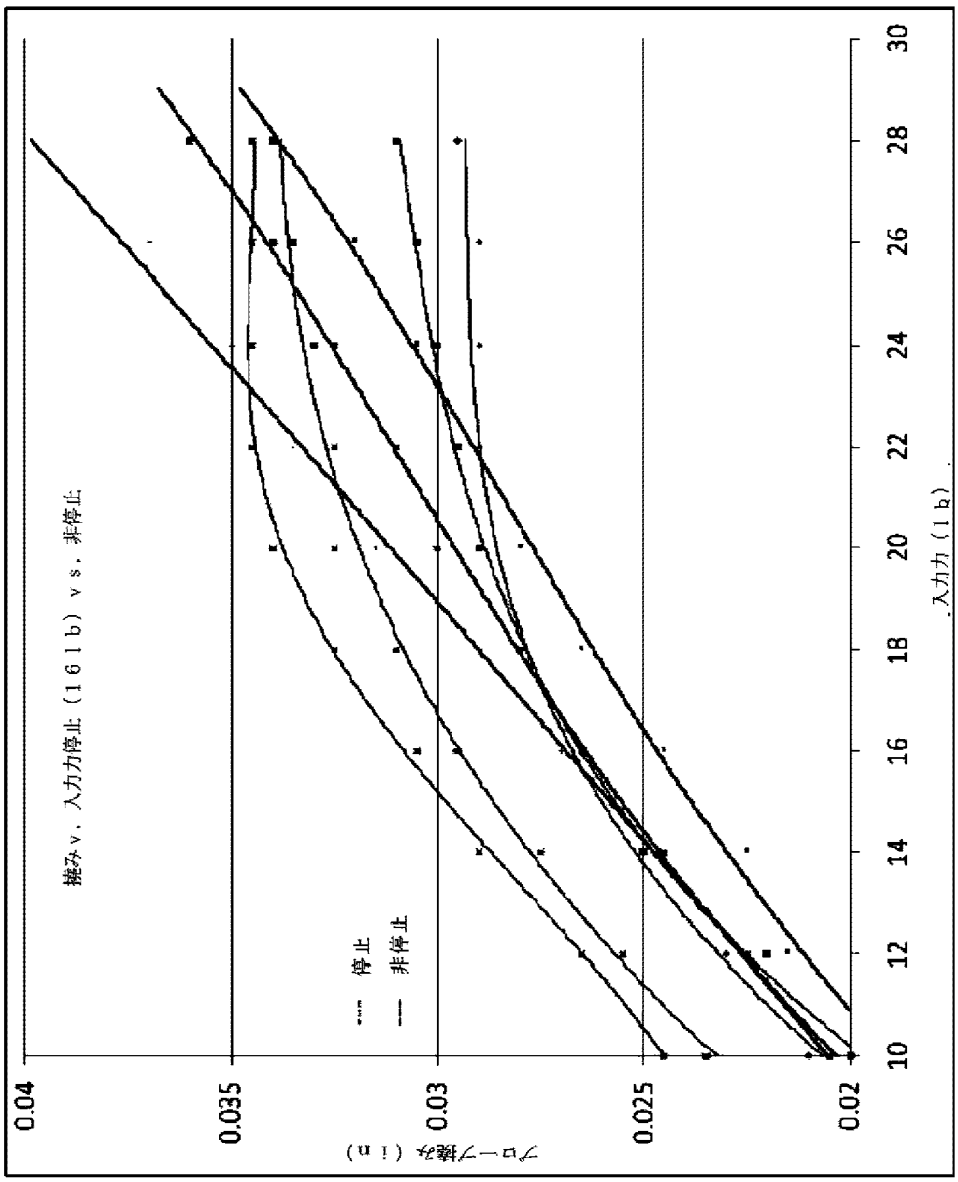

振動ｖｓ．入力力停止（１６１ｂ）ｖｓ．非停止
停止
非停止
0.04
0.035
0.03
0.025
0.02
10
12
14
16
18
20
22
24
26
28
30

