



(51) International Patent Classification:
A46B 13/00 (2006.01)

(21) International Application Number:
PCT/US2009/043137

(22) International Filing Date:
7 May 2009 (07.05.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/051,488 8 May 2008 (08.05.2008) US
12/436,201 6 May 2009 (06.05.2009) US

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(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ,
CA, CH, 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, JP, KE, KG, KM, 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, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG,
SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA,
UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ,
TM), European (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, NL, NO, PL, PT, RO, SE, SI, SK, TR),
OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML,
MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: TOOTH BRUSHING SYSTEM

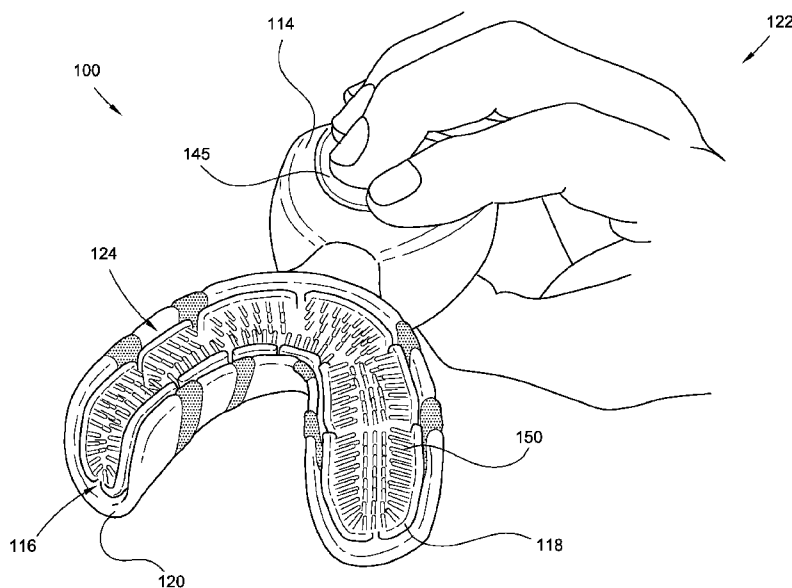


Fig. 1

(57) Abstract: A tooth brushing system adapted to simultaneously clean a set of maxilla teeth or a set of mandible teeth. The system comprises a vibration inducer, a controller for the vibration inducer, a power source and a handle adapted to enclose the vibration inducer, the controller for the vibration inducer and the power source. The system further comprises a plurality of brushes adapted to simultaneously contact the set of maxilla teeth or the set of mandible teeth, a vibration isolation plate integral with the handle and a vibration transfer plate connected to the vibration inducer and the plurality of brushes and releasably connected to the vibration isolation plate, wherein the handle is adapted to be effectively held within a hand of a user and the vibration isolation plate is adapted to isolate vibration from the set of maxilla teeth or the set of mandible teeth not contacted by the plurality of brushes.

TOOTH BRUSHING SYSTEM

TECHNICAL FIELD

[0001] The invention broadly relates to tooth brushes, more specifically to a tooth
5 brush having a plurality of brushes, and even more particularly to a tooth brushing system
having a plurality of brushes in the form of a U-shaped tray arranged to simultaneously clean
the entire set of maxilla teeth or the entire set of mandible teeth.

BACKGROUND OF THE INVENTION

[0002] Regular brushing of teeth is important to maintain the oral and general health
10 of an individual. Able body individuals typically use conventional manual or electric
toothbrushes. Many individuals, such as the elderly and disabled, do not have the ability to
regularly brush their teeth with conventional tooth brushes. The teeth of many of these
individuals are not regularly or effectively brushed by themselves, while for others, health
care workers are responsible for brushing their teeth. It is difficult and time consuming for
15 the health care workers to brush the teeth of their patients using conventional toothbrushes.
Moreover, some children have difficulty grasping traditional tooth brush handles and
manipulating the tooth brush to effectively clean their teeth due to their smaller and less
dexterous hands. In view of the foregoing, it should be apparent that for the aforementioned
reasons and for a variety of other reasons, traditional tooth brushes present issues that
20 preclude good dental hygiene.

