Docket No.: HYP-034C5
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

Application No.: Not Yet Assigned | Confirmation No.: N/A

Filed: Concurrently Herewith | Art Unit: N/A

For: MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH | Examiner: Not Yet Assigned

Submitted via Patent Center

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 accompanies the new patent application submitted herewith.

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 18/466702 filed September 13, 2023, 17/681367 filed February 25, 2022, 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.

Petitioner Therabody Ex-1004, 0001

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.

Dated: November 20, 2023

Respectfully submitted,

Electronic signature: /Sanjeet K. Dutta/
Sanjeet K. Dutta
Registration No.: 46,145
GOODWIN PROCTER LLP
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Petitioner Therabody Ex-1004, 0002

PTO/SB/35 (07-09)
Approved for use through 05/31/2024. OMB 0651-0031
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NONPUBLICATION REQUEST UNDER 35 U.S.C. 122(b)(2)(B)(i)	First Named Inventor	Philip C. Danby
	Title	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH
	Attorney Docket Number	HYP-034C5

I hereby certify that the invention disclosed in the attached application **has not and will not be** the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

I hereby request that the attached application not be published under 35 U.S.C. 122(b).

/Sanjeet K. Dutta/ — Signature

November 20, 2023 — Date

Sanjeet K. Dutta — Typed or printed name

46,145 — Registration Number, if applicable

(617) 570-1000 — Telephone Number

This request must be signed in compliance with 37 CFR 1.33(b) and submitted with the application **upon filing.**

Applicant may rescind this nonpublication request at any time. If applicant rescinds a request that an application not be published under 35 U.S.C. 122(b), the application will be scheduled for publication at eighteen months from the earliest claimed filing date for which a benefit is claimed.

If applicant subsequently files an application directed to the invention disclosed in the attached application in another country, or under a multilateral international agreement, that requires publication of applications eighteen months after filing, the applicant **must** notify the United States Patent and Trademark Office of such filing within forty-five (45) days after the date of the filing of such foreign or international application. **Failure to do so will result in abandonment of this application (35 U.S.C. 122(b)(2)(B)(iii)).**

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82A (07-13)
Approved for use through 09/30/2025. OMB 0651-0035
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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Title	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

SIGNATURE of Applicant or Patent Practitioner

Signature	/Sanjeet K. Dutta/	Date (Optional)	
Name	Sanjeet K. Dutta	Registration Number	46,145
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ *Total of 1 forms are submitted.

Petitioner Therabody Ex-1004, 0004

DocuSign Envelope ID: 23036109-D5E9-4C4C-BA92-B7584BDD3187

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 03/31/2021. OMB 0651-0035
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POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

[X] I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 162143

OR

[ ] I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

[X] The address associated with the above-mentioned Customer Number

OR

[ ] The address associated with Customer Number:

OR

[ ] Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

HYPERICE IP SUBCO, LLC

[ ] Inventor or Joint Inventor (title not required below)

[ ] Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

[X] Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

[ ] Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	DocuSigned by: 05620CF418B14D8...	Date (Optional)	2/7/2023
Name	Jon Howell		
Title	General Counsel		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

[ ] Total of 1 forms are submitted.

CLAIMS

WHAT IS CLAIMED IS:

1. A percussive massager comprising:

a housing;

a piston having a proximal end and a distal end, the distal end of the piston having a bore;

a motor operatively connected to the proximal end of the piston, wherein the motor is configured to cause the piston to reciprocate at a first speed;

a drive mechanism that controls a predetermined stroke length of the piston; and

a quick-connect system comprising the distal end of the piston and a first massaging head, wherein the quick-connect system is configured to have a proximal end of the first massaging head inserted into or removed from the bore while the piston reciprocates the predetermined stroke length at the first speed.

2. The percussive massager of claim 1, wherein the motor is configured to cause the piston to reciprocate at a second speed.

3. The percussive massager of claim 1, further comprising:

a control panel positioned on an exterior of the housing.

4. The percussive massager of claim 3, wherein the control panel is configured to display one or more visual indicators.

5. The percussive massager of claim 1, further comprising a handle and a flywheel, wherein the handle is on an opposite side of the flywheel with respect to the motor.

6. The percussive massager of claim 1, further comprising a handle, wherein the motor is positioned within the housing opposite the handle.

7. The percussive massager of claim 1, wherein the motor has an output shaft configured to rotate about a rotation axis, and wherein the drive mechanism comprises:

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a flywheel operatively connected to the output shaft of the motor to rotate about a flywheel axis, the output shaft extending into the flywheel along the flywheel axis; and

a crank pin extending from the flywheel, the crank pin being operatively connected to the piston.

8. The percussive massager of claim 7, further comprising a handle, wherein the motor and the handle are on opposite sides of a plane perpendicular to the flywheel axis that extends through the flywheel.

9. The percussive massager of claim 7, further comprising a handle, wherein the motor and the handle are on a same side of a plane perpendicular to the flywheel axis that extends through the flywheel.

10. The percussive massager of claim 7, wherein an offset between the flywheel axis and an axis of the crank pin controls the predetermined stroke length of the piston.

11. The percussive massager of claim 7, wherein the motor is directly connected to the flywheel, and wherein the crank pin is directly connected to the flywheel.

12. The percussive massager of claim 7, wherein the motor is configured to cause the piston to reciprocate at the first speed along a longitudinal axis, and further comprising:

a first bearing located on a first side of the flywheel; and

a second bearing located on a second side of the flywheel, wherein the first bearing and the second bearing are configured to restrain reciprocation of the piston to the longitudinal axis.

13. The percussive massager of claim 1, wherein the bore comprises a substantially cylindrical bore.

14. The percussive massager of claim 1, further comprising a substantially cylindrical structure within the bore.

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15. The percussive massager of claim 14, wherein the substantially cylindrical structure comprises a cylindrical seat.

16. The percussive massager of claim 14, wherein the substantially cylindrical structure comprises a magnet.

17. The percussive massager of claim 1, wherein a proximal end of the first massaging head has a pocket to receive the distal end of the piston.

18. A method of assembling a percussive massager, the method comprising:

operatively connecting a motor to a proximal end of a piston,

wherein the motor is configured to cause the piston to reciprocate at a first speed,

wherein a distal end of the piston has a bore,

wherein a drive mechanism controls a predetermined stroke length of the piston, and

wherein a quick-connect system comprising the distal end of the piston and a first massaging head is configured to have a proximal end of the first massaging head inserted into or removed from the bore while the piston reciprocates the predetermined stroke length at the first speed.

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Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/AIA/424 (04-14)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Philip C. Danby	Nonprovisional Application Number (if known):	Not Yet Assigned
Title of Invention:	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently $0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.
2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.
3. The applicable box is checked below:

I. [x] **Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)**

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via Patent Center or EFS-Web.

---OR---

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, **or** the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. [ ] **Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)**

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via Patent Center or EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature	/Sanjeet K. Dutta/	Date	November 20, 2023
Name (Print/Typed)	Sanjeet K. Dutta	Practitioner Registration Number	46,145

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

[ ] *Total of 1 forms are submitted.

IPTS/125359381.1

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/515,112	**11/20/2023 08:06:44 PM Z ET**	**HYP-034C5**

Title of Invention

MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	2915	FILED BY	Anna Beaulieu
PATENT CENTER #	63326725	FILING DATE	-
CUSTOMER #	162143	FIRST NAMED INVENTOR	Philip C. Danby
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Sanjeet Dutta

Documents

TOTAL DOCUMENTS: 12

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
HYP-034C5 - Application Data Sheet.pdf		9	Application Data Sheet	2174 KB
HYP-034C5 - DEC.pdf		2	Oath or Declaration filed	254 KB
HYP-034C5 - TRK ONE REQ.pdf		1	Track One Request	35 KB
HYP-034C5 - POA.pdf		2	Power of Attorney	75 KB
HYP-034C5 - IDS.pdf		20	-	239 KB
HYP-034C5 - IDS-TRAN.LET.pdf	(1-2)	2	Transmittal Letter	19 KB

HYP-034C5 - IDS-IDS.pdf	(3-20)	18	Information Disclosure Statement (IDS) Form (SB08)	215 KB
HYP-034C5 - DRW.pdf		7	Drawings-only black and white line drawings	310 KB
HYP-034C5 - SPEC.pdf		18	-	91 KB
HYP-034C5 - SPEC-SPEC.pdf	(1-14)	14	Specification	79 KB
HYP-034C5 - SPEC-CLM.pdf	(15-17)	3	Claims	20 KB
HYP-034C5 - SPEC-ABST.pdf	(18-18)	1	Abstract	14 KB
HYP-034C5 - NONPUBLICATION REQUEST.pdf		1	Nonpublication request from applicant	17 KB
HYP-034C5 - TRNS.pdf		1	Transmittal of New Application	33 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
HYP-034C5 - Application Data Sheet.pdf	8378ECFD6C6BC1684B0F35A85E9FC899960EC2A7145397F0AFEAC8DFFF60C3619BD4E669952BFC683641F8703CD62917CE735BE712E5B5129C7724F6CC5FE917
HYP-034C5 - DEC.pdf	426F07389574B871D18177EF90002321E25BF8916BF4A18CC8FA85925F29DFB1CB983735A2178605DE3C770B97C1DCA7A772410A61EED88B781AD71419C686D0
HYP-034C5 - TRK ONE REQ.pdf	5073804F5BCE27ABF950F12F49DE1835FD6E1CD418FE99AF26B6EB75ED89F3C45073C5C57598E5C04F14E87538361CFB8BD4C28D98FD729ECC1967B02562F8B1

HYP-034C5 - POA.pdf	19B2FB8A8DEC9B7CCE42154D8BEF880015B21011B4497DA2738E30C6E17E1D39F2C941928AD8F66CEFEFBC011A48FEE404D8B6AA65979B9F5C757A55A5283741
HYP-034C5 - IDS.pdf	85724B4F3F96025E28B2DDA3DA7F94037D451562598F410621F6C32B21F90F8FAD2AC01A9E7FC6F7F4AFF234B114879820FC10433B49B1ADE042DD0CD3ADA922
HYP-034C5 - IDS-TRAN.LET.pdf	F008BEDE4C9652743A2212DEEE1E530B4409BC1E559D5CE35BD18D9D452CF9BE8A8BCC861DF8626C5ADD409497AEC49994541173F5DCE661DCDEB3236AF7D99D
HYP-034C5 - IDS-IDS.pdf	7BC1DB31C6E19F5DF1FA7DFB721220A0AE67A270A05C828FC901116A9AD0FEA2279968FCE3DFE7DE09599218583FF21FD7C41F3A3C8858C458CDFBEBA66B178A
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HYP-034C5 - SPEC.pdf	1736D5BE003D886AFA840D69E64DA0C74F48664DBF230994B2CD57BFF6A1B8C64755487CD3BEEE7518D1C0A727E0E7D2C1C9B9EC959E2322EB723A539D7F44E3
HYP-034C5 - SPEC-SPEC.pdf	71322EACFE5194015FDC8598F9DED0A96FE1A8C045D295AA5470D3E2B2FDABC72F764B3DE4BBA229BEBE5D8F80DEF869B6346F20E201AF82CEAE68774C0638B7
HYP-034C5 - SPEC-CLM.pdf	7CEC7E3446993CD73008899EF162ACBD4B6283DD725B738BCF22306ED887C2EF46FF726FBCACB72ED6CCCC832FA86BA755994596984B2243BF07BC6F638BF98E
HYP-034C5 - SPEC-ABST.pdf	00B8BF7EFFAD0DC6B79C1D7F0B9087A3DA3F291062498EB7D4FFEAF5DB3E9DEED491B108F7E76BE580C4802840D4EC878E8153E510876BA8EC47FF96FEFD1C07
HYP-034C5 - NONPUBLICATION REQUEST.pdf	C88C4A4BE621443FF727196AC6EE0AF225BBAE6B25D6ABCAE0B0A42C292C7E46C403DC2CD3595864CEDF3637E4BEFE4BCF60D5E1B0E8C7C30FA1FE5346E16CBD

HYP-034C5 - TRNS.pdf E5C5C4AB037B9BBD43FDE97AD36BB9BBEED3ABCF10C5364D50672B4209AAF9978CB089786C056144FB28F632819B4753962C0FD97EAC64719823FED5C446ABB3

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/515,112	**11/20/2023 08:06:44 PM Z ET**	**HYP-034C5**

Title of Invention

MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH

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CUSTOMER #	162143	FILING DATE	-
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Philip C. Danby

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
CARD / 1146	**E2023AJK08118501**	**Anna Beaulieu**

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2830	PROCESSING FEE, EXCEPT IN PROVISIONAL APPLICATIONS	56.00	1	56.00
2817	REQUEST FOR PRIORITIZED EXAMINATION	1680.00	1	1680.00
2111	UTILITY PATENT APPL. SEARCH FEE	280.00	1	280.00
4011	BASIC FILING FEE- UTILITY	64.00	1	64.00
2311	EXAMINATION OF ORIGINAL PATENT APPLICATION	320.00	1	320.00
			TOTAL	**$2,400.00**

AMOUNT:

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

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New International Application Filed with the USPTO as a Receiving Office

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MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. Patent Application No. 18/466,702 filed on September 13, 2023, which is a continuation of U.S. Patent Application No. 17/681,367 filed on February 25, 2022, which is a continuation of U.S. Patent Application No. 15/892,665 filed on February 9, 2018, and entitled "MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH", (now U.S. Patent No. 11,285,075 issued on March 29, 2022), which is a continuation of U.S. Patent Application No. 14/317,573 filed on June 27, 2014, and entitled "MASSAGING DEVICE HAVING A HEAT SINK" (now U.S. Patent No. 9,889,066 issued on February 13, 2018), which claims priority to and the benefits of U.S. Provisional Patent Application No. 61/841,693 filed on July 1, 2013, and entitled "MASSAGING DEVICE", the entireties of which are incorporated herein by reference.

BACKGROUND

[0002] This invention relates generally to medical devices, and more particularly, to a deep muscle-stimulating device used to increase muscle metabolism, increase the lactic acid cycle and relieve pain.

[0003] Vibrating massaging devices are available on the market today; however, those devices suffer from many deficiencies. Many of the prior art massaging devices are bulky, get very hot, are noisy and/or are difficult to use for extended periods of time.

SUMMARY

[0004] Exemplary embodiments of massaging devices are disclosed herein. One exemplary embodiment includes a piston having a longitudinal axis and a massaging head connected to the piston. A motor is located on a first side of the longitudinal axis and a handle is located on a second side of the longitudinal axis. A drive mechanism for moving the piston and massage head is also included.

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[0005] Another exemplary embodiment of a massaging device includes a handle, a piston, a massaging head attached to the piston, a motor, a drive mechanism for converting rotary motion of the motor to linear motion to drive the piston back and forth in a reciprocating motion, a processor, memory, a data connection in circuit communication with the processor and logic for transmitting data between the massaging device and a remote device.

[0006] Still another exemplary embodiment includes a massaging device that has a handle, a motor, a drive mechanism for converting rotary motion of the motor to reciprocating motion, a piston movable in a linear reciprocating motion connected to the drive mechanism and a massage head attached to the piston. The exemplary embodiment also includes a heat sink in thermal communication with the motor and drive mechanism, and a housing having two cavities. The first cavity at least partially surrounds the motor and the second cavity at least partially surrounds the heat sink. The cavities are separated from one another and the second cavity includes one or more openings for allowing air to flow over the heat sink to dissipate heat from the massager.

[0007] Another exemplary massaging device includes a housing, a handle extending outward from the housing and a piston having a longitudinal axis extending substantially perpendicular to the handle. A massaging head is connected to the piston. In addition, the massaging device includes a motor, a drive mechanism for moving the piston and a control panel. The control panel is located on the housing above the handle.

[0008] In yet another exemplary embodiment, a massaging device includes a handle, a piston, a quick-connection mechanism and one or more massaging heads releasably connectable to the piston by the quick-connection mechanism. The massaging device further includes a motor and a drive mechanism for moving the piston.

[0009] Another exemplary massaging device includes a handle, a piston, a massaging head connected to the piston, a motor and a drive mechanism for moving the piston. The drive mechanism includes a crank bearing that has one or more spring bars.

[0010] Still yet, another exemplary massaging device includes a handle, a piston a massaging head connected to the piston, a drive mechanism for moving the piston in a back and forth motion and a lost motion mechanism located between the massaging head and the drive mechanism.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0011] These and other features and advantages of the present invention will become better understood with regard to the following description and accompanying drawings in which:

[0012] Figure 1 illustrates a perspective view of an exemplary embodiment of a massaging device;

[0013] Figure 2 illustrates a first cross-section of the exemplary massaging device of Figure 1;

[0014] Figure 3 illustrates a second cross-section of the exemplary massaging device of Figure 1;

[0015] Figure 4 illustrates an exploded perspective view of an exemplary drive mechanism of the massaging device;

[0016] Figures 5A and 5B show enlarged side views of a crank bearing having spring bars for use in the exemplary drive mechanism of Figure 4;

[0017] Figures 6, 6A and 6B illustrate an exemplary quick-disconnect mechanism for connecting one or more massaging heads to a massaging device;

[0018] Figure 7 illustrates a schematic view of an exemplary lost motion control mechanism for varying the stroke of the piston driving a massaging head; and

[0019] Figure 8 illustrates an exemplary embodiment of a simplified block circuit diagram for a massaging device.

DETAILED DESCRIPTION

[0020] The Detailed Description merely describes exemplary embodiments of the invention and is not intended to limit the scope of the claims in any way. Indeed, the invention is broader than and unlimited by the exemplary embodiments, and unless specifically indicated otherwise, the terms used in the claims have their full ordinary meaning.

[0021] "Circuit communication" as used herein indicates a communicative relationship between devices. Direct electrical, electromagnetic and optical connections and indirect electrical, electromagnetic and optical connections are examples of circuit communication. Two devices are

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in circuit communication if a signal from one is received by the other, regardless of whether the signal is modified by some other device. For example, two devices separated by one or more of the following--amplifiers, filters, transformers, optoisolators, digital or analog buffers, analog integrators, other electronic circuitry, fiber optic transceivers or satellites--are in circuit communication if a signal from one is communicated to the other, even though the signal is modified by the intermediate device(s). As another example, an electromagnetic sensor is in circuit communication with a signal if it receives electromagnetic radiation from the signal. As a final example, two devices not directly connected to each other, but both capable of interfacing with a third device, such as, for example, a processor, are in circuit communication.

[0022] Also, as used herein, voltages and values representing digitized voltages are considered to be equivalent for the purposes of this application, and thus the term "voltage" as used herein refers to either a signal, or a value in a processor representing a signal, or a value in a processor determined from a value representing a signal.

[0023] "Signal," as used herein includes, but is not limited to one or more electrical signals, analog or digital signals, one or more computer instructions, a bit or bit stream, or the like.

[0024] "Logic," synonymous with "circuit" as used herein includes, but is not limited to hardware, firmware, software and/or combinations of each to perform a function(s) or an action(s). For example, based on a desired application or needs, logic may include a software-controlled processor, microprocessor or microcontroller, discrete logic, such as an application specific integrated circuit (ASIC) or other programmed logic device. Logic may also be fully embodied as software. The circuits identified and described herein may have many different configurations to perform the desired functions.

[0025] Any values identified in the detailed description are exemplary, and they are determined as needed for a particular massaging device. Accordingly, the inventive concepts disclosed and claimed herein are not limited to particular values or ranges of values used to describe the embodiments disclosed herein.

[0026] Figure 1 is a perspective view of an exemplary embodiment of a hand-held massaging device 100. The exemplary massaging device 100 includes a main housing 102 that houses a

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motor and a drive unit and an upper housing 104 that includes a heat sink and a fan. In addition, massaging device 100 includes a first handle 106, and a second optional handle 108. Handle 106 has a longitudinal axis that extends away from the housing 102. The massaging device 100 also includes a massaging head 130. As discussed in more detail below, in some embodiments massaging head 130 includes a quick-release connection.

[0027] Massaging device 100 includes a control panel 124. In one embodiment, control panel 124 comprises a first momentary pushbutton 126 and a second momentary pushbutton 128. First and second pushbuttons 126, 128 may serve multiple purposes. In one embodiment, pushing the first pushbutton 126 once moves the massaging device 100 to a first preset speed. Pushing the first pushbutton 126 a second time moves the massaging device 100 to a second preset speed. Accordingly, multiple preset speeds may be selected by pushing a single pushbutton. In addition, pushing pushbutton 126 and holding it down may increase the speed of the massaging head until the user releases the pushbutton 126.

[0028] In addition, if the massaging device 100 is turned off, pushing second pushbutton 128 once and holding it in for a period of time turns on the massaging device 100. Pushing the second pushbutton 128 in and holding it in for a period of time, such as, for example one second, causes massaging device 100 to turn off. While massaging device 100 is turned on, pushing and releasing second pushbutton 128 decreases the speed of the massaging device 100 to the next lowest preset speed. Pushing and releasing pushbutton 128 again further reduces the speed of the massaging device 100. In some embodiments, the operating speed of the massaging device is generally between about 600 and 3600 strokes per minute.

[0029] The control panel 124 is located above handle 106 on upper housing 104. Control panel 124 is located off of the handle 106, which prevents accidental contact between a user's hand and the control panel 124 and allows a user to move her hand to any position on the handle 106 during operation. Preferably, control panel 124 is located so that it is reachable by a user's thumb without the user having to remove her hand from the handle 106. In addition, massaging device 100 includes a power cord 132 for providing power to the massaging device 100.

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[0030] Although the exemplary control panel 124 illustrates two pushbuttons 126, 128, other controls may be used, such as dials and switches. In addition, visual or audible signals may be generated and displayed on control panel 124. To that extent, control panel 124 may include a visual display (not shown), an audible device (not shown) or the like, such as, for example a speaker, or the like. If a visual or audible device is used, the visual or audible device may be located proximate the pushbuttons or other controls, or may be located apart from such controls.

[0031] Upper housing 104 includes an air intake aperture covered by intake grate 120 and one or more air outlet apertures covered by outtake grate(s) 122. As described in more detail below, the heat-generating internal components of massaging device 100 are cooled by air passing through upper housing portion 104.

[0032] Figures 2 and 3 are cross-sections of massaging device 100. Located within handle 106 is control circuitry 260. Control circuitry 260 is in circuit communication with power cord 132, control panel 124, fan 222 and motor 210.

[0033] Motor 210 is located in housing 102 opposite handle 106. Motor 210 is a variable speed DC motor; however, motor 210 may be a constant speed motor, an AC motor or the like. In one embodiment, motor 210 has an operating speed of between about 600 and 3600 revolutions per minute (RPMs).

[0034] Motor 210 includes a shaft 211 that extends into a flywheel 212. Flywheel 212 includes a cylindrical projecting member or crank pin 213 positioned offset from the centerline 400 (Figure 4) of the flywheel 212. Crank pin 213 is inserted in an aperture 410 (Figure 4) of a crank bearing 214. Crank bearing 214 is inserted into a pocket 232 of a piston 230. The piston also has an elongated cutout 402 to receive part of the flywheel 212 for compactness while permitting piston reciprocation. Crank bearing 214 is cuboid in the exemplary embodiment, however, in some exemplary embodiments, crank bearing 214 may cylindrical.

[0035] Figure 4 is an exploded perspective view of piston 230, flywheel 212 and crank bearing 214. Piston 230 may be made of any suitable material, and in some embodiments, piston 230 is made of aluminum. As illustrated in the drawings, in some embodiments, motor 210 is located on one side of the longitudinal axis of piston 230 and handle 106 is located on a second side of the

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longitudinal axis. Piston 230 includes a pocket 232 (or transverse slot) having a first wall 232A and a second wall 232B. In some embodiments, piston 230 is hollow on either side of pocket 232 to reduce weight.

[0036] Flywheel 212 includes a cylindrical projecting member 213. Crank pin 213 is off set from the centerline 400 of flywheel 212. Accordingly, as flywheel 212 rotates, crank pin 213 rotates in a circular path around the centerline 400 of the flywheel 212. Rotation of crank pin 213 causes crank bearing 214 to travel in a circular motion within piston pocket 232 causing reciprocal motion of piston 230.

[0037] Piston 230 is restrained by two spaced apart bearings 310, 311 (Figure 3). Bearing 310 is located on a first side of flywheel 212 and bearing 311 is located on a second side of flywheel 212. Accordingly, piston 230 may only move in a back-and-forth motion along its longitudinal axis. The arrangement of the bearings 310, 311 on both ends of the piston 230 provides for a very sturdy and robust drive mechanism. Because piston 230 is constrained to a linear back-and-forth motion, as crank bearing 214 rotates in a circular motion, it acts against side walls 232A and 232B of pocket 232. This mechanism for converting rotary to linear motion is known as a "Scotch yoke."

[0038] In order to correctly assemble the components of a Scotch yoke drive, the pocket 232 (or walls of transverse slot) must be milled larger than the outside dimensions of the crank bearing 214. The gap between the inside of pocket 232 and the outside of crank bearing 214 is typically 0.1 mm inches. Motor 210 rotates at between about 600 and 3600 RPMs and each time the crank bearing 214 switches from moving, for example, toward side wall 232A of pocket 232 to moving toward the other side wall 232B, the bearing block 214 travels the small gap and smacks or strikes the side wall, e.g., side 232B, which causes a significant amount of noise and wear.

[0039] In one exemplary embodiment, crank bearing 214 is made with one spring bar 412. Figure 5A is an enlarged elevation view of side 420 of crank bearing 214 and Figure 5B is an enlarged plan view showing top 422 of crank bearing 214. The spring bars 412 are created by milling the outside of the spring block 214 proud by 0.4 mm in the area of the desired spring bar.

[0040] As illustrated in Figure 5A, the surface of spring bar 412 bows outward. The size of the bow is set to increase the width of the crank bearing 214 to be slightly larger (0.4 mm) than the

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width of the pocket 232. In some embodiments, slots 502 and 504 are milled into the surfaces of side 420 and top 422 below the spring bar 412 to allow spring bar 412 to deflect inwards. In some embodiments, slots 502 and 504 intersect thereby leaving spring bar 412 supported only on each end.

[0041] Thus, when crank bearing 214 is inserted into pocket 232, the spring bar 412 contacts the corresponding surface of the pocket 232 and deflects inward which causes crank bearing 214 to fit snuggly in pocket 232. Accordingly, as crank bearing 214 changes directions from, for example, moving toward side wall 232A to moving toward side wall 232B, the spring bar 412 takes up the slack in the gap and prevent noise and wear that would otherwise be generated by the crank bearing 214 striking the side walls 232A, 232B of the pocket 232.

[0042] Crank bearing 214 may be made of any suitable material; in some embodiments, crank bearing 214 is made of plastic. Although the exemplary embodiment is shown and described as having one spring bar, exemplary embodiments may have any number of spring bars.

[0043] Massaging device 100 includes a drive housing 218. Drive housing 218 is made of a heat conducting material, such as, for example, aluminum and has a longitudinal bore 327 passing therethrough to receive piston 230. As shown in Figure 3, drive housing 218 includes a first internal cylindrical groove 308 for holding bearing 310 and a second internal cylindrical groove 309 for holding bearing 311. Spaced bearings 310 and 311 mount and guide the piston 230 relative to the drive housing 218. Drive housing 318 surrounds piston 230 and flywheel 212. In some embodiments, drive housing 318 is made up of multiple components, such as an upper drive housing and a lower drive housing.

[0044] In addition, motor 210 includes a motor housing 209 that bolts onto drive housing 218. Motor housing 209 is also made of a heat-conducting material, such as, for example, aluminum. Secured to drive housing 218 is heat sink 220. Heat sink 220 includes a plurality of fins 221. Heat sink 220 is made of a heat conducting-material, such as, for example, aluminum.

[0045] Main housing 102 contains a first cavity 281. Upper housing 104 contains a second cavity 282. First cavity 281 and second cavity 282 are separated by a barrier 280. Motor housing 209 and drive housing 218 are located in the first cavity 281. Heat sink 220 is located in second cavity

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282. The exemplary embodiment describes a main housing 102 and upper housing 104. These may be portions made up of a single structure or multiple structures secured to each other.

[0046] Second cavity 282 includes an air inlet aperture 340 which is covered by grate 120 and one or more air outlet apertures 342 covered by one or more grates 122. A fan 222 is located in second cavity 282. When the fan 222 is activated, air enters second cavity 282 through air inlet aperture 340 and passes over cooling fins 221 of heat sink 220, and the air then passes out of second cavity 282 through the one or more air outlets 342. The fan may be activated by a switch (not shown) on control panel 124, activated automatically when the massaging device 100 is turned on, or may be activated by a thermostat (not shown). Thus, the cooling system for massaging device 100 is located in second cavity 282 and is isolated from the other components in the massaging device 100.

[0047] In typical massaging devices, cooling air is blown over the motor. Because the massaging devices operate for long periods of time in an atmosphere that is subject to a significant amount of dust and lint because the massaging device is often used on a person wearing clothes, a towel or a robe. Over time, the dust and lint may build up on the motor and cause the prior art massaging devices to overheat. Locating the cooling system in a cavity 282 that is isolated from the rest of the internal components minimizes this type of failure. The air outlet grates 122 may be sized larger to allow any lint and dust to freely pass out of the cavity 282. In addition, the surface of the heat sink 220 is smooth and thus, there will be few pockets for dust and lint to get trapped.

[0048] Figures 6 and 6A illustrate an exemplary embodiment of a quick-connect system 600 for connecting a massaging head 620 to a piston 602. When providing a deep tissue massage using a massaging device, such as, for example, massaging device 100, it may be desirable to switch massaging heads to work on different muscles or different portions of muscles during the massage. The exemplary quick-connect system 600 allows a user to quickly switch massaging heads 620. Moreover, the exemplary quick-connect system 600 may be used without turning off the massaging device 100.

[0049] Quick-connect system 600 includes a piston 602 that has a hollow-end bore 608 for receiving the shaft 621 of a massaging head 620. Located within the bore 608 of piston 602 is a

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cylindrical seat 604. Cylindrical seat 604 retains a magnet 606. Magnet 606 is illustrated with its north pole located flush with the seat and facing toward the opening in bore 608. Massaging head 620 includes a shaft 621 having a cylindrical pocket 622 at the distal end. Located within the cylindrical pocket 622 is a magnet 624. Magnet 624 is positioned so that its south pole is located at the distal end of shaft 621. Accordingly, when the shaft 621 of massaging head 620 is slid into opening in bore 608, the magnets 606 and 624 are attracted to one another and magnetically hold massaging head 620 firmly in place.

[0050] To remove massaging head 620, a user need only apply a sufficient amount of force to separate the two magnets 606, 624. The strength of the magnets 606, 624 are sized to prevent the massaging head 620 from separating from the piston 602 during normal use, and yet allow a user to quickly remove and replace the massaging head 620. In some embodiments the end 626 of the massaging head 620 is rounded, pointed or tapered (not shown) to allow it to easily slip into the opening 608 even while the piston 608 is moving.

[0051] Figure 6B illustrates another quick-connect massaging head 630. Quick-connect massaging head 630 is substantially the same as massaging head 620 except that the head portion 639 has a different shape than head portion 629 of massaging head 620.

[0052] In some instances, it may be desirable to adjust the throw or the stroke length of the massaging head to work on larger or smaller muscle groups, or deeper or shallower points of stress or soreness in the muscles. Figure 7 illustrates an exemplary embodiment of a lost motion system 700. Although lost motion system 700 is a hydraulic lost motion system, other mechanical lost motion devices may be used in accordance with embodiments of the present invention.

[0053] Lost motion system 700 is contained in housing 702. Housing 702 may be similar to drive housing 218 described above except it may need to be larger to accommodate lost motion system 700. Housing 702 includes a floating piston 720 located in first cylindrical bore 708. Floating piston 720 includes a sealing member 722 for forming a seal between floating piston 720 and first cylindrical bore 708. A cam 706 secured to housing 702 may be rotated to adjust the amount of travel that floating piston 720 may move. A passage 710 fluidically connects first cylindrical bore 708 to second cylindrical bore 704.

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[0054] A drive piston 730 is located in second cylindrical bore 704. Drive piston 730 includes a sealing member 732 to seal between the drive piston 730 and second cylindrical bore 704. Drive piston 730 may be driven in substantially the same way as described above with respect to piston 230. A passage 705 fluidically connects second cylindrical bore 704 and passage 710 to third cylindrical bore 706. Located within third cylindrical bore 706 is an output piston 740.

[0055] Output piston 740 includes a sealing member 742, such as, for example, an o-ring to form a seal between drive piston 730 and third cylindrical bore 706. Hydraulic fluid 712 is located in passages 705, 710 and portions of the first, second, and third cylindrical cavities 708, 704 and 706 as illustrated. A massaging head (not shown) is connected to output piston 740.

[0056] During operation, if cam 706 is set so that floating piston 720 is retained at the proximate end of first cylindrical bore 708 (as illustrated), movement of the drive piston 730 moves output piston 740 its maximum stroke length. If cam 706 is set so that floating piston 720 moves to adjacent the distal end of first cylindrical bore 708, movement of the drive piston 730 moves output piston 740 its minimum stroke length. The cam may also be selectively rotated to intermediate positions to choose different magnitudes of floating piston movement resulting in different selected magnitudes of output piston movement.

[0057] In some embodiments, floating piston 720 is physically connected to the cam or other adjustment mechanism so that it is positioned in a predetermined position and remains stationary during operation of the drive piston 730. Thus, floating piston 720 does not float during operation of the massaging device.

[0058] In some embodiments, the lost motion system may be contained in the massaging head itself, or in an adaptor that connects between the piston and the massaging head. Thus, rather than having a cam in the housing of the massaging device, different applicator heads or adaptors having a set lost motion, or variable lost motion systems integral therein may be used. In some embodiments, such adaptors and massaging heads may be adapted with a quick-connect system similar to the ones described with respect to Figures 6 and 6A.

[0059] Figure 8 illustrates a simplified exemplary electrical schematic diagram 800 of an embodiment of a massaging device. The components disclosed as being on a particular circuit

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board may be on multiple circuit boards or individually mounted and hardwired to one another. Circuit board 801 includes memory 804, motor control circuitry 810 and fan control circuitry 816, which are in circuit communication with processor 802. Fan control circuitry 816 is in circuit communication with fan 817.

[0060] Power circuitry 812 may be included on circuit board 801 or may be located on its own external to the massager. Power circuitry 812 includes the necessary power conditioning circuitry to provide power to both the electronics and the motors. In circuit communication with power circuitry 812 is plug 814. Optionally two or more power circuits may be utilized. All of the connections between power circuitry 812 and the other components may not be shown in Figure 8; however, those skilled in the art have the required knowledge to provide power to the devices that require power. Motor control circuitry 810 is in circuit communication with drive motor 811. Drive motor 811 is used to drive the piston and massaging head as described above.

[0061] Memory 804 is a processor readable media and includes the necessary logic to operate the massaging device. Examples of different processor readable media include Flash Memory, Read-Only Memory (ROM), Random-Access Memory (RAM), programmable read-only memory (PROM), electrically programmable read-only memory (EPROM), electrically erasable programmable read-only memory (EEPROM), magnetic disk, and optically readable mediums, and others. Still further, the processes and logic described herein can be merged into one large process flow or divided into many sub-process flows. The order in which the process flows herein have been described is not critical and can be rearranged while still accomplishing the same results. Indeed, the process flows described herein may be rearranged, consolidated and/or reorganized in their implementation as warranted or desired.

[0062] In addition, processor 802 is in circuit communication with control panel 806. Control panel 806 includes any desired pushbuttons, dials, displays or the like. Control panel 806 provides the operator interface to operate and control the massaging device.

[0063] Processor 802 is also in circuit communication with data connection 820. Representative data connections 820 include an Ethernet wire, Bluetooth, WiFi, optical transmitter/reader, an IR reader and the like. Combinations of two or more different data connections 820 may be used.

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Data connection 820 may be used to transmit data to an outside device, such as, for example, a computer or hand-held portable device. Various uses for transmitting such data are described below.

[0064] In some embodiments, processor 802 includes logic to collect and store data related to use of the massaging device. Exemplary types of data may include usage rates, operating times or the like. In some embodiments, different massaging heads include an RFID chip and when inserted into the massaging device, an RFID reader (not shown) identifies and stores the type of massaging head utilized. In some embodiments, a customer number may be associated with the data. This data may be used to determine lease rates of the massaging device, for calculating cost/benefit analysis, or for setting up customized massages.

[0065] In some embodiments, data may be uploaded from a computer or hand-held portable device to the massaging device. Such data may include customized massaging programs tailored for individual needs. In some embodiments, the customized massaging program may be reflective of prior massages given to a customer that were particularly well-received by the customer.

[0066] In some embodiments, the customized massaging program may indicate to the user on a display on the control panel 806 massage times, locations, type of massage head to use or the like to ensure covering the desired locations with the customized massage.

[0067] While various inventive aspects, concepts and features of the inventions may be described and illustrated herein as embodied in combination in the exemplary embodiments, these various aspects, concepts and features may be used in many alternative embodiments, either individually or in various combinations and sub-combinations thereof. Unless expressly excluded herein all such combinations and sub-combinations are intended to be within the scope of the present inventions. Still further, while various alternative embodiments as to the various aspects, concepts and features of the inventions--such as alternative materials, structures, configurations, methods, circuits, devices and components, software, hardware, control logic, alternatives as to form, fit and function, and so on--may be described herein, such descriptions are not intended to be a complete or exhaustive list of available alternative embodiments, whether presently known or later developed. Those skilled in the art may readily adopt one or more of the inventive aspects,

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concepts or features into additional embodiments and uses within the scope of the present inventions even if such embodiments are not expressly disclosed herein. Additionally, even though some features, concepts or aspects of the inventions may be described herein as being a preferred arrangement or method, such description is not intended to suggest that such feature is required or necessary unless expressly so stated. Still further, exemplary or representative values and ranges may be included to assist in understanding the present disclosure; however, such values and ranges are not to be construed in a limiting sense and are intended to be critical values or ranges only if so expressly stated. Moreover, while various aspects, features and concepts may be expressly identified herein as being inventive or forming part of an invention, such identification is not intended to be exclusive, but rather there may be inventive aspects, concepts and features that are fully described herein without being expressly identified as such or as part of a specific invention. Descriptions of exemplary methods or processes are not limited to inclusion of all steps as being required in all cases, nor is the order that the steps are presented to be construed as required or necessary unless expressly so stated.

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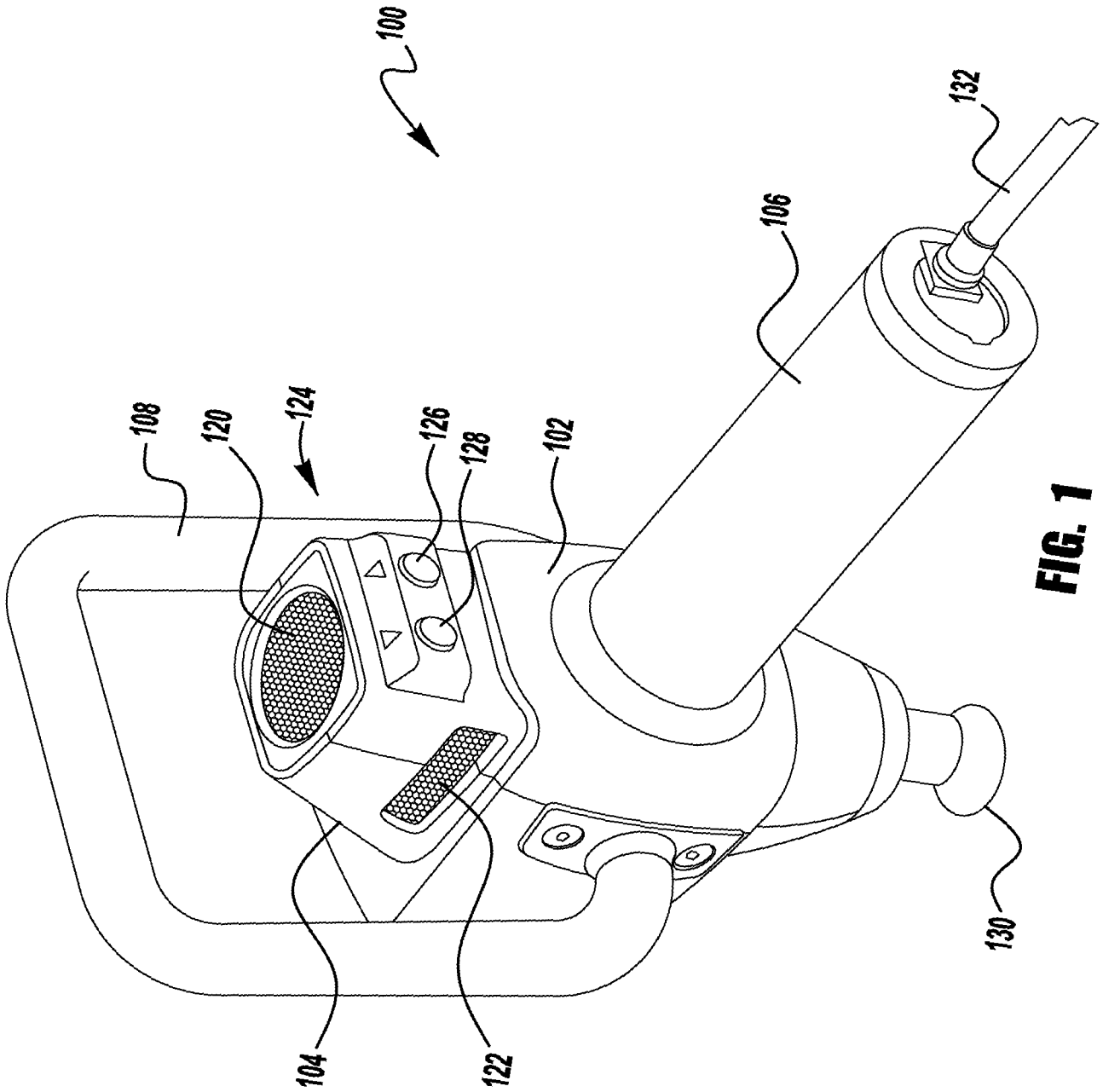


FIG. 1

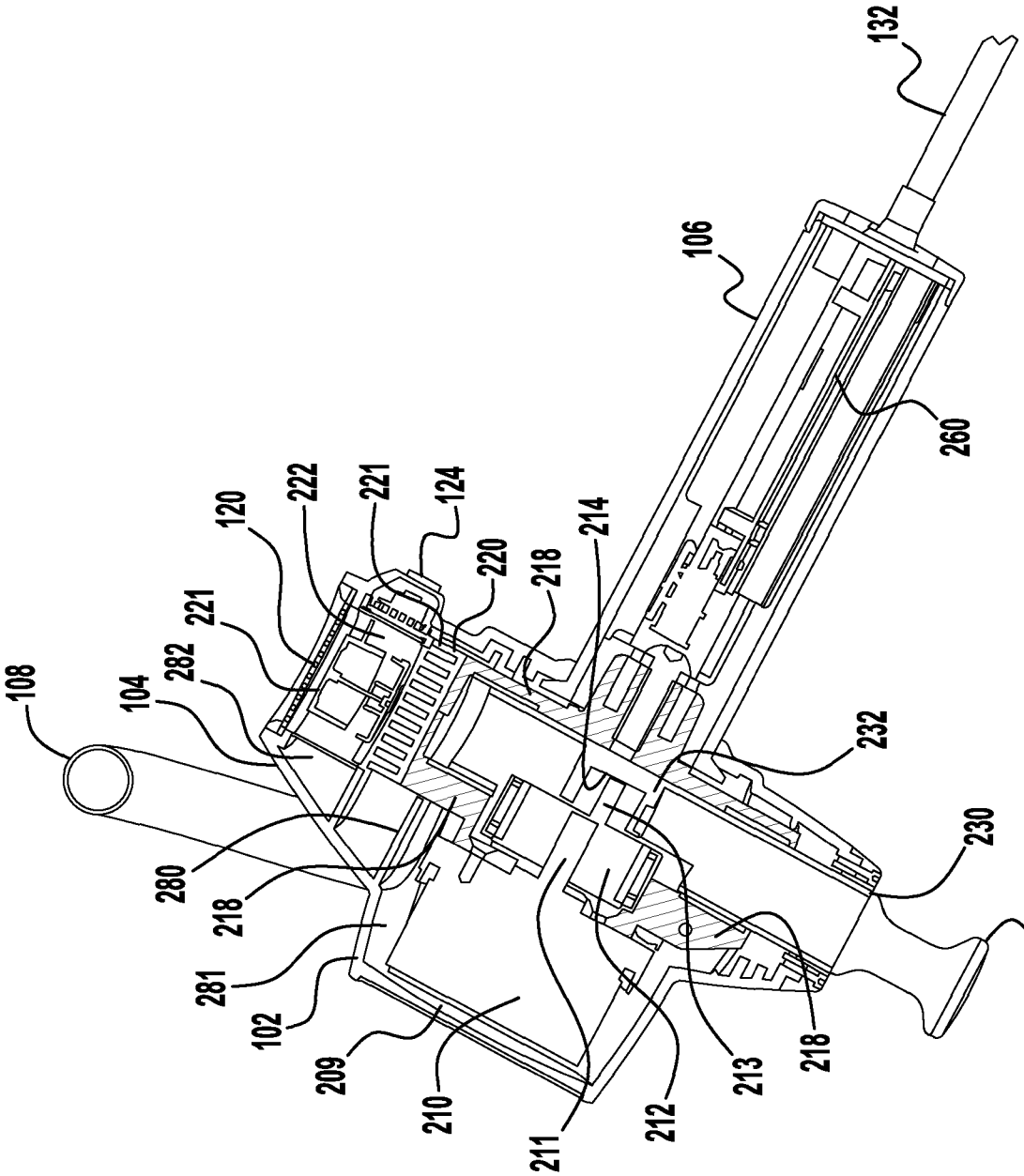

132
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260
120
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124
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FIG. 2

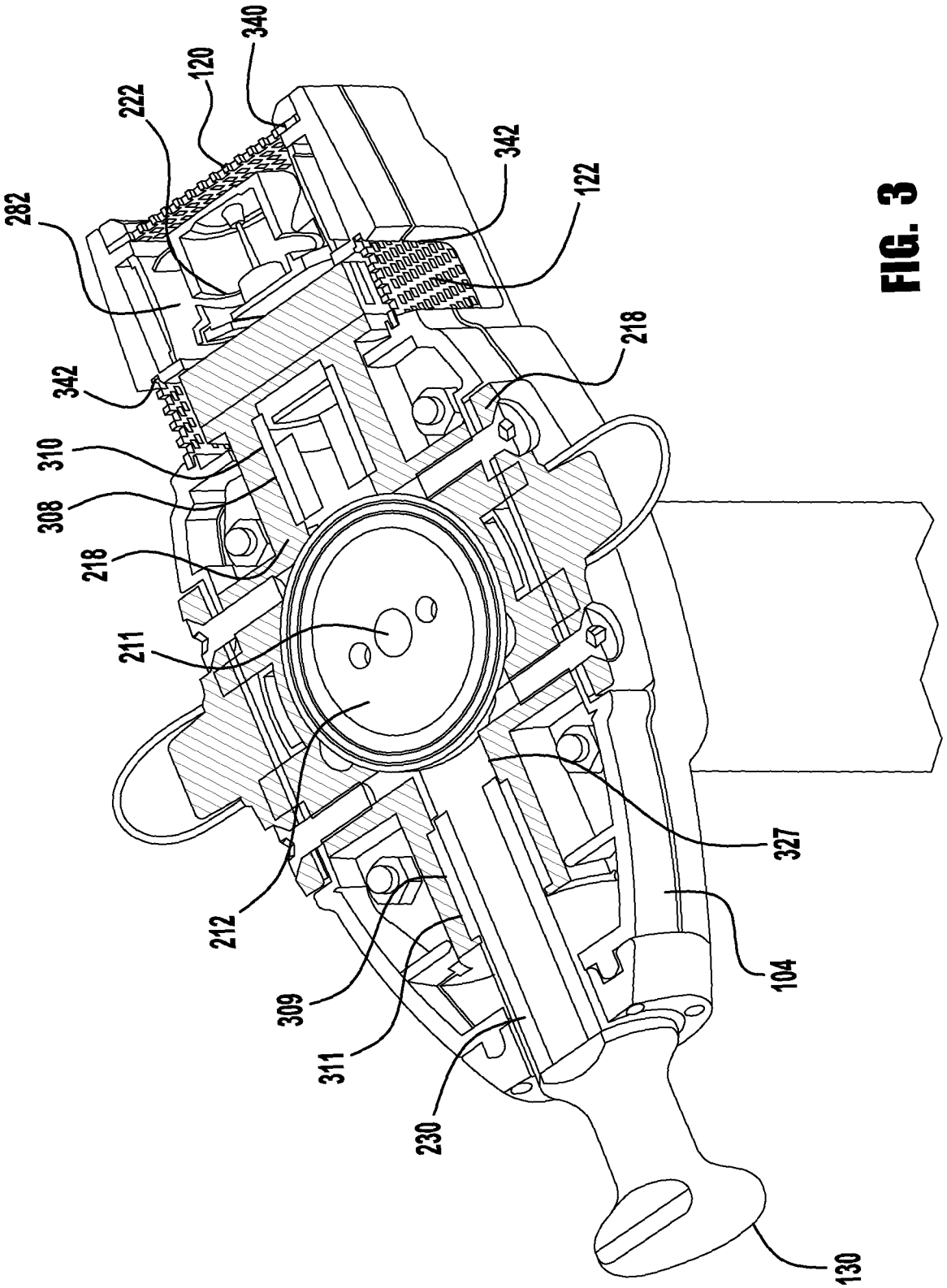

340
120
222
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122
282
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310
308
218
211
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104
309
311
230
130

FIG. 3

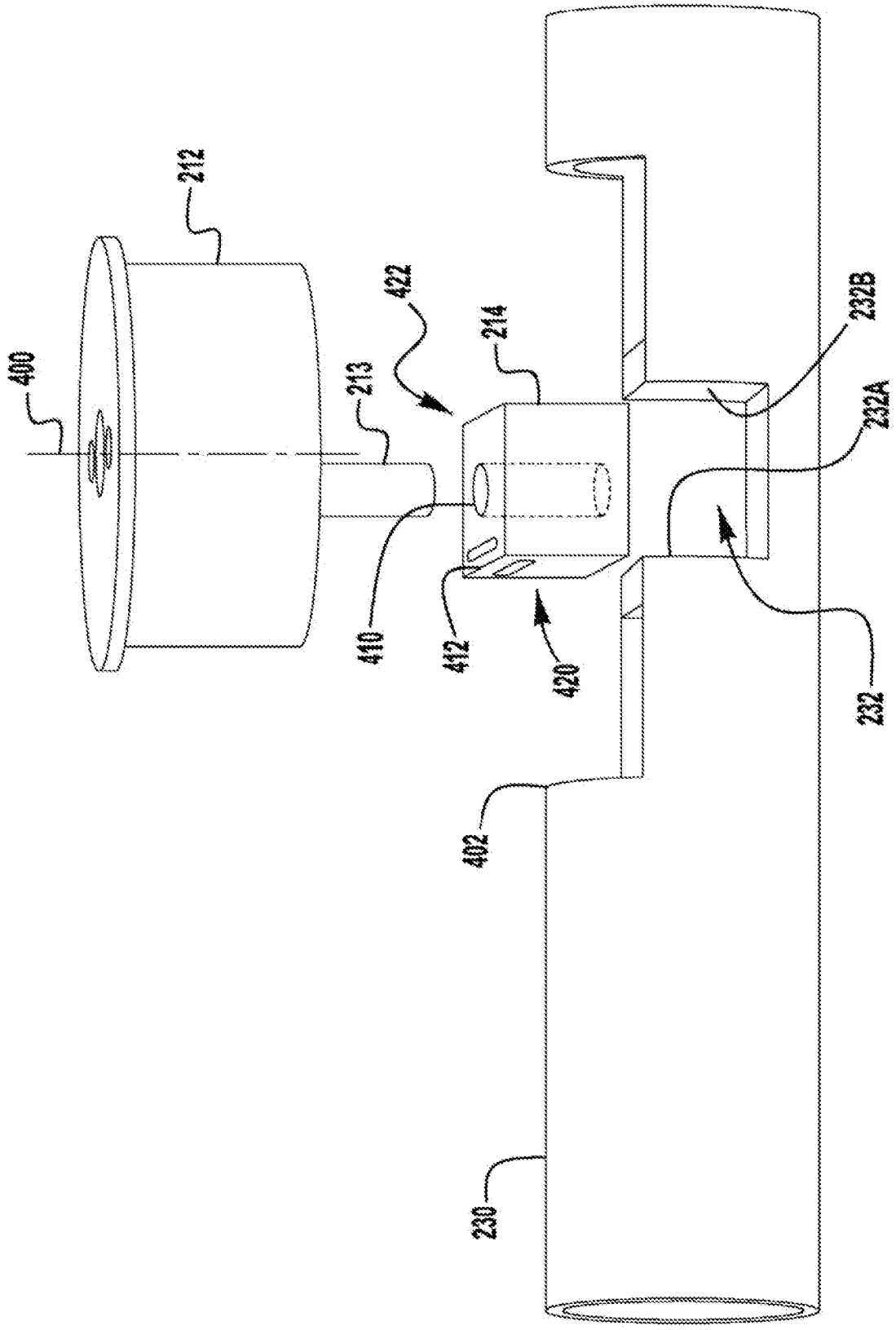


FIG. 4

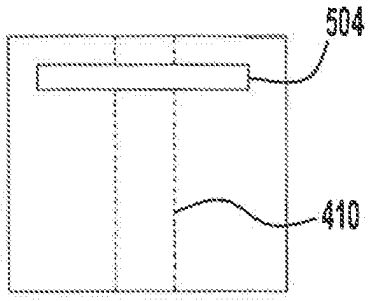


FIG. 5A

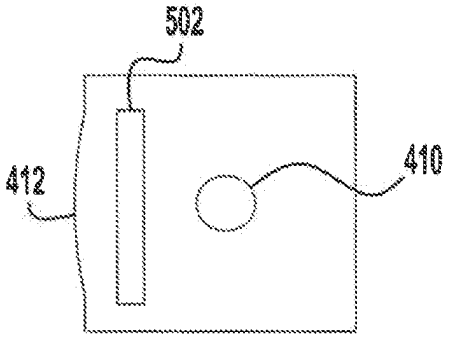


FIG. 5B

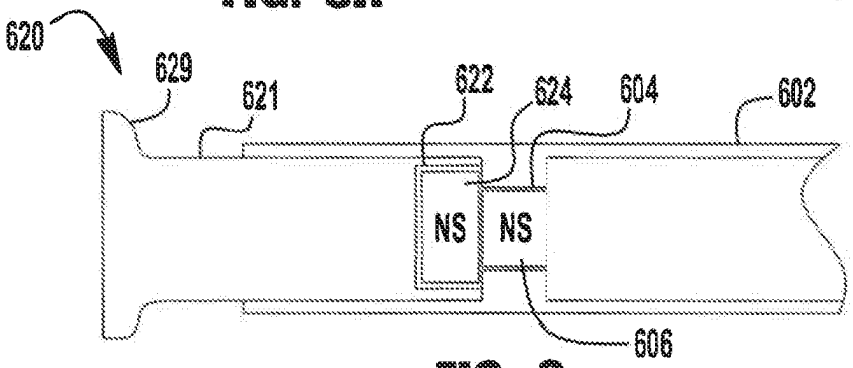


FIG. 6

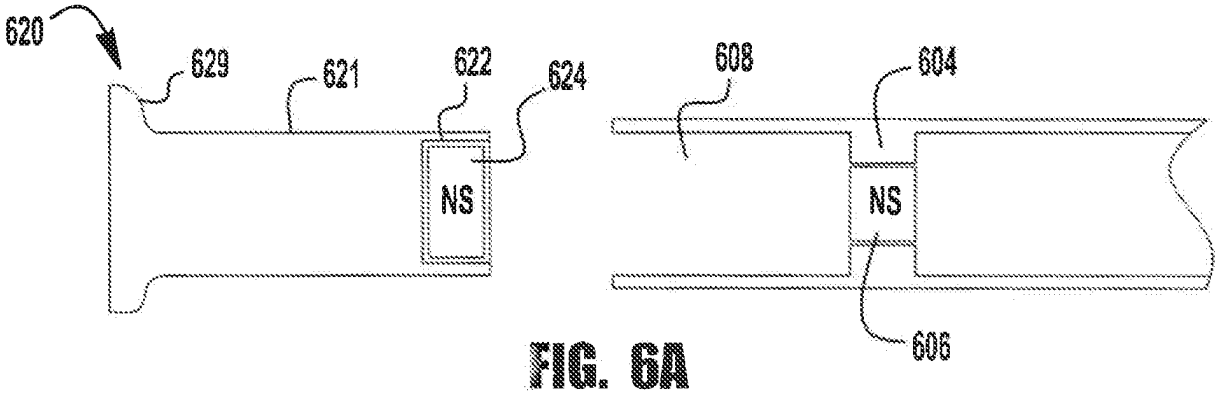


FIG. 6A

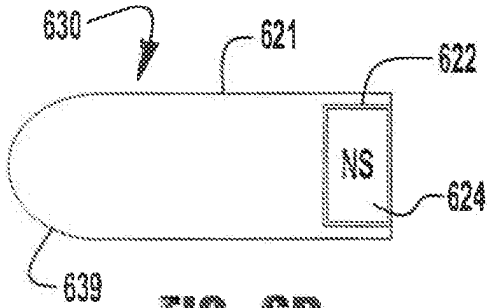


FIG. 6B

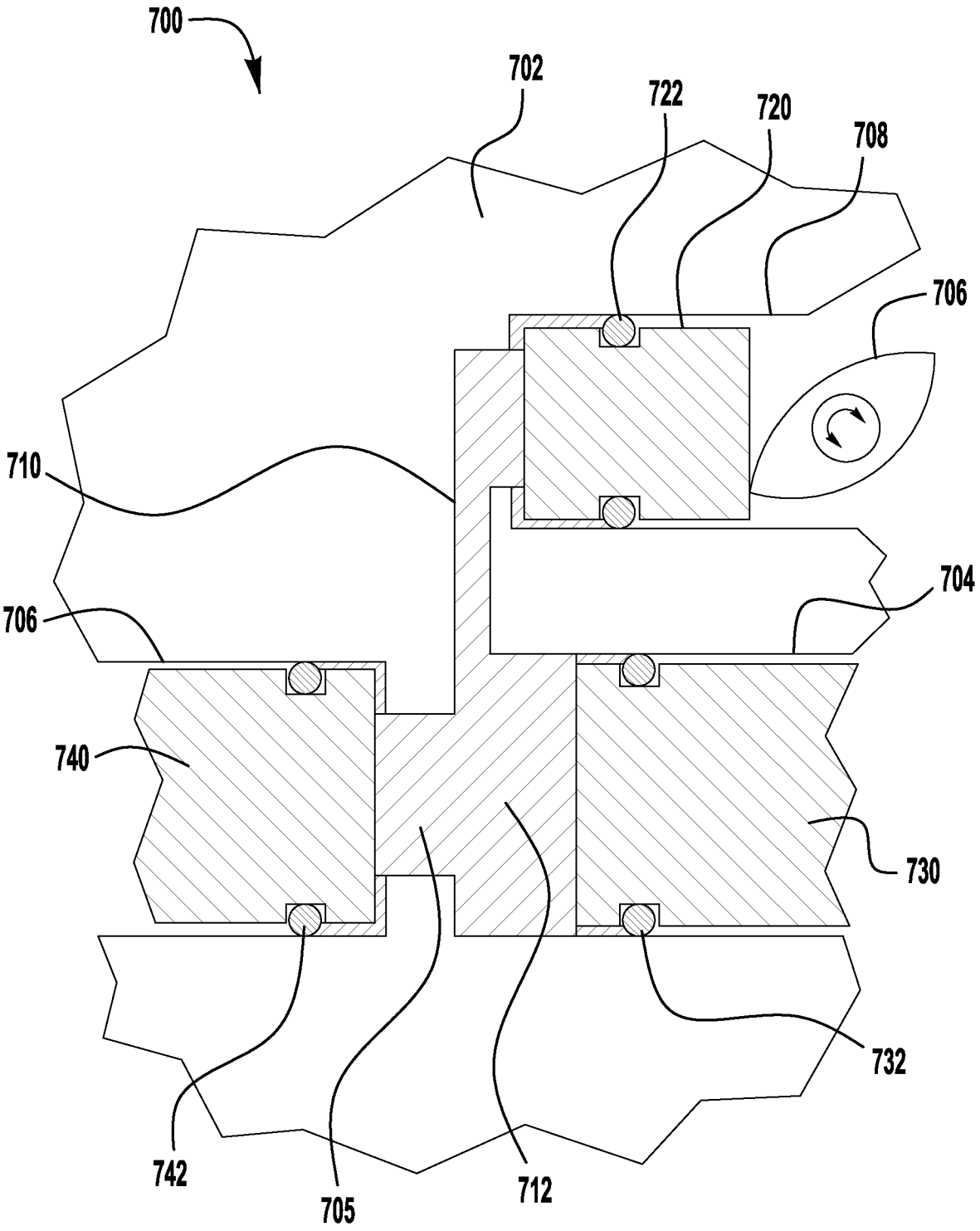


FIG. 7

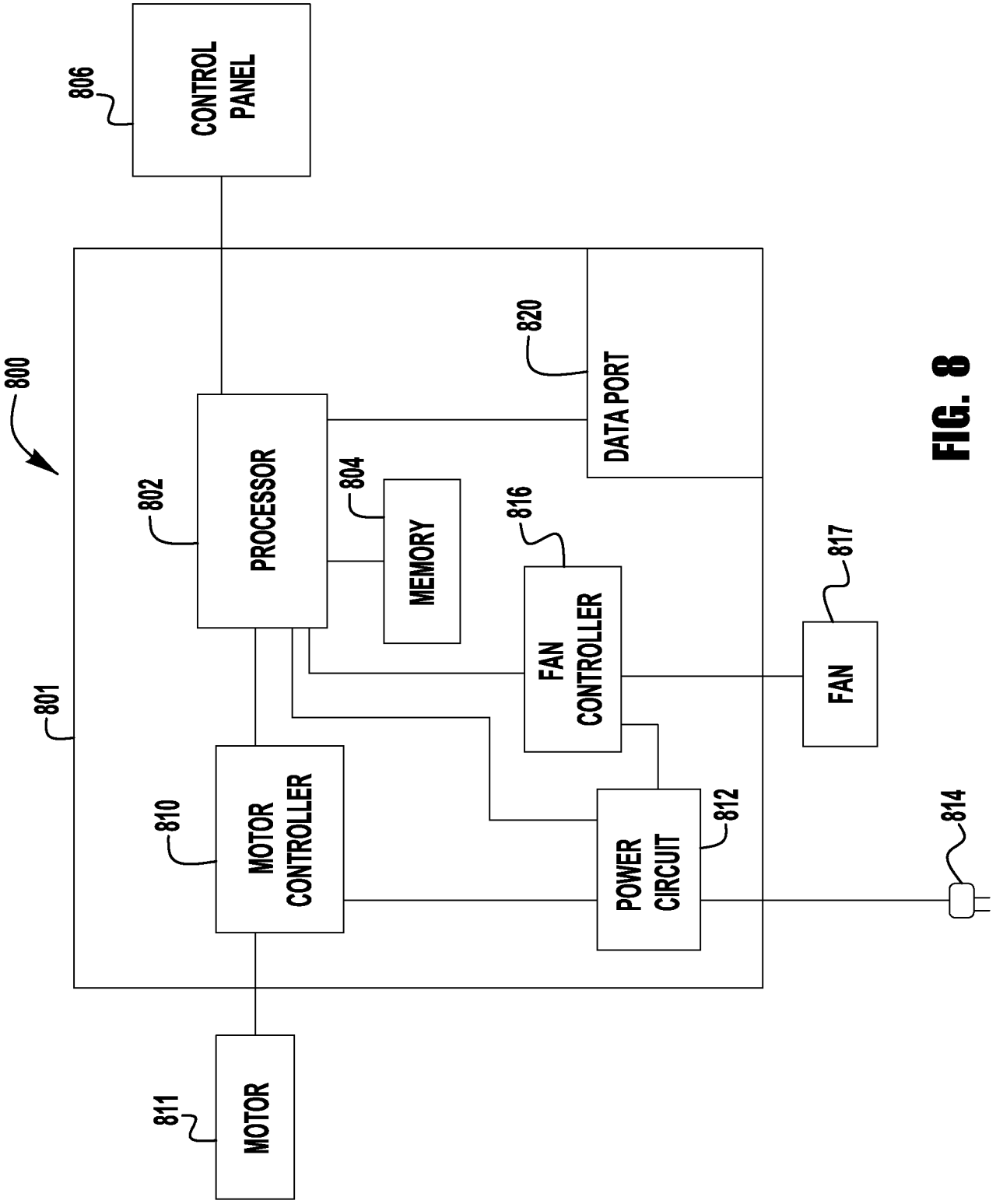

800
801
802
PROCESSOR
804
MEMORY
806
CONTROL PANEL
810
MOTOR CONTROLLER
811
MOTOR
812
POWER CIRCUIT
814
816
FAN CONTROLLER
817
FAN
820
DATA PORT

FIG. 8

ABSTRACT

Exemplary embodiments of massaging devices are disclosed herein. One exemplary embodiment includes a piston having a longitudinal axis, a massaging head connected to the piston, a motor located on a first side of the longitudinal axis and a handle located on a second side of the longitudinal axis. A drive mechanism for moving the piston and massage head is also included.

Petitioner Therabody Ex-1004, 0037

PTO/AIA/15 (10-17)
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	HYP-034C5
First Named Inventor	Philip C. Danby
Title	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH
Priority Mail Express® Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. [ ] **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. [X] **Applicant asserts small entity status.** See 37 CFR 1.27
3. [ ] **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. [X] **Specification** [*Total Pages* 18] Both the claims and abstract must start on a new page. *(See MPEP § 608.01(a) for information on the preferred arrangement)*
5. [X] **Drawing(s)** (35 U.S.C. 113) [*Total Sheets* 7]
6. **Inventor's Oath or Declaration** [*Total Pages* 2] *(including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))*
   a. [ ] Newly executed (original or copy)
   b. [X] A copy from a prior application (37 CFR 1.63(d))
7. [X] **Application Data Sheet** ** See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. **CD-ROM or CD-R** in duplicate, large table, or Computer Program (*Appendix*)
   [ ] Landscape Table on CD
9. **Nucleotide and/or Amino Acid Sequence Submission** (*if applicable, items a. – c. are required*)
   a. [ ] Computer Readable Form (CRF)
   b. [ ] Specification Sequence Listing on:
      i. [ ] CD-ROM or CD-R (2 copies); or
      ii. [ ] Paper
   c. [ ] Statements verifying identity of above copies

ADDRESS TO: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**

ACCOMPANYING APPLICATION PAPERS

10. [ ] **Assignment Papers** (cover sheet & document(s))
    Name of Assignee
11. [ ] **37 CFR 3.73(c) Statement** (*when there is an assignee*) [X] **Power of Attorney**
12. [ ] **English Translation Document** (*if applicable*)
13. [X] **Information Disclosure Statement** (PTO/SB/08 or PTO-1449)
    [ ] Copies of citations attached
14. [ ] **Preliminary Amendment**
15. [ ] **Return Receipt Postcard** (*MPEP § 503*) (*Should be specifically itemized*)
16. [ ] **Certified Copy of Priority Document(s)** (*if foreign priority is claimed*)
17. [X] **Nonpublication Request** Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. [X] **Other:** CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e)

***Note:** (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 **must** be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

19. CORRESPONDENCE ADDRESS

[X] The address associated with Customer Number: 162143 **OR** [ ] Correspondence address below

Name					
Address					
City		State		Zip Code	
Country		Telephone		Email	

Signature	/Sanjeet K. Dutta/	Date	November 20, 2023
Name (Print/Type)	Sanjeet K. Dutta	Registration No. (Attorney/Agent)	46,145

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PTO/SB/08a (07-09)
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Sheet 1 of 18

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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.	
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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	

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Sheet 2 of 18

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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, Kenichi	
	A22	US-4,149,530	04-17-1979	Gow	
	A23	US-4,150,668	04-24-1979	Johnston	
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	A25	US-4,173,217	11-06-1979	Johnston	
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	A27	US-4,505,267	03-19-1985	Inada	
	A28	US-4,513,737	04-30-1985	Mabuchi, Kenichi	
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	A30	US-4,549,535	10-29-1985	Wing, Thomas W.	
	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.	
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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		√

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Sheet 3 of 18

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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
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	A40	US-4,880,713	11-14-1989	Levine	
	A41	US-4,989,613	02-05-1991	Finkenberg	
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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		√

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

U. S. PATENT DOCUMENTS

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	A60	US-5,656,017	08-12-1997	Keller et al.	
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	A64	US-5,797,462	08-25-1998	Rahm	
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	A74	US-6,228,042	05-08-2001	Dungan, Thomas E.	
	A75	US-6,231,497	05-15-2001	Souder	
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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		√

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

U. S. PATENT DOCUMENTS

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	A78	US-6,402,710	06-11-2002	Hsu	
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	A91	US-6,663,657	12-16-2003	Miller	
	A92	US-6,682,496	01-27-2004	Pivaroff, Jake W.	
	A93	US-6,758,826	07-06-2004	Luettgen et al.	
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	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		√

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

U. S. PATENT DOCUMENTS

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	A99	US-7,033,329	04-25-2006	Liao	
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	A101	US-7,083,581	08-01-2006	Tsai	
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	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.	
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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	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet	7	of	18

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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.	

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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	

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

U. S. PATENT DOCUMENTS

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	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.	
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	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	
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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	√
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Sheet	9	of	18

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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	
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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]
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	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	√
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Sheet	10	of	18

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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-2008/0243039-A1	10-02-2008	Rhoades, Dean L.	
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	A175	US-2008/0306417-A1	12-11-2008	Imboden et al.	
	A176	US-2009/0000039-A1	01-01-2009	St. John et al.	
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	A187	US-2010/0274162-A1	10-28-2010	Evans	
	A188	US-2010/0331745-A1	12-30-2010	YAO	
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	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	√
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Petitioner Therabody Ex-1004, 0048

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 11 of 18

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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-2011/0169481-A1	07-14-2011	Nguyen et al.	
	A192	US-2012/0038483-A1	02-16-2012	DU et al.	
	A193	US-2012/0120573-A1	05-17-2012	BENTLEY	
	A194	US-2012/0253245-A1	10-04-2012	Stanbridge	
	A195	US-2012/0259255-A1	10-11-2012	TOMLINSON et al.	
	A196	US-2012/0281392-A1	11-08-2012	Workman et al.	
	A197	US-2013/0006040-A1	01-03-2013	Lee	
	A198	US-2013/0076271-A1	03-28-2013	SUDA et al.	
	A199	US-2013/0112451-A1	05-09-2013	KONDO et al.	
	A200	US-2013/0138023-A1	05-30-2013	Lerro	
	A201	US-2013/0261516-A1	10-03-2013	Cilea et al.	
	A202	US-2013/0281897-A1	10-24-2013	Hoffmann et al.	
	A203	US-2013/0294019-A1	11-07-2013	LaSota et al.	
	A204	US-2014/0014384-A1	01-16-2014	HORIE et al.	
	A205	US-2014/0094724-A1	04-03-2014	Freeman	
	A206	US-2014/0159507-A1	06-12-2014	Johnson et al.	
	A207	US-2015/0005682-A1	01-01-2015	Danby et al.	
	A208	US-2015/0148592-A1	05-28-2015	Kanbar et al.	
	A209	US-2016/0151238-A1	06-02-2016	Crunick et al.	

FOREIGN PATENT DOCUMENTS

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	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	

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Petitioner Therabody Ex-1004, 0049

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Sheet 12 of 18

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

U. S. PATENT DOCUMENTS

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	A210	US-2016/0271009-A1	09-22-2016	Giraud et al.	
	A211	US-2016/0354277-A1	12-08-2016	Fima	
	A212	US-2016/0367425-A1	12-22-2016	Wersland	
	A213	US-2017/0012257-A1	01-12-2017	Wackwitz et al.	
	A214	US-2017/0027798-A1	02-02-2017	Wersland, Jason	
	A215	US-2017/0028160-A1	02-02-2017	OLIVER	
	A216	US-2017/0304145-A1	10-26-2017	Pepe	
	A217	US-2018/0008512-A1	01-11-2018	Goldstein	
	A218	US-2018/0200141-A1	07-19-2018	Wersland et al.	
	A219	US-2019/0125972-A1	05-02-2019	Srinivasan et al.	
	A220	US-2019/0198828-A1	06-27-2019	Zanon et al.	
	A221	US-2020/0093945-A1	03-26-2020	JEONG	
	A222	US-2020/0128935-A1	04-30-2020	Turner	
	A223	US-2020/0261306-A1	08-20-2020	Pepe	
	A224	US-2020/0261307-A1	08-20-2020	Wersland et al.	
	A225	US-2020/0329858-A1	10-22-2020	KATANO et al.	
	A226	US-D323034	01-07-1992	Reinstein	
	A227	US-D323606	02-04-1992	Chang	
	A228	US-D329292	09-08-1992	Wollman	

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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-2003-11328-Y1	05-01-2003	Jong Tae Park	Engl. Abstract	
	B69**	KR-20030008342-A	01-25-2003	Kim, Sa Ung	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	

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Sheet	13	of	18

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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-D331467	12-01-1992	Wollman	
	A230	US-D335073	04-27-1993	Anthony et al.	
	A231	US-D367712	03-05-1996	Young	
	A232	US-D373640	09-10-1996	Young	
	A233	US-D378338	03-11-1997	Acciville et al.	
	A234	US-D388175	12-23-1997	Lie	
	A235	US-D403220	12-29-1998	Kimata et al.	
	A236	US-D407498	03-30-1999	Cooper	
	A237	US-D408241	04-20-1999	Jansson	
	A238	US-D437713	02-20-2001	Young	
	A239	US-D438309	02-27-2001	Young	
	A240	US-D455837	04-16-2002	Kim	
	A241	US-D460675	07-23-2002	Morgan	
	A242	US-D467148	12-17-2002	Flickinger	
	A243	US-D474089	05-06-2003	Huang	
	A244	US-D487219	03-02-2004	Chudy et al.	
	A245	US-D498128	11-09-2004	Sterling	
	A246	US-D536591	02-13-2007	Ghode et al.	
	A247	US-D544102	06-05-2007	Pivaroff	

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		√

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Sheet 14 of 18

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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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-D555255	11-13-2007	Masuda	
	A249	US-D625164	10-12-2010	Aglassinger	
	A250	US-D703337	04-22-2014	Fuhr et al.	
	A251	US-D706433	06-03-2014	Fuhr et al.	
	A252	US-D725978	04-07-2015	Uematsu et al.	
	A253	US-D738516	09-08-2015	Karim	
	A254	US-D752936	04-05-2016	King et al.	
	A255	US-D757953	05-31-2016	Philips	
	A256	US-D759831	06-21-2016	Levi et al.	
	A257	US-D823478	07-17-2018	Park	
	A258	US-D825073	08-07-2018	Lenke	
	A259	US-D827842	09-04-2018	Bainton et al.	
	A260	US-D827843	09-04-2018	Bainton et al.	
	A261	US-D840032	02-05-2019	Clifford et al.	
	A262	US-D842491	03-05-2019	Fleming et al.	
	A263	US-D869928	12-17-2019	Hsiao	
	A264	US-D879290	03-24-2020	Harman et al.	
	A265	US-RE30500	02-03-1981	Springer et al.	

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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		√
	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		

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Sheet 15 of 18

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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	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		

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Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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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

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	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		

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Sheet	17	of	18

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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=pI-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.	

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*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.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet	18	of	18

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

NON PATENT LITERATURE DOCUMENTS

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	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	

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DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	MASSAGING DEVICE

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____

filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

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LEGAL NAME OF INVENTOR

Inventor: Philip C. Danby Date (Optional): June 28 2013

Signature: Philip Danby

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Title of Invention	MASSAGING DEVICE

As the below named inventor, I hereby declare that:

This declaration is directed to:

- [■] The attached application, or
- [ ] United States application or PCT international application number _____ filed on _____.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

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LEGAL NAME OF INVENTOR

Inventor: John Charles Danby Date (Optional): 29/6/2013

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HYP-034C5
	Application Number	
Title of Invention	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
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☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Philip	C.	Danby	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Key Biscayne	State/Province	FL	Country of Residence i	US

Mailing Address of Inventor:

Address 1	177 Ocean Lane Drive, Apt. 1200		
Address 2			
City	Key Biscayne	State/Province	FL
Postal Code	33149	Country i	US

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	John	Charles	Danby	

Residence Information (Select One) ○ US Residency ◉ Non US Residency ○ Active US Military Service

City	Witham	Country of Residence i	GB

Mailing Address of Inventor:

Address 1	15 Elgar Drive		
Address 2			
City	Witham	State/Province	
Postal Code	CM81DS	Country i	GB

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HYP-034C5
	Application Number	
Title of Invention	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ **An Address is being provided for the correspondence Information of this application.**			
Customer Number	162143		
Email Address	us-patentbos@goodwinlaw.com	Add Email	Remove Email

Application Information:

Title of the Invention	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH		
Attorney Docket Number	HYP-034C5	**Small Entity Status Claimed**	☒
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	7	**Suggested Figure for Publication (if any)**	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☒ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	162143		

PTO/AIA/14 (01-22)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HYP-034C5
	Application Number	
Title of Invention	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	18/466702	2023-09-13
Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
18/466702	Continuation of	17/681367	2022-02-25
Prior Application Status	Patented		Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
17/681367	Continuation of	15/892665	2018-02-09	11285075	2022-03-29
Prior Application Status	Patented				Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15/892665	Continuation of	14/317573	2014-06-27	9889066	2018-02-13
Prior Application Status	Expired				Remove

Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
14/317573	Claims benefit of provisional	61/841693	2013-07-01

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

PTO/AIA/14 (01-22)
Approved for use through 05/31/2024. OMB 0651-0032
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.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HYP-034C5
	Application Number	
Title of Invention	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HYP-034C5
	Application Number	
Title of Invention	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HYP-034C5
	Application Number	
Title of Invention	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

(•) Assignee	( ) Legal Representative under 35 U.S.C. 117	( ) Joint Inventor
( ) Person to whom the inventor is obligated to assign.	( ) Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:

If the Applicant is an Organization check here. [X]

Organization Name	HYPERICE IP SUBCO, LLC		
Mailing Address Information For Applicant:			
Address 1	525 Technology Drive, Suite 100		
Address 2			
City	Irvine	**State/Province**	CA
Country	US	Postal Code	92618
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HYP-034C5
	Application Number	
Title of Invention	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1			
Address 2			
City		**State/Province**	
Country i		Postal Code	
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Sanjeet K. Dutta/			Date (YYYY-MM-DD)	2023-11-20
First Name	Sanjeet	Last Name	Dutta	Registration Number	46,145

Additional Signature may be generated within this form by selecting the Add button. Add

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Approved for use through 05/31/2024. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	HYP-034C5
	Application Number	
Title of Invention	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1 The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3 A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent CooperationTreaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
18/515,112	11/20/2023		664	HYP-034C5	18	2

CONFIRMATION NO. 2915

FILING RECEIPT

162143
GOODWIN PROCTER LLP/SILICON VALLEY
PATENT ADMINISTRATOR
100 NORTHERN AVENUE
BOSTON, MA 02210

OC00000065400475

Date Mailed: 12/06/2023

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Philip C. Danby, Key Biscayne, FL;
John Charles Danby, Witham, UNITED KINGDOM;

Applicant(s)

HYPERICE IP SUBCO, LLC, Irvine, CA;

Power of Attorney: The patent practitioners associated with Customer Number 162143

Domestic Priority data as claimed by applicant

This application is a CON of 18/466,702 09/13/2023
which is a CON of 17/681,367 02/25/2022
which is a CON of 15/892,665 02/09/2018 PAT 11,285,075
which is a CON of 14/317,573 06/27/2014 PAT 9,889,066
which claims benefit of 61/841,693 07/01/2013

Foreign Applications for which priority is claimed (You may be eligible to benefit from the Patent Prosecution Highway program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Petitioner Therabody Ex-1004, 0068

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 12/04/2023

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 18/515,112**

Projected Publication Date: Request for Non-Publication Acknowledged

Non-Publication Request: Yes

Early Publication Request: No
**** SMALL ENTITY ****
Title

MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

Petitioner Therabody Ex-1004, 0069

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop

Petitioner Therabody Ex-1004, 0070

technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

Petitioner Therabody Ex-1004, 0071

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 18/515,112

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	64		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	280		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	320		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	18 minus 20 =	* 0	x =	0	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*	x =	0			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	664		TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)	OR	RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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Kathi Vidal

Kathi Vidal
Under Secretary of Commerce for Intellectual Property and
Director of the United States Patent and Trademark Office

Derrick Brent
Deputy Under Secretary of Commerce for Intellectual Property and
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/515,112	11/20/2023	Philip C. Danby	HYP-034C5	2915

162143 7590 12/26/2023

GOODWIN PROCTER LLP/SILICON VALLEY
PATENT ADMINISTRATOR
100 NORTHERN AVENUE
BOSTON, MA 02210

EXAMINER
CENTRAL, DOCKET

ART UNIT	PAPER NUMBER
3785	

NOTIFICATION DATE	DELIVERY MODE
12/26/2023	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

JGoodwin@goodwinlaw.com
TFRANKLIN@GOODWINLAW.COM
US-PatentBos@goodwinlaw.com

Petitioner Therabody Ex-1004, 0074

Decision Granting Request for Prioritized Examination (Track I)	**Application No.** 18/515,112	**Applicant(s)** Danby et al.	
	Examiner FIKIRTE A GEREMEW	**Art Unit** OMBL	**AIA (FITF) Status** Yes

1. THE REQUEST FILED 20 November 2023 IS **GRANTED** .

The above-identified application has met the requirements for prioritized examination

A. ☑ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination**. The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;

B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims** , or a multiple dependent claim;

C. filing a **request for continued examination** ;

D. filing a notice of appeal;

E. filing a request for suspension of action;

F. mailing of a notice of allowance;

G. mailing of a final Office action;

H. completion of examination as defined in 37 CFR 41.102; or

I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to FIKIRTE GEREMEW at (703) 756-1930. In his/her absence, calls may be directed to Petition Help Desk at (571) 272-3282.

/FIKIRTE A GEREMEW/ PROGRAM SUPPORT ASSISTANT, OMBL	

Petitioner Therabody Ex-1004, 0075

Notice of References Cited	Application/Control No. 18/515,112	Applicant(s)/Patent Under Reexamination Danby et al.	
	Examiner TIMOTHY A STANIS	Art Unit 3785	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Name	CPC Classification	US Classification
*	A	US-1269803-A	1918-06-18	Name not available	A61H23/0254	601/108
*	B	US-2078025-A	1937-04-20	SAMUELS ABE O	A61H23/0218	601/81
*	C	US-3837335-A	1974-09-24	Teranishi; Akihiko	A61H23/0254	601/103
*	D	US-4079733-A	1978-03-21	Denton; Robert C.	A61H23/0254	601/108
	E					
	F					
	G					
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date YYYY-MM-DD	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in YYYY-MM-DD format are publication dates. Classifications may be US or foreign.