図９４

【図９５】

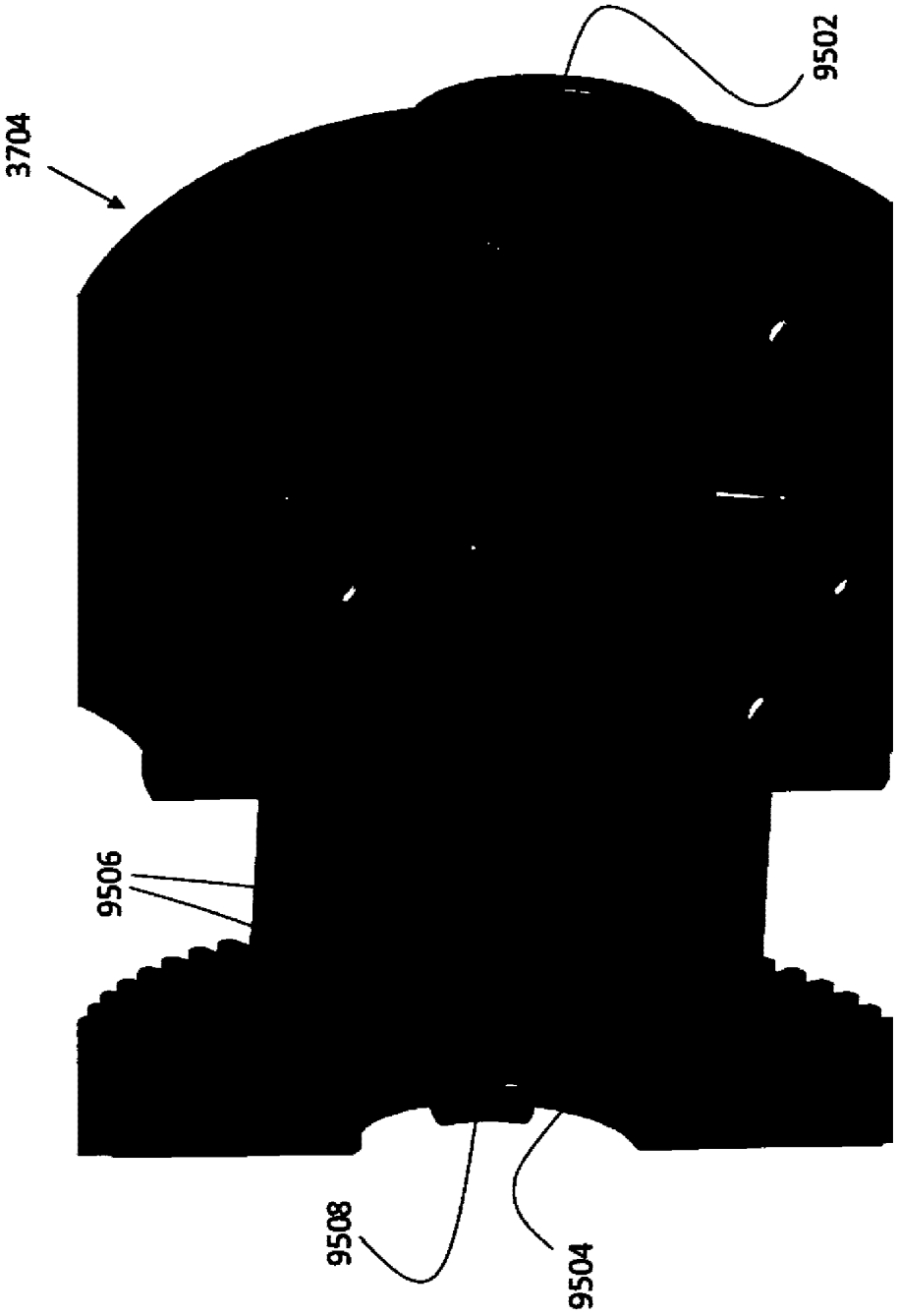


図９５

【図９６】

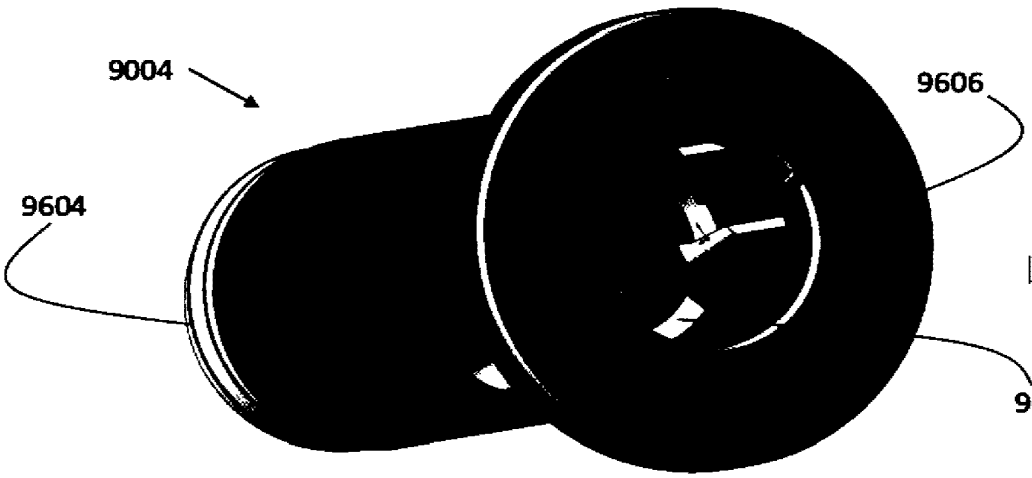


図９６

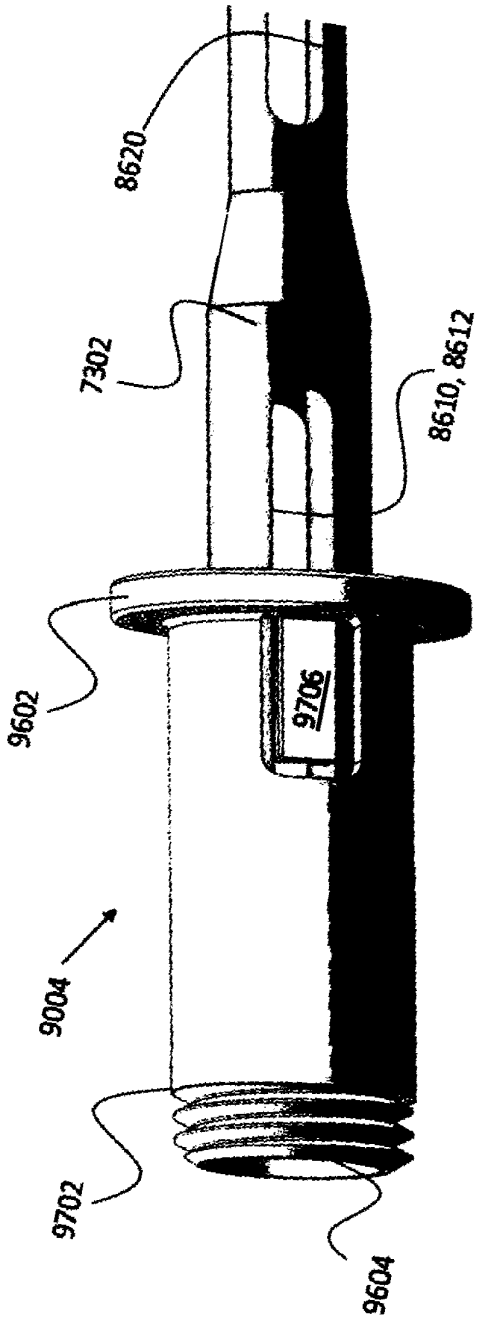


図９７

【図９８】

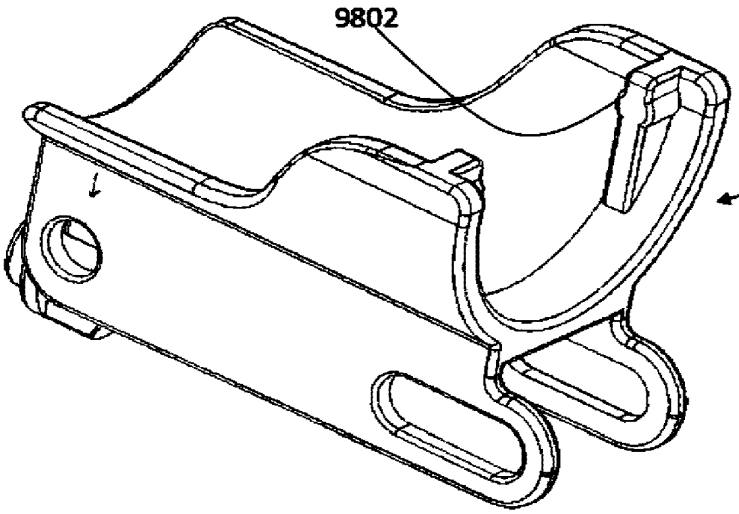


図９８

Petitioner Therabody Ex-1004, 1508

【図９９】

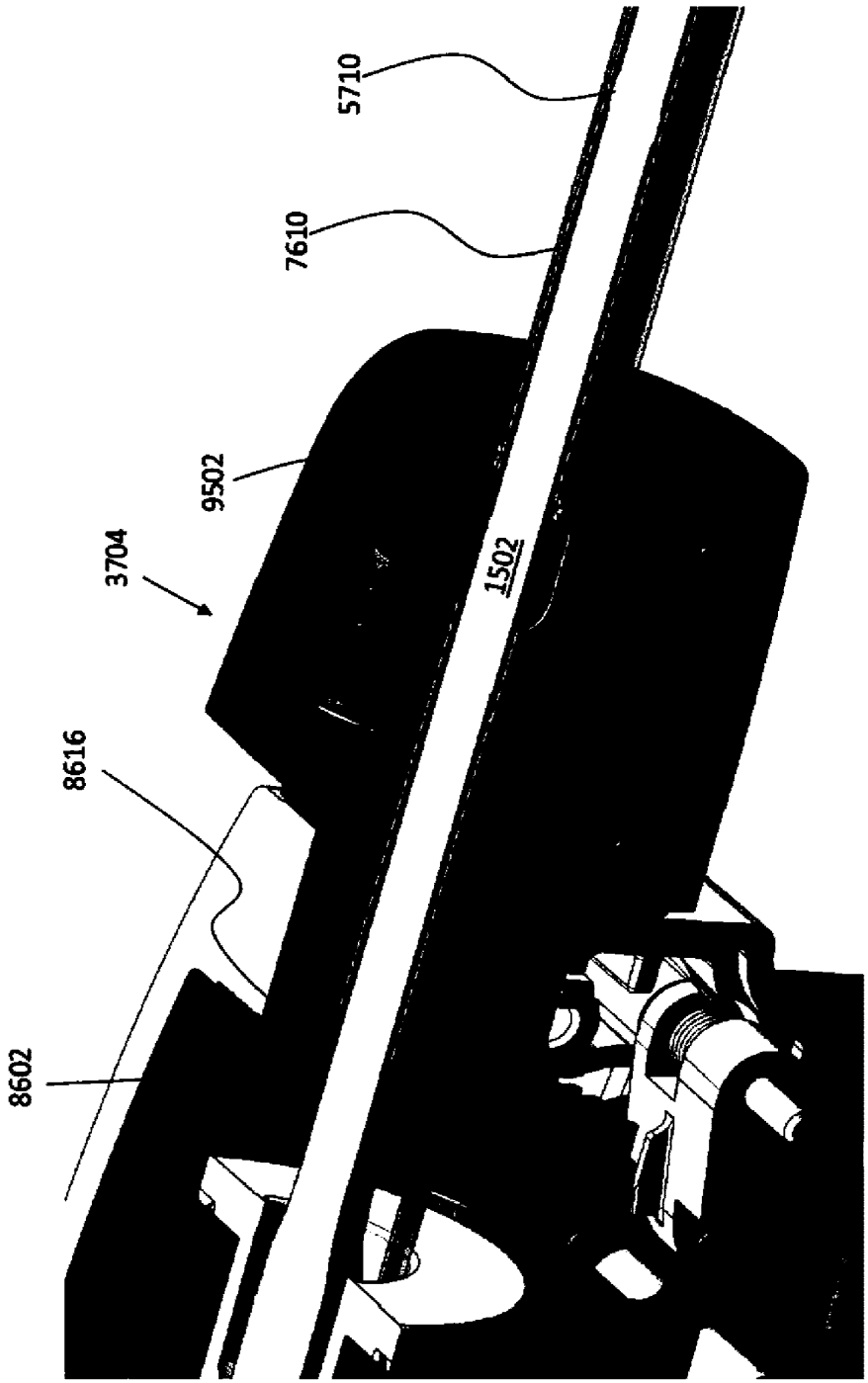


図９９

【図１００】

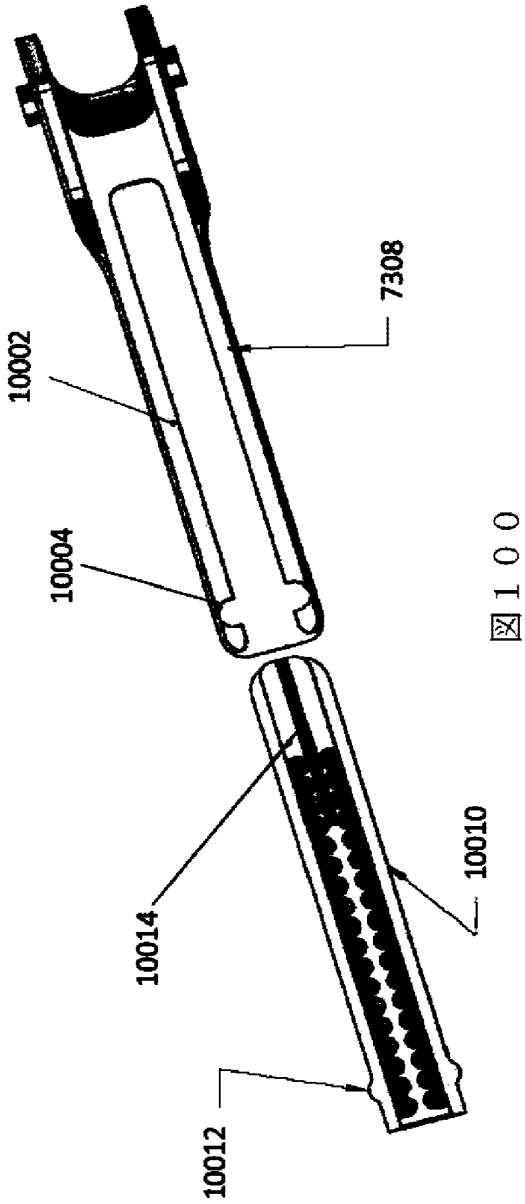


図１００

【図１０１】

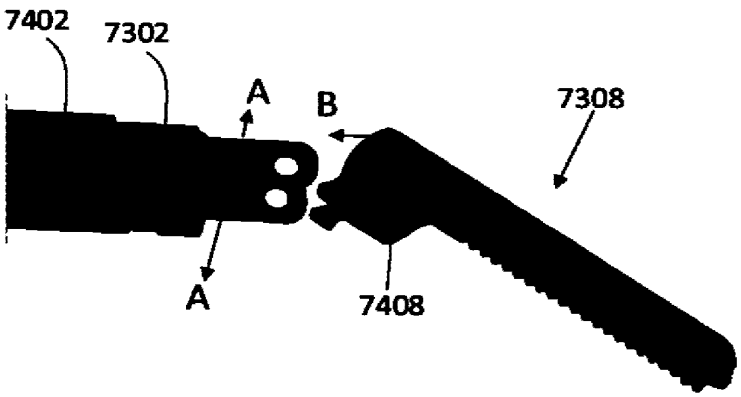


図１０１

【図１０２】

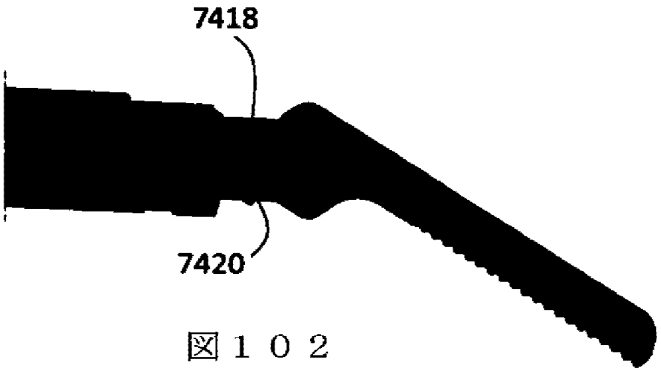


図１０２

Petitioner Therabody Ex-1004, 1512

【図１０３】

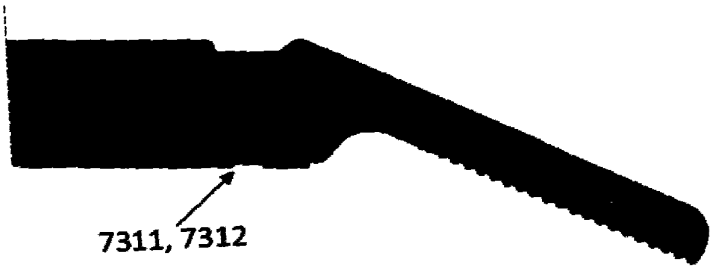


図１０３

【図１０４】

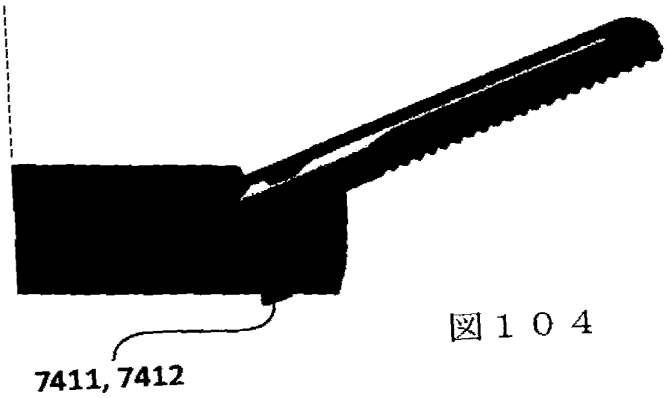


図１０４

Petitioner Therabody Ex-1004, 1514

【図１０５】

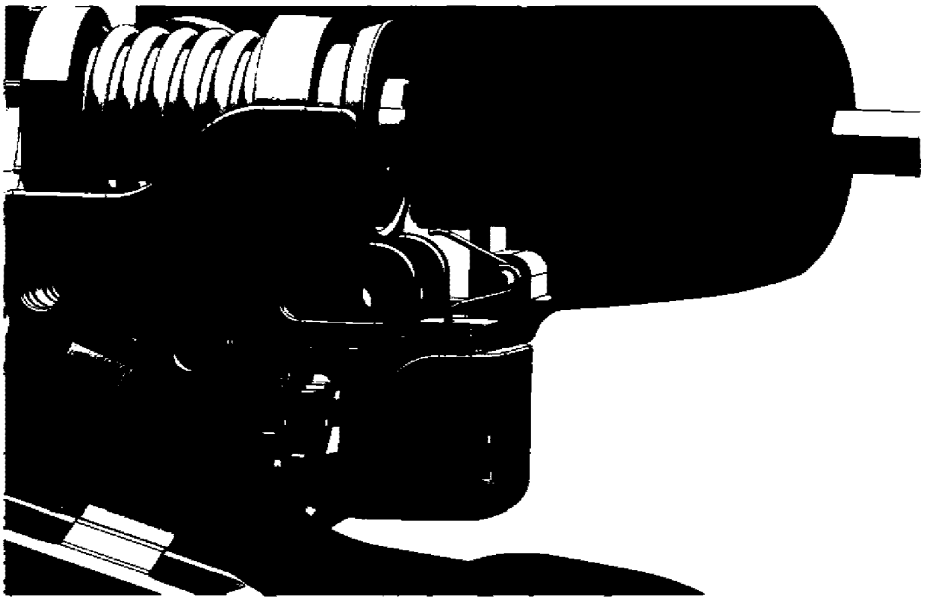


図１０５

Petitioner Therabody Ex-1004, 1515

【図１０６】

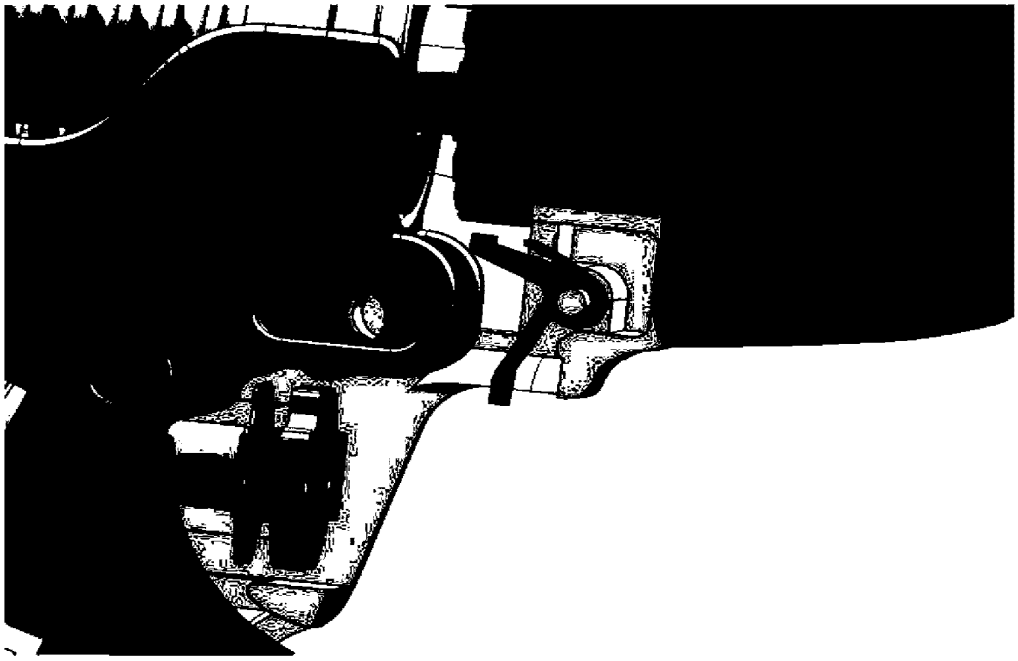


図１０６

Petitioner Therabody Ex-1004, 1516

【図１０９】

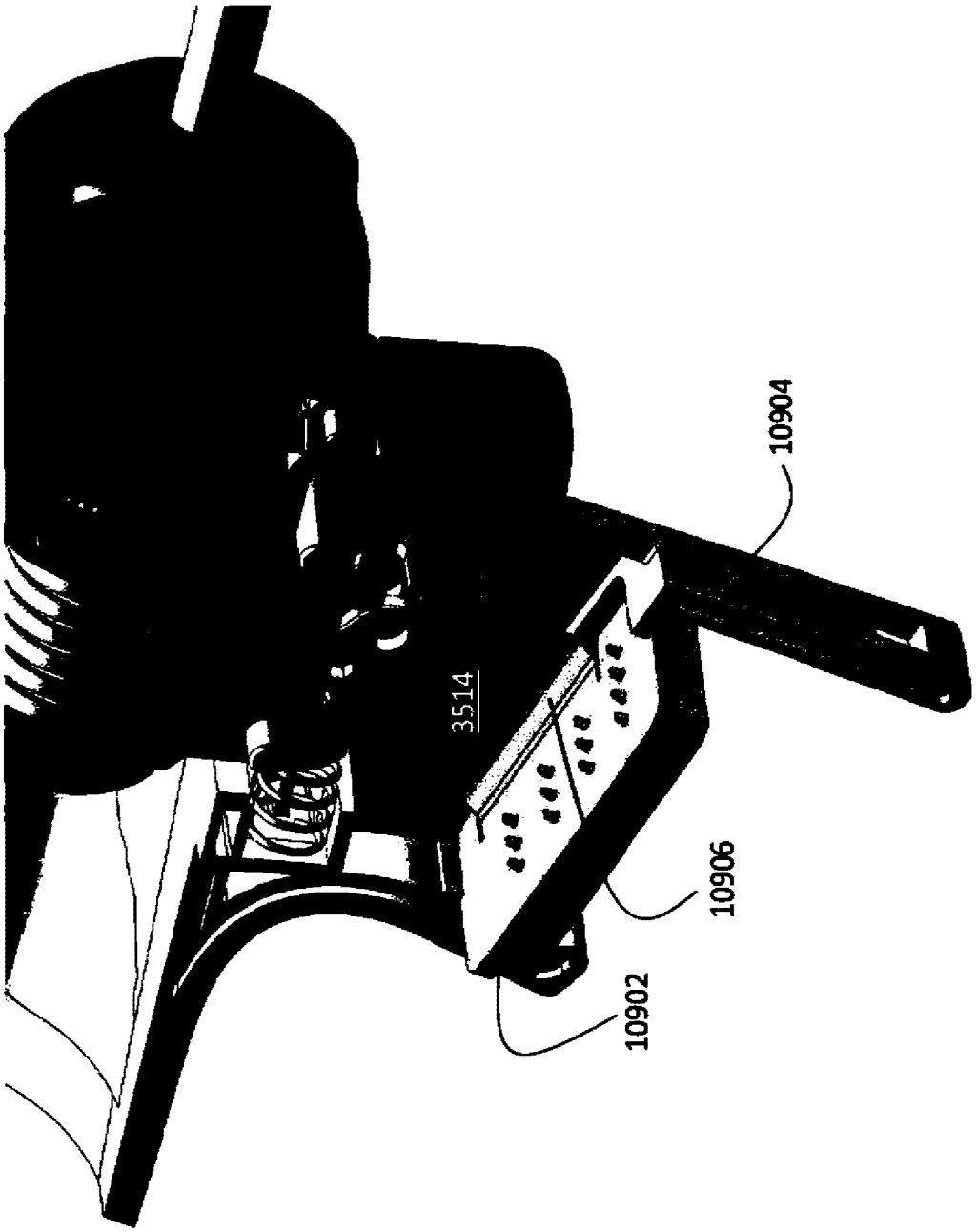


図１０９

【図１１０】

図１１０

Petitioner Therabody Ex-1004, 1518

フロントページの続き

(72)発明者 トーマス オー. ベイルズ
アメリカ合衆国, フロリダ州, コーラル ゲーブルズ, アルヴィーダ レーン ９１５１
(72)発明者 デレック ディー デヴィル
アメリカ合衆国, フロリダ州, コーラル ゲーブルズ, オーク レーン ５５００
(72)発明者 ケヴィン ダブリュー. スミス
アメリカ合衆国, フロリダ州, コーラル ゲーブルズ, アルヴィーダ パークウェイ ５７０
(72)発明者 マシュー エー. パルマー
アメリカ合衆国, フロリダ州, マイアミ, エス. ダブリュー. ６４ コート １２７９０

審査官 井上 哲男

(56)参考文献 特表２０１１－５０５２２６（ＪＰ，Ａ）
特表２００７－５３６０９８（ＪＰ，Ａ）
特開２００７－２２２６１５（ＪＰ，Ａ）
特表２００４－５２５７１８（ＪＰ，Ａ）
特開２００３－０５２７１７（ＪＰ，Ａ）
特開２００２－２００９４（ＪＰ，Ａ）
特開２０００－１８５０５２（ＪＰ，Ａ）

(58)調査した分野(Int.Cl., ＤＢ名)
Ａ６１Ｂ １８／００

Petitioner Therabody Ex-1004, 1519

KR200422971Y1 PORTABLE MASSAGE PACK MANUFACTURE DEVICE

The EPO does not accept responsibility for the accuracy of data originating from authorities other than the EPO, nor does it guarantee that such data is complete, up-to-date or fit for specific purposes.

The wording below is an initial machine translation of the original publication. To apply more advanced translation technology, use Patent Translate.

[0001] 1 is a perspective view of a portable massage pack maker formed as a preferred embodiment of the present invention;

[0002] 2 is an exploded perspective view of a portable massage pack maker formed as a preferred embodiment of the present invention;

[0003] Figures 3a and 3b are operational sectional views of a portable massage pack maker formed in a preferred embodiment of the present invention;

[0004] FIG. 4 is a perspective view of a front case of a portable massage pack maker formed as a preferred embodiment of the present invention; FIG.

[0005] ** Description of Reference Numerals to Main Parts of the Drawings

The present invention relates to a portable massage pack maker, and more particularly, to a portable massage pack maker which comprises a case in which vegetables and fruits such as cucumber and carrot are inserted into a front surface of a case in which a motor is intrinsically rotated so as to be portable and easy to use, The present invention relates to a portable massage pack maker capable of smoothly and resiliently massaging skin tissues by discharging vegetable or fruit juice to the outside by rotating the motor to scratch the skin. Generally, in order to improve skin elasticity or prevent skin aging Various kinds of vegetables and fruits are used in addition to functional cosmetics such as various cosmetics and massage creams, etc. As described above, the interest related to the skin is increasing not only for women but also for men, And a room where skin massage devices appear A. In the meantime, the skin massage method includes a method of applying cosmetics, massage cream, etc., or grinding with a blender using vegetables or fruits (hereinafter, referred to as materials). In this case, However, when the above-mentioned materials are used, the process of forming a massage pack is cumbersome and complicated, so that it is very inconvenient for a person to frequently make a massage. In order to solve the above problems, the present invention has been devised for the following purposes: (1) a front cover having a scratch portion on the front surface of a case in which a motor is housed, and The material is inserted into the inside of the front cover and is rotated by the motor so that the material (2) The structure for mixing the above materials is configured to be convenient to carry, so that a massage pack can be manufactured wherever it is desired, so that it can be massaged on the skin.

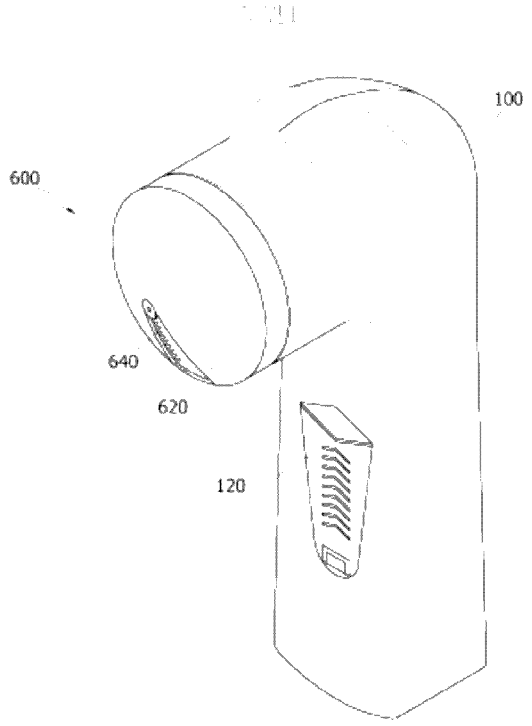
In order to achieve the above-mentioned object, the present invention is characterized in that a vegetable case in which a material such as cucumber, carrot or the like is inserted is formed in front of a body case in which a motor is inserted, and a rotating bushing, Wherein a front cover having a scratch portion at its front end is detachably coupled to the front end of the vegetable case and a compression spring is embedded in the motor housing of the rotary bushing and the motor, And the massage material is discharged from the massage pack while being rubbed against the scratch portion of the front cover by being rotated by the motor shaft. Hereinafter, a preferred embodiment of the present invention will be described in detail with reference to the accompanying drawings. 1 to 3, a motor 180 is disposed in front of a body case 100 in which cucumber, carrot, etc. A rotating bushing 400 in which the material 500 is inserted is rotatably coupled to the motor case 180 so that the rotating bushing 400 is interlocked with the motor 180, A front cover 600 having a scratch portion 640 therein is detachably coupled to the front end of the vegetable case 300 and a compression spring is inserted between the rotary bushing 400 and the motor shaft 185 of the motor 180. [The vegetable case inserted into the vegetable case 300 is rotated by the motor shaft 185 to discharge the juice-shaped massage pack while rubbing against the scratch 640 of the front cover 600. The body case 100 is formed with a battery insertion portion (not shown) in which a battery is received at the lower end of the body case 100, and a power source A switch 120 for shielding the battery 1 is formed, and a motor 1 A mounting hole 140 is formed in front of the motor 180 to be coupled with the rear of the vegetable case 300. The body case 100 (Not shown) for inserting a battery into the battery inserting unit at the rear of the battery case 300. The vegetable case 300 is cylindrical and has a plurality of engaging projections 320 A plurality of holes 360 are formed in the rear of the latching jaws 360 so as to be coupled to the body case 100 by bolts. The flange 340 is formed on the inner surface of the vegetable

Petitioner Therabody Ex-1004, 1520

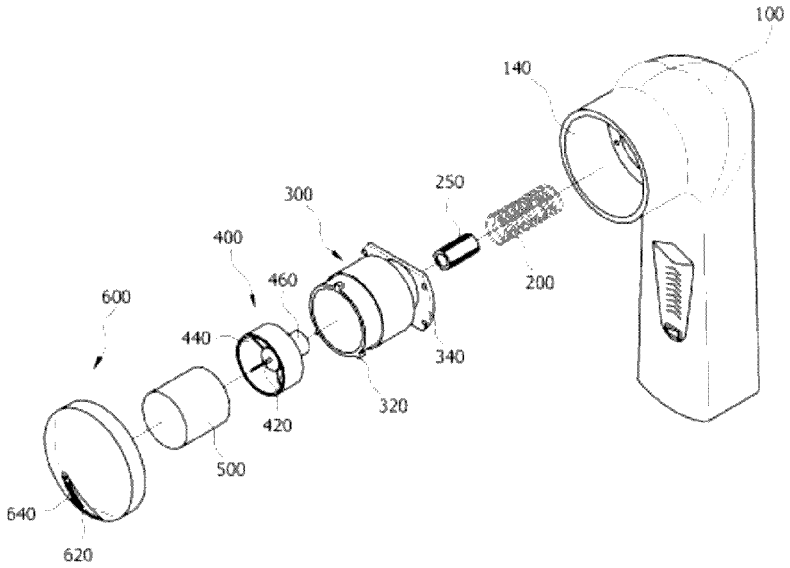
case 300. When the material 500 is inserted into the vegetable case 300, a large amount of the material 500 is inserted, To prevent the user from receiving excessive force. The rotary bushing 400 is formed by punching a material punch 420 protruding by a predetermined length from the center of the rotary bushing 400 and a plurality of fixed blades 440 And a fixing portion 460 having a fitting groove 480 coupled to the motor shaft 185 is protruded from the rear of the rotary bushing 400. The rotary bushing 400 is made of a material 500 is inserted into the interior of the vegetable case 300 so as to prevent the material 500 from slipping due to the fixed blade 440 when the rotating bushing 400 is rotated by the motor shaft 185, A shaft 250 coupled to the rotary bushing 400 and the motor shaft 185 of the motor 180 to transmit the driving force of the motor 180 to the rotary bushing 400 The front cover 600 is formed with a discharge port 620 cut out to a predetermined size on the front side thereof, A sharp shape scratch 640 is formed on one side of the air outlet 620 and a fastening groove 660 is formed in the rear of the scratch 640 so as to be fastened to the coupling protrusion 320 of the vegetable case 300. [A plurality of sharp protruding portions are formed in the inside of the scratch portion 640. The rotating bushing 400 in which the material is inserted due to the sharp protruding portion is rotated by the motor shaft 185 of the motor 180 A plurality of discharge holes 680 may be formed in the periphery of the front cover 600 as shown in FIG. 4, as shown in FIG. 4, The operation of the portable massaging pack manufacturing machine formed as an embodiment of the present invention will be described as follows. The rotating bushing 400 may be formed of a plate- Embedded Vegetable Case (300) The center surface of the material 500 is inserted into the material holder 420 of the rotating bushing 400 and the front cover 600 having the stagger part 640 is inserted When the coupling protrusion 320 of the vegetable case 300 is inserted and fastened to the coupling groove 660 of the rotary case 300, the compression spring 200 at the rear portion of the rotary bushing 400 is compressed and mounted. When the switch 120 for supplying power to the battery unit is turned on and power is applied to the motor 180, the motor 180 is operated and the rotating bushing 400 interlocked with the motor shaft 185 rotates The material 500 is deformed into a juice form by being scratched by the scratch portion 640 of the front cover 600 and the compression spring 200 Is pushed forward by the pivoting bushing 400 so that the material 500 is pushed to the end.

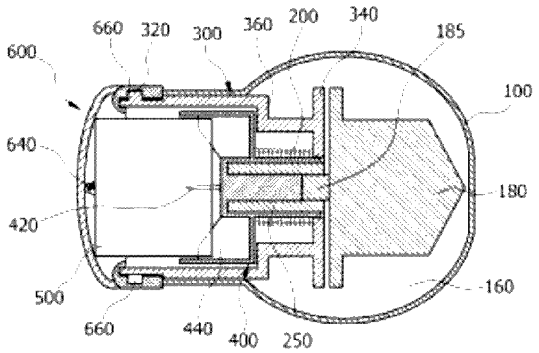
As described above, according to the present invention, the following effects are produced: (1) A front cover having a scratch portion is coupled to a front surface of a case in which a motor is housed, (2) It is possible to construct a structure for mixing vegetables and fruits with a convenient structure for carrying, so that it is possible to make Massage packs can be manufactured wherever they are, so you can massage your skin.

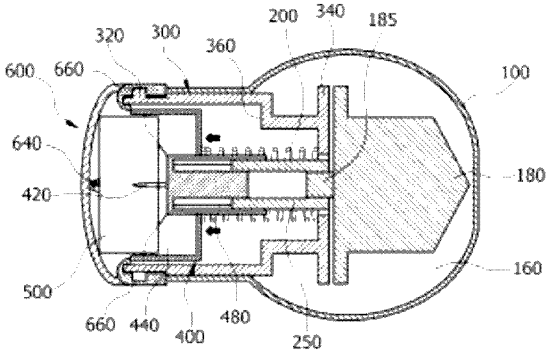
Drawings



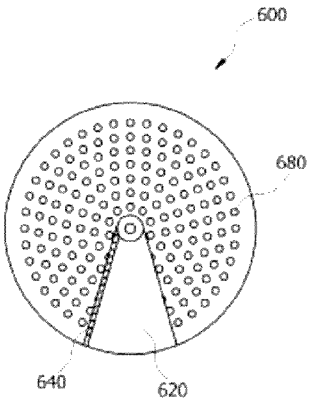
Petitioner Therabody Ex-1004, 1521







Petitioner Therabody Ex-1004, 1522



Petitioner Therabody Ex-1004, 1523

(19)대한민국특허청(KR)
(12) 등록실용신안공보(Y1)

(51) 。Int. Cl.
A45D 44/00 (2006.01)
A47J 43/04 (2006.01)

(45) 공고일자 2006년08월01일
(11) 등록번호 20-0422971
(24) 등록일자 2006년07월26일

(21) 출원번호 20-2006-0013564
(22) 출원일자 2006년05월20일

(73) 실용신안권자 선혜정
경기 시흥시 은행동 대우1차아파트 102동 1004호

(72) 고안자 선혜성
경기 시흥시 은행동 대우1차아파트 102동 1004호

(74) 대리인 황선웅

기초적요건 심사관 : 나수언

(54)휴대용 마사지팩 제조기

요약

본 고안은 휴대용 마사지팩 제조기에 관한 것으로, 보다 상세하게는 휴대가 간편하고 사용이 편리하도록 모터가 내재되어 회동되는 케이스의 전면 내부에 오이, 당근 등(이하, 재료라 칭함.)을 삽입한 후, 상기 모터를 회동시켜 스크레치시킴으로써 재료의 즙이 외부로 배출되면서 피부조직을 부드럽고 탄력있게 마사지할 수 있도록 한 휴대용 마사지팩 제조기에 관한 것이다.