Petitioner Therabody Ex-1004, 0076

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
L1	60	((US-1269803-A OR US-1339179-A OR US-1657765-A OR US-2078025-A OR US-3626934-A OR US-3710785-A OR US-4088128-A OR US-4513737-A OR US-4549535-A OR US-4566442-A OR US-4716890-A OR US-4827914-A OR US-4841955-A OR US-4858600-A OR US-4858599-A OR US-5085207-A OR US-5140979-A OR US-5327887-A OR US-5447491-A OR US-5925002-A OR US-6228042-B1 OR US-5803916-A OR US-6379375-B1 OR US-6478755-B2 OR US-6503211-B2 OR US-6537236-B2 OR US-6616621-B1 OR US-6663657-B1 OR US-6682496-B1 OR US-6723060-B2 OR US-7503923-B2 OR US-7927259-B1 OR US-7927294-B2 OR US-3837335-A OR US-4079733-A OR US-6165145-A).did. AND USPT.dbnm.) OR ((US-20020072693-A1 OR US-20020082536-A1 OR US-20030195443-A1 OR US-20060047315-A1 OR US-20060155197-A1 OR US-20060178715-A1 OR US-20060293711-A1 OR US-20070150004-A1 OR US-20070144310-A1 OR US-20070270727-A1 OR US-20080306417-A1 OR US-20100185127-	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/12 03:40 PM

Petitioner Therabody Ex-1004, 0077

		A1 OR US-20100312155-A1 OR US-20100274162-A1 OR US-20110118638-A1 OR US-20130138023-A1 OR US-20130261516-A1 OR US-20130281897-A1 OR US-20140094724-A1 OR US-20140114220-A1 OR US-20140194790-A1 OR US-20150305972-A1 OR US-20160367425-A1 OR US-20180200141-A1).did. AND PGPB.dbnm.)					
L2	106	((US-5085207-A OR US-5300095-A OR US-6902525-B1 OR US-4549535-A OR US-4790296-A OR US-6503211-B2 OR US-4716890-A OR US-7927259-B1 OR US-7503923-B2 OR US-6682496-B1 OR US-6537236-B2 OR US-6478755-B2 OR US-6228042-B1 OR US-5925002-A OR US-5447491-A OR US-5327887-A OR US-5140979-A OR US-4827914-A OR US-1657765-A OR US-4566442-A OR US-4513737-A OR US-4088128-A OR US-3626934-A OR US-3710785-A OR US-2078025-A OR US-1339179-A OR US-1269803-A OR US-4841955-A OR US-6357125-B1 OR US-4137632-A OR US-4031763-A OR US-4236874-A OR US-4245966-A OR US-4261228-A OR US-5134777-A OR US-5581896-A OR US-7658012-B2 OR US-6616621-B1 OR US-6432072-B1 OR US-	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/12 03:43 PM

Petitioner Therabody Ex-1004, 0078

		5935089-A OR US-10314762-B1 OR US-7144417-B2 OR US-4730605-A OR US-6758826-B2 OR US-7354408-B2 OR US-10201470-B2 OR US-10653581-B2 OR US-10603208-B2).did. AND USPT.dbnm.) OR ((US-20060025710-A1 OR US-20090005812-A1 OR US-20090270915-A1 OR US-20060293711-A1 OR US-20020177795-A1 OR US-20180200141-A1 OR US-20130338550-A1 OR US-20140094724-A1 OR US-20110118638-A1 OR US-20070150004-A1 OR US-20030195443-A1 OR US-20130261516-A1 OR US-20140194900-A1 OR US-20160151238-A1 OR US-20120253245-A1 OR US-20020183668-A1 OR US-20020115947-A1 OR US-20060178715-A1 OR US-20070167888-A1 OR US-20050113724-A1 OR US-20070179414-A1 OR US-20130102937-A1 OR US-20140135875-A1 OR US-20140180181-A1 OR US-20080243039-A1 OR US-20130060176-A1 OR US-20190262607-A1 OR US-20210077340-A1 OR US-20050113870-A1 OR US-20150305969-A1 OR US-20040049137-A1 OR US-20060135319-A1 OR US-20170304144-A1 OR US-20180280675-A1 OR US-20130158547-A1 OR US-20140371690-A1 OR US-					

Petitioner Therabody Ex-1004, 0079

		20150005682-A1 OR US-20150182078-A1 OR US-20150182290-A1 OR US-20170172837-A1 OR US-20220085628-A1 OR US-20060253051-A1 OR US-20080319357-A1 OR US-20140288364-A1 OR US-20200085684-A1 OR US-20170087041-A1 OR US-20030009116-A1 OR US-20030028134-A1 OR US-20030149381-A1 OR US-20050222525-A1 OR US-20100137760-A1 OR US-20150005679-A1 OR US-20170304145-A1 OR US-20200085675-A1 OR US-20100274162-A1 OR US-20200390644-A1 OR US-20060058714-A1 OR US-20190365598-A1).did. AND PGPB.dbnm.) OR ((US-2704941-A OR US-3398588-A OR US-1657765-A OR US-1339179-A).did. AND USOC.dbnm.) OR ((CN-109842256-A).did. AND FTDB.dbnm.)					
L3	1334	a61h23/0254.cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:01 AM
L4	474	a61h2201/0107,0153,0157,1215,1418,149,1664,5005,501.cpc. AND percuss$3	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:01 AM
L5	1960	a61h$.cpc. AND ((interchang$4 OR replac$5 OR remov$4) WITH head)	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:02 AM
L6	997	a61h$.cpc. AND massag$3 AND ((interchang$4 OR replac$5 OR remov$4) WITH head)	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:02 AM
L7	41	(Philip WITH Danby OR John WITH Danby).in.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:05 AM
L8	6	(Philip WITH Danby OR John WITH Danby).in.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:06 AM

Petitioner Therabody Ex-1004, 0080

		AND while.clm.					
L9	1	"11857482".pn.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:08 AM
L10	1414	((interchang$4 OR replac$5 OR remov$4) WITH ((massag$3 OR treatment) near3 head))	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:10 AM
L11	989	a61h2201/1685.cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:14 AM
L12	1140	a61h23/00.cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:15 AM
L13	699	a61h23/006.cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:15 AM
L14	1073	a61h2201/0107.cpc.	(US-PGPUB; USPAT)	OR	ON	ON	2024/01/13 09:16 AM

PE2E SEARCH - Search History (Interference)

There are no Interference searches to show.

Petitioner Therabody Ex-1004, 0081

Bibliographic Data

Application No: 18/515,112

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☑ No ☐ Met After Allowance

Verified and Acknowledged: /TIMOTHY A STANIS/ Examiner's Signature | Initials

Title: MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
11/20/2023	601	3785	HYP-034C5
RULE			

APPLICANTS

HYPERICE IP SUBCO, LLC, Irvine, CA, UNITED STATES

INVENTORS

Philip C. Danby, Key Biscayne, FL, UNITED STATES

John Charles Danby, Witham, UNITED KINGDOM

CONTINUING DATA

This application is a CON of 18466702 09/13/2023

18466702 is a CON of 17681367 02/25/2022 PAT 11857482 Yes /TS/ 1/12/24

17681367 is a CON of 15892665 02/09/2018 PAT 11285075

15892665 is a CON of 14317573 06/27/2014 PAT 9889066

14317573 has PRO of 61841693 07/01/2013

FOREIGN APPLICATIONS None /TS/ 1/12/24

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
18/515,112	11/20/2023	Philip C. Danby	HYP-034C5	2915

162143 7590 01/19/2024

GOODWIN PROCTER LLP/SILICON VALLEY
PATENT ADMINISTRATOR
100 NORTHERN AVENUE
BOSTON, MA 02210

EXAMINER	
STANIS, TIMOTHY A	

ART UNIT	PAPER NUMBER
3785	

NOTIFICATION DATE	DELIVERY MODE
01/19/2024	ELECTRONIC

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JGoodwin@goodwinlaw.com
TFRANKLIN@GOODWINLAW.COM
US-PatentBos@goodwinlaw.com

Petitioner Therabody Ex-1004, 0084

Office Action Summary	Application No. 18/515,112	Applicant(s) Danby et al.	
	Examiner TIMOTHY A STANIS	Art Unit 3785	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 11/20/2023.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-18 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-18 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 11/20/2023 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

1. This office action is in response to the filling of the application on 11/20/2023. Since the initial filing, no claims have been amended, added, or canceled. Thus, claims 1-18 are pending in the application.

Information Disclosure Statement

2. The information disclosure statement filed 11/20/2023 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. The current application and its family of applications (Application Nos. 14/317573, 15/892,665, 16/657,525, 17/681,367, and 18/466,702) do not provide a legible copy of every foreign patent document cited in the IDS of 11/20/2023. The following reference(s) have been placed in the application file, but the information referred to therein has not been considered:

- JP 5859905

Claim Interpretation- 35 USC § 112 – Sixth Paragraph/35 USC § 112(f)

3. The following is a quotation of 35 U.S.C. 112(f):

> (f) Element in Claim for a Combination. – An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The following is a quotation of pre-AIA 35 U.S.C. 112, sixth paragraph:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

The claims in this application are given their broadest reasonable interpretation using the plain meaning of the claim language in light of the specification as it would be understood by one of ordinary skill in the art. The broadest reasonable interpretation of a claim element (also commonly referred to as a claim limitation) is limited by the description in the specification when 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is invoked.

As explained in MPEP § 2181, subsection I, claim limitations that meet the following three-prong test will be interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph:

(A) the claim limitation uses the term "means" or "step" or a term used as a substitute for "means" that is a generic placeholder (also called a nonce term or a non-structural term having no specific structural meaning) for performing the claimed function;

(B) the term "means" or "step" or the generic placeholder is modified by functional language, typically, but not always linked by the transition word "for" (e.g., "means for") or another linking word or phrase, such as "configured to" or "so that"; and

(C) the term "means" or "step" or the generic placeholder is not modified by sufficient structure, material, or acts for performing the claimed function.

Use of the word "means" (or "step") in a claim with functional language creates a rebuttable presumption that the claim limitation is to be treated in accordance with 35

U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites sufficient structure, material, or acts to entirely perform the recited function.

Absence of the word "means" (or "step") in a claim creates a rebuttable presumption that the claim limitation is not to be treated in accordance with 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph. The presumption that the claim limitation is not interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, is rebutted when the claim limitation recites function without reciting sufficient structure, material or acts to entirely perform the recited function.

Claim limitations in this application that use the word "means" (or "step") are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action. Conversely, claim limitations in this application that do not use the word "means" (or "step") are not being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, except as otherwise indicated in an Office action.

4. This application includes one or more claim limitations that do not use the word "means," but are nonetheless being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, because the claim limitation(s) uses a generic placeholder that is coupled with functional language without reciting sufficient structure to perform the recited function and the generic placeholder is not preceded by a structural modifier. Such claim limitation(s) is/are:

- "a drive mechanism" (claim 1, ln. 6; claim 18, ln. 5)

Because this/these claim limitation(s) is/are being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, it/they is/are being interpreted to cover the corresponding structure described in the specification as performing the claimed function, and equivalents thereof.

If applicant does not intend to have this/these limitation(s) interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph, applicant may: (1) amend the claim limitation(s) to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph (e.g., by reciting sufficient structure to perform the claimed function); or (2) present a sufficient showing that the claim limitation(s) recite(s) sufficient structure to perform the claimed function so as to avoid it/them being interpreted under 35 U.S.C. 112(f) or pre-AIA 35 U.S.C. 112, sixth paragraph.

5. The term "drive mechanism" does **not** invoke 35 USC 112(f) in claim 7 (ln. 2) because the claim recites sufficient structure to perform the function of controlling a predetermined stroke length of the piston (i.e. the claimed "flywheel" and "crank pin")

Claim Rejections - 35 USC § 112

6. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 18 is rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the

subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.

Regarding claim 18, the limitation "wherein a drive mechanism controls a predetermined stroke length of the piston" (ln. 5) is unclear if this is a step in the "method of assembling a percussive massager" or is some type of structural limitation with an unknown connection to the method. For the purposes of examination, the limitation will be interpreted as a method step. The following is a language suggestion to overcome the rejection: --providing a drive mechanism configured to control a predetermined stroke length of the piston--.

Similarly, the limitation --wherein a quick-connect system comprising the distal end of the piston and a first massaging head is configured to have a proximal end of the first massaging head inserted into or removed from the bore while the piston reciprocates the predetermined stroke length at the first speed" (ln. 6-9) is unclear if this is a step in the "method of assembling a percussive massager" or is some type of structural limitation with an unknown connection to the method. For the purposes of examination, the limitation will be interpreted as a method step. The following is a language suggestion to overcome the rejection: --providing a quick-connect system comprising the distal end of the piston and a first massaging head, wherein a proximal end of the first massaging head is configured to be inserted into or removed from the bore while the piston reciprocates the predetermined stroke length at the first speed--.

Double Patenting

8. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the

unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The filing of a terminal disclaimer by itself is not a complete reply to a nonstatutory double patenting (NSDP) rejection. A complete reply requires that the terminal disclaimer be accompanied by a reply requesting reconsideration of the prior Office action. Even where the NSDP rejection is provisional the reply must be complete.

See MPEP § 804, subsection I.B.1. For a reply to a non-final Office action, see 37 CFR 1.111(a). For a reply to final Office action, see 37 CFR 1.113(c). A request for reconsideration while not provided for in 37 CFR 1.113(c) may be filed after final for consideration. See MPEP §§ 706.07(e) and 714.13.

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The actual filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/apply/applying-online/eterminal-disclaimer.

9. Claims 1-8, 10-11, and 13-18 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims1, 3, 7-8, 24-31, and 34 of U.S. Patent No. 11,857,482 ("the '482 Patent"). Although the claims at issue are not identical, they are not patentably distinct from each other because the claims of the '482 Patent are narrower than the pending claims, thereby anticipating the pending claims. The following is a mapping of the claims:

Pending Claims	**The '482 Patent Claims**
1	1, 34
2	3
3	7

4	8
5	28
6	24
7	25
8	28
10	26
11	27
13	1
14	29
15	30
16	31
17	34
18	32

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Elmen et al (1,269,803), Samuels (2,078,025), Teranishi (3,837,335), and Denton et al (4,079,733) disclose percussion massagers similar to the presently claimed percussion massager

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to TIMOTHY A STANIS whose telephone number is (571)272-5139. The examiner can normally be reached on Mon - Fri 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Justine Yu can be reached on 571-272-4835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TIMOTHY A STANIS/
Primary Examiner, Art Unit 3785

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/515,112	Danby et al.
	Examiner	Art Unit
	TIMOTHY A STANIS	3785

CPC - Searched*		
Symbol	Date	Examiner
A61H23/0254	01/13/2024	TS
A61H2201/0107,0153,0157,1215,1418,149,1664,5005,501	01/13/2024	TS

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Inventor Search in PE2E and PALM	01/13/2024	TS
See attached PE2E search	01/13/2024	TS

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/TIMOTHY A STANIS/ Primary Examiner, Art Unit 3785	

Petitioner Therabody Ex-1004, 0095

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	18/515,112	Danby et al.
	Examiner	Art Unit
	TIMOTHY A STANIS	3785

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	01/12/2024								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
	11	✓								
	12	✓								
	13	✓								
	14	✓								
	15	✓								
	16	✓								
	17	✓								
	18	✓								

Petitioner Therabody Ex-1004, 0096

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet	1	of	18

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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	

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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]
/T.A.S/	B1**	CA-1042745-A	11-21-1978	Kovach, Leslie J		
/T.A.S/	B2**	CA-2440783-A1	03-13-2004	Conair		
/T.A.S/	B3**	CN-101958410-B	01-16-2013	Li, Jun		√
/T.A.S/	B4**	CN-106806103-A	06-09-2017	Guangdong Tanjin Electronic Tech Co Ltd		√
/T.A.S/	B5**	CN-107157741-A	09-15-2017	Ji, Qingshuai		√
/T.A.S/	B6**	CN-1149446-A	05-14-1997	Feifan Science And Technology Co., Ltd.		√

Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

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Sheet 2 of 18

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First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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	A20	US-3,993,052	11-23-1976	Miyahara	
	A21	US-4,088,128	05-09-1978	Mabuchi, Kenichi	
	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, Kenichi	
	A29	US-4,523,580	06-18-1985	Tureaud	
	A30	US-4,549,535	10-29-1985	Wing, Thomas W.	
	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	
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	A38	US-4,841,955	06-27-1989	Evans et al.	

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/T.A.S/	B7**	CN-1228299-A	09-15-1999	Zhang, Shuxin		√
/T.A.S/	B8**	CN-201478387-U	05-19-2010	Hua Xue		√
/T.A.S/	B9**	CN-202478137-U	10-10-2012	Univ Pla 3rd Military Medical		√
/T.A.S/	B10**	CN-202536467-U	11-21-2012	Xiaolin, Guo		√
/T.A.S/	B11**	CN-203195947-U	09-18-2013	Lin, Zongyao		√
/T.A.S/	B12**	CN-204208018-U	03-18-2015	Wu, Zaimin		√

Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

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Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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	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.	

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/T.A.S/	B13**	CN-204246459-U	04-08-2015	Chen, Jingwen		√
/T.A.S/	B14**	CN-204814773-U	12-02-2015	Guangzhou Longest Science & Technology Co., Ltd		√
/T.A.S/	B15**	CN-2049126-U	12-13-1989	Wan Renquan		√
/T.A.S/	B16**	CN-205251993-U	05-25-2016	Shaanxi Dongfang Aviation Instrument Co., Ltd		√
/T.A.S/	B17**	CN-205458346-U	08-17-2016	Guangzhou Keying Cosmetic Co Ltd		√
/T.A.S/	B18**	CN-206183628-U	05-24-2017	Shandong Jialin Electronic Tech Co Ltd		√

Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

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Art Unit	N/A
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Attorney Docket Number	HYP-034C5

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	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, Thomas E.	
	A75	US-6,231,497	05-15-2001	Souder	
	A76	US-6,375,609	04-23-2002	Hastings et al.	

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/T.A.S/	B19**	CN-206333979-U	07-18-2017	Guangzhou Coretech Electric Products Ltd		√
/T.A.S/	B20**	CN-206381373-U	08-08-2017	Zhao, Jinfang		√
/T.A.S/	B21**	CN-206675699-U	11-28-2017	Esino Tech Co Ltd		√
/T.A.S/	B22**	CN-208130157-U	11-23-2018	Dongguan Esino Electronic Tech Co Ltd		√
/T.A.S/	B23**	CN-210872953-U	06-30-2020	Chen, Ke		√
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Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 5 of 18

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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	A79	US-6,432,072	08-13-2002	Harris et al.	
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	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, Jake W.	
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/T.A.S/	B26**	CN-2540948-Y	03-26-2003	Dong, Jun		√
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First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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/T.A.S/	B38**	FI-903376-A	12-31-1991	Mirfakhraei, Kaveh	Engl. Abstract	
/T.A.S/	B39**	GB-1293876-A	10-25-1972	Sunbeam, Corporation		
/T.A.S/	B40**	GB-188946-A	11-23-1922	James, Charles Hillman		
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Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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/T.A.S/	B44**	JP-2002218780-A	08-02-2002	Nidec Shibaura Corp	Engl. Abstract	
/T.A.S/	B45**	JP-2003230613-A	08-19-2003	Og Giken Co Ltd	Engl. Abstract	
/T.A.S/	B46**	JP-2004024523-A	01-29-2004	Matsushita Electric Works Ltd	Engl. Abstract	√
/T.A.S/	B47**	JP-2004141568-A	05-20-2004	Matsushita Electric Works Ltd	Engl. Abstract	√
/T.A.S/	B48**	JP-2007044319-A	02-22-2007	Kumagawa KK	Engl. Abstract	√

Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

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First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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	A154	US-2004/0010268-A1	01-15-2004	Gabehart	
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	A156	US-2005/0015030-A1	01-20-2005	Bousfield et al.	
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/T.A.S/	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	√
/T.A.S/	B53**	JP-H053903-A	01-14-1993	Sanyo Electric Co	Engl. Abstract	√
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Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

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First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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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]
/T.A.S./	B55**	JP-H0751393-A	02-28-1995	Hitachi Metals Ltd	Engl. Abstract	√
/T.A.S./	B56**	JP-H08131500-A	05-28-1996	Brother Ind Ltd	Engl. Abstract	√
/T.A.S./	B57**	JP-H0866448-A	03-12-1996	Koei Tsusho KK	Engl. Abstract	√
/T.A.S./	B58**	JP-H0992246-A	04-04-1997	Fujitsu Denso	Engl. Abstract	√
/T.A.S./	B59**	JP-S54110058-A	08-29-1979	Matsushita Electric Works Ltd	Engl. Abstract	√
/T.A.S./	B60**	JP-S6389158-A	04-20-1988	Anmin KK	Engl. Abstract	√

Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Complete if Known	
Application Number	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

U. S. PATENT DOCUMENTS

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	A191	US-2011/0169481-A1	07-14-2011	Nguyen et al.	
	A192	US-2012/0038483-A1	02-16-2012	DU et al.	
	A193	US-2012/0120573-A1	05-17-2012	BENTLEY	
	A194	US-2012/0253245-A1	10-04-2012	Stanbridge	
	A195	US-2012/0259255-A1	10-11-2012	TOMLINSON et al.	
	A196	US-2012/0281392-A1	11-08-2012	Workman et al.	
	A197	US-2013/0006040-A1	01-03-2013	Lee	
	A198	US-2013/0076271-A1	03-28-2013	SUDA et al.	
	A199	US-2013/0112451-A1	05-09-2013	KONDO et al.	
	A200	US-2013/0138023-A1	05-30-2013	Lerro	
	A201	US-2013/0261516-A1	10-03-2013	Cilea et al.	
	A202	US-2013/0281897-A1	10-24-2013	Hoffmann et al.	
	A203	US-2013/0294019-A1	11-07-2013	LaSota et al.	
	A204	US-2014/0014384-A1	01-16-2014	HORIE et al.	
	A205	US-2014/0094724-A1	04-03-2014	Freeman	
	A206	US-2014/0159507-A1	06-12-2014	Johnson et al.	
	A207	US-2015/0005682-A1	01-01-2015	Danby et al.	
	A208	US-2015/0148592-A1	05-28-2015	Kanbar et al.	
	A209	US-2016/0151238-A1	06-02-2016	Crunick et al.	

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/T.A.S/	B61**	KR-100785097-B1	12-12-2007	Korea Ind Tech Inst	Engl. Abstract	
/T.A.S/	B62**	KR-101007827-B1	01-13-2011	Shin, In Sung	Engl. Abstract	
/T.A.S/	B63**	KR-101162978-B1	07-09-2012	At System Co., Ltd	Engl. Abstract	
/T.A.S/	B64**	KR-101315314-B1	10-14-2013	Jung, Bong Ok	Engl. Abstract	
/T.A.S/	B65**	KR-101504885-B1	03-23-2015	Jo, Sung Chan	Engl. Abstract	
/T.A.S/	B66**	KR-101649522-B1	08-19-2016	Samjin Comp & It	Engl. Abstract	

Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

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Sheet 12 of 18

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First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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	A210	US-2016/0271009-A1	09-22-2016	Giraud et al.	
	A211	US-2016/0354277-A1	12-08-2016	Fima	
	A212	US-2016/0367425-A1	12-22-2016	Wersland	
	A213	US-2017/0012257-A1	01-12-2017	Wackwitz et al.	
	A214	US-2017/0027798-A1	02-02-2017	Wersland, Jason	
	A215	US-2017/0028160-A1	02-02-2017	OLIVER	
	A216	US-2017/0304145-A1	10-26-2017	Pepe	
	A217	US-2018/0008512-A1	01-11-2018	Goldstein	
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/T.A.S/	B67**	KR-20000043488-A	07-15-2000	Maxstar Industrial Co., Ltd	Engl. Abstract	
/T.A.S/	B68**	KR-2003-11328-Y1	05-01-2003	Jong Tae Park	Engl. Abstract	
/T.A.S/	B69**	KR-20030008342-A	01-25-2003	Kim, Sa Ung	Engl. Abstract	
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/T.A.S/	B71**	KR-20060074625-A	07-03-2006	Shin, Dae Chul	Engl. Abstract	
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Sheet 13 of 18

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Application Number	Not Yet Assigned
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First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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/T.A.S/	B73**	KR-2010-0023508-A	03-04-2010	Lg Innotek Co., Ltd	Engl. Abstract	
/T.A.S/	B74**	RU-2053754-C1	02-10-1996	Solomin, Vladimir A		√
/T.A.S/	B75**	RU-2464005-C1	10-20-2012	Potapov, Nikolaj Antonovich		√
/T.A.S/	B76**	TW-M272528-U	08-11-2005	Chiun Jung Co., Ltd		√
/T.A.S/	B77**	TW-M379178-U	04-21-2010	Phoenix Silicon Int Corp		√
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Art Unit	N/A
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Attorney Docket Number	HYP-034C5

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	A248	US-D555255	11-13-2007	Masuda	
	A249	US-D625164	10-12-2010	Aglassinger	
	A250	US-D703337	04-22-2014	Fuhr et al.	
	A251	US-D706433	06-03-2014	Fuhr et al.	
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	A256	US-D759831	06-21-2016	Levi et al.	
	A257	US-D823478	07-17-2018	Park	
	A258	US-D825073	08-07-2018	Lenke	
	A259	US-D827842	09-04-2018	Bainton et al.	
	A260	US-D827843	09-04-2018	Bainton et al.	
	A261	US-D840032	02-05-2019	Clifford et al.	
	A262	US-D842491	03-05-2019	Fleming et al.	
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	A264	US-D879290	03-24-2020	Harman et al.	
	A265	US-RE30500	02-03-1981	Springer et al.	

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/T.A.S/	B79**	TW-M433702-U	07-11-2012	Shin Chuan Computer Co., Ltd		√
/T.A.S/	B80**	TW-M493379-U	01-11-2015	Chen, Jing-wen		√
/T.A.S/	B81**	TW-M543692-U	06-21-2017	Wang, Gui-yuan		√
/T.A.S/	B82**	WO-03006102-A2	01-23-2003	Phymag Ltd		
/T.A.S/	B83**	WO-2008/113139-A1	09-25-2008	Cypro Ssage Pty Ltd		
/T.A.S/	B84**	WO-2009/014727-A1	01-29-2009	Activator Methods International, Limited		

Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

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Application Number	Not Yet Assigned
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First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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/T.A.S/	B85**	WO-2011122812-A2	10-06-2011	Small'lab Co., Ltd	Engl. Abstract	√
/T.A.S/	B86**	WO-2012/134469-A1	10-04-2012	Ingersoll Rand Co		
/T.A.S/	B87**	WO-2013/141359-A1	09-26-2013	Lion Corporation		√
/T.A.S/	B88**	WO-2014118596-A1	08-07-2014	Telefield Ltd		
/T.A.S/	B89**	WO-2015038005-A2	03-19-2015	Nevroflex As		
/T.A.S/	B90**	WO-2017/123841-A2	07-20-2017	Ethicon LLC		

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Art Unit	N/A
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/T.A.S/	B91**	WO-2017/184505-A2	10-26-2017	Ethicon LLC		
/T.A.S/	B92**	WO-9214435-A1	09-03-1992	Jacobi, Jacob		
/T.A.S/	B93**	WO-9625908-A1	08-29-1996	Niagara Manufacturing Ltd		

Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

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Art Unit	N/A
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/T.A.S/	C1**	Campbell, D., "Jolt Therapy Tool," https://www.youtube.com/watch?v=-1nLjD-xRgI, July 28, 2017, 3 pages.	
/T.A.S/	C2**	Centech 4 in 1 Portable Power Pack Owner's Manual & Safety Instructions, 2014, 12 pages.	
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/T.A.S/	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.	
/T.A.S/	C5**	DIY Jigsaw "Drill" Massager - Percussion Massager, February 9, 2018, 19 pages.	
/T.A.S/	C6**	Knopp, B., "How to Change Jolt Attachments," https://www.youtube.com/watch?v=pl-vHxRtXUQ, April 5, 2017, 6 pages.	
/T.A.S/	C7**	NutriKlick Deep Tissue Massage Gun, Date Unknown.	
/T.A.S/	C8**	PERFOMAX 8 Volt Li-Ion Cordless Driver Owner's Manual, www.manualslib.com, July 27, 2012, 19 pages.	
/T.A.S/	C9**	Rachel [family name unknown], "Jigsaw Massager," August 28, 2007, 8 pages. Information available online from http://www.instructables.com/id/jigsaw-massager/.	
/T.A.S/	C10**	Synthes Battery Power Line, June 2009, 6 pages.	

Examiner Signature	/TIMOTHY A STANIS/	Date Considered	01/12/2024

*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.

IPTS/125359394.1

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.A.S/

PTO/SB/08b (07-09)
Approved for use through 05/31/2024. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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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	Not Yet Assigned
Filing Date	Concurrently Herewith
First Named Inventor	Philip C. Danby
Art Unit	N/A
Examiner Name	Not Yet Assigned
Attorney Docket Number	HYP-034C5

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]
/T.A.S/	C11**	Theragun Owners Manual G2PRO, 16 pages.	
/T.A.S/	C12**	TIMTAM Power Massage 1.5, August 7, 2020, 4 pages.	
/T.A.S/	C13**	TOPiando Multifunctional Massage Gun, 19 pages, date unknown.	
/T.A.S/	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	/TIMOTHY A STANIS/	Date Considered	01/12/2024

*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.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /T.A.S/

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PATENT AND TRADEMARK OFFICE

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/515,112	**01/23/2024 07:50:13 PM Z ET**	**HYP-034C5**

Title of Invention

MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	2915	FILED BY	Tammy Franklin
PATENT CENTER #	64060522	FILING DATE	11/20/2023
CUSTOMER #	162143	FIRST NAMED INVENTOR	Philip C. Danby
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Hunter Malboeuf

Documents

TOTAL DOCUMENTS: 3

DOCUMENT		PAGES	DESCRIPTION	SIZE (KB)
HYP_034C5_Response_to_Non_Final_Office_Action.pdf		6	-	111 KB
HYP_034C5_Response_to_Non_Final_Office_Action-A....pdf	(1-1)	1	Amendment/Request for Reconsideration-After Non-Final Rejection	78 KB
HYP_034C5_Response_to_Non_Final_Office_Action-CLM.pdf	(2-4)	3	Claims	83 KB
HYP_034C5_Response_to_Non_Final_Office_Action-REM.pdf	(5-6)	2	Applicant Arguments/Remarks Made in an Amendment	100 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: HYP-034C5
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

Application No.: 18/515,112 | Confirmation No.: 2915

Filed: November 20, 2023 | Art Unit: 3785

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

Filed Electronically

AMENDMENT IN RESPONSE TO NON-FINAL OFFICE ACTION UNDER 37 C.F.R. § 1.111

INTRODUCTORY COMMENTS

In response to the Office Action dated January 19, 2024, please amend the above-identified U.S. patent application as follows:

Amendments to the Claims begin on page 2 of this paper.

Remarks/Arguments begin on page 5 of this paper.

Petitioner Therabody Ex-1004, 0117

AMENDMENTS TO THE CLAIMS

1. (Original) A percussive massager comprising:

a housing;

a piston having a proximal end and a distal end, the distal end of the piston having a bore;

a motor operatively connected to the proximal end of the piston, wherein the motor is configured to cause the piston to reciprocate at a first speed;

a drive mechanism that controls a predetermined stroke length of the piston; and

a quick-connect system comprising the distal end of the piston and a first massaging head, wherein the quick-connect system is configured to have a proximal end of the first massaging head inserted into or removed from the bore while the piston reciprocates the predetermined stroke length at the first speed.

2. (Original) The percussive massager of claim 1, wherein the motor is configured to cause the piston to reciprocate at a second speed.

3. (Original) The percussive massager of claim 1, further comprising:

a control panel positioned on an exterior of the housing.

4. (Original) The percussive massager of claim 3, wherein the control panel is configured to display one or more visual indicators.

5. (Original) The percussive massager of claim 1, further comprising a handle and a flywheel, wherein the handle is on an opposite side of the flywheel with respect to the motor.

6. (Original) The percussive massager of claim 1, further comprising a handle, wherein the motor is positioned within the housing opposite the handle.

7. (Original) The percussive massager of claim 1, wherein the motor has an output shaft configured to rotate about a rotation axis, and wherein the drive mechanism comprises:

a flywheel operatively connected to the output shaft of the motor to rotate about a flywheel axis, the output shaft extending into the flywheel along the flywheel axis; and

Petitioner Therabody Ex-1004, 0118

a crank pin extending from the flywheel, the crank pin being operatively connected to the piston.

8. (Original) The percussive massager of claim 7, further comprising a handle, wherein the motor and the handle are on opposite sides of a plane perpendicular to the flywheel axis that extends through the flywheel.

9. (Original) The percussive massager of claim 7, further comprising a handle, wherein the motor and the handle are on a same side of a plane perpendicular to the flywheel axis that extends through the flywheel.

10. (Original) The percussive massager of claim 7, wherein an offset between the flywheel axis and an axis of the crank pin controls the predetermined stroke length of the piston.

11. (Original) The percussive massager of claim 7, wherein the motor is directly connected to the flywheel, and wherein the crank pin is directly connected to the flywheel.

12. (Original) The percussive massager of claim 7, wherein the motor is configured to cause the piston to reciprocate at the first speed along a longitudinal axis, and further comprising:

a first bearing located on a first side of the flywheel; and

a second bearing located on a second side of the flywheel, wherein the first bearing and the second bearing are configured to restrain reciprocation of the piston to the longitudinal axis.

13. (Original) The percussive massager of claim 1, wherein the bore comprises a substantially cylindrical bore.

14. (Original) The percussive massager of claim 1, further comprising a substantially cylindrical structure within the bore.

Petitioner Therabody Ex-1004, 0119

15. (Original) The percussive massager of claim 14, wherein the substantially cylindrical structure comprises a cylindrical seat.

16. (Original) The percussive massager of claim 14, wherein the substantially cylindrical structure comprises a magnet.

17. (Original) The percussive massager of claim 1, wherein a proximal end of the first massaging head has a pocket to receive the distal end of the piston.

18. (Currently Amended) A method of assembling a percussive massager, the method comprising:

operatively connecting a motor to a proximal end of a piston, wherein the motor is configured to cause the piston to reciprocate at a first speed, wherein a distal end of the piston has a bore[[,]];

~~wherein~~ providing a drive mechanism configured to control[[s]] a predetermined stroke length of the piston[[,]]; and

~~wherein~~ providing a quick-connect system comprising the distal end of the piston and a first massaging head, wherein ~~is configured to have~~ a proximal end of the first massaging head is configured to be inserted into or removed from the bore while the piston reciprocates the predetermined stroke length at the first speed.

Petitioner Therabody Ex-1004, 0120

REMARKS

Administrative Overview

Prior to the Office Action of January 19, 2024 (the "Office Action"), claims 1-18 were pending. In the Office Action:

- claim 18 is rejected under 35 U.S.C. § 112(b) as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or joint inventor regards as the invention; and
- claims 1-8, 10-11, and 13-18 are rejected on the ground of nonstatutory double patenting over claims 1, 3, 7-8, 24-31, and 34 of U.S. Patent No. 11,857,482 ("'482 Patent").

In the present Amendment, claim 18 is amended without prejudice or disclaimer. No new matter is added. Thus, following entry of this Amendment, claims 1-18 will be pending. Reconsideration of claims 1-18 is respectfully requested.

Rejections Under 35 U.S.C. § 112

Claim 18 is rejected under 35 U.S.C. § 112(b), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or joint inventor regards as the invention. Without acquiescing to the merits of the rejection, claim 18 is amended herein as suggested by the Office Action at page 6. Withdrawal of the rejection is respectfully requested.

Double Patenting Rejection

Claims 1-8, 10-11, and 13-18 are rejected on the ground of nonstatutory double patenting over claims 1, 3, 7-8, 24-31, and 34 of U.S. Patent No. 11,857,482 (" '482 Patent"). Without acquiescing to the merits of the rejection, Applicant has submitted an Electronic Terminal Disclaimer relative to the '482 Patent, and has received a notification from the Office indicating that the Electronic Terminal Disclaimer has been approved. Accordingly, Applicant respectfully submits that the double patenting rejection is moot and requests that it be withdrawn.

Petitioner Therabody Ex-1004, 0121

CONCLUSION

In light of the foregoing, Applicant submits that all pending claims are now in condition for allowance. Accordingly, Applicant respectfully requests reconsideration, withdrawal of all grounds of rejection, and allowance of the pending claims in due course.

If the Examiner believes that a telephone conversation with Applicant's agent would expedite the allowance of this application or would be helpful in resolving any other outstanding issue, the Examiner is invited to call the undersigned at the telephone number set forth below.

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-034C5 from which the undersigned is authorized to draw.

Dated: January 23, 2024

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) 570-8739
Agent For Applicant

Petitioner Therabody Ex-1004, 0122

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ELECTRONIC PAYMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/515,112	01/23/2024 07:42:56 PM Z ET	HYP-034C5

Title of Invention

MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	2915	FILED BY	Tammy Franklin
PATENT CENTER #	64060618	AUTHORIZED BY	Hunter Malboeuf
CUSTOMER #	162143	FILING DATE	11/20/2023
CORRESPONDENCE ADDRESS	-	FIRST NAMED INVENTOR	Philip C. Danby

Payment Information

PAYMENT METHOD	PAYMENT TRANSACTION ID	PAYMENT AUTHORIZED BY
DA / 071700	E20241MJ43235279	Hunter Malboeuf

FEE CODE	DESCRIPTION	ITEM PRICE($)	QUANTITY	ITEM TOTAL($)
2814	STATUTORY DISCLAIMER, INCLUDING TERMINAL DISCLAIMER	170.00	1	170.00
			TOTAL AMOUNT:	$170.00

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New Applications Under 35 U.S.C. 111

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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
18/515,112	**01/23/2024 07:42:56 PM Z ET**	**HYP-034C5**

Title of Invention

MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	-
CONFIRMATION #	2915	FILED BY	Tammy Franklin
PATENT CENTER #	64060618	FILING DATE	11/20/2023
CUSTOMER #	162143	FIRST NAMED INVENTOR	Philip C. Danby
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Hunter Malboeuf

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
petition-request.pdf	3	Terminal Disclaimer-Filed (Electronic)	48 KB
grantLetter.pdf	1	Terminal Disclaimer-Electronic-Approved	19 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
petition-request.pdf	2F49AC6A693729543DA2A841B67FF16CE7E84379CF9DCAD09EF9753E5D8CEBEB1B950BAE3A3D950EC758CFC723E061CF9

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grantLetter.pdf	0CF201839DAE299F262BED4AE5A71A736FCA3394B30A39EEB BD87CA28C9D89A9ECB8EF9CE957D7E2DFCB3A828E60AD02 4C20613B1C9FB65D00200D78FA809403

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New Applications Under 35 U.S.C. 111

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APPROVAL LETTER

APPLICATION #	FILING DATE	APPLICANT/PATENT UNDER REEXAMINATION
18/515,112	11/20/2023	Phillip Danby

Title of Invention

MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH

Electronic terminal disclaimer filed on 01/23/2024

☑ Approved

This patent is subject to a Terminal Disclaimer

Approved / Disapproved by: Electronic Terminal Disclaimer automatically approved

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TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A PRIOR PATENT

APPLICATION #	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET #
18515112	11/20/2023	Philip Danby	HYP-034C5

Title of Invention

MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH

☑ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action

☑ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent interest
HYPERICE IP SUBCO, LLC	100%
Total	100%

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of any patent granted on pending reference Application Number(s)

Application #	Filing Date

as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and any patent granted on the reference application are commonly owned. This agreement runs with any patent granted on the

instant application and is binding upon the grantee, its successors or assigns.
In making the above disclaimer, the owner does not disclaim the terminal part of any patent granted on the instant application that would extend to the expiration date of the full statutory term of any patent granted on said reference application, "as the term of any patent granted on said reference application may be shortened by any terminal disclaimer filed prior to the grant of any patent on the pending reference application," in the event that any such patent granted on the pending reference application: expires for failure to pay a maintenance fee, is held unenforceable, is found invalid by a court of competent jurisdiction, is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321, has all claims canceled by a reexamination certificate, is reissued, or is in any manner terminated prior to the expiration of its full statutory term as shortened by any terminal disclaimer filed prior to its grant.

The owner(s) of percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

Patent #
11857482

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.
In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:
- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.



Terminal disclaimer fee under 37 CFR 1.20(d) included with Electronic Terminal Disclaimer request.

Applicant claims the following entity status:
Small

I hereby declare that all statements made herein of my own knowledge are true and that all statemnts 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.

I certify, in accordance with 37 CFR 1.4(d)(4) that I am: An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

Signature	Name	Registration #
/Hunter Malboeuf/	Hunter Malboeuf	79730

* Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner). Form PTO/SB/96 may be used for making this certification. See MPEP 324.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 18/515,112	Filing Date 11/20/2023	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $40 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $ 192 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	01/23/2024	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
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	Independent (37 CFR 1.16(h))	* 2	Minus	*** 3	= 0		x $ 192 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/ANGELONA D JONES/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Docket No.: HYP-034C5
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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

Application No.: 18/515,112 | Confirmation No.: 2915

Filed: November 20, 2023 | Art Unit: 3785

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

Filed Electronically

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 more than three months after the filing date of this application, OR more than three months after the date of entry of the national stage in the international application, AND after the mailing date of a first Office Action on the merits, but before the mailing date of any of a Final Action under 37 C.F.R. § 1.113, a Notice of Allowance under 37 C.F.R. § 1.311 or an action that otherwise closes prosecution in this application (37 C.F.R. § 1.97(c)).

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. Submitted herewith are copies of foreign patents and non-patent literature in accordance with 37 C.F.R. § 1.98(a)(2).

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 18/466702 filed

Petitioner Therabody Ex-1004, 0132

September 13, 2023, 17/681367 filed February 25, 2022, 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.

Applicant hereby apprises the Examiner of the following patent applications, including the contents of the file wrappers, the claims, any Office Actions issued therein, and any Notices of Allowance issued therefor:

Docket No.	**U.S. Serial No.:**	**Title**	**Filing Date**
HYP-002CIP	17/083,118 Published as: US2021/0038472	SYSTEM AND PROCESS FOR DETERMINING PRESSURE SETTINGS FOR A PERCUSSIVE MASSAGE APPLICATOR	10/28/20
HYP-034C4	18/466,702 Published as: 2024/0000656	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	9/13/23
HYP-034C6	18/515,119	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	11/20/23
HYP-034C7	18/515,122	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	11/20/23
HYP-034C9	18/515,126	MASSAGE DEVICE HAVING VARIABLE STROKE LENGTH	11/20/23
HYP-044C1	17/972,421	PERCUSSIVE MASSAGE DEVICE WITH SELECTABLE STROKE LENGTH	10/24/22

Petitioner Therabody Ex-1004, 0133

Docket No.	U.S. Serial No.:	Title	Filing Date
HYP-060C5	17/136,218 Published as: US2021/0361524	BATTERY-POWERED PERCUSSIVE MASSAGE DEVICE	12/29/20
HYP-067C1	18/342,158	PERCUSSIVE MASSAGE DEVICE WITH SELF-LUBRICATING CYLINDER	6/27/23
HYP-075C2	18/452,274	MOTOR AND PISTON ASSEMBLY FOR PERCUSSIVE DEVICE	8/18/23
HYP-084	17/402,201 Published as: US2023/0048861	COMBINATION APPLICATOR AND ADAPTOR FOR PERCUSSIVE MASSAGE DEVICE	8/13/21
Examiner Signature		Date Considered	

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.

Please charge our Credit Card in the amount of $104.00 covering the fee set forth in 37 C.F.R. § 1.17(p). The Director is hereby authorized to charge any deficiency in the fees filed,

Petitioner Therabody Ex-1004, 0134

asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 07-1700, under Order No. HYP-034C5.

Dated: January 26, 2024

Respectfully submitted,

Electronic signature: /Hunter Malboeuf/
Hunter Malboeuf
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Petitioner Therabody Ex-1004, 0135

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 10

Complete if Known	
Application Number	18/515,112-Conf. #2915
Filing Date	November 20, 2023
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C5

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-863525	12-10-1907	Gardy	
	A2	US-4,698,869	10-13-1987	Mierau et al.	
	A3	US-4,726,430	02-23-1988	Hendrikx et al.	
	A4	US-5,043,651	08-27-1991	Tamura, Yoshiharu	
	A5	US-5,134,777	08-04-1992	Meyer et al.	
	A6	US-5,769,657	06-23-1998	Kondo et al.	
	A7	US-5,935,089	08-10-1999	Shimizu	
	A8	US-6,602,211	08-05-2003	Tucek, Kevin B.	
	A9	US-7,144,417	12-05-2006	Colloca et al.	
	A10	US-7,169,169	01-30-2007	Tucek et al.	
	A11	US-7,503,923	03-17-2009	Miller, Edward W.	
	A12	US-7,658,012	02-09-2010	James et al.	
	A13	US-8,435,194	05-07-2013	Dverin et al.	
	A14	US-8,826,547	09-09-2014	Oberheim, Stephen C.	
	A15	US-8,841,871	09-23-2014	Yang et al.	
	A16	US-9,364,626	06-14-2016	Carter et al.	
	A17	US-10,201,470	02-12-2019	Griner	
	A18	US-10,456,325	10-29-2019	Fan, Shuyin	
	A19	US-10,470,970	11-12-2019	Nazarian et al.	

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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-188544-A	02-04-1919	Bennett, James C		
	B2	CA-188545-A	02-04-1919	Briese, Frederick W		
	B3	CA-188553-A	02-04-1919	Hoag, David Edgar		
	B4	CN-101801326-A	08-11-2010	Activator Methods Internationa		√
	B5	CN-103248096-A	08-14-2013	Wu, Mingfen		√
	B6	CN-103398298-A	11-20-2013	Ningbo Aisen Electric Appliance 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.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet	2	of	10

Complete if Known	
Application Number	18/515,112-Conf. #2915
Filing Date	November 20, 2023
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C5

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-10,492,984	12-03-2019	Marton et al.	
	A21	US-10,561,574	02-18-2020	Marton et al.	
	A22	US-10,617,588	04-14-2020	Wersland et al.	
	A23	US-10,702,448	07-07-2020	Wersland et al.	
	A24	US-10,774,860	09-15-2020	Wersland et al.	
	A25	US-10,847,984	11-24-2020	Solana et al.	
	A26	US-10,857,064	12-08-2020	Wersland et al.	
	A27	US-10,888,492	01-12-2021	Marton et al.	
	A28	US-10,905,627	02-02-2021	Marton et al.	
	A29	US-10,912,708	02-09-2021	Marton et al.	
	A30	US-10,993,874	05-04-2021	Marton et al.	
	A31	US-11,166,863	11-09-2021	Wersland et al.	
	A32	US-2002/0177795-A1	11-28-2002	Frye	
	A33	US-2002/0188233-A1	12-12-2002	Denyes	
	A34	US-2003/0014079-A1	01-16-2003	Tucek	
	A35	US-2003/0028134-A1	02-06-2003	Lev et al.	
	A36	US-2004/0254507-A1	12-16-2004	Off, Robert	
	A37	US-2005/0075591-A1	04-07-2005	Hafemann, Klaus	
	A38	US-2005/0113870-A1	05-26-2005	Miller, Edward W.	

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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-103655142-A	03-26-2014	Fan, Shuyin		√
	B8	CN-111759711-A	10-13-2020	Wuxi Mochi Tech Co Ltd		√
	B9	CN-202459196-U	10-03-2012	Qingdao Hailimian International Trade Co., Ltd		√
	B10	CN-203395603-U	01-15-2014	Led Lenser Co., Ltd		√
	B11	CN-205017429-U	02-03-2016	Wang, Jun		√
	B12	CN-205268525-U	06-01-2016	Guangzhou Boshikang Medical Equipment Co., Ltd		√

Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 3 of 10

Complete if Known	
Application Number	18/515,112-Conf. #2915
Filing Date	November 20, 2023
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C5

U. S. PATENT DOCUMENTS

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	A39	US-2005/0131461-A1	06-16-2005	Tucek et al.	
	A40	US-2006/0116614-A1	06-01-2006	Jones et al.	
	A41	US-2006/0211961-A1	09-21-2006	Meyer et al.	
	A42	US-2006/0293711-A1	12-28-2006	Keller et al.	
	A43	US-2007/0257638-A1	11-08-2007	Amend et al.	
	A44	US-2008/0262399-A1	10-23-2008	Kovelman et al.	
	A45	US-2008/0275371-A1	11-06-2008	Hoffmann	
	A46	US-2010/0145242-A1	06-10-2010	TSAI	
	A47	US-2010/0160841-A1	06-24-2010	Wu	
	A48	US-2011/0017742-A1	01-27-2011	Sausen et al.	
	A49	US-2012/0197357-A1	08-02-2012	Dewey et al.	
	A50	US-2012/0215141-A1	08-23-2012	Peddicord, Herschel	
	A51	US-2012/0296244-A1	11-22-2012	Ceoldo et al.	
	A52	US-2013/0030506-A1	01-31-2013	BARTOLONE et al.	
	A53	US-2013/0289457-A1	10-31-2013	Young et al.	
	A54	US-2014/0031866-A1	01-30-2014	Fuhr et al.	
	A55	US-2014/0221887-A1	08-07-2014	Wu	
	A56	US-2014/0288473-A1	09-25-2014	Matsushita, Tsuyoshi	
	A57	US-2015/0107383-A1	04-23-2015	Duesselberg 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-206381369-U	08-08-2017	Touchbeauty (shenzhen) Tech Co Ltd		√
	B14	CN-206381389-U	08-08-2017	3rd Affiliated Hospital Xinxiang Medical Univ		√
	B15	CN-210301676-U	04-14-2020	Shenzhen Jiuyida Electronics Co Ltd		√
	B16	CN-2144503-Y	10-27-1993	Guo Liwen		√
	B17	EP-0158870-A1	10-23-1985	Blendax Werke Schneider Co		√
	B18	EP-1728494-A1	12-06-2006	Oreal		√

Examiner Signature		Date Considered	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet	4	of	10

Complete if Known	
Application Number	18/515,112-Conf. #2915
Filing Date	November 20, 2023
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C5

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-2015/0119771-A1	04-30-2015	Roberts	
	A59	US-2015/0182415-A1	07-02-2015	Olkowski et al.	
	A60	US-2015/0366746-A1	12-24-2015	Ashby, Darren	
	A61	US-2016/0256348-A1	09-08-2016	Giraud et al.	
	A62	US-2016/0278436-A1	09-29-2016	Verleur et al.	
	A63	US-2017/0087379-A1	03-30-2017	Sedic, Filip	
	A64	US-2017/0333280-A1	11-23-2017	Black, Ashley D.	
	A65	US-2018/0154141-A1	06-07-2018	AHN	
	A66	US-2018/0168913-A1	06-21-2018	Sedic, Filip	
	A67	US-2018/0263845-A1	09-20-2018	Wersland et al.	
	A68	US-2019/0015294-A1	01-17-2019	Nazarian et al.	
	A69	US-2019/0091096-A1	03-28-2019	Patel, Baldevbhai Ramanlal	
	A70	US-2019/0175434-A1	06-13-2019	ZHANG	
	A71	US-2019/0209424-A1	07-11-2019	Wersland et al.	
	A72	US-2019/0232403-A1	08-01-2019	Candelaria, Alec	
	A73	US-2019/0254921-A1	08-22-2019	Marton et al.	
	A74	US-2019/0254922-A1	08-22-2019	Marton et al.	
	A75	US-2019/0350793-A1	11-21-2019	Wersland et al.	
	A76	US-2020/0069510-A1	03-05-2020	Wersland et al.	

FOREIGN PATENT DOCUMENTS

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	B19	EP-3235484-A1	10-25-2017	Beijing Xiaomi Mobile Software Co., Ltd		
	B20	EP-3320888-A1	05-16-2018	Family Inada Co., Ltd		
	B21	EP-3435381-A1	01-30-2019	Family Inada Co., Ltd		
	B22	JP-1683409-S	04-19-2021			√
	B23	JP-2781408-B2	07-30-1998	Teranishi Denki Seisakusho:KK		√
	B24	JP-2999872-B2	01-17-2000	Sanyo Electric Co Ltd		√

Examiner Signature		Date Considered	

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Petitioner Therabody Ex-1004, 0139

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

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Sheet 5 of 10

Complete if Known	
Application Number	18/515,112-Conf. #2915
Filing Date	November 20, 2023
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C5

U. S. PATENT DOCUMENTS

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	A77	US-2020/0222263-A1	07-16-2020	Wersland et al.	
	A78	US-2020/0261310-A1	08-20-2020	Wersland et al.	
	A79	US-2020/0274162-A1	08-27-2020	GALCERAN MESTRES et al.	
	A80	US-2020/0276079-A1	09-03-2020	Cheng, Guomei	
	A81	US-2020/0289365-A1	09-17-2020	Wersland et al.	
	A82	US-2020/0330321-A1	10-22-2020	Wersland et al.	
	A83	US-2020/0352820-A1	11-12-2020	Nazarian et al.	
	A84	US-2020/0352821-A1	11-12-2020	Wersland et al.	
	A85	US-2020/0405574-A1	12-31-2020	Wersland et al.	
	A86	US-2021/0022955-A1	01-28-2021	Wersland et al.	
	A87	US-D197889	04-07-1964	Hass	
	A88	US-D329,291	09-08-1992	Wollman	
	A89	US-D377100	12-31-1996	Gladieux, Jr., Bernard L.	
	A90	US-D379580	06-03-1997	Amundsen, Neil	
	A91	US-D430,938	09-12-2000	Lee	
	A92	US-D448,852	10-02-2001	Engelen	
	A93	US-D476,746	07-01-2003	Harris et al.	
	A94	US-D531,733	11-07-2006	Burout, III et al.	
	A95	US-D548354	08-07-2007	Lai, Tzn-Yung	

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	JP-3813828-B2	08-23-2006	Daito Denki Kogyo KK		√
	B26	JP-5859905-B2	02-16-2016	Covidien AG		√
	B27	JP-H0733329-B2	06-20-1995	Yamaguchi		√
	B28	KR-102078829-B1	02-19-2020	St Co., Ltd		√
	B29	KR-3010427980000	01-29-2020	Dongguan Xiqin Electrical Appliance Co., Ltd.		√
	B30	TW-202017550-A	05-16-2020	Hyper Ice, Inc		√

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Application Number	18/515,112-Conf. #2915
Filing Date	November 20, 2023
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C5

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
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	B31	TW-D202371-S	01-21-2020	Dongguan Xiqin Electrical Appliance Co., Ltd		√
	B32	TW-M599159-U	08-01-2020	Tokuyo Biotech Co., Ltd		√
	B33	WO-2011/159906-A2	12-22-2011	Peddicord, Herschel		
	B34	WO-2012/177028-A2	12-27-2012	Amorepacific Corp		√
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	B36	WO-2020/101725-A1	05-22-2020	Hyper-ice, Inc		

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Filing Date	November 20, 2023
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C5

U. S. PATENT DOCUMENTS

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	B37	WO-2020/227225-A1	11-12-2020	Theragun, Inc		
	B38	WO-2020/227230-A1	11-12-2020	Theragun, Inc		
	B39	WO-2020/227569-A1	11-12-2020	Theragun, Inc		

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Filing Date	November 20, 2023
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Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C5

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	A149	US-D952878	05-24-2022	Lin, Xiaohong	
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Filing Date	November 20, 2023
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C5

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	C7	International Search Report and the Written Opinion of corresponding International application PCT/US2018/053352, dated May 14, 2019, 16 pages.	
	C8	International Preliminary Report on Patentability and Written Opinion of International Application No. PCT/US2021/057033 dated May 11, 2023, 9 pages.	
	C9	International Preliminary Report on Patentability of International Application No. PCT/US2021/041073 dated January 10, 2023, 10 pages.	
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Filing Date	November 20, 2023
First Named Inventor	Philip C. Danby
Art Unit	3785
Examiner Name	T. A. Stanis
Attorney Docket Number	HYP-034C5

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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	International Search Report and Written Opinion of PCT/US2021/057033 dated February 16, 2022, 14 pages.	
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Espacenet

Bibliographic data: TW202017550 (A) — 2020-05-16

Battery-powered percussive massage device with pressure sensor

Inventor(s): MARTON ROBERT [US]; KATZ ANTHONY [US] ± (MARTON, ROBERT, ; KATZ, ANTHONY)

Applicant(s): HYPER ICE INC [US] ± (HYPER ICE, INC)

Classification: - international: *A61H23/00*
- cooperative: **A61H1/008 (EP, US)**; **A61H23/004 (EP, US)**; **A61H23/006 (EP, CN, KR, US)**; **A61H23/0254 (EP, CN, KR, US)**; A61H2201/0153 (EP, US); A61H2201/0157 (EP, US); A61H2201/0188 (KR); A61H2201/1215 (KR); A61H2201/1436 (EP, US); A61H2201/1685 (KR); A61H2201/169 (KR); A61H2201/5002 (EP, US); A61H2201/501 (KR); A61H2201/5041 (KR); A61H2201/5043 (EP, KR, US); A61H2201/5058 (EP, CN, US); A61H2201/5071 (EP, KR, US); A61H2201/5097 (EP, CN, US); A61H2205/081 (CN)

Application number: TW20190101360 20190114

Priority number(s): US201862759968P 20181112 ; US201862760617P 20181113 ; US201862767260P 20181114 ; US201816201542 20181127

Also published as: AU2019204770 (B1) CA3049387 (A1) CA3049387 (C) CN111166643 (A) CN111166643 (B) more

Abstract of TW202017550 (A)

A percussive massage device includes an enclosure having a cylindrical bore that extends along a longitudinal axis. A motor has a rotatable shaft that rotates about a central axis perpendicular to the longitudinal axis. A crank coupled to the shaft includes a pivot, which is offset from the central axis of the shaft. A reciprocation linkage has a first end coupled to the pivot of the crank. A piston has a first end coupled to a second end of the reciprocation linkage. The piston is constrained to move within a cylinder along the longitudinal axis of the cylindrical bore. An applicator head has a first end coupled to a second end of the piston and has a second end exposed outside the cylindrical bore for application to a person receiving treatment. A motor controller

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measures current applied to the motor and displays a pressure indicator responsive to the measured current.

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Espacenet

Description: TW202017550 (A) — 2020-05-16

Battery-powered percussive massage device with pressure sensor

Description not available for TW202017550 (A)
Description of corresponding document: US10314762 (B1)

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AU2019204770 (B1) CA3049387 (A1) CN111166643 (A) EP3650002 (A1) ES2904706 (T3) JP6643518 (B1) KR102025760 (B1) US10314762 (B1) WO2020101725 (A1) CN211157196 (U) EP4035641 (A1) US2020352822 (A1)

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RELATED APPLICATIONS

This application claims the benefit of priority under 35 USC § 119(e) of U.S. Provisional Application No. 62/759,968 filed on Nov. 12, 2018; U.S. Provisional Application No. 62/760,617 filed on Nov. 13, 2018; and U.S. Provisional Application No. 62/767,260 filed on Nov. 14, 2018, which are incorporated herein by reference in their entireties.

FIELD OF THE INVENTION

The present invention is in the field of therapeutic devices, and, more particularly, is in the field of devices that apply percussive massage to selected portions of a body.

BACKGROUND OF THE INVENTION

Percussive massage, which is also referred to as tapotement, is the rapid, percussive tapping, slapping and cupping of an area of the human body. Percussive massage is used to more aggressively work and strengthen deep-tissue muscles. Percussive massage increases local blood circulation and can even help tone muscle areas. Percussive massage may be applied by a skilled massage therapist using rapid hand movements; however, the manual force applied to the body varies, and the massage therapist may tire before completing a sufficient treatment regime.

Percussive massage may also be applied by electromechanical percussive massage

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devices (percussive applicators), which are commercially available. Such percussive applicators may include, for example, an electric motor coupled to drive a reciprocating piston within a cylinder. A variety of percussive heads may be attached to the piston to provide different percussive effects on selected areas of the body. Many of the known percussive applicators are expensive, large, relatively heavy, and tethered to an electrical power source. For example, some percussive applicators may require users to grip the applicators with both hands in order to control the applicators. Some percussive applicators are relatively noisy because of the conventional mechanisms used to convert the rotational energy of an electric motor to the reciprocating motion of the piston.

When a percussive massage device is applied to a body of a human, the efficacy of the therapy provided by the percussive massage device depends in part on the pressure applied to the body. For certain persons, a lower pressure provides a relaxing massage and a higher pressure may be uncomfortable. For other persons, a higher pressure is required to provide relief from sore muscles and other tissues. For many persons, the pressure needs to be varied from location to location on their bodies. Presently available percussive massage devices do not provide a way to determine the pressure applied to a body. Thus, achievement of a correct pressure for a particular location on the body of a specific person relies on the skill and the memory of the massage therapist applying a percussive massager. Even with the same percussive massage equipment, the same therapist is not likely to provide the appropriate pressures during two successive treatment.

SUMMARY OF THE INVENTION

A need exists for an electromechanical percussive massage device that provides a way to monitor the pressure applied to a location on a body.

One aspect of the embodiments disclosed herein is a percussive massage device that includes an enclosure having a cylindrical bore that extends along a longitudinal axis. A motor has a rotatable shaft that rotates about a central axis perpendicular to the longitudinal axis. A crank coupled to the shaft includes a pivot, which is offset from the central axis of the shaft. A reciprocation linkage has a first end coupled to the pivot of the crank. A piston has a first end coupled to a second end of the reciprocation linkage. The piston is constrained to move within a cylinder along the longitudinal axis of the cylindrical bore. An applicator head has a first end coupled to a second end of the piston and has a second end exposed outside the cylindrical bore for application to a person receiving treatment. A motor controller measures current applied to the motor and displays a pressure indicator responsive to the measured current.

Another aspect in accordance with embodiments disclosed herein is a battery-powered percussive massage device. The device includes an enclosure having a cylindrical bore. The cylindrical bore extends along a longitudinal axis. A piston is located within the cylindrical bore. The piston has a first end and a second end. The piston is constrained to move only along the longitudinal axis of the cylindrical bore. A motor is positioned within the enclosure. The motor has a rotatable shaft. The shaft has a central axis. The central axis of the shaft is perpendicular to the longitudinal axis of the cylindrical bore. A crank is coupled to the shaft. The crank includes a pivot, which is offset from the central axis of the shaft. A reciprocation linkage has a first end and a second end. The first end of the reciprocation linkage is coupled to the pivot of the crank. The second end of the reciprocation linkage is coupled to the first end of the

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piston. An applicator head has a first end and a second end. The first end of the applicator head is coupled to the second end of the piston. The second end of the applicator head is exposed outside the cylindrical bore. A battery assembly extends from the enclosure. The battery assembly provides DC electrical power. A motor controller within the enclosure receives DC electrical power from the battery assembly and selectively provides DC electrical power to the motor to control the speed of the motor. The motor controller further includes a sensor that senses a sensed magnitude of an electrical current flowing through the motor. The motor controller is responsive to the sensed magnitude of the electrical current to display a pressure indication signal corresponding to the sensed magnitude of the electrical current.

In certain embodiments in accordance with this aspect, the applicator head is removably coupled to the piston.

In certain embodiments in accordance with this aspect, the reciprocation linkage is rigid; and the second end of the reciprocation linkage is pivotally coupled to the first end of the piston.

In certain embodiments in accordance with this aspect, the reciprocation linkage is flexible; and the second end of the reciprocation linkage is fixed to the first end of the piston.

In certain embodiments in accordance with this aspect, the motor controller includes a radio frequency transceiver, which selectively transmits a signal that includes a representation of the speed of the motor and the range of pressure applied to the applicator head.

In certain embodiments in accordance with this aspect, the motor controller determines an applied current magnitude by subtracting a no-load current measured at no load from the sensed current magnitude. The motor controller displays the pressure in response to the applied current magnitude.

Another aspect in accordance with embodiments disclosed herein is method of operating a percussive massage device. The method comprises rotating a shaft of an electric motor to rotate a pivot of a crank about a centerline of the shaft. The method further comprises coupling the pivot of the crank to a first end of an interconnection linkage of a reciprocation assembly The method further comprises coupling a second end of the interconnection linkage to a first end of a piston constrained to move along a longitudinal centerline The method further comprises coupling a second end of the piston to an applicator head wherein rotational movement of the pivot of the crank causes reciprocating longitudinal movement of the piston and the applicator head The method further comprises measuring an electrical current through the motor, the electrical current having a magnitude responsive to a pressure applied to the applicator head The method further comprises displaying one of a plurality of pressure indicators, each of the plurality of pressure indicators corresponding to a range of pressures, each range of pressures corresponding to a range of current magnitudes.

In certain embodiments in accordance with this aspect, the applicator head is removably coupled to the piston.

In certain embodiments in accordance with this aspect, the interconnection linkage is rigid; and the second end of the interconnection linkage is pivotally coupled to the first

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end of the piston.

In certain embodiments in accordance with this aspect, the interconnection linkage is flexible; and the second end of the interconnection linkage is fixed to the first end of the piston.

In certain embodiments in accordance with this aspect, the method further comprises selectively transmitting a radio frequency signal that includes a representation of the speed of the motor and the range of pressure applied to the applicator head.

In certain embodiments in accordance with this aspect, the method further comprises receiving the transmitted radio frequency signal by a remote communication device; storing speed and pressure along with a time when the radio frequency signal is received; and selectively retrieving the stored speed, pressure and time to display the speed, pressure and time on the remote communication device.

In certain embodiments in accordance with this aspect, the method further comprises determining a no-load current and subtracting the no-load current from a measured current to determine the current magnitude.

Another aspect in accordance with embodiments disclosed herein is percussive massage device. The device includes a source of electrical energy. An electric motor is configured to rotate about a shaft. A piston is constrained to move in a reciprocating motion within a cylinder. A linkage is configured to couple the electrical motor to the piston such that rotation of the electrical motor causes the piston to reciprocate. An applicator head is removably coupled to the piston. A motor controller is coupled to the source of electrical energy and is coupled to the motor. The motor controller is configured to selectively provide electrical energy to the motor cause the motor to rotate. The motor controller includes a pressure indication system. The pressure indication system is configured to measure a magnitude of a current flowing through the electric motor. The magnitude of the current is responsive to pressure applied against the applicator head. The magnitude of the current includes a plurality of current ranges. The pressure indication system includes a pressure indication display having a plurality of display states, wherein each display state corresponds to a respective one of the current ranges.

In certain embodiments in accordance with this aspect, the pressure indication display comprises a first display device, a second display device and a third display device. Each display device has a respective non-illuminated state and a respective illuminated state. The first display device is in the respective non-illuminated state if the magnitude of the current is less than a first threshold magnitude and is in the respective illuminated state when the magnitude of the current is at least as great as the first threshold magnitude. The second display device is in the respective non-illuminated state if the magnitude of the current is less than a second threshold magnitude and is in the respective illuminated state when the magnitude of the current is at least as great as the second threshold magnitude. The third display device is in the respective non-illuminated state if the magnitude of the current is less than a third threshold magnitude and is in the respective illuminated state when the magnitude of the current is at least as great as the third threshold magnitude.

In certain embodiments in accordance with this aspect, the motor controller includes a radio frequency transceiver, which selectively transmits a signal that includes a

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representation of the speed of the motor and the range of pressure applied to the applicator head.

In certain embodiments in accordance with this aspect, the linkage is rigid; and an end of the linkage is pivotally coupled to an end of the piston.

In certain embodiments in accordance with this aspect, the linkage is flexible; and an end of the linkage is fixed to an end of the piston.

In certain embodiments in accordance with this aspect, the motor controller reduces the magnitude of current as measured by a no-load current to produce a calibrated current. The calibrated current is used to determine the range of pressure.

BRIEF DESCRIPTIONS OF THE DRAWINGS

The foregoing aspects and other aspects of the disclosure are described in detail below in connection with the accompanying drawings in which:

FIG. 1 illustrates a bottom perspective view of a portable electromechanical percussive massage applicator that is battery powered and has a single hand grip, the view in FIG. 1 showing the bottom, the left side and the distal end (the end facing away from a user (not shown)) of the applicator;

FIG. 2 illustrates a top perspective view of the portable electromechanical percussive massage applicator of FIG. 1 showing the top, the right side and the proximal end (the end closest to a user (not shown)) of the applicator;

FIG. 3 illustrates an exploded perspective view of the portable electromechanical percussive massage applicator of FIGS. 1, the view showing the upper housing, a motor assembly, a reciprocation assembly, and a lower housing with an attached battery assembly;

FIG. 4A illustrates an enlarged proximal end view of the combined upper and lower housing with the endcap of the housing detached and rotated to show the interlocking features, the view further showing a distal view of the main printed circuit board (PCB) positioned within the endcap of the housing;

FIG. 4B illustrates a proximal view of the main PCB isolated from the endcap of the housing;

FIG. 5 illustrates an elevational cross-sectional view of the portable electromechanical percussive massage applicator of FIGS. 1 and 2 taken along the line 5-5 in FIG. 1, the view taken through a set of the mated interconnecting features of the upper and lower housings;

FIG. 6 illustrates an elevational cross-sectional view of the portable electromechanical percussive massage applicator of FIGS. 1 and 2 taken along the line 6-6 in FIG. 1, the view taken through the centerline of the shaft of the motor in the motor assembly of FIG. 3;

FIG. 7 illustrates an elevational cross-sectional view of the portable electromechanical percussive massage applicator of FIGS. 1 and 2 taken along the line 7-7 in FIG. 1, the

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view taken through the longitudinal centerline of the apparatus;

FIG. 8 illustrates a top plan view of the lower housing of FIG. 3;

FIG. 9 illustrates an exploded perspective view of the lower housing and the battery assembly of FIG. 3;

FIG. 10 illustrates an enlarged perspective view of the lower surface of the battery assembly printed circuit board;

FIG. 11A illustrates an exploded top perspective view of the motor assembly of FIG. 3, the view showing the upper surfaces of the elements of the motor assembly;

FIG. 11B illustrates an exploded bottom perspective view of the motor assembly of FIG. 3, the view of FIG. 11B similar to the view of FIG. 11A with the elements of the motor assembly rotated to show the lower surfaces of the elements;

FIG. 12 illustrates a bottom perspective view of the upper housing of the percussive massage applicator viewed from the proximal end;

FIG. 13 illustrates an exploded perspective view of the upper housing of the percussive massage applicator corresponding to the view of FIG. 12 showing the outer sleeve, the cylindrical mounting sleeve and the cylinder body;

FIG. 14 illustrates an exploded perspective view of the reciprocation assembly of FIG. 3, the reciprocation assembly including a crank bracket, a flexible interconnection linkage, a piston and a removably attachable application head;

FIG. 15 illustrates a cross-sectional view of the assembled reciprocation assembly taken along the line 15-15 in FIG. 3;

FIG. 16 illustrates a plan view of the percussive massage applicator of FIGS. 1 and 2 with the lower cover removed, the view looking upward toward the electrical motor of the applicator, the view in FIG. 16 showing the crank in the 12 o'clock position (as viewed in FIG. 16) such the end of the applicator head is extended a first distance from the housing of the applicator;

FIG. 17 illustrates a plan view of the portable electromechanical percussive massage applicator similar to the view of FIG. 16, the view in FIG. 17 showing the crank in the 3 o'clock position (as viewed in FIG. 17) such the applicator head is extended a second distance from the housing of the applicator, wherein the second distance is greater than the first distance of FIG. 16;

FIG. 18 illustrates a plan view of the portable electromechanical percussive massage applicator similar to the views of FIGS. 16 and 17, the view in FIG. 18 showing the crank in the 6 o'clock position (as viewed in FIG. 18) such the applicator head is extended a third distance from the housing of the applicator, wherein the third distance is greater than the second distance of FIG. 17;

FIG. 19 illustrates a plan view of the portable electromechanical percussive massage applicator similar to the views of FIGS. 16, 17 and 18, the view in FIG. 19 showing the crank in the 9 o'clock position (as viewed in FIG. 19) such the applicator head is

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extended a fourth distance from the housing of the applicator, wherein the fourth distance is substantially equal to the second distance of FIG. 17;

FIG. 20 illustrates a left elevational view of the percussive massage applicator of FIGS. 1 and 2 with the bullet-shaped applicator removed and replaced with a spherical applicator;

FIG. 21 illustrates a left elevational view of the percussive massage applicator of FIGS. 1 and 2 with the bullet-shaped applicator removed and replaced with a convex applicator having a larger surface area than the bullet-shaped applicator;

FIG. 22 illustrates a left elevational view of the percussive massage applicator of FIGS. 1 and 2 with the bullet-shape applicator removed and replaced with a two-pronged applicator having two smaller distal surface areas;

FIG. 23 illustrates a schematic diagram of the battery controller circuit;

FIG. 24 illustrates a schematic diagram of the motor controller circuit;

FIG. 25 illustrates a plan view of a modified percussive massage applicator having a solid reciprocation linkage, the view shown with the lower cover removed, the view looking upward toward the electrical motor of the applicator, the components other than the motor assembly and the reciprocation assembly shown in phantom;

FIG. 26 illustrates an exploded perspective view of the solid reciprocation linkage of FIG. 25;

FIG. 27 illustrates a schematic diagram of a modified motor controller circuit similar to the motor controller circuit of FIG. 24, the modified motor controller circuit including a circuit to sense motor current corresponding to applied pressure and three additional light-emitting diodes (LEDs) to display ranges of pressure;

FIG. 28 illustrates a top perspective view of a modified portable electromechanical percussive massage applicator showing the top, the right side and the proximal end of the applicator, the proximal end including openings for the three additional LEDs;

FIG. 29 illustrates a proximal end view of a motor controller printed circuit board supporting the three additional LEDs;

FIG. 30 illustrates a flowchart of the operation of the motor controller of FIG. 27;

FIG. 31 illustrates a flowchart showing steps of the perform calibration procedure step of FIG. 30;

FIG. 32 illustrates a flowchart showing steps within the step of inputting voltages, determining current magnitudes and displaying pressure of FIG. 30;

FIG. 33 illustrates a flowchart similar to the flowchart of FIG. 32, which is modified to provide a cascading pressure display instead of the discrete pressure display provided by the flowchart of FIG. 32;

FIG. 34 illustrates a schematic diagram of a further modified motor controller circuit

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similar to the modified motor controller circuit of FIG. 27, the further modified motor controller circuit including a Bluetooth interface to communicate the status of the motor speed LEDs and the pressure range LEDs to a remote device:

FIG. 35 illustrates a pictorial representation of the percussive massage device in communication with a remote device (e.g., a smartphone); and

FIG. 36 illustrates a flowchart of the communication between the remote device and the percussive massage device of FIG. 35 to display and store the motor speed and the pressure range on the remote device.

DESCRIPTION OF ILLUSTRATED EMBODIMENTS

As used throughout this specification, the words "upper," "lower," "longitudinal," "upward," "downward," "proximal," "distal," and other similar directional words are used with respect to the views being described. It should be understood that the percussive massage applicator described herein can be used in various orientations and is not limited to use in the orientations illustrated in the drawing figures.

A portable electromechanical percussive massage applicator ("percussive massage applicator") 100 is illustrated in FIGS. 1-22. As described below, the percussive massage applicator can be applied to different locations of body to apply percussion to the body to effect percussive treatment. The percussive massage applicator is operable with removably attachable applicator heads to vary the effect of the percussive strokes. The percussive massage applicator operates at a plurality of speeds (e.g., three speeds).

The portable electromechanical percussive massage applicator 100 includes a main body 110. The main body includes an upper body portion 112 and a lower body portion 114. The two body portions engage to form a generally cylindrical enclosure about a longitudinal axis 116 (FIG. 2).

A generally cylindrical motor enclosure 120 extends upward from the upper body portion 112. The motor enclosure is substantially perpendicular to the upper body portion. The motor enclosure is capped with a motor enclosure endcap 122. The motor enclosure and the upper body portion house a motor assembly 124 (FIG. 3). The upper body portion also supports a reciprocation assembly 126 (FIG. 0.3), which is coupled to the motor assembly as described below.

A generally cylindrical battery assembly receiving enclosure 130 extends downward from the lower body portion 114 and is substantially perpendicular to the lower body portion. A battery assembly 132 extends from the battery assembly receiving enclosure.

A main body endcap 140 is positioned on a proximal end of the main body 110. In addition to other functions described below, the main body endcap also serves as a clamping mechanism to hold the respective proximal ends of the upper body portion 112 and the lower body portion 114 together. As illustrated in FIG. 4A, the endcap includes a plurality of protrusions 142 on an inner perimeter surface 144. The protrusions are positioned to engage a corresponding plurality of L-shaped notches 146 on the outer perimeters of the proximal ends of the upper body portion and the lower body portion. In the illustrated embodiment, two notches are formed on the upper body

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portion and two notches are formed on the lower body portion. The protrusions on the endcap are inserted into the proximal ends of the notches until seated against the distal ends of the notches. The endcap is then twisted by a few degrees (e.g., approximately 10 degrees) to lock the endcap to the two body portions. A screw 148 is then inserted through a bore 150 in the endcap to engage the lower body portion to prevent the endcap from rotating to unlock during normal use.

As shown in FIG. 4A, the main body endcap 140 houses a motor controller (main) printed circuit board (PCB) 160. As shown in FIG. 4B, the proximal side of the main PCB supports a central pushbutton switch 162. The operation of the switch is described below in connection with the electronic circuitry. As shown in FIG. 2, the switch is surrounded on the endcap by a plurality of bores 164, which extend perpendicularly from the outer (proximal) surface of the endcap to form a plurality of concentric rows of bores. Selected ones of the bores are through bores, which allow airflow through the endcap. Three of the bores above the switch have respective speed indication light-emitting diodes (LEDs) 166A, 166B, 166C positioned therein. The three LEDs extend from the proximal side of the PCB as shown in FIG. 4B. The three LEDs provide an indication of the operational state of the percussive massage applicator 100 as described in more detail below. Five of the bores located below the switch have respective battery charge state LEDs 168A, 168B, 168C, 168D, 168E positioned therein. The five LEDs also extend from the proximal side of the PCB as shown in FIG. 4B. The five LEDs provide an indication of the charge state of the battery when the battery assembly 132 is attached and is providing power to the percussive massage applicator. As shown in FIG. 4A, the distal side of the PCB supports a first plug 170, which includes three contact pins that are connectable to the battery assembly 132 as described below. The distal side of the PCB also supports a second plug 172, which includes five contact pins that are connectable to the motor assembly 124 as described below.

As shown in FIGS. 5 and 8, a distal portion of the lower body portion 114 includes a plurality of through bores 180 (e.g., four through bores) that are aligned with a corresponding plurality of through bores 182 in the upper body portion 112. When lower body portion is attached to the upper body portion, a plurality of interconnection screws 184 pass through the through bores in the lower body portion and engage the through bores of the upper body portion to further secure the two body portions together. A plurality of plugs 186 are inserted into outer portions of the through bores of the lower body portion to hide the ends of the interconnection screws.

As shown in FIGS. 8 and 9, the lower body portion 114 includes a battery assembly receiving tray 200, which is secured to the inside of the lower body portion in alignment with the battery assembly receiving enclosure 130. The receiving tray is secured to the lower body portion with a plurality of screws 202 (e.g., four screws). The receiving tray includes a plurality of leaf spring contacts 204A, 204B, 204C (e.g., three contacts), which are positioned in a triangular pattern. The three contacts are positioned to engage a corresponding plurality of contacts 206A, 206B, 206C, which are positioned around the top edge of the battery assembly 132 when the battery assembly is positioned in the battery assembly receiving enclosure.

The battery assembly 132 includes a first battery cover half 210 and a second battery cover half 212, which enclose a battery unit 214. In the illustrated embodiment, the battery unit comprises six 4.2-volt lithium-ion battery cells connected in series to produce an overall battery voltage of approximately 25.2 volts when fully charged. The

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battery cells are commercially available from many suppliers, such as, for example, Samsung SDI Co., Ltd., of South Korea. The first battery cover half and the second battery cover half snap together. The two halves are further held together by an outer cylindrical cover 216, which also serves as a gripping surface when the percussive massage applicator 100 is being used. In the illustrated embodiment, the outer cover extends only over the portion of the battery assembly that does not enter the battery receiving enclosure 132. In the illustrated embodiment, the outer cover comprises neoprene or another suitable material that combines a cushioning layer with an effective gripping surface.

The upper end of the battery assembly 132 includes a first mechanical engagement tab 220 and a second mechanical engagement tab 222 (FIG. 6). As shown in FIG. 6, for example, when the battery assembly is fully inserted into the battery assembly receiving enclosure 130, the first engagement tab engages a first ledge 224 and the second engagement tab engages a second ledge 226 within the battery assembly receiving enclosure to secure the battery assembly within the battery assembly receiving enclosure.

The lower body portion 114 includes a mechanical button 230 in alignment with the first engagement tab 220. When sufficient pressure is applied to the button, the first engagement tab is pushed away from the first ledge 224 to allow the first engagement tab to move downward with respect to the first ledge and thereby disengage from the ledge. In the illustrated embodiment, the mechanical button is biased by a compression spring 232. The lower body portion further includes an opening 234 (FIG. 6) opposite the mechanical button. The opening allows a user to insert a fingertip into the opening to apply pressure to disengage the second engagement tab 222 from the second ledge 226 and at the same time to apply downward pressure to move the second engagement tab downward away from the second ledge and thereby move the battery assembly 132 downward. Once disengaged in this manner, the battery assembly is easily removed from the battery assembly receiving enclosure 130. In the illustrated embodiment, the opening is covered in part by a flap 236. The flap may be biased by a compression spring 238. In alternative embodiments (not shown), a second mechanical button may be included in place of the opening.

The second battery cover half 212 includes an integral printed circuit board support structure 250, which supports a battery controller printed circuit board (PCB) 252. The battery controller PCB is shown in more detail in FIG. 10. In addition to other components, the battery controller PCB includes a charging power adapter input jack 254 and an on/off switch 256. In the illustrated embodiment, the on/off switch is a slide switch. The battery controller PCB further supports a plurality of light-emitting diodes (LEDs) 260 (e.g., six LEDs), which are mounted around the periphery of the battery controller PCB. In the illustrated embodiment, each LED is a dual-color LED (e.g., red and green), which may be illuminated to display either color. The battery controller PCB is mounted to a battery assembly endcap 262. A translucent plastic ring 264 is secured between the battery controller PCB and the battery assembly endcap such that the ring generally aligned with the LEDs. Accordingly, light emitted by the LEDs is emitted through the ring. As discussed below, the color of the LEDs may be used to indicate the charged state of the battery assembly 132. A switch actuator extender 266 is positioned on the actuator of the slide switch and extends through the endcap to enable the slide switch to be manipulated from the outside of the endcap.

As illustrated in FIG. 3, the motor enclosure 120 houses the electric motor assembly

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124, which is shown in more detail in FIGS. 11A and 11B. The electric motor assembly includes a brushless DC electric motor 310 having a central shaft 312 that rotates in response to applied electrical energy. In the illustrated embodiment, the electric motor is a 24-volt brushless DC motor. The electric motor may be a commercially available motor. The diameter and height of the motor enclosure and the mounting structures (described below) are adaptable to receive and secure the electric motor within the motor enclosure.

The electric motor 310 is secured to a motor mounting bracket 320 via a plurality of motor mounting screws 322. The motor mounting bracket includes a plurality of mounting tabs 324 (e.g., four tabs). Each mounting tab includes a central bore 326, which receives a respective rubber grommet 330, wherein first and second enlarged portions of the grommet are positioned on opposite surfaces of the tab. A respective bracket mounting screw 332 having an integral washer is passed through a respective central hole 334 in each grommet to engage a respective mounting bore 336 in the upper body portion 112. Two of the four mounting bores are shown in FIG. 12. The grommets serve as vibration dampers between the motor mounting bracket and the upper body portion.

The central shaft 312 of the electric motor 310 extends through a central opening 350 in the motor mounting bracket 320. The central shaft engages a central bore 362 of an eccentric crank 360. The central bore is press-fit onto the central shaft of the electric motor or is secured to the shaft by another suitable technique (e.g., using a setscrew).

The eccentric crank 360 has a circular disk shape. The crank has an inner surface 364 oriented toward the electric motor and an outer surface 366 oriented away from the electric motor. A cylindrical crank pivot 370 is secured to or formed on the outer surface and is offset from the central bore of the crank in a first direction by a selected distance (e.g., 2.8 millimeters in the illustrated embodiment). An arcuate cage 372 extends from the inner surface of the crank and is generally positioned diametrically opposite the crank pivot with reference to the central bore 362 of the crank. A semi-annular weight ring 374 is inserted into the arcuate cage and is secured therein by screws, crimping or by using another suitable technique. The masses of the arcuate cage and the semi-annular weight ring operate to at least partially counterbalance the mass of the crank and the forces applied to the crank, as described below.

As shown in FIGS. 12 and 13, the distal end of the upper body portion 112 supports a generally cylindrical outer sleeve 400 having a central bore 402. In the illustrated embodiment, a distal portion 406 proximate to a distal end 404 of the outer sleeve is tapered inward toward the central bore. The outer sleeve has an annular base 408 that is secured to the distal end of the upper body portion by a plurality of screws 410 (e.g., three screws).

The outer sleeve 400 surrounds a generally cylindrical mounting sleeve 420 that is secured within the outer sleeve when the outer sleeve is secured to the upper body portion 112. The mounting sleeve surrounds a cylinder body 422 that is clamped by the mounting sleeve and is secured in a concentric position with respect to the longitudinal axis 116 of the percussive massage applicator 100. In addition to securing the cylinder body, the mounting sleeve serves as a vibration damper to reduce vibrations propagating from the cylinder body to the main body 110 of the percussive massage applicator. In the illustrated embodiment, the cylinder body has a length of approximately 25 millimeters and has an inner bore 424, which has an inner diameter

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of approximately 25 millimeters. In particular, the inner diameter of the cylinder body is at least 25 millimeters plus a selected clearance fit (e.g., approximately 25 millimeters plus approximately 0.2 millimeters).

As shown in FIG. 3, the percussive massage applicator 100 includes the reciprocating assembly 126, which comprises a crank engagement bearing holder 510, which may also be referred to as a transfer bracket; a flexible interconnection linkage 512, which may also be referred to as a flexible transfer linkage; a piston 514; and an applicator head 516. The reciprocating assembly is shown in more detail in FIGS. 14 and 15.

The crank engagement bearing holder 510 comprises a bearing housing 530 having an upper end wall 532 that defines the end of a cylindrical cavity 534. An annular bearing 536 fits within the cylindrical cavity. A removably attachable lower end wall 538 is secured to the bearing housing by a plurality of screws 540 (e.g., two screws) to constrain the annual bearing within the cylindrical cavity. The annular bearing includes a central bore 542 that is sized to engage the cylindrical crank pivot 370 of the eccentric crank 360.

The crank engagement bearing holder 510 further includes an interconnect portion 550 that extends radially from the bearing housing 530. The interconnect portion includes a disk-shaped interface portion 552 having a threaded longitudinal central bore 554. The central bore is aligned with a radial line 556 directed toward the center of bearing housing. In the illustrated embodiment, the central bore is threaded with an 8×1.0 metric external thread. The interface portion has an outer surface 558, which is orthogonal to the radial line. The center of the outer surface of the interface portion is approximately 31 millimeters from the center of the bearing housing. The interface portion has an overall diameter of approximately 28 millimeters and has a thickness of approximately 8 millimeters. A lower portion 560 of the interface portion may be flattened to provide clearance with other components. Selected portions of the interface portion may be removed to form ribs 562 to reduce the overall mass of the interface portion.