본 고안은 모터가 내부에 삽입된 몸체케이스의 전방으로 야채케이스가 형성되고, 상기 야채케이스 내부에는 회전부싱이 모터와 연동되도록 회전가능하게 결합되며, 야채케이스의 선단에는 스크래치부를 내부에 갖는 전면커버가 분리가능하게 결합되고, 상기 회전부싱과 모터의 모터축사이에는 압축스프링이 내재되어, 상기 야채케이스에 삽입된 야채류가 모터축에 의해 회동됨으로써 전면커버의 스크래치부와 마찰되면서 즙형태의 마사지팩이 배출될 수 있는 것을 특징으로 한다.

본 고안의 휴대용 마사지팩 제조기에 의하면, 재료가 스크래치되는 동시에 즙형태의 마사지팩이 피부에 바로 배출될 뿐만 아니라, 피부에 바로 마사지할 수 있을 뿐만 아니라, 휴대하기 편리할 수 있는 효과가 있다.

대표도

도 1

색인어

마사지팩, 휴대용, 야채류, 야채즙, 모터, 회전부싱, 스크래치

MassagerPriorArt0000396

Petitioner Therabody Ex-1004, 1524

Petitioner Therabody Ex-1004, 1525

명세서

도면의 간단한 설명

도 1은 본 고안의 바람직한 실시예로 형성된 휴대용 마사지팩 제조기의 사시도.

도 2는 본 고안의 바람직한 실시예로 형성된 휴대용 마사지팩 제조기의 분리 사시도.

도 3a와 3b는 본 고안의 바람직한 실시예로 형성된 휴대용 마사지팩 제조기의 작동상태 단면도.

도 4는 본 고안의 바람직한 실시예로 형성된 휴대용 마사지팩 제조기의 전면케이스의 사시도.

<도면의 주요 부분에 대한 부호의 설명>

고안의 상세한 설명

고안의 목적

고안이 속하는 기술 및 그 분야의 종래기술

본 고안은 휴대용 마사지팩 제조기에 관한 것으로, 보다 상세하게는 휴대가 간편하고 사용이 편리하도록 모터가 내재되어 회동되는 케이스의 전면 내부에 오이, 당근 등의 야채류나 과일류 등을 삽입한 후, 상기 모터를 회동시켜 스크래치시킴으로써 야채 또는 과일즙이 외부로 배출되면서 피부조직을 부드럽고 탄력있게 마사지할 수 있도록 한 휴대용 마사지팩 제조기에 관한 것이다.

일반적으로 피부의 탄력을 향상시키거나 피부의 노화를 방지시키기 위하여 각종 화장품이나 마사지용 크림 등의 기능성 화장품 뿐만 아니라, 여러가지 야채류나 과일류를 사용하고 있다.

이렇듯, 상기 피부에 관련된 관심은 비단 여성들뿐만 아니라 남성들에게도 점점 커져만 가고 있고, 이를 전문으로 하는 마사지 전문업체와 피부마사지용 장치들이 등장하고 있는 실정이다. 한편, 상기 피부마사지하는 방법은 화장품이나 마사지용 크림 등을 바르거나 야채류나 과일류(이하, 재료라 칭함) 등을 사용하여 믹서기로 갈아서 바르는 방법이 있다.

이때, 상기 재료를 사용할 경우에는 상기 천연재료를 적당한 크기로 토막을 낸 후, 믹서기로 갈아서 마사지할 피부에 발라 사용하게 된다.

그러나, 상기 재료를 사용하게 되면, 마사지팩을 형성시키는 과정이 번잡스러고 복잡하여 개인직으로 자주 하는 것이 매우 불편할 뿐만 아니라, 믹서기가 있어야 하기 때문에 휴대할 수 없는 문제점이 있었다.

고안이 이루고자 하는 기술적 과제

상기한 문제점을 해결하기 위해서 본 고안은 다음과 같은 목적으로 고안되었다.

(1) 모터가 내재된 케이스의 전면에 스크래치부를 갖는 전면커버가 결합되어 상기 전면커버의 내부로 재료를 삽입하여 모터에 의해 회동시킴으로써 상기 재료가 즙형태로 간단하게 배출될 수 있다.

(2) 상기 재료를 믹싱하는 구조를 휴대하기 편리하도록 구성함으로써 원하는 곳이면 어디든지 마사지팩을 제조할 수 있어 피부에 마사지할 수 있다.

고안의 구성 및 작용

상기한 목적을 달성하기 위해서, 본 고안은 모터가 내부에 삽입된 몸체케이스의 전방으로 오이, 당근 등의 재료가 삽입되는 야채케이스가 형성되고, 상기 야채케이스 내부에는 재료가 끼워지는 회전부싱이 모터와 연동되도록 회전가능하게 결합

MassagerPriorArt0000397

Petitioner Therabody Ex-1004, 1526

되며, 야채케이스의 선단에는 스크래치부를 내부에 갖는 전면커버가 분리가능하게 결합되고, 상기 회전부싱과 모터의 모터축사이에는 압축스프링이 내재되어, 상기 야채케이스에 삽입된 재료가 모터축에 의해 회동됨으로써 전면커버의 스크래치부와 마찰되면서 즙형태의 마사지팩이 배출될 수 있는 것을 특징으로 한다.

이하, 본 고안의 바람직한 실시예로 첨부된 도면을 참조하여 상세하게 설명하면 다음과 같다.

도 1내지 도 3에서와 같이, 모터(180)가 내부에 삽입된 몸체케이스(100)의 전방으로 오이, 당근 등의 재료(500)가 삽입되는 야채케이스(300)가 형성되고, 상기 야채케이스(300) 내부에는 재료(500)가 끼워지는 회전부싱(400)이 모터(180)와 연동되도록 회전가능하게 결합되며, 야채케이스(300)의 선단에는 스크래치부(640)를 내부에 갖는 전면커버(600)가 분리가능하게 결합되고, 상기 회전부싱(400)과 모터(180)의 모터축(185)사이에는 압축스프링(200)이 내재되어, 상기 야채케이스(300)에 삽입된 야채류가 모터축(185)에 의해 회동됨으로써 전면커버(600)의 스크래치부(640)와 마찰되면서 즙형태의 마사지팩이 배출된다.

상기 몸체케이스(100)는 'ㄱ'자 형태로써 내부 하단에 밧데리가 수용되는 밧데리삽입부(미도시)가 형성되고, 상기 몸체케이스(100)의 전면에는 밧데리에서 모터(180)로 인가되는 전원을 차폐하는 스위치(120)가 형성되며, 상기 밧데리삽입부의 상측에는 모터(180)가 내장되는 모터부삽입홀(160)이 형성되고, 상기 모터(180)의 전방에는 야채케이스(300)의 후방과 결합되는 장착홀(140)이 형성된다.

또한, 상기 몸체케이스(100)의 후면에는 상기 밧데리삽입부로 밧데리를 삽입시킬 수 있도록 뚜껑(미도시)이 형성되어 밧데리를 교체할 수 있는 것이다.

상기 야채케이스(300)는 원통형으로써 전방부의 외주연에는 다수의 결합돌기(320)가 형성되고, 내부에는 회동부싱(400)의 후면이 걸리도록 걸림턱(360)이 형성되며, 상기 걸림턱(360)의 후방에는 상기 몸체케이스(100)와 볼트로 결합되도록 다수의 홀을 갖는 플렌지(340)가 형성되는데, 상기 걸림턱(360)은 야채케이스(300)의 내부로 재료(500)를 삽입시킬 때, 무리하게 많은 양의 재료(500)가 삽입됨으로써 압축스프링(200)에 무리한 힘을 받지 않하도록 제한하는 역할을 하는 것이다.

상기 회전부싱(400)은 내부중앙에 송곳형태의 재료꽂이(420)가 일정길이 돌출되어 형성되고, 상기 재료꽂이(420)를 중심으로 한 회전부싱(400)의 내주연에는 다수의 고정날개(440)가 형성되며, 상기 회전부싱(400)의 후방에는 모터축(185)과 연동되게 결합되는 끼움홈(480)을 갖는 고정부(460)가 돌출형성된다.

상기 회동부싱(400)은 재료(500)를 야채케이스(300)의 내부로 삽입하여 모터축(185)에 의해 회동부싱(400)이 회동될 때 상기 고정날개(440)로 인해 재료(500)가 미끄러지면서 헛돌지 않도록 하는 미끄럼방지역할을 하는 것이다.

또한, 상기 회전부싱(400)과 상기 모터(180)의 모터축(185)과 결합되어 상기 모터(180)의 구동력을 상기 회전부싱(400)으로 전달하는 샤프트(250)가 포함되어 구비될 수 있다.

상기 전면커버(600)는 전방일측으로 일정크기 절개된 배출구(620)가 형성되고, 상기 배출구(620)의 내부 일측으로 날카로운 형태의 스크래치부(640)가 형성되며, 상기 스크래치부(640)의 후방으로 야채케이스(300)의 결합돌기(320)와 체결될 수 있도록 체결홈(660)이 형성된다.

상기 스크래치부(640)는 내부방향으로 날카로운 돌출부가 다수개 형성되는데, 상기 날카로운 돌출부로 인해 재료가 꽂힌 회전부싱(400)이 모터(180)의 모터축(185)에 의해 회동될 때 압축스프링(200)에 의해 앞으로 밀리면서 스크래치되어 즙형태로 갈릴 수 있도록 형성된다.

또한, 도 4와 같이, 상기 전면커버(600)의 주연부에는 다수의 배출홀(680)이 관통되게 형성되어 야채즙이 상기 배출홀(680)의 외부로 배출되도록 형성될 수 있다.

이하, 본 고안의 실시예로 형성된 휴대용 맛사지팩 제조기의 작동방법을 설명하면 다음과 같다.

상기 회동부싱(400)이 내재된 야채케이스(300)의 내부에 적당하게 자른 재료(500)를 삽입하게 되는데, 상기 재료(500)의 중앙면을 상기 회동부싱(400)의 재료꽂이(420)에 꽂고, 스트래치부(640)를 갖는 전면커버(600)의 체결홈(660)에 상기 야채케이스(300)의 결합돌기(320)를 삽입하여 체결하면 상기 회동부싱(400)의 후방부에 있는 압축스프링(200)이 압축되면서 장착되게 된다.

MassagerPriorArt0000398

Petitioner Therabody Ex-1004, 1527

이후, 밧데리부의 전원을 공급하는 스위치(120)를 온(on)하여 모터(180)로 전원을 인가하면, 상기 모터(180)가 작동되면서 모터축(185)과 연동된 상기 회동부싱(400)이 회동되어 재료(500)와 함께 회동하게 되는 것이다.

이때, 상기 전면커버(600)의 스크래치부(640)에 의해 재료(500)는 스크래치되면서 즙형태로 변형되고, 상기 후방으로 압축된 압축스프링(200)은 회동부싱(400)을 전방으로 밀게 됨으로써 상기 재료(500)가 끝까지 밀어주게 되는 것이다.

고안의 효과

상기한 것과 같이, 본 고안의 휴대용 마사지팩 제조기에 의하면 다음과 같은 효과가 발생한다.

(1) 모터가 내재된 케이스의 전면에 스크래치부를 갖는 전면커버가 결합되어 상기 전면커버의 내부로 야채류나 과일류를 삽입하여 모터에 의해 회동시킴으로써 야채류나 과일류가 스크래치되는 동시에 즙형태의 마사지팩이 피부에 바로 배출될 수 있다.

(2) 야채류나 과일류를 믹싱하는 구조를 휴대하기 편리하도록 구성함으로써 원하는 곳이면 어디든지 마사지팩을 제조할 수 있어 피부에 마사지할 수 있다.

(57) 청구의 범위

청구항 1.

모터(180)가 내부에 삽입된 몸체케이스(100)의 전방으로 오이, 당근 등의 재료(500)가 삽입되는 야채케이스(300)가 형성되고, 상기 야채케이스(300) 내부에는 재료(500)가 끼워지는 회전부싱(400)이 모터(180)와 연동되도록 회전가능하게 결합되며, 야채케이스(300)의 선단에는 스크래치부(640)를 내부에 갖는 전면커버(600)가 분리가능하게 결합되고, 상기 회전부싱(400)과 모터(180)의 모터축(185)사이에는 압축스프링(200)이 내재되어, 상기 야채케이스(300)에 삽입된 재료(500)가 모터축(185)에 의해 회동됨으로써 전면커버(600)의 스크래치부(640)와 마찰되면서 즙형태의 마사지팩이 배출될 수 있는 것을 특징으로 하는 휴대용 마사지팩 제조기.

청구항 2.

제 1항에 있어서,

상기 몸체케이스(100)는 'ㄱ'자 형태로써 내부 하단에 밧데리가 수용되는 밧데리삽입부(미도시)가 형성되고, 상기 몸체케이스(100)의 전면에는 밧데리에서 모터(180)로 인가되는 전원을 차폐하는 스위치(120)가 형성되며, 상기 밧데리삽입부의 상측에는 모터(180)가 내장되는 모터부삽입홀(160)이 형성되고, 상기 모터(180)의 전방에는 야채케이스(300)의 후방과 결합되는 장착홀(140)이 형성된 것을 특징으로 하는 휴대용 마사지팩 제조기.

청구항 3.

제 1항에 있어서,

상기 야채케이스(300)는 원통형으로써 전방부의 외주연에는 다수의 결합돌기(320)가 형성되고, 내부에는 회전부싱(400)의 후면이 걸리도록 걸림턱(360)이 형성되며, 상기 걸림턱(360)의 후방에는 상기 몸체케이스(100)와 볼트로 결합되도록 다수의 홀을 갖는 플랜지(340)가 형성된 것을 특징으로 하는 휴대용 마사지팩 제조기.

청구항 4.

제 1항에 있어서,

MassagerPriorArt0000399

상기 회전부싱(300)은 내부중앙에 송곳형태의 재료꽂이(420) 가 일정길이 돌출되어 형성되고, 상기 재료꽂이(420)를 중심으로 한 회전부싱(300)의 내주연에는 다수의 고정날개(440)가 형성되며, 상기 회전부싱(300)의 후방에는 모터축(185)과 연동되게 결합되는 끼움홈(480)을 갖는 고정부(460)가 돌출형성된 것을 특징으로 하는 휴대용 마사지팩 제조기.

청구항 5.

제 1항에 있어서,

상기 전면커버(600)는 전방일측으로 일정크기 절개된 배출구(620)가 형성되고, 상기 배출구(620)의 내부 일측으로 날카로운 형태의 스크래치부(640)가 형성되며, 상기 스크래치부(640)의 후방으로 하채케이스(300)의 결합돌기(320)와 체결될 수 있도록 체결홈(660)이 형성된 것을 특징으로 하는 휴대용 마사지팩 제조기.

청구항 6.

제 1항에 있어서,

상기 회전부싱(300)과 상기 모터(180)의 모터축(185)과 결합되어 상기 모터(180)의 구동력을 상기 회전부싱(300)으로 전달하는 샤프트(250)가 포함되어 구비된 것을 특징으로 하는 휴대용 마사지팩 제조기.

청구항 7.

제 5항에 있어서,

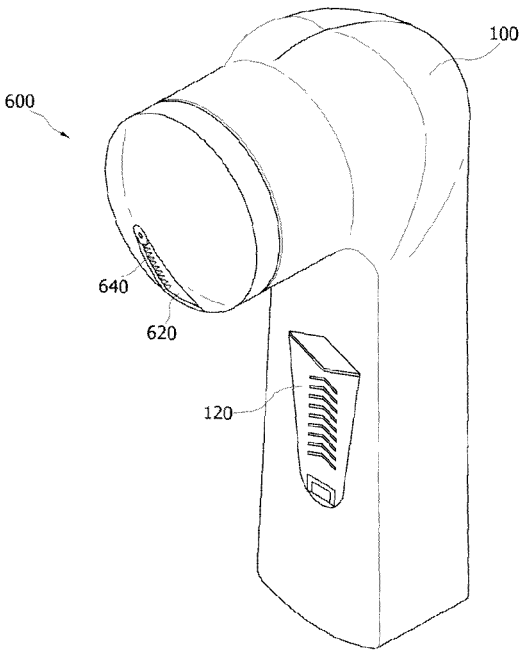
상기 전면커버(600)의 주연부에는 다수의 배출홀(680)이 관통되게 형성된 것을 특징으로 하는 휴대용 마사지팩 제조기.

도면

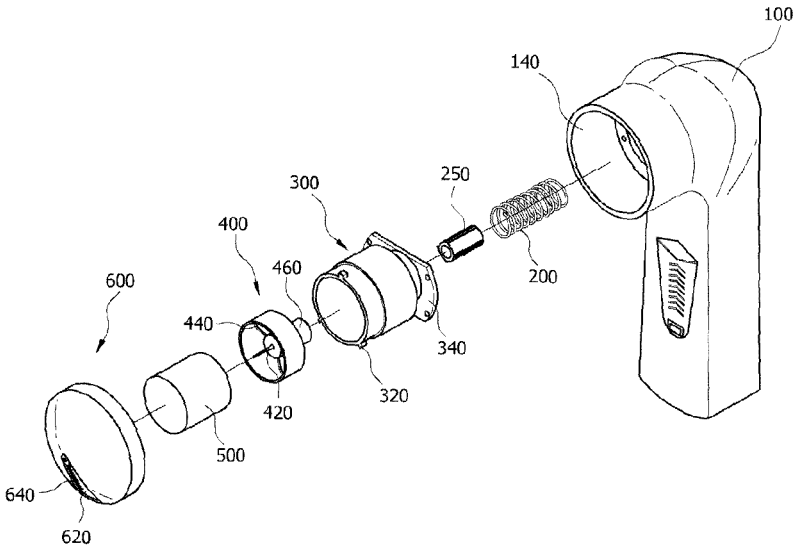
MassagerPriorArt0000400

Petitioner Therabody Ex-1004, 1528

도면1



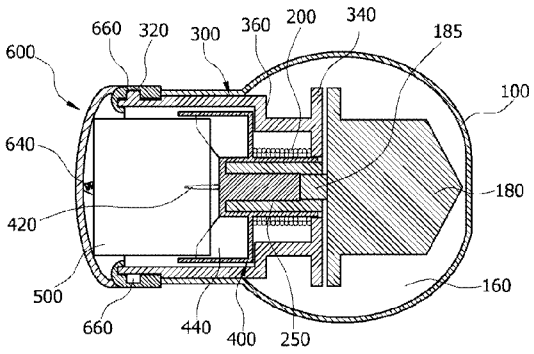
도면2



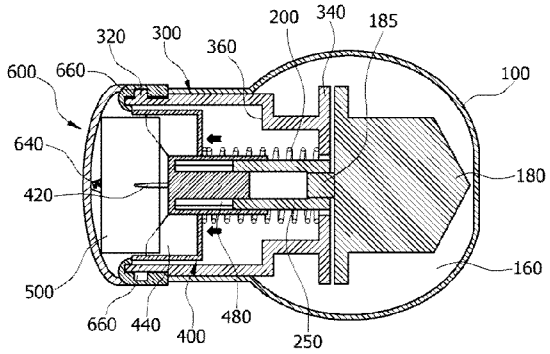
MassagerPriorArt0000401

Petitioner Therabody Ex-1004, 1529

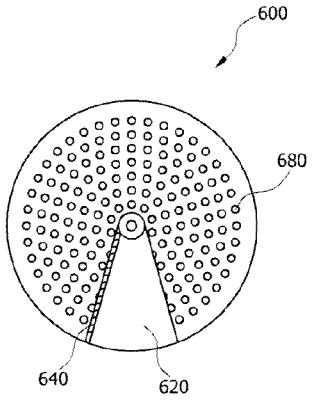
도면3a



도면3b



도면4



MassagerPriorArt0000402

Petitioner Therabody Ex-1004, 1530

CN101958410B Novel cylindrical storage battery

The EPO does not accept responsibility for the accuracy of data originating from authorities other than the EPO, nor does it guarantee that such data is complete, up-to-date or fit for specific purposes.

The wording below is an initial machine translation of the original publication. To apply more advanced translation technology, use Patent Translate.

[0001] Technical field

[0002] The invention relates to a battery, especially a new cylindrical storage battery.

[0003] Background technique

[0004] Cylindrical battery is a more traditional battery structure, which has the advantages of large volume, space saving, and assembly and use. Existing cylindrical batteries usually use a metal welding method to extract the electrode lugs on the pole pieces to form electrodes, the case serves as a positive electrode or a lead wire at the bottom, and the negative electrode is led out in the form of a pole post. Although the electrode structure is relatively simple, due to the limitations of the current longer winding equipment, it is easy to cause contact and entanglement between the positive and negative ears, which is not conducive to the installation of large power batteries and the design of heat dissipation measures. Implementation; especially when the battery is under overcharge and other extreme conditions, as the internal temperature of the battery rises, the failure of the tab insulation layer is likely to cause the internal short circuit of the battery to explode and burn.