A threaded radial bore 564 is formed in the interface portion 552. The threaded radial bore extends from the outer perimeter of the interface portion to the threaded longitudinal central bore 554. The threaded radial bore has an internal thread selected to engage a bearing holder setscrew 566 that is inserted into the third threaded bore. The bearing holder setscrew is rotated to a selected depth as described below.

As used herein, "flexible" in connection with the flexible interconnection linkage 512 means that the linkage is capable of bending without breaking. The linkage comprises a resilient rubber material. The linkage may have a Shore A durometer hardness of around 50; however, softer or harder materials in a medium soft Shore hardness range of 35 A to 55 A may be used. The linkage is molded or otherwise formed to have a shape similar to an hour glass. That is, the shape of the linkage is relatively larger at each end and relatively narrower in the middle. In the illustrated embodiment, the linkage has a first disk-shaped end portion 570 and a second disk-shaped end portion 572. In the illustrated embodiment, the two end portions have similar thicknesses of approximately 4.7 millimeters and have similar outer diameters of approximately 28 millimeters. The material between the two end portions tapers to middle portion 574, which has a diameter of approximately 18 millimeters. In general, the middle portion has a diameter that is between 50 percent and 75 percent of the diameter of the end portions; however, the middle portion may be relatively smaller or relatively larger to

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accommodate materials having a greater hardness or a lesser hardness. The linkage has an overall length between the outer surfaces of the two end portions of approximately 34 millimeters. As discussed in more detail below, the smaller diameter middle portion of the linkage allows the linkage to flex easily between the two end portions.

A first threaded interconnect rod 580 extends from the first end portion 570 of the flexible interconnection linkage 512. A second threaded interconnect rod 582 extends from the second end portion 572 of the linkage. In the illustrated embodiment, the interconnect rods are metallic and are embedded into the respective end portions. For example, in one embodiment, the linkage is molded around the two interconnect rods. In other embodiment, the two interconnect rods are adhesively fixed within respective cavities formed in the respective end portions. In a still further embodiment, the two interconnect rods are formed as integral threaded rubber portions of the linkage.

The first interconnect rod 580 of the flexible interconnection linkage 512 has an external thread selected to engage with the internal thread of the threaded longitudinal central bore 554 of the crank engagement bearing holder 510 (e.g., an 8×1.0 metric external thread). When the thread of the first interconnect rod is fully engaged with the thread of the longitudinal central bore, the bearing holder setscrew 566 is rotated to cause the inner end of the setscrew to engage the thread of the first interconnect rod within the longitudinal central bore to inhibit the first interconnect rod from rotating out of the longitudinal central bore.

In the illustrated embodiment, the second interconnect rod 582 of the flexible interconnection linkage 512 has an external thread similar to the thread of the first interconnect rod 580 (e.g., an 8×1.0 metric external thread). In other embodiments, the threads of the two interconnect rods may be different.

In the illustrated embodiment, the piston 514 comprises stainless steel or another suitable material. The piston has an outer diameter that is selected to fit snugly within the inner bore 424 of the cylinder body 422 described above. For example, the outer diameter of the illustrated piston is no greater than approximately 25 millimeters. As discussed above, the inner diameter of the inner bore of the cylinder body is at least 25 millimeters plus a selected minimum clearance allowance (e.g., approximately 0.2 millimeter). Thus, with the outer diameter of the piston being no more than 25 millimeters, the piston has sufficient clearance with respect to the cylinder body that the piston is able to move smoothly within the cylinder body without interference. The maximum clearance is selected such that no significant play exists between the two parts.

In the illustrated embodiment, the piston 514 comprises a cylinder having an outer wall 600 that extends for a length of approximately 41.2 millimeters between a first end 602 and a second end 604. A first bore 606 is formed in the piston for a selected distance from the first end toward the second end. For example, in the illustrated embodiment, the first bore has a depth (e.g., length toward the second end) of approximately 31.2 millimeters and has a base diameter of approximately 18.773 millimeters. A first portion 608 (FIG. 15) of the first bore is threaded to form a 20×1.0 metric internal thread to a depth of approximately 20 millimeters in the first bore.

A second bore 610 (FIG. 15) is formed from the second end 604 of the piston 514 toward the first end. The second bore has a base diameter of approximately 6.917

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millimeters and has a length sufficient to extend the second bore to the cavity formed by the first bore (e.g., a length of approximately 10 millimeters in the illustrated embodiment). The second bore is threaded for its entire length to form an internal thread in the second bore. The internal thread of the second bore engages the external thread of the second interconnect rod 582 of the interconnection linkage 512. Accordingly, in the illustrated embodiment, the second bore has an 8×1.0 metric internal thread.

A third bore 620 is formed in the piston 514 near the second end 604 of the piston. The third threaded bore extends radially inward from the outer wall 600 of the piston to the second threaded bore. In the illustrated embodiment, the third bore is threaded for the entire length of the bore. The third bore has an internal thread selected to engage a piston setscrew 622, which is inserted into the third threaded bore. When the external thread of the second interconnect rod 582 of the flexible interconnection linkage 512 is fully engaged with the internal thread of the second bore 610 of the piston, the piston setscrew is rotated to cause the inner end of the setscrew to engage the external thread of the second interconnect rod within the second bore to inhibit the second interconnect rod from rotating out of engagement with the thread of the second bore.

The applicator head 516 of the reciprocating assembly 500 can be configured in a variety of shapes to enable a user to apply different types of percussive massage. The illustrated applicator head is "bullet-shaped" and is useful for apply percussive massage to selected relatively small surface areas of a body such as, for example, trigger points. In the illustrated embodiment, the applicator head comprises a medium hard to hard rubber material. The applicator head has an overall length from a first distal (application) end 650 to a second proximal (mounting) end 652 of approximately 55 millimeters. The applicator head has an outer diameter of approximately 25 millimeters for a length of approximately 32 millimeters along a main body portion 654. An engagement portion 656 at the proximal (mounting) end of the applicator head has a length of approximately 11 millimeters and is threaded for a distance of approximately 9 millimeters to form an external 20×1.0 metric thread that is configured to engage the internal thread of the first bore 606 of the piston 514. The thread of the applicator head is removably engageable with the thread of the piston to allow the applicator head to be removed and replaced with a different applicator head as described below. The distal (applicator) end of the applicator has a length of approximately 12 millimeters and tapers from the diameter of the main body portion (e.g., approximately 25 millimeters to a blunt rounded portion 658 having the shape of a truncated spherical cap. The spherical cap extends distally for approximately 3.9 millimeters. The spherical cap has a longitudinal of approximately 10 millimeters and a lateral radius of approximately 7.9 millimeters. In the illustrated embodiment, the applicator head has a hollow cavity 660 for a portion of the length from the proximal mounting end 652. The cavity reduces the overall mass of the applicator head to reduce the energy required to reciprocate the applicator head as described below.

In the illustrated embodiment, percussive massage applicator 100 is assembled by positioning and securing the motor assembly 124 in the upper body portion 112 as described above. A cable (not shown) from the motor 310 in the motor assembly is connected to the five-pin second plug 172.

After installing the motor assembly 300, the reciprocation assembly 126 is installed in the enclosure 110 by first attaching the flexible interconnection linkage 512 to the crank engagement bearing holder 510 by threading the first threaded interconnect rod 580

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into the longitudinal central bore 554. The first threaded interconnect rod is secured within the longitudinal central bore by engaging the bearing holder setscrew 566 into the threaded radial bore 564. The annular bearing 536 is installed within the cylindrical cavity 534 of the bearing bracket and is secured therein by positioning the lower end wall 538 over the bearing and securing the lower end wall with the screws 548. It should be understood that the annular bearing can be installed either before or after the bearing bracket is attached to the flexible linkage.

The crank engagement bearing holder 510 and the connected flexible interconnection linkage 512 are installed by positioning the central bore 542 of the annular bearing 536 over the cylindrical crank pivot 370 of the eccentric crank 360 with the flexible interconnection linkage aligned with the longitudinal axis 116. The second threaded interconnect rod 582 is directed toward the bore 424 of the cylinder body 422 within the cylindrical outer sleeve 400 at the distal end of the percussive massage applicator 100.

The applicator head 516 is attached to the piston 514 by threading the engagement portion 656 of the applicator head into the threaded first portion 608 of the piston. The interconnected applicator head and piston are then installed through the bore 424 of the cylinder body 422 to engage the second bore 610 of the piston with the second threaded interconnector rod 582 of the flexible interconnection linkage 512. The interconnected applicator had and the piston are rotated within the bore of the cylinder body to thread the second bore of the piston onto the second threaded interconnect rod. When the second bore and the second threaded interconnector rod are fully engaged as shown in FIG. 7, for example, the piston setscrew 622 is threaded into the third bore 620 of the piston to engage the threads of the second threaded interconnect rod of the flexible linkage to secure the piston to the flexible linkage. In the illustrated embodiment, the interconnected threads of the piston and the second threaded interconnect rod are configured such that the third bore of the piston is directed generally downward as shown in FIG. 7 and is thereby accessible to tighten the piston setscrew within the third bore. After the piston is secured to the flexible linkage, the applicator head may be unthreaded from the piston without unthreading the piston from the flexible linkage to allow the applicator head to be removed and replaced without having to remove the piston.

After installing the reciprocation assembly 126, as described above, the lower body portion 114 is installed by aligning the lower body portion with the upper body portion 112 and securing the two body portions together using the screws 184 (FIG. 5). The main body endcap 140 is then placed over the proximal ends of the two body portions to engage the protrusions 142 of the endcap with the L-shaped notches 146 of the two body portions. The endcap is then secured to prevent inadvertent removal by inserting the screw 148 through the bore 150 and into the material of the lower body portion.

The battery assembly 132 is installed in the battery assembly receiving enclosure 130 of the lower body portion 114 of the percussive massage applicator 100 and electrically and mechanically engaged as described above. The battery assembly may be charged while installed; or the battery assembly may be charged while removed from the percussive massage applicator.

The operation of the percussive massage applicator 100 is illustrated in FIGS. 16-19, which are views looking up at the motor assembly in the upper body portion 112 with the lower cover 114 and the battery assembly 132 removed. In FIG. 16, the eccentric crank 360 attached to the shaft 312 of the motor 310 is shown at a first reference

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position, which is designated as the 12 o'clock position. In this first reference position, the cylindrical crank pivot 370 on the outer surface 366 of the eccentric crank is at a most proximal location (nearest the top of the illustration in FIG. 16). The crank pivot is positioned in alignment with the longitudinal axis 116. The crank engagement bearing holder 510, the flexible interconnection linkage 512, the piston 514 and the applicator head 516 are all aligned with the longitudinal axis. In this first position, the distal end of the applicator head extends by a first distance D1 from the distal end of the outer sleeve 400.

In FIG. 17, the shaft 312 of the motor 300 has rotated the eccentric crank 360 clockwise 90 degrees (as viewed in FIGS. 16-19). Accordingly, the cylindrical crank pivot 370 on the eccentric crank is now positioned to the right of the shaft of the motor at a second position designated as the 3 o'clock position. The central bore 542 of the annular bearing 536 within the crank engagement bearing holder 510 must move to the right because of the engagement with the cylindrical crank pivot. The piston 514 is constrained by the bore 424 of the cylinder body 422 (FIGS. 12-13) to remain aligned with the longitudinal axis 116. The second end 572 of the flexible interconnection linkage 512 remains aligned with the piston because of the second threaded interconnect rod 582. The first end 570 of the flexible interconnection linkage remains aligned with the crank engagement bearing holder 510 because of the first threaded interconnect rod 580. The smaller middle portion 574 of the flexible interconnection linkage allows the flexible interconnection to bend to the right to allow the crank engagement bearing holder to tilt to the right as shown. In addition to moving to the right and away from the longitudinal axis, the cylindrical crank pivot has also moved distally away from the proximal end of the percussive massage applicator 100, which causes the crank engagement bearing holder to also move distally. The distal movement of the crank engagement bearing holder is coupled to the piston via the flexible interconnector to push the piston longitudinally within the cylinder. The longitudinal movement of the piston causes the applicator head 516 to extend further outward to a second distance D2 from the distal end of the outer sleeve 400. The second distance D2 is greater than the first distance D1.

In FIG. 18, the shaft 312 of the motor 310 has rotated the eccentric crank 360 clockwise an additional 90 degrees to a position designated as the 6 o'clock position. Accordingly, the cylindrical crank pivot 370 is again aligned with the longitudinal axis 116. The crank engagement bearing holder 510 and the flexible interconnection linkage 512 have returned to the initial straight-line configuration in alignment with the piston 514. The cylindrical crank pivot has moved further from the proximal end of the percussive massage applicator 100. Thus, the crank engagement bearing holder and the flexible interconnection linkage push the piston longitudinally within the bore 424 of the cylinder body 422 to cause the applicator head 516 to extend further outward to a third distance D3 from the distal end of the outer sleeve 400. The third distance D3 is greater than the second distance D2.

In FIG. 19, the shaft 312 of the motor 310 has rotated the eccentric crank 360 clockwise an additional 90 degrees. Accordingly, the cylindrical crank pivot 370 is now positioned to the left of the shaft of the motor at a fourth position designated as the 9 o'clock position. The piston 514 is constrained by the bore 424 of the cylinder body 422 to remain aligned with the longitudinal axis 116. The smaller middle portion 574 of the flexible interconnection linkage 512 allows the flexible interconnection linkage to bend to the left to allow the crank engagement bearing holder 510 to tilt to the left as shown. In addition to moving to the left and away from the longitudinal axis, the cylindrical

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crank pivot has also moved proximally toward the proximal end of the percussive massage applicator 100. The proximal movement pulls the piston longitudinally within the cylinder to cause the applicator head 516 to retreat proximally to a fourth distance D4 from the distal end of the outer sleeve 400. The fourth distance D4 is less than the third distance D2 and is substantially the same as the second distance D2.

A further rotation of the shaft 312 of the motor 310 by an additional 90 degrees clockwise returns the eccentric crank 360 to the original 12 o'clock position shown in FIG. 16 to return the cylindrical crank pivot 370 to the most proximal location. This further rotation causes the distal end of the applicator head 516 to retreat to the original first distance D1 from the outer sleeve 400. Continued rotation of the shaft of the motor causes the distal end of the applicator head to repeatedly extend and retreat with respect to the outer sleeve. By placing the distal end of the applicator head on a body part to be massaged, the applicator head applies percussive treatment to the selected body part.

In the illustrated embodiment, the axis of the cylindrical crank pivot 370 is located approximately 2.8 millimeters from the axis of the shaft 312 of the motor 310. Accordingly, the cylindrical crank pivot moves a total longitudinal distance of approximately 5.6 millimeters from the 12 o'clock position of FIG. 16 to the 6 o'clock position of FIG. 18. This results in a 5.6-millimeter stroke distance of the distal end of the applicator head 516 from the fully retreated first distance D1 to the fully extended third distance D3.

Conventional linkage systems between a crank and a piston have two sets of bearings. A first bearing (or set of bearings) couples a first end of a drive rod to a rotating crank. A second bearing (or set of bearings) couples a second end of a drive rod to a reciprocating piston. When the piston reaches each of the two extremes of the reciprocating motion, the piston must abruptly change directions. The stresses caused by the abrupt changes in direction are applied against the bearings at each end of the drive rod as well as to the other components in the linkage system. The abrupt changes of direction also tend to generate substantial noise.

The reciprocating linkage system 126 described herein eliminates a second bearing (or set of bearings) at the piston 514. The piston is linked to the other components of the linkage via the flexible interconnection linkage 512, which bends as the cylindrical crank pivot 370 rotates about the centerline of the shaft 312 of the motor 300. The flexible interconnect cushions the abrupt changes in direction at each end of the piston stroke. For example, as the applicator head 516 and the piston reverse direction from distal movement to proximal movement at the 6 o'clock position, the flexible interconnect may stretch by a small amount during the transition. The stretching of the flexible interconnect reduces the coupling of energy through the linkage system to the bearing 536 (FIG. 14) and the cylindrical crank pivot. Similarly, as the applicator head and the piston reverse direction from proximal movement to distal movement at the 12 o'clock position, the flexible interconnect may compress by a small amount during the transition. The compression of the flexible interconnect reduces the coupling of energy though the linkage system to the bearing and the cylindrical crank pivot. Thus, in addition to eliminating the bearing at the piston end of the linkage system, the flexible interconnect also reduces the stress on the bearing at the crank end of the linkage system.

The flexible interconnection linkage 512 in the linkage assembly 126 also reduces the

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noise of the operating percussive massage applicator 100. The effectively silent stretching and compressing of the flexible interconnect when the reciprocation reverses direction at the 6 o'clock and 12 o'clock positions, respectively, eliminates the conventional metal-to-metal interaction that would occur if the linkage system were coupled to the piston 514 with a conventional bearing.

As discussed above, the bullet-shaped applicator head 516 is removably threaded onto the piston 514. The bullet-shaped applicator head may be unscrewed from the piston and replaced with a spherical-shaped applicator head 700, shown in FIG. 20. A spherical-shaped distal end portion 702 of the applicator head extends from an applicator main body portion 704, which corresponds to the main body portion 654 of the bullet-shaped applicator head. The spherical-shaped applicator head includes an engagement portion (not shown) corresponding to the engagement portion 656 of the bullet-shaped applicator head. The spherical-shaped applicator head may be used to apply percussive massage to larger areas of the body to reduce the force on the treated area and to allow the angle of application to be varied.

The bullet-shaped applicator head 516 may also be unscrewed and replaced with a disk-shaped applicator head 720 shown in FIG. 21. A disk-shaped distal end portion 722 of the applicator head extends from an applicator main body portion 724, which corresponds to the main body portion 654 of the bullet-shaped applicator head. The disk-shaped applicator head includes an engagement portion (not shown) corresponding to the engagement portion 656 of the bullet-shaped applicator head. The disk-shaped applicator head may be used to apply percussive massage to a larger area of the body to reduce the force on the treated area.

The bullet-shaped applicator head 516 may also be unscrewed and replaced with a Y-shaped applicator head 740 shown in FIG. 22. A Y-shaped distal end portion 742 of the applicator head extends from an applicator main body portion 744, which corresponds to the main body portion 654 of the bullet-shaped applicator head. The Y-shaped applicator head includes an engagement portion (not shown) corresponding to the engagement portion 656 of the bullet-shaped applicator head. The Y-shaped applicator head includes an applicator base 750. A first finger 752 and a second finger 752 extend from the applicator base and are spaced apart as shown. The two fingers of the Y-shaped applicator head may be used to apply percussive massage to muscles on both sides of the spine without applying direct pressure to the spine.

The portable electromechanical percussive massage applicator 100 may be provided with power and controlled in a variety of manners. FIG. 23 illustrates an exemplary battery control circuit 800, which comprises in part the circuitry mounted on the battery controller PCB 252. In FIG. 23, previously identified elements are numbered with like numbers as before.

The battery control circuit 800 includes the power adapter input jack 254. In the illustrated embodiment, the input power provided to the jack as a DC input voltage of approximately 30 volts DC. Other voltages may be used in other embodiments. The input voltage is provided with respect to a circuit ground reference 810. The input voltage is applied across a voltage divider circuit comprising a first voltage divider resistor 820 and a second voltage divider resistor 822. The resistances of the two resistors are selected to provide a signal voltage of approximately 5 volts when the DC input voltage is present. The signal voltage is provided through a high resistance voltage divider output resistor 824 as a DCIN signal.

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The DC input voltage is provided through a rectifier diode 830 and a series resistor 832 to a DC input bus 834. The rectifier diode prevents damage to the circuitry if the polarity of the DC input voltage is inadvertently reversed. The voltage on the DC input bus is filtered by an electrolytic capacitor 836.

The DC input voltage on the DC input bus 834 is provided through a 10-volt Zener diode 840 and a series resistor 842 to the voltage input of a voltage regulator 844. The input of the voltage regulator is filtered by a filter capacitor 846. In the illustrated embodiment, the voltage regulator is a HT7550-1 voltage regulator, which is commercially available from Holtek Semiconductor, Inc., of Taiwan. The voltage regulator provides an output voltage of approximately 5 volts on a VCC bus 848, which is filtered by a filter capacitor 850.

The voltage on the VCC bus is provided to a battery charger controller 860. The controller receives the DCIN signal from the voltage divider output resistor 824. The battery charger controller is responsive to the active high state of the DCIN signal to operate in the manner described below to control the charging of the battery unit 214. When the DCIN signal is low to indicate that the charging voltage is not present, the controller does not operate.

The battery charger controller 860 provides a pulse width modulation (PWM) output signal to the input of a buffer circuit 870, which comprises a PNP bipolar transistor 872 having a collector connected to the circuit ground reference 810. The PNP transistor has an emitter connected to the emitter of an NPN bipolar transistor 874. The bases of the two transistors are interconnected and form the input to the buffer circuit. The two transistor bases are connected to receive the PWM output signal from the controller. The commonly connected bases are also connected to the commonly connected emitters via a base-emitter resistor 876. The collector of the NPN connected to the VCC bus 848.

The commonly connected emitters of the PNP transistor 872 and the NPN transistor 874 are connected to an anode of a protection diode 878. A cathode of the protection diode is connected to the VCC bus 848. The protection diode prevents the voltage on the commonly connected emitters from exceeding the voltage on the VCC bus by more than one forward diode drop (e.g., approximately 0.7 volt). The commonly connected emitters of the two transistors are also connected through a resistor 880 to a first terminal of a coupling capacitor 882. A second terminal of the coupling capacitor is connected to a gate terminal of a power metal oxide semiconductor transistor (MOSFET) 884. In the illustrated embodiment, the MOSFET comprises an STP9527 P-Channel Enhancement Mode MOSFET, which is commercially available from Stanson Technology in Mountain View, Calif. The gate terminal of the MOSFET is also connected to an anode of a protection diode 886, which has a cathode connected a source (S) terminal of the MOSFET. The protection diode prevents the voltage on the gate terminal from exceeding the voltage on the source terminal by more than the forward diode voltage of the protection diode (e.g., approximately 0.7 volt). The gate terminal of the MOSFET is also connected to the source terminal of the MOSFET by a pull-up resistor 888. The source of the MOSFET is connected to the DC input bus 834.

A drain (D) of the MOSFET 884 is connected to an input node 892 of a buck converter 890. The buck converter further includes an inductor 894 connected between the input node and an output node 896. The output node (also identified as VBAT) is connected

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to a positive terminal of the battery unit 214. A negative terminal of the battery unit is connected to the circuit ground 810 via a low-resistance current sensing resistor 900. The input node is further connected to a cathode of a free-wheeling diode 902, which has an anode connected to the circuit ground. A first terminal of a resistor 904 is also connected to the input node. A second terminal of the resistor is connected to a first terminal of a capacitor 906. A second terminal of the capacitor is connected to the circuit ground. Accordingly, a complete circuit path is provided from the circuit ground, through the free-wheeling diode, through the inductor, through the battery unit, and through the current sensing resistor back to the circuit ground.

The battery charger controller 860 controls the operation of the buck converter 890 by applying an active low pulse on the PWM output connected to the buffer circuit 870, which responds by pulling down the voltage on the commonly connected emitters of the two transistors 872, 874 to a voltage near the ground reference potential. The low transition to the ground reference potential is coupled through the resistor 880 and the coupling capacitor 882 to the gate terminal of the MOSFET 884 to turn on the MOSFET and couple the DC voltage on the DC input bus 834 to the input node 892 of the buck converter 890. The DC voltage causes current to flow though the inductor 894 to the battery unit 214 to charge the battery unit. When the PWM signal from the battery charger controller is turned off (returned to an inactive high state), the MOSFET is turned off and no longer provides a DC voltage to the input node of the buck converter; however, the current flowing in the inductor continues to flow through the battery unit and back through the free-wheeling diode as the inductor discharges to continue charging the battery unit until the inductor is discharged. The width and repetition rate of the active low pulses generated by the battery charger controller determine the current applied to charge the battery unit in a known manner. In the illustrated embodiment, the PWM signal has a nominal repetition frequency of approximately 62.5 kHz.

The battery charger controller 860 controls the width and repetition rate of the pulses applied to the MOSFET 894 in response to feedback signals from the battery unit 214. A battery voltage sensing circuit 920 comprises a first voltage feedback resistor 922 and a second voltage feedback resistor 924. The two resistors are connected in series from the output node 896 to the circuit ground 810 and are thus connected across the battery unit. A common voltage sensing node 926 of the two resistors is connected to a voltage sensing (VSENSE) input of the controller. The battery charger controller monitors the voltage sensing input to determine the voltage across the battery unit to determine when the battery unit is at or near a maximum voltage of approximately 25.2 volts such that the charging rate should be reduced. In the illustrated embodiment, a filter capacitor 928 is connected from the voltage sensing node to the circuit ground to reduce noise on the voltage sensing node.

As described above, the negative terminal of the battery unit 214 is connected to the circuit ground 810 via the low-resistance current sensing resistor 900, which may have a resistance of, for example, 0.1 ohm. A voltage develops across the current sensing resistor proportional to the current flowing through the battery unit when charging. The voltage is provided as an input to a current sensing (ISENSE) input of the battery charger controller 860 via a high-resistance (e.g., 20,000-ohm) resistor 930. The current sensing input is filtered by a filter capacitor 932. The battery charger controller monitors the current flowing through the battery unit and thus through the current sensing resistor to determine when the current flow decreases as the charge on the battery unit nears a maximum charge. The battery charger controller may also respond

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to a large current through the battery unit and reduce the pulse width modulation to avoid exceeding a maximum magnitude for the charging current.

The output node 896 of the buck converter 890 is also the positive voltage node of the battery unit 214. The positive battery voltage node is connected to a first terminal 940 of the on/off switch 256. A second terminal 942 of the on-off switch is connected to a voltage output terminal 944, which is identified as VOUT. The voltage output terminal is connected to the first contact 206A of the battery assembly 132. The first contact of the battery assembly engages the first leaf spring contact 204A when the battery assembly is inserted into the battery receiving tray 200. When the switch is closed, the first terminal and the second terminal of the switch are electrically connected to couple the battery voltage to the voltage output terminal. The voltage output terminal is coupled to an output voltage sensing circuit 950, which comprises a first voltage divider resistor 952 and a second voltage divider resistor 954 connected in series between the voltage output terminal and the circuit ground. A common node 956 between the two resistors is connected to a VOUT sensing input of the battery charger controller 860. The common node is also connected to the circuit ground by a Zener diode 958, which clamps the voltage at the common node to no more than 4.7 volts. The resistances of the two resistors are selected such that when the switch is closed and the output voltage is applied to the output terminal, the voltage on the common node and the VOUT sensing input of the controller is approximately 4.7 volts to indicate that the switch is closed and that the battery voltage is being provided to the selected terminal of the battery assembly.

A second contact 206B of the battery assembly 132 is connected to a battery charge (CHRG) output signal of the battery charger controller 860 via a signal line 960. The battery charge output signal may be an analog signal having a magnitude indicative of the charging state of the battery unit 214. In the illustrated embodiment, the battery charge output signal is a pulsed digital signal operating in accordance with the Inter-Integrated Circuit (I<2>C) protocol, which encodes the charging state of the battery as a series of digital pulses. The second battery assembly contact engages the second leaf spring contact 204B when the battery assembly is inserted into the battery-receiving tray 200.

A third contact 206C of the battery assembly 132 is connected to the negative terminal of the battery unit 214 via a line 970 and is identified as the battery ground (GND) that is provided to the motor control PCB 160 as described below. Note that the battery ground is coupled to the circuit ground by the 0.1-ohm current sensing resistor 900. The current flowing out of the positive terminal of the battery unit to the motor control PCB and back to the negative terminal of the battery unit does not flow through the current sensing resistor. The third battery assembly contact engages the third leaf spring contact 204C when the battery assembly is inserted into the battery-receiving tray 200.

The battery charger controller 860 drives the dual-color LEDs 260 on the battery controller PCB. The controller includes a first output (LEDR) that drives the red-emitting LEDs in the dual-color LEDs and includes a second output (LEDG) that drives the green-emitting LED in the dual-color LEDs. A first current limiting resistor 980 couples the first output to the anodes of the red-emitting LEDs in a first set of three dual-color LEDs. A second current limiting resistor 982 couples the second output to the anodes of the green-emitting LEDs in the first set of three dual-color LEDs. A third current limiting resistor 984 couples the first output to the anodes of the red-emitting LEDs in a

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second set of three dual-color LEDs. A fourth current limiting resistor 986 couples the second output to the anodes of the green-emitting LEDs in the second set of three dual-color LEDs.

In the illustrated embodiment, the dual-color LEDs 260 are driven with different duty cycles to indicate the present state of charge of the battery unit 214. For example, in a first state, the first output (LEDR) of the controller 860 is driven with a 100 percent duty cycle and the second output (LEDG) of the controller is not driven such that only the red-emitting LEDs are illuminated to indicate that the battery unit needs be charged. In a second state, the first output is driven with a 75 percent duty cycle and the second output is driven with a 25 percent duty cycle such that the resulting perceived color is a mixture of red and green. In a third state, the first output and the second output are both driven with a respective 50 percent duty cycle. In a fourth state, the first output is driven with a 25 percent duty cycle and the second output is driven with a 75 percent duty cycle. In a fifth state, the first output is not driven and the second output is driven with a 100 percent duty cycle such that the color is entirely green to indicate that the battery unit is at or near a fully charged state. The duty cycles at which the two outputs are driven may be interleaved such that the two outputs are not on at the same time. Other than at the first state, the duty cycles are repeated at a rate sufficiently high that the enabled LEDs appear to be on at all times without a perceptible flicker. When the battery controller is in the first state, the battery controller may blink the red-emitting LEDS on and off at a perceptible rate to remind the user that the charge on the battery is low and should be charged before continuing to use the percussive massage applicator 100. In certain embodiments, the first state may be further segmented into two charge ranges. In a first range of charges within the first state, the red LEDs are driven with a constant illumination to indicate that the charge on the charge on the battery unit is low and that the battery unit should be charged soon. In a second range of charges, the red LEDs are blinked to indicate that the charge in the battery unit is very low and that the battery unit should be charged promptly.

FIG. 24 illustrates an exemplary motor controller circuit 1000, which comprises in part the circuitry mounted on the motor controller PCB 160. In FIG. 24, previously identified elements are numbered with like numbers as before. As described above, the battery assembly 132 provides the positive battery output voltage VOUT on the first leaf spring contact 204A of the receiving tray 200 when the battery assembly is inserted into the receiving tray. The positive battery output voltage is identified as VBAT in FIG. 24. The CHRG signal from the battery assembly is provided to the second leaf spring contact 204B when the battery assembly is inserted into the receiving tray. The battery ground (GND) is provided to the third leaf spring contact 204C when the battery assembly is inserted into the receiving tray. The DC voltage, the battery ground and the CHRG signal are coupled via a three-wire cable 1010 to a cable jack 1012. The first plug 170 on the motor controller PCB plugs into the cable jack to receive the DC voltage on a first pin 1020, to receive the CHRG signal on a second pin 1022, and to receive the battery ground (GND) on a third pin 1024. The battery ground (GND) from the third pin of the first plug is electrically connected to a local circuit ground 1026.

The DC voltage (VBAT) on the first pin 1020 of the first plug 170 is filtered by a filter capacitor 1030 connected between the first pin of the first plug and the local circuit ground 1026. The DC voltage is also provided to a first terminal of a current limiting resistor 1032. A second terminal of the current limiting resistor is provided to the voltage input terminal of a voltage regulator 1040. The voltage regulator receives the battery voltage and converts the battery voltage to 5 volts. The 5-volt output of the

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voltage regulator is provided on a local VCC bus 1042. The local VCC bus is filtered by a filter capacitor 1044, which is connected between the local VCC bus and the local circuit ground. In the illustrated embodiment, the voltage regulator is a 78L05 three-terminal regulator, which is commercially available from a number of manufacturers, such as, for example, National Semiconductor Corporation of Santa Clara, Calif.

The CHRG signal on the second pin 1022 of the first plug 170 is provided to a charge (CHRG) input of a motor controller 1050 via a series resistor 1052. The charge input to the motor controller is filtered by a filter capacitor 1054. The motor controller receives the 5 volt supply voltage from the VCC bus 1042

The DC voltage from the first pin 1020 of the first plug is also provided directly to a first pin 1060 of the five-pin second plug 172. The second plug 172 is connectable to a second jack 1070 having a corresponding number of contacts. The second jack is connected via a five-wire cable 1072 to the motor 310.

A second pin 1080 of the second plug is a tachometer (TACH) pin, which receives a tachometer signal from the motor 310 indicative of the present angular velocity of the motor. For example, the tachometer signal may comprise one pulse for every revolution of the shaft 312 of the motor or one pulse per partial revolution. The tachometer signal is provided to a first terminal of a first resistor 1084 in a voltage divider circuit 1082. A second terminal of the first resistor is connected to a first terminal of a second resistor 1086 in the voltage divider circuit. A second terminal of the second resistor is connected to the local circuit ground. A common node 1088 between the first and second resistors in the voltage divider circuit is connected to the base of an NPN bipolar transistor 1090. An emitter of the NPN transistor is connected to ground. A collector of the NPN transistor is connected to the VCC bus 1042 via a pull-up resistor 1092. The NPN transistor inverts and buffers the tachometer signal from the motor and provides the buffered signal to a TACH input of the motor controller. The buffered signal varies between +5 volts (VCC) and the local circuit ground potential when the tachometer signal varies between the local circuit ground potential and the DC voltage potential from the battery.

A third pin 1100 of the second plug 172 is a clockwise/counterclockwise (CW/CCW) signal generated by the motor controller 1050 and coupled to the third pin via a current limiting resistor 1102. The state of the CW/CCW signal determines the rotational direction of the motor 310. In the illustrated embodiment, the CW/CCW signal is maintained at a state to cause clockwise rotation; however, the rotation can be changed to the opposite direction in other embodiments.

A fourth pin 1110 of the second plug 172 is connected to the local circuit ground 1026, which corresponds to the battery ground connected to the negative terminal of the battery unit 214 in FIG. 23.

A fifth pin 1120 of the second plug 172 receives a pulse width modulation (PWM) signal generated by the motor controller 1050. The PWM signal is coupled to the fifth pin via a current limiting resistor 1122. The motor 310 is responsive to the duty cycle and the frequency of the PWM signal to rotate at a selected angular velocity. As described below, the motor controller controls the PWM signal to maintain the angular velocity at one of three selected rotational speeds.

The motor controller 1050 has a switch-in (SWIN) input that receives an input signal

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from the pushbutton switch 162. The pushbutton switch has a first contact connect to the local circuit ground 1026 and has a second contact connected to the VCC bus 1042 via a pull-up resistor 1130. The second contact is also connected to the local circuit ground via a filter capacitor 1132. The second is also connected to the SWIN input of the motor controller. The input signal is held high by the pull-up resistor until the switch contacts are closed by actuating the pushbutton switch. When the switch is actuated to close the contacts, the input signal is pulled to 0 volts (e.g., the potential on the local circuit ground). The filter capacitor reduces the switch contact bounce noise. The motor controller may include internal debounce circuitry to eliminate the effects of the switch contact bounce. The motor controller is initialized in an off-state wherein no PWM signal is provided to the motor 310, and the motor does not rotate. The motor controller is responsive to a first activation of the switch to advance from the off-state to a first on-state wherein the PWM signal provided to the motor is selected to cause the motor to rotate at a first (low) speed. A subsequent activation of the switch advances the motor controller to a second on-state wherein the PWM signal provided to the motor is selected to cause the motor to rotate at a second (medium) speed. A subsequent activation of the switch advances the motor controller to a third on-state wherein the PWM signal provided to the motor is selected to cause the motor to rotate at a third (high) speed. A subsequent activation of the switch returns the motor controller to the initial off-state wherein no PWM signal is provided to the motor and the motor does not rotate. In the illustrated embodiment, the three rotational speeds of the motor are 1,800 rpm (low), 2,500 rpm (medium) and 3,200 rpm (high).

The motor controller 1050 generates a nominal PWM signal associated with the currently selected on-state (e.g., low, medium or high speed). Each on-state corresponds to a selected rotational speed as described above. The motor controller monitors the tachometer signal (TACH) received from the pin 1080 of the five-pin plug 172 via the voltage divider 1082 and the NPN transistor 1090. If the received tachometer signal indicates that the motor speed is below the selected speed, the motor controller adjusts the PWM signal (e.g. increases the pulse width or increases the repetition rate or both) to increase the motor speed. If the received tachometer signal indicates that the motor speed is above the selected speed, the motor controller adjusts the PWM signal (e.g. decreases the pulse width or decreases the repetition rate or both) to decrease the motor speed.

The motor controller 1050 generates a first set of three LED control signals (LEDS1, LEDS2, LEDS3). The first signal (LEDS1) in the first set is coupled via a current limiting resistor 1150 to the anode of the first speed indication LED 166A. The first signal in the first set is activated to illuminate the first speed indication LED when the motor controller is in the first on-state to drive the motor at the first (low) speed. The second signal (LEDS2) in the first set is coupled via a current limiting resistor 1152 to the anode of the second speed indication LED 166B. The second signal in the first set is activated to illuminate the second speed indication LED when the motor controller is in the second on-state to drive the motor at the second (medium) speed. The third signal (LEDS3) in the first set is coupled via a current limiting resistor 1154 to the anode of the third speed indication LED 166C. The third signal in the first set is activated to illuminate the third speed indication LED when the motor controller is in the third on-state to drive the motor at the third (high) speed. In the embodiment of FIG. 24, the cathodes of the speed-indicator LEDs are grounded, and the three LED control signals are applied to the anodes of the respective LEDs such that each LED is illuminated when the respective control signal is active high. In other embodiments described below, the anodes of the indicator LEDs are connected to the VCC bus 1042, and the

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three LED control signals are applied to the cathodes of the respective LEDs through the respective current limiting resistors such that each LED is illuminated when the respective control signal is active low.

The motor controller 1050 is further responsive to the CHRG signal from the input plug 170. As discussed above, the CHRG signal is generated by the battery charger controller 860 to indicate the state of charge of the battery unit 214. The motor controller determines the present state of charge of the battery unit from the CHRG input signal and displays the state of charge on the five battery charge state LEDs 168A, 168B, 168C, 168D, 168E which are visible through the main body endcap 140. As illustrated the cathode of each battery charge state LED is grounded. The motor controller generates a second set of five LED control signals (LEDC1, LEDC2, LEDC3, LEDC4, LEDC5). The first signal (LEDC1) in the second set is coupled via a current limiting resistor 1170 to the anode of the first charge LED 168A. The first signal in the second set is activated to illuminate the first charge indication LED when the battery unit has a lowest range of charge. The motor controller may blink the first charge indication LED at a perceptible rate to indicate the lowest range of charge. The color (e.g., red) of the light emitted by the first charge LED may differ from the color (e.g., green) of the light emitted by the other LEDS to further indicate the lowest range of charge (e.g., no more than 20 percent of charge remaining). The second signal (LEDC2) in the second set is coupled via a current limiting resistor 1172 to the anode of the second charge indication LED 168B. The second signal in the second set is activated to illuminate the second charge indication LED when the battery unit has a second range of charge (e.g., 21-40 percent of charge remaining). The third signal (LEDC3) in the second set is coupled via a current limiting resistor 1174 to the anode of the third charge indication LED 168C. The third signal in the second set is activated to illuminate the third charge indication LED when the battery unit has a third range of charge (e.g., 41-60 percent of charge remaining). The fourth signal (LEDC4) in the second set is coupled via a current limiting resistor 1176 to the anode of the fourth charge indication LED 168D. The fourth signal in the second set is activated to illuminate the fourth charge indication LED when the battery unit has a fourth range of charge (e.g., 61-80 percent of charge remaining). The fifth signal (LEDC5) in the second set is coupled via a current limiting resistor 1178 to the anode of the fifth charge indication LED 168B. The fifth signal in the second set is activated to illuminate the fifth charge indication LED when the battery unit has a fifth range of charge (e.g., 81-100 percent of charge remaining). It should be understood that the ranges of charge are only approximations and are provided as examples. In the embodiment of FIG. 24, the cathodes of the charge indication LEDs are grounded, and the five LED control signals are applied to the anodes of the respective LEDs such that each LED is illuminated when the respective control signal is active high. In other embodiments described below, the anodes of the five charge indication LEDs are connected to the VCC bus 1042, and the five LED control signals are applied to the cathodes of the respective LEDs through the respective current limiting resistors such that each LED is illuminated when the respective control signal is active low.

The portable electromechanical percussive massage applicator 100 described herein advantageously allows a massage therapist to effectively apply percussion massage over an extended time duration without excessive tiring and without being tethered to an electrical power cord. The reduced noise level of the portable electromechanical percussive massage applicator described herein allows the device to be used in quiet environment such that the person being treated with the device is able to relax and enjoy any ambient music or other soothing sounds provided in the treatment room.

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FIGS. 25 and 26 illustrate an alternative embodiment of the mechanical structure of a percussive massage device 1200. FIG. 25 is a lower plan view looking up at the motor assembly 300 in the upper body portion 112 with the lower cover 114 and the battery assembly 132 removed. The upper body portion is shown in phantom to focus the drawing on the motor assembly and the linkage. In FIG. 25, the previously described reciprocation assembly 126 with the flexible interconnection linkage 512 between the motor assembly and the piston 514 is replaced with a reciprocation assembly 1210 having a solid linkage 1212 between the motor assembly and a piston 1214. The solid linkage is shown in more detail in an exploded view in FIG. 26. An annular bearing 1220 within a bearing holder 1222 at the proximal end of the solid linkage engages the cylindrical crank pivot 370 of the cylindrical crank 360 as described above. The distal end of the solid linkage includes a pivot bore 1230 that is positioned over a cylindrical protrusion 1234 of a proximal extended portion 1232 of the piston. The pivot bore extends into a bearing recess 1240 of the distal end of the solid linkage. The bearing recess receives a bearing 1242. An unthreaded portion of a pivot screw 1244 extends through the center of the bearing and engages a threaded bore 1246 in the proximal extended portion of the piston. The pivot bore of the solid linkage pivots with respect to the pivot screw to allow the movement of the solid linkage to impose reciprocating motion onto the piston. The distal end of the piston receives a selectably removable applicator head 1248 (shown in phantom lines in FIG. 25). The applicator head may be, for example, one of the applicator heads shown in FIGS. 20-22 or an applicator head having a different configuration.

In many applications of the percussive massage applicator 100, the pressure applied to a particular location on a body may vary depending on the nature of the tissue in the location (e.g., types of muscle, thickness of overlying fat, and the like). If the applicator is being used to apply pressure to a location that is very sensitive, the applied pressure should be relatively small. On the other hand, if the applicator is being used to apply pressure to a large muscle, the applied pressure should be relatively large. Feedback from the person to whom the applicator is being applied will determine an acceptable magnitude of the pressure that provides beneficial massaging without causing undue pain; however, the magnitude of the pressure is not readily quantifiable so that the person wielding the applicator can reproduce the acceptable magnitude of pressure at the same location in subsequent massage sessions or even when returning to the same location in the same massage session. Thus, a need exists for a system and method for quantifying the applied pressure so that the applied pressure can be reproduced.

FIG. 27 illustrates a modified motor controller circuit 1500, which is similar to the motor controller circuit 1000 of FIG. 24. In the motor controller circuit of FIG. 27, many of the components are the same as the components in FIG. 24 and operate in the same manner. The same components in FIG. 27 are labeled with the same element numbers as in FIG. 24.

The modified motor controller circuit 1500 of FIG. 27 includes certain modifications from the motor controller circuit 1000 of FIG. 24. For example, the controller 1050 of FIG. 24 is replaced with a controller 1510 in FIG. 27. In one embodiment, the controller in FIG. 27 is a peripheral interface controller (PIC) such as the Microchip PIC16F677 8-Bit CMOS Microcontroller, which is commercially available from Microchip Technology, Inc., of Chandler, Ariz. Other similar controllers from other suppliers may also be used. The controller in FIG. 27 may be the same controller as the controller in

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FIG. 24; however, as described below, additional input/output terminals are used in the embodiment of FIG. 27.

As a further example, the current limiting resistor 1032 in FIG. 24 is replaced in FIG. 27 with a first Zener diode 1520 and a second Zener diode 1522 connected in series between the VBAT input terminal 1020 and the voltage input terminal (Vin) of a voltage regulator 1040. For example, the two Zener diodes may have voltage values of 3 volts to thereby limit the voltage (e.g., 25.2 volts) from the battery unit 214 to less than 20 volts, which is the maximum input voltage to the voltage regulator.

As further shown in FIG. 27, the pulse width modulation signal (now labeled "PWM_C") from the controller 1500 is not connected directly to the PWM input of the motor 310 via the current limiting resistor 1122. Rather, the PWM_C signal passes through the current limiting resistor as before and is connected to the base of an NPN bipolar transistor 1530. The collector of the transistor is connected to the local circuit ground. The base of the transistor is also connected to the local circuit ground via a pulldown resistor 1532. The collector of the transistor is connected to the fifth pin 1120 of the second plug 172 and is thus connected to the motor via the second jack 1070 and the five-wire cable 1072. The collector of the transistor is also connected to the VCC bus 1042 via a pullup resistor 1534. The PWM signal functions as before except that the PWM_C signal from the controller is inverted and buffered by the transistor.

The modified motor controller circuit 1500 of FIG. 27 further includes a load current sensing circuit 1550. The load current sensing circuit comprises a current sensing resistor 1552 having a first terminal connected to the fourth pin 1110 of the second plug 172 and having a second terminal connected the local circuit ground 1026. Thus, rather than the return current from the motor 310 flowing directly to the local circuit ground as in FIG. 24, the return current in FIG. 27 flows through the current sensing resistor before reaching the local circuit ground. Accordingly, a voltage develops across the first terminal of the current sensing resistor with respect to the local circuit ground. In the illustrated embodiment, the current sensing resistor is a precision resistor having a resistance of approximately 50 milliohms and a precision of 1% or better. The voltage on the first terminal of the current sensing resistor is proportional to the current flowing through the current sensing resistor. For example, when the current flowing through the current sensing resistor has a magnitude of 1 ampere, the voltage on the first terminal of the current sensing resistor has a magnitude of 50 millivolts. Thus, the voltage on the first terminal of the current sensing resistor can be monitored to determine the instantaneous current flowing from the ground (current return) of the motor to the local circuit ground.

A first filter capacitor 1560 (e.g., a 100,000-picofarad capacitor) cis connected across the current sensing resistor 1552 from the first terminal of the current sensing resistor to the local circuit ground. A first filter resistor 1562 (e.g., a 100,000-ohm resistor) is connected from the first terminal of the current sensing resistor to an analog input pin of the controller 1510. The analog input pin is labeled as "LOAD" in FIG. 27 to indicate that the input signal received on the input pin represents the load current of the motor 310. A second filter capacitor 1564 (e.g., a 100,000 picofarad capacitor) and a third filter capacitor 1566 (e.g., a 100-microfarad electrolytic capacitor) are connected from the analog (LOAD) input pin to the local circuit ground. A second filter resistor 1568 (e.g., a 300,000-ohm resistor) is also connected from the analog input pin to the local circuit ground. Because the motor 310 is driven by pulse width modulation, the current flowing from the motor to the local circuit ground via the current sensing resistor 1552

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comprises a sequence of current pulses, which are sensed by the current sensing resistor to generate a corresponding sequence of voltage pulses. The two filter capacitors and the two filter resistors operate as a low-pass filter to convert the sequence of voltage pulses into a DC voltage signal having a magnitude that varies slowly as the average magnitude of the current pulses vary. The voltage developed across the second filter resistor and the second and third filter capacitors is provided to the analog input pin of the controller. Accordingly, a voltage directly proportional to the average motor load current is applied to the LOAD input pin of the controller.

In the embodiment of FIG. 27, the cathodes of the five charge-indicating LEDs 168A-E are connected to the respective control signals LEDC1-5 of the controller 1510 via the respective current-limiting resistors 1170, 1172, 1174, 1176, 1178, respectively. The anode of each charge-indicating LED is connected to the VCC bus 1042. Each charge-indicating LED is illuminated when the respective control signal is active low to allow current to flow through the LED.

In the embodiment of FIG. 27, the cathodes of the three speed-indicating LEDs 166A-C are connected to the respective control signals LEDS1-3 of the controller 1510 via the respective current-limiting resistors 1150, 1152, 1154, respectively. The anode of each speed-indicating LED is connected to the VCC bus 1042. Each speed-indicating LED is illuminated when the respective control signal is active low to allow current to flow through the LED.

The controller 1500 in FIG. 27 generates three additional output signals LEDP1, LEDP2 and LEDP3 on respective output pins. The LEDP1 output signal is connected via a current limiting resistor 1570 to the cathode of a first power-indicator LED 1572A, which has an anode connected to the VCC bus 1042. The first power-indicator LED is illuminated when the LEDP1 output signal is active low. The LEDP2 output signal is connected via a current limiting resistor 1574 to the cathode of a second power-indicator LED 1572B, which has an anode connected to the VCC bus. The second power-indicator LED is illuminated when the LEDP2 output signal is active low. The LEDP3 output signal is connected via a current limiting resistor 1576 to the cathode of a third power-indicator LED 1572C, which has an anode connected to the VCC bus. The third power-indicator LED is illuminated when the LEDP3 output signal is active low. As described below, the first, second and third power-indicator LEDs are selectively illuminated in response to the magnitude of the current sensed by the current sensing resistor 1552. In the illustrated embodiment, the cathodes of the respective power-indicator LEDs are driven with respective active low signals. In other embodiments, the cathodes may be connected to the VCC bus and the anodes may be driven with active low output signals from the controller such as described above with respect to LEDs in the embodiment of FIG. 24. The three additional LEDs are shown on a perspective view of the modified percussive massage device 1200 in FIG. 28 and in a perspective view of a modified motor control printed circuit board 1580 in FIG. 29. In FIG. 28, the motor enclosure 120 of the previously describe embodiment is replaced with a modified motor enclosure 1582, which is shorter and which has a larger diameter to accommodate a motor (not shown) having a different configuration. Also, the fingertip opening 234 in the lower body 114 is eliminated.

The magnitude of the load current flowing through the sensing resistor 1552 is related to the pressure applied to the massage applicator 100 to force the applicator head 516 of the massage applicator against a location on a body or against another obstacle. For example, when the applicator head is allowed to reciprocate freely, the load current will

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be a minimal amount of current needed to turn the motor 310 and to reciprocate the applicator head and to turn and reciprocate the components coupling the output shaft of the motor to the applicator head. In contrast, when the applicator head is pressed forcibly against a location on a body or against another obstacle, the motor requires additional current to maintain a selected rotational speed at the increased pressure. Thus, in the illustrated embodiment, the magnitude of the load current through the motor is measured and is compared to ranges of load current corresponding to different magnitudes of applied force to determine the instantaneous load current. The measurement and the comparison features are described below.

The motor control functions and the display of the operating speed are performed within the controller 1510 correspond to the functions described above with respect to the controller 1050 of FIG. 27. FIG. 30 illustrates a flowchart 1600 of the operation of the pressure measurement and display functions of the embodiment of FIG. 27.

The operation of the controller 1510 starts with a power sequence in an activity block 1610 wherein the controller starts operating when power is first applied via the on/off switch 256 on the battery assembly 132. The controller first performs functions defined by internal programmable memory to initialize various internal settings in a system initialization activity block 1612.

After the system initialization, the controller 1510 advances to an input/output (I/O) port initialization activity block 1614 wherein the controller initializes the input/output (I/O) ports. As indicated above, in the illustrated embodiment, the controller comprises a Microchip PIC16F677 8-Bit CMOS Microcontroller. The illustrated controller has 18 I/O pins and each pin is configurable to perform many different functions. In the initialization activity block, the pins are configured in accordance with the intended functionality. For example, the LEDS1, LEDS2, LEDS3, LEDC1, LEDC2, LEDC3, LEDC4, LEDC5, LEDP1, LEDP2 and LEDP3 pins are configured as output pins. The PWM_C pin is configured as a pulse width modulation output pin, which is supported by internal logic within the controller to generate a PWM signal at a selected frequency and a selected duty cycle. The CW/CCW pin is configured as an output pin. The LOAD pin is configured as an analog input pin to receive the voltage having a magnitude corresponding to the sensed value of the motor current. The TACH pin is configured as a digital input pin to receive the tachometer pulses from the motor 310. The CHRG pin is configured as an I<2>C to receive an input sequence from the battery controller PCB 252 having a digital value representing the charge state of the battery unit 214. The SWIN pin is configured as a digital input to receive the high or low state of the central pushbutton switch 162.

After initializing the I/O pins in the block 1614, the controller 1510 advances to a motor speed state set-to-zero activity block 1616 wherein the controller sets the desired motor speed state to 0 (e.g., off). The controller also applies control signals to the internal PWM logic to cause the PWM logic to discontinue sending PWM signals to the PWM_C output pin. On the initial pass through the activity block after initially powering up, the controller may have already set the motor speed state to zero during the initialization process.

After setting the motor speed state to 0, the controller 1510 advances to a display activity block 1620 wherein the controller selectively activates the signals on the LEDC1-5 output pins to display the battery charge via the battery charge indicator LEDs 168A-E. The controller obtains the battery charge information from the battery

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controller PCB 252 via the I2C signal on the CHRG input pin.

After activating the battery charge LEDs, the controller 1510 advances to a speed switch reading activity block 1622 wherein the controller reads the digital value on the SWIN input pin to determine the state of the pushbutton switch 162, which functions as a motor speed state selection switch as described above. A digital value of 0 indicates that the switch has been activated by a user. A digital value of 1 indicates that the switch has not been activated. The controller may be programmed with an internal debounce routine to assure that the controller only responds once to each activation of the pushbutton switch.

After reading the value on the SWIN input pin, the controller 1510 advances to a decision block 1624 in which the controller determines whether the pushbutton (speed change) switch 162 is active (e.g., the digital value on the SWIN pin is low). If the switch is inactive, the controller returns to the display activity block 1620 and continues to display the battery charge as described above and continues to read the value on the SWIN input pin in the activity block 1622. The controller will continue to loop to display the battery charge and read the pushbutton switch until the value on the SWIN input pin becomes active low.

If the pushbutton switch 162 is active when the controller 1510 evaluates the state of the switch in the decision block 1624, the controller advances to a speed change activity block 1630 wherein the controller increments the motor speed state from 0 to 1 and sets the internal PWM logic to output pulses on the PWM_C output pin to drive the motor 310 at the slowest motor speed (e.g., 1,800 rpm in the illustrated embodiment). Within the speed change activity block, the controller also activates the LEDS1 signal to cause the first motor speed indicator LED 168A to illuminate.

After setting the motor speed to the lowest level in the block 1630, the controller 1510 advances to a block 1632 wherein the controller performs a calibration procedure in which the controller first determines a no-load current magnitude INO-LOAD when no pressure is applied to the applicator head 516. The steps within the calibration procedure block are described in more detail below with respect to FIG. 31. As described below, the controller returns from the calibration procedure with a calibration flag set if the calibration procedure completes successfully and returns from the calibration procedure with the calibration flag reset (cleared) if the calibration procedure does not complete successfully.

After completing the calibration procedure in the block 1632, the controller 1510 advances to a decision block 1640 wherein the controller tests the status of the calibration flag. If the calibration flag is set, the controller advances to an activity block 1650. Otherwise, the controller skips the activity block 1650 and advances to an activity block 1660.

The activity block 1650 is a current measurement and pressure display activity block wherein the controller inputs the analog voltage value on the LOAD input pin representing the magnitude of the average current through the current sensing resistor 1552, determines a load current magnitude, and selectively activates one of the pressure indicator LEDs 1572A, 1572B, 1572C to indicate a range of pressure being applied to the applicator head 516. The steps within the current measurement and pressure display block are described in more detail below with respect to FIG. 32. The controller than advances to the activity block 1660.

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The activity block 1660 is a charge display activity block wherein the controller 1510 inputs the digital value on the CHRG input pin and selectively activates the signals on the LEDC1-5 output pins to display the battery charge via the battery charge indicator LEDs 168A-E.

After displaying the battery charge in the charge display activity block 1660, the controller advances to a speed switch reading activity block 1662 wherein the controller reads the digital value on the SWIN input pin to determine the state of the pushbutton switch 162 as described above for the speed switch reading activity block 1622.

After reading the value on the SWIN input pin, the controller 1510 advances to a decision block 1664 in which the controller determines whether the pushbutton (speed change) switch 162 is active (e.g., the digital value on the SWIN pin is low).

If the switch is inactive when evaluated in the decision block 1664, the controller 1510 returns to the decision block 1640 where the controller again determines whether the calibration flag is set or clear. If the calibration flag is set, the controller then displays the new current magnitude in the pressure display activity block 1650, displays the battery charge in the charge display activity block 1660, reads the pushbutton switch in the speed switch reading activity block 1662, and checks the reading in the decision block 1664 to determine whether the switch is active. Otherwise, the controller skips the block 1650 and performs the steps in the blocks 1660, 1662 and 1664. The controller remains in the five-block loop (calibration flag set) or four-block loop (calibration flag clear) until the pushbutton switch is activated. In the illustrated embodiment, the functions performed in the loop are timed such that the current is measured approximately eight times per second. The timing may be accomplished by software delays, by implementing a countdown timer, or by other known methods for controlling loop timing. Until the pushbutton switch is activated, the controller will remain in the loop as long as power is being provided from the battery assembly 132.

If the pushbutton switch 162 is active when the controller 1510 evaluates the state of the switch in the decision block 1664, the controller advances to a speed change activity block 1670 wherein the controller increments the motor speed state by 1. The controller then advances to a decision block 1672 wherein the controller determines whether the new motor speed state is greater than 3. If the motor speed state is greater than 3, the controller returns to the motor speed state set-to-zero activity block 1616 wherein the controller sets the desired motor speed state to 0 (e.g., off). The controller also applies control signals to the internal PWM logic to cause the PWM logic to discontinue sending PWM signals to the PWM_C output pin. The controller also deactivates the signals on the LEDS1, LEDS2 and LEDS3 output pins such that all of the speed indicator LEDs 168A, 1686 and 168C are turned off. The controller then continues in the four-block loop comprising the blocks 1616, 1620, 1622 and 1624 until the pushbutton switch is again activated to restart the motor 310.

If the new motor speed state is no more than 3 when the controller 1510 reaches the decision block 1672, the controller advances to a motor speed setting block 1680 wherein the controller sets the motor speed to a value corresponding to the new motor speed state. If the new motor speed state is 2, the controller applies control signals to the internal PWM logic to cause the PWM logic to send PWM signals to the PWM_C output pin to cause the motor 310 to rotate at the medium speed (e.g., 2,500 rpm in the illustrated embodiment). Within the motor speed setting block, the controller also

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deactivates the previously active signal on the LEDS1 output pin and activates the signal on the LEDS2 output pin to turn on the second speed indicator LED 168B. If the new motor speed state is 3, the controller applies control signals to the internal PWM logic to cause the PWM logic to send PWM signals to the PWM_C output pin to cause the motor 310 to rotate at the high speed (e.g., 3,200 rpm in the illustrated embodiment). The controller deactivates the previously active signal on the LEDS2 output pin and activates the signal on the LEDS3 output pin to turn on the third speed indicator LED 168C.

After setting the new motor speed in the motor speed setting block 1680, the controller 1510 returns to the decision block 1640 wherein the controller checks the status of the calibration flag and then performs either the five-block loop (calibration flag set) or the four-block loop (calibration flag clear) as described above. The controller remains in the five-block loop or the four-block loop until the switch is activated. The controller repeats the actions in the loop approximately 8 times per second until the pushbutton switch is activated or until power is no longer being provided from the battery assembly 132.

FIG. 31 illustrates steps within the perform calibration procedure block 1632 of FIG. 30. The calibration procedure is performed when the user initially activates the central pushbutton (speed change) switch 162 to cause the controller 1510 to turn on the motor 310 and set the speed at the lowest level (level 1) as described above with respect to FIG. 30. The documentation with the percussive massage device 100 instructs the user that calibration is performed when power is initially applied and further instructs the user to not activate the speed selection switch to increase the speed and to not apply pressure against the applicator head 516.

In a first activity block 1700, the controller 1510 activates the power indication LEDs 1572A, 1572B, 1572C in a flashing pattern to alert the user that the calibration procedure is being performed. The pattern may be a counting pattern with the illuminated LEDs representing a binary count, a shifting pattern wherein one LED is illuminated at a time or another selected pattern that changes to indicate the calibration procedure is active. While continuing to flash the LEDs, the controller advances to an activity block 1702 wherein the controller inputs the analog voltage value on the LOAD input pin representing the magnitude of the average current through the current sensing resistor 1552. The controller saves (records) the initial current magnitude and advances to a decision block 1704 wherein the controller determines whether the speed selection switch 162 has been activated by the user during the calibration procedure. If the speed selection switch has been activated, the controller exits the calibration procedure without completing the calibration process. When exiting the calibration procedure early, the controller resets (clears) the calibration flag in an activity block 1706, turns of the LEDs in an activity block 1708 and then exits the calibration procedure via a block 1710.

If the user does not activate the speed selection switch 162 during the calibration procedure, the controller 1510 advances from the decision block 1704 to a decision block 1720 wherein the controller determines whether 40 current samples have been saved, which represents approximately 5 seconds of sampling at approximately 8 samples per second. If the 40 samples have not been saved, the controller returns to the activity block 1702 wherein the controller inputs the next sample and then checks to determine whether the speed selection switch has been activated. The controller continues in this current sampling loop until 40 current samples are saved or until the user interrupts the calibration procedure by activating the speed selection switch.

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When the controller 1510 determines that 40 current samples have been saved (recorded), the controller advances from the decision block 1720 to an activity block 1722 wherein the controller averages the 40 current samples to determine an average current. Then, in a decision block 1722, the controller determines whether the average current exceeds 1,000 milliamperes. If the user has complied with the calibration procedure instructions and has not applied pressure against the applicator head 516 during the calibration procedure, the average current should not exceed 1,000 milliamperes. If the average current exceeds 1,000 milliamperes, the controller advances to the activity block 1706 to reset (clear) the calibration flag, turns off the flashing LEDs in the block 1708 and exits the calibration procedure via the block 1710.

If the average of the current samples is no more than 1,000 milliamperes, the controller 1510 advances from the decision step 1730 to an activity block 1732 wherein the controller saves the average current as the no-load current value INO-LOAD. The no-load current value is used in the pressure measurement steps described below with respect to FIG. 32. The controller sets the calibration flag to indicate that the calibration procedure was successful and that the no-load current value can be used in the current measurement and pressure display procedure 1650 as described below.

After saving the no-load current magnitude and setting the calibration flag in the block 1732, the controller 1510 advances to an activity block 1734 wherein the controller activates the three pressure indicator LEDs 1572A, 1572B, 1572C together for approximately one second to inform the user that the calibration procedure was completed successfully. Alternatively, the controller may indicate successful completion of the calibration procedure by multiple flashes (e.g., two flashes) of the three LEDs together. In a further alternative, the three LEDs may be activated in a selected sequence to indicate the successful completion of the calibration procedure. The controller than advances to the activity block 1708 to turn off the LEDs and then exits the calibration procedure via the block 1710.

The procedure 1650 of inputting voltages, determining current magnitudes and displaying pressure is illustrated in more detail in FIG. 32. In a first activity block 1800, the controller 1510 inputs a current magnitude sample by measuring the voltage across the current sensing resistor 1552 as described above. The controller then advances to an activity block 1802 wherein the controller calculates a rolling average IAVG of the last eight current samples. The first seven times through the overall measurement loop, the controller may average less than eight samples; however, the full averaging will occur after the percussive massage device 100 has been operating for at least one second.

After generating the average current in the block 1802, the controller 1510 advances to an activity block 1804 wherein the controller calculates a current difference ΔI between the average current IAVG (determined in the block 1802) and the no-load current INO-LOAD (determined in the calibration procedure 1616 of FIG. 31). After calculating the current difference ΔI, the controller advances to a branching decision block 1806 wherein the controller branches to one of three pressure display routines based on the selected speed level.

If the selected speed is at level 1 (low speed), the controller 1510 branches from the branching decision block 1806 to a first pressure display routine 1810. The first pressure display routine includes a respective first decision block 1812, a respective

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second decision block 1814, and a respective third decision block 1816.

If the selected speed is at level 2 (medium speed), the controller 1510 branches from the branching decision block 1806 to a second pressure display routine 1820. The second pressure display routine includes a respective first decision block 1822, a respective second decision block 1824, and a respective third decision block 1826.

If the selected speed is at level 3 (high speed), the controller 1510 branches from the branching decision block 1806 to a third pressure display routine 1830. The third pressure display routine includes a respective first decision block 1832, a respective second decision block 1834, and a respective third decision block 1836.

Within the first pressure display routine 1810, the controller 1510 first determines in the respective first decision block 1812 whether the difference ΔI between the average current IAVG and the no-load current INO-LOAD is less than 300 milliamperes. If the difference is less than 300 milliamperes, the controller advances to an activity block 1840 wherein the controller turns off all of the pressure indicator LEDs 1752A, 1752B, 1752C to indicate that no pressure or only a small amount of pressure is being applied to the application head 516. For example, in one embodiment, an applied pressure of less than 0.1 kilogram will not increase the average current over the no-load current by 300 milliamperes at the first (low) speed level.

If the controller 1510 determines in the respective first decision block 1812 that the difference ΔI between the average current and the no-load current is at least 300 milliamperes, the controller advances to the respective second decision block 1814 wherein the controller determines whether the difference ΔI between the average current and the no-load current is less than 600 milliamperes. If the difference is less than 600 milliamperes, the controller advances to an activity block 1842 wherein the controller turns on the first pressure indicator LED 1752A to indicate that the pressure is in a first pressure range. For example, in one embodiment, an applied pressure in a first pressure range of approximately 0.1 kilogram to 0.5 kilogram will cause an average load current in a range of approximately 300 milliamperes to approximately 599 milliamperes greater than the no-load current at the first (low) speed level.

If the controller 1510 determines in the respective second decision block 1814 that the difference ΔI between the average current and the no-load current is at least 600 milliamperes, the controller advances to the respective third decision block 1816 wherein the controller determines whether the difference ΔI between the average current and the no-load current is less than 900 milliamperes. If the difference is less than 900 milliamperes, the controller advances to an activity block 1844 wherein the controller turns on the second pressure indicator LED 1752B to indicate that the pressure is in a second pressure range. For example, in one embodiment, an applied pressure in a second pressure range of approximately 0.5 kilogram to approximately 1.5 kilograms will cause an average load current in a range of approximately 600 milliamperes to approximately 899 milliamperes greater than the no-load current at the first (low) speed level.

If the controller 1510 determines in the respective third decision block 1816 that the difference ΔI between the average current and the no-load current is at least 900 milliamperes, the controller advances to an activity block 1846 wherein the controller turns on the third pressure indicator LED 1752C to indicate that the pressure is in a third pressure range. For example, in one embodiment, an applied pressure in a third

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pressure range greater than approximately 2.5 kilograms will cause an average load current at least 900 milliamperes greater than the no-load current at the first (low) speed level.

Within the second pressure display routine 1820, the controller 1510 first determines in the respective first decision block 1822 whether a difference ΔI between the average current and the no-load current is less than 600 milliamperes. If the difference is less than 600 milliamperes, the controller advances to the activity block 1840 wherein the controller turns off all of the pressure indicator LEDs 1752A, 1752B, 1752C to indicate that no pressure or only a small amount of pressure is being applied to the application head 516. For example, in one embodiment, an applied pressure of less than 0.1 kilogram will not increase the average current over the no-load current by 600 milliamperes at the second (medium) speed level.

If the controller 1510 determines in the respective first decision block 1822 that the difference ΔI between the average current and the no-load current is at least 600 milliamperes, the controller advances to the respective second decision block 1824 wherein the controller determines whether the difference ΔI between the average current and the no-load current is less than 900 milliamperes. If the difference is less than 900 milliamperes, the controller advances to the activity block 1842 wherein the controller turns on the first pressure indicator LED 1752A to indicate that the pressure is in a first pressure range. For example, in one embodiment, an applied pressure in the first pressure range of approximately 0.1 kilogram to 0.5 kilogram will cause an average load current in a range of approximately 600 milliamperes to approximately 899 milliamperes greater than the no-load current at the second (medium) speed level.

If the controller 1510 determines in the respective second decision block 1824 that the difference ΔI between the average current and the no-load current is at least 900 milliamperes, the controller advances to the respective third decision block 1826 wherein the controller determines whether the difference ΔI between the average current and the no-load current is less than 1,200 milliamperes. If the difference is less than 1,200 milliamperes, the controller advances to the activity block 1844 wherein the controller turns on the second pressure indicator LED 1752B to indicate that the pressure is in a second pressure range. For example, in one embodiment, an applied pressure in the second pressure range of approximately 0.5 kilogram to approximately 1.5 kilograms will cause an average load current in a range of approximately 900 milliamperes to approximately 1,199 milliamperes greater than the no-load current at the first (medium) speed level.

If the controller 1510 determines in the respective third decision block 1826 that the difference ΔI between the average current and the no-load current is at least 1,200 milliamperes, the controller advances to the activity block 1846 wherein the controller turns on the third pressure indicator LED 1752C to indicate that the pressure is in a third pressure range. For example, in one embodiment, an applied pressure in the third pressure range greater than approximately 2.5 kilograms will cause an average load current at least 1,200 milliamperes greater than the no-load current at the second (medium) speed level.

Within the third pressure display routine 1830, the controller 1510 first determines in the respective first decision block 1832 whether a difference ΔI between the average current and the no-load current is less than 900 milliamperes. If the difference is less than 900 milliamperes, the controller advances to the activity block 1840 wherein the

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controller turns off all of the pressure indicator LEDs 1752A, 1752B, 1752C to indicate that no pressure or only a small amount of pressure is being applied to the application head 516. For example, in one embodiment, an applied pressure of less than 0.1 kilogram will not increase the average current over the no-load current by 900 milliamperes at the third (high) speed level.

If the controller 1510 determines in the respective first decision block 1832 that the difference ΔI between the average current and the no-load current is at least 900 milliamperes, the controller advances to the respective second decision block 1834 wherein the controller determines whether the difference ΔI between the average current and the no-load current is less than 1,200 milliamperes. If the difference is less than 1,200 milliamperes, the controller advances to the activity block 1842 wherein the controller turns on the first pressure indicator LED 1752A to indicate that the pressure is in a first pressure range. For example, in one embodiment, an applied pressure in the first pressure range of approximately 0.1 kilogram to 0.5 kilogram will cause an average load current in a range of approximately 900 milliamperes to approximately 1,199 milliamperes greater than the no-load current at the third (high) speed level.

If the controller 1510 determines in the respective second decision block 1834 that the difference ΔI between the average current and the no-load current is at least 1,200 milliamperes, the controller advances to the respective third decision block 1836 wherein the controller determines whether the difference ΔI between the average current and the no-load current is less than 1,500 milliamperes. If the difference is less than 1,500 milliamperes, the controller advances to the activity block 1844 wherein the controller turns on the second pressure indicator LED 1752B to indicate that the pressure is in a second pressure range. For example, in one embodiment, an applied pressure in the second pressure range of approximately 0.5 kilogram to approximately 1.5 kilograms will cause an average load current in a range of approximately 1,200 milliamperes to approximately 1,499 milliamperes greater than the no-load current at the first (medium) speed level.

If the controller 1510 determines in the respective third decision block 1836 that the difference ΔI between the average current and the no-load current is at least 1,500 milliamperes, the controller advances to the activity block 1846 wherein the controller turns on the third pressure indicator LED 1752C to indicate that the pressure is in a third pressure range. For example, in one embodiment, an applied pressure in the third pressure range greater than approximately 2.5 kilograms will cause an average load current at least 1,500 milliamperes greater than the no-load current at the third (high) speed level.

By first establishing a no-load current magnitude and then determining the applied pressure based on the difference between the measured current and the no-load current, the pressure indications produced by individual units will be similar. The no-load currents may vary from unit to unit because of differences in friction levels within the reciprocating mechanism for example; however, the differences in current caused by applied pressure will be similar. Thus, the pressure indications provided by different units will be similar.

In the embodiment illustrated in FIG. 32, each of the pressure indicator LEDs 1572A, 1572B, 1572C is illuminated only for the specific range of current differences for the selected motor speed. Accordingly, as the applied pressure increases, the three pressure indicator LEDs illuminate such that only one LED is illuminated at any time

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(other than during the calibration procedure 1616 described above).

In an alternative embodiment illustrated by a flowchart 1850 in FIG. 33, the first pressure indicator LED 1572A is illuminated for the first active range of applied pressures and remains illuminated for the second and third ranges of applied pressures. Similarly, the second pressure indicator LED 1572B is illuminated for the second range of applied pressures and remains illuminated for the third range of applied pressures. The third pressure indicator LED 1572C is illuminated only for the third range of applied pressures. Thus, when the applied pressure increases to the higher ranges in the alternative embodiment, the pressure indicator LEDs provide a cumulative lighting effect rather than a discrete effect as in the illustrated embodiment. In FIG. 33, the modified sequencing of the pressure indicator LEDs is implemented by having the controller 1510 exit the block 1846 and advance to the block 1844 and by having the controller exit the block 1844 and advance to the block 1842. The controller exits the procedure from the block 1842 as previously described. Thus, when the controller activates the third pressure indicator to indicate the highest applied pressure range, the controller also activates the second pressure indicator LED and the first pressure indicator LED before exiting the modified procedure. When the controller activates the second pressure indicator to indicate the middle applied pressure range, the controller also activates the first pressure indicator LED before exiting the modified procedure. When the controller activates the first pressure indicator LED to indicate the lowest applied pressure range, the controller only activates the first pressure indicator LED before exiting the modified procedure.

The flowcharts in FIGS. 32 and 33 represent an implementation of the decision process for determining which, if any, of pressure indicator LEDs 1572A, 15726, 1572C to activate. The decision process may also be implemented in other manners, such as, for example, lookup tables or the like.

In the illustrated embodiment, the differences between the average current and the no-load current are characterized in four ranges for each motor speed, which results in the illumination of no pressure indicator LEDs at the lowest range of current differences caused by little or no applied pressure; the illumination of the first pressure indicator LED 1572A at a second range of current differences caused by applied pressure in a first range; the illumination of the second pressure indicator LED 1572B at a third range of current differences caused by applied pressure in a second range; and the illumination of the third pressure indicator LED 1572C at a fourth range of current differences caused by applied pressure in a third range. In other embodiments, the current differences may be divided into more than four ranges (e.g., eleven current ranges) and more pressure indicators (e.g., ten pressure indicator LEDs) may be used to indicate the additional ranges of pressure applied against the applicator head.

In further alternative embodiments, the signals representing the pressure ranges may be encoded (e.g., binary encoded) such that three LEDs may be indicate up to seven active pressure ranges. In such an embodiment, a condition of no LEDs being illuminated represents zero or near zero pressure applied to the applicator head; and each of the seven possible combinations of one or more illuminated LEDs represents a respective one of seven pressure ranges. The encoded signals may also be used to control a numeric display (e.g., an LCD) of pressure ranges.

The above-described relationships between particular current magnitudes and particular pressure ranges are examples of ranges. The specific relationship between

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the ranges of measured current and the ranges of applied pressure may vary from unit to unit.

In the illustrated embodiment, the calibration procedure to establish the no-load current INO-LOAD is performed at the lowest speed (level 1). The same no-load current is used to determine the pressure at all three operational speeds as described above. In alternative embodiments, a separate no-load current may be established for each of the three operational speeds. In the alternative embodiment, the current difference is calculated based on the no-load current for the selected speed.

As illustrated in FIG. 35, in certain embodiments, a modified percussive massage device 1900 may be used with a wireless remote device 1910 (e.g., a smartphone), which obtains and stores data representing the use of the percussive massage device. FIG. 34 illustrates a further modified motor controller circuit 1920, which is similar to the motor controller circuit 1500 of FIG. 27 except that the motor controller circuit of FIG. 34 includes a Bluetooth transceiver (BT XCVR) 1930 (referred to herein as a Bluetooth interface), which is coupled to selected LED driver outputs of the controller 1510. The Bluetooth transceiver is an example of a radio frequency wireless communication device that may be used. In particular, the Bluetooth interface includes a plurality of input/output (I/O) ports (e.g., six I/O ports), which are configured as input ports. The six input ports are identified as I0, I1, I2, I3, I4 and I5. The first port (I0) is connected to the LEDS1 output of the controller. The second port (I1) is connected to the LEDS2 output of the controller. The third port (I2) is connected to the LEDS3 output of the controller. The fourth port (I3) is connected to the LEDP1 output of the controller. The fifth port (I4) is connected to the LEDP2 output of the controller. The sixth port (I5) is connected to the LEDP3 output of the controller.

The Bluetooth interface 1930 receives "AT" command signals from the remote control device 1910 by signals sent from the remote control device to the Bluetooth interface. For example, sending an "AT+PIO??" command to the Bluetooth interface causes the Bluetooth interface to respond with three hexadecimal characters in which the status (e.g., a digital "1" or a digital "0") of each of twelve input/output pins is encoded as a bit in one of the hexadecimal characters. The remote control device decodes the bits corresponding to the input pins I1-I5 to determine the speed and the pressure value (e.g., current magnitude range) when the command is sent to the Bluetooth interface.

The remote control device 1920 periodically sends the "AT+PIO??" command to the Bluetooth interface to obtain the speed and pressure readings. The remote control device stores the readings in memory along with the date and time of the readings and along with further information such as the identity of the person receiving the percussive massage. Thus, the remote control device is enabled to maintain a history of the percussive massage provided to a person. The person may retrieve the saved information to obtain the speed, pressure and duration of previous treatments. Based on the qualitative experience from a previous treatment, the person may repeat the previous treatment or modify one or more of the parameters (e.g., speed, pressure, duration) for a current treatment to attempt to obtain an improved experience.

The foregoing is shown in FIG. 36, which illustrates a flowchart 1950 of the operation of the remote control device (e.g., smartphone) 1900 of FIG. 35 and the further modified motor controller circuit 1910 of FIG. 34 within the percussive massage device 100. In a first activity block 1960, the remote control device establishes Bluetooth communication with the modified motor controller circuit such that the remote control device is paired

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with the percussive massage device. After establishing communication, the remote control device sends a status request command to the modified motor controller circuit in an activity block 1962. The remote control device receives the status information from the modified motor controller circuit in an activity block 1964. In an activity block 1966, the remote control device parses the status information to separate the six bits representing the motor speed and the pressure. In an activity block 1970, the remote control device displays the current motor speed and pressure. The remote control device stores the motor speed and the pressure along with the date and time when the status information is received. The remote control device then returns to the activity block 1962 to send another status request commend to the modified motor controller circuit to obtain updated status information. The process of repeatedly requesting status information may be timed by programmable delays or by internal timers within the remote control device. After a massage session is ended, the saved status information along with the data and time may be reviewed by the user. Depending on the results of a previous massage session, the user may choose to increase or decrease the pressure, increase or decrease the speed, increase or decrease the duration of the application of a particular pressure and speed, or a combination of variations. The user may also determine that the previous massage session was particularly helpful and may choose to reproduce the previous settings for a current setting.

In certain embodiments, the remote device (e.g., smartphone) includes application software (an "app") to enable the user to indicate certain portions of a recipient's body that are receiving percussive massages during segments of an overall massage session. For example, the app may display one or more images of a recipient's body (e.g., generic pictorial images) having target areas may be selected by the user to indicate that a massage segment is beginning on a certain portion of the recipient's body (e.g., the left trapezius muscle). The app records the information, as discussed above, as the massage segment is being performed. At the end of the massage segment, the user again selects the same target area to indicate the end of the massage segment or selects a new target area to start a new massage segment at a different location, which automatically ends the previous segment. The identification of the massage location is saved in the memory of the remote device along with the speed, pressure and duration of the massage segment in association with the name of the recipient. The stored information may also include feedback from the recipient and the user regarding the perceived effectiveness of the massage segment. When the recipient returns for a new massage session, the user may access the stored information from previous massage sessions and use the stored information to repeat the locations, speeds, pressures and durations of the previous segments or to modify one or more parameters of certain segments (e.g., decrease the pressure and increase the duration of the massage segment applied to the trapezius muscle). The stored information for a particular recipient may also be transferred to cloud storage to maintain a long-term percussive massage history.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all the matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

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Espacenet

Claims: TW202017550 (A) — 2020-05-16

Battery-powered percussive massage device with pressure sensor

Claims not available for TW202017550 (A)
Claims of corresponding document: US10314762 (B1)

A high quality text as facsimile in your desired language may be available amongst the following family members:

AU2019204770 (B1) CA3049387 (A1) CN111166643 (A) EP3650002 (A1) ES2904706 (T3) JP6643518 (B1) KR102025760 (B1) US10314762 (B1) WO2020101725 (A1) CN211157196 (U) EP4035641 (A1) US2020352822 (A1)

- Original claims
- Claims tree

The EPO does not accept any responsibility for the accuracy of data and information originating from other authorities than the EPO; in particular, the EPO does not guarantee that they are complete, up-to-date or fit for specific purposes.

1. What is claimed is: 1. A battery-powered percussive massage device comprising:
an enclosure having a cylindrical bore, the cylindrical bore extending along a longitudinal axis;
a piston located within the cylindrical bore, the piston having a first end and a second end, the piston constrained to move only along the longitudinal axis of the cylindrical bore;
a motor positioned within the enclosure, the motor having a rotatable shaft, the shaft having a central axis, the central axis of the shaft perpendicular to the longitudinal axis of the cylindrical bore;
a crank coupled to the shaft, the crank including a pivot, the pivot offset from the central axis of the shaft;
a reciprocation linkage having a first end and a second end, the first end of the reciprocation linkage coupled to the pivot of the crank, the second end of the reciprocation linkage coupled to the first end of the piston;
an applicator head having a first end and a second end, the first end of the applicator head coupled to the second end of the piston, the second end of the applicator head exposed outside the cylindrical bore;
a battery assembly extending from the enclosure, the battery assembly providing DC electrical power;
a motor controller within the enclosure, the motor controller receiving DC electrical power from the battery assembly and selectively providing DC electrical power to the motor to control a speed of the motor, the motor controller further including a sensor that senses a sensed magnitude of an electrical current flowing through the motor, the

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motor controller responsive to the sensed magnitude of the electrical current to a selectively activate at least one pressure indication signal corresponding to the sensed magnitude of the electrical current, wherein the motor controller determines an applied current magnitude by subtracting a no-load current from the sensed current magnitude, the motor controller selectively activating the at least one pressure indication signal in response to the applied current magnitude; and
at least one display device that receives the at least one pressure indication signal and that is responsive to the at least one pressure indication signal to display a visual indication of a range of pressure corresponding to the applied current magnitude.

2. The percussive massage device of claim 1, wherein the applicator head is removably coupled to the piston.

3. The percussive massage device of claim 1, wherein:
the reciprocation linkage is rigid; and
the second end of the reciprocation linkage is pivotally coupled to the first end of the piston.

4. The percussive massage device of claim 1, wherein:
the reciprocation linkage is flexible; and
the second end of the reciprocation linkage is fixed to the first end of the piston.

5. The percussive massage device of claim 1, wherein the motor controller includes a radio frequency transceiver, which selectively transmits a signal that includes a representation of the speed of the motor and the range of pressure applied to the applicator head.

6. A method of operating a percussive massage device comprising:
rotating a shaft of an electric motor to rotate a pivot of a crank about a centerline of the shaft;
coupling the pivot of the crank to a first end of an interconnection linkage of a reciprocation assembly;
coupling a second end of the interconnection linkage to a first end of a piston constrained to move along a longitudinal centerline;
coupling a second end of the piston to an applicator head wherein rotational movement of the pivot of the crank causes reciprocating longitudinal movement of the piston and the applicator head;
measuring a measured magnitude of electrical current through the motor, the measured magnitude of electrical current having a component of current magnitude responsive to a pressure applied to the applicator head;
subtracting a no-load current from the measured current to determine the component of the measured current magnitude responsive to the pressure applied to the applicator head;
displaying at least one of a plurality of pressure indicators, each of the plurality of pressure indicators corresponding to a range of pressures, each range of pressures corresponding to a range of components of current magnitudes responsive to a pressure applied to the applicator head.

7. The method of claim 6, wherein the applicator head is removably coupled to the piston.

8. The method of claim 6, wherein:

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the interconnection linkage is rigid; and
the second end of the interconnection linkage is pivotally coupled to the first end of the piston.

9. The method of claim 6, wherein:
the interconnection linkage is flexible; and
the second end of the interconnection linkage is fixed to the first end of the piston.

10. The method of claim 6, further comprising selectively transmitting a radio frequency signal that includes a representation of a speed of the motor and the range of pressure applied to the applicator head.

11. The method of claim 10, further comprising receiving the transmitted radio frequency signal by a remote communication device; storing the speed and the range of pressure along with a time when the radio frequency signal is received; and selectively retrieving the stored speed, range of pressure and time to display the speed, range of pressure and time on the remote communication device.

12. A percussive massage device comprising:
a source of electrical energy;
an electric motor configured to rotate about a shaft;
a piston constrained to move in a reciprocating motion within a cylinder;
a linkage configured to couple the electrical motor to the piston such that rotation of the electrical motor causes the piston to reciprocate;
an applicator head removably coupled to the piston; and
a motor controller coupled to the source of electrical energy and coupled to the motor, the motor controller configured to selectively provide electrical energy to the motor to cause the motor to rotate a speed, the motor controller including a pressure indication system, the pressure indication system configured to measure a magnitude of a current flowing through the electric motor and to subtract a no-load current from the magnitude of the current to produce a calibrated current, the calibrated current having a magnitude responsive to pressure applied against the applicator head, the magnitude of the calibrated current including a plurality of calibrated current ranges, the pressure indication system including a pressure indication display having a plurality of display states, each display state corresponding to a respective one of the calibrated current ranges, each calibrated current range corresponding to a range of pressure applied against the applicator head.

13. The percussive massage device of claim 12, wherein the pressure indication display comprises a first display device, a second display device and a third display device, each display device having a respective non-illuminated state and a respective illuminated state, wherein:
the first display device is in the respective non-illuminated state if the magnitude of the calibrated current is less than a first threshold magnitude and is in the respective illuminated state when the magnitude of the calibrated current is at least as great as the first threshold magnitude and less than a second threshold magnitude;
the second display device is in the respective non-illuminated state if the magnitude of the calibrated current is less than the second threshold magnitude and is in the respective illuminated state when the magnitude of the calibrated current is at least as great as the second threshold magnitude and is less than a third threshold magnitude; and
the third display device is in the respective non-illuminated state if the magnitude of the

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calibrated current is less than the third threshold magnitude and is in the respective illuminated state when the magnitude of the calibrated current is at least as great as the third threshold magnitude.

14. The percussive massage device of claim 12, wherein the motor controller includes a radio frequency transceiver, which selectively transmits a signal that includes a representation of the speed of the motor and the range of pressure applied to the applicator head.

15. The percussive massage device of claim 12, wherein:
the linkage is rigid; and
an end of the linkage is pivotally coupled to an end of the piston.

16. The percussive massage device of claim 12, wherein:
the linkage is flexible; and
an end of the linkage is fixed to an end of the piston.

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202017550

(19)中華民國智慧財產局

(12)發明說明書公開本 (11)公開編號：TW 202017550 A

(43)公開日： 中華民國 109 (2020) 年 05 月 16 日

(21)申請案號：108101360 (22)申請日： 中華民國 108 (2019) 年 01 月 14 日

(51)Int. Cl.： *A61H23/00 (2006.01)*

(30)優先權：2018/11/12 美國 62/759,968

2018/11/13 美國 62/760,617

2018/11/14 美國 62/767,260

2018/11/27 美國 16/201,542

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申請實體審查：有 申請專利範圍項數：19 項 圖式數：36 共 125 頁

(54)名稱

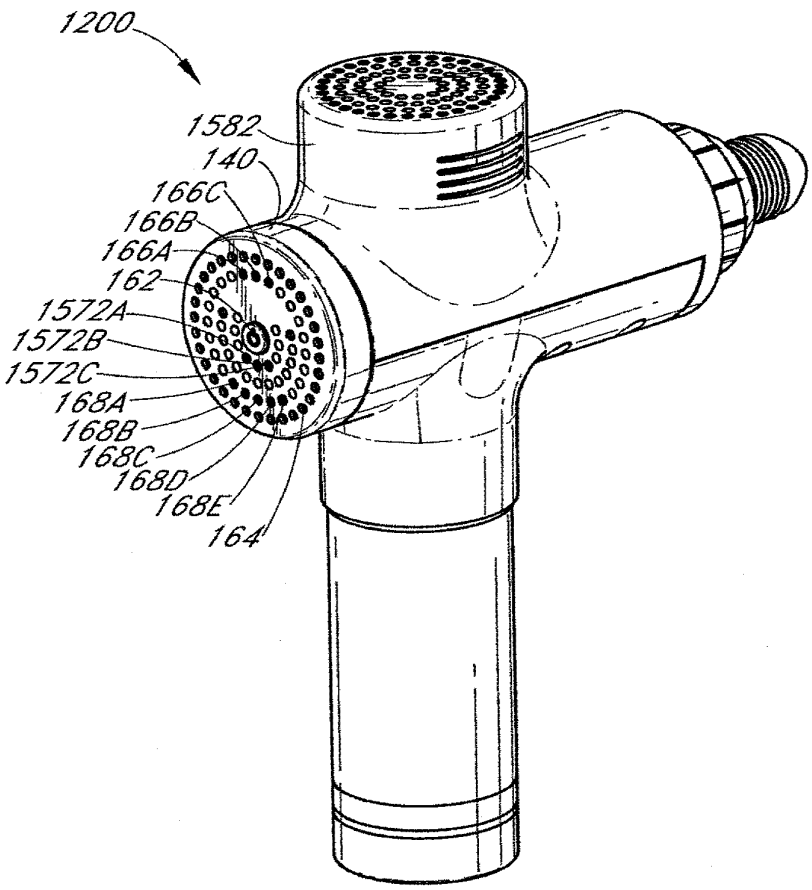
具有壓力感測器的電池動力衝擊式按摩裝置及其操作方法

(57)摘要

一種衝擊式按摩裝置包含包體，該包體具有沿著縱向軸線延伸之圓柱形孔。一馬達具有可旋轉軸桿，該可旋轉軸桿繞著垂直於該縱向軸線之中央軸線而旋轉。一曲柄耦合至包含樞軸之軸桿，該樞軸從該軸桿之該中央軸線偏移。一往復連桿具有第一端，其被耦合至該曲柄之該樞軸。一活塞具有第一端，其被耦合至該往復連桿之第二端。該活塞被拘束以在圓筒內沿著該圓柱形孔之該縱向軸線移動。一施力器頭具有第一端及第二端，該施力器頭之該第一端耦合至該活塞之第二端，該施力器頭之該第二端曝露在該圓柱形孔外側以對接受治療之人士施力。一馬達控制器測量施加至該馬達之電流且回應於該測量的電流來顯示一壓力指示器。

A percussive massage device includes an enclosure having a cylindrical bore that extends along a longitudinal axis. A motor has a rotatable shaft that rotates about a central axis perpendicular to the longitudinal axis. A crank coupled to the shaft includes a pivot, which is offset from the central axis of the shaft. A reciprocation linkage has a first end coupled to the pivot of the crank. A piston has a first end coupled to a second end of the reciprocation linkage. The piston is constrained to move within a cylinder along the longitudinal axis of the cylindrical bore. An applicator head has a first end coupled to a second end of the piston and has a second end exposed outside the cylindrical bore for application to a person receiving treatment. A motor controller measures current applied to the motor and displays a pressure indicator responsive to the measured current.

指定代表圖：



【圖 28】

符號簡單說明：

140:主體端蓋

162:按鈕開關

164:孔

166A:速度指示發光二極體

166B:速度指示發光二極體

166C:速度指示發光二極體

168A:電池充電狀態 LED

168B:電池充電狀態 LED

168C:電池充電狀態 LED

168D:電池充電狀態 LED

168E:電池充電狀態 LED

1200:衝擊式按摩裝置

1572A:第一壓力指示器 LED

1572B:第二電力指示器 LED

1572C:第三壓力指示器 LED

1582:馬達包體

【發明說明書】

【中文發明名稱】

具有壓力感測器的電池動力衝擊式按摩裝置

【英文發明名稱】

BATTERY-POWERED PERCUSSIVE MASSAGE DEVICE WITH PRESSURE SENSOR

相關申請案

【0001】本申請案依美國專利法35 USC §119(e)主張2018年11月12日申請之美國臨時專利申請案第62/759,968號；2018年11月13日申請之美國臨時專利申請案第62/760,617號；及2018年11月14日申請之美國臨時專利申請案第62/767,260號之優先權，這些申請案以其全文併入本文中。

【技術領域】

【0002】本發明係關於治療裝置之領域，且更特定言之，係關於對身體之選定部位施予衝擊式按摩之裝置的領域。

【先前技術】

【0003】衝擊式按摩(亦稱之為輕拍式按摩)係對人體之部位進行快速、衝擊式輕拍、拍打及拔罐。衝擊式按摩

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係用以積極作用及強化深組織肌肉。衝擊式按摩提升局部血液循環及甚至可幫助堅實肌肉部位。衝擊式按摩可由熟練的按摩治療師利用快速的手移動來進行；然而，施加至身體的手動力量會變化，且該按摩治療師可能在完成足夠治療療程之前便會疲勞。

【0004】衝擊式按摩亦可藉由可在市面上購得之電機衝擊式按摩裝置(衝擊式施力器)來施加。此衝擊式施力器可包含例如耦合的電動馬達以驅動在一圓筒中的往復活塞。各種不同的衝擊頭可被附接至活塞以對身體之選定部位提供不同的衝擊效果。許多已知的衝擊式施力器係昂貴、龐大、較笨重且被繫連至電力源。例如，某些衝擊式施力器可能需要使用者用雙手握持該施力器來控制該施力器。某些衝擊式施力器會因為使用習知機構來將電動馬達之旋轉能轉換成活塞之往復運動而較為吵雜。

【0005】當衝擊式按摩裝置被施加至人體時，由衝擊式按摩裝置所提供之治療效果部分取決於施加至身體的壓力。對某些人而言，較小壓力提供放鬆的按摩，而較大壓力則感到不舒服。對其他人而言，需要較大壓力來提供減緩酸痛肌肉及其他組織。對許多人而言，在其身體上之各部位之間所需之壓力是不同的。目前可用的衝擊式按摩裝置並未提供判斷施加至身體之壓力的方法。因此，達成對於特定人士身體上的特定位置的正確壓力需依賴應用衝擊式按摩器之按摩治療師的技巧與記憶。即使使用同樣的衝擊式按摩設備，同一治療師也不太可能在兩個連續的治療

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期間來提供適當的壓力。

【發明內容】

【0006】存在一種電機衝擊式按摩裝置之需求，其可提供監測施加至身體上之部位的壓力的方法。

【0007】本文中所揭示之實施例之一態樣係一種衝擊式按摩裝置，其包含包體，該包體具有沿著縱向軸線延伸之圓柱形孔。一馬達具有可旋轉軸桿，該可旋轉軸桿繞著垂直於該縱向軸線之中央軸線而旋轉。一曲柄耦合至包含樞軸之軸桿，該樞軸從該軸桿之該中央軸線偏移。一往復連桿具有第一端，其被耦合至該曲柄之該樞軸。一活塞具有第一端，其被耦合至該往復連桿之第二端。該活塞被拘束以在圓筒內沿著該圓柱形孔之該縱向軸線移動。一施力器頭具有第一端及第二端，該施力器頭之該第一端耦合至該活塞之第二端，該施力器頭之該第二端曝露在該圓柱形孔外側以對接受治療之人士施力。一馬達控制器測量施加至該馬達之電流且回應於該測量的電流來顯示一壓力指示器。

【0008】依照本文中所揭示之實施例之另一態樣係一種電池動力衝擊式按摩裝置。該裝置包含包體，該包體具有圓柱形孔。該圓柱形孔沿著縱向軸線延伸。一活塞被定位在該圓柱形孔中。該活塞具有第一端及第二端。該活塞被拘束以僅沿著該圓柱形孔之該縱向軸線移動。一馬達被定位在該包體中。該馬達具有可旋轉軸桿。該軸桿具有中

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央軸線。該軸桿之中央軸線垂直於該圓柱形孔之縱向軸線。一曲柄被耦合至該軸桿。該曲柄包含樞軸，該樞軸從該軸桿之該中央軸線偏移。一往復連桿具有第一端及第二端。該往復連桿之該第一端被耦合至該曲柄之該樞軸。該往復連桿之該第二端被耦合至該活塞之該第一端。一施力器頭具有第一端及第二端。該施力器頭之該第一端被耦合至該活塞之該第二端。該施力器頭之該第二端被曝露在該圓柱形孔外側。一電池總成從該包體延伸。該電池總成提供DC電力。在該包體中之一馬達控制器接收來自於該電池總成之DC電力且選擇性地提供DC電力至該馬達以控制該馬達之速度。該馬達控制器進一步包含一感測器，該感測器感測流經該馬達之電流的感測量值。該馬達控制器回應於該電流之該感測量值以顯示對應於該電流之該感測量值的壓力之指示信號。

【0009】在依照此態樣之某些實施例中，該施力器頭被可移除式地耦合至該活塞。

【0010】在依照此態樣之某些實施例中，該往復連桿係剛性的；且該往復連桿之該第二端被可樞轉地耦接至該活塞之該第一端。

【0011】在依照此態樣之某些實施例中，該往復連桿係可撓性的；且該往復連桿之該第二端被固定至該活塞之該第一端。

【0012】在依照此態樣之某些實施例中，該馬達控制器包含射頻收發器，其選擇性地傳輸信號，該信號包含該

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馬達之速度與施加至該施力器頭之壓力之範圍之表示。

【0013】在依照此態樣之某些實施例中，該馬達控制器藉由從該感測電流量值減去在無負載處測量之無負載電流而判定施加的電流量值。該馬達控制器顯示回應於該施加的電流量值之該壓力。

【0014】依照本文中所揭示之實施例之另一態樣係操作衝擊式按摩裝置之方法。該方法包括旋轉電動馬達之軸桿以將曲柄之樞軸繞著該軸桿之中心線旋轉。該方法進一步包括將該曲柄之該樞軸耦合至往復總成之互連連桿的第一端。該方法進一步包括將該互連連桿之第二端耦合至被拘束以沿著縱向中心線移動之活塞的第一端。該方法進一步包括將該活塞之第二端耦合至施力器頭，其中，該曲柄之該樞軸之旋轉移動造成該活塞與該施力器頭之往復縱向移動。該方法進一步包括測量流經該馬達之電流，該電流具有回應於施加至該施力器頭之壓力的量值。該方法進一步包括顯示複數個壓力指示器之至少一者，該複數個壓力指示器之各者對應於一壓力範圍，各壓力範圍對應於電流量值之一範圍。

【0015】在依照此態樣之某些實施例中，該施力器頭被可移除式地耦合至該活塞。

【0016】在依照此態樣之某些實施例中，該互連連桿係剛性的；且該互連連桿之該第二端被可樞轉地耦接至該活塞之該第一端。

【0017】在依照此態樣之某些實施例中，該互連連桿

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係可撓性的；且該互連連桿之該第二端被固定至該活塞之該第一端。

【0018】在依照此態樣之某些實施例中，該方法進一步包括選擇性地傳輸射頻信號，該射頻信號包含該馬達之速度與施加至該施力器頭之該壓力之範圍之表示。

【0019】在依照此態樣之某些實施例中，該方法進一步包括藉由遠程通信裝置接收該傳輸的射頻信號；儲存速度及壓力連同當該射頻信號被接收時之時間；及選擇性地檢索被儲存的該速度、壓力及時間以在該遠程通信裝置上顯示該速度、壓力及時間。

【0020】在依照此態樣之某些實施例中，該方法進一步包括判定無負載電流且從測量的電流減去該無負載電流來判定該電流量值。

【0021】依照本文中所揭示之實施例之另一態樣係衝擊式按摩裝置。該裝置包含一電能源。一電動馬達被組構成繞軸桿旋轉。一活塞被拘束以在圓筒內以往復運動來移動。一連桿被組構成用以將該電動馬達耦合至該活塞，使得該電動馬達之旋轉造成該活塞往復。一施力器頭被可移除式地耦合至該活塞。一馬達控制器被耦合至該電能源且被耦合至該馬達。該馬達控制器被組構成用以選擇性地提供電能至該馬達以造成該馬達旋轉。該馬達控制器包含一壓力指示系統。該壓力指示系統被組構成用以測量流經該電動馬達之電流的量值。該電流量值回應於施加在該施力器頭上的壓力。該電流量值包含複數個電流範圍。該壓力

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指示系統包含具有複數個顯示狀態之壓力指示顯示器，其中，各顯示狀態對應於各自一個該電流範圍。

【0022】在依照此態樣之某些實施例中，該壓力指示顯示器包括第一顯示裝置、第二顯示裝置及第三顯示裝置。各顯示裝置具有各自的未照亮狀態及各自的照亮狀態。若該電流量值小於第一臨限量值，則該第一顯示裝置處在該各自的未照亮狀態，且當該電流量值至少與該第一臨限量值一樣大，則該第一顯示裝置處在該各自的照亮狀態。若該電流量值小於第二臨限量值，則該第二顯示裝置處在該各自的未照亮狀態，且當該電流量值至少與該第二臨限量值一樣大，則該第二顯示裝置處在該各自的照亮狀態。若該電流量值小於第三臨限量值，則該第三顯示裝置處在該各自的未照亮狀態，且當該電流量值至少與該第三臨限量值一樣大，則該第三顯示裝置處在該各自的照亮狀態。

【0023】在依照此態樣之某些實施例中，該馬達控制器包含射頻收發器，其選擇性地傳輸信號，該信號包含該馬達之速度與施加至該施力器頭之壓力之範圍之表示。

【0024】在依照此態樣之某些實施例中，該連桿係剛性的；且該連桿之一端部被可樞轉地耦接至該活塞之一端部。

【0025】在依照此態樣之某些實施例中，該連桿係可撓性的；且該連桿之一端部被固定至該活塞之一端部。

【0026】在依照此態樣之某些實施例中，該馬達控制

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器將該電流量值減少如所測量之無負載電流以產生校正電流。該校正電流用以判定該壓力之範圍。

【圖式簡單說明】

【0027】本發明之上述態樣及其他態樣將在下文中結合附圖詳細說明，其中：

【0028】圖1繪示由電池供電且具有單一把手之可攜式電機衝擊式按摩施力器之仰視立體圖，在圖1中之視圖展示該施力器之底側、左側及遠端(背向使用者(未圖示)之端部)；

【0029】圖2繪示圖1之可攜式電機衝擊式按摩施力器之俯視立體圖，其中展示該施力器之頂部、右側及近端(最靠近使用者(未圖示)之端部)；

【0030】圖3繪示圖1之可攜式電機衝擊式按摩施力器之分解立體圖，該視圖展示上外殼、一馬達總成、一往復總成及具有一附接電池總成之一下外殼；

【0031】圖4A繪示組合之上及下外殼且該外殼之端蓋卸離並旋轉以展示互鎖特徵之放大近端視圖，該視圖展示定位在該外殼之端蓋中之主印刷電路板(PCB)的遠端視圖；

【0032】圖4B繪示與該外殼之端蓋隔離之主PCB的近端視圖；

【0033】圖5繪示沿著圖1中之線5--5所截取之圖1及圖2之可攜式電機衝擊式按摩施力器之正視截面圖，該視

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圖通過該上及下外殼之一組配合的互連特徵；

【0034】圖6繪示沿著圖1中之線6--6所截取之圖1及圖2之可攜式電機衝擊式按摩施力器之正視截面圖，該視圖通過在圖3之馬達總成中之馬達之軸桿的中心線；

【0035】圖7繪示沿著圖1中之線7--7所截取之圖1及圖2之可攜式電機衝擊式按摩施力器之正視截面圖，該視圖通過該設備之縱向中心線；

【0036】圖8繪示圖3之下外殼的俯視平面圖；

【0037】圖9繪示圖3之下外殼與電池總成之分解立體圖；

【0038】圖10繪示電池總成印刷電路板之下表面的放大立體圖；

【0039】圖11A繪示圖3之馬達總成的分解俯視立體圖，該視圖展示馬達總成之元件的上表面；

【0040】圖11B繪示圖3之馬達總成的分解仰視立體圖，圖11B之視圖類似於圖11A之視圖，且該馬達總成之元件被旋轉以展示該元件之下表面；

【0041】圖12繪示從近端觀看之衝擊式按摩施力器之上外殼的仰視立體圖；

【0042】圖13繪示對應於圖12之衝擊式按摩施力器之上外殼的分解立體圖，其中展示外套筒、圓柱形安裝套筒及圓筒本體；

【0043】圖14繪示圖3之往復總成的分解立體圖，該往復總成包含一曲柄托架、一可撓性互連連桿、一活塞及

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一可移除式附接的施力頭；

【0044】圖15繪示沿著圖3中之線15--15所截取之組裝往復總成的截面圖；

【0045】圖16繪示圖1及2之衝擊式按摩施力器之平面圖，其中該下罩蓋被移除，該視圖係朝向施力器之電動馬達向上觀看，在圖16中之視圖展示該曲柄位在12點鐘位置(如圖16中所示)，使得該施力器頭之端部從該施力器之外殼延伸出一段第一距離；

【0046】圖17繪示類似於圖16之視圖之可攜式電機衝擊式按摩施力器的平面圖，在圖17中之視圖展示該曲柄位在3點鐘位置(如圖17中所示)，使得該施力器頭從該施力器之外殼延伸出一段第二距離，其中該第二距離大於圖16之第一距離；

【0047】圖18繪示類似於圖16及圖17之視圖之可攜式電機衝擊式按摩施力器的平面圖，在圖18中之視圖展示該曲柄位在6點鐘位置(如圖18中所示)，使得該施力器頭從該施力器之外殼延伸出一段第三距離，其中該第三距離大於圖17之第二距離；

【0048】圖19繪示類似於圖16、圖17及圖18之視圖之可攜式電機衝擊式按摩施力器的平面圖，在圖19中之視圖展示該曲柄位在9點鐘位置(如圖19中所示)，使得該施力器頭從該施力器之外殼延伸出一段第四距離，其中該第四距離大致上等於圖17之第二距離；

【0049】圖20繪示圖1及圖2之衝擊式按摩施力器之左

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側正視圖，其中子彈狀施力器被移除而更換一球形施力器；

【0050】圖21繪示圖1及2之衝擊式按摩施力器的左側正視圖，其中子彈狀施力器被移除而更換具有比子彈狀施力器還大之表面積的凸形施力器；

【0051】圖22繪示圖1及2之衝擊式按摩施力器的左側正視圖，其中子彈形狀施力器被移除而更換具有兩個較小遠端表面積之雙叉形施力器；

【0052】圖23繪示電池控制器電路之概要示意圖；

【0053】圖24繪示馬達控制器電路之概要示意圖；

【0054】圖25繪示具有實心往復連桿之經修改的衝擊式按摩施力器之平面圖，所展示之視圖已將下部罩蓋移除，此視圖係朝向該施力器之電動馬達向上看，該馬達總成與該往復總成以外的組件係以虛線展示；

【0055】圖26繪示圖25之實心往復連桿之分解立體圖；

【0056】圖27繪示類似於圖24之馬達控制器電路之經修改的馬達控制器電路，該經修改的馬達控制器電路包含用以感測對應於施加壓力之馬達電流的電路及三個額外的發光二極體(LED)以顯示壓力範圍；

【0057】圖28繪示經修改之可攜式電機衝擊式按摩施力器之俯視立體圖，其中展示該施力器之頂側、右側及近端，該近端包含用於三個額外LED之開口；

【0058】圖29繪示支撐三個額外LED之馬達控制器印

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刷電路板之近端視圖；

【0059】圖30繪示圖27之馬達控制器之操作的流程圖；

【0060】圖31繪示流程圖，其中展示執行圖30之校正程序步驟之步驟；

【0061】圖32繪示流程圖，其中展示圖30之輸入電壓、判定電流量值及顯示壓力之步驟中的步驟；

【0062】圖33繪示類似於圖32之流程圖的流程圖，其經修改以提供串聯壓力顯示以取代由圖32之流程圖提供之離散壓力顯示；

【0063】圖34繪示類似於圖27之經修改的馬達控制器電路之進一步經修改的馬達控制器電路之示意圖，該進一步經修改的馬達控制器電路包含藍牙介面以將馬達速度LED及壓力範圍LED之狀態傳遞至遠程裝置；

【0064】圖35繪示該衝擊式按摩裝置與遠程裝置(例如，智慧型手機)通信之圖示表示；及

【0065】圖36繪示圖35之遠程裝置與衝擊式按摩裝置之間之通信以在該遠程裝置上顯示及儲存馬達速度與壓力範圍的流程圖。

【實施方式】

【0066】如在整篇說明書中所使用的，詞語「上」、「下」、「縱向」、「向上」、「向下」、「近端」、「遠端」及其他相似的方向詞語被使用於關於正被描述的

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視圖。應理解，在本文中所描述之衝擊式按摩施力器可以各種定向來使用，且不被限制於以在圖式中所繪示之定向來使用。

【0067】一可攜式電機衝擊式按摩施力器(「衝擊式按摩施力器」)100被繪示於圖1至22中。如下文所描述，該衝擊式按摩施力器可被應用於身體的不同位置，以將衝擊施加至身體上來進行衝擊式治療。該衝擊式按摩施力器可與可拆卸地附接的施力器頭一起操作，以改變衝擊衝程的效果。該衝擊式按摩施力器能以多種速度(例如，三種速度)來操作。

【0068】該可攜式電機衝擊式按摩施力器100包含主體110。該主體包含上本體部分112及下本體部分114。該兩個本體部分接合以圍繞縱向軸線116來形成大致上圓柱形的包體(圖2)。

【0069】大致上圓柱形的馬達包體120從上本體部分112向上延伸。該馬達包體大致上垂直於上本體部分。該馬達包體由馬達包體端蓋122所蓋住。該馬達包體及該上本體部分容置馬達總成124 (圖3)。該上本體部分亦支撐往復總成126 (圖3)，其如下文所述被耦合至該馬達總成。

【0070】 大致上圓柱形的電池總成接受包體130從下本體部分114向下延伸且大致上垂直於下本體部分。電池總成132從電池總成接受包體延伸。

【0071】主體端蓋140定位於主體110的近端上。除了下文所描述的其他功能之外，該主體端蓋亦用作為夾持機

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構以將上本體部分112與下本體部分114之各別的近端固持在一起。如在圖4A中所繪示的，端蓋包含在內周邊表面144上的複數個突部142。該突部被定位成接合在上本體部分與下本體部分之近端之外周邊上的相對應的複數個L形缺口146。在繪示的實施例中，兩個缺口形成於上本體部分上，而兩個缺口形成於下本體部分上。在端蓋上之突部被插入至缺口的近端中，直到安座抵靠缺口的遠端。接著將端蓋扭轉幾度(例如，大約10度)以將端蓋鎖定至兩個本體部分。接著將螺釘148插入穿過端蓋中的孔150以接合下本體部分，以防止端蓋在正常使用期間旋轉而解鎖。

【0072】如在圖4A中所示，主體端蓋140容置馬達控制器(主要的)印刷電路板(PCB)160。如在圖4B中所示，該主PCB之近端側支撐中央按鈕開關162。下文結合電子電路來描述開關的操作。如在圖2中所示，該開關在端蓋上被複數個孔164所圍繞，孔164從端蓋的外(近)表面垂直地延伸，以形成複數個同心的孔列。選定的孔為穿孔，其允許氣流穿過端蓋。該開關上方的三個孔具有定位於其中的各別的速度指示發光二極體(LED)166A、166B、166C。三個LED從PCB的近端側延伸，如在圖4B中所展示的。三個LED提供衝擊式按摩施力器100之操作狀態的指示，如下文更詳細地描述的。定位於開關下方的五個孔具有定位於其中之各別的電池充電狀態LED 168A、168B、168C、168D、168E。該五個LED亦從PCB的近端側延伸，如在圖4B中所展示的。該五個LED在附接電池總成132時提供電

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池之充電狀態的指示，且提供電力至衝擊式按摩施力器。如在圖4A中所示，該PCB的遠端側支撐第一插頭170，第一插頭170包含可連接至電池總成132的三個接觸接腳，如下文所述。該PCB之遠端側亦支撐第二插頭172，第二插頭172包含可連接至馬達總成124的五個接觸接腳，如下文所述。

【0073】如在圖5及圖8中所示，下本體部分114的遠端部分包含複數個穿孔180(例如，四個穿孔)，其與在上本體部分112中之相對應的複數個穿孔182對準。當下本體部分被附接至上本體部分時，複數個互連螺釘184穿過在下本體部分中之穿孔且接合上本體部分之穿孔，以進一步將兩個本體部分固定在一起。複數個插頭186被插入至下本體部分之穿孔的外部分中，以隱藏互連螺釘的端部。

【0074】如在圖8及圖9中所示，下本體部分114包含電池總成接受托盤200，其與電池總成接受包體130對準而固定至下本體部分的內部。該接受托盤利用複數個螺釘202 (例如，四個螺釘)而被固定至下本體部分。該接受托盤包含複數個簧片接觸件204A、204B、204C (例如，三個接觸件)，其等以三角形圖案來定位。該三個接觸件被定位成用以接合相對應的複數個接觸件206A、206B、206C，當電池總成132被定位在電池總成接受包體中時，接觸件206A、206B、206C環繞電池總成132之頂部邊緣來定位。

【0075】電池總成132包含第一電池罩蓋半體210及第

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二電池罩蓋半體212，其封圍電池單元214。在繪示實施例中，該電池單元包括串聯連接的六個4.2伏特的鋰離子電池單元，當完全充電時，產生大約25.2伏特的總電池電壓。該電池單元可從許多供應商處商購，諸如，例如，南韓的Samsung SDI Co., Ltd.。該第一電池罩蓋半體與該第二電池罩蓋半體扣合在一起。該兩個半體藉由外圓柱形罩蓋216而進一步固持在一起，外圓柱形罩蓋216在使用衝擊式按摩施力器100時亦用作為握持表面。在繪示實施例中，外罩蓋僅在電池總成之不進入電池接受包體132之部分之上延伸。在繪示實施例中，該外罩蓋包括氯丁烯橡膠或其他合適的材料，其將緩衝層與有效握持表面結合。

【0076】電池總成132之上端包含第一機械接合突片220及第二機械接合突片222 (圖6)。如在圖6中所示，例如，當電池總成完全地被插入至電池總成接受包體130中時，第一接合突片接合第一突緣224，而第二接合突片接合在電池總成接受包體內之第二突緣226，以將電池總成固定於電池總成接受包體內。

【0077】下本體部分114包含與第一接合突片220對準的機械按鈕230。當對按鈕施加足夠的壓力時，第一接合突片被推離第一突緣224以允許第一接合突片相對於第一突緣向下移動，且因此脫離突緣。在繪示實施例中，機械按鈕藉由壓縮彈簧232來偏壓。下本體部分進一步包含與機械按鈕相對的開口234(圖6)。該開口允許使用者將指尖插入開口中以施加壓力以使第二接合突片222與第二突緣

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226脫離，且同時施加向下的壓力以使第二接合突片向下移動遠離第二突緣，且因此向下移動電池總成132。一旦以此種方式脫離，該電池總成便可容易地從電池總成接受包體130中被移除。在繪示實施例中，開口部分地由折片236所覆蓋。該折片可藉由壓縮彈簧238來偏壓。在替代實施例(未圖示)中，可包括第二機械按鈕來代替開口。

【0078】第二電池罩蓋半體212包含積體印刷電路板支撐結構250，其支撐電池控制器印刷電路板(PCB)252。該電池控制器PCB更詳細地被展示於圖10中。除了其他組件之外，電池控制器PCB包含充電電源轉接器輸入插孔254及開閉開關256。在繪示實施例中，該開閉開關為滑動開關。該電池控制器PCB進一步支撐複數個發光二極體(LED)260 (例如，六個LED)，其被安裝在電池控制器PCB的外圍周圍。在繪示實施例中，每個LED為雙色LED(例如，紅色與綠色)，其可被照亮以顯示任一顏色。該電池控制器PCB被安裝至電池總成端蓋262。半透明的塑膠環264被固定在電池控制器PCB與電池總成端蓋之間，使得環大致上與LED對準。因此，由LED所發射的光係通過環來發射。如下文所討論的，LED的顏色可被使用以指示電池總成132之充電狀態。開關致動器延伸器266被定位於滑動開關的致動器上且延伸穿過端蓋以使滑動開關能夠從端蓋的外部被操縱。

【0079】如在圖3中所繪示的，馬達包體120容置電動馬達總成124，其更詳細地被展示於圖11A及11B中。電動

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馬達總成包含無刷DC電動馬達310，其具有中央軸桿312，中央軸桿312回應於所施加的電能而旋轉。在繪示實施例中，電動馬達為24伏特的無刷DC馬達。該電動馬達可為可商購取得的馬達。馬達包體及安裝結構(下文所描述)的直徑及高度適於將電動馬達接收及固定在馬達包體內。

【0080】電動馬達310經由複數個馬達安裝螺釘322而被固定至馬達安裝托架320。馬達安裝托架包含複數個安裝突片324(例如，四個突片)。每個安裝突片包含中央孔326，其接收各別的橡膠套圈330，其中套圈的第一及第二擴大部分被定位在突片的相對表面上。具有整合墊圈的各別的托架安裝螺釘332穿過每個套圈中的各別的中央孔334，以接合上本體部分112中的各別的安裝孔336。在圖12中展示四個安裝孔中的兩個。套圈用作為馬達安裝托架與上本體部分之間的振動阻尼器。

【0081】電動馬達310之中央軸桿312延伸穿過馬達安裝托架320中的中央開口350。該中央軸桿接合偏心曲柄360的中央孔362。該中央孔被壓配至電動馬達之中央軸桿上或藉由其他合適的技術被固定至軸桿上(例如，使用固定螺釘)。

【0082】偏心曲柄360具有圓碟形狀。該曲柄具有朝向電動馬達定向的內表面364及遠離電動馬達定向的外表面366。圓柱形曲柄樞軸370被固定至或形成於外表面上，且在第一方向上從曲柄的中央孔偏移一段選定的距離(例

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如，在繪示實施例中為2.8毫米)。弧形罩372從曲柄的內表面延伸，且大致上相對於曲柄的中央孔362與曲柄樞軸徑向相對地定位。半環形配重環374被插入至弧形罩中且藉由螺釘、壓接或藉由使用其他合適的技術被固定在其中。如下文所述，弧形罩及半環形配重環的質量操作至少部分地抵消曲柄的質量及施加至曲柄的力。

【0083】如在圖12及圖13中所示，上本體部分112之遠端支撐具有中央孔402之大致上圓柱形的外套筒400。在繪示實施例中，靠近外套筒之遠端404的遠端部分406朝向中央孔向內逐漸變細。外套筒具有環形基部408，其藉由複數個螺釘410 (例如，三個螺釘)被固定至上本體部分的遠端。

【0084】外套筒400圍繞大致上圓柱形的安裝套筒420，當外套筒被固定至上本體部分112時，安裝套筒420被固定在外套筒內。安裝套筒圍繞由安裝套筒所夾緊的圓筒本體422且相對於衝擊式按摩施力器100之縱向軸線116被固定在同心位置中。除了固定圓筒本體之外，安裝套筒亦用作為振動阻尼器，以減少從圓筒本體傳播至衝擊式按摩施力器之主體110的振動。在繪示實施例中，圓筒本體具有大約25毫米的長度且具有內孔424，內孔424具有大約25毫米的內直徑。特定言之，圓筒本體的內直徑至少為25毫米加上選定的間隙配合(例如，大約為25毫米加上大約0.2毫米)。

【0085】如在圖3中所示，衝擊式按摩施力器100包

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含：往復總成126，其包括曲柄接合軸承支架510，其亦可被稱之為轉移托架；可撓性互連連桿512，其亦可被稱之為可撓性轉移連桿；活塞514；及施力器頭516。在圖14及圖15中更詳細地展示往復總成。

【0086】曲柄接合軸承支架510包括軸承外殼530，軸承外殼530具有限定圓柱形腔534之端部的上端壁532。環形軸承536裝配在圓柱形腔內。可拆卸地附接的下端壁538藉由複數個螺釘540(例如，兩個螺釘)被固定至軸承外殼，以將環形軸承限制在圓柱形腔內。環形軸承包含中央孔542，其被定尺寸以接合偏心曲柄360之圓柱形曲柄樞軸370。

【0087】曲柄接合軸承支架510進一步包含從軸承外殼530徑向延伸之互連部分550。互連部分包含具有螺紋縱向中央孔554之圓碟狀介面部分552。中央孔與指向軸承外殼之中心的徑向線556對準。在繪示實施例中，中央孔螺刻有8x1.0公制外螺紋。介面部分具有外表面558，其與徑向線正交。介面部分之外表面的中心距軸承外殼的中心大約為31毫米。介面部分具有大約為28毫米的總直徑，且具有大約為8毫米的厚度。介面部分的下部分560可為扁平的，以提供與其他組件的間隙。可移除介面部分的選定部分以形成肋部562，以減小介面部分的總質量。

【0088】螺紋徑向孔564形成在介面部分552中。螺紋徑向孔從介面部分的外周邊延伸至螺紋縱向中央孔554。螺紋徑向孔具有選定用於接合軸承支架固定螺釘566的內

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螺紋，軸承支架固定螺釘566插入至第三螺紋孔中。如下文所描述，軸承支架固定螺釘被旋轉至選定的深度。

【0089】如本文中所使用的，與可撓性互連連桿512相關的「可撓性」是指連桿能夠彎曲而不會斷裂。連桿包括彈性橡膠材料。連桿可具有大約為50的蕭氏A硬度計硬度；然而，可使用在中等軟度蕭氏硬度範圍內為35A至55A之較軟或較硬的材料。模製或以其他方式形成連桿以具有類似於沙漏的形狀。意即，連桿的形狀在每個端部處相對地較大而在中間相對地較窄。在繪示實施例中，連桿具有第一圓碟狀端部分570及第二圓碟狀端部部分572。在繪示實施例中，兩個端部分具有大約為4.7毫米的類似厚度且具有大約為28毫米的類似外部直徑。位於兩個端部分之間之材料逐漸變細至中間部分574，中間部分574具有大約為18毫米的直徑。通常，中間部分具有的直徑介於端部分之直徑的50 %至75 %之間；然而，中間部分可相對地較小或相對地較大，以適應具有較大硬度或較小硬度的材料。連桿具有在兩個端部分的外表面之間的總長度大約為34毫米。如下文更詳細地討論的，連桿之較小直徑的中間部分允許連桿在兩個端部分之間容易地彎曲。

【0090】第一螺紋互連桿580從可撓性互連連桿512的第一端部分570延伸。第二螺紋互連桿582從連桿的第二端部分572延伸。在繪示實施例中，互連桿金屬的且嵌入至各別的端部分中。例如，在一實施例中，連桿環繞兩個互連桿來模製。在其他實施例中，兩個互連桿黏接地被固定

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在形成於各別的端部分中之各別的腔內。在又進一步的實施例中，兩個互連桿形成為連桿之整合的螺合橡膠部分。

【0091】可撓性互連連桿512之第一互連桿580具有外螺紋，外螺紋被選定成與曲柄接合軸承支架510之螺紋縱向中央孔554之內螺紋接合(例如，8x1.0公制外螺紋)。當第一互連桿的螺紋與縱向中央孔的螺紋完全地接合時，軸承支架固定螺釘566旋轉以使固定螺釘的內端與縱向中央孔內的第一互連桿的螺紋接合，以阻止第一互連桿旋轉出縱向中央孔。

【0092】在繪示實施例中，可撓性互連連桿512之第二互連桿582具有類似於第一互連桿580之螺紋的外螺紋(例如，8x1.0量度的外螺紋)。在其他實施例中，兩個互連桿的螺紋可為不同的。

【0093】在繪示實施例中，活塞514包括不銹鋼或其他合適的材料。活塞所具有的外直徑被選定成緊密地裝配在上文所描述的圓筒本體422之內孔424內。例如，繪示活塞之外直徑不大於大約25毫米。如上文所論述，圓筒本體之內孔的內直徑至少為25毫米加上選定的最小間隙容差(例如，大約0.2毫米)。因此，在活塞的外直徑不大於25毫米的情況下，活塞相對於圓筒本體具有足夠的間隙，使得活塞能夠在圓筒本體內平穩地移動而沒有干擾。所選定之最大間隙使得兩個部分之間不存在顯著的間隙。

【0094】在繪示實施例中，活塞514包括具有外壁600的圓筒，外壁600在第一端602與第二端604之間延伸大約

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為41.2毫米的長度。第一孔606形成於活塞中從第一端朝第二端的選定距離。例如，在繪示實施例中，第一孔具有大約為31.2毫米的深度(例如，朝向第二端的長度)，且具有大約為18.773毫米的底部直徑。螺刻第一孔的第一部分608(圖15)，以在第一孔中形成深度至大約為20毫米的20x1.0公制內螺紋。

【0095】第二孔610(圖15)從活塞514之第二端604朝向第一端形成。第二孔具有大約為6.917毫米的底部直徑且具有的長度足以將第二孔延伸至由第一孔所形成之空腔(例如，在繪示實施例中，大約為10毫米的長度)。第二孔在其之整個長度上被螺刻，以在第二孔內形成內螺紋。第二孔之內螺紋與互連連桿512之第二互連桿582之外螺紋接合。因此，在繪示實施例中，第二孔具有8x1.0公制內螺紋。

【0096】第三孔620形成在活塞514中靠近活塞的第二端604處。第三螺紋孔從活塞的外壁600徑向向內延伸至第二螺紋孔。在繪示實施例中，第三孔在孔的整個長度上被螺刻。第三孔具有內螺紋，內螺紋被選定成與活塞固定螺釘622接合，活塞固定螺釘622被插入至第三螺紋孔中。當可撓性互連連桿512之第二互連桿582之外螺紋與活塞之第二孔610之內螺紋完全地接合時，活塞固定螺釘旋轉以使固定螺釘的內端與在第二孔內之第二互連桿的外螺紋接合，以防止第二互連桿旋轉脫離與第二孔之螺紋的接合。

【0097】往復總成500之施力器頭516可被組構成各種

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的形狀，以使使用者能夠施加不同類型的衝擊式按摩。繪示的施力器頭為「子彈狀」且可使用於將衝擊式按摩施加至身體的選定的相對地小的表面區域，諸如，例如，觸發點。在繪示實施例中，施力器頭包括中等堅硬至硬橡膠材料。施力器頭具有從第一遠(施力)端650至第二近(安裝)端652的總長度，大約為55毫米。施力器頭具有大約為25毫米之外直徑，沿著主體部分654的長度大約為32毫米。在施力器頭之近(安裝)端處的接合部分656具有大約為11毫米的長度且被螺刻大約為9毫米的距離以形成外部20x1.0公制螺紋，其被組構成與活塞514之第一孔606之內螺紋接合。如下文所述，施力器頭的螺紋可與活塞的螺紋可拆卸地接合，以允許移除施力器頭且以不同的施力器頭來替換。施力器之遠(施力器)端具有大約為12毫米的長度且從主體部分的直徑逐漸變細(例如，至具有截頭球形帽之形狀的鈍修圓部分658大約為25毫米)。球形帽向遠側延伸大約為3.9毫米。球形帽具有大約為10毫米的縱向及大約為7.9毫米的橫向半徑。在繪示實施例中，施力器頭針對距近端安裝端652的一部分長度具有中空腔660。如下文所述，該腔減小了施力器頭的總質量，以減少使施力器頭往復所需要的能量。

【0098】在繪示實施例中，如上文所描述的，藉由將馬達總成124定位且固定在上本體部分112中來組裝衝擊式按摩施力器100。來自馬達總成中的馬達310的線纜(未圖示)被連接至五接腳第二插頭172。

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【0099】在安裝馬達總成300之後，首先藉由將第一螺紋互連桿580螺合至縱向中央孔554中而將可撓性互連連桿512附接至曲柄接合軸承支架510，來將往復總成126安裝在包體110中。藉由將軸承支架固定螺釘566接合至螺紋徑向孔564中，來將第一螺紋互連桿固定在縱向中央孔內。環形軸承536被安裝在軸承托架的圓柱形腔534內且藉由定位下端壁538於軸承之上且利用螺釘548來固定下端壁來將其固定於其中。應理解的是，環形軸承可在軸承托架被附接至可撓性連桿之前或之後來安裝。

【0100】藉由將環形軸承536之中央孔542定位在偏心曲柄360之圓柱形曲柄樞軸370之上，使可撓性互連連桿與縱向軸線116對準，來安裝曲柄接合軸承支架510及連接的可撓性互連連桿512。第二螺紋互連桿582在衝擊式按摩施力器100之遠端處被引導朝向圓柱形外套筒400內的圓筒本體422的孔424。

【0101】藉由將施力器頭之接合部分656螺合至活塞之帶螺紋的第一部分608中，來將施力器頭516附接至活塞514。接著，互連的施力器頭及活塞透過圓筒本體422之孔424來安裝，以使活塞之第二孔610與可撓性互連連桿512之第二螺紋互連桿582接合。互連的施力器頭及活塞被旋轉於圓筒本體的孔內，以將活塞的第二孔螺合至第二螺紋互連桿上。當第二孔與第二螺紋互連桿完全地接合時，例如，如在圖7中所展示的，活塞固定螺釘622被螺合至活塞之第三孔620中，以接合可撓性連桿之第二螺紋互連桿的

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螺紋，來將活塞固定至可撓性連桿。在繪示實施例中，活塞與第二螺紋互連桿的互連螺紋被組構成使得活塞的第三孔大致上被導引向下，如在圖7中所展示的，且因此可將活塞固定螺釘擰緊在第三孔內。在活塞被固定至可撓性連桿之後，施力器頭可從活塞上鬆開，而不會從可撓性連桿鬆開活塞，以允許移除及更換施力器頭而不必移除活塞。

【0102】在安裝往復總成126之後，如上文所描述的，藉由將下本體部分與上本體部分112對準且使用螺釘184將兩個本體部分固定在一起來安裝下本體部分114(圖5)。接著，將主體端蓋140放置在兩個本體部分的近端之上，以使端蓋的突部142與兩個本體部分的L形缺口146接合。接著，藉由將螺釘148插入穿過孔150且進入下本體部分的材料中來固定端蓋以防止意外的移除。

【0103】電池總成132被安裝在衝擊式按摩施力器100之下本體部分114的電池總成接受包體130中，且如上文所描述的電氣地且機械地接合。電池總成可在安裝時充電；或者，電池總成可在從衝擊式按摩施力器中移除時充電。

【0104】衝擊式按摩施力器100之操作繪示於圖16至19中，其係仰視在上本體部分112中之馬達總成的視圖，其中下蓋114及電池總成132被移除。在圖16中，被附接至馬達310之軸桿312的偏心曲柄360被展示於第一參考位置處，第一參考位置被指定為12點鐘的位置。在此第一參考位置中，在偏心曲柄之外表面366上的圓柱形曲柄樞軸370位於最接近位置(最靠近在圖16中所繪示之頂部)處。曲柄

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樞軸被定位成與縱向軸線116對準。曲柄接合軸承支架510、可撓性互連連桿512、活塞514及施力器頭516全部與縱向軸線對準。在此第一位置中，施力器頭之遠端從外套筒400之遠端延伸第一距離D1。

【0105】在圖17中，馬達300之軸桿312使偏心曲柄360順時針旋轉90度(如在圖16至19中所見)。因此，在偏心曲柄上的圓柱形曲柄樞軸370現在被定位於馬達之軸桿的右側，處於被指定為3點鐘位置的第二位置。在曲柄接合軸承支架510內之環形軸承536的中央孔542必須由於與圓柱形曲柄樞軸的接合而向右移動。活塞514被圓筒本體422之孔424(圖12至13)所拘束，以保持與縱向軸線116的對準。由於第二螺紋互連桿582，可撓性互連連桿512之第二端572保持與活塞對準。由於第一螺紋互連桿580，可撓性互連連桿之第一端570保持與曲柄接合軸承支架510對準。可撓性互連連桿之較小中間部分574允許可撓性互連連桿向右彎曲，如所展示的，以允許曲柄接合軸承支架向右傾斜。除了向右移動且遠離縱向軸線之外，圓柱形曲柄樞軸亦遠離衝擊式按摩施力器100之近端向遠端移動，其使得曲柄接合軸承支架亦向遠端移動。曲柄接合軸承支架之遠端移動經由可撓性互連器而被耦合至活塞，以在圓筒內縱向地推動活塞。活塞之縱向移動使得施力器頭516從外套筒400之遠端進一步向外延伸至第二距離D2。第二距離D2大於第一距離D1。

【0106】在圖18中，馬達310之軸桿312使偏心曲柄

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360順時針旋轉另外的90度至被指定為6點鐘位置的位置。因此，圓柱形曲柄樞軸370再次與縱向軸線116對準。曲柄接合軸承支架510與可撓性互連連桿512已經返回至與活塞514對準之初始直線構造。圓柱形曲柄樞軸已經從衝擊式按摩施力器100之近端進一步移動。因此，曲柄接合軸承支架與可撓性互連連桿在圓筒本體422之孔424內縱向地推動活塞，以使施力器頭516從外套筒400之遠端進一步向外延伸至第三距離D3。第三距離D3大於第二距離D2。

【0107】在圖19中，馬達310之軸桿312使偏心曲柄360順時針旋轉另外的90度。因此，圓柱形曲柄樞軸370現在被定位於馬達之軸桿的左側，處於被指定為9點鐘位置的第四位置。活塞514被圓筒本體422之孔424所拘束，以保持與縱向軸線116的對準。可撓性互連連桿512之較小中間部分574允許可撓性互連連桿向左彎曲，如所展示的，以允許曲柄接合軸承支架510向左傾斜。除了向左移動且遠離縱向軸線之外，圓柱形曲柄樞軸亦已經朝向衝擊式按摩施力器100之近端往近端移動。近端移動在圓筒內縱向地拉動活塞以使施力器頭516從外套筒400之遠端向近端退回至第四距離D4。第四距離D4小於第三距離D2且與第二距離D2大致上相同。

【0108】馬達310之軸桿312進一步順時針旋轉另外的90度，使偏心曲柄360返回至在圖16中所展示之原始的12點鐘位置，以使圓柱形曲柄樞軸370返回至最近端的位置。此種進一步的旋轉使得施力器頭516之遠端從外套筒

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400退回至原始的第一距離D1。馬達之軸桿的繼續旋轉使得施力器頭之遠端相對於外套筒重複地延伸及後退。藉由將施力器頭之遠端放置在欲按摩的身體部位上，施力器頭對選定的身體部位施行衝擊式治療。

【0109】在繪示實施例中，圓柱形曲柄樞軸370之軸線被定位於距馬達310之軸桿312之軸線大約為2.8毫米處。因此，圓柱形曲柄樞軸移動的總縱向距離大約為5.6毫米，從圖16之12點鐘位置至圖18之6點鐘位置。此導致施力器頭516之遠端從完全地後退的第一距離D1至完全地延伸的第三距離D3之5.6毫米的衝程距離。

【0110】在曲柄與活塞之間的習知連桿系統具有兩組的軸承。第一軸承(或一組軸承)將驅動桿之第一端耦合至旋轉曲柄。第二軸承(或一組軸承)將驅動桿之第二端耦合至往復活塞。當活塞到達往復運動之兩個極端中之一者時，活塞必須突然改變方向。由突然的改變方向所引起之應力被施加在驅動桿之每個端部處之軸承以及連桿系統中的其他組件上。方向的突然改變亦傾向產生大量的噪音。

【0111】在本文中所描述的往復連桿系統126消除了在活塞514處的第二軸承(或一組軸承)。活塞經由可撓性互連連桿512而被連接至連桿的其他組件，當圓柱形曲柄樞軸370圍繞馬達300之軸桿312之中心線旋轉時，可撓性互連連桿512彎曲。可撓性互連在活塞衝程的每個端部處緩衝在方向上的突然改變。例如，當施力器頭516與活塞在6點鐘位置處反轉從遠端移動至近端移動的方向時，可

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撓性互連可在過渡期間拉伸少量。可撓性互連之拉伸減少了通過連桿系統至軸承536(圖14)及圓柱形曲柄樞軸之能量的耦合。類似地，當施力器頭與活塞在12點鐘位置處反轉從近端移動至遠端移動的方向時，可撓性互連可在過渡期間壓縮少量。可撓性互連之壓縮減少了通過連桿系統至軸承及圓柱形曲柄樞軸之能量的耦合。因此，除了消除了在連桿系統之活塞端部處之軸承之外，可撓性互連亦減小了在連桿系統之曲柄端處之軸承上的應力。

【0112】在連桿總成126中的可撓性互連連桿512亦降低了操作衝擊式按摩施力器100的噪音。當往復分別地在6點鐘及12點鐘位置處反轉方向時，可撓性互連之有效靜音拉伸及壓縮消除了若連桿系統利用習知的軸承被耦合至活塞514可能會發生的習知的金屬對金屬的相互作用。

【0113】如上文所論述，子彈狀施力器頭516可拆卸地被螺合至活塞514上。子彈狀施力器頭可從活塞上被旋出且以球狀施力器頭700來代替，如在圖20中所展示的。施力器頭之球狀遠端部分702從施力器主體部分704延伸，施力器主體部分704對應於子彈狀施力器頭之主體部分654。球狀施力器頭包含與子彈狀施力器頭之接合部分656相對應的接合部分(未圖示)。球狀施力器頭可被使用以對身體的較大區域施加衝擊式按摩，以減小在治療區域上的力且允許改變施加的角度。

【0114】子彈狀施力器頭516亦可被旋出且以圓碟狀施力器頭720來代替，如在圖21中所展示的。施力器頭之

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圓碟狀遠端部分722從施力器主體部分724延伸，施力器主體部分724與子彈狀施力器頭之主體部分654相對應。圓碟狀施力器頭包含與子彈狀施力器頭之接合部分656相對應的接合部分(未圖示)。圓碟狀施力器頭可被使用以將衝擊式按摩施加至身體的較大區域以減小在治療區域上的力。

【0115】子彈狀施力器頭516亦可被旋出且以Y形施力器頭740來代替，如在圖22中所展示的。施力器頭之Y形遠端部分742從施力器主體部分744延伸，施力器主體部分742與子彈狀施力器頭之主體部分654相對應。Y形施力器頭包含與子彈狀施力器頭之接合部分656相對應的接合部分(未圖示)。Y形施力器頭包含施力器基部750。第一指狀物752及第二指狀物752從施力器基部延伸且如所展示的被隔開。Y形施力器頭之兩個指狀物可被使用以對脊椎兩側上的肌肉施加衝擊式按摩，而不對脊椎施加直接的壓力。

【0116】可攜式電機衝擊式按摩施力器100可設置有電力且以各種方式來控制。圖23繪示例示性電池控制電路800，其部分地包括安裝在電池控制器PCB 252上之電路。在圖23中，先前識別的元件以與之前相同的數字來編號。

【0117】電池控制電路800包含電源轉接器輸入插孔254。在繪示實施例中，被提供至插孔之輸入電力為大約30伏特DC之DC輸入電壓。在其他實施例中可使用其他電壓。輸入電壓係相對於電路接地參考810而提供。輸入電壓被施加在分壓器電路上，分壓器電路包括第一分壓器電阻器820及第二分壓器電阻器822。選定兩個電阻器之電阻

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以提供當存在DC輸入電壓時大約為5伏特的信號電壓。信號電壓通過高電阻分壓器輸出電阻器824來提供作為DCIN信號。

【0118】DC輸入電壓通過整流器二極體830及串聯電阻器832來提供給DC輸入匯流排834。若DC輸入電壓之極性被無意地反轉，則整流器二極體防止對電路的損壞。在DC輸入匯流排上的電壓由電解電容器836來濾波。

【0119】在DC輸入匯流排834上的DC輸入電壓通過10伏特的齊納二極體840及串聯電阻器842來提供給電壓調節器844之電壓輸入。電壓調節器之輸入由濾波電容器846來濾波。在繪示實施例中，電壓調節器HT7550-1電壓調節器，其可從台灣的Holtek Semiconductor, Inc.,來商購取得。電壓調節器在VCC匯流排848上提供大約為5伏特的輸出電壓，其由濾波電容器850來濾波。

【0120】在VCC匯流排上之電壓被提供至電池充電器控制器860。控制器從分壓器輸出電阻器824接收DCIN信號。電池充電器控制器回應於DCIN信號之高態有效狀態，而以在下文所描述的方式來操作以控制電池單元214的充電。當DCIN信號為低以指示不存在充電電壓時，則控制器不操作。

【0121】電池充電器控制器860將脈衝寬度調變(PWM)輸出信號提供至緩衝器電路870之輸入，緩衝器電路870包括PNP雙極電晶體872，其具有連接至電路接地參考810的集極。PNP電晶體具有連接至NPN雙極電晶體874

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之射極的射極。兩個電晶體之基極互連且形成緩衝器電路之輸入。連接兩個電晶體基極以接收來自控制器之PWM輸出信號。共同連接基極亦經由基極-射極電阻器876而被連接至共同連接射極。NPN之集極被連接至VCC匯流排848。

【0122】PNP電晶體872及NPN電晶體874之共同連接射極被連接至保護二極體878之陽極。保護二極體之陰極被連接至VCC匯流排848。保護二極體防止在共同連接射極上之電壓超過在VCC匯流排上之電壓達大於一個正向二極體的壓降(例如，大約為0.7伏特)。兩個電晶體之共同連接射極亦通過電阻器880而被連接至耦合電容器882之第一端子。耦合電容器之第二端子被連接至功率金屬氧化物半導體電晶體(MOSFET)884之閘極端子。在繪示實施例中，MOSFET包括STP9527 P頻道增強模式MOSFET，其可從加州山景城的Stanson Technology商購取得。MOSFET之閘極端子亦被連接至保護二極體886之陽極，保護二極體886具有連接MOSFET之源極(S)端子的陰極。保護二極體防止在閘極端子上之電壓超過在源極端子上之電壓達大於保護二極體之正向二極體電壓(例如，大約0.7伏特)。MOSFET之閘極端子亦藉由上拉電阻器888而連接至MOSFET之源極端子。MOSFET之源極連接至DC輸入匯流排834。

【0123】MOSFET 884之汲極(D)連接至降壓式轉換器890之輸入節點892。降壓式轉換器進一步包含連接在輸入節點與輸出節點896之間的電感器894。輸出節點(亦被識

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別為VBAT)被連接至電池單元214之正端子。電池單元之負端子經由低阻抗電流感測電阻器900而被連接至電路接地810。輸入節點進一步被連接至飛輪二極體902之陰極，其具有連接至電路接地之陽極。電阻器904之第一端子亦被連接至輸入節點。電阻器之第二端子被連接至電容器906之第一端子。電容器之第二端子被連接至電路接地。因此，從電路接地，通過飛輪二極體，通過電感器，通過電池單元，且通過電流感測電阻器而返回至電路接地提供了完整的電路路徑。

【0124】電池充電器控制器860藉由在連接至緩衝器電路870之PWM輸出上施加有效低脈衝來控制降壓式轉換器890之操作，緩衝器電路870藉由下拉在兩個電晶體872、874之共同連接射極上之電壓至靠近接地參考電位之電壓來回應。至接地參考電位之低轉變通過電阻器880及耦合電容器882而被耦合至MOSFET 884之閘極端子以導通MOSFET且將在DC輸入匯流排834上的DC電壓耦合至降壓式轉換器890之輸入節點892。DC電壓使電流流動通過電感器894至電池單元214以對電池單元進行充電。當來自電池充電器控制器之PWM信號被關閉(返回至高態無效狀態)時，MOSFET被關閉，且不再向降壓式轉換器之輸入節點提供DC電壓；然而，當電感器放電以繼續對電池單元進行充電直到電感器放電時，流入電感器之電流繼續流動通過電池單元且返回通過飛輪二極體。由電池充電器控制器所產生的有效低脈衝的寬度及重複率係以已知的方式來決

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定被施加以對電池單元進行充電之電流。在繪示實施例中，PWM信號具有大約為62.5 kHz的標稱重複頻率。

【0125】電池充電器控制器860控制被施加至MOSFET 894之脈衝的寬度及重複率以回應來自電池單元214之反饋信號。電池電壓感測電路920包括第一電壓反饋電阻器922及第二電壓反饋電阻器924。兩個電阻器從輸出節點896被串聯連接至電路接地810且因此被連接電池單元兩端。兩個電阻器之共同電壓感測節點926被連接至控制器之電壓感測(VSENSE)輸入。電池充電器控制器監測電壓感測輸入以決定電池單元兩端之電壓，以決定電池單元何時處於或接近大約為25.2伏特的最大電壓，使得應降低充電速率。在繪示實施例中，濾波電容器928從電壓感測節點被連接至電路接地，以減少在電壓感測節點上的噪音。

【0126】如上文所描述的，電池單元214之負端子經由低阻抗電流感測電阻器900而被連接至電路接地810，低阻抗電流感測電阻器900可具有例如0.1歐姆的電阻。在充電時，通過電流感測電阻器所形成的電壓與流動通過電池單元之電流成比例。電壓經由高電阻(例如，20,000歐姆)電阻器930而被提供作為電池充電器控制器860之電流感測(ISENSE)輸入之輸入。電流感測輸入藉由濾波電容器932來進行濾波。電池充電器控制器監測流動通過電池單元且因此通過電流感測電阻器之電流來決定當在電池單元上之充電接近最大充電時何時減小電流流動。電池充電器控制

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器亦可回應通過電池單元的大電流且減小脈衝寬度調變以避免超過充電電流的最大量值。

【0127】降壓式轉換器890之輸出節點896亦為電池單元214之正電壓節點。正電池電壓節點被連接至開閉開關256之第一端子940。通斷開關之第二端子942被連接至電壓輸出端子944，其被識別為VOUT。電壓輸出端子被連接至電池總成132之第一接觸件206A。當電池總成被插入至電池接受托盤200中時，電池總成之第一接觸件接合第一簧片接觸件204A。當開關被關閉時，開關之第一端子及第二端子電連接，以將電池電壓耦合至電壓輸出端子。電壓輸出端子被耦合至輸出電壓感測電路950，其包括在電壓輸出端子與電路接地之間串聯連接的第一分壓器電阻器952與第二分壓器電阻器954。在兩個電阻器之間的共同節點956被連接至電池充電器控制器860之VOUT感測輸入。共同節點亦藉由齊納二極體958而被連接至電路接地，齊納二極體958將在共同節點處之電壓箝制至不超過4.7伏特。選定兩個電阻器之電阻，使得當開關被關閉且輸出電壓被施加至輸出端子時，在共同節點上之電壓及控制器之VOUT感測輸入大約為4.7伏特，以指示開關為關閉的且電池電壓被提供至電池總成之選定的端子。

【0128】電池總成132之第二接觸件206B經由信號線960而被連接至電池充電器控制器860之電池充電(CHRG)輸出信號。電池充電輸出信號可以係具有指示電池單元214之充電狀態之量值的類比信號。在繪示實施例中，電

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池充電輸出信號係依照積體電路間(I^2C)架構操作之脈衝式數位信號，其將電池之充電狀態編碼為一系列的數位脈衝。當電池總成被插入至電池接受托盤200中時，第二電池總成接觸件接合第二簧片接觸件204B。

【0129】電池總成132之第三接觸件206C經由線970而連接至電池單元214之負端子，且被識別為提供給馬達控制PCB 160之電池接地(GND)，如下文所述。應注意，電池接地藉由0.1歐姆的電流感測電阻器900而被耦合至電路接地。從電池單元之正端子流出至馬達控制PCB且返回至電池單元之負端子之電流不流動通過電流感測電阻器。當電池總成被插入至電池接受托盤200中時，第三電池總成接觸件接合第三簧片接觸件204C。

【0130】電池充電器控制器860驅動在電池控制器PCB上之雙色LED 260。控制器包含第一輸出(LEDR)，其驅動雙色LED中之發紅光LED，且包含第二輸出(LEDG)，其驅動雙色LED中之發綠光LED。第一電流限制電阻器980將第一輸出耦合至第一組之三個雙色LED中之發紅光LED的陽極。第二電流限制電阻器982將第二輸出耦合至第一組之三個雙色LED中之發綠光LED的陽極。第三電流限制電阻器984將第一輸出耦合至第二組之三個雙色LED中之發紅光LED的陽極。第四電流限制電阻器986將第二輸出耦合至第二組之三個雙色LED中之發綠光LED的陽極。

【0131】在繪示實施例中，雙色LED 260以不同的工作週期來驅動以指示電池單元214之充電的當前狀態。例

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如，在第一狀態中，控制器860之第一輸出(LEDR)以100%工作週期來驅動，且控制器之第二輸出(LEDG)不被驅動，使得僅發紅光LED被點亮以指示電池單元需要被充電。在第二狀態中，第一輸出以75 %的工作週期來驅動，而第二輸出以25 %的工作週期來驅動，使得所得到的感知顏色為紅色與綠色的混合物。在第三狀態中，第一輸出與第二輸出皆以各別的50 %工作週期來驅動。在第四狀態中，第一輸出以25 %工作週期來驅動，而第二輸出以75 %工作週期來驅動。在第五狀態中，不驅動第一輸出，且以100 %工作週期來驅動第二輸出，使得顏色完全為綠色的，以指示電池單元處於或接近完全充電狀態。驅動兩個輸出之工作週期可為交錯的，使得兩個輸出非同時被啟動。除了在第一狀態之外，工作週期以足夠高的速率來重複，使得啟用的LED看起來始終為導通的而沒有可察覺的閃爍。當電池控制器處於第一狀態時，電池控制器可依可察覺的速率來打開及關閉發紅光LED的閃爍以提醒使用者在電池上的電量為低的且在繼續使用衝擊式按摩施力器100之前應先充電。在某些實施例中，第一狀態可進一步分段為兩個充電範圍。在第一狀態中的第一充電範圍內，紅色LED以恆定的照明來驅動，以指示對電池單元之充電的電量為低的且電池單元應很快地被充電。在第二充電範圍內，紅色LED閃爍，以指示在電池單元中的電量非常低，且電池單元應立即地被充電。

【0132】圖24繪示例示性馬達控制器電路1000，其部

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分地包括被安裝在馬達控制器PCB 160上之之電路。在圖24中，先前識別的元件以與之前相同的數字來編號。如上文所描述的，當電池總成被插入至接受托盤中時，電池總成132在接受托盤200之第一簧片接觸件204A上提供正電池輸出電壓VOUT。正電池輸出電壓在圖24中被識別為VBAT。當電池總成被插入至接受托盤中時，來自電池總成之CHRG信號被提供至第二簧片接觸件204B。當電池總成被插入至接受托盤中時，電池接地(GND)被提供至第三簧片接觸件204C。DC電壓、電池接地及CHRG信號經由三線電纜1010被耦合至電纜插孔1012。在馬達控制器PCB上之第一插頭170插入至電纜插孔中以在第一接腳1020上接收DC電壓，在第二接腳1022上接收CHRG信號，且在第三接腳1024上接收電池接地(GND)。來自第一插頭之第三接腳之電池接地(GND)電連接至本端電路接地1026。

【0133】在第一插頭170之第一接腳1020上之DC電壓(VBAT)由連接在第一插頭之第一接腳與本端電路接地1026之間的濾波電容器1030來進行濾波。DC電壓亦被提供至電流限制電阻器1032之第一端子。電流限制電阻器之第二端子被提供至電壓調節器1040之電壓輸入端子。電壓調節器接收電池電壓且將電池電壓轉換為5伏特。電壓調節器之5伏特輸出被提供於本端VCC匯流排1042上。本端VCC匯流排由濾波電容器1044來進行濾波，濾波電容器1044連接在本端VCC匯流排與本端電路接地之間。在繪示實施例中，電壓調節器為78L05三端調節器，其可從許多

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製造商來商購取得，諸如，例如，加州聖克拉拉的美國國家半導體公司(National Semiconductor Corporation)。

【0134】在第一插頭170之第二接腳1022上之CHRG信號經由串聯電阻器1052而被提供至馬達控制器1050之充電(CHRG)輸入。藉由濾波電容器1054對輸入至馬達控制器之充電進行濾波。馬達控制器從VCC匯流排1042接收5伏特的供應電壓。

【0135】來自第一插頭之第一接腳1020之DC電壓亦直接地被提供至五接腳第二插頭172之第一接腳1060。第二插頭172可被連接至具有相對應數量之接觸件的第二插孔1070。第二插孔經由五線電纜1072而被連接至馬達310。

【0136】第二插頭之第二接腳1080為轉速計(TACH)接腳，其接收來自馬達310之指示馬達的目前角速度的轉速計信號。例如，轉速計信號可包括用於馬達之軸桿312之每次旋轉的一個脈衝或每個部分旋轉的一個脈衝。轉速計信號被提供至分壓器電路1082中之第一電阻器1084的第一端子。第一電阻器之第二端子連接至分壓器電路中之第二電阻器1086的第一端子。第二電阻器之第二端子連接至本端電路接地。在分壓器電路中之位於第一與第二電阻器之間的共同節點1088被連接至NPN雙極電晶體1090之基極。NPN電晶體之射極被連接至接地。NPN電晶體之集極經由上拉電阻器1092而被連接至VCC匯流排1042。NPN電晶體反相且緩衝來自馬達之轉速計信號，且將緩衝信號提

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供至馬達控制器之TACH輸入。當轉速計信號在本端電路接地電位與來自電池之DC電壓電位之間變化時，緩衝信號在+5伏特(VCC)與本端電路接地電位之間變化。

【0137】第二插頭172之第三接腳1100由馬達控制器1050所產生的順時針/逆時針(CW/CCW)信號，且經由電流限制電阻器1102被耦合至第三接腳。CW/CCW信號之狀態決定馬達310之旋轉方向。在繪示實施例中，CW/CCW信號維持在導致順時針旋轉的狀態；然而，在其他實施例中，旋轉可被改變至相反的方向。

【0138】第二插頭172之第四接腳1110被連接至本端電路接地1026，其對應於連接至圖23中之電池單元214之負端子的電池接地。

【0139】第二插頭172之第五接腳1120接收由馬達控制器1050所產生的脈衝寬度調變(PWM)信號。PWM信號經由電流限制電阻器1122被耦合至第五接腳。馬達310回應於工作週期及PWM信號之頻率而以選定的角速度來旋轉。如下文所述，馬達控制器控制PWM信號以將角速度維持在三個選定的旋轉速度中之一者。

【0140】馬達控制器1050具有接入式(SWIN)輸入，其接收來自按鈕開關162之輸入信號。按鈕開關具有連接至本端電路接地1026之第一接觸件且具有經由上拉電阻器1130連接至VCC匯流排1042之第二接觸件。第二接觸件亦經由濾波電容器1132而被連接至本端電路接地。第二接觸件亦被連接至馬達控制器之SWIN輸入。輸入信號由上拉

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電阻器來保持為高的，直到藉由致動按鈕開關來關閉開關接觸件。當致動開關以關閉接觸件時，輸入信號被拉至0伏特(例如，在本端電路接地上之電位)。濾波電容器可降低開關接觸件跳動噪音。馬達控制器可包含內部去跳動電路，以消除開關接觸件跳動的影響。馬達控制器在斷開狀態下初始化，其中沒有PWM信號被提供至馬達310，且馬達不旋轉。馬達控制器回應於開關的第一次啟動以從斷開狀態前進至第一導通狀態，其中選定提供至馬達之PWM信號以使馬達以第一(低)速度來旋轉。隨後的開關之啟動使馬達控制器前進至第二導通狀態，其中選定提供至馬達之PWM信號以使馬達以第二(中等)速度來旋轉。隨後的開關之啟動使馬達控制器前進至第三導通狀態，其中選定提供至馬達之PWM信號以使馬達以第三(高)速度來旋轉。隨後的開關之啟動使馬達控制器返回至初始斷開狀態，其中沒有PWM信號被提供至馬達，且馬達不旋轉。在繪示實施例中，馬達之三個旋轉速度為1,800 rpm(低速)、2,500 rpm(中速)及3,200 rpm(高速)。

【0141】馬達控制器1050產生與當前選定的導通狀態(例如，低速、中速或高速)相關聯的標稱PWM信號。每個導通狀態對應於如上文所描述之選定旋轉速度。馬達控制器經由分壓器1082及NPN電晶體1090來監測從五接腳插頭172之接腳1080所接收的轉速計信號(TACH)。若接收的轉速計信號指示馬達速度低於選定速度，則馬達控制器調整PWM信號(例如增加脈衝寬度或增加重複率或兩者)以增加

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馬達速度。若接收的轉速計信號指示馬達速度高於選定速度，則馬達控制器調整PWM信號(例如減少脈衝寬度或減少重複率或兩者)以減少馬達速度。

【0142】馬達控制器1050產生第一組之三個LED控制信號(LEDS1、LEDS2、LEDS3)。在第一組中之第一信號(LEDS1)經由電流限制電阻器1150而耦合至第一速度指示LED 166A之陽極。當馬達控制器處於第一導通狀態時，在第一組中之第一信號被啟動以點亮第一速度指示LED，以便以第一(低)速度來驅動馬達。在第一組中之第二信號(LEDS2)經由電流限制電阻器1152而被耦合至第二速度指示LED 166B之陽極。當馬達控制器處於第二導通狀態時，在第一組中之第二信號被啟動以點亮第二速度指示LED，以便以第二(中等)速度來驅動馬達。在第一組中之第三信號(LEDS3)經由電流限制電阻器1154而被耦合至第三速度指示LED 166C之陽極。當馬達控制器處於第三導通狀態時，在第一組中之第三信號被啟動以點亮第三速度指示LED，以便以第三(高)速度來驅動馬達。在圖24之實施例中，速度-指示器LED之陰極被接地，且三個LED控制信號被施加至各自LED之陽極，使得當各自控制信號係高態有效時各LED被點亮。在下文所述之其他實施例中，指示器LED之陽極被連接至VCC匯流排1042，且三個LED控制信號通過該各自電流限制電阻器而被施加至各自LED之陰極，使得當各自有效控制信號係低態有效時各LED被點亮。

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【0143】馬達控制器1050進一步回應來自輸入插頭170之CHRG信號。如上文所論述，CHRG信號由電池充電器控制器860所產生，以指示電池單元214之充電狀態。馬達控制器從CHRG輸入信號來決定電池單元之充電的當前狀態，且在通過主體端蓋140可見的五個電池充電狀態LED 168A、168B、168C、168D、168E上顯示充電的狀態。如繪示，各電池充電狀態LED之陰極被接地。馬達控制器產生第二組的五個LED控制信號(LEDC1、LEDC2、LEDC3、LEDC4、LEDC5)。在第二組中之第一信號(LEDC1)經由電流限制電阻器1170而被耦合至第一充電LED 168A之陽極。當電池單元具有最低充電範圍時，在第二組中之第一信號被啟動以點亮第一充電指示LED。馬達控制器可依可察覺的速度使第一充電指示LED閃爍以指示最低的充電範圍。由第一充電LED所發出的光的顏色(例如，紅色)可與另一個LED所發出的光的顏色(例如，綠色)不同，以進一步指示最低充電範圍(例如，不超過剩餘電量的20 %)。在第二組中之第二信號(LEDC2)經由電流限制電阻器1172而被耦合至第二充電指示LED 168B之陽極。當電池單元具有第二充電範圍(例如，剩餘電量的21至40 %)時，在第二組中之第二信號被啟動以點亮第二充電指示LED。在第二組中之第三信號(LEDC3)經由電流限制電阻器1174而被耦合至第三充電指示LED 168C之陽極。當電池單元具有第三充電範圍(例如，剩餘電量的41至60 %)時，在第二組中之第三信號被啟動以點亮第三充

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電指示LED。在第二組中之第四信號(LEDC4)經由電流限制電阻器1176而被耦合至第四充電指示LED 168D之陽極。當電池單元具有第四充電範圍(例如，剩餘電量的61至80 %)時，在第二組中之第四信號被啟動以點亮第四充電指示LED。在第二組中之第五信號(LEDC5)經由電流限制電阻器1178而被耦合至第五充電指示LED 168B之陽極。當電池單元具有第五充電範圍(例如，剩餘電量的81至100 %)時，在第二組中之第五信號被啟動以點亮第五充電指示LED。應理解的是，充電之範圍僅為近似值且提供作為實例。在圖24之實施例中，充電指示LED之陰極被接地，且五個LED控制信號被施加至各自LED之陽極，使得當各自控制信號係高態有效時各LED被點亮。在下文所述之其他實施例中，五個充電指示LED之陽極被連接至VCC匯流排1042，且五個LED控制信號通過該各自電流限制電阻器而被施加至各自LED之陰極，使得當各自有效控制信號係低態有效時各LED被點亮。

【0144】在本文中所描述的可攜式電機衝擊式按摩施力器100有利地允許按摩治療師在延長的持續時間內有效地施加衝擊按摩而不會過度疲勞且不會被束縛在電源線上。在本文中所描述之可攜式電機衝擊式按摩施力器的降低的噪音位準允許裝置在安靜的環境中使用，使得使用裝置來治療的人能夠放鬆且享受在治療室中所提供的任何環境音樂或其他舒緩的聲音。

【0145】圖25及26繪示衝擊式按摩裝置1200之機械結

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構的替代實施例。圖25係仰視上本體部分112中之馬達總成300的下部平面圖，其中下蓋114及電池總成132被移除。上本體部分以虛線來展示，以將附圖聚焦在馬達總成及連桿上。在圖25中，先前所描述之具有在馬達總成與活塞514之間的可撓性互連連桿512的往復總成126由往復總成1210來代替，往復總成1210在馬達總成與活塞1214之間具有實心連桿1212。在圖26中之分解視圖中更詳細地展示實心連桿。在實心連桿的近端處的軸承支架1222內的環形軸承1220接合圓柱形曲柄360之圓柱形曲柄樞軸370，如以上所描述的。實心連桿的遠端包含樞軸孔1230，樞軸孔1230被定位在活塞之近端延伸部分1232的圓柱形突部1234之上方。樞軸孔延伸至實心連桿之遠端的軸承凹部1240中。軸承凹部接收軸承1242。樞轉螺釘1244之無螺紋部分延伸穿過軸承的中心且與活塞的近端延伸部分中的螺紋孔1246接合。實心連桿之樞軸孔相對於樞轉螺釘樞轉，以允許實心連桿的移動將往復運動施加至活塞上。活塞的遠端接收可選擇性地可移除的施力器頭1248(在圖25中以虛線來展示)。施力器頭可以是例如在圖20至22中所展示之施力器頭中之一者或具有不同配置的施力器頭。

【0146】在衝擊式按摩施力器100的許多應用中，施加至身體上的特定位置的壓力可根據位置中的組織的性質(例如，肌肉的類型、所覆蓋脂肪的厚度等等)而變化。若施力器被使用於向非常敏感的位置施加壓力，則所施加的壓力應相對地較小。另一方面，若施力器被使用於向大的

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肌肉施加壓力，則所施加的壓力應相對地較大。來自該施力器施加於其上之接受者的反饋將判定可接受的壓力量值，其提供有益的按摩而不會引起過度的疼痛；然而，壓力的量值不容易量化，使得揮動該施力器的人可在隨後的按摩期間在相同位置處或甚至當在相同按摩期間返回相同位置時再現可接受的壓力量值大小。因此，需要一種用於量化所施加的壓力的系統及方法，以便可再現該施加壓力。

【0147】圖27繪示修改的馬達控制器電路1500，其類似於圖24之馬達控制器電路1000。在圖27之馬達控制器電路中，許多組件與圖24中的組件相同且以相同的方式來操作。在圖27中的相同組件以與在圖24中相同的元件編號來標記。

【0148】圖27之修改的馬達控制器電路1500包含來自圖24之馬達控制器電路1000的某些修改。例如，圖24之控制器1050被圖27中的控制器1510所代替。在一實施例中，在圖27中之控制器係周邊介面控制器(PIC)，諸如微晶片PIC16F677 8位元CMOS微控制器，其可從亞利桑那州錢德勒的微晶片科技(Microchip Technology)公司商購獲得。亦可使用來自其他供應商的其他類似控制器。在圖27中之控制器可以係與在圖24中之控制器相同的控制器；然而，如下文所述，在圖27之實施例中使用附加的輸入/輸出端子。

【0149】作為進一步的實例，在圖24中之電流限制電

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阻器1032在圖27中被替換為在VBAT輸入端子1020與電壓調節器1040之電壓輸入端子(Vin)之間串聯連接的第一齊納二極體1520與第二齊納二極體1522。例如，兩個齊納二極體可具有3伏特的電壓值，從而將電池單元214之電壓(例如，25.2伏特)限制至小於20伏特，其係至電壓調節器之最大輸入電壓。

【0150】如在圖27中進一步所展示的，來自控制器1500之脈衝寬度調變信號(現在標記為「PWM_C」)不經由電流限制電阻器1122而直接地連接至馬達310之PWM輸入。而是，PWM_C信號如前所述通過電流限制電阻器而被連接至NPN雙極電晶體1530之基極。電晶體之集極被連接至本端電路接地。電晶體之基極亦經由下拉電阻器1532而連接至本端電路接地。電晶體之集極連接至第二插頭172之第五接腳1120，且因此經由第二插孔1070及五線電纜1072而連接至馬達。電晶體之集極亦經由上拉電阻器1534而連接至VCC匯流排1042。PWM信號如前所述起作用，除了來自控制器的PWM_C信號被電晶體反相且緩衝之外。

【0151】圖27之修改的馬達控制器電路1500進一步包含負載電流感測電路1550。負載電流感測電路包括電流感測電阻器1552，其具有連接至第二插頭172之第四接腳1110的第一端子且具有連接本端電路接地1026之第二端子。因此，不是如在圖24中所示的，來自馬達310之返回電流直接地流至本端電路接地，而是在圖27中之返回電流

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流過電流感測電阻器，然後到達本端電路接地。因此，相對於本端電路接地而橫跨電流感測電阻器之第一端子來產生電壓。在該繪示實施例中，電流感測電阻器係精密電阻器，其具有大約為50毫歐姆之電阻，及為1%或更好的精確度。在電流感測電阻器之第一端子上的電壓與流過電流感測電阻器的電流成比例。例如，當流過電流感測電阻器的電流具有1安培的量值時，在電流感測電阻器之第一端子上的電壓具有50毫伏特的量值。因此，可監視在電流感測電阻器之第一端子上的電壓，以判定從馬達的接地(電流返回)流至本端電路接地的瞬時電流。

【0152】第一濾波電容器1560(例如，100,000皮法電容器)順式地連接橫跨電流感測電阻器1552，從電流感測電阻器之第一端子至本端電路接地。第一濾波電阻器1562(例如，100,000歐姆電阻器)從電流感測電阻器之第一端子連接至控制器1510之類比輸入接腳。類比輸入接腳在圖27中標記為「LOAD」，以指示在輸入接腳上接收的輸入信號表示馬達310之負載電流。第二濾波電容器1564(例如，100,000皮法電容器)及第三濾波電容器1566(例如，100微法電解電容器)從類比(LOAD)輸入接腳連接至本端電路接地。第二濾波電阻器1568(例如，300,000歐姆電阻器)亦從類比輸入接腳連接至本端電路接地。因為馬達310由脈衝寬度調變來驅動，所以經由電流感測電阻器1552從馬達流至本端電路接地的電流包括電流脈衝之序列，其由電流感測電阻器所感測以產生對應的電壓脈衝之序列。兩

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個濾波電容器及兩個濾波電阻器操作為低通濾波器，以將電壓脈衝之序列轉換成DC電壓信號，其具有隨著電流脈衝之平均量值變化而緩慢地變化的量值。跨越第二濾波電阻器及第二與第三濾波電容器兩端所產生的電壓被提供至控制器的類比輸入接腳。因此，與平均馬達負載電流直接地成比例的電壓係被施加至控制器的LOAD輸入接腳。

【0153】在圖27之實施例中，五個充電指示LED 168A至E的陰極係經由各別的電流限制電阻器1170、1172、1174、1176、1178而分別地連接至控制器1510之各別的控制信號LEDC1至5。每個充電指示LED的陽極係連接至VCC匯流排1042。當各別的控制信號係低態有效以允許電流流過LED時，每個充電指示LED被點亮。

【0154】在圖27之實施例中，三個速度指示LED 166A至C的陰極經由各別的電流限制電阻器1150、1152、1154而分別地連接至控制器1510之各別的控制信號LEDS1至3。每個速度指示LED的陽極連接至VCC匯流排1042。當各別的控制信號係低態有效以允許電流流過LED時，每個速度指示LED被點亮。

【0155】在圖27中之控制器1500在各別的輸出接腳上產生三個附加的輸出信號LEDP1、LEDP2及LEDP3。LEDP1輸出信號經由電流限制電阻器1570而連接至第一電力指示器LED 1572A的陰極，第一電力指示器LED 1572A的陽極連接至VCC匯流排1042。當LEDP1輸出信號係低態有效時，第一電力指示器LED被點亮。LEDP2輸出信號經

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由電流限制電阻器1574連接至第二電力指示器LED 1572B的陰極，第二電力指示器LED 1572B的陽極連接至VCC匯流排。當LEDP2輸出信號係低態有效時，第二電力指示器LED被點亮。LEDP3輸出信號經由電流限制電阻器1576連接至第三電力指示器LED 1572C的陰極，第三電力指示器LED 1572C的陽極連接至VCC匯流排。當LEDP3輸出信號係低態有效時，第三電力指示器LED被點亮。如下文所述，回應於由電流感測電阻器1552所感測的電流的量值，選擇性地點亮第一、第二及第三電力指示器LED。在該繪示實施例中，各別的電力指示器LED的陰極由各別的低態有效信號來驅動。在其他實施例中，陰極可被連接至VCC匯流排，而陽極可利用來自控制器的低態有效輸出信號來驅動，諸如以上關於圖24之實施例中的LED所描述的。三個附加的LED被展示在圖28中的修改之衝擊式按摩裝置1200的透視圖上及在圖29中之修改的馬達控制印刷電路板1580的透視圖中。在圖28中，先前所描述實施例的馬達包體120被替換為修改的馬達包體1582，其較短且其具有較大的直徑以容納具有不同配置的馬達(未圖示)。而且，消除了下主體114中的指尖開口234。