[0005] Summary of the invention

[0006] In view of the shortcomings in the above technology, the present invention provides a new type of cylindrical storage battery with reasonable structure, which can effectively prevent the internal short circuit of the battery due to the failure of the insulating layer on the tab and cause the battery to explode and burn.

[0007] In order to achieve the above object, the present invention provides a new type of cylindrical storage battery, which is mainly composed of a casing and internal electrodes and batteries arranged inside the casing; a casing cover is further provided on the upper end of the casing. The surface of the shell cover is provided with a positive electrode and a negative electrode, one ends of the

Petitioner Therabody Ex-1004, 1531

positive electrode and the negative electrode are penetrated on the surface of the shell cover, and any one of the positive and negative electrodes is connected to the Is connected to the inner electrode, and the other electrode is connected to the housing through the cover.

[0008] Further, a collector device is also provided inside the casing. The collector device is mainly made of insulating material. The positive and negative electrode tabs on the battery core pass through the collector device through the conductor and the The internal electrode is connected to another electrode provided on the cover.

[0009] Further, the negative electrode tabs and the positive electrode tabs on the cell are kept apart and separated by a collector device.

[0010] Further, an insulating gasket is provided between any one of the positive electrode or the negative electrode and the case cover, and between the case cover and the internal electrode.

[0011] Further, a copper gasket is also provided between the positive electrode and the insulating gasket.

[0012] Further, a liquid injection hole is further provided on the surface of the shell cover.

[0013] Furthermore, the inside of the housing is also filled with electrolyte.

[0014] The advantage of the present invention is that it uses a collector device to separate the positive and negative electrode lugs drawn from the cell, and the collector device uses insulation to separate the positive and negative electrode lugs. The structure is reasonable and can effectively prevent The internal short circuit of the battery due to the failure of the insulating layer on the pole ears causes the battery to explode and burn.

[0015] BRIEF DESCRIPTION

[0016] Figure 1 is a cross-sectional view of the present invention;

[0017] FIG. 2 is a schematic plan view of the collector device.

[0018] FIG. 3 is a cross-sectional view along the A-A direction in FIG. 2.

[0019] The main component symbols are as follows:

Petitioner Therabody Ex-1004, 1532

[0020] 1Positive electrode 2 Copper gasket 3 Insulation gasket 4 Inner electrode 5 Shell

[0021] 6Negative electrode 7 shell cover 8 liquid injection hole 9 battery core 10 collector electrode device

[0022] 11Negative electrode tab 12 Positive electrode tab 13 Insulation 14 conductor

[0023] detailed description

[0024] In order to describe the present invention more clearly, the present invention will be further described below with reference to the drawings.

[0025] As shown in FIGS. 1 to 3, the present invention provides a novel cylindrical storage battery, which is mainly composed of a case 5 and an internal electrode 4 and a battery 9 provided inside the case 5; A cover 7 is also provided on the upper end of the housing, and a positive electrode 1 and a negative electrode 6 are provided on the surface of the housing cover 7, one ends of the positive electrode 1 and the negative electrode 6 are penetrated on the surface of the housing cover 7, In addition, the positive electrode 1 is connected to the internal electrode 4, and the negative electrode 6 communicates with the housing 5 through the housing cover 7.

[0026] A collector device 10 is also provided inside the casing 5. The collector device 10 is mainly made of an insulating material. The positive electrode tab 12 on the battery core 9 passes through the collector device 10 through a conductor 14 is connected to the inner electrode 4, and the negative electrode tab 11 passes through the collector device 10 and is connected to the negative electrode 6 through the conductor 14.

[0027] The negative electrode tabs 11 and the positive electrode tabs 12 on the cell 9 are kept apart and separated by a collector device 10.

[0028] Insulating gaskets 3 are provided between the positive electrode 1 and the cover 7 and between the cover 7 and the internal electrode 4.

[0029] A copper gasket 2 is also provided between the positive electrode 1 and the insulating gasket 3.

[0030] A liquid injection hole 8 is also provided on the surface of the cover 7.

[0031] The inside of the housing 5 is also filled with electrolyte.

Petitioner Therabody Ex-1004, 1533

[0032] The above is only the preferred embodiment of the present invention, and does not limit the present invention in any form. Although the present invention has been disclosed as the preferred embodiment above, it is not intended to limit the present invention. Any technology familiar with the profession Personnel, without departing from the scope of the technical solutions of the present invention, when the technical contents disclosed above can be used to make some changes or modifications to equivalent equivalent embodiments, but any content that does not deviate from the technical solutions of the present invention, according to the present invention Any simple modifications, equivalent changes, and modifications made to the above embodiments by the technical essence still fall within the protection scope of the technical solution of the present invention.

Petitioner Therabody Ex-1004, 1534

Drawings

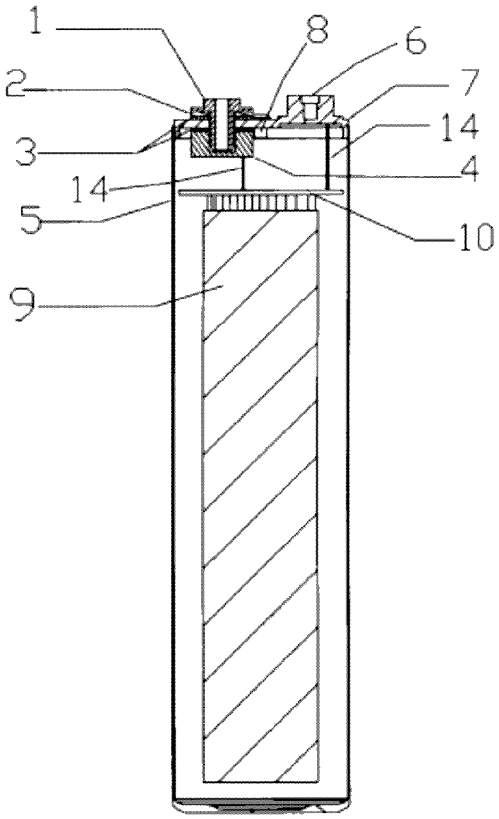


图 1

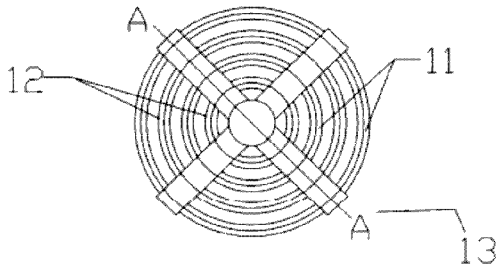


图 2

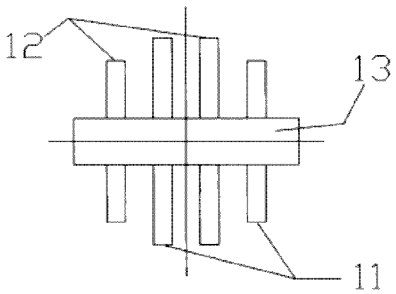


图 3

Petitioner Therabody Ex-1004, 1535

(19)中华人民共和国国家知识产权局

(12)发明专利

(10)授权公告号 CN 101958410 B
(45)授权公告日 2013.01.16

(21)申请号 201010157943.7
(22)申请日 2010.04.22
(73)专利权人 李俊
地址 广东省深圳市罗湖区翠竹路1089号翠珠小区2栋一单元602
(72)发明人 李俊 李家林
(51)Int.Cl.
H01M 2/34(2006.01)
H01M 2/26(2006.01)
H01M 10/00(2006.01)

审查员 钟毓

(56)对比文件
CN 201352581 Y,2009.11.25, 全文.
CN 201478387 U,2010.05.19, 说明书第3段至第15段、图1-2.
CN 1917272 A,2007.02.21, 全文.
JP 特开平11-86833 A,1999.03.30, 全文.

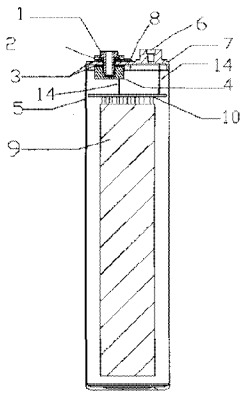
权利要求书 1 页 说明书 2 页 附图 2 页

(54)发明名称

一种新型圆柱形蓄电池

(57)摘要

一种新型圆柱形蓄电池，其主要由壳体以及设置于所述壳体内部的内电极、电芯组成；在所述壳体的上端还设有壳盖，在所述壳盖的表面设有正电极与负电极，所述的正电极和负电极的一端穿设于所述壳盖的表面，并且所述的正、负电极中的任意一电极与所述的内电极相连接，另一电极通过所述壳盖与所述壳体相导通。在所述壳体的内部还设有一集电极装置，所述的集电极装置主要由绝缘材料制成，电芯上的正、负电极极耳穿过集电极装置通过导体与所述的内电极和设置在壳盖上的另一电极相导通。



CN 101958410 B

MassagerPriorArt0000337

Petitioner Therabody Ex-1004, 1536

1. 一种新型圆柱形蓄电池，其主要由壳体以及设置于所述壳体内部的内电极、电芯组成；在所述壳体的上端还设有壳盖，在所述壳盖的表面设有正电极与负电极，所述的正电极和负电极的一端穿设于所述壳盖的表面，并且所述的正、负电极中的任意一电极与所述的内电极相连接，另一电极通过所述壳盖与所述壳体相导通，其特征在于：在所述壳体的内部还设有一集电极装置，所述的集电极装置主要由绝缘材料制成，电芯上的正、负电极极耳穿过集电极装置通过导体与所述的内电极和设置在壳盖上的另一电极相导通，在所述的正电极与所述壳盖之间、所述壳盖与所述内电极之间均设有绝缘垫片；在所述正电极与所述绝缘垫片之间还设有铜垫片。

2. 根据权利要求 1 所述的一种新型圆柱形蓄电池，其特征在于：所述电芯上的负电极极耳与正电极极耳之间通过集电极装置保持相互间隔和间距。

MassagerPriorArt0000338

Petitioner Therabody Ex-1004, 1537

一种新型圆柱形蓄电池

技术领域

[0001] 本发明涉及一种电池，尤其是一种新型圆柱形蓄电池。

背景技术

[0002] 圆柱形电池是较为传统的一种蓄电池结构，其具有容积大、节省空间、利于装配使用的优点。现有圆柱形电池通常在极片上采用金属焊接方式引出极耳形成电极，壳体作为正极或在底部引出线，负极在顶部以极柱形式出线。电极结构虽然比较简单，但是由于目前受较大长度的卷绕设备的局限性，极易造成正负极耳之间的接触、纠缠的状况，不利于较大功率电池的安装和散热措施的设计实施；尤其是当电池处于过充等极端情况下，随着电池内部温度上升导致极耳绝缘层的失效极易造成电池的内部短路而发生爆炸燃烧。

发明内容

[0003] 针对上述技术中存在的不足之处，本发明提供一种结构合理，可有效防止由于极耳上的绝缘层的失效而造成的电池的内部短路而导致电池发生爆炸燃烧的新型圆柱形蓄电池。

[0004] 为实现上述目的，本发明提供一种新型圆柱形蓄电池，其主要由壳体以及设置于所述壳体内部的内电极、电芯组成；在所述壳体的上端还设有壳盖，在所述壳盖的表面设有正电极与负电极，所述的正电极和负电极的一端穿设于所述壳盖的表面，并且所述的正、负电极中的任意一电极与所述的内电极相连接，另一电极通过所述壳盖与所述壳体相导通。

[0005] 进一步，在所述壳体的内部还设有一集电极装置，所述的集电极装置主要由绝缘材料制成，电芯上的正、负电极极耳穿过集电极装置通过导体与所述的内电极和设置在壳盖上的另一电极相导通。

[0006] 进一步，所述电芯上的负电极极耳与正电极极耳之间通过集电极装置保持相互间隔和间距。

[0007] 进一步，在所述的正电极或负电极的任意一电极与所述壳盖之间、所述壳盖与所述内电极之间均设有绝缘垫片。

[0008] 进一步，在所述正电极与所述绝缘垫片之间还设有铜垫片。

[0009] 进一步，在所述壳盖的表面还设有注液孔。

[0010] 进一步，在所述壳体的内部还填充有电解液。

[0011] 本发明的优点在于：其通过采用集电极装置来分隔从电芯上引接出来的正负极极耳，并且集电极装置采用绝缘制作将正负电极极耳相间隔，其结构合理，可有效防止由于极耳上的绝缘层的失效而造成的电池的内部短路而导致电池发生爆炸燃烧现象的发生。

[0012] 附图说明

[0013] 图 1 为本发明的剖视图；

[0014] 图 2 为集电极装置的平面结构示意图。

[0015] 图 3 为沿图 2 中的 A-A 方向的剖面图。

MassagerPriorArt0000339

Petitioner Therabody Ex-1004, 1538

[0016] 主要元件符号说明如下：

[0017] 1 正电极 2 铜垫片 3 绝缘垫片 4 内电极 5 壳体

[0018] 6 负电极 7 壳盖 8 注液孔 9 电芯 10 集电极装置

[0019] 11 负电极极耳 12 正电极极耳 13 绝缘件 14 导体

[0020] 具体实施方式

[0021] 为了更清楚的表述本发明，下面结合附图对本发明作进一步的描述。

[0022] 如图 1 至图 3 所示，本发明提供一种新型圆柱形蓄电池，其主要由壳体 5 以及设置于所述壳体 5 内部的内电极 4、电芯 9 组成；在所述壳体 5 的上端还设有壳盖 7，在所述壳盖 7 的表面设有正电极 1 与负电极 6，所述的正电极 1 和负电极 6 的一端穿设于所述壳盖 7 的表面，并且所述的正电极 1 与所述的内电极 4 相连接，负电极 6 通过所述壳盖 7 与所述壳体 5 相导通。

[0023] 在所述壳体 5 的内部还设有一集电极装置 10，所述的集电极装置 10 主要由绝缘材料制成，该电芯 9 上的正电极极耳 12 穿过集电极装置 10 通 过导体 14 与所述的内电极 4 相导通，负电极极耳 11 穿过集电极装置 10 通过导体 14 与所述的负电极 6 相导通。

[0024] 所述电芯 9 上的负电极极耳 11 与正电极极耳 12 之间通过集电极装置 10 保持相互间隔和间距。

[0025] 在所述的正电极 1 与所述壳盖 7 之间、所述壳盖 7 与所述内电极 4 之间均设有绝缘垫片 3。

[0026] 在所述正电极 1 与所述绝缘垫片 3 之间还设有铜垫片 2。

[0027] 在所述壳盖 7 的表面还设有注液孔 8。

[0028] 在所述壳体 5 的内部还填充有电解液。

[0029] 以上所述，仅是本发明的较佳实施例，并非对本发明作任何形式上的限制，虽然本发明已以较佳实施例揭露如上，然而并非用以限定本发明，任何熟悉本专业的技术人员，在不脱离本发明技术方案范围内，当可利用上述揭示的技术内容作出些许更动或修饰为等同变化的等效实施例，但凡是未脱离本发明技术方案的内容，依据本发明的技术实质对以上实施例所作的任何简单修改、等同变化与修饰，均仍属于本发明技术方案的保护范围内。

MassagerPriorArt0000340

Petitioner Therabody Ex-1004, 1539

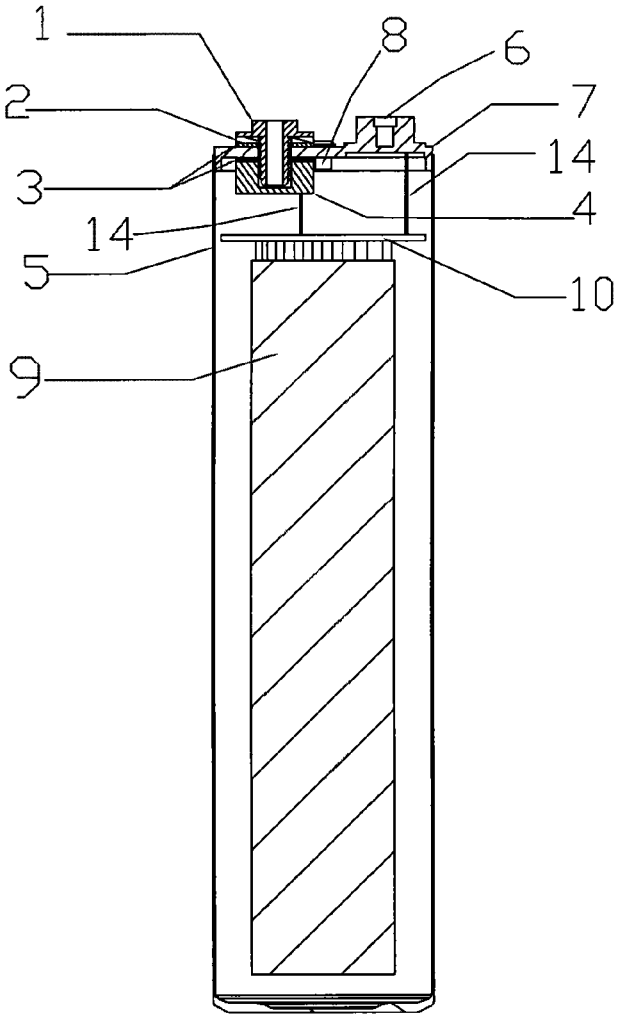


图 1

MassagerPriorArt0000341

Petitioner Therabody Ex-1004, 1540

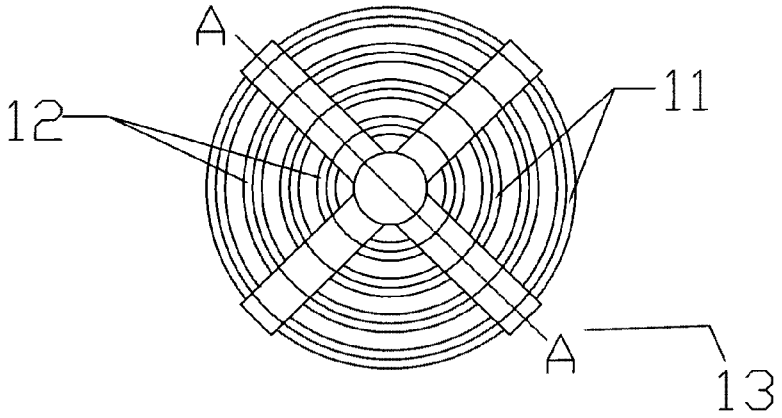


图 2

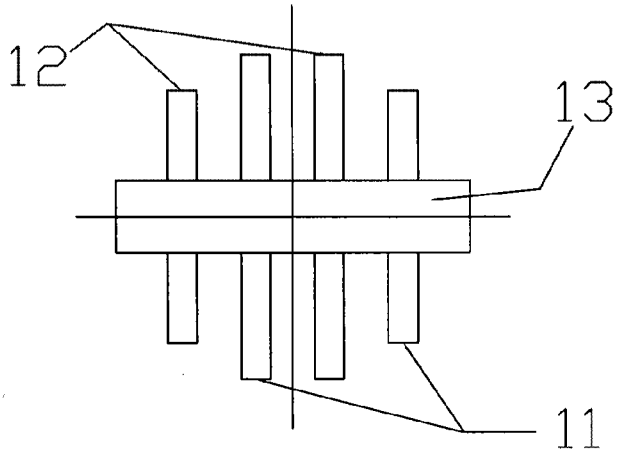


图 3

MassagerPriorArt0000342

Petitioner Therabody Ex-1004, 1541

CN204814773U

Deep muscle stimulation instrument

Abstract

The utility model provides a deep muscle stimulation instrument, including the treatment head, a main bod, the eccentric axle, the driven shaft, including a motor, an end cap, a controller, and a cover plate, the handle pipe, rechargeable battery and supply socket hole, the one end scarf joint of treatment head is in the main part, the treatment head is connected with the bearing aluminium pig through the connecting rod, and it is fixed through tip, bearing A is installed to bearing aluminium pig middle -end, bearing A lower extreme scarf joint has the eccentric axle, the lower extreme of eccentric axle is connected with the driven shaft, bearing B is installed to the driven shaft middle - end, the coupling joint is passed through on the motor to the one end of driven shaft, the middle -end at the handle pipe is installed to the motor, rechargeable battery installs under the motor, the rechargeable battery lower extreme is equipped with the switch, and the switch mounting is covered at handle pipe end bottom, and the supply socket hole is still installed to the downside of terminal lid. This deep muscle stimulation instrument utilizes mechanical oscillation to replace artifical gimmick, when making things convenient for the doctor to operate, improves treatment efficiency, and its structure is small and exquisite, easy operation, convenient to carry, can supply the patient by oneself the treatment use.