【0156】流過感測電阻器1552之負載電流的量值與施加至按摩施力器100的壓力有關，以迫使按摩施力器的施力器頭516抵靠身體上的位置或抵靠另一個障礙物。例如，當允許施力器頭自由地往復時，負載電流將是欲轉動馬達310及使施力器頭往復所需的最小電流量，且使耦合

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馬達之輸出軸桿的組件轉動及往復施力器頭。相反地，當施力器頭被強制地壓靠在身體上的位置或另一個障礙物上時，馬達需要額外的電流以在增加的壓力下維持選定的旋轉速度。因此，在該繪示實施例中，測量通過馬達的負載電流的量值，且將其與對應於不同施加力量值的負載電流範圍進行比較，以判定瞬時負載電流。測量及比較特徵係如下文所述。

【0157】馬達控制功能及操作速度的顯示係在控制器1510內執行，對應於以上關於圖27之控制器1050所描述的功能。圖30繪示壓力測量之操作的流程圖1600及顯示圖27之實施例的功能。

【0158】控制器1510的操作係由動作區塊1610中的電力序列開始，其中控制器當經由電池總成132上的開閉開關256首次施加電力時開始操作。控制器首先執行由內部可編程記憶體所定義的功能，以用於初始化在系統初始化動作區塊1612中的各種內部設定。

【0159】在系統初始化之後，控制器1510前進至輸入/輸出(I/O)埠初始化動作區塊1614，其中控制器初始化輸入/輸出(I/O)埠。如以上所述，在該繪示實施例中，控制器包括微晶片PIC16F677 8位元CMOS微控制器。該繪示控制器具有18個I/O接腳，且每個接腳可組構為用以執行許多不同的功能。在初始化動作區塊中，根據預期的功能性來組構接腳。例如，LEDS1、LEDS2、LEDS3、LEDC1、LEDC2、LEDC3、LEDC4、LEDC5、LEDP1、LEDP2及

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LEDP3接腳被組構為輸出接腳。PWM_C接腳被組構為脈衝寬度調變輸出接腳，由控制器中的內部邏輯所支持，以在選定的頻率及選定的工作週期下產生PWM信號。CW/CCW接腳被組構為輸出接腳。LOAD接腳被組構為類比輸入接腳，以接收具有與感測到的馬達電流值相對應的量值的電壓。TACH接腳被組構為數位輸入接腳以接收來自馬達310之轉速計脈衝。CHRG接腳被組構為I^2C以從電池控制器PCB 252接收具有表示電池單元214之充電狀態的數位值的輸入序列。SWIN接腳被組構為數位輸入，以接收中央按鈕開關162的高或低狀態。

【0160】在初始化區塊1614中的I/O接腳之後，控制器1510前進至馬達速度狀態歸零動作區塊1616，其中控制器將期望的馬達速度狀態設定為0(例如，關閉)。控制器亦將控制信號施加至內部PWM邏輯，以使PWM邏輯停止向PWM_C輸出接腳發送PWM信號。在最初電力開啟後初始通過該動作區塊時，控制器可能已經在初始化程序期間將馬達速度狀態設定為零。

【0161】在將馬達速度狀態設定為0之後，控制器1510前進至顯示動作區塊1620，其中控制器選擇性地啟動LEDC1至5輸出接腳上的信號以經由電池充電指示器LED168A至E來顯示電池電量。控制器經由CHRG輸入接腳上的I2C信號而從電池控制器PCB 252獲得電池電量資訊。

【0162】在啟動電池充電LED之後，控制器1510前進

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至速度切換讀取動作區塊1622，其中控制器讀取SWIN輸入接腳上的數位值以判定按鈕開關162的狀態，其作用為如以上所描述的馬達速度狀態選擇開關。數位值0表示開關已經被使用者所啟動。數位值1表示開關尚未被啟動。可利用內部去抖動常式對控制器進行編程，以確保控制器對於按鈕開關的每次啟動僅回應一次。

【0163】在讀取SWIN輸入接腳上的值之後，控制器1510前進至決策區塊1624，其中控制器判定按鈕(速度改變)開關162是否有效(例如，在SWIN接腳上的數位值是低的)。若開關係無效的，則控制器返回至顯示動作區塊1620且如以上所描述的繼續顯示電池電量且繼續讀取動作區塊1622中的SWIN輸入接腳上的值。控制器將繼續迴路以顯示電池電量且讀取按鈕開關，直到SWIN輸入接腳上的值變為低態有效。

【0164】若當控制器1510在決策區塊1624中評估開關的狀態時按鈕開關162係有效的，則控制器前進至速度改變動作區塊1630，其中控制器將馬達速度狀態從0遞增至1且設定內部PWM邏輯以在PWM_C輸出接腳上輸出脈衝，以便以最慢的馬達速度(例如，在該繪示實施例中為1,800 rpm)來驅動馬達310。在速度改變動作區塊內，控制器亦啟動LEDS1信號，以使第一馬達速度指示器LED168A被點亮。

【0165】在區塊1630中將馬達速度設定為最低位準之後，控制器1510前進至區塊1632，其中控制器執行校正程

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序，其中控制器當沒有任何壓力被施加至施力器頭516時首先判定無負載電流量值$I_{NO-LOAD}$。校正程序區塊內的步驟將在下面參照圖31更詳細地描述。如下文所述，若校正程序成功地完成，則控制器從校正程序返回且設置校正旗標設定，若校正程序未成功地完成，則從校正程序返回，設置校正旗標重設(清除)。

【0166】在區塊1632中完成校正程序之後，控制器1510前進至決策區塊1640，其中控制器測試校正旗標的狀態。若設定了校正旗標，則控制器前進至動作區塊1650。否則，控制器跳過動作區塊1650且前進至動作區塊1660。

【0167】動作區塊1650係電流測量及壓力顯示動作區塊，其中控制器在LOAD輸入接腳上輸入類比電壓值，表示通過電流感測電阻器1552的平均電流的量值，以判定負載電流量值，且選擇性地啟動壓力指示器LED 1572A、1572B、1572C中之一者，以指示施加至施力器頭516的壓力範圍。電流測量及壓力顯示區塊內的步驟在下面參照圖32更詳細地描述。接著，控制器前進至動作區塊1660。

【0168】動作區塊1660係電量顯示動作區塊，其中控制器1510在CHRG輸入接腳上輸入數位值且選擇性地啟動LEDC1至5輸出接腳上的信號以經由電池充電指示器LED168A至E來顯示電池電量。

【0169】在電量顯示動作區塊1660中顯示電池電量之後，控制器前進至速度切換讀取動作區塊1662，其中控制器讀取SWIN輸入接腳上的數位值以判定按鈕開關162的狀

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態，如以上所描述的用於速度切換讀取動作區塊1622。

【0170】在讀取SWIN輸入接腳上的值之後，控制器1510前進至決策區塊1664，其中控制器判定按鈕(速度改變)開關162是否有效(例如，在SWIN接腳上的數位值是低的)。

【0171】若在決策區塊1664中評估時該開關係無效的，則控制器1510返回至決策區塊1640，其中控制器再次判定校正旗標是設定還是清除。若設定了校正旗標，則控制器接著在壓力顯示動作區塊1650中顯示新的電流量值，在電量顯示動作區塊1660中顯示電池電量，在速度切換讀取動作區塊1662中讀取按鈕開關，且檢查在決策區塊1664中的讀取以判定開關是否係有效的。否則，控制器跳過區塊1650且執行區塊1660、1662及1664中的步驟。控制器維持在五區塊迴路(校正旗標設定)或四區塊迴路(校正旗標清除)中，直到按鈕開關是啟動的。在該繪示實施例中，在迴路中所執行的功能被定時，使得每秒測量電流大約八次。定時可藉由軟體延遲、藉由實施倒數計時器或藉由用於控制迴路定時的其他已知方法來完成。直到按鈕開關被啟動之前，只要從電池總成132提供電力，則控制器將維持在迴路中。

【0172】若當控制器1510在決策區塊1664中評估開關的狀態時按鈕開關162係有效的，則控制器前進至速度改變動作區塊1670，其中控制器將馬達速度狀態增加達1。控制器接著前進至決策區塊1672，其中控制器判定新的馬

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達速度狀態是否大於3。若馬達速度狀態大於3，則控制器返回至馬達速度狀態歸零動作區塊1616，其中控制器將所需的馬達速度狀態設定為0(例如，關閉)。控制器亦將控制信號施加至內部PWM邏輯，以使PWM邏輯停止向PWM_C輸出接腳發送PWM信號。控制器亦撤消LEDS1、LEDS2及LEDS3輸出接腳上的信號，使得所有的速度指示器LED168A、168B及168C皆關閉。控制器接著在包括區塊1616、1620、1622及1624的四區塊迴路中繼續，直到再次啟動按鈕開關以重啟馬達310。

【0173】若當控制器1510到達決策區塊1672時新的馬達速度狀態不大於3，則控制器前進至馬達速度設定區塊1680，其中控制器將馬達速度設定為對應於新的馬達速度狀態的值。若新的馬達速度狀態是2，則控制器將控制信號施加至內部PWM邏輯，以使PWM邏輯將PWM信號發送至PWM_C輸出接腳，以使馬達310以中速(例如，在繪示實施例中的2,500 rpm)來旋轉。在馬達速度設定區塊內，控制器亦撤消LEDS1輸出接腳上的先前有效信號，且啟動LEDS2輸出接腳上的信號以開啟第二速度指示器LED 168B。若新的馬達速度狀態是3，則控制器將控制信號施加至內部PWM邏輯，以使PWM邏輯將PWM信號發送至PWM_C輸出接腳，以使馬達310以高速(例如，在繪示實施例中的3,200 rpm)來旋轉。控制器撤消LEDS2輸出接腳上的先前有效信號，且啟動LEDS3輸出接腳上的信號以開啟第三速度指示器LED 168C。

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【0174】在馬達速度設定區塊1680中設定新的馬達速度之後，控制器1510返回至決策區塊1640，其中控制器檢查校正旗標的狀態，且接著執行如以上所描述的五區塊迴路(校正旗標設定)或四區塊迴路(校正旗標清除)。控制器維持在五區塊迴路或四區塊迴路中，直到開關被啟動。控制器每秒大約8次重複迴路中的動作，直到按鈕開關被啟動或直到不再從電池總成132提供電力為止。

【0175】圖31繪示圖30之執行校正程序區塊1632內的步驟。當使用者最初啟動中央按鈕(速度改變)開關162以使控制器1510開啟馬達310時，執行校正程序，且如以上參照圖30所描述的將速度設定在最低位準(位準1)。衝擊式按摩裝置100之說明書指示使用者在最初施加電力時執行校正且進一步指示使用者不啟動速度選擇開關以增加速度而不對施力器頭516施加壓力。

【0176】在第一動作區塊1700中，控制器1510啟動電力指示器LED 1572A、1572B、1572C呈閃爍型樣，以警示使用者正在執行校正程序。該圖案可以係計數圖案(其中照明的LED表示二進制計數)、移位圖案(其中一次點亮一個LED)或另一個所選圖案(改變以指示校正程序係有效的)。在繼續閃爍該LED的同時，該控制器前進至動作區塊1702，其中該控制器輸入LOAD輸入接腳上的類比電壓值，表示通過電流感測電阻器1552的平均電流的量值。控制器保存(記錄)初始電流量值且前進至決策區塊1704，其中控制器判定在校正程序期間使用者是否已啟動速度選擇

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開關162。若已啟動速度選擇開關，則控制器退出校正程序而不完成校正程序。當提前退出校正程序時，控制器在動作區塊1706中重設(清除)校正旗標，在動作區塊1708中關閉LED，且接著經由區塊1710退出校正程序。

【0177】若使用者在校正程序期間未啟動速度選擇開關162，則控制器1510從決策區塊1704前進至決策區塊1720，其中控制器判定是否已保存40個電流樣本，其表示以每秒大約8個樣本來採樣大約5秒。若尚未保存40個樣本，則控制器返回至動作區塊1702，其中控制器輸入下一個樣本，且接著檢查以判定速度選擇開關是否已被啟動。該控制器在此電流採樣迴路中繼續，直到保存40個電流樣本或直到使用者藉由啟動速度選擇開關來中斷校正程序。

【0178】當控制器1510判定已經保存(記錄)了40個電流樣本時，該控制器從決策區塊1720前進至動作區塊1722，其中該控制器平均40個電流樣本以判定平均電流。接著，在決策區塊1722中，該控制器判定平均電流是否超過1,000毫安培。若使用者已經遵守校正程序指令且在校正程序期間沒有對施力器頭516施加壓力，則平均電流不應超過1,000毫安培。若平均電流超過1,000毫安培，則控制器前進至動作區塊1706以重設(清除)校正旗標，在區塊1708中關閉閃爍的LED且經由區塊1710退出校正程序。

【0179】若電流樣本的平均值不大於1,000毫安培，則控制器1510從決策步驟1730前進至動作區塊1732，其中控制器將平均電流保存為無負載電流值$I_{NO\text{-}LOAD}$。無負載

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電流值被使用於下文參照圖32所描述的壓力測量步驟中。該控制器設定校正旗標以指示校正程序係成功的且無負載電流值可使用於如下文所述的電流測量及壓力顯示程序1650中。

【0180】在區塊1732中保存無負載電流量值且設定校正旗標之後，控制器1510前進至動作區塊1734，其中該控制器一起啟動三個壓力指示器LED 1572A、1572B、1572C大約一秒鐘以告知使用者校正程序已經成功地完成。或者，該控制器可藉由三個LED的多次閃爍(例如，兩次閃爍)一起指示校正程序的成功完成。在進一步的替代方案中，可依選定的順序來啟動三個LED以指示校正程序的成功完成。接著，該控制器前進至動作區塊1708以關閉LED，且接著經由區塊1710退出校正程序。

【0181】在圖32中更詳細地繪示輸入電壓、判定電流量值及顯示壓力的程序1650。在第一動作區塊1800中，如以上所描述的，控制器1510藉由測量通過電流感測電阻器1552兩端的電壓來輸入電流量值樣本。接著，該控制器前進至動作區塊1802，其中該控制器計算最後八個電流樣本的滾動平均I_{AVG}。通過整個測量迴路的前七次，該控制器可平均少於八個樣本；然而，在衝擊式按摩裝置100已經操作至少一秒之後將發生完全的平均。

【0182】在區塊1802中產生平均電流之後，控制器1510前進至動作區塊1804，其中控制器計算平均電流I_{AVG}(在區塊1802中判定)與無負載電流$I_{NO-LOAD}$(在圖31之

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校正程序1616中判定)之間的電流差值ΔI。在計算電流差值ΔI之後，該控制器前進至分支決策區塊1806，其中該控制器基於所選擇的速度位準而分支至三個壓力顯示常式中之一者。

【0183】若所選擇的速度處於位準1(低速)，則控制器1510從分支決策區塊1806分支至第一壓力顯示常式1810。第一壓力顯示常式包含各別的第一決策區塊1812、各別的第二決策區塊1814及各別的第三決策區塊1816。

【0184】若所選擇的速度處於位準2(中速)，則控制器1510從分支決策區塊1806分支至第二壓力顯示常式1820。第二壓力顯示常式包含各別的第一決策區塊1822、各別的第二決策區塊1824及各別的第三決策區塊1826。

【0185】若所選擇的速度處於位準3(高速)，則控制器1510從分支決策區塊1806分支至第三壓力顯示常式1830。第三壓力顯示常式包含各別的第一決策區塊1832、各別的第二決策區塊1834及各別的第三決策區塊1836。

【0186】在第一壓力顯示常式1810內，控制器1510首先在各別的第一決策區塊1812中判定平均電流I_{AVG}與無負載電流$I_{NO-LOAD}$之間的差值ΔI是否小於300毫安培。若差值小於300毫安培，則該控制器前進至動作區塊1840，其中該控制器關閉所有的壓力指示器LED 1752A、1752B、1752C以指示沒有任何壓力或僅施加少量的壓力至施力器頭516。例如，在一實施例中，小於0.1公斤的施加壓力在第一(低)速度位準下不會增加平均電流超過無負載電流達

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300毫安培。

【0187】若控制器1510在各別的第一決策區塊1812中判定平均電流與無負載電流之間的差值ΔI係至少300毫安培，則該控制器前進至各別的第二決策區塊1814，其中該控制器判定平均電流與無負載電流之間的差值ΔI是否小於600毫安培。若差值小於600毫安培，則該控制器前進至動作區塊1842，其中該控制器開啟第一壓力指示器LED 1752A以指示壓力處於第一壓力範圍內。例如，在一實施例中，在大約0.1公斤至0.5公斤的第一壓力範圍內之施加壓力將導致在第一(低)速度位準下的平均負載電流大於無負載電流在大約300毫安培至大約599毫安培的範圍內。

【0188】若控制器1510在各別的第二決策區塊1814中判定平均電流與無負載電流之間的差值ΔI係至少600毫安培，則該控制器前進至各別的第三決策區塊1816，其中該控制器判定平均電流與無負載電流之間的差值ΔI是否小於900毫安培。若差值小於900毫安培，則該控制器前進至動作區塊1844，其中該控制器開啟第二壓力指示器LED 1752B以指示壓力處於第二壓力範圍內。例如，在一實施例中，在大約0.5公斤至大約1.5公斤的第二壓力範圍內之施加壓力將導致在第一(低)速度位準下的平均負載電流大於無負載電流在大約600毫安培至大約899毫安培的範圍內。

【0189】若控制器1510在各別的第三決策區塊1816中判定平均電流與無負載電流之間的差值ΔI係至少900毫安

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培，則該控制器前進至動作區塊1846，其中該控制器開啟第三壓力指示器LED 1752C以指示壓力處於第三壓力範圍內。例如，在一實施例中，在大於大約2.5公斤的第三壓力範圍內之施加壓力將導致在第一(低)速度位準下的平均負載電流大於無負載電流至少900毫安培。

【0190】在第二壓力顯示常式1820內，控制器1510首先在各別的第一決策區塊1822中判定平均電流與無負載電流之間的差值ΔI是否小於600毫安培。若差值小於600毫安培，則該控制器前進至動作區塊1840，其中該控制器關閉所有的壓力指示器LED 1752A、1752B、1752C以指示沒有任何壓力或僅施加少量的壓力至施力器頭516。例如，在一實施例中，小於0.1公斤的施加壓力在第二(中等)速度位準下將不會增加平均電流超過無負載電流達600毫安培。

【0191】若控制器1510在各別的第一決策區塊1822中判定平均電流與無負載電流之間的差值ΔI係至少600毫安培，則該控制器前進至各別的第二決策區塊1824，其中該控制器判定平均電流與無負載電流之間的差值ΔI是否小於900毫安培。若差值小於900毫安培，則該控制器前進至動作區塊1842，其中該控制器開啟第一壓力指示器LED 1752A以指示壓力處於第一壓力範圍內。例如，在一實施例中，在大約0.1公斤至0.5公斤的第一壓力範圍內之施加壓力將導致在第二(中等)速度位準下的平均負載電流大於無負載電流在大約600毫安培至大約899毫安培的範圍內。

【0192】若控制器1510在各別的第二決策區塊1824中

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判定平均電流與無負載電流之間的差值ΔI係至少900毫安培，則該控制器前進至各別的第三決策區塊1826，其中該控制器判定平均電流與無負載電流之間的差值ΔI是否小於1,200毫安培。若差值小於1,200毫安培，則該控制器前進至動作區塊1844，其中該控制器開啟第二壓力指示器LED 1752B以指示壓力處於第二壓力範圍內。例如，在一實施例中，在大約0.5公斤至大約1.5公斤的第二壓力範圍內之施加壓力將導致在第一(中等)速度位準下的平均負載電流大於無負載電流在大約900毫安培至大約1,199毫安培的範圍內。

【0193】若控制器1510在各別的第三決策區塊1826中判定平均電流與無負載電流之間的差值ΔI係至少1,200毫安培，則該控制器前進至動作區塊1846，其中該控制器開啟第三壓力指示器LED 1752C以指示壓力處於第三壓力範圍內。例如，在一實施例中，在大於大約2.5公斤的第三壓力範圍內之施加壓力將導致在第二(中等)速度位準下的平均負載電流大於無負載電流至少1,200毫安培。

【0194】在第三壓力顯示常式1830內，控制器1510首先在各別的第一決策區塊1832中判定平均電流與無負載電流之間的差值ΔI是否小於900毫安培。若差值小於900毫安培，則該控制器前進至動作區塊1840，其中該控制器關閉所有的壓力指示器LED 1752A、1752B、1752C以指示沒有任何壓力或僅施加少量的壓力至施力器頭516。例如，在一實施例中，小於0.1公斤的施加壓力在第三(高)速度位準

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下不會增加平均電流超過無負載電流達900毫安培。

【0195】若控制器1510在各別的第一決策區塊1832中判定平均電流與無負載電流之間的差值ΔI係至少900毫安培，則該控制器前進至各別的第二決策區塊1834，其中該控制器判定平均電流與無負載電流之間的差值ΔI是否小於1,200毫安培。若差值小於1,200毫安培，則該控制器前進至動作區塊1842，其中該控制器開啟第一壓力指示器LED 1752A以指示壓力處於第一壓力範圍內。例如，在一實施例中，在大約0.1公斤至0.5公斤的第一壓力範圍內之施加壓力將導致在第三(高)速度位準下的平均負載電流大於無負載電流在大約900毫安培至大約1,199毫安培的範圍內。

【0196】若控制器1510在各別的第二決策區塊1834中判定平均電流與無負載電流之間的差值ΔI係至少1,200毫安培，則該控制器前進至各別的第三決策區塊1836，其中該控制器判定平均電流與無負載電流之間的差值ΔI是否小於1,500毫安培。若差值小於1,500毫安培，則該控制器前進至動作區塊1844，其中該控制器開啟第二壓力指示器LED 1752B以指示壓力處於第二壓力範圍內。例如，在一實施例中，在大約0.5公斤至大約1.5公斤的第二壓力範圍內之施加壓力將導致在第一(中等)速度位準下的平均負載電流大於無負載電流在大約1,200毫安培至大約1,499毫安培的範圍內。

【0197】若控制器1510在各別的第三決策區塊1836中判定平均電流與無負載電流之間的差值ΔI係至少1,500毫

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安培，則該控制器前進至動作區塊1846，其中該控制器開啟第三壓力指示器LED 1752C以指示壓力處於第三壓力範圍內。例如，在一實施例中，在大於大約2.5公斤的第三壓力範圍內之施加壓力將導致在第三(高)速度位準下的平均負載電流大於無負載電流至少1,500毫安培。

【0198】藉由首先建立無負載電流量值，且接著基於測量電流與無負載電流之間的差值來判定施加的壓力，由各個單元所產生的壓力指示將是相似的。由於例如在往復機構內的摩擦位準上的差值，無負載電流可能因單元與單元而有所差異；然而，由施加壓力所引起的在電流上的差值將是相似的。因此，由不同單元所提供的壓力指示將是相似的。

【0199】在圖32中所繪示之實施例中，壓力指示器LED 1572A、1572B、1572C中之各者僅針對所選馬達速度的特定電流差值範圍被點亮。因此，隨著施加的壓力增加，三個壓力指示器LED點亮，使得在任何時間僅點亮一個LED(除了在以上所描述的校正程序1616期間)。

【0200】在由圖33中之流程圖1850所繪示的替代性實施例中，第一壓力指示器LED 1572A在第一有效施加壓力範圍內被點亮且在第二及第三施加壓力的範圍內維持點亮。類似地，第二壓力指示器LED 1572B在第二施加壓力範圍內被點亮且在第三施加壓力範圍內維持點亮。第三壓力指示器LED 1572C僅在第三施加壓力範圍內被點亮。因此，當在替代性實施例中施加的壓力增加至較高範圍時，

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壓力指示器LED提供累積照明效果而不是如在繪示實施例中的離散效果。在圖33中，壓力指示器LED的修改順序是藉由使控制器1510退出區塊1846且前進至區塊1844且藉由使控制器退出區塊1844且前進至區塊1842來實現。該控制器從如先前所描述的區塊1842之程序退出。因此，當該控制器啟動第三壓力指示器以指示最高施加壓力範圍時，該控制器亦在退出修改程序之前啟動第二壓力指示器LED及第一壓力指示器LED。當該控制器啟動第二壓力指示器以指示中間施加壓力範圍時，該控制器亦在退出修改程序之前啟動第一壓力指示器LED。當該控制器啟動第一壓力指示器LED以指示最低施加壓力範圍時，該控制器在退出修改程序之前僅啟動第一壓力指示器LED。

【0201】在圖32及33中之流程圖中表示用於判定哪個(若有)壓力指示器LED 1572A、1572B、1572C被啟動之決策程序的實施方式。該決策程序亦可以其他方式來實施，諸如例如查找表等等。

【0202】在該繪示實施例中，平均電流與無負載電流之間的差值表徵於各個馬達速度的四個範圍中，其導致在由施加的壓力很小或沒有施加壓力所引起的最低電流差值範圍內沒有壓力指示器LED的照明；在由於第一範圍內之施加壓力所引起的第二電流差值範圍內的第一壓力指示器LED1572A的照明；在由於第二範圍內之施加壓力所引起的第三電流差值範圍內的第二壓力指示器LED1572B的照明；及在由於第三範圍內之施加壓力所引起的第四電流差

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值範圍內的第三壓力指示器LED1572C的照明。在其他實施例中，電流差值可被分成多於四個的範圍(例如，11個電流範圍)，且可使用更多的壓力指示器(例如，10個壓力指示器LED)來指示施加在施力器頭上的額外壓力範圍。

【0203】在進一步的替代性實施例中，表示壓力範圍的信號可被編碼(例如，二進制編碼)，使得三個LED可指示多達七個有效壓力範圍。在此一實施例中，沒有LED被點亮的狀態是表示施加至施力器頭的零或接近零的壓力；及一個或多個點亮的LED之七種可能組合中的每一種代表七個壓力範圍中之各別的一個。該編碼信號亦可使用於控制壓力範圍的數字顯示器(例如，LCD)。

【0204】以上所描述的特定電流量值與特定壓力範圍之間的關係是範圍的實例。測量電流之範圍與施加壓力之範圍之間的具體關係可因單元與單元而有所差異。

【0205】在該繪示實施例中，以最低速度(位準1)執行建立無負載電流$I_{NO-LOAD}$之校正程序。如以上所描述的，使用相同的無負載電流來判定在所有三個操作速度下的壓力。在替代性實施例中，可為三個操作速度中之各者建立單獨的無負載電流。在該替代性實施例中，基於所選速度之無負載電流來計算電流差值。

【0206】如在圖35中所繪示的，在某些實施例中，修改的衝擊式按摩裝置1900可與無線遠程裝置1910(例如，智慧型手機)一起使用，其獲得且儲存表示使用衝擊式按摩裝置的資料。圖34繪示進一步修改的馬達控制器電路

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1920，其類似於圖27之馬達控制器電路1500，除了圖34之馬達控制器電路包含藍牙收發器(BT XCVR)1930(在本文中稱之為藍牙介面)，其耦合至控制器1510之所選的LED驅動器輸出。該藍牙收發器是可使用的射頻無線通信裝置的實例。特定言之，藍牙介面包含複數個輸入/輸出(I/O)埠(例如，六個I/O埠)，其被組構為輸入埠。六個輸入埠被識別為I0、I1、I2、I3、I4及I5。第一埠(I0)被連接至控制器的LEDS1輸出。第二埠(I1)被連接至控制器的LEDS2輸出。第三埠(I2)被連接至控制器的LEDS3輸出。第四埠(I3)被連接至控制器的LEDP1輸出。第五埠(I4)被連接至控制器的LEDP2輸出。第六埠(I5)被連接至控制器的LEDP3輸出。

【0207】藍牙介面1930藉由從遙控裝置發送至藍牙介面的信號而從遙控裝置1910接收「AT」命令信號。例如，向藍牙介面發送「AT+PIO??」命令使藍牙介面以三個十六進制字符回應，其中十二個輸入/輸出接腳中之各者的狀態(例如，數位「1」或數位「0」)被編碼為一個十六進制字符中之一者中的一位元。當命令被發送至藍牙介面時，遙控裝置解碼對應於輸入接腳I1至I5的位元以判定速度及壓力值(例如，電流量值範圍)。

【0208】遙控裝置1920週期性地向藍牙介面發送「AT + PIO ??」命令以獲得速度及壓力讀數。遙控裝置將讀數連同讀數的日期及時間且連同諸如接收衝擊式按摩的人的身份之類的進一步資訊一起儲存在記憶體中。因此，

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遙控裝置能夠維持提供給人的衝擊式按摩的歷史。此人可檢索所保存的資訊以獲得先前治療的速度、壓力及持續時間。基於來自先前治療的定性經驗，此人可重複先前的治療或修改電流治療的一或多個參數(例如，速度、壓力、持續時間)以試圖獲得改善的體驗。

【0209】前述內容展示於圖36中，圖36繪示圖35之遙控裝置(例如，智慧型手機)1900的操作的流程圖1950及在衝擊式按摩裝置100內的圖34之進一步修改的馬達控制器電路1910。在第一動作區塊1960中，遙控裝置與修改的馬達控制器電路建立藍牙通信，使得遙控裝置與衝擊式按摩裝置配對。在建立通信之後，遙控裝置在動作區塊1962中向修改的馬達控制器電路發送狀態請求命令。遙控裝置在動作區塊1964中從修改的馬達控制器電路接收狀態資訊。在動作區塊1966中，遙控裝置解析狀態資訊以分離表示馬達速度及壓力的六個位元。在動作區塊1970中，遙控裝置顯示電流馬達速度及壓力。遙控裝置儲存馬達速度及壓力連同當接收狀態資訊時的日期及時間。接著，遙控裝置返回至動作區塊1962，以向修改的馬達控制器電路發送另一個狀態請求命令，以獲得更新的狀態資訊。重複請求狀態資訊的過程可藉由可編程延遲或藉由遙控裝置內的內部定時器來定時。在按摩期間結束之後，使用者可查看保存的狀態資訊連同資料及時間。取決於先前按摩期間的結果，使用者可選擇增加或減少壓力，增加或減少速度，增加或減少施加特定壓力及速度的持續時間，或變化的組合。使

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用者亦可判定先前的按摩期間特別地有幫助，且可選擇再現電流設定之先前設定。

【0210】在某些實施例中，遠程裝置(例如，智慧型手機)包含應用程式軟體(「app」)，以使使用者能夠在整個按摩期間的部分期間指示正在接收衝擊式按摩的接收者身體的某些部分。例如，該app可顯示具有目標區域之接收者身體的一或多個影像(例如，通用的圖片影像)，使用者可選擇影像以指示按摩部分在接收者身體的某個部分上開始(例如，左斜方肌)。如以上所討論的，當正在執行按摩部分時，該app記錄該資訊。在該按摩部分結束時，使用者再次選擇相同的目標區域以指示按摩部分的結束或選擇新的目標區域以在不同的位置處開始新的按摩部分，其自動地結束先前的部分。按摩位置的識別連同按摩部分的速度、壓力及持續時間與接收者的姓名相關聯地保存在遠程裝置的記憶體中。該儲存資訊亦可包含來自接收者及使用者關於按摩部分的感知有效性的反饋。當接收者返回新的按摩期間時，使用者可從先前的按摩期間來取得儲存的資訊且使用儲存資訊重複先前部分的位置、速度、壓力及持續時間或修改某些部分的一或多個參數(例如，降低壓力且增加施加至斜方肌的按摩部分的持續時間)。特定接受者的儲存資訊亦可被轉移至雲端儲存器以維持長期的衝擊式按摩歷史。

【0211】由於可在不脫離本發明之範疇的情況下對上述結構進行各種改變，所以其旨在包含在以上描述中或在

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附圖中所展示的所有內容應當被解釋為闡釋性的而不是限制性的意涵。

【符號說明】

【0212】

100：可攜式電機衝擊式按摩施力器

110：主體

112：上本體部分

114：下本體部分

116：縱向軸線

120：馬達包體

122：馬達包體端蓋

124：馬達總成

126：往復總成

130：電池總成接受包體

132：電池總成

140：主體端蓋

142：突部

144：內周邊表面

146：L形缺口

148：螺釘

150：孔

160：主印刷電路板(PCB)

162：按鈕開關

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164：孔

166A：速度指示發光二極體

166B：速度指示發光二極體

166C：速度指示發光二極體

168A：電池充電狀態LED

168B：電池充電狀態LED

168C：電池充電狀態LED

168D：電池充電狀態LED

168E：電池充電狀態LED

170：第一插頭

172：第二插頭

180：穿孔

182：穿孔

184：互連螺釘

186：插頭

200：電池總成接受托盤

202：螺釘

204A：第一簧片接觸件

204B：第二簧片接觸件

204C：第三簧片接觸件

206A：第一接觸件

206B：第二接觸件

206C：第三接觸件

210：第一電池罩蓋半體

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212：第二電池罩蓋半體

214：電池單元

216：外圓柱形罩蓋

220：第一機械接合突片

222：第二機械接合突片

224：第一突緣

226：第二突緣

230：機械按鈕

232：壓縮彈簧

234：指尖開口

236：折片

238：壓縮彈簧

250：積體印刷電路板支撐結構

252：電池控制器印刷電路板(PCB)

254：充電電源轉接器輸入插孔

256：開閉開關

260：雙色LED

262：電池總成端蓋

264：半透明塑膠環

266：開關致動器延伸器

300：馬達總成

310：無刷DC電動馬達

312：中央軸桿

320：馬達安裝托架

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322：馬達安裝螺釘

324：安裝突片

326：中央孔

330：橡膠套圈

332：托架安裝螺釘

334：中央孔

336：安裝孔

350：中央開口

360：偏心曲柄

362：中央孔

364：內表面

366：外表面

370：圓柱形曲柄樞軸

372：弧形罩

374：半環形配重環

400：外套筒

402：中央孔

404：遠端

406：遠端部分

408：環形基部

410：螺釘

420：安裝套筒

422：圓筒本體

424：內孔

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510：曲柄接合軸承支架

512：可撓性互連連桿

514：活塞

516：施力器頭

530：軸承外殼

532：上端壁

534：圓柱形腔

536：環形軸承

538：下端壁

540：螺釘

542：中央孔

548：螺釘

550：互連部分

552：介面部分

554：螺紋縱向中央孔

556：徑向線

558：外表面

560：下部分

562：肋部

564：螺紋徑向孔

566：軸承支架固定螺釘

570：第一端部分

572：第二端部分

574：中間部分

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580：第一螺紋互連桿

582：第二螺紋互連桿

600：外壁

602：第一端

604：第二端

606：第一孔

608：第一部分

610：第二孔

620：第三孔

622：活塞固定螺釘

650：遠端(施力端)

652：近端(安裝端)

654：主體部分

656：接合部分

658：鈍修圓部分

660：中空腔

700：球狀施力器頭

702：球狀遠端部分

704：施力器主體部分

720：圓碟狀施力器頭

722：圓碟狀遠端部分

724：施力器主體部分

740：Y形施力器頭

742：Y形遠端部分

744：施力器主體部分

750：施力器基部

752：第一指狀物

754：第二指狀物

800：電池控制電路

810：電路接地參考

820：第一分壓器電阻器

822：第二分壓器電阻器

824：分壓器輸出電阻器

830：整流器二極體

832：串聯電阻器

834：DC輸入匯流排

836：電解電容器

840：齊納二極體

842：串聯電阻器

844：電壓調節器

846：濾波電容器

848：VCC匯流排

850：濾波電容器

860：電池充電器控制器

870：緩衝器電路

872：PNP雙極電晶體

874：NPN雙極電晶體

876：基極-射極電阻器

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878：保護二極體

880：電阻器

882：耦合電容器

884：金屬氧化物半導體電晶體

886：保護二極體

888：上拉電阻器

890：降壓式轉換器

892：輸入節點

894：電感器

896：輸出節點

900：低阻抗電流感測電阻器

902：飛輪二極體

904：電阻器

906：電容器

920：電池電壓感測電路

922：第一電壓反饋電阻器

924：第二電壓反饋電阻器

926：共同電壓感測節點

928：濾波電容器

930：電阻器

932：濾波電容器

940：第一端子

942：第二端子

944：電壓輸出端子

950：輸出電壓感測電路

952：第一分壓器電阻器

954：第二分壓器電阻器

956：共同節點

958：齊納二極體

960：信號線

970：線

980：第一電流限制電阻器

982：第二電流限制電阻器

984：第三電流限制電阻器

986：第四電流限制電阻器

1000：馬達控制器電路

1010：三線電纜

1012：電纜插孔

1020：第一接腳

1022：第二接腳

1024：第三接腳

1026：本端電路接地

1030：濾波電容器

1032：電流限制電阻器

1040：電壓調節器

1042：本端VCC匯流排

1044：濾波電容器

1050：馬達控制器

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1052：串聯電阻器

1054：濾波電容器

1060：第一接腳

1070：第二插孔

1072：五線電纜

1080：第二接腳

1082：分壓器電路

1084：第一電阻器

1086：第二電阻器

1088：共同節點

1090：NPN雙極電晶體

1092：上拉電阻器

1100：第三接腳

1102：電流限制電阻器

1110：第四接腳

1120：第五接腳

1122：電流限制電阻器

1130：上拉電阻器

1132：濾波電容器

1150：電流限制電阻器

1152：電流限制電阻器

1154：電流限制電阻器

1170：電流限制電阻器

1172：電流限制電阻器

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1174：電流限制電阻器

1176：電流限制電阻器

1178：電流限制電阻器

1200：衝擊式按摩裝置

1210：往復總成

1212：實心連桿

1214：活塞

1220：環形軸承

1222：軸承支架

1230：樞軸孔

1232：近端延伸部分

1234：圓柱形突部

1240：軸承凹部

1242：軸承

1244：樞轉螺釘

1246：螺紋孔

1248：施力器頭

1500：馬達控制器電路

1510：控制器

1520：第一齊納二極體

1522：第二齊納二極體

1530：NPN雙極電晶體

1532：下拉電阻器

1534：上拉電阻器

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1550：負載電流感測電路

1552：電流感測電阻器

1560：第一濾波電容器

1562：第一濾波電阻器

1564：第二濾波電容器

1566：第三濾波電容器

1568：第二濾波電阻器

1570：電流限制電阻器

1572A：第一壓力指示器LED

1572B：第二電力指示器LED

1572C：第三壓力指示器LED

1574：電流限制電阻器

1576：電流限制電阻器

1580：馬達控制印刷電路板

1582：馬達包體

1600：流程圖

1610：動作區塊

1612：系統初始化動作區塊

1614：輸入/輸出(I/O)埠初始化動作區塊

1616：馬達速度狀態歸零動作區塊

1620：顯示動作區塊

1622：速度切換讀取動作區塊

1624：決策區塊

1630：速度改變動作區塊

1632：執行校正程序區塊

1640：決策區塊

1650：動作區塊

1660：電量顯示動作區塊

1662：速度切換讀取動作區塊

1664：決策區塊

1670：速度改變動作區塊

1672：決策區塊

1680：馬達速度設定區塊

1700：第一動作區塊

1702：動作區塊

1704：決策區塊

1706：動作區塊

1708：動作區塊

1710：區塊

1720：決策區塊

1722：動作區塊

1730：決策步驟

1732：動作區塊

1734：動作區塊

1752A：壓力指示器LED

1752B：第二壓力指示器LED

1752C：第三壓力指示器LED

1800：第一動作區塊

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1802：動作區塊

1804：動作區塊

1806：分支決策區塊

1810：第一壓力顯示常式

1812：第一決策區塊

1814：第二決策區塊

1816：第三決策區塊

1820：第二壓力顯示常式

1822：第一決策區塊

1824：第二決策區塊

1826：第三決策區塊

1830：第三壓力顯示常式

1832：第一決策區塊

1834：第二決策區塊

1836：第三決策區塊

1840：動作區塊

1842：動作區塊

1844：動作區塊

1846：動作區塊

1850：流程圖

1900：衝擊式按摩裝置

1910：無線遠程裝置

1920：馬達控制器電路

1930：藍牙收發器

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1950：流程圖

1960：第一動作區塊

1962：動作區塊

1964：動作區塊

1966：動作區塊

1970：動作區塊

202017550

【發明摘要】

【中文發明名稱】

具有壓力感測器的電池動力衝擊式按摩裝置

【英文發明名稱】

BATTERY-POWERED PERCUSSIVE MASSAGE DEVICE WITH PRESSURE SENSOR

【中文】

一種衝擊式按摩裝置包含包體，該包體具有沿著縱向軸線延伸之圓柱形孔。一馬達具有可旋轉軸桿，該可旋轉軸桿繞著垂直於該縱向軸線之中央軸線而旋轉。一曲柄耦合至包含樞軸之軸桿，該樞軸從該軸桿之該中央軸線偏移。一往復連桿具有第一端，其被耦合至該曲柄之該樞軸。一活塞具有第一端，其被耦合至該往復連桿之第二端。該活塞被拘束以在圓筒內沿著該圓柱形孔之該縱向軸線移動。一施力器頭具有第一端及第二端，該施力器頭之該第一端耦合至該活塞之第二端，該施力器頭之該第二端曝露在該圓柱形孔外側以對接受治療之人士施力。一馬達控制器測量施加至該馬達之電流且回應於該測量的電流來顯示一壓力指示器。

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【英文】

A percussive massage device includes an enclosure having a cylindrical bore that extends along a longitudinal axis. A motor has a rotatable shaft that rotates about a central axis perpendicular to the longitudinal axis. A crank coupled to the shaft includes a pivot, which is offset from the central axis of the shaft. A reciprocation linkage has a first end coupled to the pivot of the crank. A piston has a first end coupled to a second end of the reciprocation linkage. The piston is constrained to move within a cylinder along the longitudinal axis of the cylindrical bore. An applicator head has a first end coupled to a second end of the piston and has a second end exposed outside the cylindrical bore for application to a person receiving treatment. A motor controller measures current applied to the motor and displays a pressure indicator responsive to the measured current.

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【指定代表圖】第(28)圖。

【代表圖之符號簡單說明】

140：主體端蓋

162：按鈕開關

164：孔

166A：速度指示發光二極體

166B：速度指示發光二極體

166C：速度指示發光二極體

168A：電池充電狀態LED

168B：電池充電狀態LED

168C：電池充電狀態LED

168D：電池充電狀態LED

168E：電池充電狀態LED

1200：衝擊式按摩裝置

1572A：第一壓力指示器LED

1572B：第二電力指示器LED

1572C：第三壓力指示器LED

1582：馬達包體

【特徵化學式】無

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【發明申請專利範圍】

【第1項】

一種電池動力衝擊式按摩裝置，包括：

包體，具有圓柱形孔，該圓柱形孔沿著縱向軸線延伸；

活塞，定位在該圓柱形孔中，該活塞具有第一端及第二端，該活塞被拘束以僅沿著該圓柱形孔之該縱向軸線移動；

馬達，被定位在該包體中，該馬達具有可旋轉軸桿，該軸桿具有中央軸線，該軸桿之該中央軸線垂直於該圓柱形孔之該縱向軸線；

曲柄，被耦合至該軸桿，該曲柄包含樞軸，該樞軸從該軸桿之該中央軸線偏移；

往復連桿，具有第一端及第二端，該往復連桿之第一端耦合至該曲柄之該樞軸，該往復連桿之該第二端耦合至該活塞之該第一端；

施力器頭，具有第一端及第二端，該施力器頭之該第一端耦合至該活塞之該第二端，該施力器頭之該第二端曝露在該圓柱形孔外側；

電池總成，從該包體延伸，該電池總成提供DC電力；及

馬達控制器，位在該包體中，該馬達控制器接收來自該電池總成之DC電力且選擇性地提供DC電力至該馬達以控制該馬達之速度，該馬達控制器進一步包含感測器，該

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感測器感測流經該馬達之電流之感測量值，該馬達控制器回應於該電流之該感測量值而顯示對應於該電流之該感測量值之壓力之指示信號。

【第2項】

如申請專利範圍第1項之衝擊式按摩裝置，其中，該施力器頭可移除式地耦合至該活塞。

【第3項】

如申請專利範圍第1項之衝擊式按摩裝置，其中：

該往復連桿係剛性的；且

該往復連桿之該第二端可樞轉地耦接至該活塞之該第一端。

【第4項】

如申請專利範圍第1項之衝擊式按摩裝置，其中：

該往復連桿係可撓性的；且

該往復連桿之該第二端被固定至該活塞之該第一端。

【第5項】

如申請專利範圍第1項之衝擊式按摩裝置，其中，該馬達控制器包含射頻收發器，其選擇性地傳輸信號，該信號包含該馬達之速度與施加至該施力器頭之該壓力之範圍之表示。

【第6項】

如申請專利範圍第1項之衝擊式按摩裝置，其中，該馬達控制器藉由從該感測電流量值減去在無負載處測量之無負載電流而判定施加的電流量值，該馬達控制器顯示回

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應於該施加的電流量值之該壓力。

【第7項】

一種操作衝擊式按摩裝置之方法，包括：

旋轉電動馬達之軸桿以將曲柄之樞軸繞著該軸桿之中心線旋轉；

將該曲柄之該樞軸耦合至往復總成之互連連桿的第一端；

將該互連連桿之第二端耦合至被拘束以沿著縱向中心線移動之活塞的第一端；

將該活塞之第二端耦合至施力器頭，其中，該曲柄之該樞軸之旋轉移動造成該活塞與該施力器頭之往復縱向移動；

測量流經該馬達之電流，該電流具有回應於施加至該施力器頭之壓力的量值；及

顯示複數個壓力指示器之至少一者，該複數個壓力指示器之各者對應於一壓力範圍，各壓力範圍對應於電流量值之一範圍。

【第8項】

如申請專利範圍第7項之方法，其中，該施力器頭可移除式地耦合至該活塞。

【第9項】

如申請專利範圍第7項之方法，其中：

該互連連桿係剛性的；且

該互連連桿之該第二端可樞轉地耦接至該活塞之該第

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一端。

【第10項】

如申請專利範圍第7項之方法，其中：

該互連連桿係可撓性的；且

該互連連桿之該第二端被固定至該活塞之該第一端。

【第11項】

如申請專利範圍第7項之方法，其進一步包括選擇性地傳輸射頻信號，該射頻信號包含該馬達之速度與施加至該施力器頭之該壓力之範圍之表示。

【第12項】

如申請專利範圍第11項之方法，其進一步包括藉由遠程通信裝置接收該傳輸的射頻信號；儲存速度及壓力連同當該射頻信號被接收時之時間；及選擇性地檢索被儲存的該速度、壓力及時間以在該遠程通信裝置上顯示該速度、壓力及時間。

【第13項】

如申請專利範圍第7項之方法，其進一步包括判定無負載電流且從測量的電流減去該無負載電流來判定該電流量值。

【第14項】

一種衝擊式按摩裝置，包括：

電能源；

電動馬達，被組構成繞軸桿旋轉；

活塞，被拘束以在圓筒內以往復運動來移動；

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連桿，被組構成用以將該電動馬達耦合至該活塞，使得該電動馬達之旋轉造成該活塞往復；

施力器頭，可移除式地耦合至該活塞；及

馬達控制器，被耦合至該電能源且被耦合至該馬達，該馬達控制器被組構成用以選擇性地提供電能至該馬達以造成該馬達旋轉，該馬達控制器包含壓力指示系統，該壓力指示系統被組構成用以測量流經該電動馬達之電流量值，該電流量值回應於施加在該施力器頭上之壓力，該電流量值包含複數個電流範圍，該壓力指示系統包含具有複數個顯示狀態之壓力指示顯示器，各顯示狀態對應於各自一個該電流範圍。

【第15項】

如申請專利範圍第14項之衝擊式按摩裝置，其中，該壓力指示顯示器包括第一顯示裝置、第二顯示裝置及第三顯示裝置，各顯示裝置具有各自的未照亮狀態及各自的照亮狀態，其中：

若該電流量值小於第一臨限量值，則該第一顯示裝置處在該各自的未照亮狀態，且當該電流量值至少與該第一臨限量值一樣大且小於第二臨限量值，則該第一顯示裝置處在該各自的照亮狀態；

若該電流量值小於該第二臨限量值，則該第二顯示裝置處在該各自的未照亮狀態，且當該電流量值至少與該第二臨限量值一樣大且小於第三臨限量值，則該第二顯示裝置處在該各自的照亮狀態；且

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若該電流量值小於該第三臨限量值，則該第三顯示裝置處在該各自的未照亮狀態，且當該電流量值至少與該第三臨限量值一樣大，則該第三顯示裝置處在該各自的照亮狀態。

【第16項】

如申請專利範圍第14項之衝擊式按摩裝置，其中，該馬達控制器包含射頻收發器，其選擇性地傳輸信號，該信號包含該馬達之速度與施加至該施力器頭之該壓力之範圍之表示。

【第17項】

如申請專利範圍第14項之衝擊式按摩裝置，其中：

該連桿係剛性的；且

該連桿之一端部可樞轉地耦接至該活塞之一端部。

【第18項】

如申請專利範圍第14項之衝擊式按摩裝置，其中：

該連桿係可撓性的；且

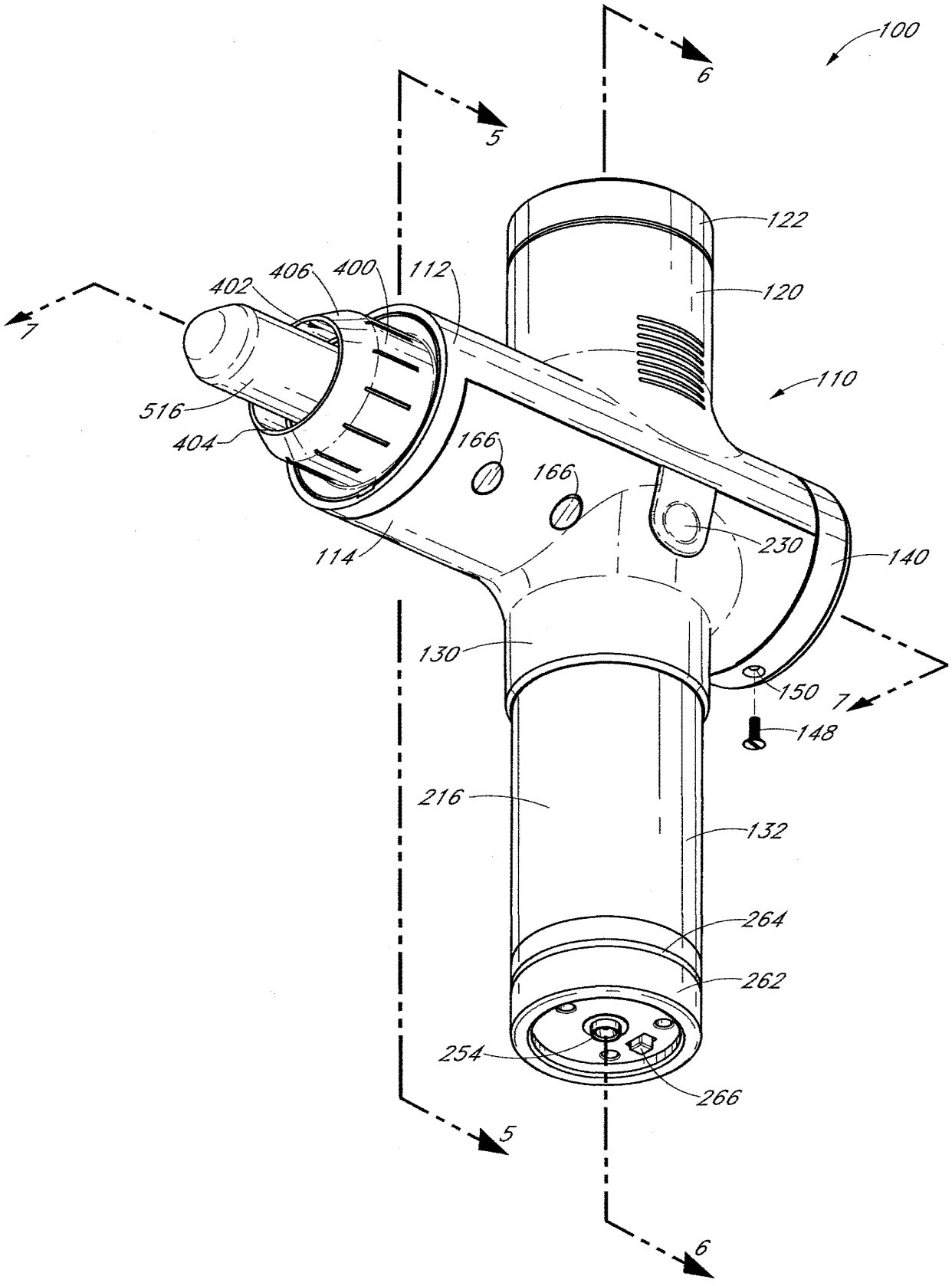
該連桿之一端部被固定至該活塞之一端部。

【第19項】

如申請專利範圍第14項之衝擊式按摩裝置，其中，該馬達控制器將該電流量值減少如所測量之無負載電流以產生校正電流，其用以判定該壓力之範圍。

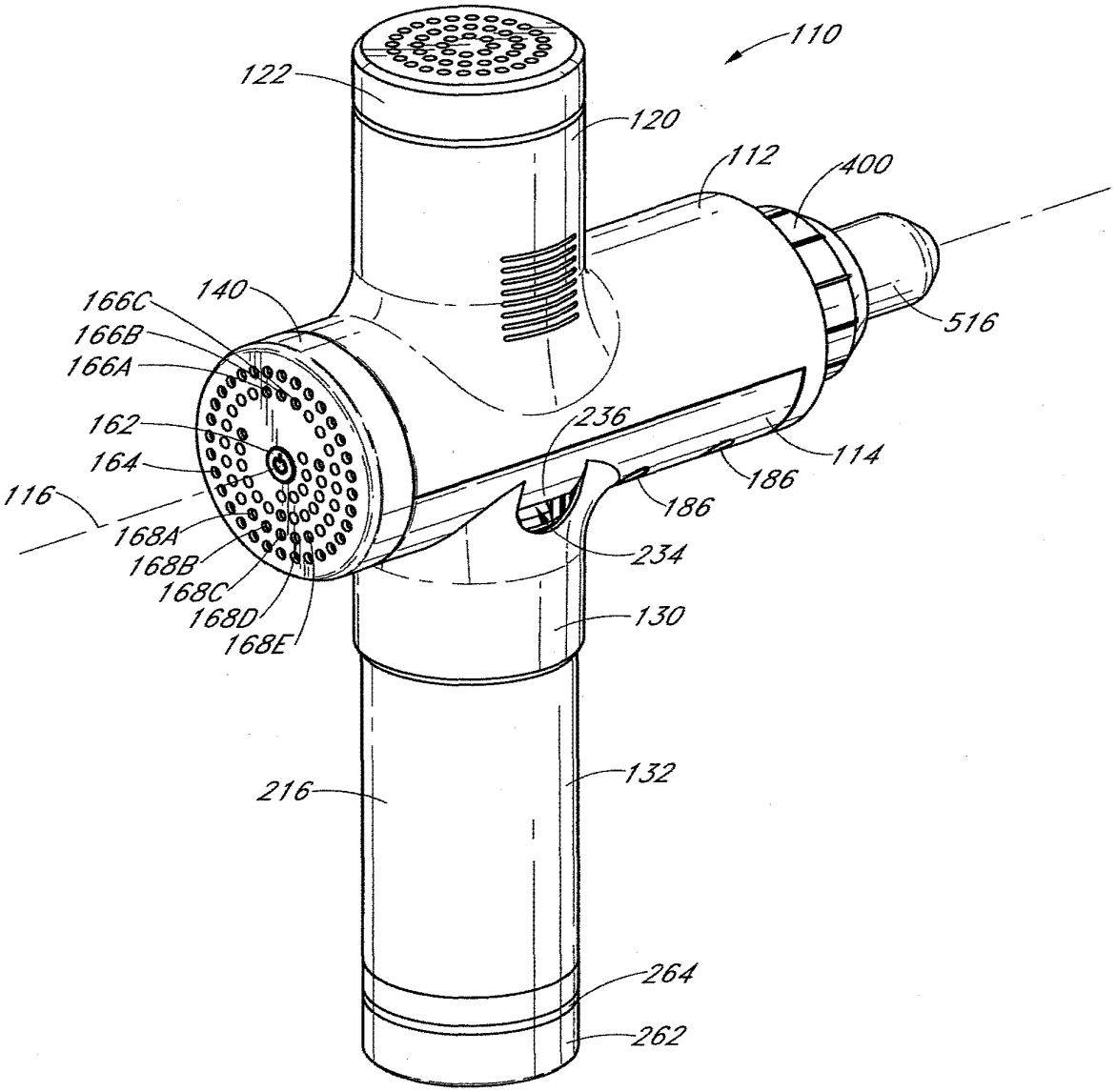
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【發明圖式】

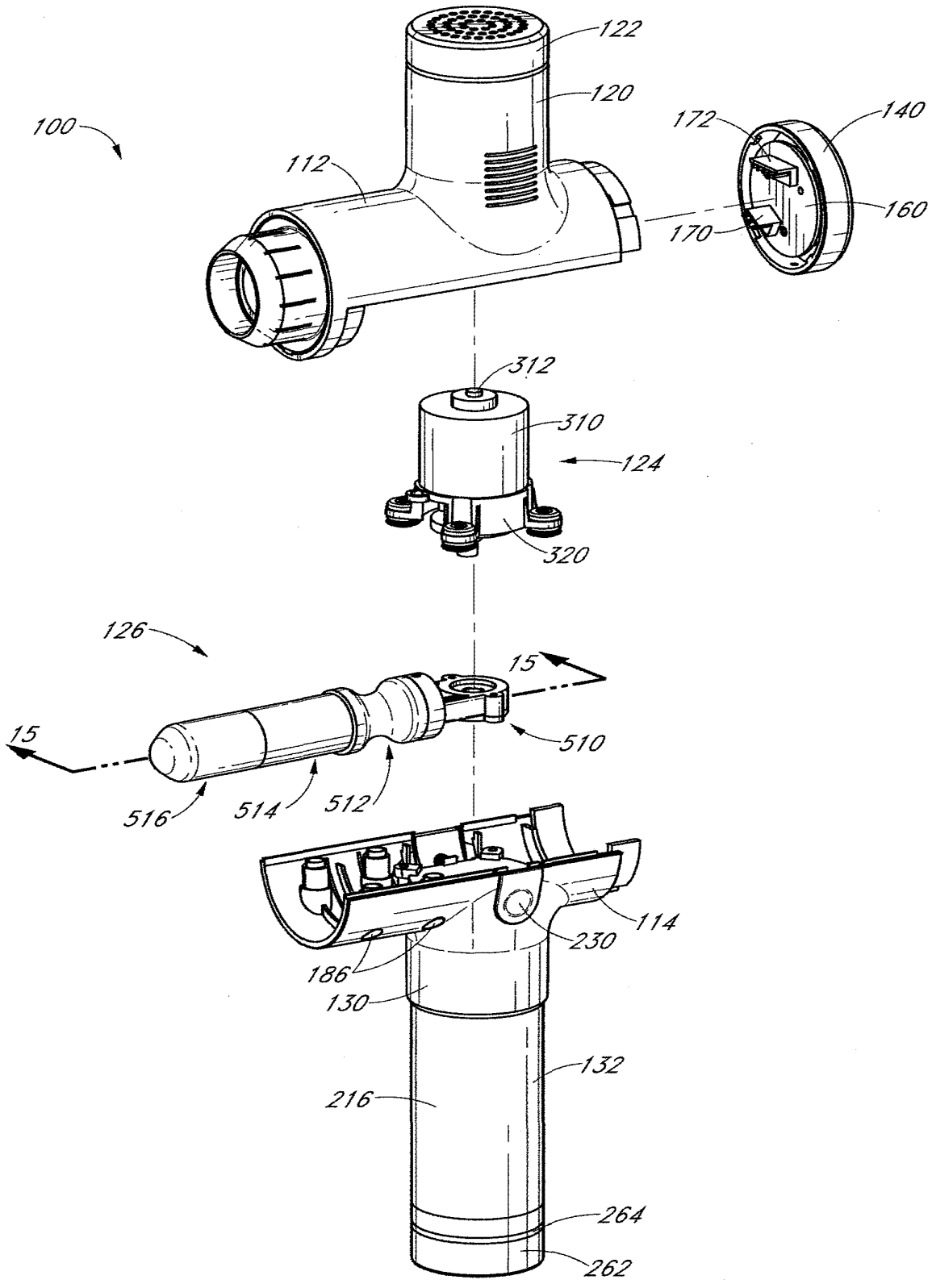


【圖 1】

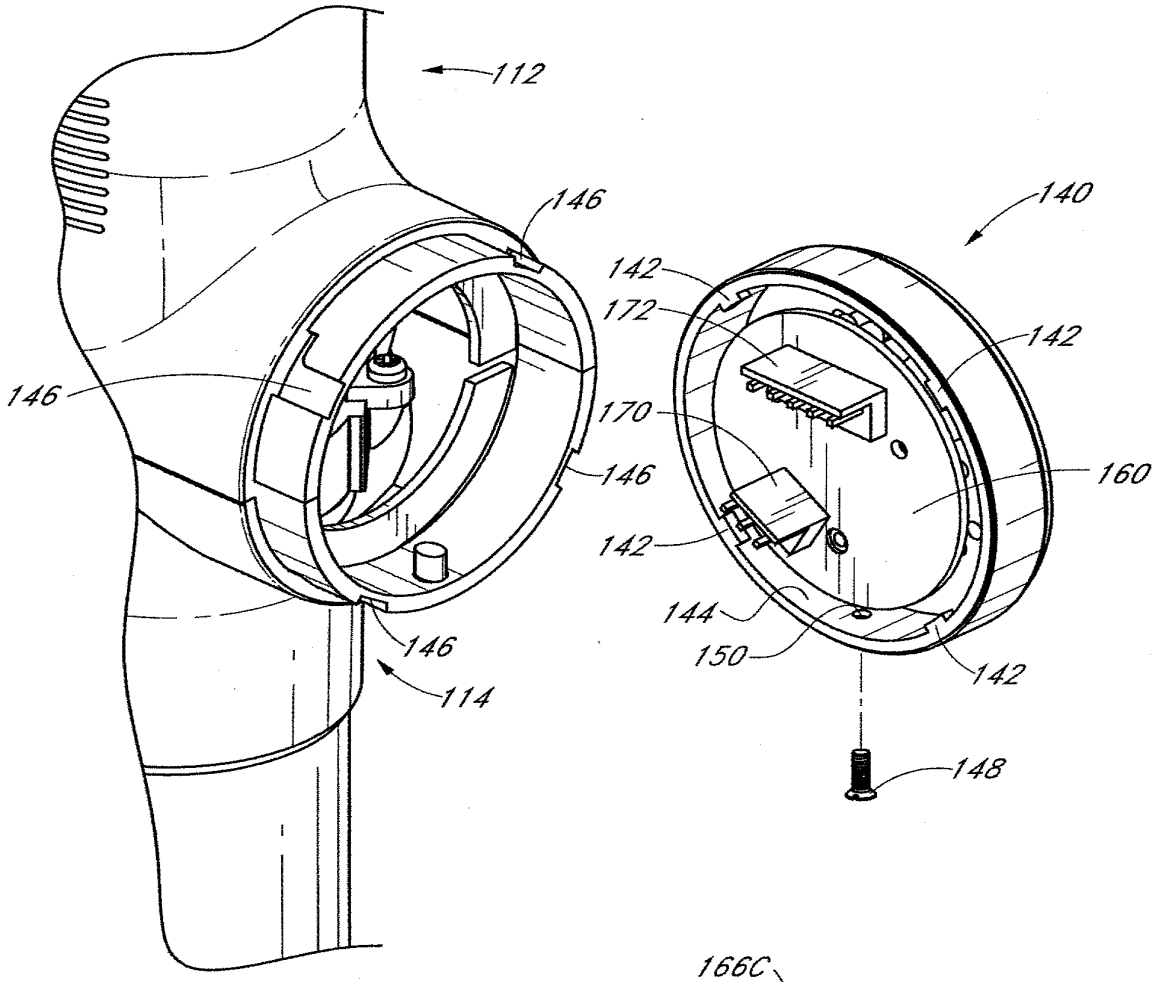
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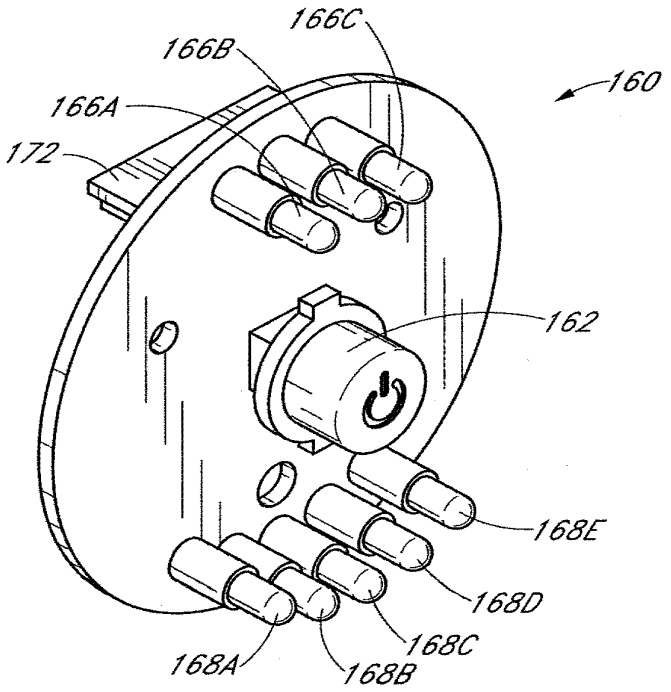
【圖 2】


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【圖 3】

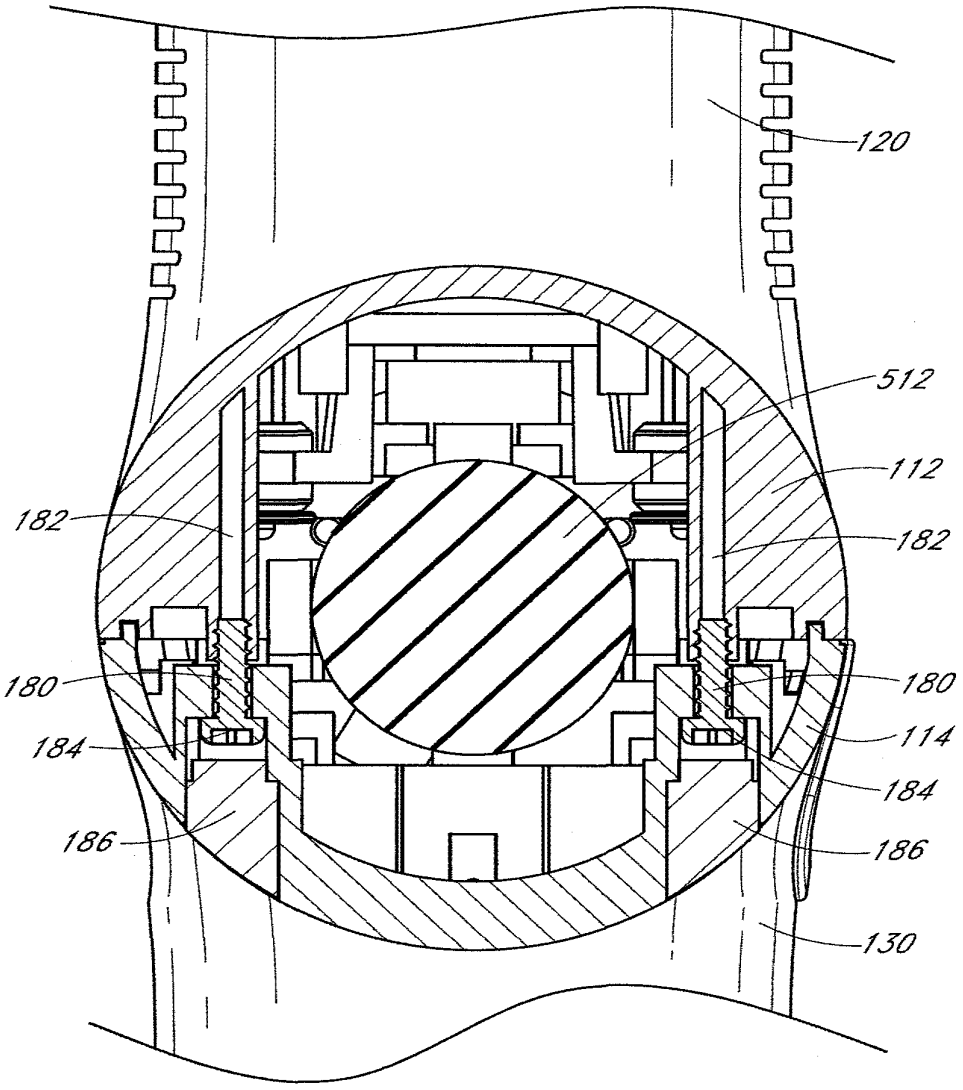


【圖 4A】



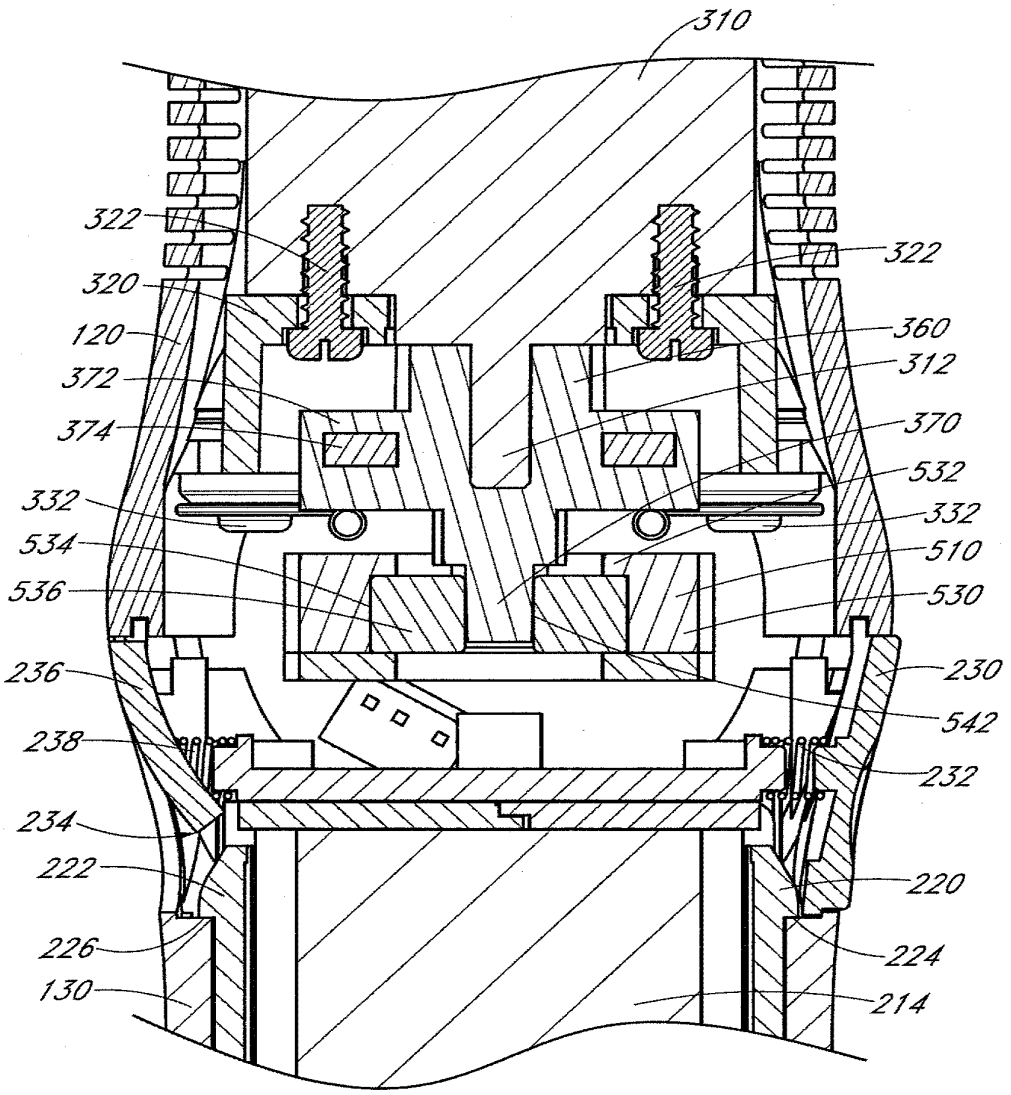
【圖 4B】

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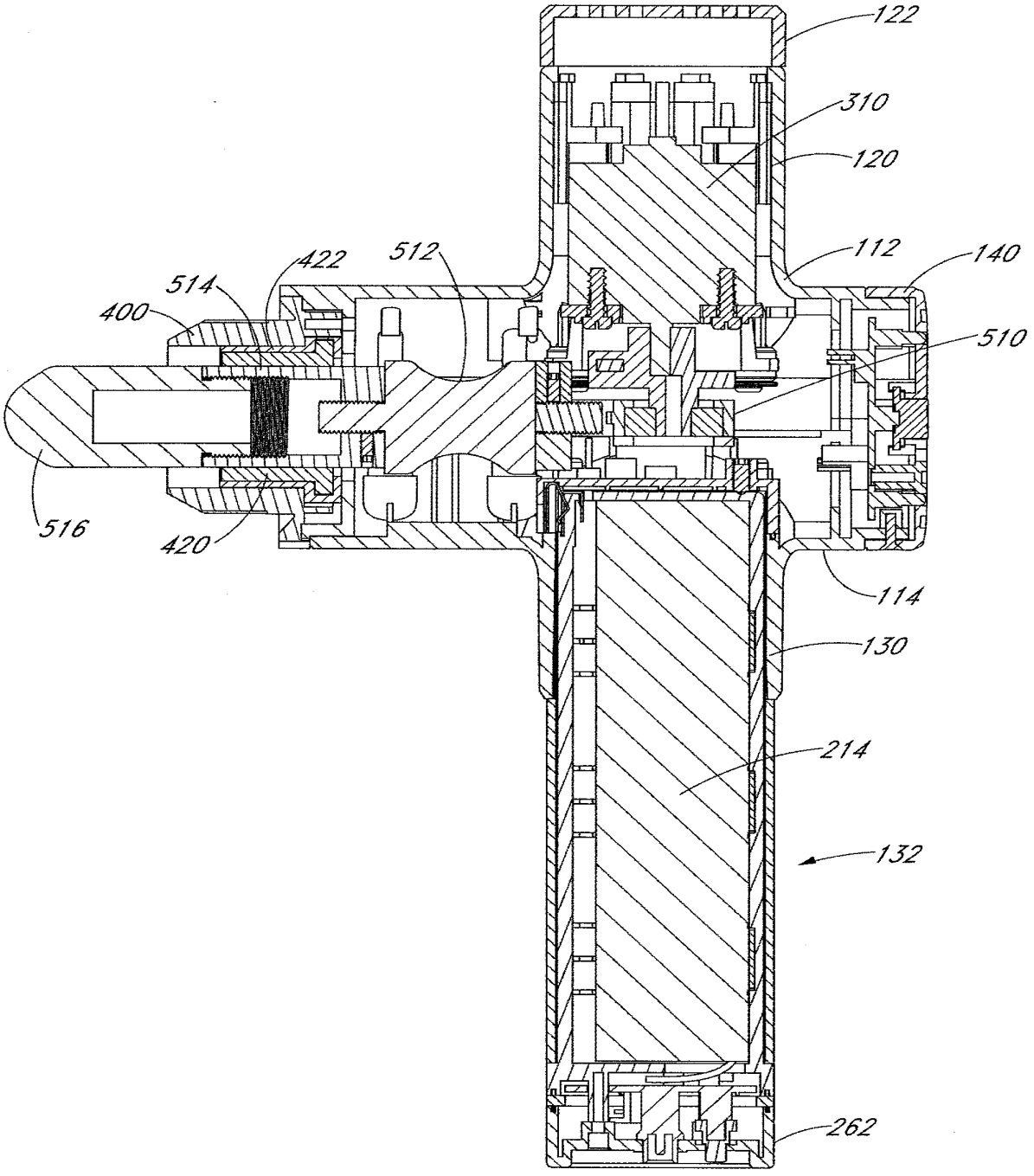
【圖 5】

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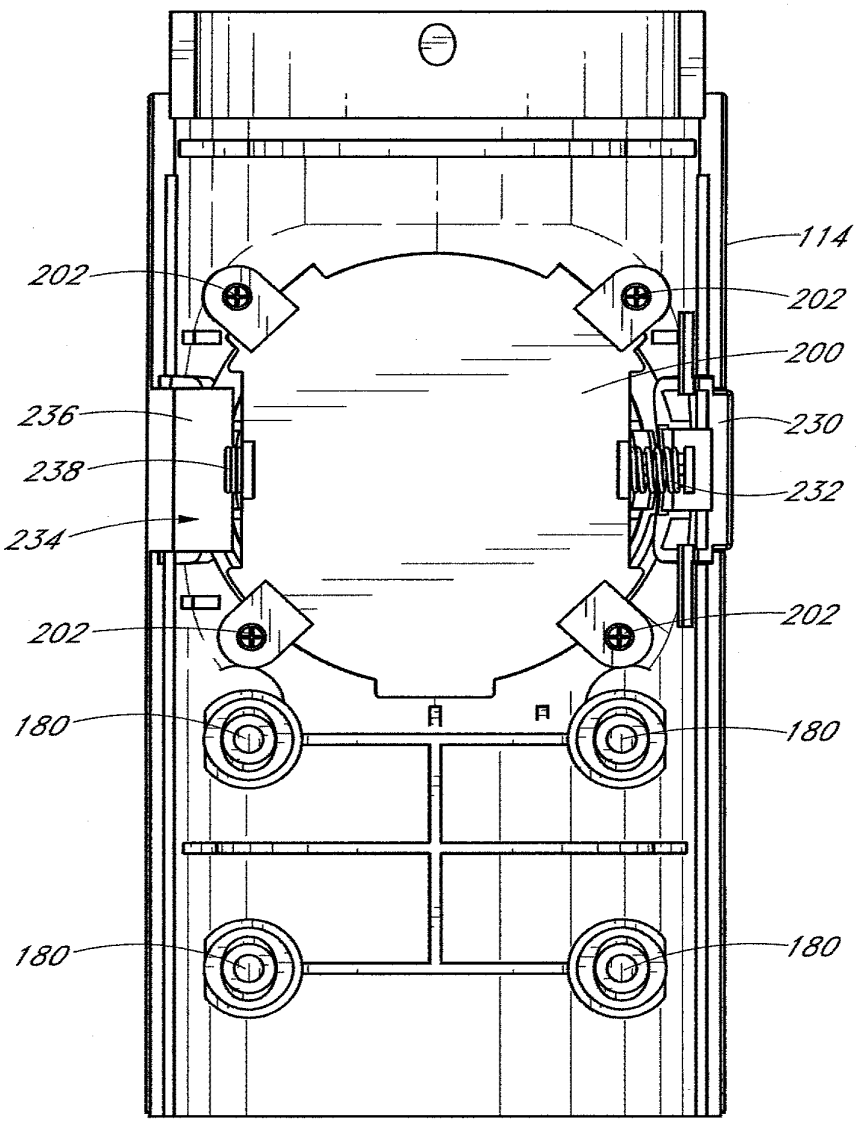


【圖 6】

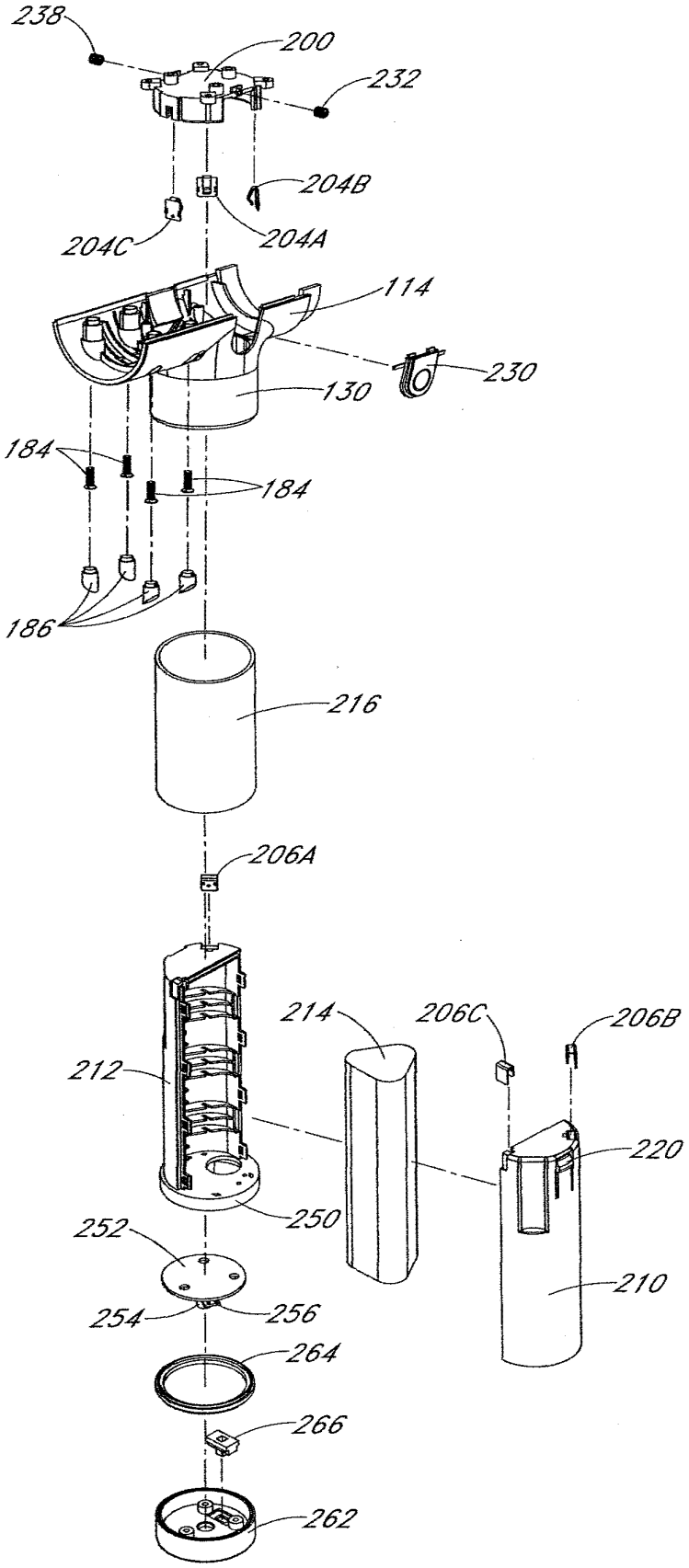
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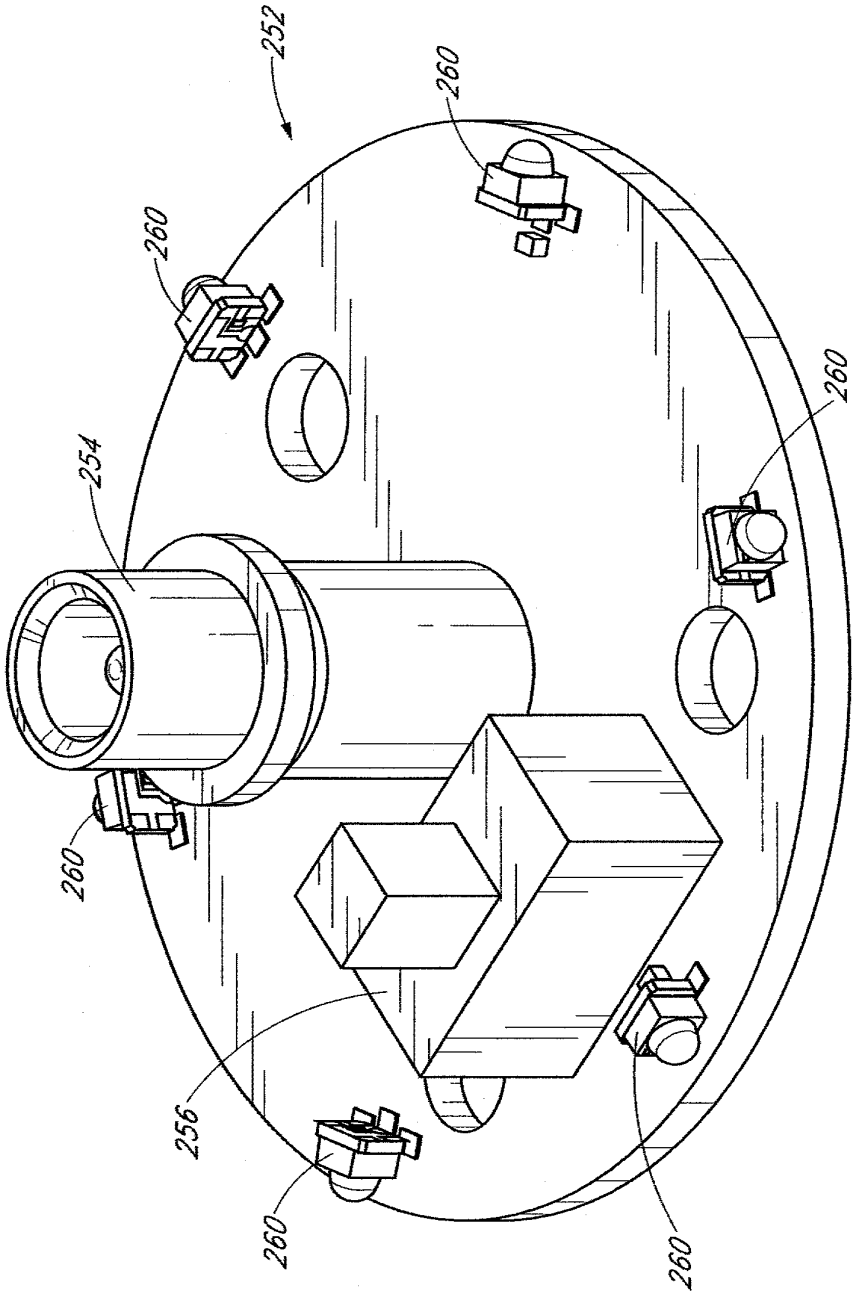
【圖 7】



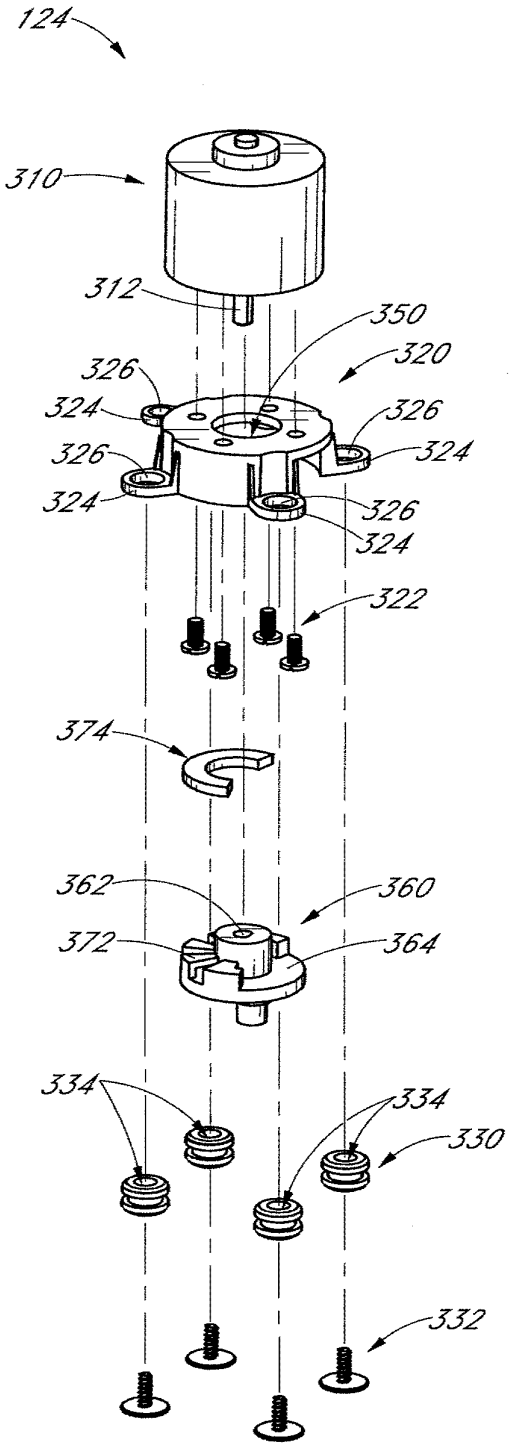
【圖 8】


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204B
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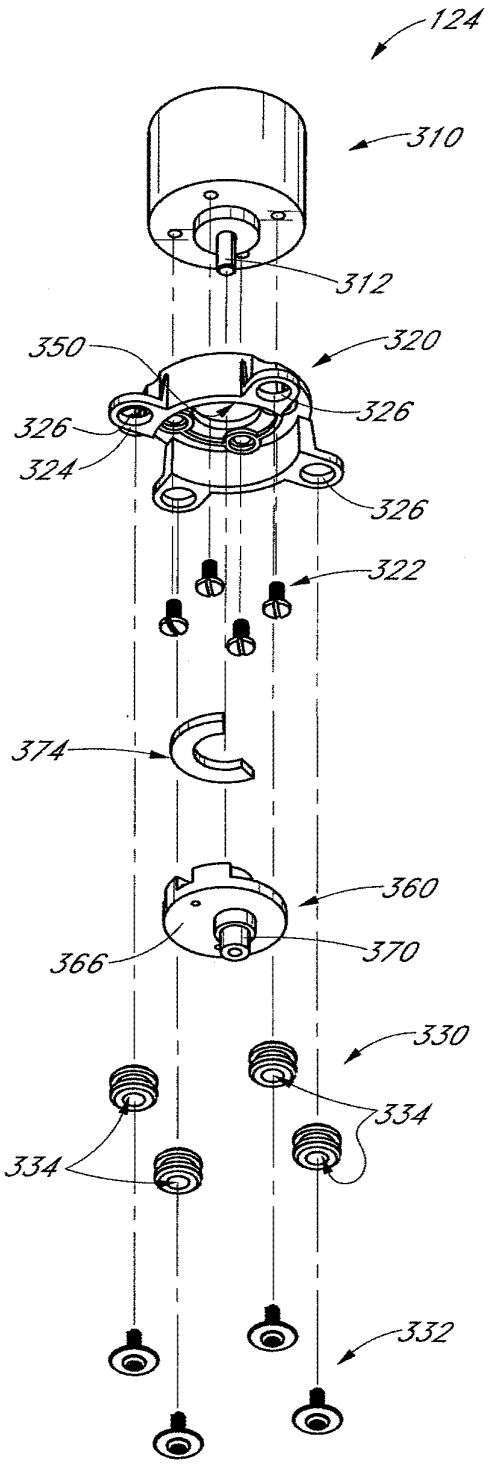
【圖 9】



【圖 10】

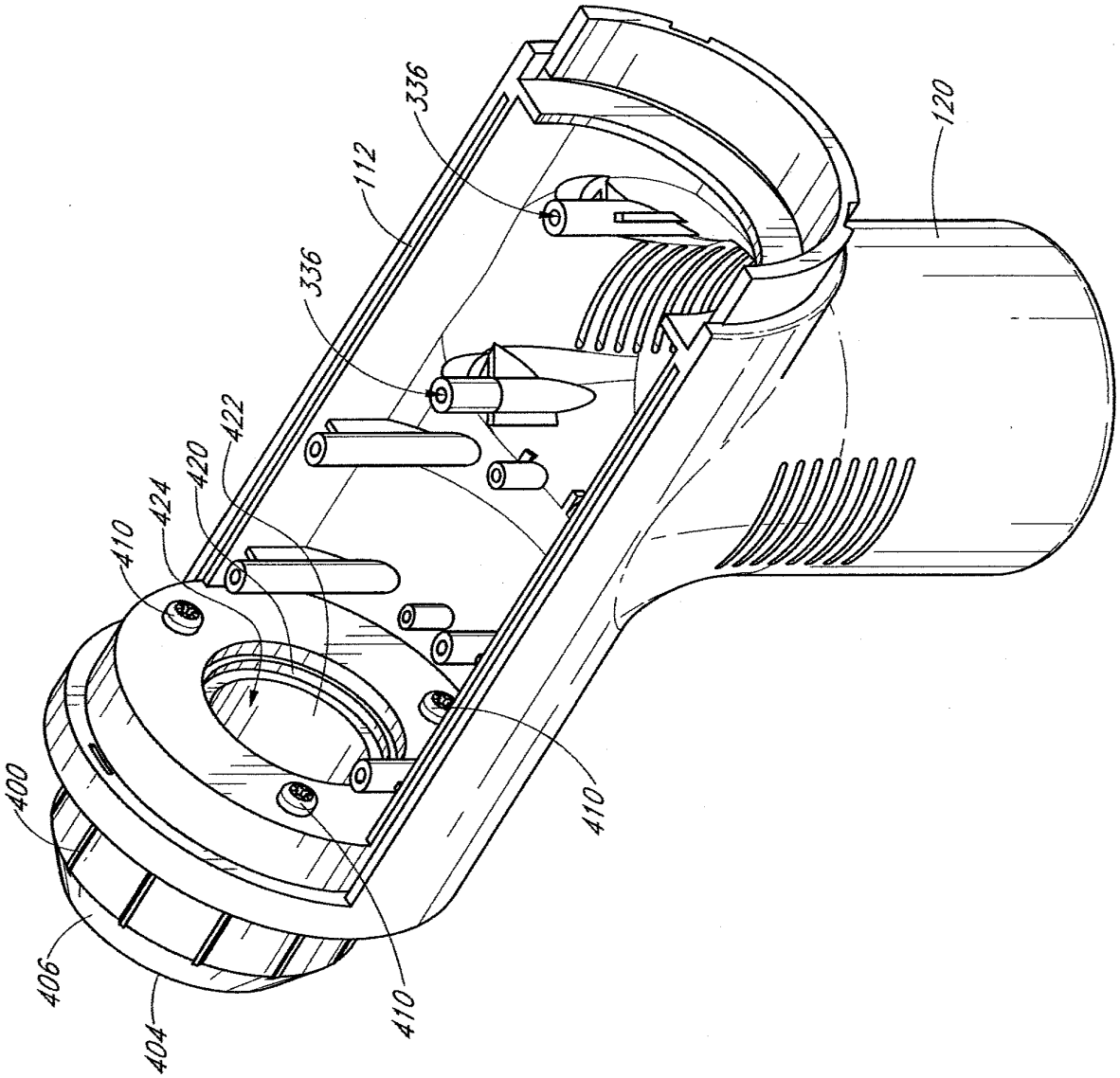


【圖 11A】

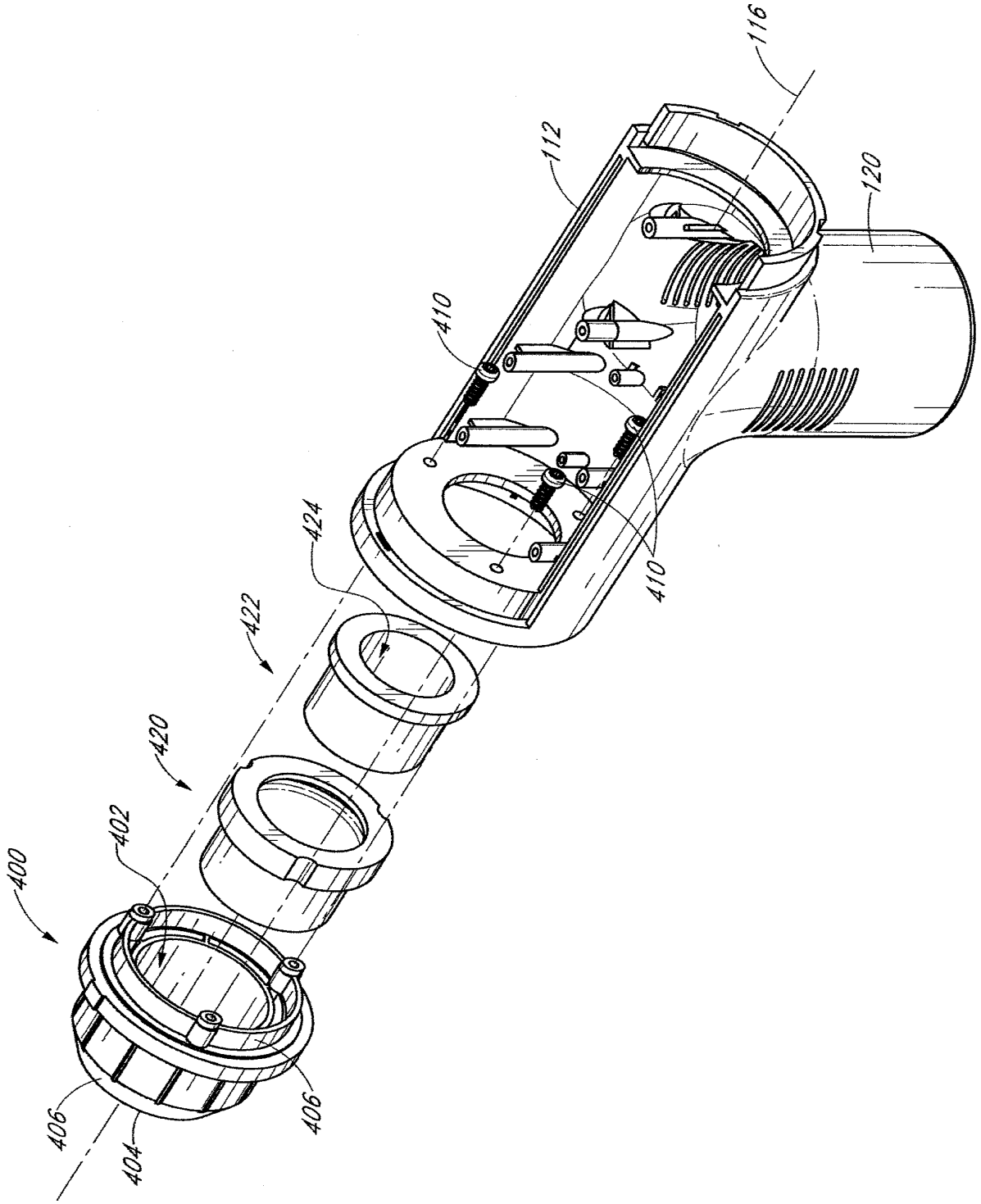


【圖 11B】

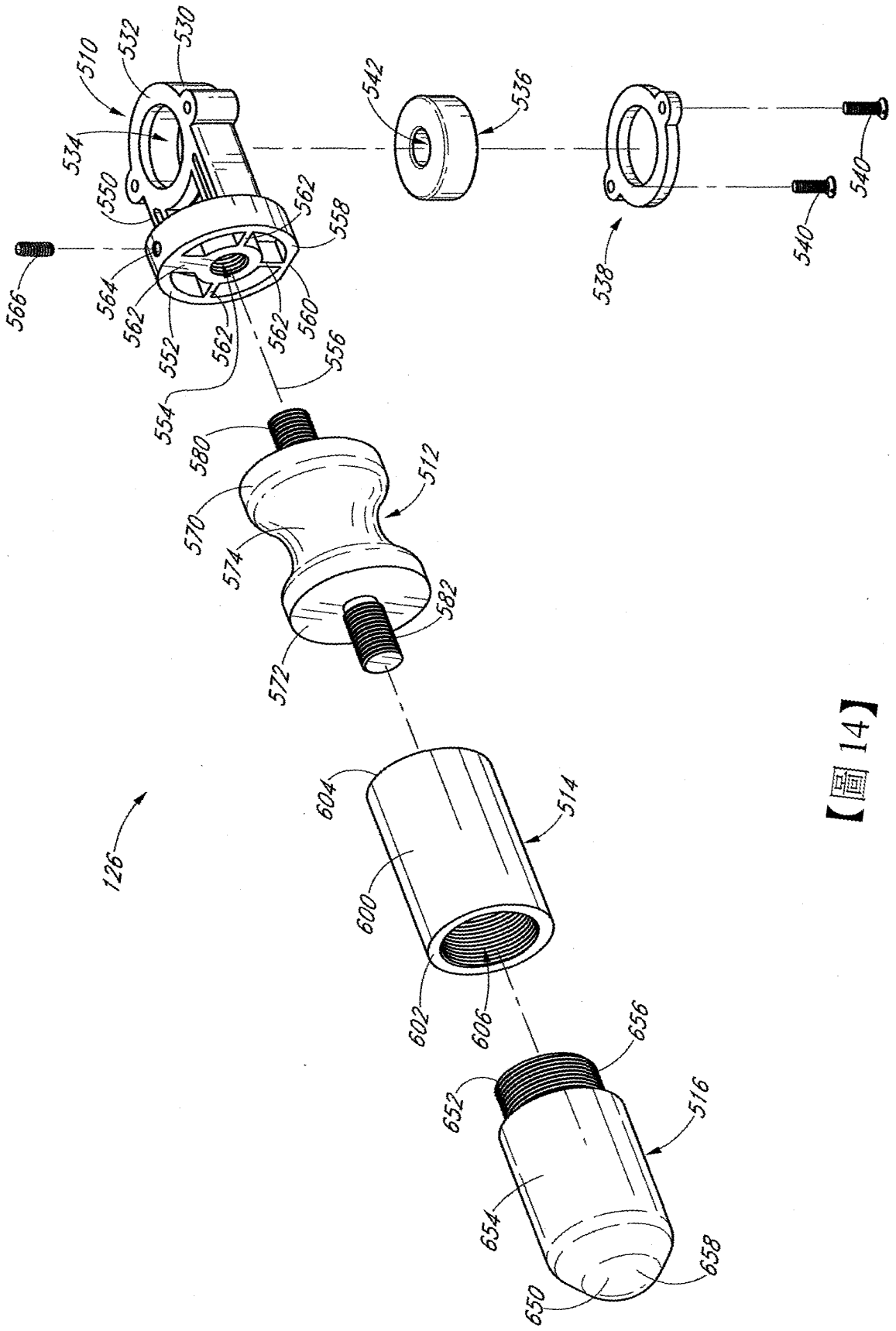
Petitioner Therabody Ex-1004, 0298



【圖 12】

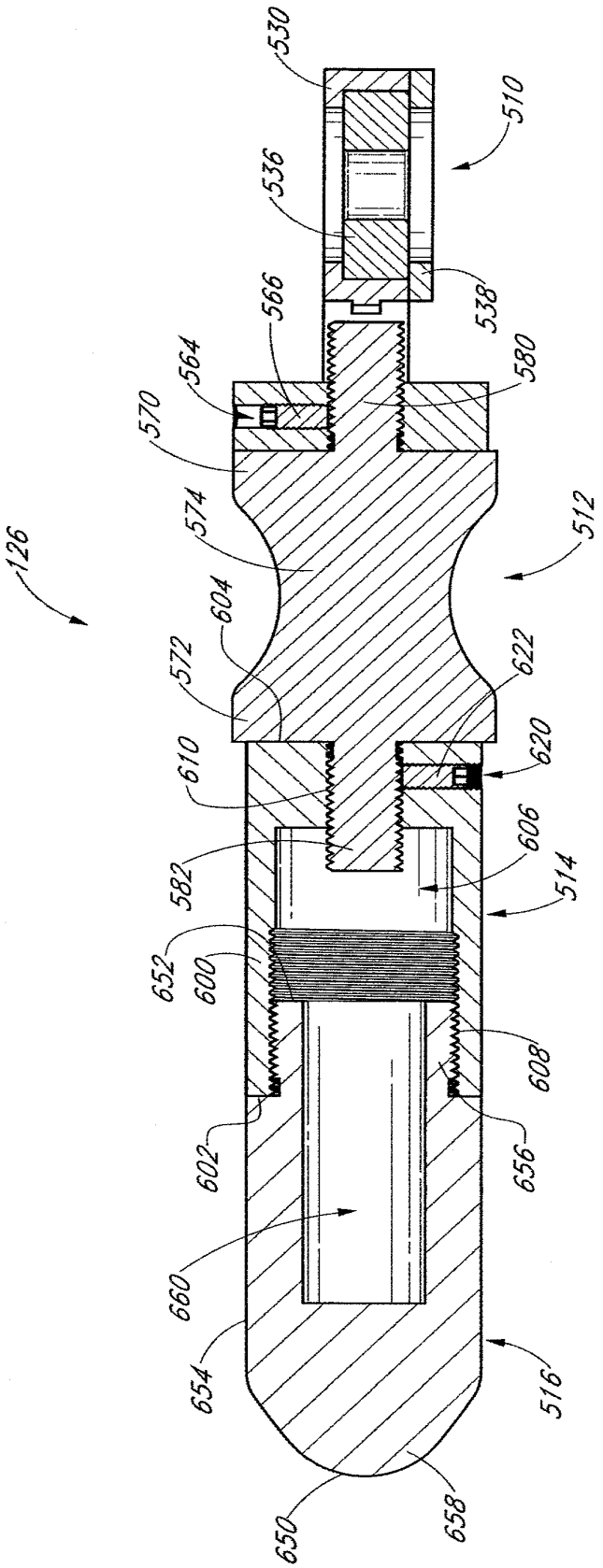


【圖 13】

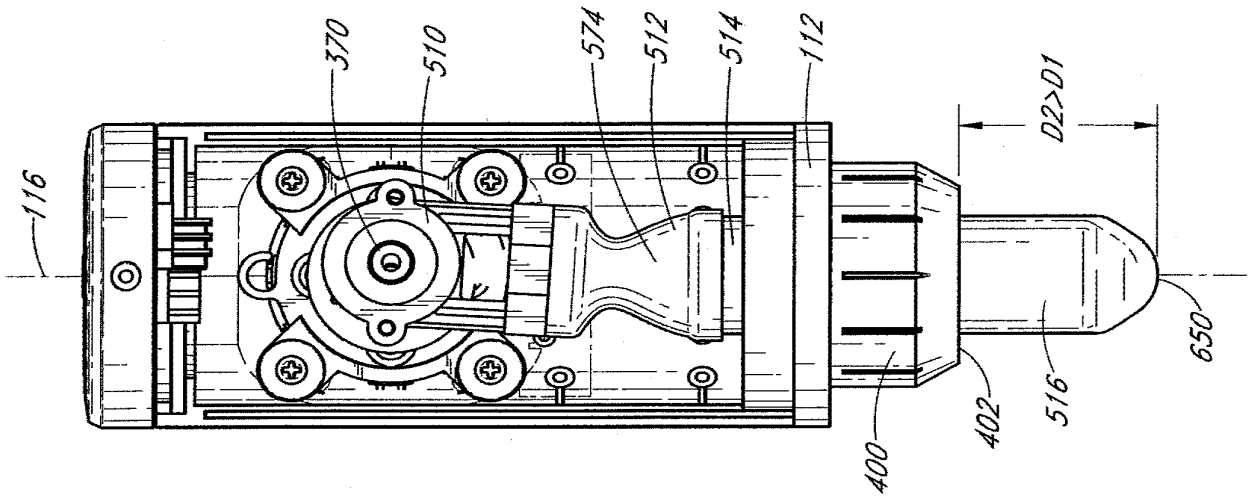


【圖 14】

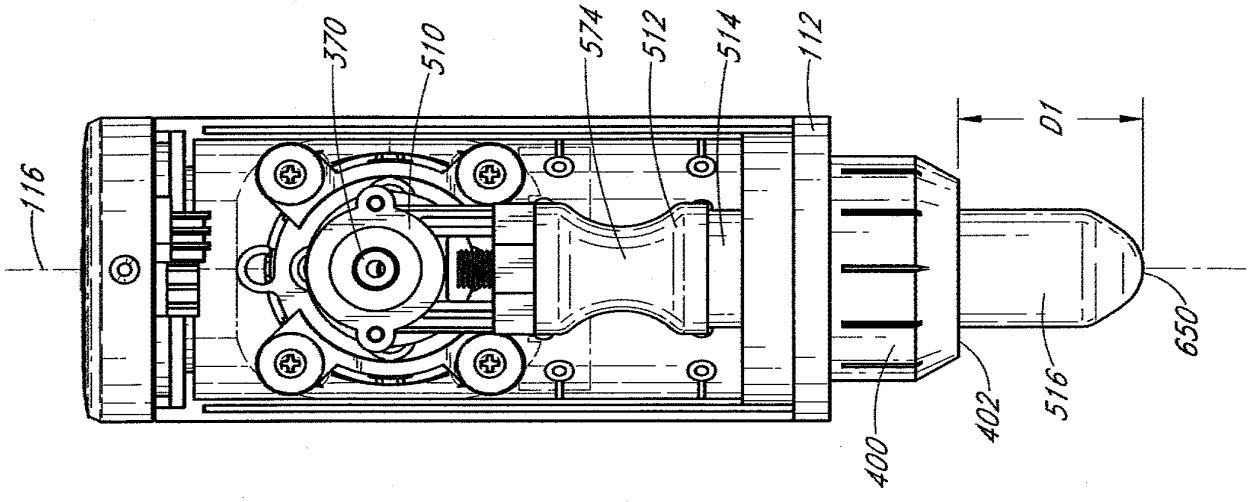
Petitioner Therabody Ex-1004, 0301


126
510
512
514
516
530
536
538
564
566
570
572
574
580
582
600
602
604
606
608
610
620
622
650
652
654
656
658
660

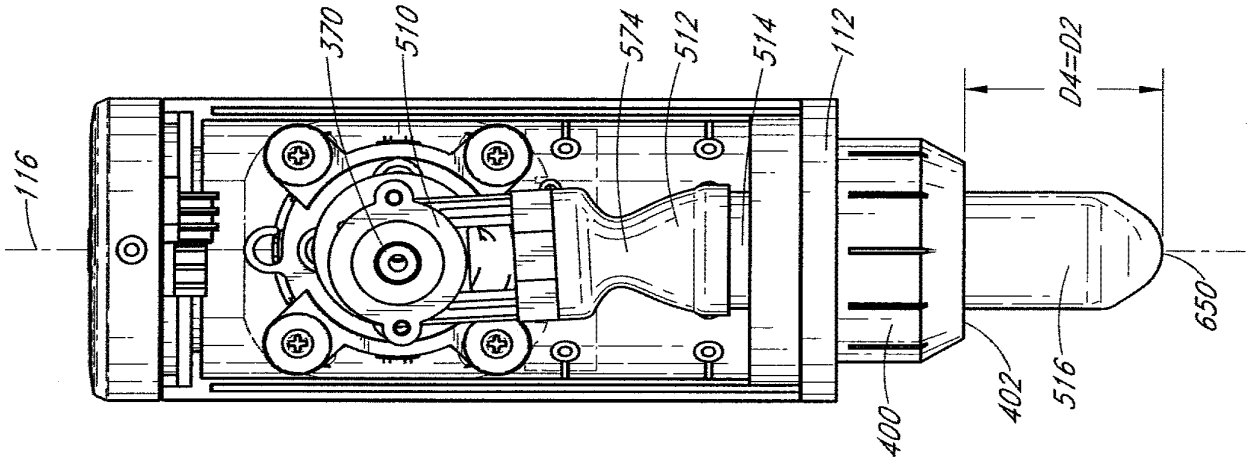
【圖 15】


370
510
574
512
514
112
D2>D1
116
650
516
402
400

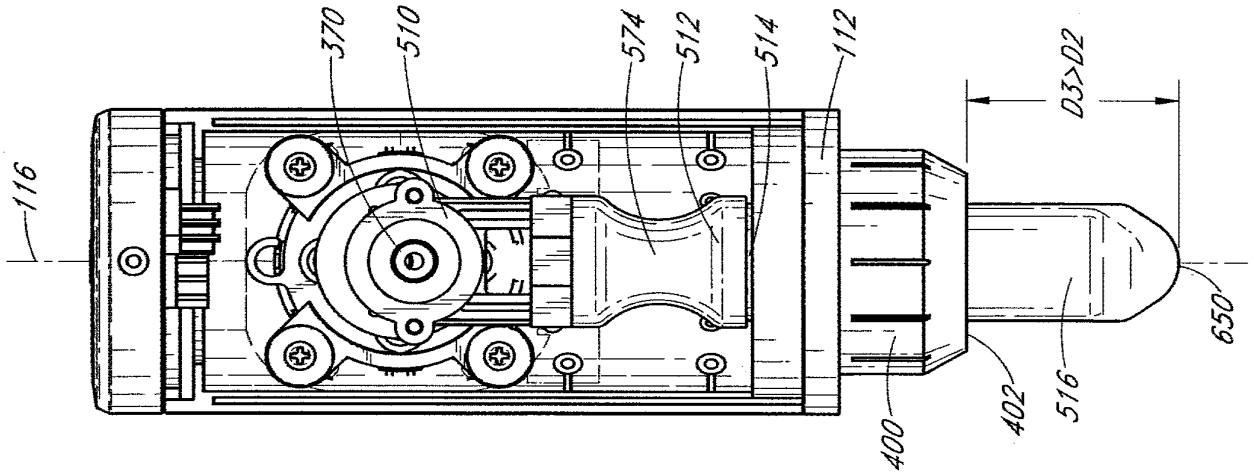
【圖 17】


370
510
574
512
514
112
D1
116
650
516
402
400

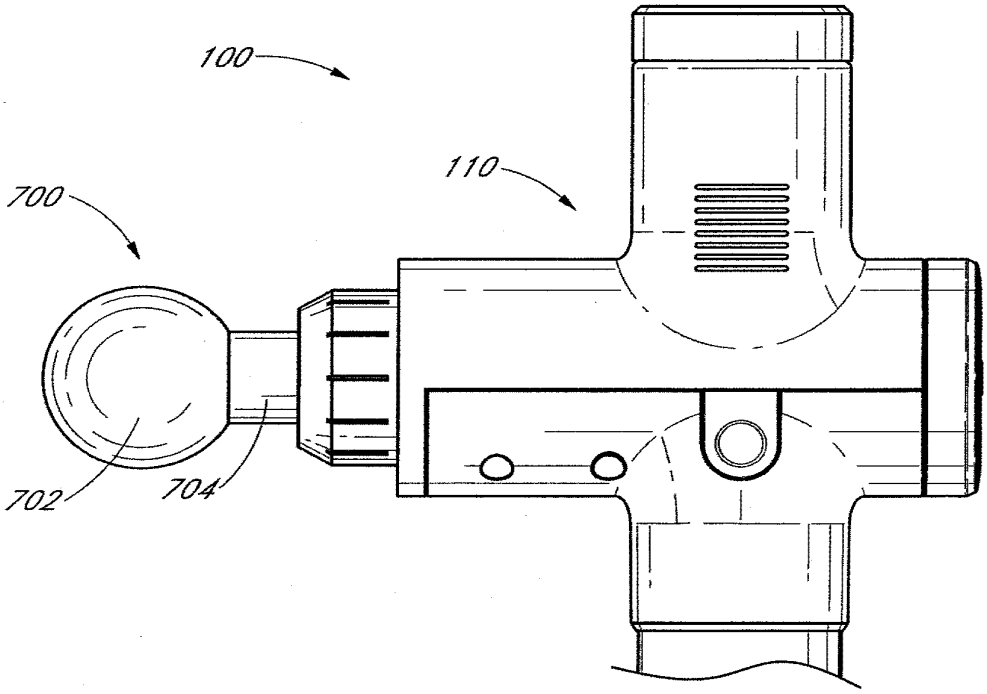
【圖 16】


370
510
574
512
514
112
116
04=02
650
516
402
400

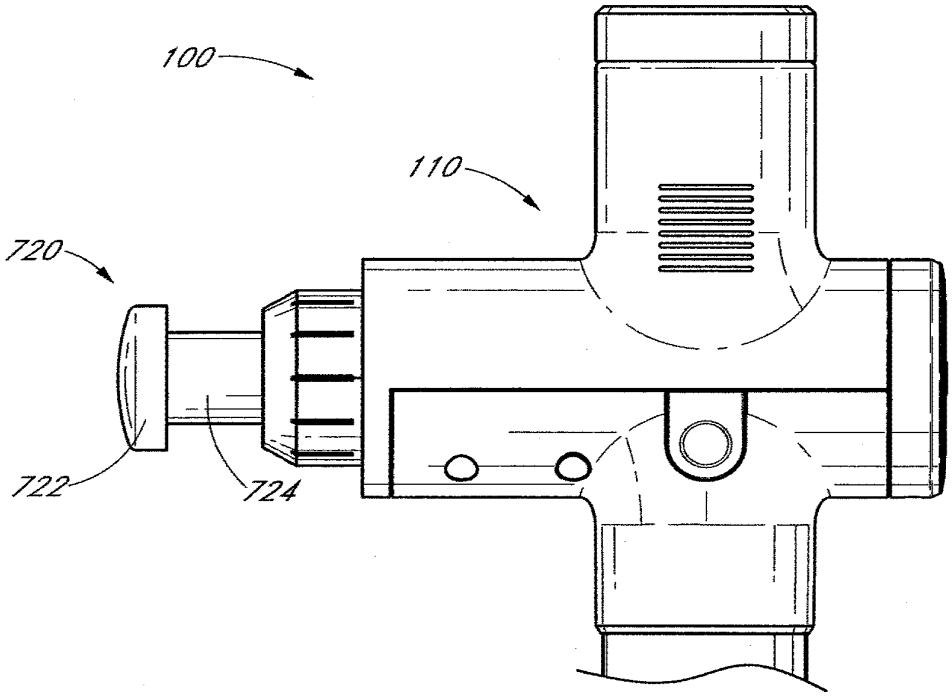
【圖 19】


370
510
574
512
514
112
116
03>02
650
516
402
400

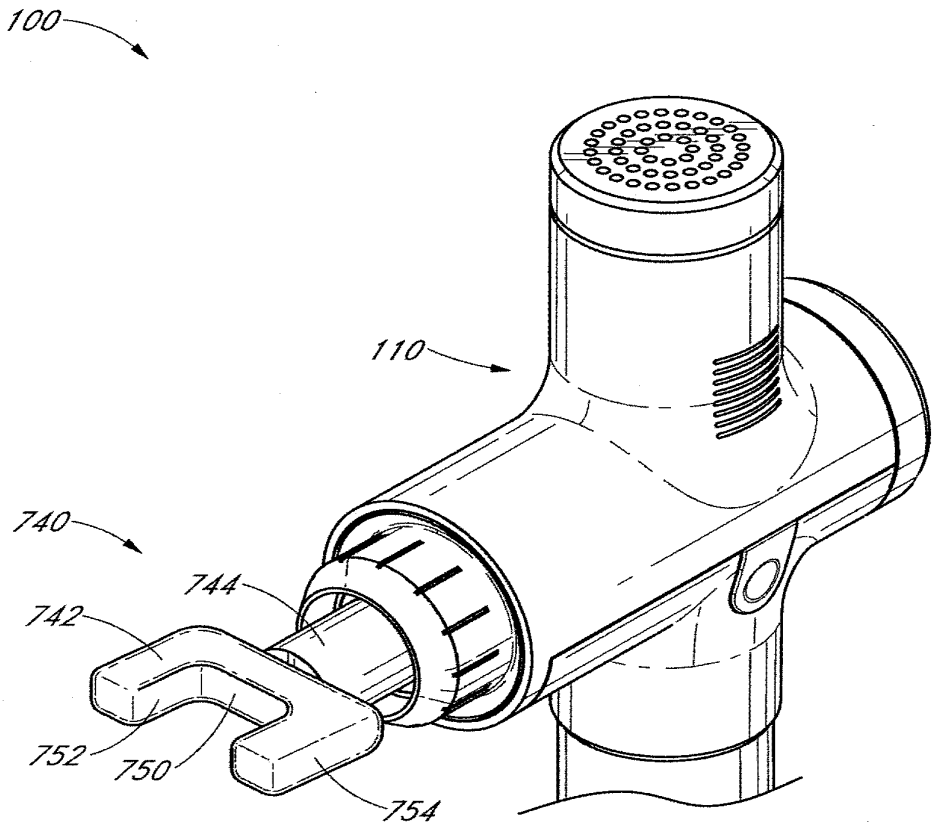
【圖 18】



【圖 20】

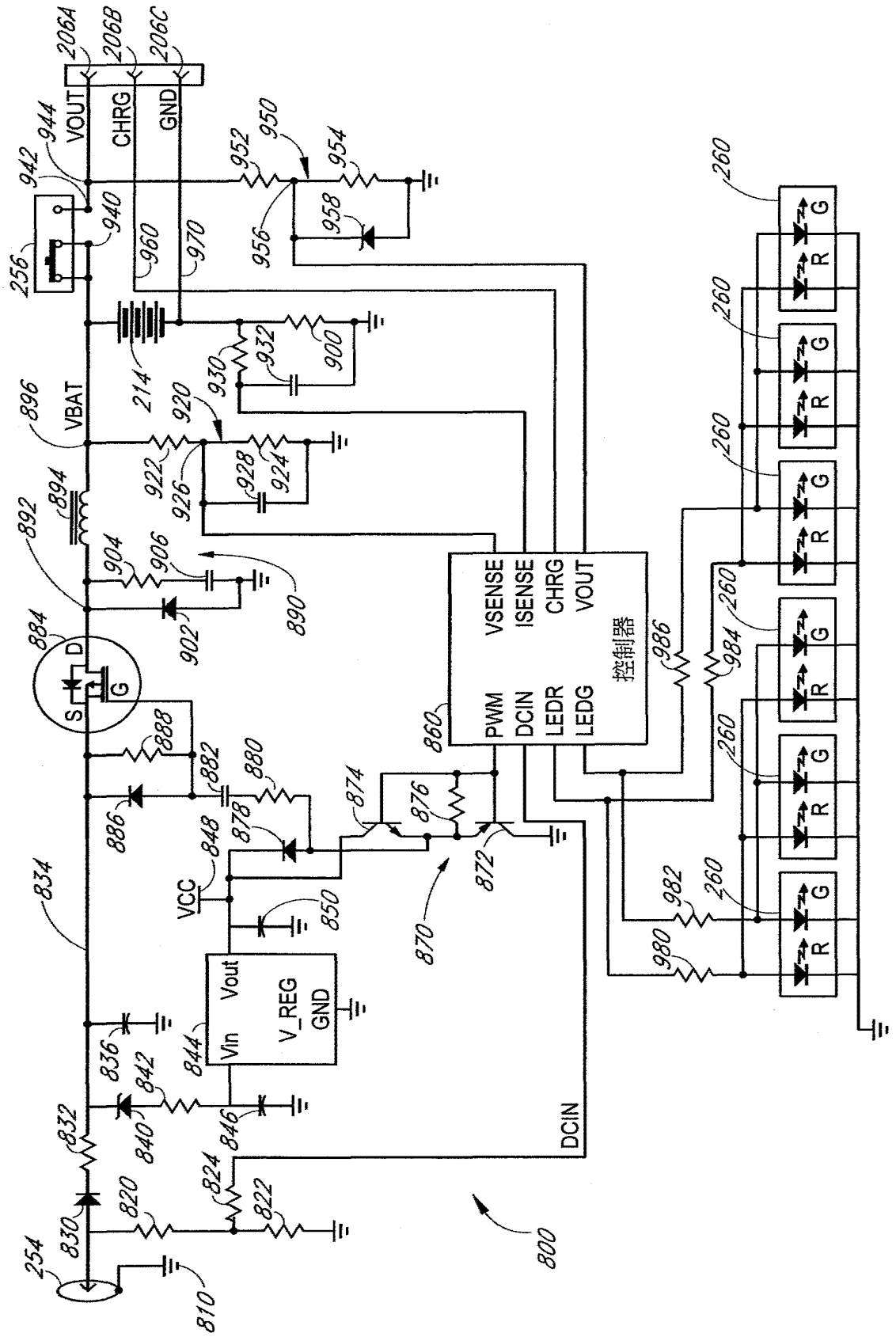


【圖 21】

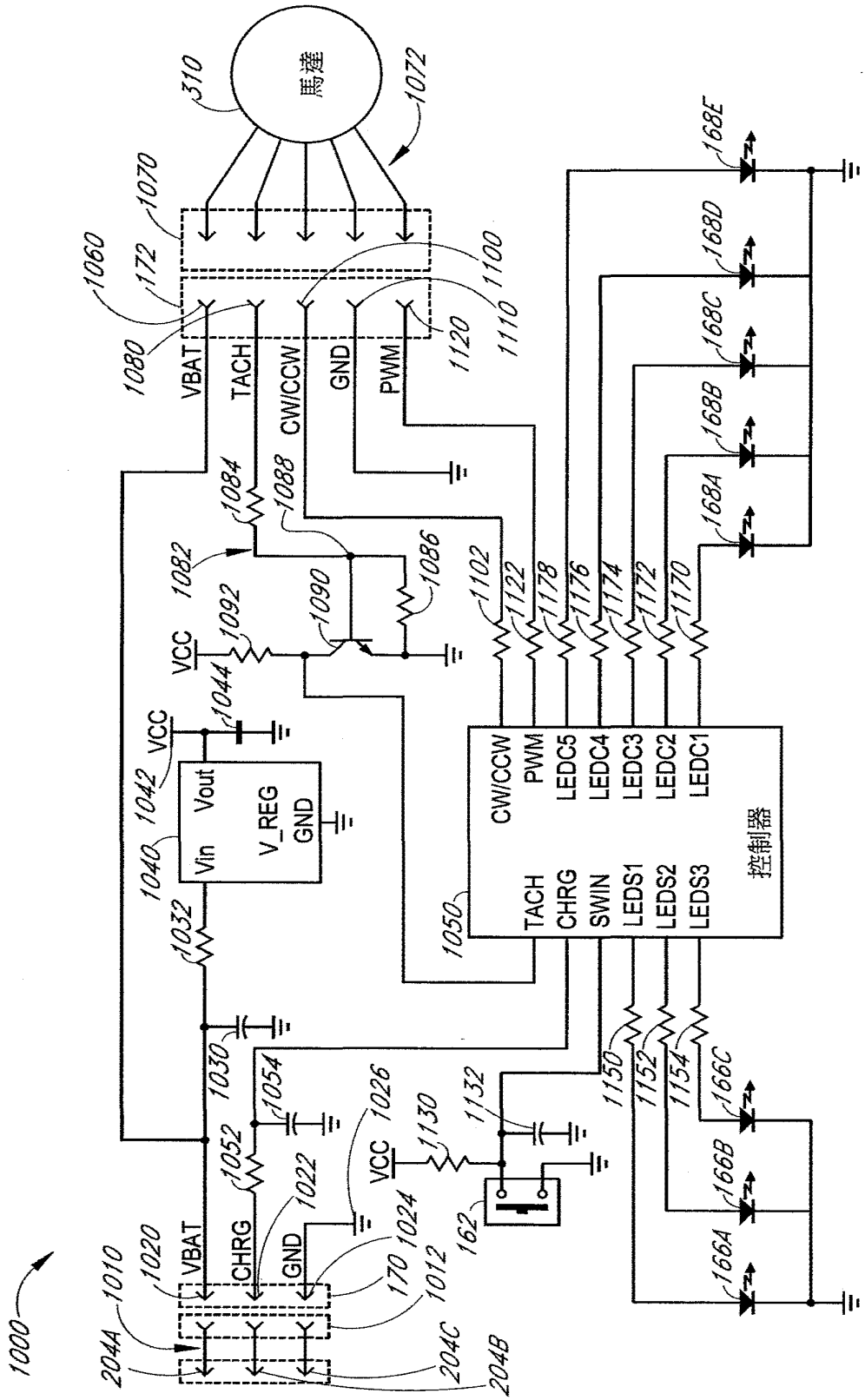


【圖 22】

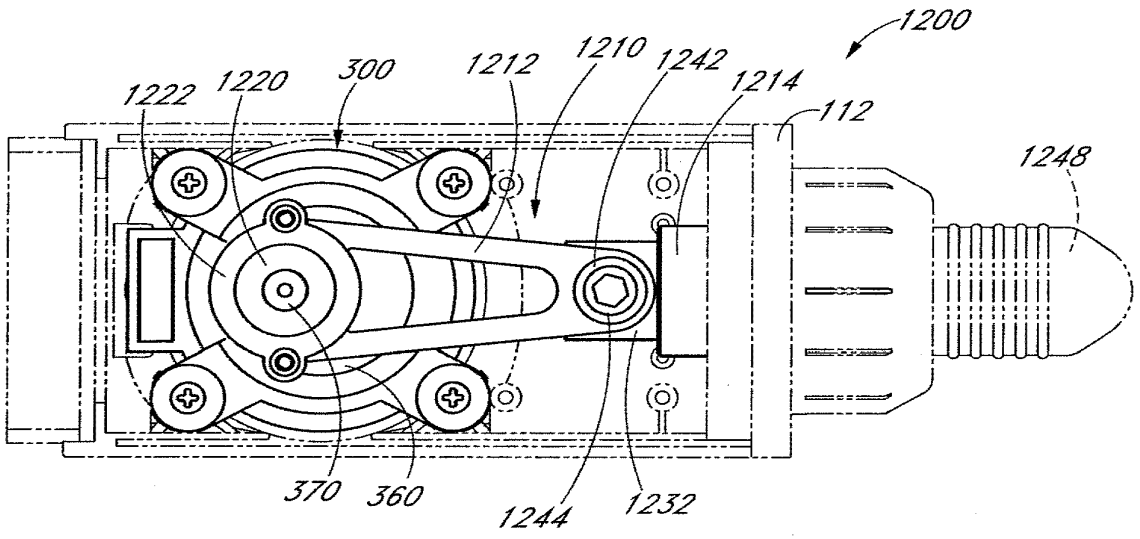
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206A
206B
206C
VOUT
CHRG
GND
256
214
VBAT
254
810
800
VSENSE
ISENSE
CHRG
VOUT
PWM
DCIN
LEDR
LEDG
控制器
860
VCC
Vout
Vin
V_REG
GND
DCIN
S
D
G
R
G
260

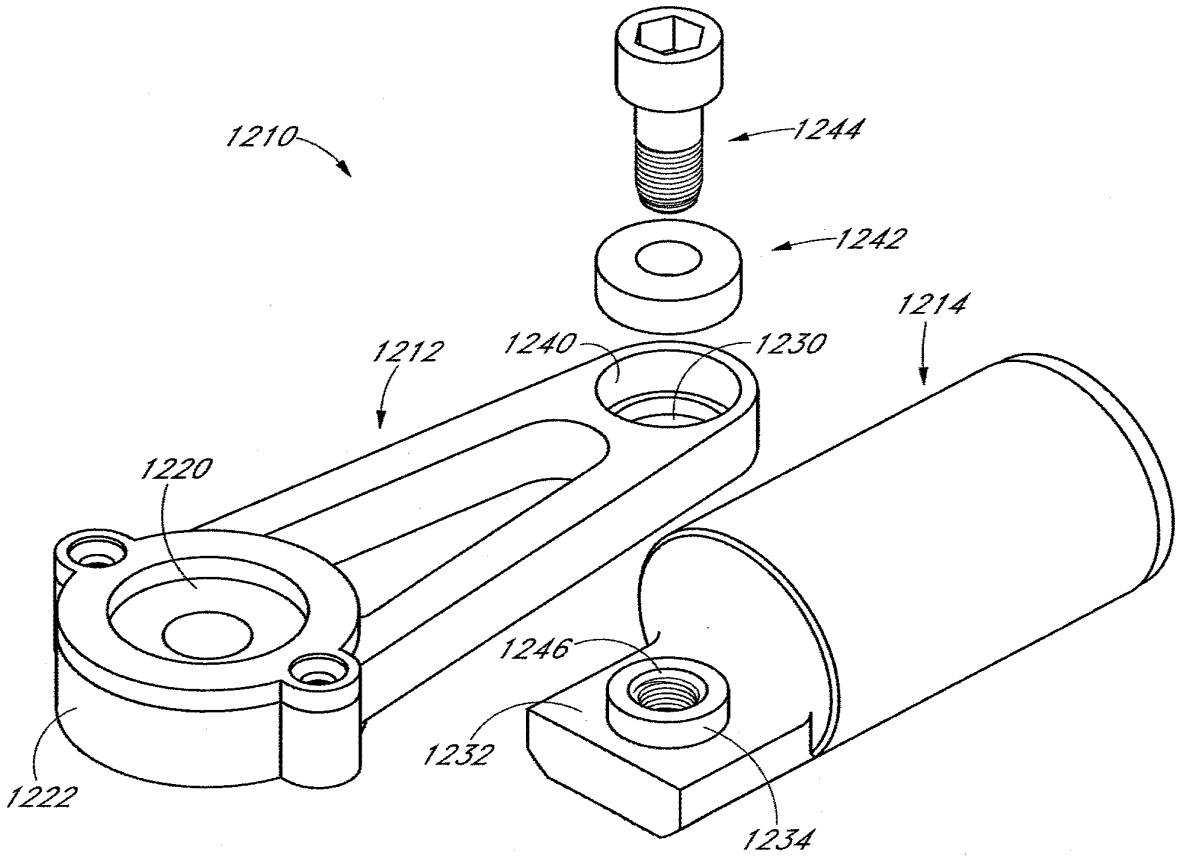
【圖 23】


馬達
310
1072
1070
1060
172
1080
1100
1110
1120
VBAT
TACH
CW/CCW
GND
PWM
1084
1088
1082
1086
1090
1092
VCC
1044
1042
1040
1032
1030
1054
1026
1052
1022
1024
1020
1010
1012
170
162
1130
1132
1150
1152
1154
1102
1122
1178
1176
1174
1172
1170
168E
168D
168C
168B
168A
166C
166B
166A
CW/CCW
PWM
LEDC5
LEDC4
LEDC3
LEDC2
LEDC1
TACH
CHRG
SWIN
LEDS1
LEDS2
LEDS3
控制器
Vout
Vin
V_REG
GND
1050
1000
204A
204C
204B

【圖 24】

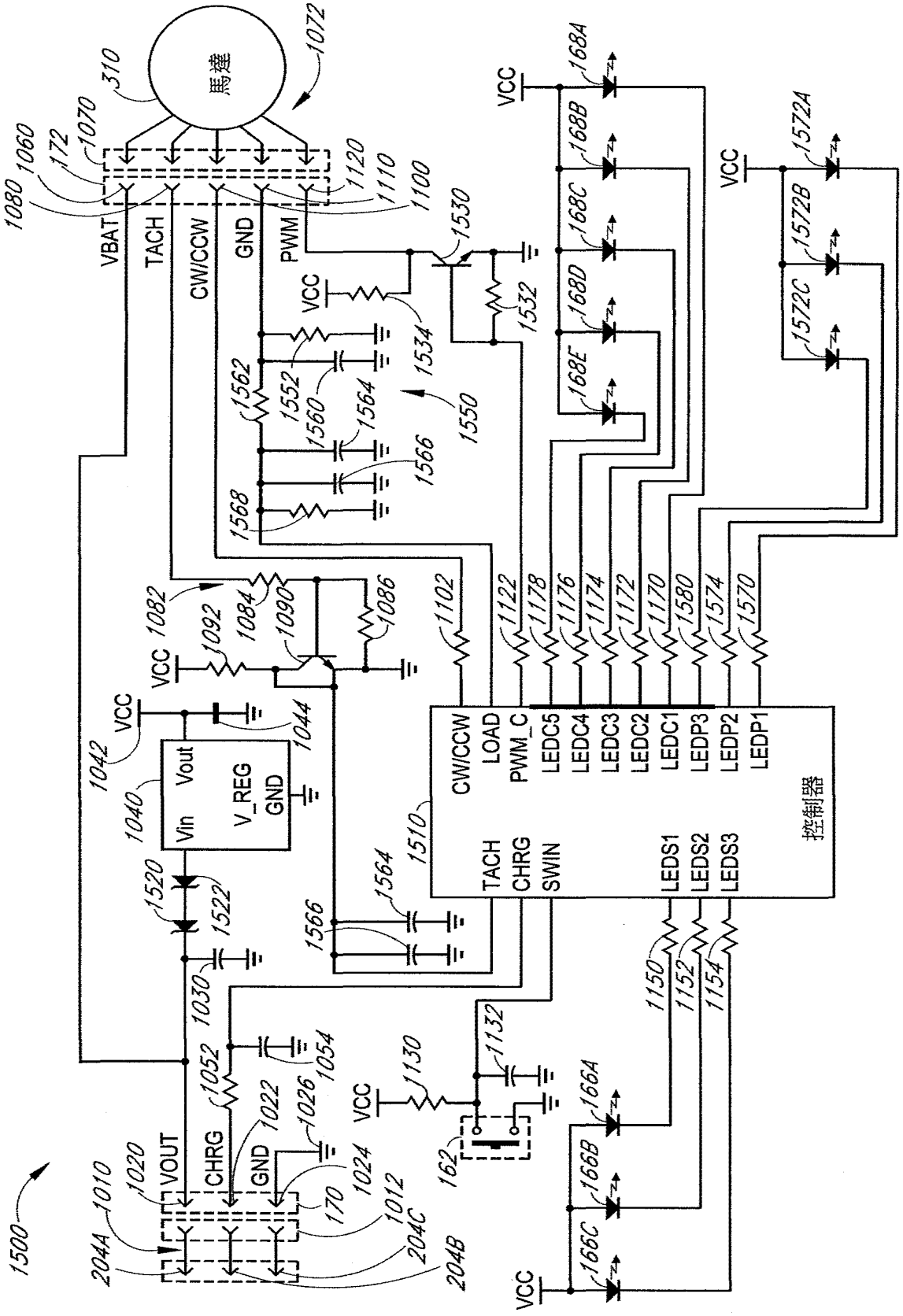


【圖 25】

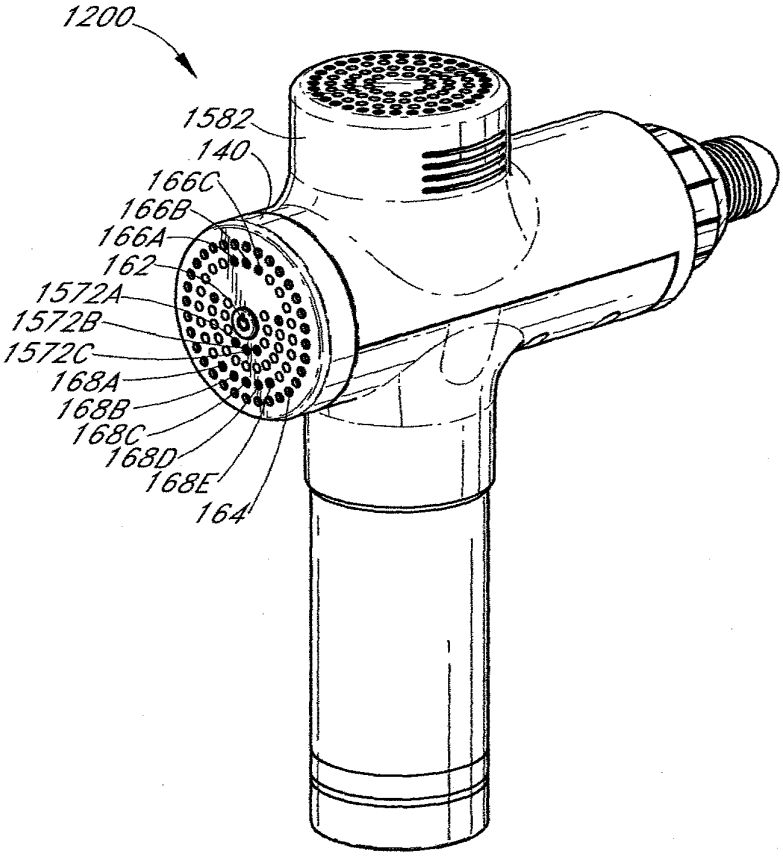


【圖 26】

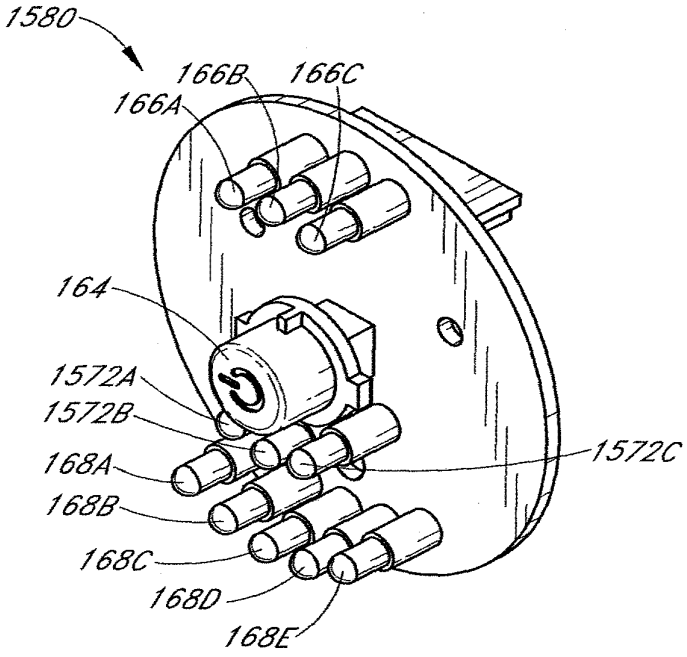
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馬達
1072
310
1070
172
1060
1080
VBAT
TACH
CW/CCW
GND
PWM
1120
1110
1100
1530
1532
1534
1550
1562
1552
1560
1564
1566
1568
VCC
1082
1092
1084
1090
1086
1102
1122
1178
1176
1174
1172
1170
1580
1574
1570
168A
168B
168C
168D
168E
1572A
1572B
1572C
1042
1044
1040
Vout
V_REG
GND
Vin
1520
1522
1030
1510
CW/CCW
LOAD
PWM_C
LEDC5
LEDC4
LEDC3
LEDC2
LEDC1
LEDP3
LEDP2
LEDP1
TACH
CHRG
SWIN
LEDS1
LEDS2
LEDS3
控制器
1150
1152
1154
1132
1130
1052
1054
1022
1026
1024
VOUT
CHRG
GND
1020
1010
170
1012
162
166A
166B
166C
204A
204C
204B
1500

【圖 27】

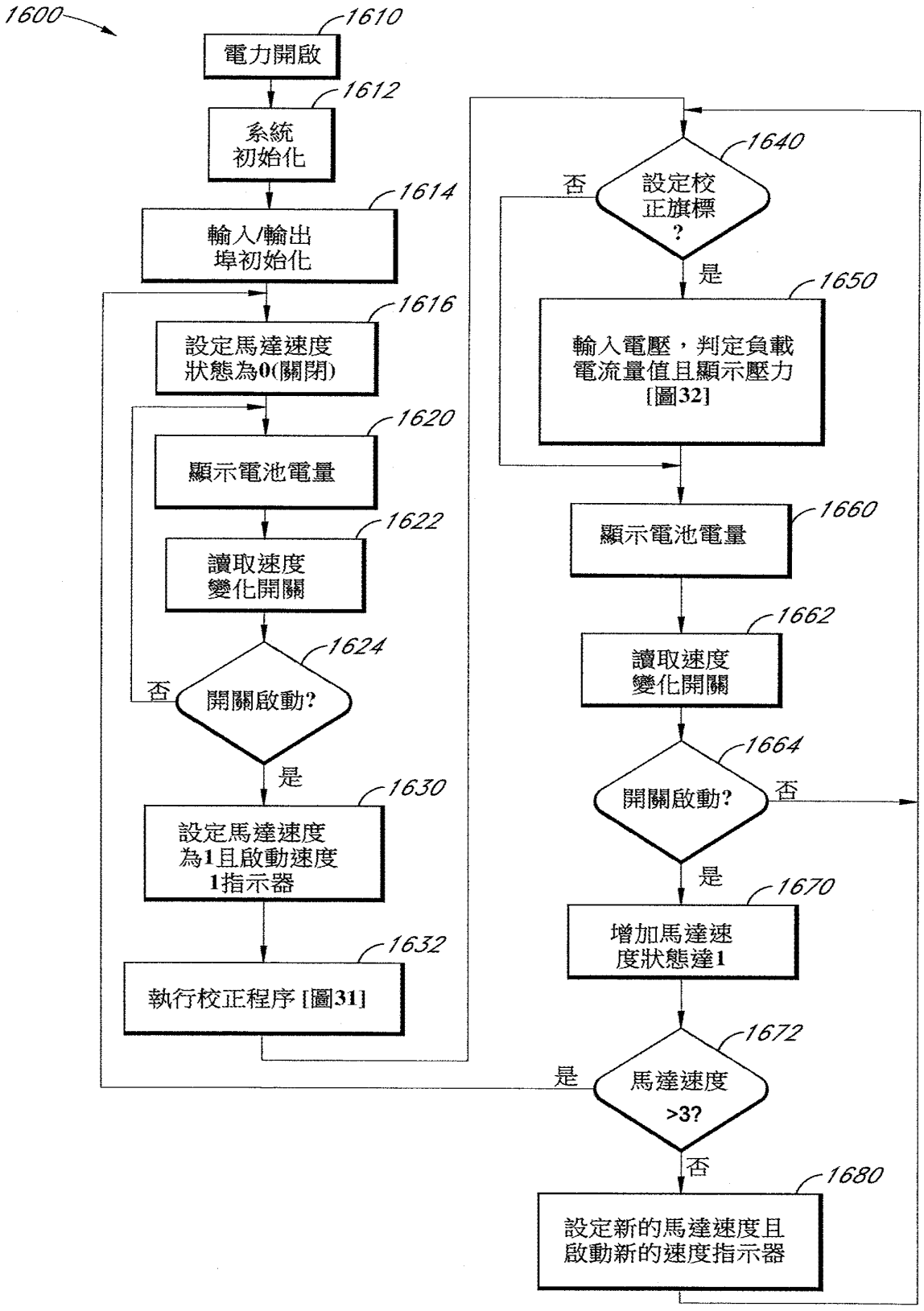


【圖 28】

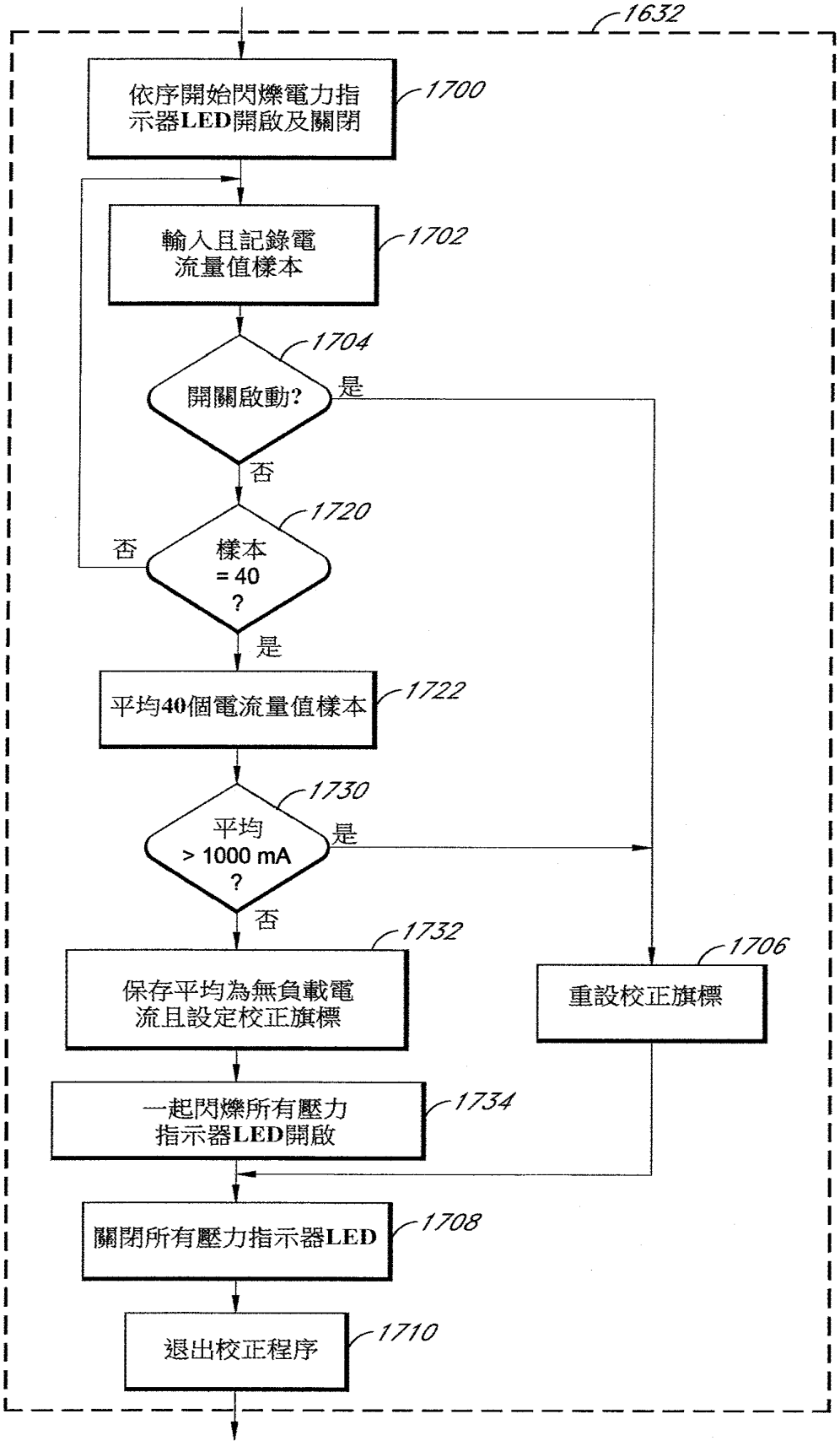


【圖 29】

Petitioner Therabody Ex-1004, 0311

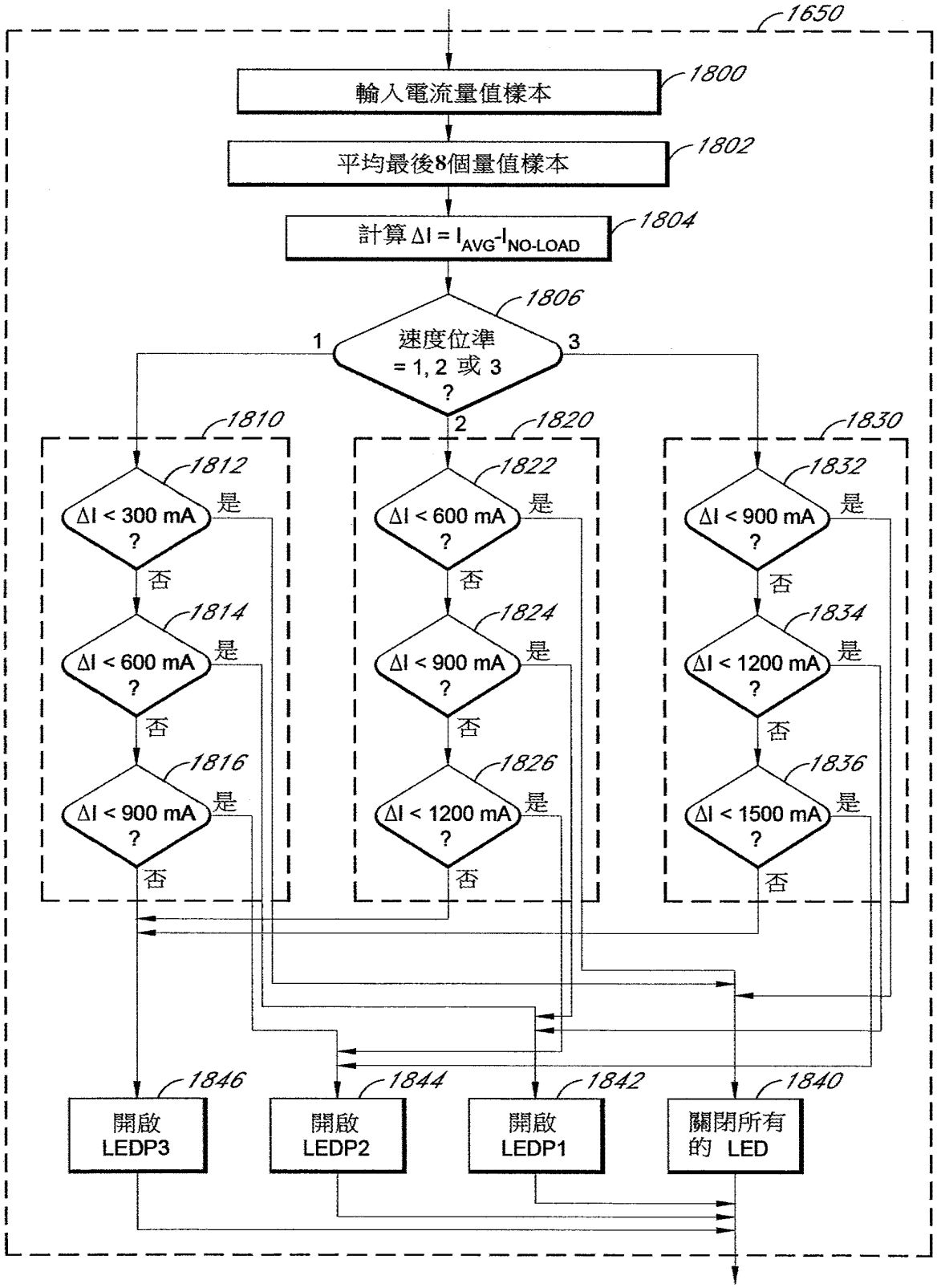

1600
1610
電力開啟
1612
系統
初始化
1614
輸入/輸出
埠初始化
1616
設定馬達速度
狀態為0(關閉)
1620
顯示電池電量
1622
讀取速度
變化開關
1624
開關啟動?
否
是
1630
設定馬達速度
為1且啟動速度
1指示器
1632
執行校正程序 [圖31]
1640
設定校
正旗標
?
否
是
1650
輸入電壓，判定負載
電流量值且顯示壓力
[圖32]
1660
顯示電池電量
1662
讀取速度
變化開關
1664
開關啟動?
否
是
1670
增加馬達速
度狀態達1
1672
馬達速度
>3?
是
否
1680
設定新的馬達速度且
啟動新的速度指示器

【圖 30】



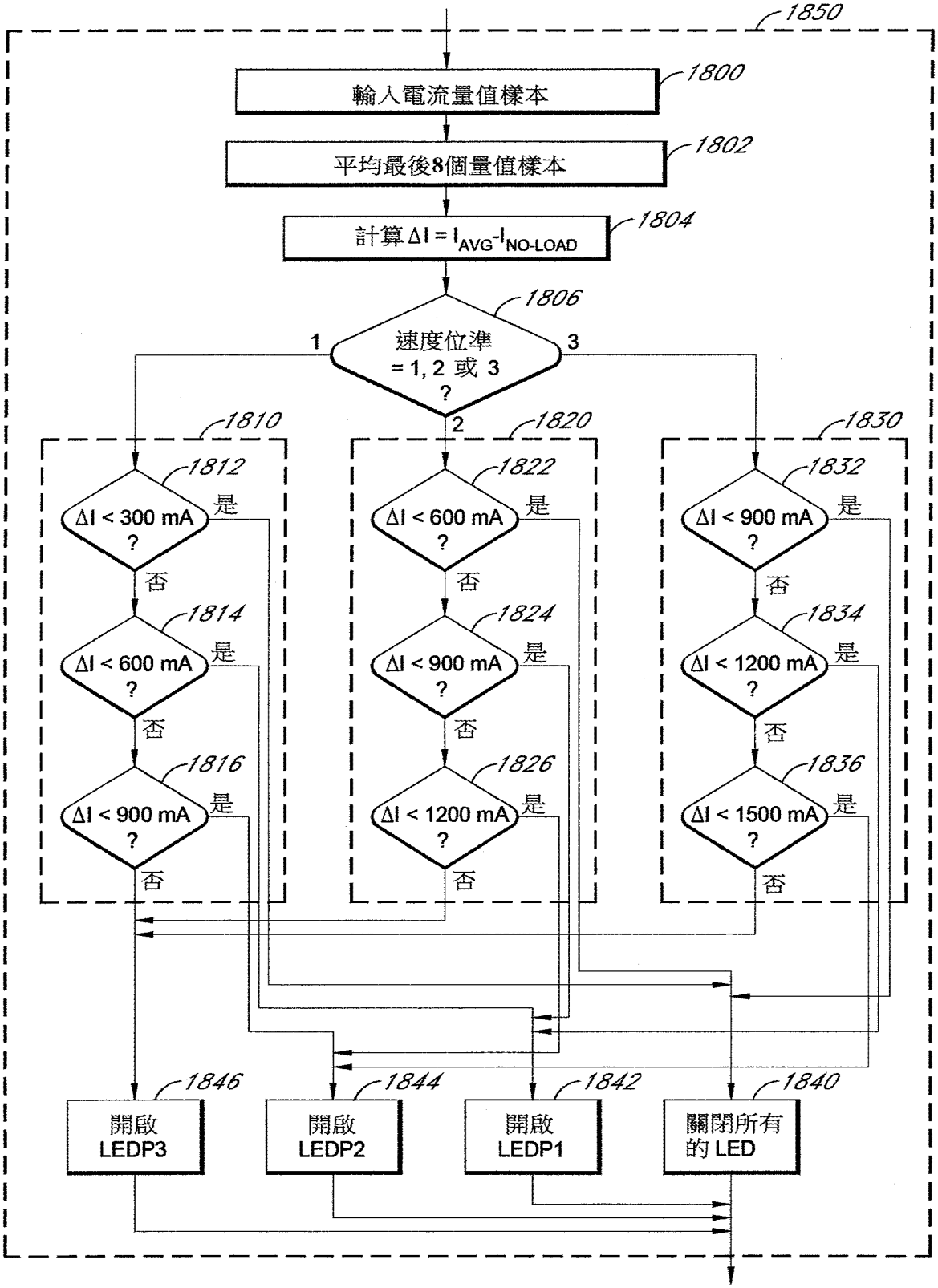
【圖 31】

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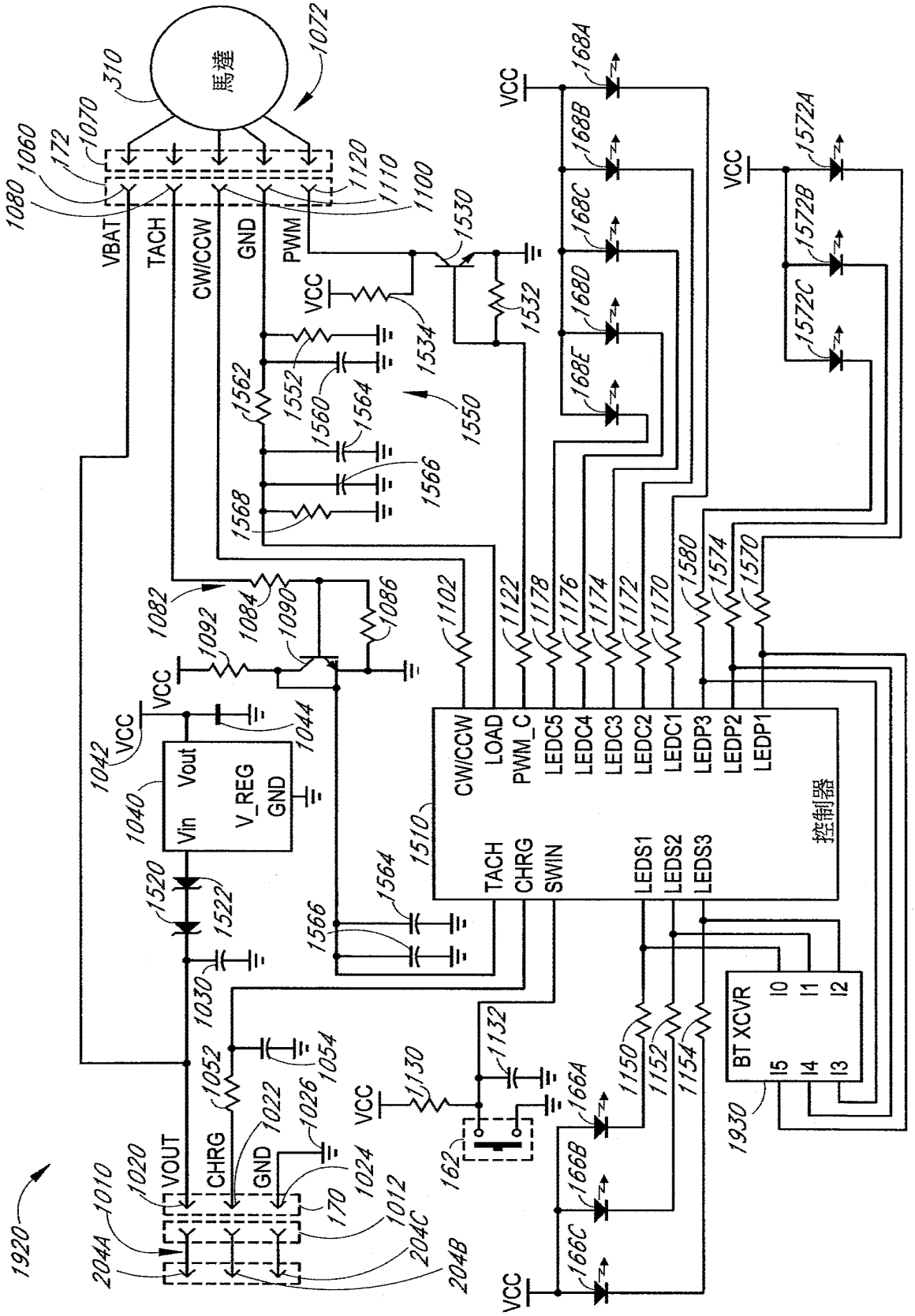


【圖 32】

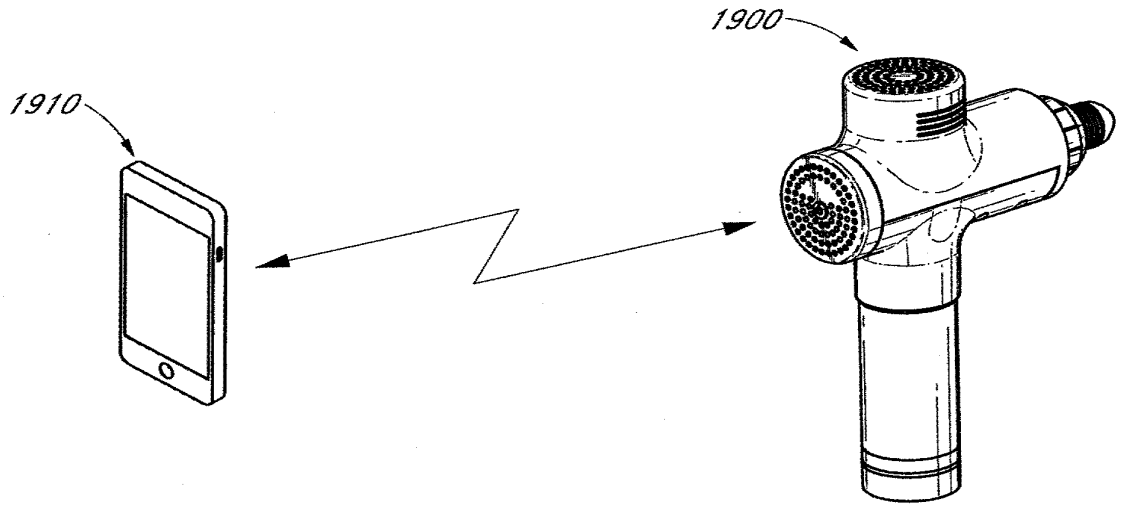
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1850
輸入電流量值樣本
1800
平均最後8個量值樣本
1802
計算 ΔI = I_AVG-I_NO-LOAD
1804
速度位準 = 1, 2 或 3 ?
1806
1
2
3
1810
1812
ΔI < 300 mA ?
是
否
1814
ΔI < 600 mA ?
是
否
1816
ΔI < 900 mA ?
是
否
1820
1822
ΔI < 600 mA ?
是
否
1824
ΔI < 900 mA ?
是
否
1826
ΔI < 1200 mA ?
是
否
1830
1832
ΔI < 900 mA ?
是
否
1834
ΔI < 1200 mA ?
是
否
1836
ΔI < 1500 mA ?
是
否
1846
開啟 LEDP3
1844
開啟 LEDP2
1842
開啟 LEDP1
1840
關閉所有的 LED

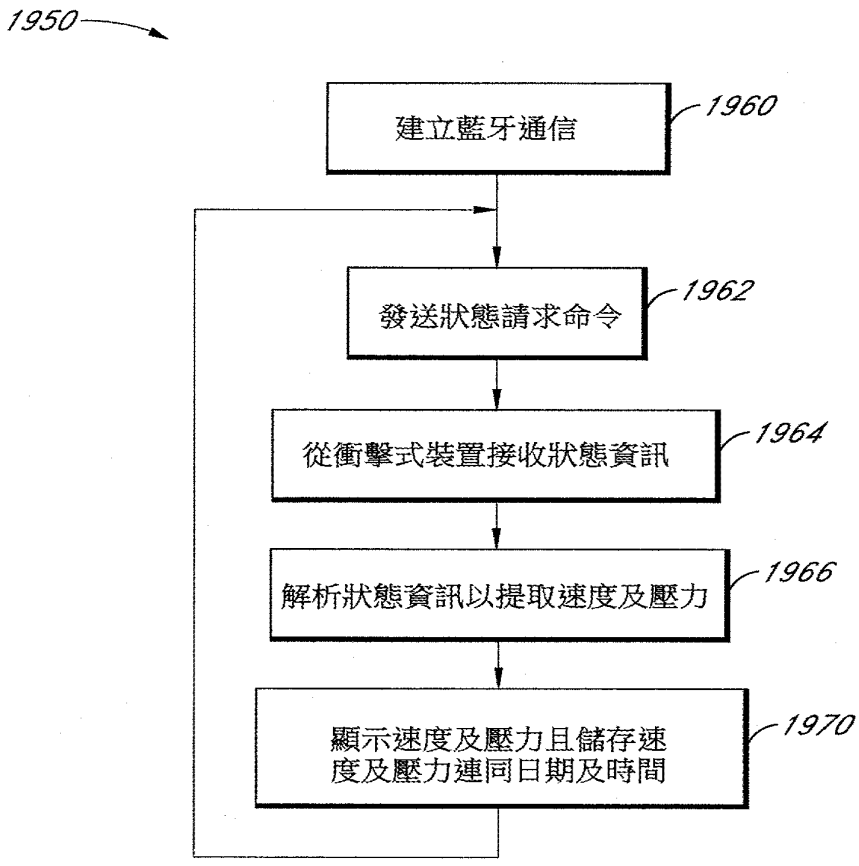
【圖 33】


馬達
1072
310
1070
172
1060
1080
VBAT
TACH
CW/CCW
GND
PWM
1120
1110
1100
1530
1532
1534
1550
VCC
1562
1552
1560
1564
1566
1568
1082
1084
1090
1086
1092
1102
1122
1178
1176
1174
1172
1170
1580
1574
1570
1042
1044
1040
Vout
Vin
V_REG
GND
1510
CW/CCW
LOAD
PWM_C
LEDC5
LEDC4
LEDC3
LEDC2
LEDC1
LEDP3
LEDP2
LEDP1
TACH
CHRG
SWIN
LEDS1
LEDS2
LEDS3
控制器
1520
1522
1030
1052
1054
1022
1026
1024
1012
1010
1020
VOUT
CHRG
GND
170
204A
204C
204B
1920
1132
1130
162
166A
166B
166C
168A
168B
168C
168D
168E
1572A
1572B
1572C
1150
1152
1154
BT XCVR
I0
I1
I2
I3
I4
I5
1930

【圖 34】


1900
1910

【圖 35】


1950
建立藍牙通信
1960
發送狀態請求命令
1962
從衝擊式裝置接收狀態資訊
1964
解析狀態資訊以提取速度及壓力
1966
顯示速度及壓力且儲存速度及壓力連同日期及時間
1970

【圖 36】

第 108101360 號　　民國 108 年 7 月 3 日修正

【發明申請專利範圍】

【第1項】

一種電池動力衝擊式按摩裝置，包括：

包體，具有圓柱形孔，該圓柱形孔沿著縱向軸線延伸；

活塞，定位在該圓柱形孔中，該活塞具有第一端及第二端，該活塞被拘束以僅沿著該圓柱形孔之該縱向軸線移動；

馬達，被定位在該包體中，該馬達具有可旋轉軸桿，該軸桿具有中央軸線，該軸桿之該中央軸線垂直於該圓柱形孔之該縱向軸線；

曲柄，被耦合至該軸桿，該曲柄包含樞軸，該樞軸從該軸桿之該中央軸線偏移；

往復連桿，具有第一端及第二端，該往復連桿之第一端耦合至該曲柄之該樞軸，該往復連桿之該第二端耦合至該活塞之該第一端；

施力器頭，具有第一端及第二端，該施力器頭之該第一端耦合至該活塞之該第二端，該施力器頭之該第二端曝露在該圓柱形孔外側；

電池總成，從該包體延伸，該電池總成提供DC電力；

馬達控制器，位在該包體中，該馬達控制器接收來自該電池總成之DC電力且選擇性地提供DC電力至該馬達以控制該馬達之速度，該馬達控制器進一步包含感測器，該

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感測器感測流經該馬達之電流之感測量值，該馬達控制器回應於該電流之該感測量值而選擇性地啟動對應於該電流之該感測量值之至少一壓力之指示信號，其中，該馬達控制器藉由從該感測電流量值減去無負載電流而判定施加的電流量值，該馬達控制器選擇性地啟動回應於該施加的電流量值之該至少一壓力之指示信號；及

至少一顯示裝置，其接收該至少一壓力之指示信號且回應於該至少一壓力之指示信號以顯示對應於該施加的電流量值的壓力範圍的視覺指示。

【第2項】

如申請專利範圍第1項之衝擊式按摩裝置，其中，該施力器頭可移除式地耦合至該活塞。

【第3項】

如申請專利範圍第1項之衝擊式按摩裝置，其中：

該往復連桿係剛性的；且

該往復連桿之該第二端可樞轉地耦接至該活塞之該第一端。

【第4項】

如申請專利範圍第1項之衝擊式按摩裝置，其中：

該往復連桿係可撓性的；且

該往復連桿之該第二端被固定至該活塞之該第一端。

【第5項】

如申請專利範圍第1項之衝擊式按摩裝置，其中，該馬達控制器包含射頻收發器，其選擇性地傳輸信號，該信

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號包含該馬達之速度與施加至該施力器頭之該壓力之範圍之表示。

【第6項】

一種操作衝擊式按摩裝置之方法，包括：

旋轉電動馬達之軸桿以將曲柄之樞軸繞著該軸桿之中心線旋轉；

將該曲柄之該樞軸耦合至往復總成之互連連桿的第一端；

將該互連連桿之第二端耦合至被拘束以沿著縱向中心線移動之活塞的第一端；

將該活塞之第二端耦合至施力器頭，其中，該曲柄之該樞軸之旋轉移動造成該活塞與該施力器頭之往復縱向移動；

測量流經該馬達之測量電流量值，該測量電流量值具有回應於施加至該施力器頭之壓力的電流量值的分量；

從該測量電流減去無負載電流來判定回應於施加至該施力器頭之該壓力的該測量電流量值的該分量；及

顯示複數個壓力指示器之至少一者，該複數個壓力指示器之各者對應於一壓力範圍，各壓力範圍對應於回應於施加至該施力器頭之壓力的電流量值的分量之一範圍。

【第7項】

如申請專利範圍第6項之方法，其中，該施力器頭可移除式地耦合至該活塞。

【第8項】

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如申請專利範圍第6項之方法，其中：

該互連連桿係剛性的；且

該互連連桿之該第二端可樞轉地耦接至該活塞之該第一端。

【第9項】

如申請專利範圍第6項之方法，其中：

該互連連桿係可撓性的；且

該互連連桿之該第二端被固定至該活塞之該第一端。

【第10項】

如申請專利範圍第6項之方法，其進一步包括選擇性地傳輸射頻信號，該射頻信號包含該馬達之速度與施加至該施力器頭之該壓力之範圍之表示。

【第11項】

如申請專利範圍第10項之方法，其進一步包括藉由遠程通信裝置接收該傳輸的射頻信號；儲存該速度及該壓力之範圍連同當該射頻信號被接收時之時間；及選擇性地檢索被儲存的該速度、壓力之範圍及時間以在該遠程通信裝置上顯示該速度、壓力之範圍及時間。

【第12項】

一種衝擊式按摩裝置，包括：

電能源；

電動馬達，被組構成繞軸桿旋轉；

活塞，被拘束以在圓筒內以往復運動來移動；

連桿，被組構成用以將該電動馬達耦合至該活塞，使

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得該電動馬達之旋轉造成該活塞往復；

施力器頭，可移除式地耦合至該活塞；及

馬達控制器，被耦合至該電能源且被耦合至該馬達，該馬達控制器被組構成用以選擇性地提供電能至該馬達以造成該馬達旋轉一速度，該馬達控制器包含壓力指示系統，該壓力指示系統被組構成用以測量流經該電動馬達之電流量值且從該電流之該量值減去無負載電流以產生校正電流，該校正電流具有回應於施加在該施力器頭上之壓力的量值，該校正電流量值包含複數個校正電流範圍，該壓力指示系統包含具有複數個顯示狀態之壓力指示顯示器，各顯示狀態對應於各自一個該校正電流範圍，各校正電流範圍對應於施加在該施力器頭上的壓力範圍。

【第13項】

如申請專利範圍第12項之衝擊式按摩裝置，其中，該壓力指示顯示器包括第一顯示裝置、第二顯示裝置及第三顯示裝置，各顯示裝置具有各自的未照亮狀態及各自的照亮狀態，其中：

若該校正電流的該量值小於第一臨限量值，則該第一顯示裝置處在該各自的未照亮狀態，且當該校正電流的該量值至少與該第一臨限量值一樣大且小於第二臨限量值，則該第一顯示裝置處在該各自的照亮狀態；

若該校正電流的該量值小於該第二臨限量值，則該第二顯示裝置處在該各自的未照亮狀態，且當該校正電流的該量值至少與該第二臨限量值一樣大且小於第三臨限量

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值，則該第二顯示裝置處在該各自的照亮狀態；且

若該校正電流的該量值小於該第三臨限量值，則該第三顯示裝置處在該各自的未照亮狀態，且當該校正電流的該量值至少與該第三臨限量值一樣大，則該第三顯示裝置處在該各自的照亮狀態。

【第14項】

如申請專利範圍第12項之衝擊式按摩裝置，其中，該馬達控制器包含射頻收發器，其選擇性地傳輸信號，該信號包含該馬達之速度與施加至該施力器頭之該壓力之範圍之表示。

【第15項】

如申請專利範圍第12項之衝擊式按摩裝置，其中：

該連桿係剛性的；且

該連桿之一端部可樞轉地耦接至該活塞之一端部。

【第16項】

如申請專利範圍第12項之衝擊式按摩裝置，其中：

該連桿係可撓性的；且

該連桿之一端部被固定至該活塞之一端部。

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Espacenet

Bibliographic data: WO2014038359 (A1) — 2014-03-13

RECHARGEABLE ELECTRIC DEVICE

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Classification: - international: ***B25F5/00; B25F5/02; H01M50/247; H01M50/271***
- cooperative: **B25F5/02 (EP)**; **H01M50/24 (EP)**; **H01M50/247 (EP, US)**; **H01M50/271 (EP, US)**; H01M2220/30 (EP); Y02E60/10 (EP)

Application number: WO2013JP71866 20130813 Global Dossier

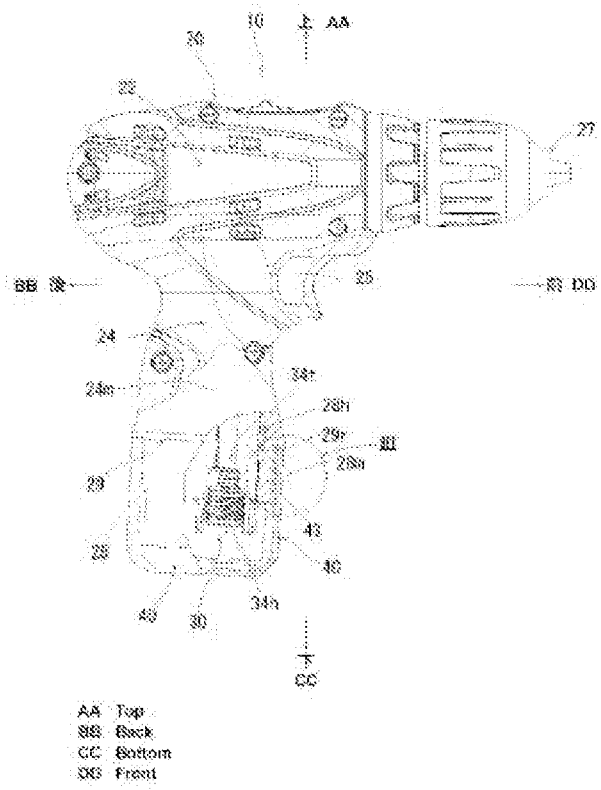
Priority number (s): JP20120196967 20120907

Also published as: JP2014050918 (A)

Abstract of WO2014038359 (A1)

An electric driver (10) has a driver main body (20), a battery pack (30), a waterproof cover (40), a cover holder (29), and a waterproof cover support mechanism. The battery pack (30) is connected to a battery attachment part (28) of the driver main body (20). The waterproof cover (40) covers the battery pack (30) and the battery attachment part (28) with a bottomed cylindrical shape. The cover holder (29) is formed on the driver main body (20) so as to be in watertight contact with the entire peripheral edge of an opening (45) in the waterproof cover (40). The waterproof cover support mechanism supports the peripheral edge of the opening (45) of the waterproof cover (40) in a state of contact with the cover holder (29).