Other languages: Chinese

Inventor: 吴仁培

Worldwide applications

2015 CN

Application CN201520542670.6U events

2015-07-24 Application filed by 广州龙之杰科技有限公司

2015-07-24 Priority to CN201520542670.6U

2015-12-02 Application granted

2015-12-02 Publication of CN204814773U

Info: Cited by (4), Legal events, Similar documents, Priority and Related Applications

External links: Espacenet, Global Dossier, Discuss

Claims (8)

Hide Dependent

1. a muscle and deep stimulation instrument, comprise treatment head (1), main body (2), torque-transmitting axle (10), driven shaft (13), motor (15), handle tube (16), chargeable battery (17) and power plug bore (20), it is characterized in that: one end interlocking of described treatment head (1) is in main body (2), described treatment head (1) is connected with bearing aluminium block (8) by connecting rod (4), and fixed by mortise pin (6), described bearing aluminium block (8) middle-end is provided with bearing A(9), described bearing A(9) lower end interlocking have torque-transmitting axle (10), the lower end of described torque-transmitting axle (10) is connected with driven shaft (13), described driven shaft (13) middle-end is provided with bearing B(11), one end of described driven shaft (13) is connected on motor (15) by shaft coupling (14), described motor (15) is arranged on the middle-end of handle tube (16), chargeable battery (17) is arranged on immediately below described motor (15), described chargeable battery (17) lower end is provided with switch (19), described switch (19) is arranged in handle tube (16) end cap bottom (18), the downside of described end cap (18) is also provided with power plug bore (20).

2. muscle and deep stimulation instrument as claimed in claim 1, is characterized in that: described treatment head (1) is connected by screw thread or draw-in groove with connecting rod (4).

3. muscle and deep stimulation instrument as claimed in claim 1, is characterized in that: described treatment head (1) is rabbeted in main body (2) by screw thread or draw-in groove.

4. muscle and deep stimulation instrument as claimed in claim 1, is characterized in that: described bearing aluminium block (8) and bearing A(9) be connected by interference fit, described bearing aluminium block (8) and main body (2) are fixed by screw thread.

5. muscle and deep stimulation instrument as claimed in claim 1, is characterized in that: described connecting rod (4) outer surface is socketed with guide pin bushing (3).

6. muscle and deep stimulation instrument as claimed in claim 1, is characterized in that: described main body (2) top is provided with upper cover (7), being fixed in main body (2) by hexagon socket head cap screw (5) of described upper cover (7).

7. muscle and deep stimulation instrument as claimed in claim 1, it is characterized in that: the shaft coupling (14) that described driven shaft (13) is connected with motor (15) is yielding coupling, described shaft coupling (14) is all fix by marking closely screw with the connection of driven shaft (13) and motor (15).

8. muscle and deep stimulation instrument as claimed in claim 1, is characterized in that: described main body (2) and handle tube (16) are threaded connection, and described thread surface is provided with threaded cap (12).

Description

A kind of muscle and deep stimulation instrument

Technical field

This utility model relates to technical field of medical instruments, is specifically related to a kind of muscle and deep stimulation instrument.

Background technology

In today of athletics sports and nationwide fitness programs high speed development, healthy and body constitution has been the most important thing of living.From professional athlete to general population, all can occur various soft tissue pains problem, wherein most relevant issues are all because muscle disease causes, such as: trigger point, muscle adhesion, pull, lactic acid is piled up, scar tissue etc.

MassagerPriorArt0001384

Petitioner Therabody Ex-1004, 1542

The traditional therapy of above-mentioned disease be massage, massage, but general doctor is when carrying out massaging, massaging, the operating time is longer, can bring tired out to doctor, and dynamics, frequency are also different, and therapeutic effect is not obvious, inefficiency.

Electronic muscle and deep stimulation instrument thoroughly breaks the traditional therapies such as massage, massage, and muscle and deep stimulation instrument acts on deep musculature by mechanical vibration, makes its somesthetic sensibility recover normalization, thus eliminates soft tissue pain.

Muscle and deep stimulation instrument has the effect of significant blood circulation promoting and lymphatic return.The rhythmical pressing produced can obviously increase blood circulation speed with vibration, in addition, also can promote vasodilation to the stimulation of neural sensor, accelerates blood circulation.

Muscle and deep stimulation instrument can also relax the muscle that the muscle of contracture and length shorten, and stimulates muscle that is more weak and atrophy, effectively promotes muscle strength balance, correct biomechanics disorderly, help patient to recover correct body appearance, promote many more efficiently motions.Therefore manipulation and numerous musculoskeletal disease is widely used in.Muscle and deep stimulation instrument also can be used for soft tissue injury rehabilitations such as spraining, pull in addition.

Utility model content

The purpose of this utility model is to provide a kind of muscle and deep stimulation instrument, and this muscle and deep stimulation instrument utilizes mechanical vibration to replace artificial maneuver, while facilitating doctor to operate, improves therapeutic efficiency; This muscle and deep stimulation instrument compact structure, simple to operate, easy to carry, can for patient's self-treatment.

For realizing such scheme, this utility model provides a kind of muscle and deep stimulation instrument, comprise treatment head, main body, torque-transmitting axle, driven shaft, motor, handle tube, chargeable battery and power plug bore, one end interlocking of described treatment head is in main body, described treatment head is connected with bearing aluminium block by connecting rod, and fixed by mortise pin, described bearing aluminium block middle-end is provided with bearing A, the interlocking of described bearing A lower end has torque-transmitting axle, the lower end of described torque-transmitting axle is connected with driven shaft, described driven shaft middle-end is provided with bearing B, one end of described driven shaft is connected on motor by shaft coupling, described motor is arranged on the middle-end of handle tube, chargeable battery is arranged on immediately below described motor, described chargeable battery lower end is provided with switch, described switch is arranged in handle tube end cap bottom, the downside of described end cap is also provided with power plug bore.

In technique scheme, described chargeable battery is equipped with the DC voltage power supply adapter that voltage is 12V, and use rechargeable battery to facilitate use of the present utility model not to be subject to the restriction in time and place, more convenient patient treats anywhere or anytime.

In technique scheme, described treatment head is connected by screw thread or draw-in groove with connecting rod, adopt screw thread or draw-in groove to connect the replacing making to treat head more convenient, this utility model is equipped with the treatment head of multiple different poplar formula, facilitates dissimilar patient to select voluntarily.

In technique scheme, described treatment head is rabbeted in main body by screw thread or draw-in groove.

In technique scheme, described bearing aluminium block is connected by interference fit with bearing A, and described bearing aluminium block and main body are fixed by screw thread.

In technique scheme, described connecting rod outer surface is socketed with guide pin bushing, and the effect of guide pin bushing ensures to run up in process, and connecting rod can not sideslip, makes the operation of connecting rod more stable.

In technique scheme, described main body top is provided with upper cover, and described upper cover is fixed in main body by hexagon socket head cap screw, and described upper cover can be opened, and is easily installed in the maintenance of the miscellaneous part in main body.

In technique scheme, the shaft coupling that described driven shaft is connected with motor is yielding coupling, the connection of described shaft coupling and driven shaft and motor is all fix by marking closely screw, use yielding coupling can ensure that the rotating speed of driven shaft is consistent with motor speed, thus ensure that the vibration frequency for the treatment of head is consistent with the frequency that motor exports.

In technique scheme, described main body and handle tube are threaded connection, and described thread surface is provided with threaded cap, and main body and handle tube are threaded connection the maintenance of the component in main body more convenient to install and the replacing of rechargeable battery .

This utility model is compared to the beneficial effect of prior art: 1) utilize mechanical vibration to replace artificial maneuver, facilitate doctor to operate, and improves therapeutic efficiency; 2) compact structure, simple to operate, easy to carry, can for patient's self-treatment; 3) treatment is changed conveniently first watch, and the demand that can meet different patient is selected to change treatment head; 4) be equipped with rechargeable battery, it is more convenient to use.

Accompanying drawing explanation

Fig. 1 is front view of the present utility model.

Fig. 2 is front view of the present utility model.

Fig. 3 is top view of the present utility model.

In figure: 1-treats head, 2-main body, 3-guide pin bushing, 4-connecting rod, 5-hexagon socket head cap screw, 6-mortise pin, 7-upper cover, 8-bearing aluminium block, 9-bearing A, 10-torque-transmitting axle, 11-bearing B, 12-threaded cap, 13-driven shaft, 14-shaft coupling, 15-motor, 16-handle tube, 17-chargeable battery, 18-end cap, 19-switch, 20-power plug bore.

Detailed description of the invention

Below in conjunction with the accompanying drawing in this utility model embodiment, carry out clear, complete description to the technical scheme in this utility model embodiment, obviously, described embodiment is only this utility model part embodiment, instead of whole embodiments.This area ordinary person, not making the every other embodiment obtained under creative work prerequisite, all belongs to protection domain of the present utility model.

Embodiment: a kind of muscle and deep stimulation instrument.

Shown in Fig. 3, a kind of muscle and deep stimulation instrument, comprise treatment 1, main body 2, torque-transmitting axle 10, driven shaft 13, motor 15, handle tube 16, chargeable battery 17 and power plug bore 20, one end interlocking of described treatment 1 is in main body 2, described treatment 1 is connected with bearing aluminium block 8 by connecting rod 4, and fixed by mortise pin 6, described bearing aluminium block 8 middle-end is provided with bearing A9, the interlocking of described bearing A9 lower end has torque-transmitting axle 10, the lower end of described torque-transmitting axle 10 is connected with driven shaft 13, described driven shaft 13 middle-end is provided with bearing B11, one end of described driven shaft 13 is connected on motor 15 by shaft coupling 14, described motor 15 is arranged on the middle-end of handle tube 16, chargeable battery 17 is arranged on immediately below described motor 15, described chargeable battery 17 lower end is provided with switch 19, described switch 19 is arranged in handle tube 16 end cap 18 bottom, the downside of described end cap 18 is also provided with power plug bore 20.

MassagerPriorArt0001385

Petitioner Therabody Ex-1004, 1543

In technique scheme, described chargeable battery 17 is equipped with the DC voltage power supply adapter that voltage is 12V, and use rechargeable battery 17 to facilitate use of the present utility model not to be subject to the restriction in time and place, more convenient patient treats anywhere or anytime.

In technique scheme, described treatment 1 is connected by screw thread or draw-in groove with connecting rod 4, adopting screw thread or draw-in groove to connect makes the replacing for the treatment of 1 more convenient, and this utility model is equipped with the treatment 1 of multiple different pattern, facilitates dissimilar patient to select voluntarily.

In technique scheme, described treatment 1 by screw thread or draw-in groove interlocking in main body 2.

In technique scheme, described bearing aluminium block 8 is connected by interference fit with bearing A9, and described bearing aluminium block 8 and main body 2 are fixed by screw thread.

In technique scheme, described connecting rod 4 outer surface is socketed with guide pin bushing 3, and the effect of guide pin bushing 3 ensures to run up in process, and connecting rod 4 can not sideslip, makes the operation of connecting rod 4 more stable.

In technique scheme, described main body 2 top is provided with upper cover 7, and described upper cover 7 is fixed in main body by hexagon socket head cap screw 6, and described upper cover 7 can be opened, and is easily installed in the maintenance of other parts in main body 2.

In technique scheme, the shaft coupling 14 that described driven shaft 13 is connected with motor 15 is yielding coupling, described shaft coupling 14 is all fix by marking closely screw with the connection of driven shaft 13 and motor 15, use yielding coupling can ensure that the rotating speed of driven shaft 13 is consistent with output 1 rotating speed of motor 15, thus ensure to treat the vibrations of head or stretching frequency consistent with the frequency that motor 15 exports.

In technique scheme, described main body 2 is threaded connection with handle tube 16, and described thread surface is provided with threaded cap 12, and main body 2 and handle tube 16 are threaded connection the maintenance of the component in main body 2 more convenient to install and the replacing of rechargeable battery 17 .

In order to illustrate further this utility model, operation principle of the present utility model is explained as follows by spy: press switch 19, rechargeable battery 17 is connected with motor 15, motor 15 drives driven shaft 13, and then drive torque-transmitting axle 10, the rotation of torque-transmitting axle 10 can seesaw by driving bearing aluminium block 8, and then is driven through treatment that connecting rod 4 is connected with bearing aluminium block 81 and seesaws, generation vibrating effect.

The foregoing is only preferred embodiment of the present utility model; not in order to limit this utility model; all within spirit of the present utility model and principle, done any amendment, equivalent replacement, improvement etc., all should be included within protection domain of the present utility model.

Cited By (4)

Publication number	Priority date	Publication date	Assignee	Title
CN105726259A *	2016-03-30	2016-07-06	陈曙	Shock physiotherapy machine
CN107252388A *	2017-05-03	2017-10-17	郑州飞龙医疗设备有限公司	Muscle arthrosis viberation therapeutic instrument
CN108836792A *	2018-07-06	2018-11-20	施旭梅	A kind of muscle and deep is loosened instrument
CN108836792B *	2018-07-06	2020-06-19	潍坊医学院	Deep muscle release instrument

Family To Family Citations

* Cited by examiner, † Cited by third party, ‡ Family to family citation

Similar Documents

Publication	Publication Date	Title
US10166168B2	2019-01-01	At-home light-emitting diode and massage device for vaginal rejuvenation
Herman et al.	2002	Spinal cord stimulation facilitates functional walking in a chronic, incomplete spinal cord injured
US6102875A	2000-08-15	Apparatus for combined application of massage, accupressure and biomagnetic therapy
US7167752B2	2007-01-23	Electronic electrical and electro-magnetic health enhancement and stimulation device
US20090076421A1	2009-03-19	Frequency Stimulation Trainer
US7155287B2	2006-12-26	Device for percutaneous nerve stimulation
US9254395B1	2016-02-09	Multi-mode microcurrent stimulus system with safety circuitry and related methods
US5707346A	1998-01-13	System and method for performing soft tissue massage therapy
CN102395397A	2012-03-28	Improvements to apparatus, article and method for reducing pain during skin puncturing procedures
CN101184524A	2008-05-21	Micro-dermal tone skin stimulator
US20050187601A1	2005-08-25	Method for moderation of back pain
KR20120036177A	2012-04-17	Micro current device having function of electrical impulse
CN201625339U	2010-11-10	Rehabilitation therapy device
KR100996859B1	2010-11-26	A probe for electric stimulator having a variable vaginal electrode
JP2009517176A	2009-04-30	Power stimulator

MassagerPriorArt0001386

Petitioner Therabody Ex-1004, 1544

WO2007069854A1	2007-06-21	Microcurrent stimulus apparatus
US20130261516A1	2013-10-03	Hand Held Percussion Device
KR101699852B1	2017-02-13	Physical massage apparatus
CN204744895U	2015-11-11	Rotary type massage back portion fitness equipment
KR20110047634A	2011-05-09	Electrical srimulation appratus for working exercise
CN103431985A	2013-12-11	Intelligent massage device
WO2008113139A1	2008-09-25	A massage device
TW201231039A	2012-08-01	Handheld cell excitation terminal capable of dynamic optimization of therapeutic effect and remote therapeutic system
CN202526775U	2012-11-14	Portable magnetic actuation, vibration and heating integrated therapeutic instrument
CN106237506B	2018-10-26	Multi-function health-care regulating instrument

Priority And Related Applications

Priority Applications (1)

Application	Priority date	Filing date	Title
CN201520542670.6U	2015-07-24	2015-07-24	Deep muscle stimulation instrument

Applications Claiming Priority (1)

Application	Filing date	Title
CN201520542670.6U	2015-07-24	Deep muscle stimulation instrument

Legal Events

Date	Code	Title	Description
2015-12-02	GR01	Patent grant	
2015-12-02	C14	Grant of patent or utility model	

Concepts

machine-extracted

Download Filter table

Name	Image	Sections	Count	Query match
Muscles		title,claims,abstract,description	29	0.000
stimulation		title,claims,abstract,description	26	0.000
aluminium		claims,abstract,description	17	0.000
aluminum		claims,abstract,description	17	0.000
coupling		claims,abstract,description	16	0.000
coupling process		claims,abstract,description	16	0.000
coupling reaction		claims,abstract,description	16	0.000

Show all concepts from the description section

About Send Feedback Public Datasets Terms Privacy Policy

MassagerPriorArt0001387

Petitioner Therabody Ex-1004, 1545

(19)中华人民共和国国家知识产权局

(12)实用新型专利

(10)授权公告号 CN 204814773 U
(45)授权公告日 2015.12.02

(21)申请号 201520542670.6

(22)申请日 2015.07.24

(73)专利权人 广州龙之杰科技有限公司
地址 510530 广东省广州市高新技术产业开发区科学城开源大道11号B4栋五至六层

(72)发明人 吴仁培

(51)Int.Cl.
A61H 23/02(2006.01)

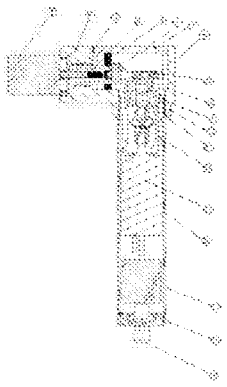
权利要求书1页 说明书3页 附图1页

(54)实用新型名称

一种深层肌肉刺激仪

(57)摘要

本实用新型提供了一种深层肌肉刺激仪，包括治疗头、主体、偏芯轴、从动轴、电机、手柄管、可充电池和电源插座孔，治疗头的一端嵌接在主体内，治疗头通过连接杆与轴承铝块连接，并且通过梢子固定，轴承铝块中端安装有轴承A，轴承A下端嵌接有偏芯轴，偏芯轴的下端连接有从动轴，从动轴中端安装有轴承B，从动轴的一端通过联轴器连接在电机上，电机安装在手柄管的中端，可充电池安装在所述电机的正下方，可充电池下端设有开关，开关安装在手柄管最下端的末端盖上，末端盖的下侧还安装有电源插座孔。本深层肌肉刺激仪利用机械振动代替人工手法，方便医师操作的同时，提高治疗效率，其结构小巧、操作简单、携带方便，可供患者自行治疗使用。



CN 204814773 U

MassagerPriorArt0001388

Petitioner Therabody Ex-1004, 1546

1. 一种深层肌肉刺激仪，包括治疗头（1）、主体（2）、偏芯轴（10）、从动轴（13）、电机（15）、手柄管（16）、可充电池（17）和电源插座孔（20），其特征在于：所述治疗头（1）的一端嵌接在主体（2）内，所述治疗头（1）通过连接杆（4）与轴承铝块（8）连接，并且通过梢子（6）固定，所述轴承铝块（8）中端安装有轴承 A（9），所述轴承 A（9）下端嵌接有偏芯轴（10），所述偏芯轴（10）的下端连接有从动轴（13），所述从动轴（13）中端安装有轴承 B（11），所述从动轴（13）的一端通过联轴器（14）连接在电机（15）上，所述电机（15）安装在手柄管（16）的中端，可充电池（17）安装在所述电机（15）的正下方，所述可充电池（17）下端设有开关（19），所述开关（19）安装在手柄管（16）最下端的末端盖（18）上，所述末端盖（18）的下侧还安装有电源插座孔（20）。

2. 如权利要求 1 所述的深层肌肉刺激仪，其特征在于：所述治疗头（1）与连接杆（4）通过螺纹或者卡槽连接。

3. 如权利要求 1 所述的深层肌肉刺激仪，其特征在于：所述治疗头（1）通过螺纹或者卡槽嵌接在主体（2）内。

4. 如权利要求 1 所述的深层肌肉刺激仪，其特征在于：所述轴承铝块（8）与轴承 A（9）通过过盈配合连接，所述轴承铝块（8）和主体（2）通过螺纹固定。

5. 如权利要求 1 所述的深层肌肉刺激仪，其特征在于：所述连接杆（4）外表面套接有导套（3）。

6. 如权利要求 1 所述的深层肌肉刺激仪，其特征在于：所述主体（2）顶端安装有上盖（7），所述上盖（7）的通过内六角螺栓（5）固定在主体（2）上。

7. 如权利要求 1 所述的深层肌肉刺激仪，其特征在于：所述从动轴（13）与电机（15）连接的联轴器（14）为弹性联轴器，所述联轴器（14）与从动轴（13）和电机（15）的连接均是通过紧钉螺丝固定。

8. 如权利要求 1 所述的深层肌肉刺激仪，其特征在于：所述主体（2）与手柄管（16）通过螺纹连接，所述螺纹表面设有螺纹盖（12）。

MassagerPriorArt0001389

Petitioner Therabody Ex-1004, 1547

一种深层肌肉刺激仪

技术领域

[0001] 本实用新型涉及医疗器械技术领域，具体涉及一种深层肌肉刺激仪。

背景技术

[0002] 在竞技体育和全民健身高速发展的今天，健康和体质已经是生活的重中之重。从专业运动员到普通人群，都会出现各种各样的软组织疼痛问题，其中绝大部分相关问题都是由于肌肉疾病导致的，比如：扳机点、肌肉粘连、拉伤、乳酸堆积、瘢痕组织等等。

[0003] 上述疾病的传统治疗方法是推拿、按摩，但是一般医师在进行推拿、按摩时，操作时间较长，会给医师带来疲惫，而且力度、频率也不一样，治疗效果不明显，工作效率低。

[0004] 电动深层肌肉刺激仪彻底打破推拿、按摩等传统治疗方法，深层肌肉刺激仪通过机械振动作用于深层肌肉组织，使其本体感觉恢复正常化，从而消除软组织疼痛。

[0005] 深层肌肉刺激仪具有显著的促进血液循环与淋巴回流的作用。产生的有节奏的按压与振动可以明显增加血液循环速度，另外，对神经感受器的刺激也可促进血管舒张，加速血循环。

[0006] 深层肌肉刺激仪还可以松弛挛缩的肌肉和长度变短的肌肉，刺激较弱以及萎缩的肌肉，有效促进肌肉力量平衡，纠正生物力学紊乱，帮助患者恢复正确体姿，促进许多更为有效的运动。因此广泛用于手法治疗以及众多肌肉骨骼疾病。另外深层肌肉刺激仪还可用于扭伤、拉伤等软组织损伤康复。