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(12) 特許協力条約に基づいて公開された国際出願

(19) 世界知的所有権機関
国際事務局

(43) 国際公開日
2014 年 3 月 13 日(13.03.2014)

WIPO | PCT

(10) 国際公開番号
WO 2014/038359 A1

(51) 国際特許分類:
B25F 5/00 (2006.01) *H01M 2/10* (2006.01)
B25F 5/02 (2006.01)

(21) 国際出願番号: PCT/JP2013/071866

(22) 国際出願日: 2013 年 8 月 13 日(13.08.2013)

(25) 国際出願の言語: 日本語

(26) 国際公開の言語: 日本語

(30) 優先権データ:
特願 2012-196967 2012 年 9 月 7 日(07.09.2012) JP

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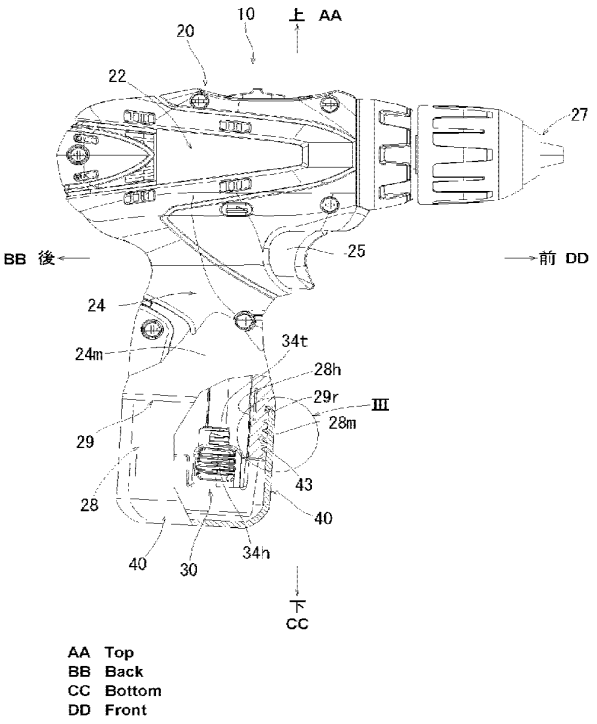
(81) 指定国 (表示のない限り、全ての種類の国内保護が可能): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) 指定国 (表示のない限り、全ての種類の広域保護が可能): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア (AM, AZ, BY, KG, KZ, RU, TJ, TM), ヨーロッパ (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT,

[続葉有]

(54) **Title**: RECHARGEABLE ELECTRIC DEVICE

(54) 発明の名称 : 充電式の電気機器



AA Top
BB Back
CC Bottom
DD Front

(57) **Abstract**: An electric driver (10) has a driver main body (20), a battery pack (30), a waterproof cover (40), a cover holder (29), and a waterproof cover support mechanism. The battery pack (30) is connected to a battery attachment part (28) of the driver main body (20). The waterproof cover (40) covers the battery pack (30) and the battery attachment part (28) with a bottomed cylindrical shape. The cover holder (29) is formed on the driver main body (20) so as to be in watertight contact with the entire peripheral edge of an opening (45) in the waterproof cover (40). The waterproof cover support mechanism supports the peripheral edge of the opening (45) of the waterproof cover (40) in a state of contact with the cover holder (29).

(57) 要約: 電動ドライバ（１０）は、ドライバ本体（２０）、バッテリパック（３０）、防水カバー（４０）、カバー受け部（２９）、防水カバー保持機構を有する。バッテリパック（３０）は、ドライバ本体（２０）のバッテリ装着部（２８）に接続される。防水カバー（４０）は、有底筒形でバッテリパック（３０）とバッテリ装着部（２８）を覆う。カバー受け部（２９）は、防水カバー（４０）の開口（４５）周縁の全周と水密に当接するようにドライバ本体（２０）に形成される。防水カバー保持機構は、防水カバー（４０）の開口（４５）周縁をカバー受け部（２９）に当接した状態に保持する。

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NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

添付公開書類:

— 国際調査報告（条約第 21 条(3)）

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明　細　書

発明の名称 ： 充電式の電気機器

技術分野

[0001] 本発明は、バッテリ装着部を備える電気機器本体と、バッテリ装着部に連結されるバッテリパックを備える充電式の電気機器に関する。

背景技術

[0002] 充電式の電気機器は、例えば特開２０１２－８１５７６号公報に開示されている。電気機器は、図５に示すように充電式のインパクトドライバ１００である。インパクトドライバ１００は、インパクトドライバ本体１０２とバッテリパック１０４と防水カバー１０６を有する。インパクトドライバ本体１０２は、グリップ部１０２ｇの下端にバッテリ装着部１０２ｂを有する。バッテリ装着部１０２ｂにバッテリパック１０４が前方から後方にスライドして連結される。バッテリ装着部１０２ｂの上方部分の全周に段差状のシール面１０２ｓが形成される。

[0003] 防水カバー１０６は、シール面１０２ｓの下側においてバッテリ装着部１０２ｂとバッテリパック１０４を覆う。防水カバー１０６は、袋状であって、上部に開口１０６ｅを備える。防水カバー１０６は、前カバー部１０６ｆと後カバー部１０６ｂと連結機構１０７を有する。前後カバー部１０６ｆ，１０６ｂは、相互に当接する接合面１０６ｘ，１０６ｙを有する。連結機構１０７は、前後カバー部１０６ｆ，１０６ｂを前後方向に押すことで保持する。防水カバー１０６の開口１０６ｅの周縁部がインパクトドライバ本体１０２のシール面１０２ｓに当接される。これにより防水カバー１０６は、インパクトドライバ本体１０２とバッテリパック１０４の連結部をある程度防水し得る。

[0004] 防水カバー１０６は、連結機構１０７が前後カバー部１０６ｆ，１０６ｂを前後方向に押すことで袋状に保持される。このため前後カバー部１０６ｆ，１０６ｂの接合面１０６ｘ，１０６ｙ間がある程度シールされる。しかし

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連結機構１０７は、防水カバー１０６の開口１０６ｅの周縁部をインパクトドライバ本体１０２のシール面１０２ｓに均等に当接させる押圧力を付与しない。このため開口１０６ｅの周縁部とシール面１０２ｓ間のシール性が不十分になり得る。

発明の概要

発明が解決しようとする課題

[0005] そのため電気機器本体と防水カバー間のシール性の高い充電式の電気機器が従来必要とされている。

課題を解決するための手段

[0006] １つの特徴によると充電式の電気機器は、電気機器本体、バッテリパック、防水カバー、カバー受け部、防水カバー保持機構を有する。バッテリパックは、電気機器本体のバッテリ装着部に接続される。防水カバーは、有底筒形でバッテリパックとバッテリ装着部を覆う。カバー受け部は、防水カバーの開口周縁の全周と水密に当接するように電気機器本体に形成される。防水カバー保持機構は、防水カバーの開口周縁をカバー受け部に当接した状態に保持する。防水カバーの開口周縁は、カバー受け部に直接的に当接しても良いし、あるいはシール材等を介して当接しても良い。

[0007] したがって防水カバーの開口周縁と電気機器本体のカバー受け部間のシール性が確保される。さらに防水カバーは、単一の部材で、従来のように複数の部材を組み合わせて構成されるものではない。そのため防水カバー本体のシール性も高くなる。

[0008] 他の特徴によると防水カバー保持機構は、防水カバーの開口周縁をカバー受け部に周方向に均一な力で押圧するように構成されても良い。したがって防水カバーの周方向においてシール性能がばらつくことがなくなる、あるいは少なくなる。

[0009] 他の特徴によると電気機器は、カバー受け部と防水カバーの開口周縁を水密に保持するようにカバー受け部と防水カバーの開口周縁に挟持される防浸部材を有しても良い。したがって防浸部材がない場合と比較してシール性能

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が高い。

[0010] 他の特徴によるとカバー受け部あるいは防水カバーの開口周縁には、防浸部材が設置される凹部が形成され得る。したがって防浸部材は、カバー受け部あるいは防水カバーの開口周縁に保持され得る。これにより防水カバーを電気機器本体に取付ける際または防水カバーを電気機器本体から取外す際に防浸部材が脱落することが防止され得る。

[0011] 他の特徴によると防水カバー保持機構は、防水カバーが被せられる電気機器本体の外周面に形成された雄ネジと、防水カバーの内周面に形成されて雄ネジと螺合される雌ネジを有し得る。したがって防水カバーの開口周縁が電気機器本体のカバー受け部に対し周方向に均一な力で押圧され得る。また電気機器本体と防水カバーを確実に連結し得る。

[0012] 他の特徴によると防水カバーの開口周縁は、カバー受け部に当接可能なリング先端面と、リング先端面の半径方向内側にてリング先端面と同軸に位置するテーパ面を有し得る。防浸部材がカバー受け部とテーパ面の間に挟まれて半径方向及び軸方向に押圧されるように構成され得る。

[0013] 他の特徴によると充電式の電気機器は、電気機器本体、バッテリパック、防水カバー、防水カバー保持機構を有しても良い。バッテリパックは、電気機器本体のバッテリ装着部に接続される。防水カバーは、有底筒形でバッテリパックとバッテリ装着部を水密に覆う。防水カバー保持機構は、防水カバーを電気機器本体に保持するように電気機器本体と防水カバーに設けられる。

図面の簡単な説明

[0014] [図1]電動ドライバの一部破断側面図である。

[図2]電動ドライバの分解側面図である。

[図3]図１のIII矢視拡大図である。

[図4]図３のIV矢視拡大図である。

[図5]従来のインパクトドライバの全体斜視図である。

発明を実施するための形態

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[0015] 図１～４を参照して１つの実施の形態を説明する。本形態に係る充電式の電気機器は、充電式の電動ドライバ１０であり、ドライバ本体（電気機器）２０とバッテリパック３０と防水カバー４０を有する。図中の前後及び上下は、電動ドライバ１０の前後及び上下に対応する。

[0016] 図１，２に示すようにドライバ本体２０は、ネジ締め等に使用されるハンディタイプの電動工具である。ドライバ本体２０は、側面略Ｔ字形であって、筒状のハウジング本体部２２と、ハウジング本体部２２の下面から下方に突出するグリップ部２４を有する。ハウジング本体部２２にドライバ本体２０の駆動源であるモータと図示省略の歯車機構等が収納される。モータと歯車機構等は、ハウジング本体部２２とほぼ同軸上に配置される。ハウジング本体部２２の前端から軸方向に突出する図番省略の出力軸が設けられる。出力軸の先端にドライバビット等の先端工具が装着されるチャック部２７が設けられる。

[0017] 図２に示すようにドライバ本体２０のグリップ部２４は、グリップ本体２４ｍとグリップ本体２４ｍの下側に位置するバッテリ装着部２８を有する。グリップ本体２４ｍとハウジング本体部２２の境界の前側にトリガ形式の変速スイッチ２５が設けられる。バッテリ装着部２８にバッテリパック３０が下方から連結される。

[0018] 図２に示すようにバッテリ装着部２８の外観は、略円柱形である。バッテリ装着部２８の外径寸法は、グリップ本体２４ｍの下端の外径寸法より若干小さい。バッテリ装着部２８にグリップ部２４とほぼ同軸に収納穴部２８ｈが形成される。収納穴部２８ｈにバッテリパック３０の挿入部３２が軸方向に挿入される。収納穴部２８ｈの断面形状は、バッテリパック３０の挿入部３２の断面形状とほぼ等しい略楕円形である。

[0019] 図１，２に示すようにバッテリパック３０がバッテリ装着部２８に連結され、防水カバー４０がバッテリ装着部２８に被せられる。防水カバー４０は、防水カバー保持機構によってグリップ部２４に保持される。防水カバー保持機構は、バッテリ装着部２８の外周面の全体に亘って形成される雄ネジ２

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８ｍと、防水カバー４０の内周面に形成される雌ネジ４３を有する。防水カバー４０は、雌ネジ４３が雄ネジ２８ｍに螺合されることでグリップ部２４に保持される。

[0020] 図１，２に示すようにバッテリ装着部２８は、グリップ本体２４ｍと同軸に形成される。グリップ本体２４ｍとバッテリ装着部２８の境界にリング状のカバー受け部２９が形成される。図４に示すようにカバー受け部２９は、カバー受け部２９の全周に亘って延出する段差部２９ｄと、段差部２９ｄに沿って形成されるリング溝部（凹部）２９ｋを有する。リング溝部２９ｋにゴム製のオーリング２９ｒ等の防浸部材が嵌め込まれる。防浸部材は、カバー受け部２９と防水カバー４０の開口周縁間を水密にシールする。

[0021] 図１，２に示すようにバッテリパック３０は、挿入部３２と蓋部３４を有する。挿入部３２は、バッテリ装着部２８の収納穴部２８ｈに挿入される。蓋部３４は、収納穴部２８ｈの開口を塞ぐ。挿入部３２は、収納穴部２８ｈと等しい断面形状である。挿入部３２の挿入先端に電極３２ｐ，３２ｎが設けられる。蓋部３４と挿入部３２の境界に鉤部３４ｔが設けられる。挿入部３２をバッテリ装着部２８に挿入すると、鉤部３４ｔがバッテリ装着部２８に設けられた図示省略の鉤受け部に係合する。これによりバッテリパック３０とドライバ本体２０が連結されかつ電気的に接続される。

[0022] 図２に示すように鉤部３４ｔに操作部３４ｈが一体に設けられる。操作部３４ｈが押されることで鉤部３４ｔが弾性力に抗してロック位置からロック解除位置まで変位する。これにより鉤部３４ｔが鉤受け部から外れ得る。

[0023] 図１，２に示すように防水カバー４０は、グリップ部２４（バッテリ装着部２８）とバッテリパック３０間の防水性を確保する。防水カバー４０は、バッテリ装着部２８とバッテリパック３０を覆うように有底円筒形あるいはキャップ状である。防水カバー４０の外径寸法は、カバー受け部２９の外径寸法と等しい。このため防水カバー４０の開口周縁がカバー受け部２９に当接すると、防水カバー４０の外周面がグリップ部２４の外周面と連続する。

[0024] 図１，２に示すように防水カバー４０の内径寸法は、バッテリ装着部２８

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の外径寸法とほぼ等しい。防水カバー４０の内周面には、バッテリ装着部２８の雄ネジ２８ｍと螺合可能な雌ネジ４３が形成される。防水カバー４０の深さ寸法は、カバー受け部２９からバッテリパック３０の蓋部３４の先端（下端）までの寸法よりも若干大きい。

[0025] 図２－４に示すように防水カバー４０は、開口４５の周縁にリング先端面４５ｆとテーパ面４５ｔが設けられる。リング先端面４５ｆは、ドライバ本体２０の段差部２９ｄに当接される。テーパ面４５ｔは、リング先端面４５ｆの半径方向内側にリング先端面４５ｆと同軸に形成される。テーパ面４５ｔは、オーリング２９ｒを軸方向へ押し、かつオーリング２９ｒを半径方向外側から押す。

[0026] 図１，２に示すようにバッテリパック３０をドライバ本体２０に連結し、バッテリ装着部２８の雄ネジ２８ｍに防水カバー４０の雌ネジ４３を螺合させる。これにより防水カバー４０がバッテリ装着部２８とバッテリパック３０を覆う。防水カバー４０のリング先端面４５ｆが段差部２９ｄに全周に亘って当接し、テーパ面４５ｔがオーリング２９ｒを押圧する。これにより防水カバー４０の開口４５の周縁とドライバ本体２０のカバー受け部２９のシール性が確保される。

[0027] 上述するようにバッテリ装着部２８とバッテリパック３０が有底筒形の防水カバー４０に覆われる。防水カバー保持機構（バッテリ装着部２８の雄ネジ２８ｍと防水カバー４０の雌ネジ４３）は、防水カバー４０のリング先端面４５ｆとテーパ面４５ｔ（開口周縁）を全周に亘ってドライバ本体２０のカバー受け部２９に水密に当接させる。

[0028] このため防水カバー４０とドライバ本体２０間のシール性が確保される。防水カバー４０は、単一の部材である。一方従来のカバーは、複数の部材を組み合わせて構成される。そのため防水カバー４０は、従来の構造に比べてシール性に優れ得る。

[0029] 図１，２に示すように防水カバー保持機構は、バッテリ装着部２８の雄ネジ２８ｍと防水カバー４０の雌ネジ４３を有する。そのため防水カバー保持

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機構は、防水カバー４０の開口周縁をドライバ本体２０のカバー受け部２９に周方向に均一な力で押し付け得る。また防水カバー保持機構は、ドライバ本体２０と防水カバー４０を確実に連結し得る。

[0030] 図４に示すようにオーリング（防浸部材）２９ｒは、リング溝部２９ｋに保持される。そのため防水カバー４０をドライバ本体２０に取付ける際あるいは防水カバー４０をドライバ本体２０から取外す際、オーリング２９ｒがカバー受け部２９から脱落することが防止され得る。

[0031] 本発明の形態を上記構造を参照して説明したが、本発明の目的を逸脱せずに多くの交代、改良、変更が可能であることは当業者であれば明らかである。したがって本発明の形態は、添付された請求項の精神と目的を逸脱しない全ての交代、改良、変更を含み得る。例えば本発明の形態は、前記特別な構造に限定されず、下記のように変更が可能である。

[0032] 上述するように防水カバー保持機構は、バッテリ装着部２８の雄ネジ２８ｍと防水カバー４０の雌ネジ４３を有し得る。これに代えて防水カバー保持機構は、防水カバー４０をグリップ部２４に取付けるための複数のネジを有していても良い。あるいは防水カバー保持機構は、係合バンドを有し、係合バンドのバネ力によって防水カバー４０の開口周縁をドライバ本体２０のカバー受け部２９に当接させても良い。

[0033] 上述するようにドライバ本体２０は、バッテリパック３０が挿入されて装着されるバッテリ装着部２８を有する。これに代えてドライバ本体２０は、バッテリパックがスライドされて装着されるバッテリ装着部を有していても良い。

[0034] 上述するようにドライバ本体２０のカバー受け部２９は、段差部２９ｄとリング溝部２９ｋを有し、リング溝部２９ｋにオーリング２９ｒが嵌め込まれる。この構造に代えて防水カバー４０の開口周縁を例えばシール性を有する弾性部材等により形成しても良い。

[0035] 上述するように電気機器は、電動ドライバ１０でも良い。これに代えて電気機器は、他の電動工具、あるいは電動工具以外の草刈機または刈り込み機

等、ポリッシャーを使用する洗浄機器等でも良い。

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請求の範囲

[請求項1] 充電式の電気機器であって、

バッテリ装着部を備える電気機器本体と、

前記バッテリ装着部に接続されるバッテリパックと、

有底筒形で前記バッテリパックと前記バッテリ装着部を覆う防水カバーと、

前記防水カバーの開口周縁の全周と水密に当接するように前記電気機器本体に形成されたカバー受け部と、

前記防水カバーの前記開口周縁を前記カバー受け部に当接した状態に保持する防水カバー保持機構を有する充電式の電気機器。

[請求項2] 請求項１に記載の充電式の電気機器であって、

前記防水カバー保持機構は、前記防水カバーの前記開口周縁を前記カバー受け部に周方向に均一な力で押圧するように構成される充電式の電気機器。

[請求項3] 請求項１又は２に記載の充電式の電気機器であって、

前記カバー受け部と前記防水カバーの開口周縁を水密に保持するように前記カバー受け部と前記防水カバーの開口周縁に挟持される防浸部材を有する充電式の電気機器。

[請求項4] 請求項３に記載の充電式の電気機器であって、

前記カバー受け部あるいは前記防水カバーの開口周縁には、前記防浸部材が設置される凹部が形成される充電式の電気機器。

[請求項5] 請求項１～４のいずれか１項に記載の充電式の電気機器であって、

前記防水カバー保持機構は、前記防水カバーが被せられる前記電気機器本体の外周面に形成された雄ネジと、前記防水カバーの内周面に形成されて前記雄ネジと螺合される雌ネジを有する充電式の電気機器。

[請求項6] 請求項１～５のいずれか１項に記載の充電式の電気機器であって、

前記防水カバーの開口周縁は、前記カバー受け部に当接可能なリン

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グ先端面と、前記リング先端面の半径方向内側にて前記リング先端面と同軸に位置するテーパ面を有し、

前記防浸部材が前記カバー受け部と前記テーパ面の間に挟まれて半径方向及び軸方向に押圧されるように構成される充電式の電気機器。

[請求項7] 充電式の電気機器であって、

バッテリ装着部を備える電気機器本体と、

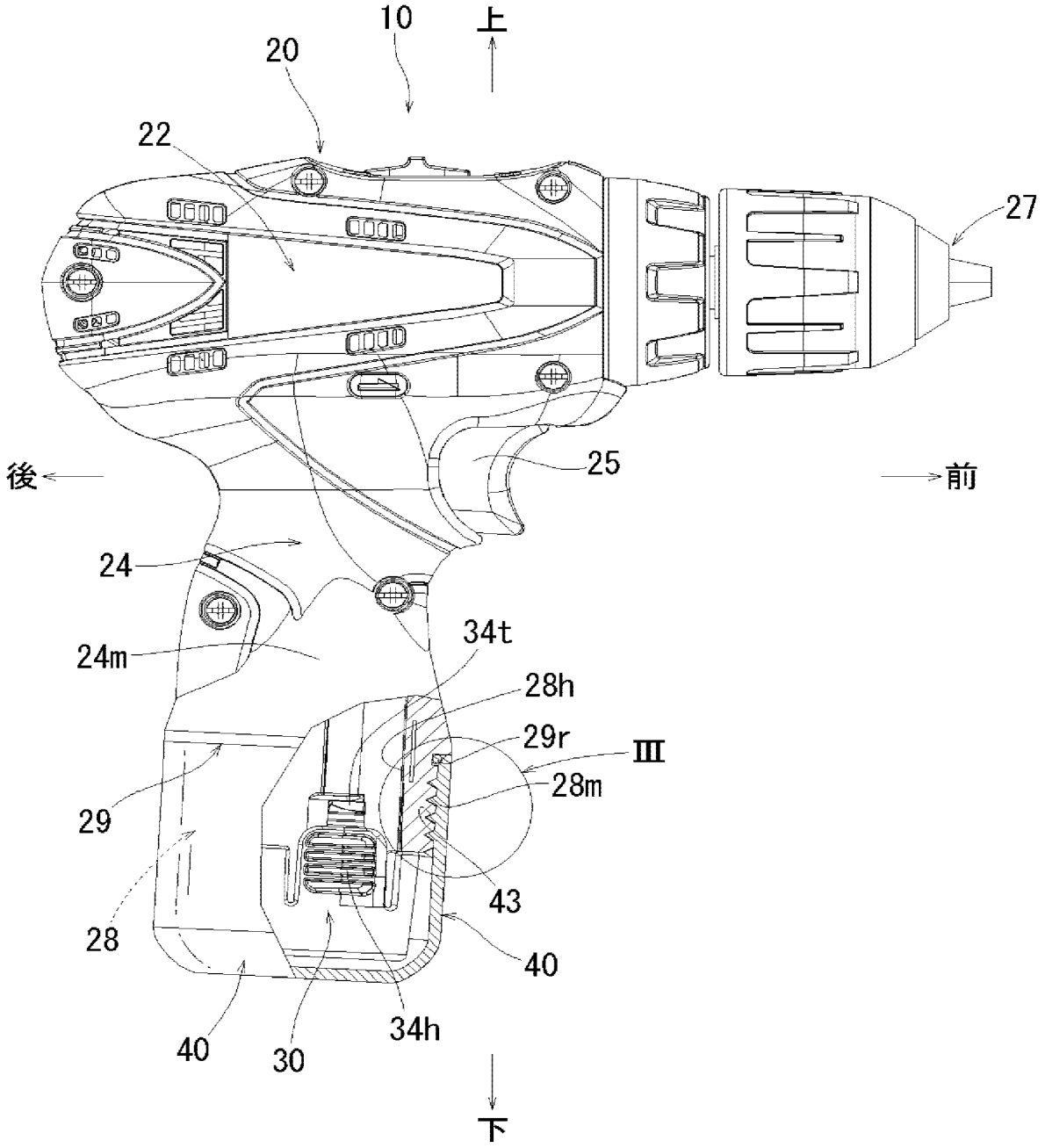
前記バッテリ装着部に接続されるバッテリパックと、

有底筒形で前記バッテリパックと前記バッテリ装着部を水密に覆う防水カバーと、

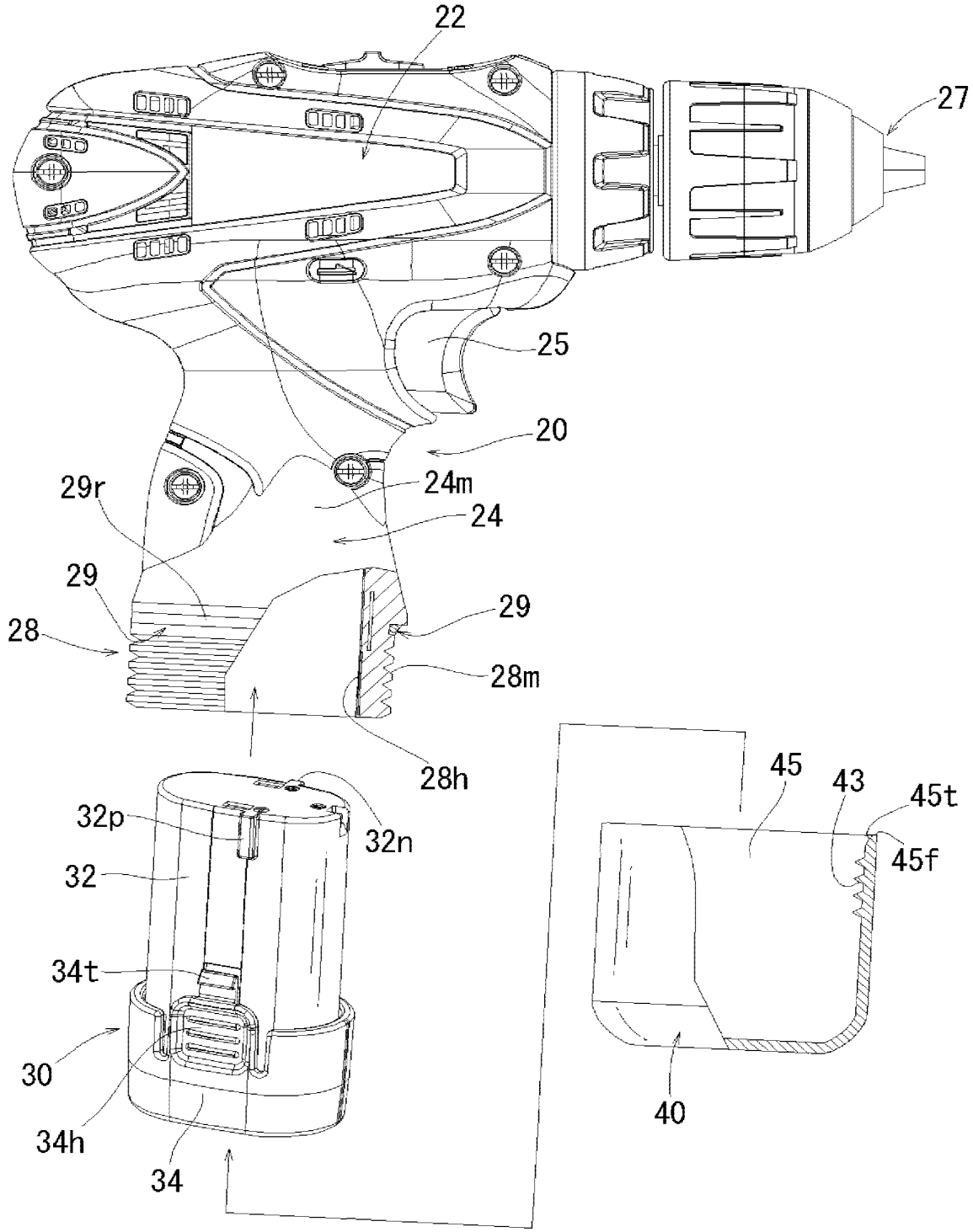
前記防水カバーを前記電気機器本体に保持する充電式の電気機器。

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[図1]

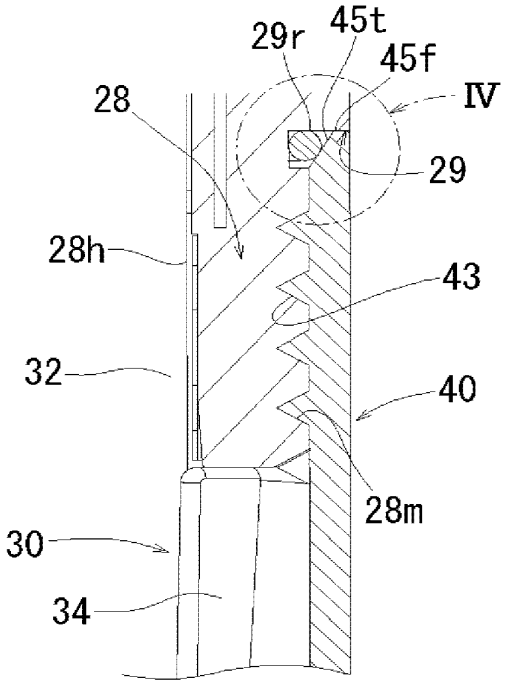


[図2]

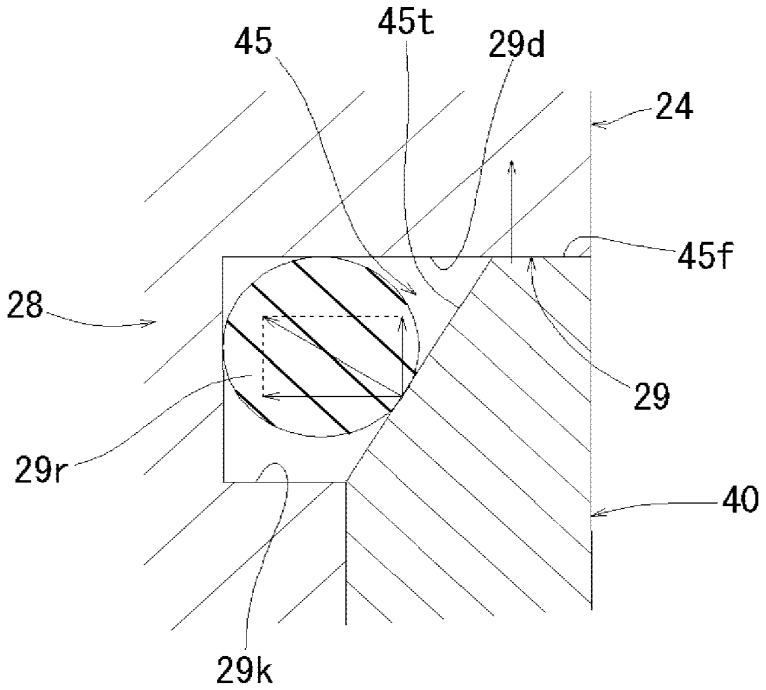


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[図3]



[図4]

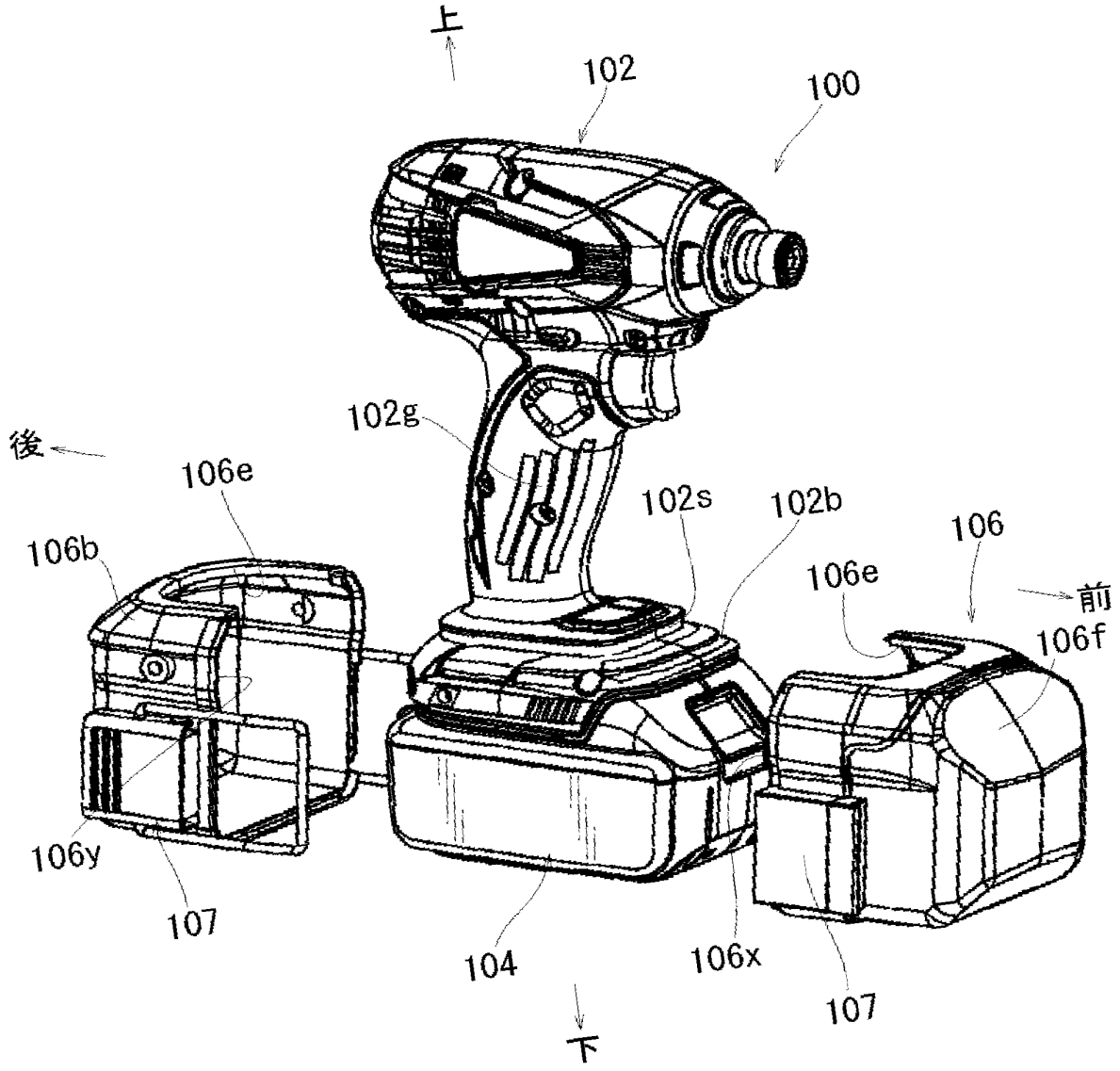


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WO 2014/038359

[図5]



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/071866

A. CLASSIFICATION OF SUBJECT MATTER
B25F5/00(2006.01)i, *B25F5/02*(2006.01)i, *H01M2/10*(2006.01)i

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B25F5/00, B25F5/02, H01M2/10

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2013
Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2009-529758 A (Mag Instrument, Inc.), 20 August 2009 (20.08.2009), paragraphs [0036] to [0038]; fig. 2 & US 2006/0193128 A1 & US 2006/0120069 A1 & US 2012/0133296 A1 & US 2007/0064354 A1 & US 2009/0284170 A1 & US 2010/0013394 A1 & EP 1982563 A & EP 1842119 A & WO 2007/092500 A2 & WO 2006/063061 A2 & CN 101379886 A & KR 10-2009-0003199 A & CN 102612237 A	1-5,7
X Y	JP 9-158483 A (Makita Corp.), 17 June 1997 (17.06.1997), paragraphs [0010], [0020] to [0028]; fig. 1, 6, 7 & US 5725304 A & DE 19651723 A	1-3,7 4

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
02 October, 2013 (02.10.13)	22 October, 2013 (22.10.13)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2013/071866

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 7-220704 A (Seiko Corp.), 18 August 1995 (18.08.1995), paragraphs [0007] to [0014]; fig. 2 (Family: none)	1-3,7 4
Y	JP 2008-310966 A (Sanyo Electric Co., Ltd.), 25 December 2008 (25.12.2008), paragraph [0010]; fig. 1 (Family: none)	4
A	JP 10-69801 A (Mag Instrument, Inc.), 10 March 1998 (10.03.1998), entire text; all drawings & US 4577263 A & US 4577263 A & US 4656565 A & US 4658336 A & EP 236113 A2	1-7
A	JP 2011-140110 A (Makita Corp.), 21 July 2011 (21.07.2011), entire text; all drawings & US 2011/0139479 A1 & EP 2332697 A1 & CN 102107422 A & RU 2010150616 A	1-7

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国際調査報告

国際出願番号　ＰＣＴ／ＪＰ２０１３／０７１８６６

Ａ．　発明の属する分野の分類（国際特許分類（ＩＰＣ））

Int.Cl.　B25F5/00(2006.01)i, B25F5/02(2006.01)i, H01M2/10(2006.01)i

Ｂ．　調査を行った分野

調査を行った最小限資料（国際特許分類（ＩＰＣ））

Int.Cl.　B25F5/00, B25F5/02, H01M2/10

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	１９２２－１９９６年
日本国公開実用新案公報	１９７１－２０１３年
日本国実用新案登録公報	１９９６－２０１３年
日本国登録実用新案公報	１９９４－２０１３年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

Ｃ．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求項の番号
X	JP 2009-529758 A（マグ　インスツルメント　インコーポレーテッド）2009.08.20, 【0036】-【0038】,図２ & US 2006/0193128 A1 & US 2006/0120069 A1 & US 2012/0133296 A1 & US 2007/0064354 A1 & US 2009/0284170 A1 & US 2010/0013394 A1 & EP 1982563 A & EP 1842119 A & WO 2007/092500 A2 & WO 2006/063061 A2 & CN 101379886 A & KR 10-2009-0003199 A & CN 102612237 A	1-5,7

☑　Ｃ欄の続きにも文献が列挙されている。

☐　パテントファミリーに関する別紙を参照。

＊　引用文献のカテゴリー

「Ａ」特に関連のある文献ではなく、一般的技術水準を示すもの

「Ｅ」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの

「Ｌ」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）

「Ｏ」口頭による開示、使用、展示等に言及する文献

「Ｐ」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献

「Ｔ」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの

「Ｘ」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの

「Ｙ」特に関連のある文献であって、当該文献と他の１以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの

「＆」同一パテントファミリー文献

国際調査を完了した日	国際調査報告の発送日
０２．１０．２０１３	２２．１０．２０１３

国際調査機関の名称及びあて先
日本国特許庁（ＩＳＡ／ＪＰ）
郵便番号１００－８９１５
東京都千代田区霞が関三丁目４番３号

特許庁審査官（権限のある職員）　４Ｘ　９３５４
井原　純
電話番号　０３－３５８１－１１０１　内線　３４７７

Petitioner Therabody Ex-1004, 0344

Ｃ（続き）．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求項の番号
X Y	JP 9-158483 A（株式会社マキタ）1997.06.17, 【0010】，【0020】－【0028】，図 1,6,7 & US 5725304 A & DE 19651723 A	1-3,7 4
X Y	JP 7-220704 A（株式会社精工舎）1995.08.18, 【0007】－【0014】，図２（ファミリーなし）	1-3,7 4
Y	JP 2008-310966 A（三洋電機株式会社）2008.12.25, 【0010】，図１（ファミリーなし）	4
A	JP 10-69801 A (マグ・インストウルメント・インコーポレイテツド) 1998.03.10, 全文，全図 & US 4577263 A & US 4577263 A & US 4656565 A & US 4658336 A & EP 236113 A2	1-7
A	JP 2011-140110 A（株式会社マキタ）2011.07.21, 全文，全図 & US 2011/0139479 A1 & EP 2332697 A1 & CN 102107422 A & RU 2010150616 A	1-7

Petitioner Therabody Ex-1004, 0345

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION CONCERNING
TRANSMITTAL OF COPY OF INTERNATIONAL
PRELIMINARY REPORT ON PATENTABILITY
(CHAPTER I OF THE PATENT COOPERATION TREATY)

(PCT Rule 44bis.1(c))

To:

MARTIN C. GOMEZ
Goodwin Procter LLP
100 Northern Avenue
Boston, Massachusetts 02210
ÉTATS-UNIS D'AMÉRIQUE

Date of mailing *(day/month/year)* 11 May 2023 (11.05.2023)	
Applicant's or agent's file reference HYP-002WO	**IMPORTANT NOTICE**

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2021/057033	28 October 2021 (28.10.2021)	28 October 2020 (28.10.2020)

Applicant
HYPER ICE, INC.

The International Bureau transmits herewith a copy of the international preliminary report on patentability (Chapter I of the Patent Cooperation Treaty)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer
Agnès Wittmann-Regis
e-mail pct.team6@wipo.int
Telephone No. +41 22 338 74 06

Form PCT/IB/326 (revised January 2020)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44*bis*)

Applicant's or agent's file reference HYP-002WO	**FOR FURTHER ACTION**	See item 4 below
International application No. PCT/US2021/057033	International filing date *(day/month/year)* 28 October 2021 (28.10.2021)	Priority date *(day/month/year)* 28 October 2020 (28.10.2020)
International Patent Classification (IPC) or national classification and IPC See relevant information in Form PCT/ISA/237		
Applicant HYPER ICE, INC.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 *bis*.1(a).

2. This REPORT consists of a total of 8 sheets, including this cover sheet.

   In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44*bis*.3(c) and 93*bis*.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44*bis* .2).

	Date of issuance of this report 02 May 2023 (02.05.2023)
The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Agnès Wittmann-Regis e-mail pct.team6@wipo.int

Form PCT/IB/373 (revised January 2020)

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

see form PCT/ISA/220

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US2021/057033	28.10.2021	28.10.2020

International Patent Classification (IPC) or both national classification and IPC
INV. A61H23/00 A61H23/02

Applicant
HYPER ICE, INC.

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notifed the International Bureau under Rule 66.1*bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:	Date of completion of this opinion	Authorized Officer
European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465	see form PCT/ISA/210	Turmo, Robert Telephone No. +49 89 2399-0

Form PCT/ISA/237 (Cover Sheet) (January 2015)

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a))

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

Petitioner Therabody Ex-1004, 0349

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	
	No:	Claims	1-20
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-20
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Petitioner Therabody Ex-1004, 0350

1 **State of the art**

Reference is made to the following documents:

D1: WO2020101725A1

D2: CN111759711A (*)

* see annexed translation

2 **Re Item V**

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

2.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent **claim 1** is not new in the sense of Article 33(2) PCT.

2.1.1 Document **D1** discloses all the technical features defined in claim 1:

"A method for determining a pressure level of a massage applicator, the method comprising:

obtaining a first value for a parameter of a motor (current magnitude) of the applicator when the applicator has no load (paragraphs [0165], [0175]-[0179]);

obtaining a second value for the parameter of the motor (current magnitude) when the applicator has a load (paragraph [0181]);

determining a difference value between the first value and the second value (paragraph [0182]);

comparing the difference value to two or more predetermined ranges of values that correspond to a pressure level of the applicator (levels 1 to 3; paragraphs [0183]-[0197]); and

selecting the predetermined range that comprises the difference value, thereby determining the pressure level of the applicator (paragraphs [0183]-[0197])".

The subject-matter of claim 1 is therefore not new (Article 33(2) PCT).

2.1.2 The subject-matter of claim 1 is also fully anticipated by document **D2**.

Petitioner Therabody Ex-1004, 0351

2.2 Furthermore, all the additional features defined in the dependent **claims 2 to 13** are either explicitly or implicitly disclosed in documents D1 (claims 2 to 10 and 13) and D2 (claims 5 and 8 to 13); and/or suggest only slight constructional changes (claims 11 and 12) in the method for determining a pressure level of a massage applicator of claim 1, which come within the scope of the customary practise followed by persons skilled in the art, especially as the advantages thus achieved can be readily contemplated in advance.

Hence, the subject-matter of dependent **claims 2 to 13** is not novel (Article 33(2) PCT).

In particular:

2.2.1 Document **D1** discloses a method for determining a pressure level of a massage applicator wherein:

- "obtaining the first value of the parameter comprises obtaining the first value of the parameter at each of a plurality of vibration levels, the vibration levels related to a speed of the motor (paragraph [0205])" (**claim 2**);
- "obtaining the first value of the parameter comprises:

  obtaining at least 40 first values of the parameter; and

  averaging the at least 40 first values to determine the average first value of the parameter (paragraphs [0177], [0178]; figure 31)" (**claim 3**);
- "the parameter is a rotation speed (paragraph [0136])" (**claim 5**);
- "the parameter is a reading of variations in a rotation pulse (paragraph [0136])" (**claim 6**);
- "the parameter is a duty cycle of a control signal (paragraph [0139])" (**claim 7**);
- "it further comprises providing the determined pressure level of the applicator in a user interface (paragraph [0186])" (**claim 8**);
- "the user interface is at least one of: (i) a plurality of LEDs (1752A-C; paragraph [0186]); (ii) a plurality of auditory signals; or (iii) a plurality of vibratory signal" (**claim 9**); and
- "the first value of the parameter is obtained following assembly of the massage applicator and before regular use (paragraph 175)" (**claim 13**).

Petitioner Therabody Ex-1004, 0352

2.3 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of independent **claim 14** is not new in the sense of Article 33(2) PCT.

The subject-matter of claim 14 is directed to a massage applicator comprising features that correspond to the steps of the method for determining a pressure level of a massage applicator defined in claim 1. Thus, the patentability objection raised above for claim 1 (see item 2.1) extends to claim 14 as well.

2.4 Furthermore, all the additional features defined in the dependent claims 15 to 20 are already disclosed in documents D1 (claims 15 to 20) and D2 (claims 17 and 20). Hence, the subject-matter of dependent **claims 15 to 20** is not novel (Article 33(2) PCT).

In particular, the subject-matter of **claims 15 to 20** is directed to a massage applicator comprising features that correspond to the steps of the method for determining a pressure level of a massage applicator defined in claims 2, 4 to 8, respectively. Thus, the patentability objections raised above for claims 2, 4 to 8 (see item 2.2) also apply to claims 15 to 20.

2.5 The industrial applicability of **claims 1 to 20** is self-evident (Article 33(4) PCT).

3 **Re Item VII**

Certain defects in the international application

3.1 The application does not meet the requirements of Article 6 PCT, because **claim 20** is not clear.

3.1.1 Due to the fact that the "processor" is not defined in claim 1, on which **claim 20** depends, its dependency is incorrectly formulated. At present, it appears that claim 20 should have been reformulated as dependent on claim 14. For the purpose of this opinion, as best understood, claim 20 has been interpreted to depend on claim 14, not claim 1.

3.2 Independent **claims 1 and 14** are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (**D1**) being placed in the preamble (Rule 6.3(b)(i) PCT) and the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

3.3 The features of the **claims** are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

Petitioner Therabody Ex-1004, 0353

3.4 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in documents **D1** and **D2** is not mentioned in the description, nor are these documents identified therein.

Petitioner Therabody Ex-1004, 0354

Espacenet

Bibliographic data: JPS63126821 (A) — 1988-05-30

COMPOSITION FOR SUGAR COATING

Inventor(s): NODA KINSABURO; NOGAMI YUUSHIROU; NISHIDA CHIKASHI ± (NODA KINSABURO, ; NOGAMI YUUSHIROU, ; NISHIDA CHIKASHI, ; NOGAMI JUSHIRO, ; NISHIDA CHIKAYUKI)

Applicant(s): SHIONOGI & CO ± (SHIONOGI & CO LTD, ; SHIONOGI SEIYAKU KK)

Classification: **- international:** ***A61K47/00; A61K47/36; A61K47/42; A61K9/28;*** (IPC1-7): A61K47/00; A61K9/28

- cooperative:

Application number: JP19860271000 19861113

Priority number(s): JP19860271000 19861113

Also published as: JPH0733329 (B2)

Abstract of JPS63126821 (A)

PURPOSE:To obtain the titled composition having proper integrity, extending and spreading characteristics and drying properties, exerting a slight bad influence on other additives used in sugar coating operation, containing sucrose, pullulan, gelatin and low-molecular gelatin. CONSTITUTION:A composition for sugar coating containing (A) sucrose, (B) pullulan having preferably 10,000-1,000,000 molecular weight, (C) gelatin having 61,000-67,000 average-molecular weight and (D) low-molecular gelatin obtained by hydrolyzing an ordinary gelatin, having 4,000-10,000 molecular

Petitioner Therabody Ex-1004, 0355

weight in a weight ratio of 0.35-3.5wt% component B, 0.25-2.5wt% component C and 0.5-3.5wt% component D based on the sucrose. Sugar coated preparation obtained by using the composition does not show much prolongation of disintegration with time and has extremely slight fading of color tone.

Petitioner Therabody Ex-1004, 0356

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Notice

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DESCRIPTION JPS63126821A

[0001]

[Industrial Application Field] The present invention relates to a solid pharmaceutical product, that is, a sugar coating composition for applying sugar coating to fine granules, granules or tablets, a large sword, or the like. [Prior Technique] As is well known, sugar coating technology in the pharmaceutical field is one of the coating methods commonly used for the purpose of protecting and / or tasting, odorizing, etc. of a pharmaceutical active ingredient (main agent). This sugar coating operation is performed by frequently pouring sugar-coated syrup mainly composed of an aqueous solution of sucrose into solid preparations such as fine granules, granules or tablets, and large swords of pharmaceutical products, and repeatedly drying the syrup. A sucrose-coated layer is formed on the outer surface of the solid preparation. By the way, gelatin and / or gum arabic powder have been widely used as a binder for this sugar-coated syrup. Occasionally, in addition to this, one or a mixture of two or more water-soluble viscous substances such as polyvinylpyrrolidone, polyvinyl alcohol, sodium alginate or pullulan was used in combination. However, among these known binders in sugar coating syrups, other substances other than Arabics rubber powder promote the fading of colorants (water-soluble food dyes can be frequently used) that are generally used at the same time in sugar coating operations. This tendency is particularly remarkable in the case of red and fruit colorants, and even when used in combination with an aluminum lake dye, which is generally considered to be less likely to fade than the water-soluble food dye, such inconvenience is slightly present. Be looked at. Furthermore, it has been pointed out that when gelatin is used as a binder, the disintegration time of the sugar-coated preparation is prolonged over time. On the other hand, when gum arabic powder is used, although the above-mentioned inconveniences are small, there is a slight difficulty in the covering property itself, and therefore, if a large amount of the gum arabic powder is used, cracks may occur during drying. Therefore, it is not preferable, and moreover, so-called natural product-derived products such as gum arabic powder have a localized production area, and their production volume fluctuates depending on the local weather conditions. For example, I was a little worried about the stable supply. Under such circumstances, some improvement proposals for such a binder have already been made. For example, Japanese Patent Application Laid-Open No. 58-219220 describes a sugar coating method for a solid preparation using purulan and / or water-soluble purulan. Also disclosed in Japanese Patent Publication No. 44-22316, vinyl pyrrolidone homopolymer, vinyl acetate homopolymer, vinyl alcohol homopolymer, vinyl alcohol / vinyl acetate copolymer and vinyl pyrroildone / vinyl acetate. A method for producing a sugar-coated tablet, which comprises using a vinyl polymer selected from the group consisting of a copolymer, is disclosed.

However, when pullulan is used alone as a binder for sugar-coated syrup, pullulan has excellent spreadability but dries slowly, so that adhesion is particularly poor in the syrup portion of tablets and the like, and a uniform sugar-coated layer is formed. In addition, when the vinyl polymer is used alone, it is difficult to obtain a smooth sugar-coated layer because the syrup has sufficient binding property but dries quickly. [Problems to be Solved by the Invention] As described above, the present invention is inconvenient in using a binder in known sugar-coated syrups, that is, uniform due to poor adhesion to solid formulations due to slow drying when pullulan is used alone. This is an attempt to solve the problems that it is difficult to form a smooth sugar-coated layer and that it is difficult to form a smooth sugar-coated layer due to quick-drying when the vinyl polymer is used alone. [Means for Solving Problems] The present invention is proposed for solving the above-mentioned problems, and uses sucrose, pullulan, gelatin and low molecular weight gelatin as a composition for sugar coating. be. [Usage] Since the present invention is a composition for sugar coating containing sucrose, pullulan, gelatin and low molecular weight gelatin as essential components as described above, the composition itself has appropriate binding properties, ductility and drying properties. In addition, there is very little adverse effect (fading effect) on other additives that are often used at the same time in sugar coating work, such as coloranis. [Example] The composition for sugar coating according to the present invention contains sucrose, pullulan, gelatin and low molecular weight gelatin as essential components as described above. Here, the sucrose is a known sucrose which is a main component of various syrups widely used in the field of medicine or food. The pullulan is an extracellular viscous substance obtained by culturing pullularia pullulan, which was discovered by Bauer in 1938, and was found in 1959 by Bender et al. (Biochem). Using maltotriose, which is a glucose trimer whose structure was clarified by Biophys, Acta, 36309 (1957) 1, as a unit, repeated binding by α-1,6 binding, which is a binding different from this trimer. It is a natural polymer linear polymer. The physical properties of this pullulan differ slightly depending on the type of strain and the

Petitioner Therabody Ex-1004, 0357

culture conditions, but in the present invention, any of them can be used, and the molecular weight thereof is not particularly limited, preferably 10,000 or more, s. oooo, oooo. The following may be preferable, and the pullulan may be a water-soluble pullulan derivative synthesized by a general synthesis / method using the pullulan as a raw material, for example, a water-soluble pullulan ether, the same ester, or the like.

On the other hand, as the gelatin, known gelatin having an average molecular weight of 61,000 to 67,000, which is also commonly used in this field, can be used as it is. Further, the small molecule gelatin used in the present invention is a water-soluble gelatin having an average molecule t of 4,000 to 10,000 obtained by hydrolyzing the above-mentioned ordinary gelatin. The composition for sugar coating according to the present invention contains the above-mentioned pullulan, gelatin and low-molecular-weight gelatin in an amount of 0.35 to 3.5% (% by weight, the same applies hereinafter) and 0.25 to 2.5%, respectively, with respect to shirasu. And it is used in the range of 0.5 to 3.5%. That is, when the amount of pullulan used for sucrose is less than 0.35%, the binding (adhesiveness) of the sugar-coated syrup is insufficient, and when it exceeds 3 or 5%, the drying property of the syrup deteriorates. In any case, it becomes difficult to form a uniform syrup layer. When the amount of gelatin used is less than 0.25% with respect to sucrose, the binding property of the sugar-coated syrup is not sufficient, and when it exceeds 2.5%, the sugar-coated preparation made using the syrup is used. It causes the inconvenience that the disintegration property is prolonged over time. Further, when the amount of the small molecule gelatin used is less than 0.5% with respect to sucrose, the binding property of the syrup for sugar coating becomes insufficient as in the above-mentioned case, and when it exceeds 3 or 5%, the sugar coating becomes sugar-coated. It causes inconveniences such as prolonged disintegration of the pharmaceutical product over time, which is also not preferable in either case. By the way, the composition for sugar coating of the present invention is prepared into a syrup for sugar coating according to a conventional method. That is, a predetermined amount of sucrose, pullulan, gelatin and low molecular weight gelatin may be sequentially added to a predetermined amount of purified water and sufficiently stirred. Of course, the order of addition thereof is not particularly limited, and the working environment at that time. , And can be arbitrarily prepared depending on working conditions and the like. The sugar-coated syrup is used by suspending known powders such as precipitated calcium carbonate, talc, powdered sugar and / or calcium sulfate, if necessary. Hereinafter, the present invention will be described in more detail with reference to Examples. Example 1 A bare tablet 193.000 with a diameter of 7.0 mm, a weight of 120 mg, and a starch composition was placed in an onion-type sugar-coated bread having a capacity of 1802, and a syrup containing gum arabic powder as a binder and talc as a spraying agent were used. 78 mg of undercoat per tablet covers the layer. For this syrup, coat the tablets with a smoothing solution having the composition shown in the following table for each of the five smoothing layers according to the following procedure, and then apply white 9850 g, purified water 450 g, gelatin 5 g and a dye solution to the tablets. A layer of glue is coated with a colored syrup consisting of 10 m1.

(Hereinafter, margin) The covering conditions of the smoothing layer and the color layer are as shown in the following table. The details of the amount of liquid to be added and the amount of coating when both layers are formed and the work thereof are as follows. [Smoothing layer] According to the coating table in the above table, the undercoat is a tablet coated with a layer, and the sugar coating solution for smoothing is poured and stirred, and after 7 minutes, it is blown to dry. This operation is repeated 20 times to coat the smoothing layer 57 mg / tablet. [Color layer] Add the sugar coating solution for color layer according to the coating table in the above table, stir, and blow air for 5 minutes to dry. This operation is repeated 15 times to coat the color layer 9 mg / tablet, and the tablets coated with the color layer are finished by a usual method to give gloss. When the disintegration property and the light exposure resistance of the sugar-coated tablets thus produced were tested, the following results were obtained. (Margins below) (1) Disintegration test [Test solution purified water (37 ° C)) (Exposure light resistance test test method) Stored in a fluorescent counter with an illuminance of 10,000 lux for 18 days (4.32 million lux). A sensory test is performed on the degree of fading of the color tone after 7, 14, and 18 days. (Hereinafter, margin) In the above table, -1 is slight fading, -2 is slight fading, -3 is small fading (a little redness remains and yellowishness is strong), and -4 is large fading (red). It means no taste and only yellow remains). [Effect of the invention] As is clear from the above experimental results, when purulan, gelatin and low molecular weight gelatin are used as a binder for the sugar-coated syrup as in the sugar-coated composition of the present invention, the finished sugar-coated preparation is prepared. The disintegration property does not show a prolongation over time as much as the left, and the fading of the color tone is extremely slight, so that an excellent sugar-coated preparation can be provided.

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1.

, Pullulan, Gelatin and Small Molecule Gelatin. (2) The amounts of pullulan, gelatin and small molecule gelatin are 0.35 to 3.5% (% by weight, the same applies hereinafter), 0.25 to 2.5%, and 0.5 to 0.5%, respectively, with respect to sucrose. The composition according to claim (1), which is 3.5%. (3) The composition according to claim (1) or 2, wherein the small molecule gelatin is selected from gelatin having a molecular weight in the range of 4000 to 10000.

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(19)日本国特許庁（ＪＰ）　(12)特　許　公　報（Ｂ２）　(11)特許出願公告番号

特公平7－33329

(24)(44)公告日　平成７年(1995)４月12日

(51)Int.Cl.[6]	識別記号	庁内整理番号	ＦＩ	技術表示箇所
Ａ６１Ｋ　9/28	Ａ			
47/36	Ｄ			
47/42	Ｄ			

発明の数１(全　４　頁)

(21)出願番号　特願昭61－271000

(22)出願日　昭和61年(1986)11月13日

(65)公開番号　特開昭63－126821

(43)公開日　昭和63年(1988)５月30日

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(54)【発明の名称】　糖衣用組成物

【特許請求の範囲】

【請求項１】ショ糖、プルラン、ゼラチンおよび低分子ゼラチンを含むことを特徴とする糖衣用組成物。

【請求項２】プルラン、ゼラチンおよび低分子ゼラチンの量が、ショ糖に対してそれぞれ0.35～3.5%（重量%、以下同じ）、0.25～2.5%、および0.5～3.5%である特許請求の範囲第（１）項記載の組成物。

【請求項３】低分子ゼラチンが、分子量4000～10000の範囲のゼラチンから選ばれたものである特許請求の範囲第（１）項または第（２）項記載の組成物。

【発明の詳細な説明】

〔産業上の利用分野〕

本発明は医薬品の固形製剤、すなわち細粒、顆粒または錠剤、丸剤などに糖衣を施すための糖衣用組成物に関するものである。

〔従来技術〕

周知のとおり医薬品分野における糖衣技術は、医薬活性成分（主薬）の保護および／または矯味、矯臭等の目的で繁用されるコーテイング法の１つである。この糖衣作業は、医薬品の細粒、顆粒または錠剤、丸剤などの固形製剤に、主としてショ糖水溶液からなる糖衣用シロップを頻繁に注加し、かつその乾燥を繰り返し実施することにより行われ、前記固形製剤の外表面にはショ糖被覆層が形成される。

ところで、この糖衣用シロップの結合剤としては、従来からゼラチンおよび／またはアラビアゴム末が多用されてきた。また、時には、このものに加えてポリビニールピロリドン、ポリビニールアルコール、アルギン酸ナトリウムあるいはプルランなどの水可溶性粘性物質の１種または２種以上の混合物が併用されることもあった。

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しかしながら、糖衣用シロップにおけるこれら公知の結合剤のうち、アラビアゴム末を除く他の物質は、一般に糖衣作業において同時に使用されることの多い着色剤（水溶性食用色素が多用される）の退色を促進させ、この傾向は特に赤および青系の着色剤の場合に著しい。また、前記水溶性食用色素に比べて一般に退色しにくいとされているアルミニウムレーキ色素との併用時においてもこのような不都合が若干みられる。さらに、結合剤としてゼラチンを使用した場合には、その糖衣製剤の崩壊時間が経時的に延長することが指摘されている。

一方、アラビアゴム末を使用した場合には、上記のような不都合は少ないものの、被覆性自体にやや難点を有し、このため該アラビアゴム末を多量に用いれば乾燥時にヒビ割れを生じたりするので好ましくない。さらに、かかるアラビアゴム末のようないわゆる天然物由来品は、産地が局在し、また現地の時々の気象状況によりその生産量に変動を来すので、需要者の立場からすれば安定供給の面で一抹の不安を有するものであった。

このような状況から、かかる結合在についての改良提案も既にいくつかなされており、例えば、特開昭59－219220号公報には、プルランおよび／または水溶性のプルランの使用による固形製剤の糖衣法が開示されており、また、特公昭44－22316号公報には、ビニールピロリドン単独重合体と酢酸ビニール単独重合体とビニールアルコール単独重合体とビニールアルコール／酢酸ビニール共重合体とビニールピロリドン／酢酸ビニール共重合体とからなる群から選ばれたビニール重合体を使用することを特徴とする糖衣錠剤の製法が開示されている。

しかしながら、糖衣用シロップの結合剤としてプルランを単独で使用した場合、プルランは展延性に優れているものの乾きが遅いので、特に錠剤等のエッジ部における付着性が悪く、均一な糖衣層を形成するのが困難であり、また、ビニール重合体を単独で使用する場合には、シロップの結合性は一応充分であるもののその乾きが速いので、これまた平滑な糖衣層を得るのが困難である。

〔発明が解決しようとする問題点〕

本発明は上述したように公知の糖衣用シロップにおける結合剤の使用上の不都合、すなわちプルラン単独使用時における遅乾性のための固形製剤への付着不良による均一な糖衣層形成が困難なこと、また、ビニール重合体単独使用時における速乾性のための平滑な糖衣層の形成が困難である、といった難点を解消しようとするものである。

〔問題点を解決するための手段〕

本発明は上記のような問題を解決するために提案するものであって、糖衣用組成物としてショ糖、プルラン、ゼラチンおよび低分子ゼラチンを使用するものである。

〔作　用〕

本発明は上記のとおりショ糖、プルラン、ゼラチンおよび低分子ゼラチンを必須の成分として含む糖衣用組成物なので、当該組成物自体適度の結合性、展延性および乾燥性を有し、また、糖衣作業において同時に使用されることの多い他の添加剤、例えば着色剤への悪影響（退色作用）もきわめて少ない。

〔実施例〕

本発明に係る糖衣用組成物は、前述のとおりショ糖、プルラン、ゼラチンおよび低分子ゼラチンを必須の成分として含むものである。ここで、前記ショ糖は、かかる医薬あるいは食品の分野において汎用される各種シロップ類の主成分をなす公知のショ糖である。

また、前記プルラン、プルラリア・プルランスの培養により得られる菌体外粘性物で、1938年にバウアー（R.Bauer）により見出され、1959年にベンダー（H.Bender）等の研究〔Biochem.Biophys.Acta.36 309（1957）〕により構造が明らかとなったグルコースの３量体であるマルトトリオースを単位として、この３量体とは異なった結合であるα－1,6結合により反復結合した天然高分子線状重合体である。このプルランは菌株の種類や培養条件により物性が若干異なるが、本発明においては、いずれのものも用いることができ、その分子量に特に制限はない。好ましくは10,000以上で5,000,000以下のものがよい。また、前記プルランは、該プルランを原料として一般的な合成法により合成される水溶性プルラン誘導体、例えば水溶性プルランエーテル、同エステル等であってもよい。

一方、前記ゼラチンは、これまたこの種分野において常用されるところの平均分子量61,000～67,000の公知のゼラチンをそのまま使用し得る。さらに、本発明において用いられる低分子ゼラチンとは、前記通常のゼラチンを加水分解して得られる平均分子量4,000～10,000の水溶性ゼラチンである。

本発明に係る糖衣用組成物は、上記プルラン、ゼラチンおよび低分子ゼラチンを、それぞれショ糖に対して0.35～3.5%（重量%、以下同じ）、0.25～2.5%および0.5～3.5%の範囲で使用するものである。すなわち、ショ糖に対するプルランの使用量が0.35%未満のときは、糖衣用シロップの結合性（付着性）が充分でなく、また3.5%を越えると当該シロップの乾燥性が悪くなり、いずれにしても均一な糖衣層を形成することが困難となる。また、ゼラチンの使用量がショ糖に対して0.25%未満のときは糖衣シロップの結合性が充分でなく、反対に2.5%を越えると当該シロップを使用して製した糖衣製剤の崩壊製が経時的に延長するという不都合を生じる。さらに、前記低分子ゼラチンの使用量がショ糖に対して0.5%未満のときは、前述の場合と同様に糖衣用シロップの結合性が不充分となり、また3.5%を越えると糖衣製剤の崩壊製の経時的延長といった不都合を生じ、これまたいずれの場合も好ましくない。

ところで、本発明糖衣用組成物は常法に従って糖衣用シロップに調節される。すなわち、所定量の精製水に所定

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量のショ糖、プルラン、ゼラチンおよび低分子ゼラチンを順次添加して充分に撹拌すればよい。もちろん、これらの添加順序には特に制限はなく、その時の作業環境、また作業条件等によって任意に調製し得る。当該糖衣用シロップは、必要に応じて公知の粉末、例えば沈降炭酸カルシウム、タルク、粉糖および／または硫酸カルシウム等を懸濁せしめて使用される。

以下実施例により本発明をさらに具体的に説明する。

実施例１

直径7.0㎜、重量120㎎の乳糖、デンプン組成の裸錠193,000錠を、容量180のオニオン型糖衣パンに入れ、アラビアゴム末を結合剤としたシロップと散布剤にタルクを用いて１錠当り78㎎の下掛け層を被覆する。

この下掛け錠に次表に示す組成のスムーシング液を用いて下記の要領によりそれぞれ５個のスムーシング層を被覆し、次いでそれらの錠剤に、白糖850g、精製水450g、ゼラチン5gおよび色素液10mlからなる着色シロップを用いてカラー層を被覆する。

	実験No. 糖衣剤	本発明	比較例１	比較例２	比較例３	比較例４
糖衣液シロップ	白糖	850g	850g	850g	850g	850g
	精製水	450	450	450	450	450
	プルラン	5	5	—	—	—
	ゼラチン	5	—	5	—	5
	低分子ゼラチン	15	—	—	15	—
	アラビアゴム末	—	—	—	—	15
	色素液	10	10	10	10	10
懸濁液	（着色シロップ）	1335	1315	1315	1325	1330
	沈降炭酸カルシウム	650	650	650	650	650
	タルク	100	100	100	100	100

上記スムーシング層およびカラー層の被覆条件は次表のとおりである。

条件 工程	送風		液温度	被覆間隔
	温度	風量		
スムーシング層	50℃	2.7㎥／分	50℃	20℃
カラー層	50℃	1.8　〃	50℃	15℃

なお、両層形成時のそれぞれの注加液量と被覆量およびその作業の詳細は次のとおりである。

スムーシング

回次	糖衣液
1	1000g
2	850
3～15	730
16～20	650

カラー

回次	糖衣液
1	220g
2～15	180

〔スムーシング層〕

上表のコーテイング表により下掛け層を被覆した錠剤に、スムーシング用糖衣液を注加し、撹拌し、７分後送風乾燥する。この操作を20回反復してスムーシング層57㎎/錠を被覆する。

〔カラー層〕

上表のコーテイング表によりカラー層用糖衣液を注加、撹拌し、５分後送風し乾燥する。この操作を15回反復してカラー層9㎎/錠を被覆する。このカラー層を被覆形成した錠剤を通常の方法でフィニッシングして光沢を付与する。

このようにして製して糖衣錠剤の崩壊性と耐曝光性について試験したところ、次のような結果を得た。

（１）崩壊性試験〔試験液精製水（37℃）〕

実験No.	直後（分）	45℃加温（分）	
		30日後	60日後
本発明	13(11～14)	16(14～17)	20(19～22)
比較例１	13(12～14)	15(14～16)	22(18～23)
比較例２	13(11～14)	16(13～17)	20(18～21)
比較例３	11(10～11)	14(13～15)	18(16～19)
比較例４	14(13～15)	21(19～24)	29(26～32)

（２）耐曝光性試験

試験方法　照度10,000ルックスの螢光灯下に18日間（432万ルックス）保存し、７日、14日、18日後の色調の退色度合いを官能試験する。

実験No.	７日	14日	18日
本発明	－１	－１	－2
比較例１	－２	－４	－
比較例２	－１	－３	－4
比較例３	－１	－３	－4
比較例４	－１	－２	－2.5

なお、上表において、

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－１は、退色軽微、
－２は、退色僅か、
－３は、退色小（赤味が少し残り、黄色味が強い）
－４は、退色大（赤味なし、黄色だけが残る）
をそれぞれ意味する。

〔発明の効果〕

以上の実験結果からも明らかなように本発明糖衣用組成物のようにプルラン、ゼラチンおよび低分子ゼラチンを糖衣用シロップの結合剤として用いた場合には、出来上がった糖衣製剤の崩壊性も経時的な延長を左程示さず、また、その色調の退色もきわめて軽微なものとなり、優れた糖衣製剤を提供し得る。

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1. CN205268525-MULTI-CONTACT ENERGY MUSCLE STIMULATOR

Office
China

Application Number
201520525835.9

Application Date
20.07.2015

Publication Number
205268525

Publication Date
01.06.2016

Publication Kind
U

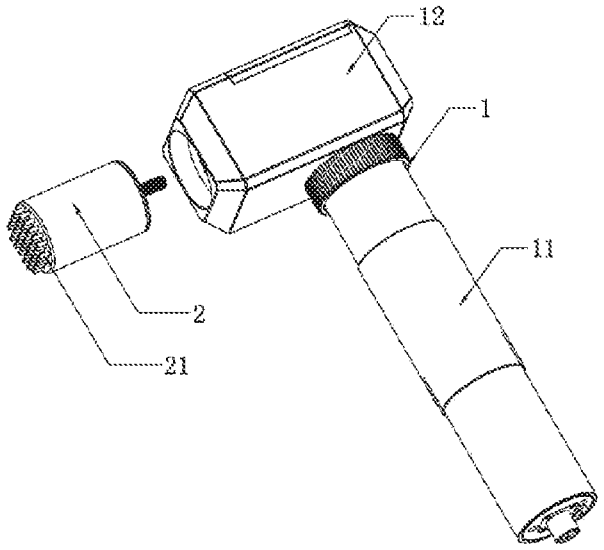
IPC
A61H 15/00 | A61H 23/02

Applicants
广州博什康医疗设备有限公司

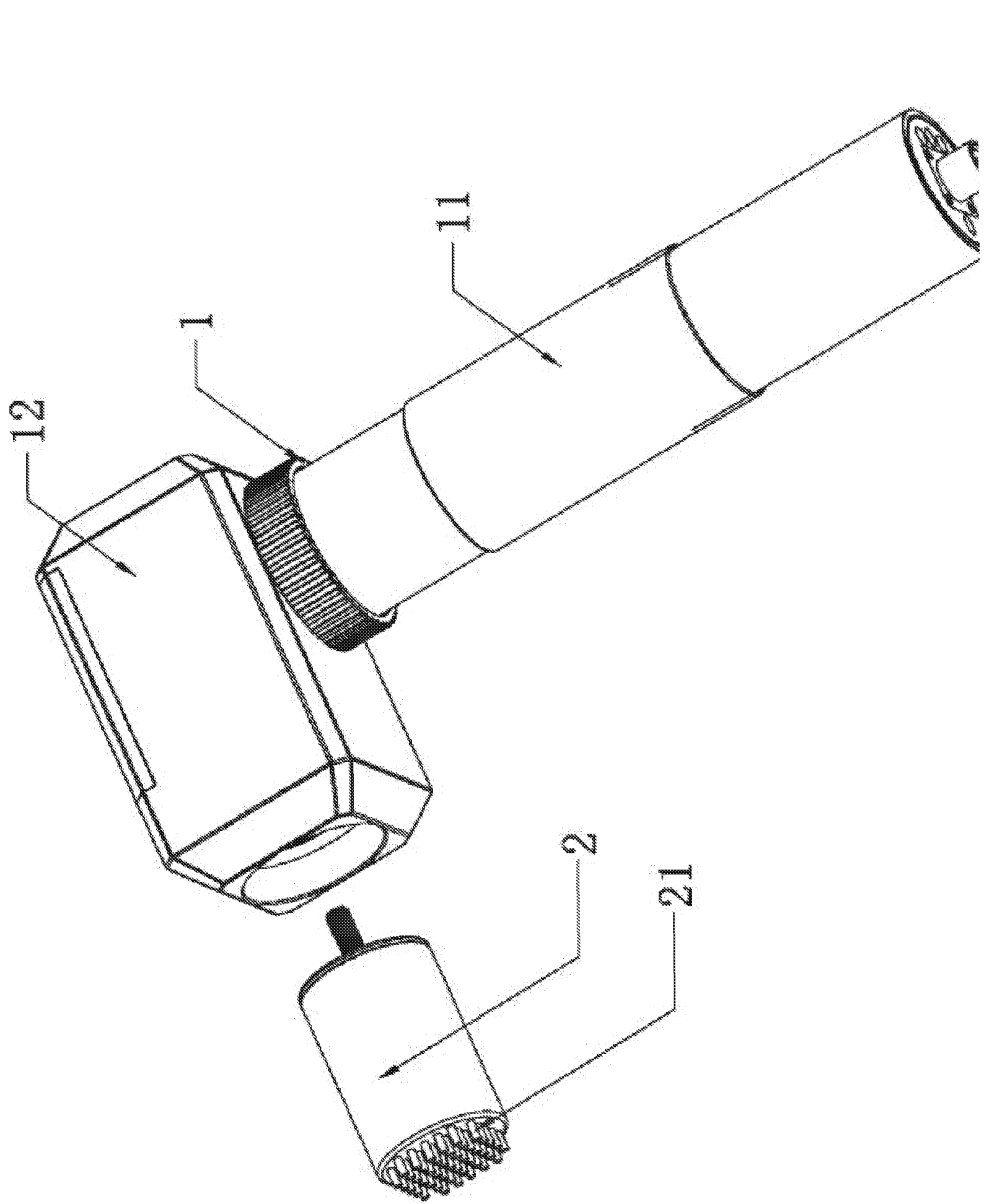
Inventors
刘刚

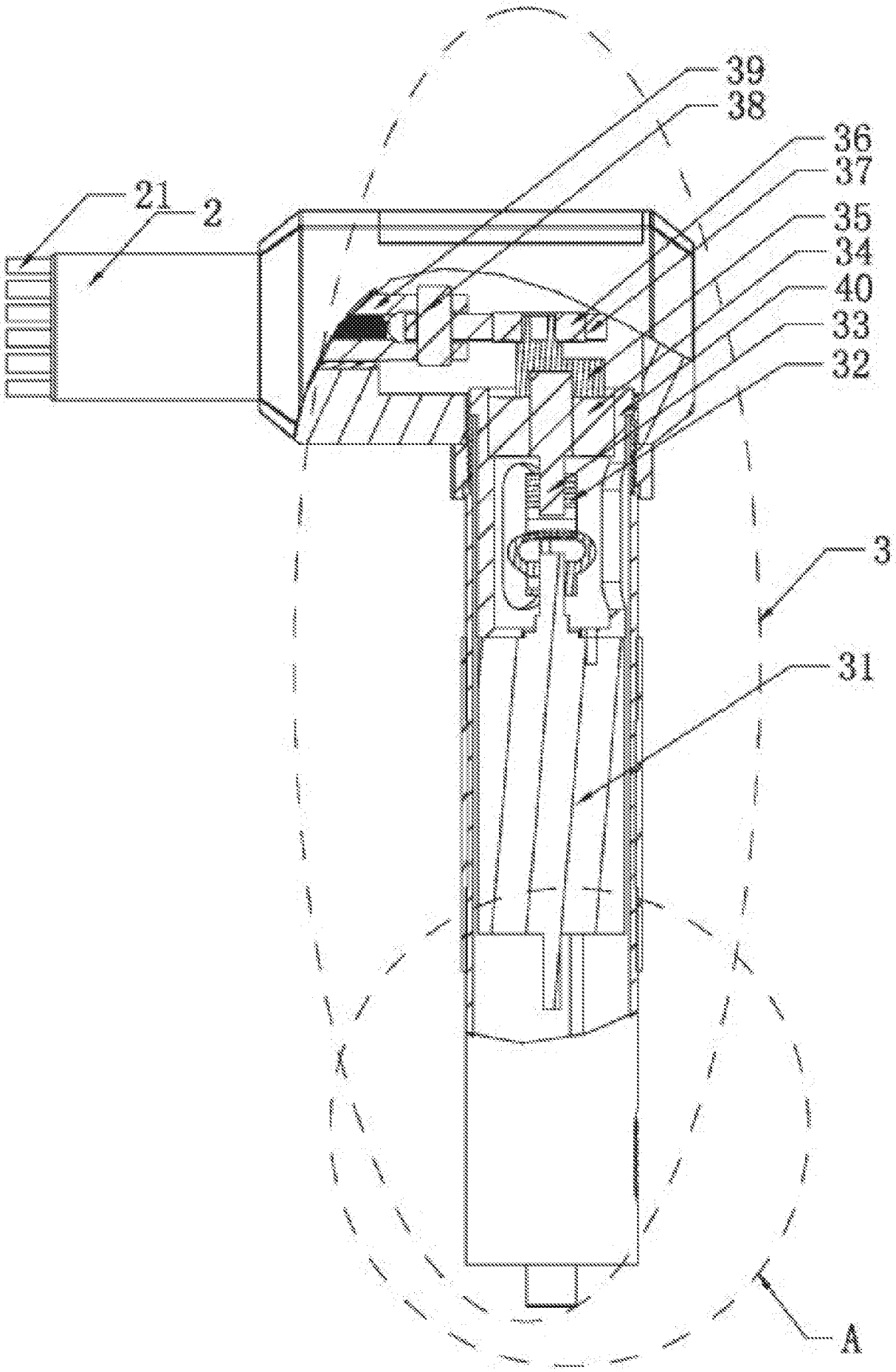
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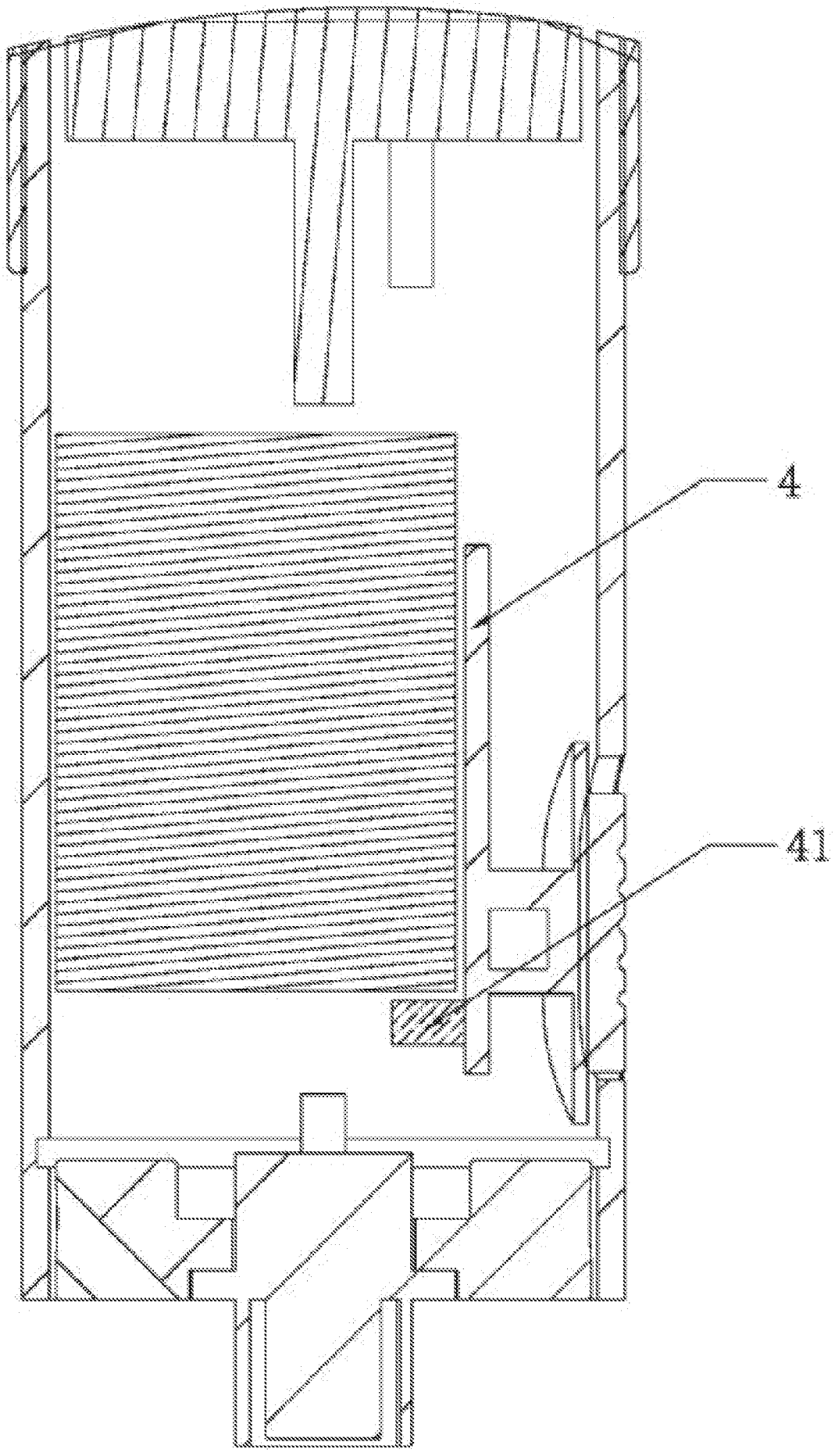
Title
(ZH) Multi-contact energy muscle stimulator

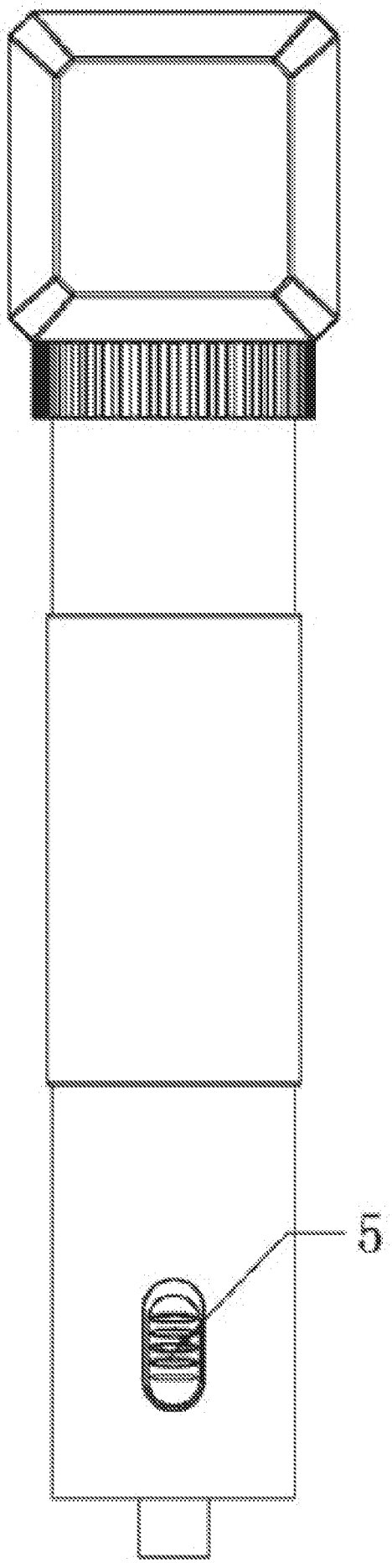


Abstract
(ZH)
A multi-contact energy muscle stimulator relates to the technical field of medical devices. Its structure includes a weighted shell, a detachable integrated treatment head and a power source. The power source includes a power device and an eccentric shaft, and the power device and the eccentric shaft Located inside the ballast housing, the power device drives the eccentric shaft to rotate, and the eccentric shaft drives the treatment head. The utility model has more than two integrated treatment heads that can be disassembled. The massage column, when in contact with the skin, can produce a piezoelectric effect, increase the stimulation intensity, dredge the meridians, and stimulate the muscles better, which helps promote blood circulation and accelerate muscle recovery.


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[权利要求0001]

1.一种多触点能量肌肉刺激仪，其特征在于：包括压重外壳、可拆卸的一体式治疗头和动力源，所述动力源包括动力装置和偏芯轴，所述动力装置和所述偏芯轴设于所述压重外壳的内部，所述动力装置驱动所述偏芯轴转动，所述偏芯轴带动所述可拆卸的一体式治疗头运动，所述可拆卸的一体式治疗头设置有两个以上按摩柱。

[权利要求0002]

2.如权利要求1所述的一种多触点能量肌肉刺激仪，其特征在于：所述两个以上按摩柱的高度一致。

[权利要求0003]

3.如权利要求1所述的一种多触点能量肌肉刺激仪，其特征在于：所述两个以上按摩柱的端部形成曲面。

[权利要求0004]

4.如权利要求1所述的一种多触点能量肌肉刺激仪，其特征在于：所述两个以上按摩柱呈矩阵排列设置。

[权利要求0005]

5.如权利要求1所述的一种多触点能量肌肉刺激仪，其特征在于：所述动力源与所述可拆卸的一体式治疗头螺接。

[权利要求0006]

6.如权利要求1所述的一种多触点能量肌肉刺激仪，其特征在于：所述动力装置包括电机、弹性联轴器、从动轴、大轴承、小轴承、小轴承固定座、梢子和连接轴，所述电机通过所述弹性联轴器转动，所述从动轴与所述弹性联轴器连接，所述大轴承固定于所述从动轴，所述偏芯轴固定于所述大轴承的一侧，所述小轴承设于所述偏芯轴，且固定于所述小轴承固定座，所述连接轴通过梢子固定于所述小轴承固定座，所述可拆卸的一体式治疗头固定于所述小轴承固定座。

[权利要求0007]

7.如权利要求6所述的一种多触点能量肌肉刺激仪，其特征在于：所述压重外壳包括手柄部和治疗头支撑部，所述手柄部和治疗头支撑部互相垂直。

[权利要求0008]

8.如权利要求6所述的一种多触点能量肌肉刺激仪，其特征在于：所述电机设为变频电机。

[权利要求0009]

9.如权利要求6所述的一种多触点能量肌肉刺激仪，其特征在于：所述压重外壳内部还设有电路板，所述电路板设有温度传感器和过温报警电路，所述温度传感器靠近所述电机设置。

[权利要求0010]

10.如权利要求9所述的一种多触点能量肌肉刺激仪，其特征在于：所述电路板还设有时间设置按键。

一种多触点能量肌肉刺激仪

[0001]

技术领域

[0002]

本实用新型涉及医疗器械技术领域，特别是涉及一种多触点能量肌肉刺激仪。

[0003]

背景技术

[0004]

众所周知，为了防止肌肉萎缩，而保持肌张力，应该锻炼肌肉和骨骼。当伤及骨骼、肌肉组织和结缔组织等受伤部位时，通常非常希望在受控方式下在特定参数内使受伤部位附近的肌肉得到锻炼，其中受伤骨骼和/或组织保持稳定。然而，不幸的是，关于特定病人进行规定的锻炼的方式，医生通常不能获得足够信息，或者说没有把握。医生不知道病人可以自愿使用或者将自愿使用多大的力，而且不知道病人是否坚持重复锻炼身体。没有监督的锻炼很可能对受伤组织有不利影响，因此延长了康复时间，而且有时引起无法恢复的损伤。

[0005]

现有技术一般采用电击的方式对肌肉进行恢复或者采用振动的方式刺激肌肉，但是现有技术的振动装置的振动头一般采用平面设置，然而平面设置的治疗头与用户的皮肤的接触面积较大，对肌肉的刺激效果较差。

[0006]

实用新型内容

[0007]

本实用新型的目的在于避免现有技术中的不足之处而提供一种多触点能量肌肉刺激仪，该多触点能量肌肉刺激仪对肌肉的刺激效果更好，有助于促进血液循环，加快肌肉的恢复。

[0008]

本实用新型的目的通过以下技术方案实现：

[0009]

提供一种多触点能量肌肉刺激仪，包括压重外壳、可拆卸的一体式治疗头和动力源，所述动力源包括动力装置和偏芯轴，所述动力装置和所述偏芯轴设于所述压重外壳的内部，所述动力装置驱动所述偏芯轴转动，所述偏芯轴带动所述可拆卸的一体式治疗头运动，所述可拆卸的一体式治疗头设置有两个以上按摩柱。

[0010]

所述两个以上按摩柱的高度一致。

[0011]

所述两个以上按摩柱的端部形成曲面。

[0012]
所述两个以上按摩柱呈矩阵排列设置。

[0013]
所述动力源与所述可拆卸的一体式治疗头螺接。

[0014]
所述动力装置包括电机、弹性联轴器、从动轴、大轴承、小轴承、小轴承固定座、梢子和连接轴，所述电机通过所述弹性联轴器转动，所述从动轴与所述弹性联轴器连接，所述大轴承固定于所述从动轴，所述偏芯轴固定于所述大轴承的一侧，所述小轴承设于所述偏芯轴，且固定于所述小轴承固定座，所述连接轴通过梢子固定于所述小轴承固定座，所述可拆卸的一体式治疗头固定于所述小轴承固定座。

[0015]
所述压重外壳包括手柄部和治疗头支撑部，所述手柄部和治疗头支撑部互相垂直。

[0016]
所述电机设为变频电机。

[0017]
所述压重外壳内部还设有电路板，所述电路板设有温度传感器和过温报警电路，所述温度传感器靠近所述电机设置。

[0018]
所述电路板还设有时间设置按键。

[0019]
本实用新型的有益效果：本实用新型包括压重外壳、能够拆卸的一体式治疗头和动力源，所述动力源包括动力装置和偏芯轴，所述动力装置和所述偏芯轴设于所述压重外壳内部，所述动力装置驱动所述偏芯轴转动，所述偏芯轴带动所述治疗头运动，所述能够拆卸的一体式治疗头设置有两个以上按摩柱。

[0020]
本实用新型的压重外壳在治疗头运动时可通过多触点能量肌肉刺激仪自身的重量压至使用者的皮肤表面，在使用者的皮肤表面实现运动，比如振动或者转动，可带给肌肉能量，深度刺激肌肉，促进血液循环，使得肌肉更好地得到放松，加快肌肉的恢复，本实用新型由于能够拆卸的一体式治疗头设置有两个以上按摩柱，接触皮肤时，可产生压电效应，增加刺激强度，疏通经络，对肌肉的刺激效果更好，有助于促进血液循环，加快肌肉的恢复。

[0021]
本实用新型还因为治疗头是可拆卸的一体式治疗头，因此，可根据用户的需要更好治疗头，以应不同用户的需求。

[0022]
本实用新型还因为安装时，只需要将可拆卸的一体式治疗头与动力源螺接即可，结构简单，安装方便。

[0023]
附图说明

[0024]
利用附图对实用新型作进一步说明，但附图中的实施例不构成对本实用新型的任何限制，对于本领域的普通技术人员，在不付出创造性劳动的前提下，还可以根据以下附图获得其它的附图。

[0025]
图1是本实用新型的一种多触点能量肌肉刺激仪的一个视角的分解结构示意图。

[0026]
图2是本实用新型的一种多触点能量肌肉刺激仪的局部剖面示意图。

[0027]
图3是图2的A处的剖面示意图。

[0028]
图4是本实用新型的一种多触点能量肌肉刺激仪的另一个视角的整体结构示意图。

[0029]
图中包括有：

[0030]
压重外壳1、手柄部11、治疗头支撑部12；

[0031]
可拆卸的一体式治疗头2、21——按摩柱；

[0032]
动力源3、电机31、弹性联轴器32、从动轴33、大轴承34、偏芯轴35、小轴承36、小轴承固定座37、梢子38、连接轴39、大轴承固定座40；

[0033]
电路板4、温度传感器41；

[0034]
开关5。

[0035]
具体实施方式

[0036]
结合以下实施例对本实用新型作进一步描述。

[0037]

本实施例的一种多触点能量肌肉刺激仪，如图1至图4所示，包括压重外壳1、可拆卸的一体式治疗头2和动力源3，所述动力源3包括动力装置和偏芯轴35，所述动力装置和所述偏芯轴35设于所述压重外壳1的内部，所述动力装置驱动所述偏芯轴35转动，所述偏芯轴35带动所述能够拆卸的一体式治疗头2运动，所述能够拆卸的一体式治疗头2设置有两个以上按摩柱，所有按摩柱的高度一致。

[0038]
本实施例的压重外壳在治疗头运动时可通过多触点能量肌肉刺激仪自身的重量压至使用者的皮肤表面，在使用者的皮肤表面实现运动，比如振动或者转动，可带给肌肉能量，深度刺激肌肉，促进血液循环，使得肌肉更好地得到放松，加快肌肉的恢复，能够拆卸的一体式治疗头2设置有两个以上按摩柱接触皮肤时，可产生压电效应，增加刺激强度，疏通经络，对肌肉的刺激效果更好，有助于促进血液循环，加快肌肉的恢复。

[0039]
本实施例还因为治疗头是可拆卸的一体式治疗头2，因此，可根据用户的需要更好治疗头，以应不同用户的需求。

[0040]
所述两个以上按摩柱的高度一致，可提高与皮肤的接触的点的数量，提高对肌肉的刺激效果。

[0041]
所述两个以上按摩柱的端部形成曲面，使用户使用起来较为舒适。

[0042]
所述两个以上按摩柱呈矩阵排列设置，按摩柱排列规则，可确保施加到用户皮肤上的力度更加均匀。

[0043]
所述动力源3与所述可拆卸的一体式治疗头2螺接。

[0044]
本实施例还因为安装时，只需要将可拆卸的一体式治疗头2与动力源3螺接即可，结构简单，安装方便。

[0045]
所述动力装置包括电机31、弹性联轴器32、从动轴33、大轴承34、小轴承36、小轴承固定座37、梢子38和连接轴39，所述电机31通过所述弹性联轴器32转动，所述从动轴33与所述弹性联轴器32连接，所述大轴承34固定于所述从动轴33，所述偏芯轴35固定于所述大轴承34的一侧，所述小轴承36设于所述偏芯轴35，且固定于所述小轴承固定座37，所述连接轴39通过梢子固定于所述小轴承固定座37，所述可拆卸的一体式治疗头2固定于所述小轴承固定座37。

[0046]
所述压重外壳1包括手柄部11和治疗头支撑部12，所述手柄部11和治疗头支撑部12互相垂直。

[0047]
所述连接轴39与所述偏芯轴35垂直设置，即可实现接在连接轴39上的治疗头的振动，如果连接轴39与偏心轴同轴设置，则可实现接在连接轴39上的治疗头的转动。

[0048]
工作原理是：

[0049]
电机31同时带动弹性联轴器32、从动轴33、大轴承34、偏芯轴35、小轴承36和小轴承固定座37转动，连接轴39通过销子38固定于小轴承固定座37，连接轴39随着小轴承固定座37的转动而伸缩，能够拆卸的治疗头随着连接轴39的伸缩而伸缩，即实现振动，在治疗头运动时可通过多触点能量肌肉刺激仪自身的重量压至使用者的皮肤表面，在使用者的皮肤表面实现振动，可带给肌肉能量，深度刺激肌肉，促进血液循环，使得肌肉更好地得到放松，加快肌肉的恢复，能够拆卸的一体式治疗头2设置有两个以上按摩柱接触皮肤时，可产生压电效应，增加刺激强度，疏通经络，对肌肉的刺激效果更好，有助于促进血液循环，加快肌肉的恢复。

[0050]
所述小轴承固定座37设有内螺纹，所述可拆卸的一体式治疗头2设有外螺纹，所述可拆卸的一体式治疗头2与所述小轴承固定座37螺接，方便拆卸。

[0051]
所述大轴承34固定于大轴承固定座40。

[0052]
所述电机31设为频率可变的电机31，频率可变的电机31可根据用户的需求调整电机31的频率，只需拨动开关5的档位即可调节电机的转速，转速分高中低三档，分别用于不同程度或者病症的病人治疗，以达到更好的治疗效果。

[0053]
所述电路板还设有时间设置按键，可供用户设置治疗时间，手柄上设有led数码管，可以实时显示剩余的使用时间。

[0054]
目前市场上的肌肉刺激仪都是用市电通过适配器转换为12V直流电源输入，本实施例的多触点能量肌肉刺激仪使用一节3000Mah，15V输出的聚合物锂电池，使用外接电源时可以为锂电池充电，拔掉外部电源，由锂电池供电，可连续工作一个小时以上。如果用于医院为病人治疗，一个病人治疗5分钟，可治疗10个病人以上，这样可以随时随地的为有需要的病人提供治疗，增加了设备的使用环境和场合，提高了设备的使用效率。

[0055]
所述压重外壳1的内部还设有电路板4，所述电路板4设有温度传感器41和过温报警电路，所述温度传感器41靠近所述电机31设置，温度传感器41感应到电机31和电池等发热组件的温度，如果该温度超过电路板4预设的温度，则驱动过温报警电路报警，可更好地保护电机31以及用户的安全。

[0056]
最后应当说明的是，以上实施例仅用以说明本实用新型的技术方案，而非对本实用新型保护范围的限制，尽管参照较佳实施例对本实用新型作了详细地说明，本领域的普通技术人员应当理解，可以对本实用新型的技术方案进行修改或者等同替换，而不脱离本实用新型技术方案的实质和范围。

TECHNICAL FIELD

The invention relates to the technical field of medical instruments, in particular to a multi-contact energy muscle stimulator.

BACKGROUND OF THE INVENTION

It is well known that Mucus and Bone Should Be Outside Order to Prevent Mucus Atrophy and Maintenance Mucus Tensions. When Jinjured Sites Suchas Bone, Mucus Tissue and Connectivity Tissue are in Judice, It is generally highly desirable to exercise mud near the injured site within a controlled Manner, where the Injut Bone and or Tissue Remanins Stable. Unfortubelly, Unfortutorially, With SPECT to the Manner in Whitea Particulate Patient Perform A Prescribed Exercise, The Physio Typient Cannot Oblient Information, OR IS NOT GRAD. The patient can not know that the patient can voled use or will voluntarily use multiple forces, and does not knowwhen the patient is insistently repeated for the body.. No. Oversight Exercise is Likely to Have An Inverse Effect on Injured Tisssues, Thus proLonging the Recapabilities Time, and Alsocausing Unrecovered Dammage.

In the prior art, the muscle is restored or the muscle is stimulated in a vibration mode, but the vibration head of the vibration device in the prior art is generally arranged in a plane; however, the contact area between the treatment head arranged in the plane and the skin of the user is large, and the stimulation effect on the muscle is poor.

SUMMARY OF THE INVENTION

The invention aims to avoid the defects in the prior art, and provides a multi-contact energy muscle stimulator. The multi-contact energy muscle stimulator has better stimulation effect on muscles, is helpful for promoting blood circulation and accelerating muscle recovery.

The objective of the invention is realized by the following technical scheme:

A multi-contact energy muscle stimulator is provided, A detachable integrated treatment head and a power source are included. The power source comprises a power device and a bias core shaft. The power device and the eccentric core shaft are arranged in the pressure heavy shell. The power device drives the eccentric mandrel to rotate. The eccentric mandrel drives the detachable integrated treatment head to move

The height of the two or more massage columns is consistent.

The ends of the two or more massage columns form a curved surface.

The two or more massage columns are arranged in a matrix arrangement

The power source is in screw connection with the detachable integrated treatment head.

The power device comprises a motor, elastic coupling, driven shaft, large bearing, small bearing, small bearing fixing seat, A rotor and a connecting shaft, The motor is rotated by the elastic coupling, The driven shaft is connected with the elastic coupling, the large bearing is fixed to the driven shaft, the eccentric mandrel is fixed to one side of the large bearing, the small bearing is arranged on the eccentric mandrel and fixed to the small bearing fixing seat, the connecting shaft is fixed to the small bearing fixing seat through a rotor, and the detachable integrated treatment head is fixed to the small bearing fixing seat

The weight housing comprises a handle portion and a treatment head support portion, and the handle portion and the treatment head support portion are perpendicular to each other.

The motor is arranged as a variable frequency motor.

A circuit board is further arranged in the pressure-weight housing, the circuit board is provided with a temperature sensor and an over-temperature alarm circuit, and the temperature sensor is arranged close to the motor

The circuit board is also provided with a time setting button.

Petitioner Therabody Ex-1004, 0376

The power source comprises a power device and a core shaft. The power device and the eccentric core shaft are arranged in the pressure heavy shell. The power device drives the eccentric mandrel to rotate. The eccentric mandrel drives the treatment head to move. The detachable integrated treatment head is provided with more than two massage columns.

The pressure weight housing of the invention can be pressed to the skin surface of an user through the weight of the multi-contact energy muscle stimulation instrument when the treatment head moves, Movement can be achieved on the skin surface of an user, such as vibration or rotation, muscle energy can be brought to the muscle, muscle can be stimulated, blood circulation is promoted, muscles can be better relaxed, and recovery of muscles is accelerated. Due to the fact that the detachable integrated treatment head is provided with more than two massage columns, a piezoelectric effect can be generated, stimulation intensity is increased, meridian obstruction is dredged, stimulation effect on muscles is better, blood circulation is promoted, and muscle recovery is accelerated.

According to the invention, the treatment head is a detachable integrated treatment head, so that the treatment head can be better treated according to the needs of the user, so that the requirements of different users can be met.

Due to the fact that the detachable integrated treatment head is in threaded connection with the power source during installation, the structure is simple, and installation is convenient.

BRIEF DESCRIPTION OF THE DRAWINGS

BRIEF DESCRIPTION OF THE DRAWINGS. The present invention is further described with reference to the accompanying drawings, in which embodiments of the drawings are not intended to limit any of the limitations of the present invention, and other figures may be obtained according to the following drawings without creative efforts.

FIG. 1 is an exploded structural diagram of a perspective view of a multi-contact energy muscle stimulator in accordance with the present invention.

FIG. 2 is a partial cross-sectional view of a multi-contact energy muscle stimulator according to the present invention.

FIG. 3 is a schematic cross-sectional view of FIG. 2.

FIG. 4 is a schematic structural diagram of another view angle of a multi-contact energy muscle stimulator according to the present invention.

The method comprises the following steps:

a pressure weight housing 1, a handle portion 11, and a treatment head support portion 12;

The detachable integrated treatment head (2 and 21) comprises a massage column;

A power source 3, a motor 31, an elastic coupling 32, a driven shaft 33, a large bearing 34, a mandrel 35, a small bearing 36, a small bearing fixing seat 37, a rotor 38, a connecting shaft 39 and a large bearing fixing seat 40 are provided;

a circuit board 4 and a temperature sensor 41;

switch 5

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is further described in conjunction with the following examples.

The multi-contact energy muscle stimulation instrument of the embodiment of the invention, As shown in FIGS. 1-4, The traditional Chinese medicine composition comprises a pressure-weight housing 1, The detachable integrated treatment head 2 and the power source 3, The power source 3 comprises a power device and a mandrel 35. The power device and the core shaft 35 are arranged in the weight housing 1. The power device drives the eccentric mandrel 35 to rotate. The mandrel 35 drives the

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detachable integrated treatment head 2 to move. The detachable integrated treatment head 2 is provided with more than two massage columns, and the heights of all the massage columns are consistent.

The pressure weight housing of the embodiment can be pressed to the skin surface of an user through the weight of the multi-contact energy muscle stimulation instrument when the treatment head moves, Movement can be achieved on the skin surface of an user, such as vibration or rotation, muscle energy can be brought to the muscle, muscle can be stimulated, blood circulation is promoted, muscle can be better relaxed, muscle recovery is accelerated, the detachable integrated treatment head 2 is provided with more than two massage columns to contact the skin, the piezoelectric effect can be generated, the stimulation intensity is increased, the meridian obstruction is dredged, the stimulation effect on the muscles is better, the blood circulation is promoted, and the muscle recovery is accelerated.

According to the embodiment, the treatment head is a detachable integrated treatment head 2, so that the treatment head can be better treated according to the needs of the user, so that the requirements of different users can be met.

The height of the two or more massage columns is consistent, the number of points in contact with the skin can be improved, and the stimulation effect on the muscles is improved.

The ends of the two or more massage columns form a curved surface, so that the user is more comfortable to use.

The two or more massage columns are arranged in a matrix arrangement mode, a massage column arrangement rule is adopted, and the force applied to the skin of an user can be ensured to be more uniform.

The power source 3 is in screw connection with the detachable integrated treatment head 2

According to the embodiment of the invention, the detachable integrated treatment head 2 and the power source 3 only need to be screwed in the installation process, the structure is simple, and the installation is convenient.

The power device includes a motor 31, The elastic coupling 32, driven shaft 33, large bearing 34, small bearing 36, Small bearing fixing seat 37, The rotor 38 and the connecting shaft 39, The motor 31 is rotated by the elastic coupling 32, The driven shaft 33 is connected to the elastic coupling 32, The large bearing 34 is fixed to the driven shaft 33. The eccentric shaft 35 is fixed to one side of the large bearing 34. The small bearing 36 is arranged on the eccentric mandrel 35 and fixed to the small bearing fixing base 37. The connecting shaft 39 is fixed to the small bearing fixing base 37 through a rotor. The detachable integrated treatment head 2 is fixed to the small bearing fixing base 37

The weight housing 1 comprises a handle portion 11 and a treatment head support portion 12. The handle portion 11 and the treatment head support portion 12 are perpendicular to each other.

The connecting shaft 39 and the eccentric shaft 35 are vertically arranged, so that the vibration of the treatment head connected to the connecting shaft 39 can be realized; if the connecting shaft 39 is coaxially arranged with the eccentric shaft, the rotation of the treatment head connected to the connecting shaft 39 can be realized.

The working principle is as follows:

The motor 31 simultaneously drives the elastic coupling 32, driven shaft 33, large bearing 34, Mandrel 35, The small bearing 36 and the small bearing fixing seat 37 rotate, The connecting shaft 39 is fixed to the small bearing fixing seat 37 through the rotor 38, The connecting shaft 39 stretches and retracts along with rotation of the small bearing fixing seat 37, so that the detachable treatment head can stretch and retract along with the expansion and contraction of the connecting shaft 39, so that vibration can be realized through the weight of the multi-contact energy muscle stimulator itself when the treatment head moves, the vibration is realized on the surface of the skin of the user, the muscle energy can be brought to the muscle, the muscle can be stimulated, blood circulation is promoted, the muscle is better relaxed, and the muscle recovery is accelerated.The detachable

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integrated treatment head 2 is provided with more than two massage columns to contact the skin, the piezoelectric effect can be generated, the stimulation intensity is increased, the meridian obstruction is dredged, the stimulation effect on the muscles is better, the blood circulation is facilitated, and the recovery of the muscles is accelerated.

The small bearing fixing base 37 is provided with internal threads, the detachable integrated treatment head 2 is provided with external threads, and the detachable integrated treatment head 2 is screwed with the small bearing fixing base 37 and is convenient to disassemble.

The large bearing 34 is fixed to the large bearing fixing seat 40

The motor 31 is arranged as a frequency-variable motor 31, the frequency of the motor 31 can be adjusted according to the needs of the user, the rotating speed of the motor can be adjusted only by shifting the gear position of the switch 5, the rotating speed is divided into high school and low three gears, and the motor 31 is used for treating patients with different degrees or conditions, so that a better treatment effect is achieved.

The circuit board is also provided with a time setting button, so that an user can set a treatment time; an LED digital tube is arranged on the handle, and the remaining use time can be displayed in real time.

In the current market, the muscle stimulator is converted into a 12V direct current power supply through an adapter. The multi-contact energy muscle stimulator of the embodiment uses a polymer lithium battery with 3000 Mah/cm and 15 V output. When an external power supply is used, the lithium battery can be charged, an external power supply is pulled out, power is supplied by the lithium battery, and the lithium battery can be continuously operated for more than one hour.. If the traditional Chinese medicine composition is used for treatment of a patient, one patient is treated for 5 minutes, more than ten patients can be treated, the treatment is provided for patients with the need at any time and any place, the use environment and occasion of the equipment are increased, and the use efficiency of the equipment is improved.

The circuit board 4 is provided with a temperature sensor 41 and an over-temperature alarm circuit. The temperature sensor 41 is arranged close to the motor 31. The temperature sensor 41 senses the temperature of the heating assembly such as the motor 31 and the battery. If the temperature exceeds the preset temperature of the circuit board 4, the over-temperature alarm circuit is driven to give an alarm, so that the safety of the motor 31 and the user can be better protected.

Finally, it should be noted that the above embodiments are merely used to illustrate the technical solutions of the present invention and are not intended to limit the scope of the present invention. Although the invention has been described in detail with reference to preferred embodiments, it will be understood by those of ordinary skill in the art that modifications or equivalent substitutions may be made to the technical solutions of the present invention without departing from the spirit and scope of the technical solutions of the present invention.

CLAIM OF THE INVENTION

1. Multi-contact energy muscle stimulation instrument, The detachable integrated treatment head is characterized by comprising a pressure-weight shell, a detachable integrated treatment head and a power source, wherein the power source comprises a power device and a bias core shaft, the power device and the eccentric core shaft are arranged in the pressure-weight shell, the power device drives the eccentric mandrel to rotate, the eccentric mandrel drives the detachable integrated treatment head to move, and the detachable integrated treatment head is provided with more than two massage columns.

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2. The multi-contact energy muscle stimulation instrument of claim 1, wherein the height of the two or more massage columns is consistent.

3. The multi-contact energy muscle stimulation instrument of claim 1, wherein the ends of the two or more massage columns form a curved surface.

4. The multi-contact energy muscle stimulation instrument of claim 1, wherein the two or more massage columns are arranged in a matrix arrangement.

5. The multi-contact energy muscle stimulation instrument of claim 1, wherein the power source is in screw connection with the detachable integrated treatment head.

6. The multi-contact energy muscle stimulator of claim 1, The traditional Chinese medicine composition is characterized: The power device comprises a motor, elastic coupling, driven shaft, large bearing, small bearing, small bearing fixing seat, A rotor and a connecting shaft, The motor is rotated by the elastic coupling, The driven shaft is connected with the elastic coupling, the large bearing is fixed to the driven shaft, the eccentric mandrel is fixed to one side of the large bearing, the small bearing is arranged on the eccentric mandrel and fixed to the small bearing fixing seat, the connecting shaft is fixed to the small bearing fixing seat through a rotor, and the detachable integrated treatment head is fixed to the small bearing fixing seat

7. The multi-contact energy muscle stimulation instrument of claim 6, wherein the weight housing comprises a handle portion and a treatment head support portion, and the handle portion and the treatment head support portion are perpendicular to each other.

8. The multi-contact energy muscle stimulation instrument of claim 6, wherein the motor is arranged as a variable frequency motor.

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9. The multi-contact energy muscle stimulation instrument is characterized in that a circuit board is further arranged in the pressure-weight housing; the circuit board is provided with a temperature sensor and an over-temperature alarm circuit; the temperature sensor is arranged close to the motor;

10. The multi-contact energy muscle stimulation instrument of claim 9, wherein the circuit board is further provided with a time setting button.

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Espacenet

Bibliographic data: EP3235484 (A1) — 2017-10-25

METHOD AND DEVICE FOR CONTROLLING TARGET MASSAGE EQUIPMENT

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Classification: - international: *A61H7/00; G06F19/00*
- cooperative: **A61B5/0004 (CN)**; **A61B5/0015 (CN)**; **A61B5/02 (CN)**; **A61B5/02438 (CN)**; **A61B5/1114 (CN)**; **A61B5/1118 (CN)**; **A61B5/681 (CN)**; **A61H1/00 (CN)**; **A61H39/04 (CN)**; **A61H7/00 (EP, US)**; **A63B24/0062 (US)**; **G05B19/042 (US)**; **G16H20/30 (EP, US)**; A61H2201/0149 (EP, CN, US); A61H2201/501 (EP, US); A61H2201/5028 (EP, US); A61H2201/5046 (EP, US); A61H2201/5058 (EP, US); A61H2201/5061 (EP, US); A61H2201/5084 (EP, US); A61H2201/5097 (EP, US); A61H2205/06 (CN); A61H2205/10 (CN); A61H2205/125 (CN); A61H2230/045 (CN); A61H2230/065 (CN); A61H2230/625 (CN); A63B2024/0068 (US); A63B2220/836 (US); A63B2230/045 (US); G05B2219/25208 (US)

Application number: EP20160197637 20161108
Global Dossier

Priority number(s): CN201610252504 20160421

Also published as: EP3235484 (B1) CN105853136 (A) CN105853136 (B) US10732592 (B2) US2017308046 (A1) more

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Abstract of EP3235484 (A1)

The present invention relates to a method and a device for controlling a target massage equipment. The method includes: obtaining (S101) exercise information in order to identify the body part to be massaged; and controlling (S102) the target massage equipment to operate according to the exercise information.

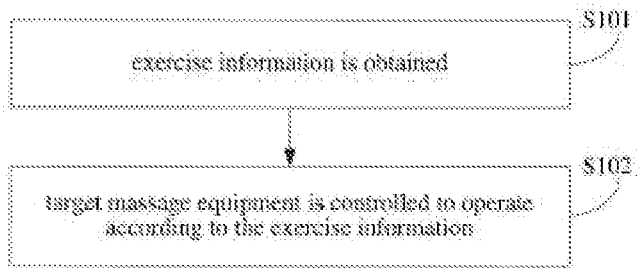


Fig. 1

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(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 235 484 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
25.10.2017 Bulletin 2017/43

(51) Int Cl.:
A61H 7/00 *(2006.01)* ***G06F 19/00*** *(2011.01)*

(21) Application number: **16197637.8**

(22) Date of filing: **08.11.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(30) Priority: **21.04.2016 CN 201610252504**

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(54) METHOD AND DEVICE FOR CONTROLLING TARGET MASSAGE EQUIPMENT

(57) The present invention relates to a method and a device for controlling a target massage equipment. The method includes: obtaining (S101) exercise information in order to identify the body part to be massaged; and controlling (S102) the target massage equipment to operate according to the exercise information.

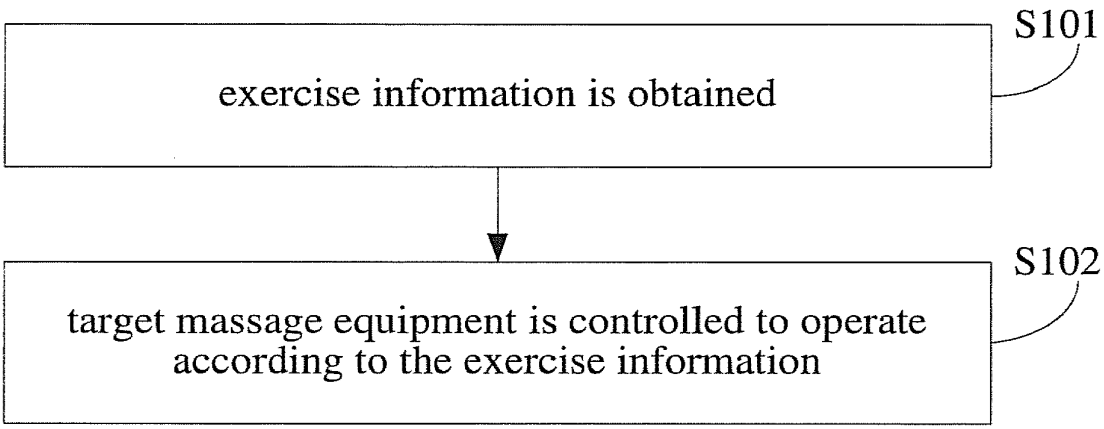


Fig. 1

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Printed by Jouve, 75001 PARIS (FR)

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Description

FIELD

[0001] The present invention relates to a field of massage equipment technology, and more particularly relates to a method and a device for controlling a target massage equipment.

BACKGROUND

[0002] At present, with the development of society, an increasing number of users have better fitness consciousness, and an effective recovery after exercises often brings a better effect. Thus, massage equipment is required to provide massage for assisting the recovery. However, the existing massage equipment is not intelligent enough, and the massage mode is simplex, thereby causing great inconvenience for the user.

SUMMARY

[0003] Embodiments of the present invention provide a method and a device for controlling a target massage equipment. The technical solutions will be described as follows.

[0004] According to a first aspect of embodiments of the present invention, a method for controlling a target massage equipment is provided. The method includes:

obtaining exercise information; and
controlling the target massage equipment to operate according to the exercise information.

[0005] In an embodiment, obtaining exercise information includes:

obtaining an arm swing frequency through a wearable device, in which the wearable device includes at least one of a smart band and a smart watch;
comparing the arm swing frequency with at least two preset arm swing frequencies; and
when the arm swing frequency matches with any one of the at least two preset arm swing frequencies, determining the exercise information according to a moving part of a user's body corresponding to the any one of the at least two preset arm swing frequencies.

It should be noted that by the arm swing frequency matches with any one of the at least two preset arm swing frequencies when, for example, the arm swing frequency obtained in real-time is equal to any one of the at least two preset arm swing frequencies completely, or the difference between the two swing frequencies is less than or equal to a preset frequency threshold.

[0006] In an embodiment, obtaining exercise information includes:

obtaining a total exercise intensity when a user is doing exercise through a wearable device, in which the total exercise intensity includes one or more of a pulse rate, a pulse intensity, a heartbeat frequency and a heartbeat intensity when the user is doing exercise; and
determining the exercise information according to the total exercise intensity.

[0007] In an embodiment, obtaining exercise information includes:

determining an exercise equipment identification in the exercise information;
determining information of a used exercise equipment according to the exercise equipment identification, in which the information of the used exercise equipment includes: at least one of a name of the used exercise equipment and a working parameter of the used exercise equipment.

[0008] In an embodiment, the exercise information includes at least one of: body moving part information, an exercise intensity ratio between each two moving parts, exercise intensity information of each moving part and information of a used exercise equipment.

[0009] In an embodiment, controlling the target massage equipment to operate according to the exercise information includes:

obtaining a massage mode matched with the exercise information;
obtaining the target massage equipment with the massage mode; and
controlling the target massage equipment to operate based on the massage mode.

[0010] In an embodiment, the massage mode includes: a historical massage mode matched with the exercise information.

[0011] In an embodiment, controlling the target massage equipment to operate according to the exercise information includes:

controlling the target massage equipment to operate according to the exercise information by sending the exercise information to the target massage equipment.

[0012] According to a second aspect of embodiments of the present invention, a device for controlling a target massage equipment is provided. The device includes:

an obtaining module, configured to obtain exercise information; and
a control module, configured to control the target massage equipment to operate according to the exercise information obtained by the obtaining module.

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[0013] In an embodiment, the obtaining module includes:

a first obtaining sub-module, configured to obtain an arm swing frequency through a wearable device, in which the wearable device includes at least one of a smart band and a smart watch;
a comparing sub-module, configured to compare the arm swing frequency obtained by the first obtaining sub-module with at least two preset arm swing frequencies; and
a first determining sub-module, configured to determine the exercise information according to a moving part of a user's body corresponding to any one of the at least two preset arm swing frequencies when the comparison result obtained by the comparing sub-module indicates that the arm swing frequency matches with the any one of the at least two preset arm swing frequencies.

[0014] In an embodiment, the obtaining module includes:

a second obtaining sub-module, configured to obtain a total exercise intensity when a user is doing exercise through a wearable device, in which the total exercise intensity includes one or more of a pulse rate, a pulse intensity, a heartbeat frequency and a heartbeat intensity when the user is doing exercise; and
a second determining sub-module, configured to determine the exercise information according to the total exercise intensity obtained by the second obtaining sub-module.

[0015] In an embodiment, the obtaining module includes:

a third determining sub-module, configured to determine an exercise equipment identification in the exercise information;
a fourth determining sub-module, configured to determine information of a used exercise equipment according to the exercise equipment identification determined by the third determining sub-module, in which the information of the used exercise equipment includes: at least one of a name of the used exercise equipment and a working parameter of the used exercise equipment.

[0016] In an embodiment, the exercise information includes at least one of: body moving part information, an exercise intensity ratio between each two moving parts, exercise intensity information of each moving part and information of a used exercise equipment.

[0017] In an embodiment, the control module includes:

a third obtaining sub-module, configured to obtain a massage mode matched with the exercise information obtained by the obtaining module;
a fourth obtaining sub-module, configured to obtain the target massage equipment with the massage mode obtained by the third obtaining sub-module; and
a first control sub-module, configured to control the target massage equipment obtained by the fourth obtaining sub-module to operate based on the massage mode.

[0018] In an embodiment, the massage mode includes: a historical massage mode matched with the exercise information.

[0019] In an embodiment, the control module includes:

a second control sub-module, configured to control the target massage equipment to operate according to the exercise information by sending the exercise information to the target massage equipment.

[0020] According to a third aspect of embodiments of the present invention, a device for controlling a target massage equipment is provided. The device includes:

a processor;
a memory for storing an instruction executable by the processor;
in which the processor is configured to:

obtain exercise information; and
control the target massage equipment to operate according to the exercise information.

[0021] It should be understood that the above general descriptions and the following detail descriptions are explanatory and illustrative, and these descriptions shall not be construed to limit the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments consistent with the present invention and, together with the description, serve to explain the principles of the present invention.

Fig. 1 is a flow chart of a method for controlling a target massage equipment according to an example embodiment of the present invention.
Fig. 2 is a flow chart of obtaining exercise information according to an example embodiment of the present invention.
Fig. 3 is another flow chart of obtaining exercise information according to an example embodiment of the present invention.
Fig. 4 is yet another flow chart of obtaining exercise information according to an example embodiment of

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the present invention.

Fig. 5 is a flow chart of controlling a target massage equipment to operate according to exercise information, according to an example embodiment of the present invention.

Fig. 6 is another flow chart of controlling a target massage equipment to operate according to exercise information, according to an example embodiment of the present invention.

Fig. 7 is a block diagram of a device for controlling a target massage equipment according to an example embodiment of the present invention.

Fig. 8 is a block diagram of an obtaining module according to an example embodiment of the present invention.

Fig. 9 is a block diagram of another obtaining module according to an example embodiment of the present invention.

Fig. 10 is a block diagram of yet another obtaining module according to an example embodiment of the present invention.

Fig. 11 is a block diagram of a control module according to an example embodiment of the present invention.

Fig. 12 is a block diagram of another control module according to an example embodiment of the present invention.

Fig. 13 is a block diagram of a device for controlling a target massage equipment according to an example embodiment of the present invention.

DETAILED DESCRIPTION

[0023] Reference will now be made in detail to exemplary embodiments, examples of which are illustrated in the accompanying drawings. The following description refers to the accompanying drawings in which the same numbers in different drawings represent the same or similar elements unless otherwise represented. The implementations set forth in the following description of exemplary embodiments do not represent all implementations consistent with the invention. Instead, they are merely examples of devices and methods consistent with aspects related to the invention as recited in the appended claims.

[0024] At present, with the development of society, an increasing number of users have better fitness consciousness, and an effective recovery after exercises often brings a better effect. Thus, massage equipment is required to provide massage to assist the recovery. However, the existing massage equipment is not intelligent enough, and the massage mode is simplex, thereby causing great inconvenience for users.

[0025] In order to solve the above problems, embodiments of the present invention provide a method for controlling a target massage equipment. The method may be applied in a control program, a system or a device of the target massage equipment, and the executive subject corresponding the method may be a terminal or a target massage equipment.

[0026] Fig. 1 is a flow chart of a method for controlling a target massage equipment according to an example embodiment of the present invention.

[0027] As shown in Fig. 1, the method may include: act S101 to act S102.

[0028] In act S101, exercise information is obtained.

[0029] The exercise information refers to information obtained when a user is doing physical exercise (or keeping fit) within a preset time period (such as a latest week or latest N days). The exercise information includes but is not limited to at least one of the followings: body moving part information of the user, an exercise intensity ratio between each two moving parts, exercise intensity information of each moving part and information of a used exercise equipment.

[0030] Additionally, the executive subject for obtaining the exercise information may be a terminal or a target massage equipment.

[0031] In act S102, the target massage equipment is controlled to operate according to the exercise information. When the target massage equipment is controlled to operate according to the exercise information, the target massage equipment may provide personalized massage service for the user automatically according to the exercise information, or the target massage equipment may be controlled to move through the terminal so as to provide personalized massage service for the user.

[0032] The user's exercise status may be precisely determined according to the obtained exercise information, such that the target massage equipment may be controlled to conduct a targeted movement based on the exercise information when the user is doing exercise, and to automatically provide the most comfortable, the most suitable and the most effective massage for the user with respect to the user's exercise information, such that the user's body may be recovered better and faster through the optimum massage after exercises, thereby prevent the user from selecting the massage mode manually and reducing the user's operations.

[0033] Fig. 2 is a flow chart of obtaining exercise information according to an example embodiment of the present invention.

[0034] As shown in Fig. 2, in an embodiment, the act S101 in Fig. 1 may be executed as follows.

[0035] In act A1, an arm swing frequency is obtained through a wearable device, in which the wearable device includes at least one of a smart band and a smart watch.

[0036] To obtain the exercise information by either a terminal or the target massage equipment, the arm swing frequency may be obtained firstly through a wearable device, in which the wearable device may be a smart band and a smart watch wore on the user's wrist. The wearable device, of course, may also be a smart band wore on the user's finger. These wearable devices may be connected to the terminal or the target massage equipment through a communication mode such as blue-tooth,

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or even infrared technology, WiFi (Wireless Fidelity, wireless local area network based on IEEE 802.11b standard), and then the swing frequency is transmitted to the terminal or the target massage equipment, such that the terminal or the target massage equipment may perform operations shown in the following act A2 and act A3.

[0037] In act A2, the arm swing frequency is compared with at least two preset arm swing frequencies.

[0038] In act A3, if the arm swing frequency matches with any one of the at least two preset arm swing frequencies, the exercise information is determined according to a moving part of a user's body corresponding to the any one of the at least two preset arm swing frequencies.

[0039] Since each pre-stored preset arm swing frequency may be corresponding to a distinct moving part (for example, when a user is lifting dumbbells, the arm swing frequency and the moving part are different from those when the user is jogging), each preset arm swing frequency may correspond to distinct exercise information. Thus, it may be judged whether the arm swing frequency obtained in real-time matches with one of the at least two preset arm swing frequencies by comparing the obtained arm swing frequency with the at least two preset arm swing frequencies. If the arm swing frequency obtained in real-time matches with any one of the at least two preset arm swing frequencies (for example, the arm swing frequency obtained in real-time is equal to any one of the at least two preset arm swing frequencies completely, or the difference between the two swing frequencies is less than or equal to a preset frequency threshold), it indicates that the exercise information corresponding to the arm swing frequency obtained in real-time is the same as the exercise information corresponding to the preset arm swing frequency matched with the arm swing frequency obtained in real-time. Therefore, the current exercise information of the user may be determined according to the moving part corresponding to the preset arm swing frequency matched with the arm swing frequency obtained in real-time. For example, the user's body moving part information or the like may be determined according to the moving part corresponding to the preset arm swing frequency matched with the arm swing frequency obtained in real-time.

[0040] Besides, since the arm swing frequency is not often at a constant speed no matter what kind of equipment is used or what kind of exercise intensity is applied during the user's exercise or fitness process, each of the at least two preset arm swing frequencies may have frequency fluctuation or even may be an arm swing frequency spectrogram, also the arm swing frequency obtained in real-time may have frequency fluctuation or even may be an arm swing frequency spectrogram. Thus, when comparing, the similarity of two arm swing frequency spectrograms may be compared. If the similarity is higher than a preset similarity (e.g. 90%), the exercise information may be determined according to a preset swing frequency spectrogram with which the arm swing frequency obtained in real-time has a similarity higher than the preset similarity.

[0041] Additionally, each of the at least two preset arm swing frequencies may include an arm swing frequency in the vertical direction and an arm swing frequency in the horizontal direction. When comparing, the arm swing frequency in each direction may be compared respectively. If the arm swing frequency in each direction is matched respectively, the exercise information may be determined according to the moving part corresponding to the preset arm swing frequency matched, thereby increasing accuracy of the determination result.

[0042] Fig. 3 is another flow chart of obtaining exercise information according to an example embodiment of the present invention.

[0043] As shown in Fig. 3, in an embodiment, the act S101 in Fig. 1 may be executed as follows.

[0044] In act B1, a total exercise intensity is obtained through a wearable device, in which the total exercise intensity includes one or more of a pulse rate, a pulse intensity, a heartbeat frequency and a heartbeat intensity when the user is doing exercise.

[0045] The wearable device such as a smart band and a smart watch may directly detect the pulse rate and the pulse intensity when the user is doing exercise, and then the heartbeat frequency and the heartbeat intensity of the user may be obtained indirectly according to the pulse rate and the pulse intensity, such that the total exercise intensity when the user is doing exercise may be obtained through the wearable device. Further, these wearable devices may be connected to the terminal or the target massage equipment through a communication mode such as blue-tooth, or even infrared technology, WiFi (Wireless Fidelity, wireless local area network based on IEEE 802.11b standard), and then the total exercise intensity is transmitted to the terminal or the target massage equipment, in order to enable the terminal or the target massage equipment to perform operations shown in the following act B2 and act B3.

[0046] In act B2, the exercise information is determined according to the total exercise intensity.

[0047] After the total exercise intensity is obtained, the terminal or the target massage equipment may determine the current exercise information of the user automatically according to the total exercise intensity. For example, the exercise intensity ratio between various moving parts and the exercise intensity information of each moving part may be determined accurately by combining with the body moving part information obtained based on the arm swing frequency (for example, after the user's body moving part is determined as the leg according to the arm swing frequency and the user is perhaps using a running machine for jogging, the exercise intensities of upper limbs and lower limbs may be determined according to the total exercise intensity, and the exercise intensity ratio of upper limbs to lower limbs may be further determined, etc.). Thus, the target massage equipment may conduct a targeted movement based on the exercise

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information when the user is doing exercise, so as to automatically provide the most comfortable, the most suitable and the most effective massage for the user with respect to the user's exercise information. Therefore, after exercises, the user's body may be recovered better through the optimum massage, thereby prevent the user from selecting the massage mode manually and reducing the user's operations.

[0048] Additionally, this embodiment may be combined with the above embodiment in which the exercise information is determined according to the arm swing frequency obtained by the wearable device or may also be combined with the following embodiment in which information of an exercise equipment used when the user is doing exercise is determined, so as to obtain more comprehensive and accurate exercise information.

[0049] Fig. 4 is another flow chart of obtaining exercise information according to an example embodiment of the present invention.

[0050] As shown in Fig. 4, in an embodiment, the act S101 in Fig. 1 may be executed as follows.

[0051] In act C1, an exercise equipment identification in the exercise information is determined.

[0052] The terminal or the target massage equipment may identify the exercise information obtained by the wearable device, and then determine the exercise equipment identification included in the exercise information. The specific method for obtaining the exercise equipment identification by the wearable device includes but is not limited to the followings.

[0053] The user manually inputs the exercise equipment identification of the exercise equipment used when the user is doing exercise into the wearable device such as the smart band, the smart watch etc. worn by himself/herself.

[0054] Alternatively, the user's current movement direction may be determined automatically by an acceleration sensor or a direction sensor embedded in the wearable device such as the smart band, the smart watch etc. worn by the user, and then the exercise equipment identification may be determined indirectly. For example, if the acceleration sensor or the direction sensor detects that the user's arm moves upwardly all the time, the exercise equipment identification may be determined as an identification of a dumbbell or a horizontal bar.

[0055] Alternatively, if the exercise equipment used by the user is relatively intelligent (such as configured with blue-tooth functionality), the exercise equipment identification may be sent to the wearable device the user wears such as the smart band, the smart watch etc. via the blue tooth.

[0056] In act C2, information of the used exercise equipment may be determined according to the exercise equipment identification, in which the information of the used exercise equipment includes: at least one of a name of the exercise equipment and a working parameter of the exercise equipment.

[0057] After the exercise equipment identification is determined by the terminal or the target massage equipment, the information of the exercise equipment used when the user is doing exercise, such as the name of the exercise equipment and the working parameter of the exercise equipment (such as movement rate of the running machine if the used exercise equipment is a running machine, or weight of the dumbbell if the used exercise equipment is a dumbbell) etc., may be determined according to the exercise equipment identification. Then, the target massage equipment may be controlled to provide a targeted massage for the user according to the information of the exercise equipment used when the user is doing exercise, such that the user's body may be recovered from fatigue as soon as possible, and the user's comfortable experience may be improved.

[0058] Additionally, this embodiment may be combined with the above embodiment in which the exercise information is determined according to the arm swing frequency obtained by the wearable device, or may also be combined with the above embodiment in which the exercise information is determined according to the obtained total exercise intensity, so as to obtain more comprehensive and accurate exercise information.

[0059] In an embodiment, the exercise information includes at least one of the followings: body moving part information, an exercise intensity ratio between each two moving parts, exercise intensity information of each moving part and information of the used exercise equipment.

[0060] The exercise information includes but is not limited to at least one of the followings: the user's body moving part information, an exercise intensity ratio between various moving parts, exercise intensity information of each moving part and the information of the used exercise equipment. The exercise information, for example, may also include total exercise time of the user.

[0061] Fig. 5 is a flow chart of controlling a target massage equipment to operate according to exercise information, according to an example embodiment of the present invention.

[0062] As shown in Fig. 5, in an embodiment, the act S102 in Fig. 1 may be executed as follows.

[0063] In act D1, a massage mode matched with the exercise information is determined.

[0064] When the target massage equipment is controlled to operate according to the exercise information for providing a targeted massage for a user, a massage mode matched with the exercise information may be obtained firstly, i.e., the massage mode which matches with the exercise information and make the user's body be recovered from the fatigue due to exercise as soon as possible is obtained. For example, if the exercise equipment used by the user is a running machine, since the main body moving part is the leg and the leg conducts a large amount of activity, the massage mode may be a foot massage mode, a leg massage mode etc.; if the exercise equipment used by the user is a dumbbell or a horizontal bar, since the main body moving part is the arm and the arm conducts a large amount of activity, the

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massage mode may be an arm massage mode, a hand massage mode etc..

[0065] In act D2, the target massage equipment with the massage mode is obtained.

[0066] For example, when the massage mode is foot massage mode, the target massage equipment may be a massage chair or a foot massager, a foot massage basin etc..

[0067] In act D3, the target massage equipment is controlled to operate based on the massage mode.

[0068] Further, the target massage equipment with the massage mode is obtained, and then the target massage equipment is controlled to operate based on the massage mode so as to automatically provide the most comfortable, the most suitable and the most effective massage for the user with respect to the user's exercise information, such that the user's body may be recovered better and faster through the optimum massage after exercises, thereby prevent the user from selecting the massage mode manually and reducing the user's operations.

[0069] Since each massage mode has its corresponding preset massage parameter but each user's specific exercise information is distinct (for example, when the same exercise equipment is used to do exercise, the total exercise intensity, the exercise intensity of each body part, exercise ratio and length of exercise time may be changed), after the rough matched massage mode is determined, the target massage equipment may be controlled to operate followings.

[0070] The exercise information is compared with the preset exercise information corresponding to the massage mode.

[0071] The preset massage parameter corresponding to the massage mode is adjusted according to the comparison result, in which the preset massage parameter includes: one or more of a preset length of massage time and a preset massage intensity. For example, when the massage mode is upper limb massage, and the exercise intensity ratio of the upper limb to the lower limb in this exercise is higher than the preset exercise intensity ratio of the upper limb to the lower limb corresponding to the massage mode, the preset massage parameter corresponding to the massage mode may be increased for increasing the massage time and intensity for the upper limb; when the exercise intensity ratio of the upper limb to the lower limb in this exercise is lower than the preset exercise intensity ratio of the upper limb to the lower limb corresponding to the massage mode, the preset massage parameter corresponding to the massage mode may be decreased for decreasing the massage time and intensity for the upper limb. In this way, the inherent preset massage parameter of the massage mode may be adjusted according to the user's specific exercise information, so as to provide a more intelligent targeted massage service for the user automatically. Thus, the user's body may be recovered from exercise better and faster, and the user's comfortable experience may be improved further.

[0072] In an embodiment, the massage mode includes: a historical massage mode matched with the exercise information.

[0073] When determining the massage mode, it is unnecessary to re-determine the mode every time. The exercise information of the user in each exercise and the determined matched massage mode may be stored in relation to each other. Thus, when the user does exercise next time, if the determined exercise information is exactly the same as that in one previous exercise, or the difference is minor, it is not required to re-determine the massage mode suitable for the user. Instead, the historical massage mode matched with the exercise information in this exercise may be directly determined as the massage mode for this exercise, so as to avoid re-determination and reduce operations and burden of the terminal and the target massage equipment.

[0074] Fig. 6 is another flow chart of controlling a target massage equipment to operate according to exercise information, according to an example embodiment of the present invention.

[0075] As shown in Fig. 6, in an embodiment, the act S102 in Fig. 1 may be executed as follows.

[0076] In act E1, the target massage equipment is controlled to operate according to the exercise information by sending the exercise information to the target massage equipment.

[0077] When the subject of obtaining the exercise information is a terminal and the target massage equipment is controlled to operate according to the exercise information, the terminal may send the obtained exercise information to the target massage equipment, and then control the target massage equipment to operate according to the exercise information, such that the target massage equipment is controlled automatically through the terminal to provide the most comfortable, the most suitable and the most effective massage for the user with respect to the user's exercise information. Thus, after exercises, the user's body may be recovered better through the optimum massage, thereby prevent the user from selecting the massage mode manually and reducing the user's operations.

[0078] Corresponding to the above method for controlling a target massage equipment provided by embodiments of the present invention, embodiments of the present invention also provide a device for controlling a target massage equipment. Fig. 7 is a block diagram of a device for controlling a target massage equipment according to an example embodiment of the present invention.

[0079] As shown in Fig. 7, the device includes: an obtaining module 701 and a control module 702. The obtaining module 701 is configured to obtain exercise information.

[0080] The exercise information obtained by the obtaining module 701 is information obtained when the user is doing exercise this time. The exercise information includes but is not limited to at least one of the followings:

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the user's body moving part information, an exercise intensity ratio between each two moving parts, exercise intensity information of each moving part and information of a used exercise equipment.

[0081] Additionally, the subject of obtaining the exercise information may be a terminal or a target massage equipment.

[0082] The control module 702 is configured to control the target massage equipment to operate according to the exercise information obtained by the obtaining module 701. When the target massage equipment is controlled to operate according to the exercise information, the target massage equipment may provide personalized massage service for the user automatically, or the target massage equipment may be controlled to operate through the terminal so as to provide personalized massage service for the user.

[0083] The user's exercise status may be precisely determined according to the obtained exercise information. Thus, the control module 702 may control the target massage equipment to conduct a targeted movement based on the exercise information when the user is doing exercise, so as to automatically provide the most comfortable, the most suitable and the most effective personalized massage for the user with respect to the user's exercise information. Therefore, after exercises, the user's body may be recovered better through the optimum massage, thereby prevent the user from selecting the massage mode manually and reducing the user's operations.

[0084] Fig. 8 is a block diagram of an obtaining module according to an example embodiment of the present invention.

[0085] As shown in Fig. 8, in an embodiment, the obtaining module 701 in Fig. 7 may include: a first obtaining sub-module 7011, a comparing sub-module 7012, and a first determining sub-module 7013.

[0086] The first obtaining sub-module 7011 is configured to obtain an arm swing frequency through a wearable device, in which the wearable device includes at least one of a smart band and a smart watch.

[0087] To obtain the exercise information by either a terminal or the target massage equipment, the arm swing frequency may be obtained firstly by the first obtaining sub-module 7011 through a wearable device, in which the wearable device may be a smart band and a smart watch worn on the user's wrist. The wearable device, of course, may also be a smart band wore on the user's finger. These wearable devices may be connected to the terminal or the target massage equipment through a communication mode such as blue-tooth, or even infrared technology, WiFi (Wireless Fidelity, wireless local area network based on IEEE 802.11b standard), and then the swing frequency is transmitted to the terminal or the target massage equipment, in order to enable the terminal or the target massage equipment to perform operations.

[0088] The comparing sub-module 7012 is configured to compare the arm swing frequency obtained by the first obtaining sub-module 7011 with at least two preset arm swing frequencies.

[0089] The first determining sub-module 7013 is configured to determine the exercise information according to a moving part of a user's body corresponding to any one of the at least two preset arm swing frequencies when the comparison result obtained by the comparing sub-module 7012 indicates that the arm swing frequency matches with the any one of the at least two preset arm swing frequencies.

[0090] Since each pre-stored preset arm swing frequency may correspond to a distinct moving part (for example, when a user is lifting dumbbells, the arm swing frequency and the moving part are different from those when the user is jogging), each preset arm swing frequency may correspond to distinct exercise information. Thus, it may be judged whether the arm swing frequency may obtained in real-time matches with one of the at least two preset arm swing frequencies by comparing the obtained arm swing frequency with the at least two preset arm swing frequencies by the comparing sub-module 7012. If the determination result of the first determining sub-module 7013 is that the arm swing frequency obtained in real-time matches with any one of the at least two preset arm swing frequencies (for example, the arm swing frequency obtained in real-time is equal to any one of the at least two preset arm swing frequencies completely, or the difference between the two swing frequencies is less than or equal to a preset frequency threshold), it indicates that the exercise information corresponding to the arm swing frequency obtained in real-time is the same as the exercise information based on the preset arm swing frequency matched with the arm swing frequency obtained in real-time. Therefore, the current exercise information of the user may be determined according to the moving part corresponding to the preset arm swing frequency matched with the arm swing frequency obtained in real-time. For example, the user's body moving part information or the like may be determined according to the moving part corresponding to the preset arm swing frequency matched with the arm swing frequency obtained in real-time.

[0091] Besides, since the arm swing frequency is not often at a constant speed no matter what kind of equipment is used or what kind of exercise intensity is applied during the user's exercise or fitness process, each of the at least two preset arm swing frequencies may have frequency fluctuation or even may be an arm swing frequency spectrogram, also the arm swing frequency obtained in real-time may have frequency fluctuation or even may be an arm swing frequency spectrogram. Thus, when comparing, the similarity of two arm swing frequency spectrograms may be compared. If the similarity is higher than a preset similarity (e.g. 90%), the exercise information may be determined according to a preset swing frequency spectrogram with which the arm swing frequency obtained in real-time has a similarity higher than the preset similarity.

[0092] Additionally, each of the at least two preset arm

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swing frequencies may include an arm swing frequency in the vertical direction and an arm swing frequency in the horizontal direction. When comparing, the arm swing frequency in each direction may be compared respectively. If the arm swing frequency in each direction is matched respectively, the exercise information may be determined according to the moving part corresponding to the preset arm swing frequency matched, thereby increasing accuracy of the determination result.

[0093] Fig. 9 is a block diagram of another obtaining module according to an example embodiment of the present invention.

[0094] As shown in Fig. 9, in an embodiment, the obtaining module 701 in Fig. 7 may include: a second obtaining sub-module 7014, and a second determining sub-module 7015.

[0095] The second obtaining sub-module 7014 is configured to obtain a total exercise intensity through a wearable device, in which the total exercise intensity includes one or more of a pulse rate, a pulse intensity, a heartbeat frequency and a heartbeat intensity when the user is doing exercise.

[0096] The wearable device such as a smart band and a smart watch may directly detect the pulse rate and the pulse intensity when the user is doing exercise, and then the heartbeat frequency and the heartbeat intensity of the user may be obtained indirectly according to the pulse rate and the pulse intensity, such that the second obtaining sub-module 7014 may obtain the total exercise intensity when the user is doing exercise through the wearable device. Further, these wearable devices may be connected to the terminal or the target massage equipment through a communication mode such as blue-tooth, or even infrared technology, WiFi (Wireless Fidelity, wireless local area network based on IEEE 802.11b standard), and then the total exercise intensity is transmitted to the terminal or the target massage equipment, in order to enable the terminal or the target massage equipment to perform operations.

[0097] The second determining sub-module 7015 is configured to determine the exercise information according to the total exercise intensity obtained by the second obtaining sub-module 7014.

[0098] After the total exercise intensity is obtained by the second obtaining sub-module 7014, the second determining sub-module 7015 in the terminal or the target massage equipment may determine the current exercise information of the user automatically according to the total exercise intensity. For example, the exercise intensity ratio between various moving parts and the exercise intensity information of each moving part may be determined accurately by combining with the body moving part information obtained based on the arm swing frequency (for example, after the user's body moving part is determined as the leg according to the arm swing frequency and the user is perhaps using a running machine for jogging, the exercise intensities of upper limbs and lower limbs may be determined according to the total exercise intensity, and the exercise intensity ratio of upper limbs to lower limbs may be further determined, etc.). Thus, the target massage equipment may conduct a targeted movement based on the exercise information when the user is doing exercise, so as to automatically provide the most comfortable, the most suitable and the most effective massage for the user with respect to the user's exercise information. Therefore, after exercise, the user's body may be recovered better through the optimum massage, thereby prevent the user from selecting the massage mode manually and reducing the user's operations.

[0099] Additionally, this embodiment may be combined with the above embodiment in which the exercise information is determined according to the arm swing frequency obtained by the wearable device, or may also be combined with the following embodiment in which information of an exercise equipment used when the user is doing exercise is determined, so as to obtain more comprehensive and accurate exercise information.

[0100] Fig. 10 is a block diagram of another obtaining module according to an example embodiment of the present invention.

[0101] As shown in Fig. 10, in an embodiment, the obtaining module 701 in Fig. 7 may include: a third determining sub-module 7016, and a fourth determining sub-module 7017.

[0102] The third determining sub-module 7016 is configured to determine an exercise equipment identification in the exercise information.

[0103] The third determining sub-module 7016 in the terminal or the target massage equipment may identify the exercise information obtained by the wearable device, and then determine the exercise equipment identification included in the exercise information. The specific method for obtaining the exercise equipment identification by the wearable device includes but is not limited to the followings.

[0104] The user manually inputs the exercise equipment identification of the exercise equipment used when the user is doing exercise into the wearable device such as the smart band, the smart watch etc. worn by himself/herself.

[0105] Alternatively, the user's current movement direction may be determined automatically by an acceleration sensor or a direction sensor embedded in the wearable device such as the smart band, the smart watch etc. worn by the user, and then the exercise equipment identification may be determined indirectly. For example, if the acceleration sensor or the direction sensor detects that the user's arm moves upwardly all the time, the exercise equipment identification may be determined as an identification of a dumbbell or a horizontal bar.

[0106] Alternatively, if the exercise equipment used by the user used is relatively intelligent (such as configured with blue-tooth functionality), the exercise equipment identification may be sent to the wearable device the user wears such as the smart band, the smart watch etc. via the blue-tooth.

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[0107] The fourth determining sub-module 7017 is configured to determine information of the used exercise equipment according to the exercise equipment identification determined by the third determining sub-module 7016, in which the information of the used exercise equipment includes: at least one of a name of the exercise equipment and a working parameter of the exercise equipment.

[0108] After the exercise equipment identification is determined by the third determining sub-module 7016 in the terminal or the target massage equipment, the fourth determining sub-module 7017 may determine the information of the exercise equipment used when the user is doing exercise, such as the name of the exercise equipment and the working parameter of the exercise equipment (such as movement rate of the running machine if the used exercise equipment is a running machine, or weight of the dumbbell if the used exercise equipment is a dumbbell) etc.. Then, the target massage equipment may be controlled to provide a targeted massage for the user according to the information of the exercise equipment used when the user is doing exercise, such that the user's body may be recovered from fatigue as soon as possible, and the user's comfortable experience may be improved.

[0109] Additionally, this embodiment may be combined with the above embodiment in which the exercise information is determined according to the arm swing frequency obtained by the wearable device, or may be combined with the above embodiment in which the exercise information is determined according to the obtained total exercise intensity, so as to obtain more comprehensive and accurate exercise information.

[0110] In an embodiment, the exercise information includes at least one of the followings: body moving part information, an exercise intensity ratio between each two moving parts, exercise intensity information of each moving part and information of a used exercise equipment.

[0111] The exercise information includes but is not limited to at least one of the followings: body moving part information of the user, an exercise intensity ratio between various moving parts, exercise intensity information of each moving part and the information of the used exercise equipment. The exercise information, for example, may also include total exercise time of the user.

[0112] Fig. 11 is a block diagram of a control module according to an example embodiment of the present invention.

[0113] As shown in Fig. 11, in an embodiment, the control module 702 in Fig. 7 may include: a third obtaining sub-module 7021, a fourth obtaining sub-module 7022, and a first control sub-module 7023.

[0114] The third obtaining sub-module 7021 is configured to obtain a massage mode matched with the exercise information obtained by the obtaining module 701.

[0115] When the target massage equipment is controlled to operate according to the exercise information for providing a targeted massage for a user, a massage mode matched with the exercise information may be obtained firstly through the third obtaining sub-module 7021, i.e., a massage mode which matches with the exercise information and make the user's body be recovered from the fatigue due to exercise as soon as possible is obtained. For example, if the exercise equipment used by the user is a running machine, since the main body moving part is the leg and the leg conducts a large amount of activity, the massage mode may be a foot massage mode, a leg massage mode etc.; if the exercise equipment used by the user is a dumbbell or a horizontal bar, since the main body moving part is the arm and the arm conducts a large amount of activity, the massage mode may be an arm massage mode, a hand massage mode etc..

[0116] The fourth obtaining sub-module 7022 is configured to obtain the target massage equipment with the massage mode obtained by the third obtaining sub-module 7021.

[0117] For example, when the massage mode is foot massage mode, the target massage equipment may be a massage chair or a foot massager, a foot massage basin etc..

[0118] The first control sub-module 7023 is configured to control the target massage equipment obtained by the fourth obtaining sub-module 7022 to operate based on the massage mode.

[0119] Further, the target massage equipment with the massage mode is obtained by the fourth obtaining sub-module 7022, and then the target massage equipment is controlled by the first control sub-module 7023 to operate based on the massage mode so as to automatically provide the most comfortable, the most suitable and the most effective massage for the user with respect to the user's exercise information, such that the user's body may be recovered better and faster through the optimum massage after exercises, thereby prevent the user from selecting the massage mode manually and reducing the user's operations.

[0120] Since each massage mode has its corresponding preset massage parameter but each user's specific exercise information is distinct (for example, when the same exercise equipment is used to do exercise, the total exercise intensity, the exercise intensity of each body part, exercise ratio and length of exercise time may be changed), after the rough matched massage mode is determined, the target massage equipment may be controlled to operate followings.

[0121] The exercise information is compared with the preset exercise information corresponding to the massage mode.

[0122] The preset massage parameter corresponding to the massage mode is adjusted according to the comparison result, in which the preset massage parameter includes: one or more of a preset length of massage time and a preset massage intensity. For example, when the massage mode is upper limb massage, and the exercise intensity ratio of the upper limb to the lower limb in this

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exercise is higher than the preset exercise intensity ratio of the upper limb to the lower limb corresponding to the massage mode, the preset massage parameter corresponding to the massage mode may be increased for increasing the massage time and intensity for the upper limb; when the exercise intensity ratio of the upper limb to the lower limb in this exercise is lower than the preset exercise intensity ratio of the upper limb to the lower limb corresponding to the massage mode, the preset massage parameter corresponding to the massage mode may be decreased for decreasing the massage time and intensity for the upper limb. In this way, the inherent preset massage parameter of the massage mode may be adjusted according to user's specific exercise information, so as to provide a more intelligent targeted massage service for the user automatically. Thus, the user's body may be recovered from exercise better and faster, and the user's comfortable experience may be improved further.

[0123] In an embodiment, the massage mode includes: a historical massage mode matched with the exercise information.

[0124] When determining the massage mode, it is unnecessary to re-determine the mode every time. The exercise information of the user in each exercise and the determined matched massage mode may be stored in relation to each other. Thus, when the user does exercise next time, if the determined exercise information is exactly the same as that in one previous exercise, or the difference is minor, it is not required to re-determine the massage mode suitable for the user. Instead, the historical massage mode matched with the exercise information in this exercise may be directly determined as the massage mode for this exercise, so as to avoid re- determination and reduce operations and burden of the terminal and the target massage equipment.

[0125] Fig. 12 is a block diagram of another control module according to an example embodiment of the present invention.

[0126] As shown in Fig. 12, in an embodiment, the control module 702 in Fig. 7 may include: a second control sub-module 7024.

[0127] The second control sub-module 7024 is configured to control the target massage equipment to operate according to the exercise information by sending the exercise information to the target massage equipment.

[0128] When the subject of obtaining the exercise information is a terminal and the target massage equipment is controlled to operate according to the exercise information, the second control sub-module 7024 in the terminal may send the obtained exercise information to the target massage equipment, and then control the target massage equipment to operate according to the exercise information, such that the target massage equipment is controlled automatically through the terminal to provide the most comfortable, the most suitable and the most effective massage for the user with respect to the user's exercise information. Thus, after exercises, the user's body may be recovered better through the optimum massage, thereby prevent the user from selecting the massage mode manually and reducing the user's operations.

[0129] According to a third aspect of the present invention, a device for controlling a target massage equipment is provided. The device includes:

a processor;
a memory for storing an instruction executable by the processor;
in which the processor is configured to:

obtain exercise information; and
control the target massage equipment to operate according to the exercise information.

[0130] The processor is further configured to obtain exercise information by:

obtaining an arm swing frequency through a wearable device, in which the wearable device includes at least one of a smart band and a smart watch;
comparing the arm swing frequency with at least two preset arm swing frequencies; and
if the arm swing frequency matches with any one of the at least two preset arm swing frequencies, determining the exercise information according to a moving part of a user's body corresponding to the any one of the at least two preset arm swing frequencies.

[0131] The processor is also configured to obtain exercise information, by:

obtaining a total exercise intensity when a user is doing exercise through a wearable device, in which the total exercise intensity includes one or more of a pulse rate, a pulse intensity, a heartbeat frequency and a heartbeat intensity when the user is doing exercise; and
determining the exercise information according to the total exercise intensity.

[0132] The processor is also configured to obtain exercise information, by:

determining an exercise equipment identification in the exercise information;
determining information of a used exercise equipment according to the exercise equipment identification, in which the information of the used exercise equipment includes: at least one of a name of the used exercise equipment name and a working parameter of the used exercise equipment.

[0133] The processor is also configured as: the exercise information including at least one of: body moving

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part information, an exercise intensity ratio between each two moving parts, exercise intensity information of each moving part and information of a used exercise equipment.

[0134] The processor is also configured to control the target massage equipment to operate according to the exercise information, by:

obtaining a massage mode matched with the exercise information;
obtaining the target massage equipment with the massage mode; and
controlling the target massage equipment to operate based on the massage mode.

[0135] The processor is also configured as: the massage mode including: a historical massage mode matched with the exercise information.

[0136] The processor is also configured to control the target massage equipment to operate according to the exercise information by:

controlling the target massage equipment to operate according to the exercise information by sending the exercise information to the target massage equipment.

[0137] Fig. 13 is a block diagram of a device 1300 for controlling a target massage equipment according to an example embodiment of the present invention. The device is applied in a terminal. For example, the device 1300 may be a mobile phone, a computer a digital broadcast terminal, a messaging device, a gaming console, a tablet, a medical device, an exercise equipment, a personal digital assistant, and the like.

[0138] Referring to Fig. 13, the device 1300 may include one or at least two of the following components: a processing component 1302, a memory 1304, a power component 1306, a multimedia component 1308, an audio component 1310, an input/output (I/O) interface 1312, a sensor component 1314, and a communication component 1316.

[0139] The processing component 1302 typically controls overall operations of the device 1300, such as the operations associated with display, telephone calls, data communications, camera operations, and recording operations. The processing component 1302 may include one or at least two processors 1320 to execute instructions to perform all or part of the acts in the above described methods. Moreover, the processing component 1302 may include one or at least two modules which facilitate the interaction between the processing component 1302 and other components. For instance, the processing component 1302 may include a multimedia module to facilitate the interaction between the multimedia component 1308 and the processing component 1302 .

[0140] The memory 1304 is configured to store various types of data to support the operation of the device 1300. Examples of such data include instructions for any applications or methods operated on the device 1300, contact data, phonebook data, messages, pictures, video, etc. The memory 1304 may be implemented using any type of volatile or non-volatile memory devices, or a combination thereof, such as a static random access memory (SRAM), an electrically erasable programmable read-only memory (EEPROM), an erasable programmable read-only memory (EPROM), a programmable read-only memory (PROM), a read-only memory (ROM), a magnetic memory, a flash memory, a magnetic or optical disk.

[0141] The power component 1306 provides power to various components of the device 1300. The power component 1306 may include a power management system, one or more power sources, and any other components associated with the generation, management, and distribution of power in the device 1300.

[0142] The multimedia component 1308 includes a screen providing an output interface between the device 1300 and the user. In some embodiments, the screen may include a liquid crystal display (LCD) and a touch panel (TP). If the screen includes the touch panel, the screen may be implemented as a touch screen to receive input signals from the user. The touch panel includes one or more touch sensors to sense touches, swipes, and gestures on the touch panel. The touch sensors may not only sense a boundary of a touch or swipe action, but also sense a period of time and a pressure associated with the touch or swipe action. In some embodiments, the multimedia component 1308 includes a front camera and/or a rear camera. The front camera and the rear camera may receive an external multimedia datum while the device 1300 is in an operation mode, such as a photographing mode or a video mode. Each of the front camera and the rear camera may be a fixed optical lens system or have focus and optical zoom capability.

[0143] The audio component 1310 is configured to output and/or input audio signals. For example, the audio component 1310 includes a microphone ("MIC") configured to receive an external audio signal when the device 1300 is in an operation mode, such as a call mode, a recording mode, and a voice recognition mode. The received audio signal may be further stored in the memory 1304 or transmitted via the communication component 1316. In some embodiments, the audio component 1310 further includes a speaker to output audio signals.

[0144] The I/O interface 1312 provides an interface between the processing component 1302 and peripheral interface modules, such as a keyboard, a click wheel, buttons, and the like. The buttons may include, but are not limited to, a home button, a volume button, a starting button, and a locking button.

[0145] The sensor component 1314 includes one or at least two sensors to provide status assessments of various aspects of the device 1300. For instance, the sensor component 1314 may detect an open/closed status of the device 1300, relative positioning of components, e.g.,

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the display and the keypad, of the device 1300, a change in position of the device 1300or a component of the device 1300, a presence or absence of user contact with the device 1300, an orientation or an acceleration/deceleration of the device 1300, and a change in temperature of the device 1300. The sensor component 1314 may include a proximity sensor configured to detect the presence of nearby objects without any physical contact. The sensor component 1314 may also include a light sensor, such as a CMOS or CCD image sensor, for use in imaging applications. In some embodiments, the sensor component 1314 may also include an accelerometer sensor, a gyroscope sensor, a magnetic sensor, a pressure sensor, or a temperature sensor.

[0146] The communication component 1316 is configured to facilitate communication, wired or wirelessly, between the device 1300 and other devices. The device 1300 can access a wireless network based on a communication standard, such as WiFi, 2G, or 3G, or a combination thereof. In one exemplary embodiment, the communication component 1316 receives a broadcast signal or broadcast associated information from an external broadcast management system via a broadcast channel. In one exemplary embodiment, the communication component 1316 further includes a near field communication (NFC) module to facilitate short-range communications. For example, the NFC module may be implemented based on a radio frequency identification (RFID) technology, an infrared data association (IrDA) technology, an ultra-wideband (UWB) technology, a Bluetooth (BT) technology, and other technologies.

[0147] In exemplary embodiments, the device 1300 may be implemented with one or more application specific integrated circuits (ASICs), digital signal processors (DSPs), digital signal processing devices (DSPDs), programmable logic devices (PLDs), field programmable gate arrays (FPGAs), controllers, micro-controllers, microprocessors, or other electronic components, for performing the above described methods.

[0148] In exemplary embodiments, there is also provided a non-transitory computer-readable storage medium including instructions, such as included in the memory 1304, executable by the processor 1320 in the device 1300, for performing the above-described methods. For example, the non-transitory computer-readable storage medium may be a ROM, a RAM, a CD-ROM, a magnetic tape, a floppy disc, an optical data storage device, and the like.

[0149] A non-transitory computer-readable storage medium has stored therein instructions that, when executed by a processor, causes the device 1300 to perform the method for controlling a target massage equipment, including:

obtaining exercise information; and
controlling the target massage equipment to operate according to the exercise information.

[0150] In an embodiment, obtaining exercise information includes:

obtaining an arm swing frequency through a wearable device, in which the wearable device includes at least one of a smart band and a smart watch;
comparing the arm swing frequency with at least two preset arm swing frequencies; and
when the arm swing frequency matches with any one of the at least two preset arm swing frequencies, determining the exercise information according to a moving of a user's body part corresponding to the any one of the at least two preset arm swing frequencies.

[0151] In an embodiment, obtaining exercise information includes:

obtaining a total exercise intensity when a user is doing exercise through a wearable device, in which the total exercise intensity includes one or more of a pulse rate, a pulse intensity, a heartbeat frequency and a heartbeat intensity when the user is doing exercise; and
determining the exercise information according to the total exercise intensity.

[0152] In an embodiment, obtaining exercise information includes:

determining an exercise equipment identification in the exercise information;
determining information of a used exercise equipment according to the exercise equipment identification, in which the information of the used exercise equipment includes: at least one of a name of the used exercise equipment and a working parameter of the used exercise equipment.

[0153] In an embodiment, the exercise information includes at least one of: body moving part information, an exercise intensity ratio between each two moving parts, exercise intensity information of each moving part and information of a used exercise equipment.

[0154] In an embodiment, controlling the target massage equipment to operate according to the exercise information includes:

obtaining a massage mode matched with the exercise information;
obtaining the target massage equipment with the massage mode; and
controlling the target massage equipment to operate based on the massage mode.

[0155] In an embodiment, the massage mode includes: a historical massage mode matched with the exercise information.

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