实用新型内容

[0007] 本实用新型的目的是提供一种深层肌肉刺激仪，本深层肌肉刺激仪利用机械振动代替人工手法，方便医师操作的同时，提高治疗效率；本深层肌肉刺激仪结构小巧、操作简单、携带方便，可供患者自行治疗使用。

[0008] 为实现上述方案，本实用新型提供了一种深层肌肉刺激仪，包括治疗头、主体、偏芯轴、从动轴、电机、手柄管、可充电池和电源插座孔，所述治疗头的一端嵌接在主体内，所述治疗头通过连接杆与轴承铝块连接，并且通过梢子固定，所述轴承铝块中端安装有轴承A，所述轴承A下端嵌接有偏芯轴，所述偏芯轴的下端连接有从动轴，所述从动轴中端安装有轴承B，所述从动轴的一端通过联轴器连接在电机上，所述电机安装在手柄管的中端，可充电池安装在所述电机的正下方，所述可充电池下端设有开关，所述开关安装在手柄管最下端的末端盖上，所述末端盖的下侧还安装有电源插座孔。

[0009] 在上述技术方案中，所述可充电池配备电压为12V的直流电压电源适配器，使用可充电电池方便本实用新型的使用不受时间及地点的限制，更加便捷患者随时随地的治疗。

[0010] 在上述技术方案中，所述治疗头与连接杆通过螺纹或者卡槽连接，采用螺纹或者卡槽连接使得治疗头的更换更加便捷，本实用新型配备了多种不同杨式的治疗头，方便不同类型的患者自行选择。

MassagerPriorArt0001390

Petitioner Therabody Ex-1004, 1548

[0011] 在上述技术方案中，所述治疗头通过螺纹或者卡槽嵌接在主体内。

[0012] 在上述技术方案中，所述轴承铝块与轴承 A 通过过盈配合连接，所述轴承铝块和主体通过螺纹固定。

[0013] 在上述技术方案中，所述连接杆外表面套接有导套，导套的作用是保证高速运转过程中，连接杆不会跑偏，使得连接杆的运行更加稳定。

[0014] 在上述技术方案中，所述主体顶端安装有上盖，所述上盖通过内六角螺栓固定在主体上，所述上盖可以打开，方便安装在主体内的其他部件的检修。

[0015] 在上述技术方案中，所述从动轴与电机连接的联轴器为弹性联轴器，所述联轴器与从动轴和电机的连接均是通过紧钉螺丝固定，使用弹性联轴器可以保证从动轴的转速和电机转速一致，从而保证治疗头的震动频率和电机输出的频率一致。

[0016] 在上述技术方案中，所述主体与手柄管通过螺纹连接，所述螺纹表面设有螺纹盖，主体与手柄管通过螺纹连接更加方便安装在主体内的元部件的检修以及充电电池的更换。

[0017] 本实用新型相较于现有技术的有益效果在于：1）利用机械振动代替人工手法，方便医师操作，提高治疗效率； 2）结构小巧、操作简单、携带方便，可供患者自行治疗使用；3)治疗头更换方便，可满足不同患者的需求选择更换治疗头；4)配备可充电电池，使用更加便捷。

附图说明

[0018] 图 1 是本实用新型的主视图。

[0019] 图 2 是本实用新型的前视图。

[0020] 图 3 是本实用新型的俯视图。

[0021] 图中：1- 治疗头，2- 主体，3- 导套，4- 连接杆，5- 内六角螺栓，6- 梢子，7- 上盖，8- 轴承铝块，9- 轴承 A，10- 偏芯轴，11- 轴承 B，12- 螺纹盖，13- 从动轴，14- 联轴器，15- 电机，16- 手柄管，17- 可充电池，18- 末端盖，19- 开关，20- 电源插座孔。

具体实施方式

[0022] 下面将结合本实用新型实施例中的附图，对本实用新型实施例中的技术方案进行清楚、完整的描述，显然，所描述的实施例仅仅是本实用新型一部分实施例，而不是全部的实施例。本领域普通人员在没有做出创造性劳动前提下所获得的所有其他实施例，均属于本实用新型的保护范围。

[0023] 实施例：一种深层肌肉刺激仪。

[0024] 参照图 1 至图 3 所示，一种深层肌肉刺激仪，包括治疗头 1、主体 2、偏芯轴 10、从动轴 13、电机 15、手柄管 16、可充电池 17 和电源插座孔 20，所述治疗头 1 的一端嵌接在主体 2 内，所述治疗头 1 通过连接杆 4 与轴承铝块 8 连接，并且通过梢子 6 固定，所述轴承铝块 8 中端安装有轴承 A9，所述轴承 A9 下端嵌接有偏芯轴 10，所述偏芯轴 10 的下端连接有从动轴 13，所述从动轴 13 中端安装有轴承 B11，所述从动轴 13 的一端通过联轴器 14 连接在电机 15 上，所述电机 15 安装在手柄管 16 的中端，可充电池 17 安装在所述电机 15 的正下方，所述可充电池 17 下端设有开关 19，所述开关 19 安装在手柄管 16 最下端的末端盖 18 上，所述末端盖 18 的下侧还安装有电源插座孔 20。

MassagerPriorArt0001391

Petitioner Therabody Ex-1004, 1549

[0025] 在上述技术方案中，所述可充电池 17 配备电压为 12V 的直流电压电源适配器，使用可充电电池 17 方便本实用新型的使用不受时间及地点的限制，更加便捷患者随时随地的治疗。

[0026] 在上述技术方案中，所述治疗头 1 与连接杆 4 通过螺纹或者卡槽连接，采用螺纹或者卡槽连接使得治疗 1 的更换更加便捷，本实用新型配备了多种不同样式的治疗头 1，方便不同类型的患者自行选择。

[0027] 在上述技术方案中，所述治疗头 1 通过螺纹或者卡槽嵌接在主体 2 内。

[0028] 在上述技术方案中，所述轴承铝块 8 与轴承 A9 通过过盈配合连接，所述轴承铝块 8 和主体 2 通过螺纹固定。

[0029] 在上述技术方案中，所述连接杆 4 外表面套接有导套 3，导套 3 的作用是保证高速运转过程中，连接杆 4 不会跑偏，使得连接杆 4 的运行更加稳定。

[0030] 在上述技术方案中，所述主体 2 顶端安装有上盖 7，所述上盖 7 通过内六角螺栓 6 固定在主体上，所述上盖 7 可以打开，方便安装在主体 2 内的其它部件的检修。

[0031] 在上述技术方案中，所述从动轴 13 与电机 15 连接的联轴器 14 为弹性联轴器，所述联轴器 14 与从动轴 13 和电机 15 的连接均是通过紧钉螺丝固定，使用弹性联轴器可以保证从动轴 13 的转速和电机 15 的输出 1 转速一致，从而保证治疗头的震动或者伸缩频率和电机 15 输出的频率一致。

[0032] 在上述技术方案中，所述主体 2 与手柄管 16 通过螺纹连接，所述螺纹表面设有螺纹盖 12，主体 2 与手柄管 16 通过螺纹连接更加方便安装在主体 2 内的元部件的检修以及充电电池 17 的更换。

[0033] 为了更进一步说明本实用新型，特将本实用新型的工作原理解释如下：按下开关 19，可充电电池 17 与电机 15 连接，电机 15 驱动从动轴 13，进而带动偏芯轴 10，偏芯轴 10 的转动会驱动轴承铝块 8 前后运动，进而驱动通过连接杆 4 与轴承铝块 8 连接的治疗头 1 前后运动，产生震动效果。

[0034] 以上所述仅为本实用新型的较佳实施例而已，并不用以限制本实用新型，凡在本实用新型的精神和原则之内，所作出的任何修改、等同替换、改进等，均应包含在本实用新型的保护范围之内。

MassagerPriorArt0001392

Petitioner Therabody Ex-1004, 1550

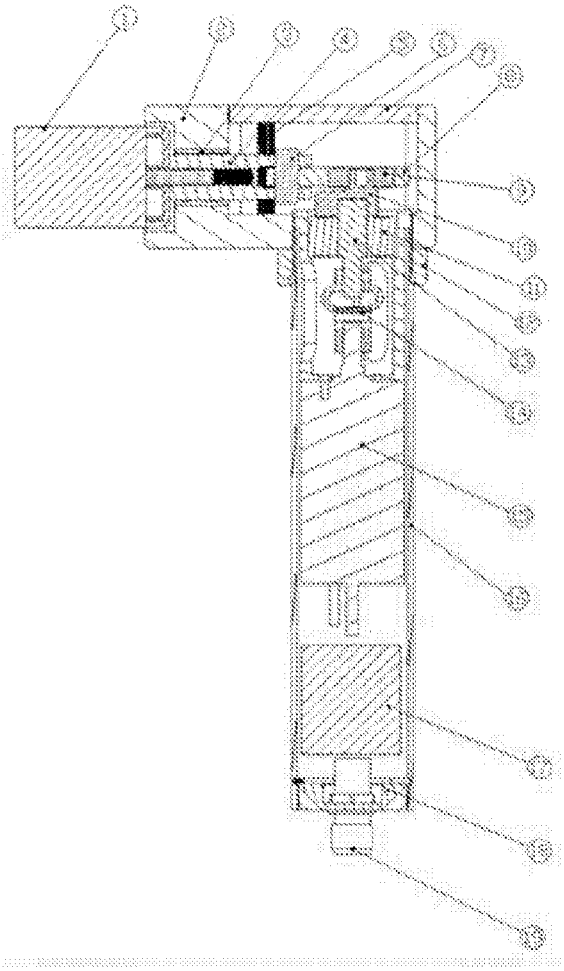


图 1

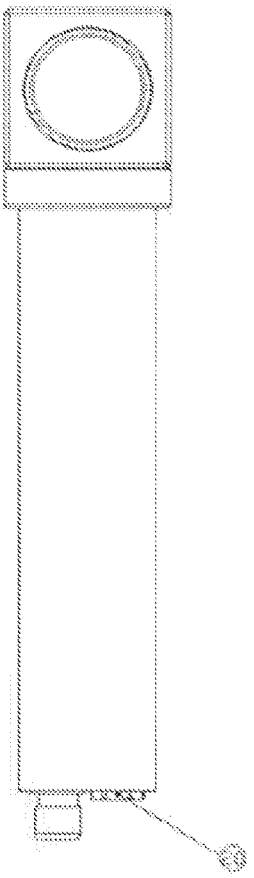


图 2

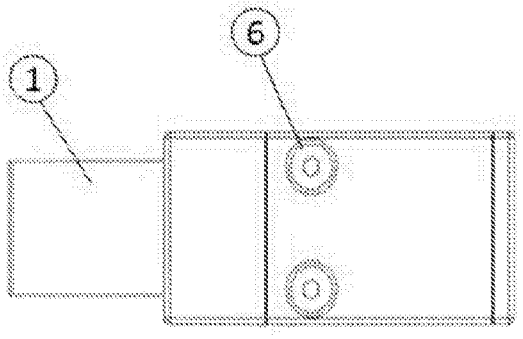


图 3

MassagerPriorArt0001393

Petitioner Therabody Ex-1004, 1551

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 620 233 B1

(12) EUROPÄISCHE PATENTSCHRIFT

(45) Veröffentlichungstag und Bekanntmachung des Hinweises auf die Patenterteilung:
21.02.2007 Patentblatt 2007/08

(21) Anmeldenummer: **03785561.6**

(22) Anmeldetag: **11.12.2003**

(51) Int Cl.:
B25F 5/00 *(2006.01)* ***H01M 2/10*** *(2006.01)*

(86) Internationale Anmeldenummer:
PCT/DE2003/004103

(87) Internationale Veröffentlichungsnummer:
WO 2004/096500 (11.11.2004 Gazette 2004/46)

(54) ELEKTRISCHE HANDWERKZEUGMASCHINE MIT AKKUPACK

ELECTRICAL HAND TOOL MACHINE WITH AN ACCUMULATOR PACK

MACHINE-OUTIL MANUELLE ELECTRIQUE COMPORTANT UN BLOC D'ACCUMULATEUR

(84) Benannte Vertragsstaaten:
DE FR GB

(30) Priorität: **26.04.2003 DE 10318947**

(43) Veröffentlichungstag der Anmeldung:
01.02.2006 Patentblatt 2006/05

(73) Patentinhaber: **ROBERT BOSCH GMBH**
70442 Stuttgart (DE)

(72) Erfinder:
- **HOFMANN, Albrecht**
  71144 Steinenbronn (DE)
- **KRONDORFER, Harald**
  Chicago, IL 606046 (US)
- **HECKMANN, Markus**
  70771 Leinfelden-Echterdingen (DE)
- **SCHADOW, Joachim**
  72135 Dettenhausen (DE)
- **SCHOMISCH, Thomas**
  70771 Leinfelden-Echterdingen (DE)

(74) Vertreter: **Gleiss & Grosse**
Patentanwälte Rechtsanwälte
Leitzstrasse 45
70469 Stuttgart (DE)

(56) Entgegenhaltungen:
EP-A- 0 804 985
EP-A- 1 260 321
JP-A- 10 296 660

Anmerkung: Innerhalb von neun Monaten nach der Bekanntmachung des Hinweises auf die Erteilung des europäischen Patents kann jedermann beim Europäischen Patentamt gegen das erteilte europäische Patent Einspruch einlegen. Der Einspruch ist schriftlich einzureichen und zu begründen. Er gilt erst als eingelegt, wenn die Einspruchsgebühr entrichtet worden ist. (Art. 99(1) Europäisches Patentübereinkommen).

Printed by Jouve, 75001 PARIS (FR)

EP 1 620 233 B1

MassagerPriorArt0000095

Petitioner Therabody Ex-1004, 1552

Beschreibung

[0001] Die Erfindung betrifft eine elektrische Handwerkzeugmaschine gemäß dem Oberbegriff des Anspruchs 1. Eine solche Vorrichtung ist in JP 10 29 6660 offenbart.

Stand der Technik

[0002] Elektrische Handwerkzeugmaschinen, wie zum Beispiel Schlagschrauber, Bohrmaschinen, Winkelschleifer, Stichsägen, Kreissägen oder Hobelmaschinen für den Handwerker- oder Heimwerkerbedarf weisen als Antriebsmotor gewöhnlich entweder einen Wechselstrommotor oder einen Gleichstrommotor auf. Während der erstere in der Regel über ein Netzkabel mit Wechselstrom aus dem Netz gespeist wird, stammt die elektrische Energie zur Versorgung des Gleichstrommotors in der Regel aus einem sogenannten Akkupack, einem wiederaufladbaren Akkumulator in einem mit dem Gehäuse der Handwerkzeugmaschine kuppelbaren Gehäuse, der beim Kuppeln der beiden Gehäuse elektrisch an die Stromzufuhrleitungen des Gleichstrommotors angeschlossen wird. Zum Kuppeln der beiden Gehäuse der Handwerkzeugmaschine und des Akkupacks ist gewöhnlich das letztere mit einer überstehenden Verrastungsvorrichtung versehen, die in eine komplementäre Einsteckbuchse der ersteren eingeschoben und in dieser verrastet wird.

[0003] Um ein sicheres Verrasten der Handwerkzeugmaschine und des Akkupacks zu gewährleisten, muss jedoch üblicherweise zwischen der überstehenden Verrastungsvorrichtung der einen Komponente und der komplementären Einsteckbuchse der anderen Komponente ein gewisses Spiel vorhanden sein. Dieses Spiel hat zur Folge, dass es beim Betrieb der Handwerkzeugmaschine aufgrund von betriebsbedingten Vibrationen und der Trägheit des Akkupacks zum Auftreten von Relativbewegung zwischen dem Akkupack und dem Gehäuse der Handwerkzeugmaschine kommt. Im Zusammenspiel mit Umgebungseinflüssen, zum Beispiel Staub, können diese Relativbewegungen zu einem Verschleiß von Rastelementen der Verrastungsvorrichtung und damit zu einer Vergrößerung des Spiels bis hin zu einem Ausfall der Verrastung führen.

[0004] Aus der JP 10 296660 ist bereits eine Handwerkzeugmaschine der eingangs genannten Art bekannt, bei der am unteren Rand eines im Griffteil der Handwerkzeugmaschine vorgesehenen Akkupack-Aufnahmeschachts zwei elastische Körper angeordnet sind, die an ihrer Unterseite überstehende, durch Aussparungen getrennte Erhebungen aufweisen. Diese können beim Auftreten von Schwingungen in Längsrichtung des Griffteils in die Aussparungen ausweichen, wenn sie unter Verformung zusammengedrückt werden. Jedoch ermöglichen derartige elastische Körper in der Hauptschwingungsrichtung der Handwerkzeugmaschine keine besonders gute Schwingungsdämpfung und verschleißen darüber hinaus relativ schnell.

Vorteile der Erfindung

[0005] Die erfindungsgemäße Handwerkzeugmaschine mit den Merkmalen des Anspruchs 1 weist demgegenüber den Vorteil auf, dass das zwischen dem Akkupack und dem Gehäuse der Handwerkzeugmaschine vorhandene mindestens eine Feder-/Dämpfungselement durch seine Dämpfungseigenschaft vibrationsbedingte Relativbewegungen zwischen dem Akkupack und dem Gehäuse in der Hauptschwingungsrichtung der Handwerkzeugmaschine dämpft und durch seine Federeigenschaft zugleich das verrastungsbedingt zwischen diesen Komponenten vorhandene Spiel beseitigt. Die durch die Dämpfung bewirkte Absorption eines großen Teils der von der Handwerkzeugmaschine auf den Akkupack übertragenen Vibrationsenergie sowie die durch die Reduzierung des Spiels bewirkte Verkürzung von Schwingungsamplituden der vibrationsbedingten Relativbewegungen haben zur Folge, dass ein vibrationsbedingter Verschleiß der Rastelemente weitgehend vermieden bzw. stark vermindert werden kann. Darüber hinaus wird bei verrastetem Akkupack durch das fehlende Spiel zwischen diesem und dem Gehäuse der Handwerkzeugmaschine eine sehr hochwertige Gesamtanmutung der Handwerkzeugmaschine erreicht.

[0006] Da das am Gehäuse oder am Akkupack angebrachte Feder-/Dämpfungselement mit einer im Wesentlichen senkrecht zu einer Hauptschwingungsrichtung der Handwerkzeugmaschine ausgerichteten Oberfläche der jeweils anderen Komponente in Berührungseingriff tritt und bevorzugt in einer Richtung verformbar ist, die dieser Hauptschwingungsrichtung entspricht, können unerwünschte Relativbewegungen zwischen dem Akkupack und dem Gehäuse der Handwerkzeugmaschine in dieser Richtung wirkungsvoll verhindert werden. Die Hauptschwingungsrichtung entspricht zum Beispiel bei einem Schwingschleifer dessen Schwingungsrichtung, während sie bei einem Schlagbohrschrauber in Richtung der Bohrachse ausgerichtet ist, was bedeutet, dass die Anordnung der Feder-/Dämpfungselemente bei verschiedenen Werkzeugmaschinen unterschiedlich sein kann.

[0007] Das Feder-/Dämpfungselement oder die Feder-/Dämpfungselemente können wahlweise an einer der beiden Komponenten, das heißt am Gehäuse der Handwerkzeugmaschine oder am Akkupack, vorgesehen sein und beim Verrasten der beiden Komponenten mit der jeweils anderen Komponente in Berührungseingriff treten. Vorzugsweise werden das Feder-/Dämpfungselement oder die Feder-/Dämpfungselemente jedoch an der mit der Einsteckbuchse versehenen Komponente, das heißt in der Regel dem Gehäuse der Handwerkzeugmaschine, vorgesehen, weil sie im Inneren dieser Einsteckbuchse besser vor Beschädigungen geschützt sind als an der überstehenden Verrastungsvorrichtung der anderen Komponente. Außerdem macht eine Anbringung der Feder-/Dämpfungselemente an der

MassagerPriorArt0000096

Petitioner Therabody Ex-1004, 1553

Werkzeugmaschine ohne Beeinträchtigung der Dämpfungseigenschaften eine Verwendung baugleicher Akkupacks für unterschiedliche Werkzeugmaschinen möglich.

[0008] Das Feder-/Dämpfungselement oder die Feder-/Dämpfungselemente bestehen vorzugsweise aus einem gummielastisch verformbaren Material, das sowohl dämpfende als auch federnde Eigenschaften aufweist. Beispiele für ein solches Material sind unter anderem Natur- oder Synthesekautschuk, Silikonkautschuk, reversibel verformbarer weichen Schaumstoff oder ein anderes Elastomer. Eine besonders kostengünstige Herstellung der Handwerkzeugmaschine wird erreicht, wenn das Feder-/Dämpfungselement oder die Feder-/Dämpfungselemente aus einem thermoplastischen Elastomer hergestellt und bei der Fertigung des Gehäuses der Handwerkzeugmaschine an der bzw. den vorgesehenen Stellen einstückig mit den entsprechenden Teilen des Gehäuses geformt bzw. an diese angeformt werden. Diese Lösung ist insbesondere dann von Vorteil, wenn das Gehäuse weitere Teile aus thermoplastischem Elastomer aufweist, zum Beispiel einen sogenannten Softgrip an seinem Griffteil, die dann zusammen mit den Feder-/Dämpfungselementen in einem Arbeitsgang in 2K-Technik direkt am Gehäuse angespritzt werden können.

[0009] Alternativ dazu können jedoch auch ein oder mehrere Federelemente zur Beseitigung des Spiels mit einem oder mehreren Dämpfungselementen zur Minderung von Relativbewegungen kombiniert werden, wobei es in diesem Fall grundsätzlich auch möglich ist, die Federelemente an anderen Stellen als die Dämpfungselemente vorzusehen. Beispielsweise können ein oder mehrere, aus einem federelastischen Material, zum Beispiel Federstahl, hergestellte und in Form einer Blatt- oder Spiralfeder zwischen dem Gehäuse der Handwerkzeugmaschine und dem Akkupack angebrachte Federelemente in Kombination mit einem oder mehreren plastisch verformbaren. Dämpfungselementen, wie beispielsweise Gelkissen oder dergleichen, verwendet oder die Elastizität der Federelemente durch geeignete Dämpfungselemente gedämpft werden.

[0010] Vorzugsweise sind mehrere Feder-/Dämpfungselemente im Abstand voneinander angeordnet, um an allen Seiten des Akkupacks bzw. der Handwerkzeugmaschine für einen gleichmäßigen Spielausgleich zu sorgen. Ein besonders guter Spielausgleich in den beiden hauptsächlichen Bewegungsrichtungen des Akkupacks in Bezug zur Handwerksmaschine wird erreicht, wenn zumindest ein Teil der Feder-/Dämpfungselemente in Richtungen federnd verformbar ist, die zu den Seitenwänden des Akkupacks parallel bzw. zu einer Richtung eines Ausweichens von Rastelementen beim Verrasten von Akkupack und Gehäuse senkrecht ausgerichtet sind.

Zeichnungen

[0011] Die Erfindung wird nachfolgend in einem Ausführungsbeispiel anhand der zugehörigen Zeichnungen näher erläutert. Es zeigen:

Figur 1 eine perspektivische Ansicht eines elektrischen Schlagbohrschraubers mit Akkupack;

Figur 2 eine perspektivische Ansicht des vom Schlagbohrschrauber abgenommenen Akkupacks;

Figur 3 eine teilweise geschnittene Unterseitenansicht eines Griffteils des Schlagbohrschraubers bei abgenommenem Akkupack.

Beschreibung des Ausführungsbeispiels

[0012] Der in der Zeichnung dargestellte elektrische Schlagbohrschrauber 2 mit Akkupack 4 besteht im Wesentlichen aus einem Gehäuse 6 mit einem Griffteil 8, einem im Gehäuse 6 untergebrachten Elektromotor mit Untersetzungsgetriebe (nicht dargestellt), einem über das Gehäuse 6 überstehenden und vom Untersetzungsgetriebe angetriebenen Schnellspannbohrfutter 10 zum Einspannen eines Bohrers oder eines Schraubeinsatzes (nicht dargestellt), einem zwischen dem Schnellspannbohrfutter 10 und dem Gehäuse 6 angeordneten Drehmomenteinstellring 12 sowie dem lösbar mit dem unteren Ende des Griffteils verrasteten Akkupack 4 zur netzunabhängigen Versorgung des Elektromotors mit Gleichstrom.

[0013] Das Gehäuse 6 des Schlagbohrschraubers 2 ist am oberen Ende des Griffteils 8 mit einem Ein-/Aus-Schalter 14 sowie einem Drehrichtungsumkehrschalter 16 mit Einschaltsperre versehen und weist auf seiner Oberseite einen Schalter 18 für den 1. und 2. Gang sowie eine Magnetplatte 20 auf. An einer Seite des Gehäuses 6 ist ein Zusatzhandgriff 22 lösbar befestigt. Der Griffteil 8 ist an seiner vom Ein-/Aus-Schalter 14 abgewandten Seite mit einem sogenannten Softgrip 24 versehen, das heißt einem bei der Fertigung des Gehäuses 6 in 2K-Technik am Griffteil 8 angespritzten Polster oder Kissen aus einem thermoplastischen Elastomermaterial.

[0014] Wie am besten in Figur 2 dargestellt, ist der vom Schlagbohrschrauber 2 getrennte Akkupack 4 auf seiner Oberseite mit einer im Wesentlichen U-förmigen Verrastungsvorrichtung 26 und einem nach oben über die Verrastungsvorrichtung 26 überstehenden Kontaktsockel 28 versehen. Die Verrastungsvorrichtung 26 umfasst vier Rastelemente 30, die mit entsprechenden Rastnasen 32 in einer zum Einführen der Verrastungsvorrichtung 26 und des Kontaktsockels 28 dienenden Einsteckbuchse 34 an der Unterseite des Griffteils 8 des Gehäuses 6 (vgl. Figur 3) in Eingriff treten, wenn der Akkupack 4 am Griffteil 8 des Gehäuses 6 befestigt wird. Zum Lösen des Akkupacks 4 vom Griffteil 8 können die Rastelemente 30 mit Hilfe zweier an entgegengesetzten Breitseitenflächen des Akkupacks 4 vorgesehener Drucktaster 36 aus dem Eingriff mit den Rastnasen 32 ausgerückt werden.

[0015] Wie am besten in Figur 3 dargestellt, ist das

MassagerPriorArt0000097

Petitioner Therabody Ex-1004, 1554

Gehäuse 6 des Schlagbohrschraubers 2 im Inneren der zum Einführen der Verrastungsvorrichtung 26 und des Kontaktsockels 28 des Akkupacks 4 dienenden Einsteckbuchse 34 mit insgesamt vier Feder-/Dämpfungselementen 38 versehen. Die Aufgabe dieser Dämpfungselemente 38 ist es, das nach dem Verrasten des Akkupacks 4 in der Einsteckbuchse 34 zwisehen dem Akkupack 4 und dem Gehäuse 6 vorhandene Spiel zu minimieren und für eine Dämpfung der vom Gehäuse 6 auf den Akkupack 4 übertragenen Vibrationen zu sorgen.

[0016] Die Feder-/Dämpfungselemente 38 bestehen aus demselben thermoplastischen Elastomer wie der Softgrip 24 auf der Außenseite des Griffteils 8 und werden bei der Fertigung des Gehäuses 6 zeitgleich mit diesem am Griffteil 8 angespritzt und dadurch einstückig mit dem Gehäuse 6 verbunden. Um einen sicheren Sitz der Feder-/Dämpfungselemente 38 zu gewährleisten, kann eine mit den Feder-/Dämpfungselementen 38 versehene Innenwand 40 des Gehäuses 6 im Montagebereich jedes Feder-/Dämpfungselements 38 mit einer Durchtrittsöffnung (nicht dargestellt) versehen werden, deren Abmessungen kleiner als die Abmessungen des Feder-/Dämpfungselements 38 beiderseits der Durchtrittsöffnung sind, so dass das Feder-/Dämpfungselement 38 formschlüssig in der Öffnung festgehalten wird.

[0017] Bei dem in der Zeichnung dargestellten Schlagbohrschrauber 2 sind die Feder-/Dämpfungselemente 38 so angebracht, dass sie sich nach einem Verrasten des Akkupacks 4 mit dem Gehäuse 6 des Schlagbohrschraubers 2 gegen vier paarweise entgegengesetzte Oberflächen 42 der Verrastungsvorrichtung 26 abstützen, die den paarweise angeordneten Feder-/Dämpfungselementen 38 gegenüberliegen. Die Oberflächen 42 der Verrastungsvorrichtung 26 und die freien, dagegen anliegenden Stirnenden 44 der Feder-/Dämpfungselemente 38 sind so ausgerichtet, dass sie senkrecht zu einer Bohrachse 46 des Schlagbohrschraubers 2 und damit senkrecht zu einer beim Schlagbohren auftretenden Hauptschwingungsrichtung P des Gehäuses 6 ausgerichtet sind. Dadurch wird die in dieser Richtung auf die Feder-/Dämpfungselemente 38 aufgebrachte Vibrationsenergie besonders gut abgebaut und zwischen dem Akkupack 4 und dem Gehäuse 6 Relativbewegungen mit großer Schwingungsamplitude verhindert.

[0018] Wie man aus Figur 2 sehen kann, sind die Anlageflächen 44 der Feder-/Dämpfungselemente 38 auch im Wesentlichen senkrecht zu der Richtung R angeordnet, in der die vier Rastelemente 30 der Verrastungsvorrichtung 26 beim Einführen in die Einsteckbuchse 34 ausweichen.

[0019] Im Vergleich zu den angrenzenden Teilen des Gehäuses 6 stehen die Feder-/Dämpfungselemente 38 geringfügig ins Innere der Einsteckbuchse 34 über, so dass sie das Einführen der Verrastungsvorrichtung 26 in die Einsteckbuchse 34 nicht behindern, jedoch nach dem Verrasten im Wesentlichen ohne Spiel gegen die Oberflächen 42 der Verrastungsvorrichtung 26 anliegen.

[0020] Um das Einführen der Verrastungsvorrichtung 26 in die Einsteckbuchse 34 zu erleichtern, sind die Oberflächen 42 mit zunehmendem Abstand von der Oberseite des Akkupacks 4 von dessen äußeren Stirnseitenflächen 48 weg gerundet, was auch das Einführen der Oberflächen 42 zwischen die sich paarweise im Abstand gegenüberliegenden Feder-/Dämpfungselemente 38 erleichtert.

Patentansprüche

1. Handwerkzeugmaschine mit einem Gehäuse, einem im Gehäuse untergebrachten Elektromotor und einem lösbar mit dem Gehäuse verrasteten Akkupack zur Speisung des Elektromotors mit elektrischem Strom, sowie mindestens zwei zwischen dem Akkupack (4) und dem Gehäuse (6) der Handwerkzeugmaschine (2) angebrachten Feder-/Dämpfungselementen (38) zur Dämpfung von Vibrationen und zur Beseitigung eines verrastungsbedingten Spiels zwischen dem Akkupack (4) und dem Gehäuse (6), **dadurch gekennzeichnet, dass** die Feder-/Dämpfungselemente (38) mit paarweise entgegengesetzten, im Wesentlichen senkrecht zu einer Hauptschwingungsrichtung (P) der Handwerkzeugmaschine ausgerichteten Oberflächen (42) einer zur Verrastung des Akkupacks (4) mit dem Gehäuse (6) dienenden Verrastungsvorrichtung (26) in Berührungseingriff treten.

2. Handwerkzeugmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** mindestens ein Feder-/Dämpfungselement (38) am Gehäuse (6) befestigt ist und beim Verrasten von Akkupack (4) und Gehäuse (6) mit dem Akkupack (4) in Berührungseingriff tritt.

3. Handwerkzeugmaschine nach Anspruch 1, **dadurch gekennzeichnet, dass** mindestens ein Feder-/Dämpfungselement am Akkupack befestigt ist und beim Verrasten von Akkupack und Gehäuse mit dem Gehäuse in Berührungseingriff tritt.

4. Handwerkzeugmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Oberfläche (42) in Bewegungsrichtung beim Verrasten geneigt oder gerundet ist.

5. Handwerkzeugmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Feder-/Dämpfungselemente (38) in einer Richtung verformbar sind, die einer Hauptschwingungsrichtung (P) der Handwerkzeugmaschine entspricht.

6. Handwerkzeugmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Feder-/Dämpfungselemente (38) in einer

MassagerPriorArt0000098

Petitioner Therabody Ex-1004, 1555

Richtung verformbar sind, die zu einer Richtung (R) eines Ausweichens von Rastelementen (32) beim Verrasten von Akkupack (4) und Gehäuse (6) senkrecht ist.

7. Handwerkzeugmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Feder-/Dämpfungselemente (38) aus einem gummielastischen Material bestehen.

8. Handwerkzeugmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Feder-/Dämpfungselemente (38) aus einem durch Spritzgießen einstückig mit dem Gehäuse (6) verbindbaren Material bestehen.

9. Handwerkzeugmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Feder-/Dämpfungselemente (38) aus einem thermoplastischen Elastomer bestehen.

10. Handwerkzeugmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Feder-/Dämpfungselemente (38) am Gehäuse (6) oder am Akkupack (4) angeformt sind.

11. Handwerkzeugmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** mehrere Feder-/Dämpfungselemente (38) im Abstand voneinander angeordnet sind.

12. Handwerkzeugmaschine nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, dass** die Feder-/Dämpfungselemente aus einem Federelement und einem Dämpfungselement bestehen.

Claims

1. Hand-held power tool comprising a housing, an electric motor which is accommodated in the housing, and a battery pack which is locked to the housing in a detachable manner and serves to feed electrical power to the electric motor, and also at least two spring/damping elements (38) which are fitted between the battery pack (4) and the housing (6) of the hand-held power tool (2) and serve to damp vibrations and to eliminate locking-induced play between the battery pack (4) and the housing (6), **characterized in that** the spring/damping elements (38) come into touching engagement with surfaces (42) of a locking apparatus (26) which serves to lock the battery pack (4) to the housing (6), which surfaces (42) oppose one another in pairs and are oriented substantially perpendicular to a main vibration direction (P) of the hand-held power tool.

2. Hand-held power tool according to Claim 1, **characterized in that** at least one spring/damping element (38) is fixed to the housing (6) and comes into touching engagement with the battery pack (4) when the battery pack (4) and the housing (6) are locked to one another.

3. Hand-held power tool according to Claim 1, **characterized in that** at least one spring/damping element is fixed to the battery pack and comes into touching engagement with the housing when the battery pack and the housing are locked to one another.

4. Hand-held power tool according to one of the preceding claims, **characterized in that** the surface (42) is inclined or rounded in the movement direction during locking.

5. Hand-held power tool according to one of the preceding claims, **characterized in that** the spring/damping elements (38) can be deformed in a direction which corresponds to a main vibration direction (P) of the hand-held power tool.

6. Hand-held power tool according to one of the preceding claims, **characterized in that** the spring/damping elements (38) can be deformed in a direction which is perpendicular to a direction (R) of deflection of locking elements (32) when the battery pack (4) and the housing (6) are locked to one another.

7. Hand-held power tool according to one of the preceding claims, **characterized in that** the spring/damping elements (38) are composed of an elastomeric material.

8. Hand-held power tool according to one of the preceding claims, **characterized in that** the spring/damping elements (38) are composed of a material which can be integrally connected to the housing (6) by injection moulding.

9. Hand-held power tool according to one of the preceding claims, **characterized in that** the spring/damping elements (38) are composed of a thermoplastic elastomer.

10. Hand-held power tool according to one of the preceding claims, **characterized in that** the spring/damping elements (38) are integrally formed on the housing (6) or on the battery pack (4).

11. Hand-held power tool according to one of the preceding claims, **characterized in that** a plurality of spring/damping elements (38) are arranged at a distance from one another.

MassagerPriorArt0000099

Petitioner Therabody Ex-1004, 1556

12. Hand-held power tool according to one of the preceding claims, **characterized in that** the spring/damping elements comprise a spring element and a damping element.

Revendications

1. Machine-outil portative comprenant un boîtier, un moteur électrique logé dans le boîtier et un bloc batterie enclenché de façon amovible sur le boîtier pour alimenter le moteur électrique en courant électrique, ainsi qu'au moins deux éléments de ressort/d'amortissement (38) situés entre le bloc batterie (4) et le boîtier (6) de la machine-outil (2) pour amortir des vibrations et supprimer un jeu dû à l'enclenchement entre le bloc batterie (4) et le boîtier (6),
caractérisée en ce que
les éléments de ressort/d'amortissement (38) entrent en contact avec des surfaces (42) d'un dispositif d'enclenchement (26) du bloc batterie (4) avec le boîtier (6), orientées par paires opposées pour l'essentiel perpendiculairement à une direction d'oscillation principale (P) de la machine-outil portative.

2. Machine-outil portative selon la revendication 1,
caractérisée en ce qu'
au moins un élément de ressort/d'amortissement (38) est fixé au boîtier (6) et entre en contact avec le bloc batterie (4) lors de l'enclenchement du bloc batterie (4) et du boîtier (6).

3. Machine-outil portative selon la revendication 1,
caractérisée en ce qu'
au moins un élément de ressort/ d'amortissement est fixé au bloc batterie et entre en contact avec le boîtier lors de l'enclenchement du bloc batterie et du boîtier.

4. Machine-outil portative selon l'une quelconque des revendications précédentes,
caractérisée en ce que
lors de l'enclenchement, la surface (42) est inclinée ou arrondie dans la direction du mouvement.

5. Machine-outil portative selon l'une quelconque des revendications précédentes,
caractérisée en ce que
les éléments de ressort/d'amortissement (38) sont déformables dans une direction qui correspond à une direction d'oscillation principale (P) de la machine-outil manuelle.

6. Machine-outil portative selon l'une quelconque des revendications précédentes,
caractérisée en ce que
les éléments de ressort/d'amortissement (38) sont déformables dans une direction perpendiculaire à une direction (R) de déplacement d'éléments d'enclenchement (32) lors de l'enclenchement du bloc batterie (4) et du boîtier (6).

7. Machine-outil portative selon l'une quelconque des revendications précédentes,
caractérisée en ce que
les éléments de ressort/d'amortissement (38) sont réalisés à partir d'un matériau de caoutchouc élastique.

8. Machine-outil portative selon l'une quelconque des revendications précédentes,
caractérisée en ce que
les éléments de ressort/d'amortissement (38) sont réalisés à partir d'un matériau pouvant être relié d'un seul tenant au boîtier (6) par moulage par injection.

9. Machine-outil portative selon l'une quelconque des revendications précédentes,
caractérisée en ce que
les éléments de ressort/d'amortissement (38) sont réalisés à partir d'un élastomère thermoplastique.

10. Machine-outil portative selon l'une quelconque des revendications précédentes,
caractérisée en ce que
les éléments de ressort/d'amortissement (38) sont rapportés par moulage sur le boîtier (6) ou le bloc batterie (4).

11. Machine-outil portative selon l'une quelconque des revendications précédentes,
caractérisée par
plusieurs éléments de ressort/d'amortissement (38) écartée les uns des autres.

12. Machine-outil portative selon l'une quelconque des revendications précédentes,
caractérisée en ce que
les éléments de ressort/d'amortissement sont composés d'un élément de ressort et d'un élément d'amortissement.

MassagerPriorArt0000100

Petitioner Therabody Ex-1004, 1557

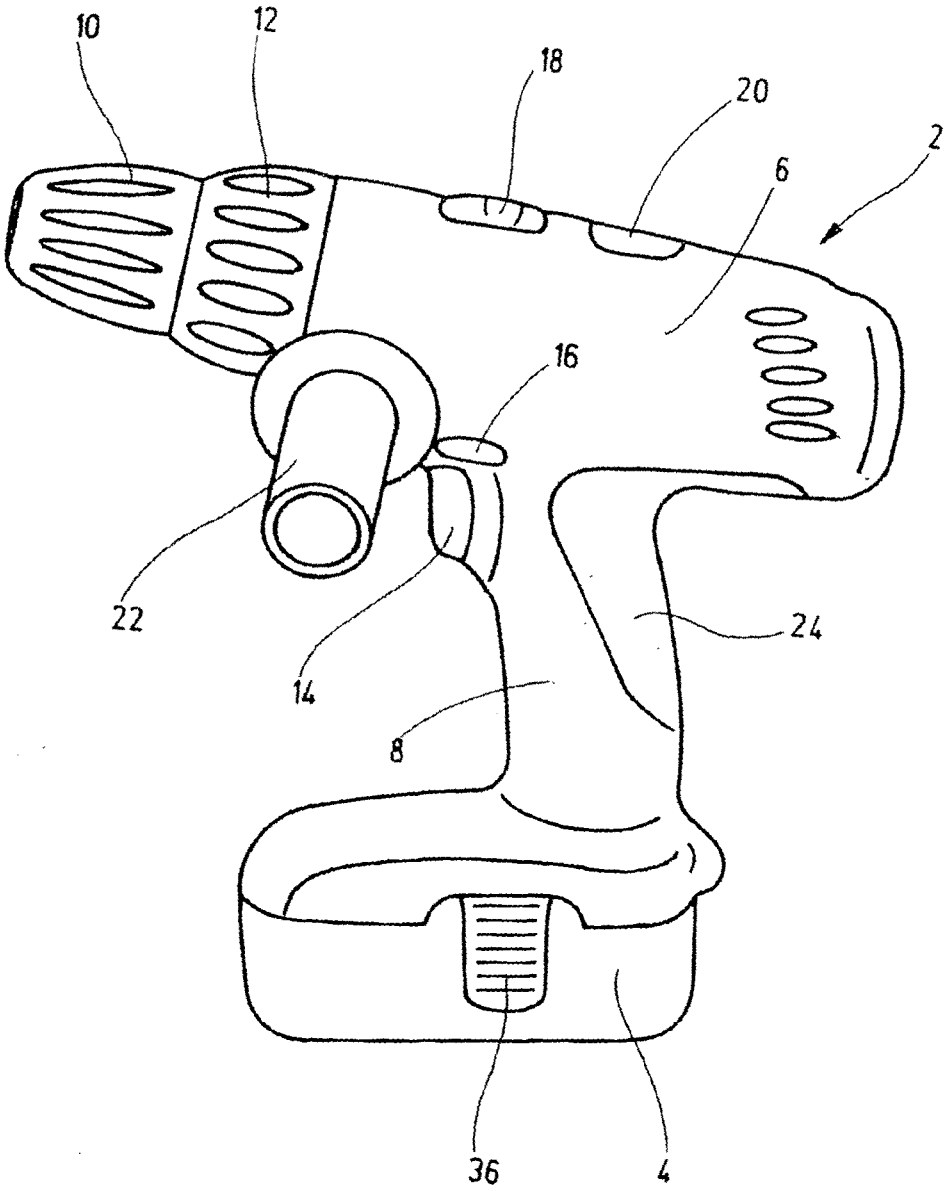


Fig.1

MassagerPriorArt0000101
Petitioner Therabody Ex-1004, 1558

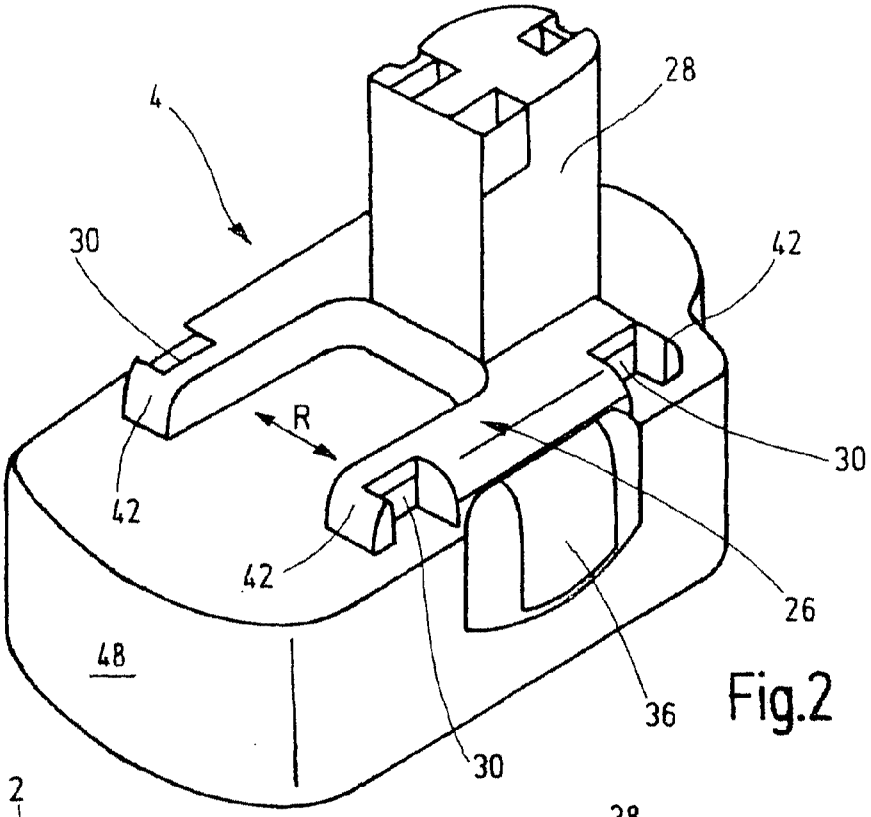


Fig.2

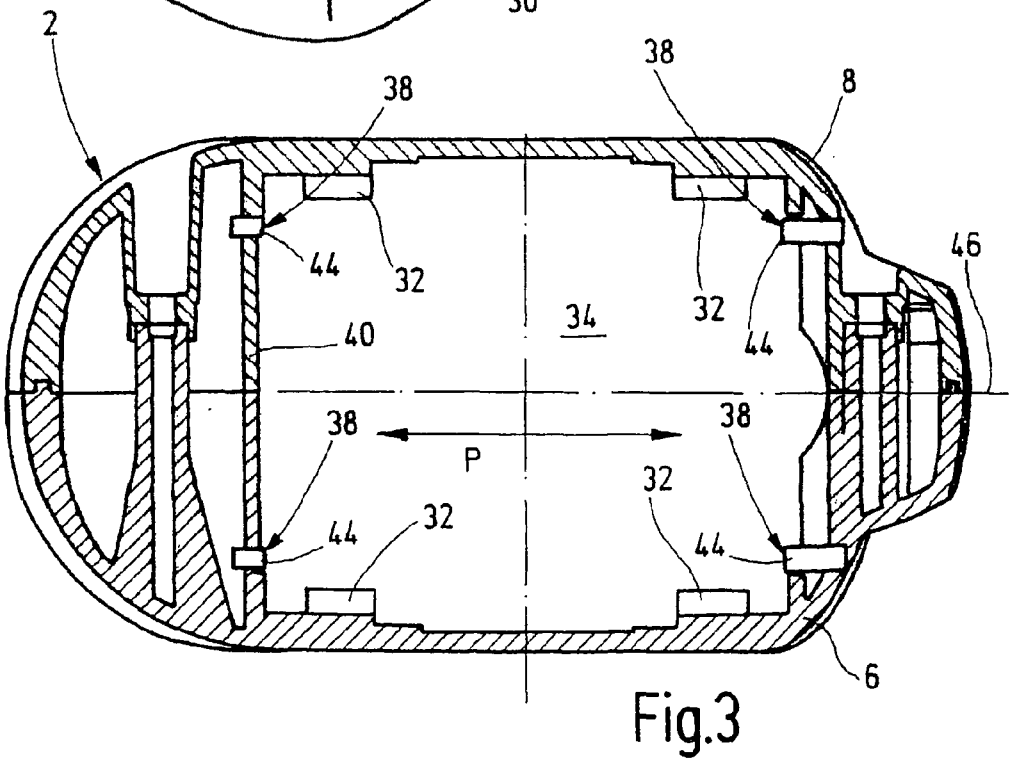


Fig.3

MassagerPriorArt0000102

Petitioner Therabody Ex-1004, 1559

Back percussion apparatus for newborns

List of publications

Application number	Publication date
2017C. CN107157741 A Publi…	2017-09-15

Abstract

The invention discloses a back percussion apparatus for newborns. The back percussion apparatus comprises a shell, wherein the shell is of an L-shaped structure; a battery and a motor are arranged in a hand-held part of the shell; a power switch is arranged on the cavity wall of the hand-held part of the shell; the motor and the battery are connected by virtue of the power switch, so that a controllable closed circuit is defined; an artificial back percussion vibrator is arranged in a vibrator part of the shell; a vibrating source is arranged on a motor shaft of the motor; the artificial back percussion vibrator is in vibrating connection to the vibrating source; and a detachable and replaceable percussion head is arranged on the artificial back percussion vibrator. In comparison with the prior art, different back percussion amplitudes and rhythms can be selected in accordance with birth weights, ages in days and disease characteristics of children patients; and the back percussion apparatus is simple and convenient to use.

English Abstract (Native or MT)

The invention discloses a back percussion apparatus for newborns. The back percussion apparatus comprises a shell, wherein the shell is of an L-shaped structure; a battery and a motor are arranged in a hand-held part of the shell; a power switch is arranged on the cavity wall of the hand-held part of the shell; the motor and the battery are connected by virtue of the power switch, so that a controllable closed circuit is defined; an artificial back percussion vibrator is arranged in a vibrator part of the shell; a vibrating source is arranged on a motor shaft of the motor; the artificial back percussion vibrator is in vibrating connection to the vibrating source; and a detachable and replaceable percussion head is arranged on the artificial back percussion vibrator. In comparison with the prior art, different back percussion amplitudes and rhythms can be selected in accordance with birth weights, ages in days and disease characteristics of children patients; and the back percussion apparatus is simple and convenient to use.

Other Abstracts

新生儿叩背器，包括壳体，壳体为L型壳体，在壳体的手持部内设有电池和电机，在壳体的手持部的腔壁上设有电源开关，电机和电池通过电源开关连接成可控闭合电路，在壳体的振子部内安装有仿人工叩背振子，在电机的电机轴上设有振动源，仿人工叩背振子与振动源振动连接，在仿人工叩背振子上设有可拆卸可更换叩头。与现有技术相比，本发明能够根据患儿的出生体重、日龄、疾病特点，选择不同的叩背振幅、节律，使用简便。

Inventor(s)

JI QINGSHUAI
LIU LIYAN
ZHAI SHUFEN
YAN JUNRONG

MA SUFANG
ZHU ZHIMEI
QUAN YANHUA
YANG HONGFANG

Applicant/Assignee	JI QINGSHUAI
Patent Assignee History	JI QINGSHUAI
Application Numbers & Dates	CN201710410058 2017-06-03 [2017CN-0410058]
Priority Numbers & Dates	CN201710410058 2017-06-03 [2017CN-0410058]
Technology domain	Medical technology
IPC codes	A61H-023/02*
CPC codes	A61H-023/02* A61H-2201/0153 A61H-2201/1207A61H-2201/5058 A61H-2201/5076 A61H-2205/081
Notes	Number of Claims: 9 Number of Pages: 9 Gazette number: 33-3702 Gazette date: 2017-09-15

Claims

1. Neonatal call-back device, comprising a housing (4), characterized in, L-shaped housing (4) is a housing, the housing (4) of the hand-held portion (4-1), battery and the (9) motor is arranged in the housing (4) of the hand-held portion (4-1) on the walls of a power switch (6), the (9) motor and the battery through the power switch is connected to (6) a controllable electrical circuit is completed, the housing (4) of the pendulum parts (4-2) internally provided with knock back the oscillator (2), imitating work of the (8) electric machine is provided with a vibration source motor shaft (9-1), knock back the oscillator (2) and the vibration source to a humanoid duplex (9-1) vibration connection, knock back the oscillator (2) is provided with a removable replaceable imitating work at the kowtow (1).

2. Neonatal call-back device according to claim 1, characterized in, knock back the oscillator (2) by the cross-shaped piston humanoid duplex (2-1), the balance spring I (2-2) and the balancing spring II (2-3) forming, cross-shaped piston (2-1) is slightly smaller than the maximum diameter of (4) the housing element portion in the middle of (4-2) has an inner diameter, the housing (4) of the pendulum parts (4-2) in the middle of an internal flange (4-0), a cross-shaped piston (2-1) of the left section being slightly smaller than the inner flange (4-0) has an inner diameter, the housing (4) of the pendulum parts (4-2) of the transparent cover (3) with end portions, a cross-shaped piston (2-1) the left section being slightly smaller than the inner diameter of the transparent cover (3), a cross-shaped piston (2-1) at the left end of the stretch to the left outer transparent cover (3), a cross-shaped piston (2-1) of the inner flange protrudes rightward from the right end (4-0) an outer, balance spring I (2-2) is fitted over the cross-shaped piston (2-1) of the upper left section, a balance spring I (2-2) of the left side and a transparent cover (3) contact,

Petitioner Therabody Ex-1004, 1561

balance spring I (2-2) with the right end of the piston cross-shaped (2-1) in the middle of the left end surface contacts, the balance spring II (2-3) is fitted over the cross-shaped piston (2-1) of the upper right section, the balance spring II (2-3) of the left side and a cross-shaped piston (2-1) in the middle of the right end surface in contact with, the balance spring II (2-3) of the right end of the inner flange (4-0) of the contact left end face, the vibration source (9-1) as a cam, a free state, a cross-shaped piston (2-1) from the center line of the right end surface of the motor shaft from the end surface of the motor shaft centerline distance less than the cam, with the distance from the end surface of the center line of the cam shaft of the motor in a free state cross-shaped piston (2-1) of the difference in the distances from the center line of the right end face of the motor shaft into an amplitude, vibration frequency is the rotational speed of the motor.

3. Neonatal call-back device according to claim 2, characterized in, of the cruciform plunger (2-1) is provided with means for adjusting the amplitude of the right end block electromagnetic retractor I (2-4), the housing (4) of the hand-held portion (4-1) of the cavity wall is provided with amplitude-modulation switch (7), a power (6) switch serves as a small amplitude modulating switch.

4. Neonatal call-back device according to claim 3, characterized in, is fitted in the cam for adjusting the amplitude of the distal end portion of the electromagnetic expansion device II (9-2), the electromagnetic expansion device II (9-2) of the electromagnetic expansion device is greater than I stretch (2-4) the amount of projection, the modulating switch is a (7) 4 th, 4 amplitude modulated according to the magnitude of the vibration amplitude is divided into four-speed switch, wherein the maximum amplitude range 4, 3 when is lower, 2 next greatest gear, 1 at the minimum amplitude range, the minimum amplitude of the power switch (6) 1 i.e. gear, the electromagnetic expansion device I (2-4) to extend from the corresponding 2 gear, when the electromagnetic retractor II (9-2) stretch at the corresponding gear 3, when the electromagnetic retractor I (2-4) and an electromagnetic expansion device II (9-2) are both stretch back to state corresponds to a maximum magnitude of 4 stages; motor shaft is a hollow shaft of (9) the motor, the motor shaft are provided with electrically conductive slip rings, is an electromagnetic expansion device II (9-2) of the power supply through the hollow shaft and an electrically conductive slip rings connected to power wires.

5. Neonatal call-back device according to claim 1, characterized in, frequency-modulated direct current motor is a (9) motor, which is provided with a frequency modulation module in the (4) housing, the housing (4) of the hand-held portion (4-1) is provided with a frequency modulation (10) switching on the walls of.

6. Neonatal call-back device according to claim 2, characterized in, of the cruciform plunger (2-1) the left end thereof with a threaded blind hole, threaded blind hole matched with the threaded rod is connected to the kowtow (1), a rod attached to the kowtow (1) threads of the threaded blind

Petitioner Therabody Ex-1004, 1562

bore, in accordance with the size of the kowtow (1) equipped with a plurality of diameters, depending on the size of the neonate age. kowtow (1) suitable replacement

7. Neonatal call-back device according to claim 2, characterized in, battery is a rechargeable battery, the lower end of the (4) housing is provided with a charging unit inside, at the output of the charging unit is connected to the rechargeable battery, the charging unit is connected with the plug.

8. Neonatal call-back device according to claim 2, characterized in, battery is a rechargeable battery, the charging unit is provided inside the lower end of the (4) housing, an output of the charging unit is connected to the rechargeable battery, the charging induction coil is provided inside the lower end of the (4) housing I and the sensing magnet, also includes a charger (8), the charger (8) charging induction coil II are provided, relative to the charger (8) housing is provided with a power supply socket, with the groove of (8) the charger housing (4) the hand grip (4-1) match, hand-held portion of (4) the housing (4-1) is inserted into the groove of the charger (8) power supply to the mains connection of (8) the charger and the socket may be recharged.

9. Neonatal call-back device according to claim 2 or 5, characterized in, is fitted in the housing (4) wall, on the display (5) in the shell (4) cavity amplitude sensor, the motor shaft of the (9) electric machine is provided with a frequency sensor, amplitude sensor, sensor and display (5) are electrically connected with the battery frequency, amplitude and frequency sensor and the display (5) signal is connected inductors, inductor amplitude, frequency sensor, display (5) and battery which forms the display circuit.

Petitioner Therabody Ex-1004, 1563

(19)中华人民共和国国家知识产权局

(12)发明专利申请

(10)申请公布号 CN 107157741 A
(43)申请公布日 2017.09.15

(21)申请号 201710410058.7

(22)申请日 2017.06.03

(71)申请人 冀清帅
地址 056001 河北省邯郸市中心医院

(72)发明人 冀清帅 刘莉燕 翟淑芬 闫俊荣
马素芳 祝志梅 权艳华 杨鸿芳

(51)Int.Cl.
A61H 23/02(2006.01)

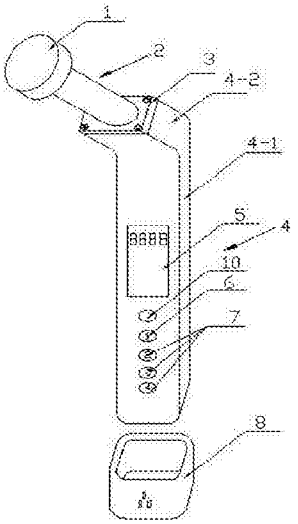
权利要求书2页 说明书4页 附图2页

(54)发明名称

新生儿叩背器

(57)摘要

新生儿叩背器，包括壳体，壳体为L型壳体，在壳体的手持部内设有电池和电机，在壳体的手持部的腔壁上设有电源开关，电机和电池通过电源开关连接成可控闭合电路，在壳体的振子部内安装有仿人工叩背振子，在电机的电机轴上设有振动源，仿人工叩背振子与振动源振动连接，在仿人工叩背振子上设有可拆卸可更换叩头。与现有技术相比，本发明能够根据患儿的出生体重、日龄、疾病特点，选择不同的叩背振幅、节律，使用简便。



CN 107157741 A

MassagerPriorArt0000647

Petitioner Therabody Ex-1004, 1564

1.新生儿叩背器，包括壳体(4)，其特征在于，壳体(4)为L型壳体，在壳体(4)的手持部(4-1)内设有电池和电机(9)，在壳体(4)的手持部(4-1)的腔壁上设有电源开关(6)，电机(9)和电池通过电源开关(6)连接成可控闭合电路，在壳体(4)的振子部(4-2)内安装有仿人工叩背振子(2)，在电机(8)的电机轴上设有振动源(9-1)，仿人工叩背振子(2)与振动源(9-1)振动连接，在仿人工叩背振子(2)上设有可拆卸可更换叩头(1)。

2.根据权利要求1所述的新生儿叩背器，其特征在于，所述的仿人工叩背振子(2)由十字形活塞(2-1)、平衡弹簧I(2-2)和平衡弹簧II(2-3)构成，十字形活塞(2-1)的中部最大直径略小于壳体(4)的振子部(4-2)的内径，在壳体(4)的振子部(4-2)的中部有内凸缘(4-0)，十字形活塞(2-1)的左段的直径略小于内凸缘(4-0)的内径，在壳体(4)的振子部(4-2)的端部有透盖(3)，十字形活塞(2-1)的左段的直径略小于透盖(3)内径，十字形活塞(2-1)的左端向左伸出透盖(3)外，十字形活塞(2-1)的右端向右伸出内凸缘(4-0)外，平衡弹簧I(2-2)套装在十字形活塞(2-1)的左段上，平衡弹簧I(2-2)的左端与透盖(3)接触，平衡弹簧I(2-2)的右端与十字形活塞(2-1)的中部左端面接触，平衡弹簧II(2-3)套装在十字形活塞(2-1)的右段上，平衡弹簧II(2-3)的左端与十字形活塞(2-1)的中部右端面接触，平衡弹簧II(2-3)的右端与内凸缘(4-0)的左端面接触，所述的振动源(9-1)为凸轮，自由状态下，十字形活塞(2-1)的右端面距电机轴的中心线的距离小于凸轮最远端距电机轴的中心线的距离，凸轮最远端距电机轴的中心线的距离与自由状态下十字形活塞(2-1)的右端面距电机轴的中心线的距离之差为振幅，电机的转速即为振动频率。

3.根据权利要求2所述的新生儿叩背器，其特征在于，在十字形活塞(2-1)的右端部嵌装有用于调整振幅的电磁伸缩装置I(2-4)，在壳体(4)的手持部(4-1)的腔壁上设有调幅开关(7)，电源开关(6)充当小振幅调幅开关。

4.根据权利要求3所述的新生儿叩背器，其特征在于，在凸轮的远端部嵌装有用于调整振幅的电磁伸缩装置II(9-2)，电磁伸缩装置II(9-2)的伸出量大于电磁伸缩装置I(2-4)的伸出量，所述的调幅开关(7)为4个，4个调幅开关按振动幅度的大小分为四个档，其中4档振幅最大、3当次之、2档再次之、1档振幅最小，振幅最小的1档即电源开关(6)，电磁伸缩装置I(2-4)伸出时对应2档，当电磁伸缩装置II(9-2)伸出时对应3档，当电磁伸缩装置I(2-4)和电磁伸缩装置II(9-2)均为伸出回状态时对应振幅最大的4档；电机(9)的电机轴为空心轴，在电机轴上设有导电滑环，为电磁伸缩装置II(9-2)供电的电线通过空心轴和导电滑环与电源连接。

5.根据权利要求1所述的新生儿叩背器，其特征在于，所述的电机(9)为直流调频电机，在壳体(4)内设有调频模块，在壳体(4)的手持部(4-1)的腔壁上设有调频开关(10)。

6.根据权利要求2所述的新生儿叩背器，其特征在于，在十字形活塞(2-1)的左端部有螺纹盲孔，叩头(1)上有螺纹盲孔匹配的连接用螺纹杆，叩头(1)的螺纹杆旋装在螺纹盲孔内，所述的叩头(1)根据直径的大小配备有若干个，根据新生儿的日龄更换大小合适的叩头(1)。

7.根据权利要求2所述的新生儿叩背器，其特征在于，所述的电池为可充电电池，在壳体(4)的下端内部设有充电单元，充电单元的输出端与可充电电池连接，充电单元的输入端连接有插头。

8.根据权利要求2所述的新生儿叩背器，其特征在于，所述的电池为可充电电池，在壳

MassagerPriorArt0000648

Petitioner Therabody Ex-1004, 1565

体(4)的下端内部设有充电单元,充电单元的输出端与可充电电池连接,在壳体(4)的下端内部设有充电感应线圈I和感应磁铁,还包括充电器(8),在充电器(8)内设有充电感应线圈II,在充电器(8)的壳体上设有供电插座,充电器(8)的凹槽与壳体(4)的手持部(4-1)匹配,壳体(4)的手持部(4-1)插进充电器(8)的凹槽内并将充电器(8)的供电插座与市电连接即可充电。

9.根据权利要求2或5所述的新生儿叩背器,其特征在于,在壳体(4)腔壁上嵌装有显示器(5),在壳体(4)腔内设有振幅感应器,在电机(9)的电机轴上设有频率感应器,振幅感应器、频率感应器和显示器(5)均与电池电连接,振幅感应器和频率感应器与显示器(5)信号连接,振幅感应器、频率感应器、显示器(5)和电池构成显示电路。

MassagerPriorArt0000649

Petitioner Therabody Ex-1004, 1566