[0003] In view of some elderly and disabled person's inability to regularly and/or
properly brush their teeth, those people may experience tooth decay, gum disease and other
issues. Similarly, children and able body individuals who fail to perform sufficient and/or
correct brushing also experience tooth decay, gum disease and other issues.

25 [0004] Similar health benefits are provided to animals by proper oral hygiene, and in
addition to the difficulties described above relative to people cleaning their teeth, it is also
extremely difficult to clean the teeth of animals. For example, dogs and cats are typically
unwilling to permit a person to brush their teeth. The greater the length of time required
clean the animal's teeth, the less likely that it will be possible to complete the cleaning.
30 Thus, using a conventional manual or electric toothbrush, which is capable of cleaning only a
single tooth at a time, typically results in the incomplete cleaning of the animal's teeth.

[0005] Many devices have been created in an attempt to facilitate effective and proper cleaning of teeth, for example, the devices described in United States Patent Nos. 4,011,616; 4,237,574; 5,337,435; 6,223,376; 6,353,956; and, 7,082,638. Each of the devices disclosed in these patents suffers from defects and/or shortcomings that renders them ineffective, such as complexity of design, difficulty of operation, inability to properly sanitize after use, *etc.*.

[0006] As can be derived from the variety of devices and methods directed at teeth cleaning, many means have been contemplated to accomplish the desired end, *i.e.*, good dental hygiene including but not limited to minimization of tooth decay and gum disease. Heretofore, tradeoffs between ease of use, effectiveness and cost of manufacture were required. Thus, there is a long-felt need for a tooth brushing system that can effectively clean an entire upper or lower set of teeth simultaneously and that is easy to use and inexpensive to manufacture. Moreover, there is a long-felt need for a tooth brushing system that can be used by health care workers to clean the teeth of patients or used by individuals such as elderly, disabled or children to clean their own teeth, where these individuals have a disability that makes it difficult to use or an inability to effectively use a conventional tooth brush. Furthermore, there is a long-felt need for a tooth brushing system that can be used by veterinarians and pet owners that facilitates the efficient and effective cleaning of an animal's teeth.

BRIEF SUMMARY OF THE INVENTION

[0007] A tooth brushing system has been developed including a U-shaped mouthpiece having a vibrating or reciprocating inner brush tray with bristles and an outer base tray that is generally isolated from the movement of the brush tray. The brush tray is seated in the base tray by resilient mounts that may also align the brush tray in the base tray. The resilient mounts allow the brush tray to be easily removed for replacement or cleaning. The base tray includes a front handle housing a battery, motor and gearing system to vibrate or reciprocate the brush tray. The handle and optionally the base tray may be stored on a battery recharging mount while the brush tray is separately soaked or cleaned.

[0008] The present invention broadly comprises a tooth brushing system adapted to simultaneously clean a set of maxilla teeth or a set of mandible teeth. The system includes a vibration inducer, a controller for the vibration inducer, a power source and a handle adapted to enclose the vibration inducer, the controller for the vibration inducer and the power source. The system further includes a plurality of brushes adapted to simultaneously contact the set

of maxilla teeth or the set of mandible teeth, a vibration isolation plate integral with the handle and a vibration transfer plate connected to the vibration inducer and the plurality of brushes and releasably connected to the vibration isolation plate, wherein the handle is adapted to be effectively held within a hand of a user and the vibration isolation plate is adapted to isolate vibration from the set of maxilla teeth or the set of mandible teeth not contacted by the plurality of brushes.

[0009] In some embodiments, the vibration inducer is vibrationally isolated from the handle. In other embodiments, the vibration inducer includes a motor arranged to rotate an asymmetric mass, while in still other embodiments, the vibration inducer includes an ultrasonic transducer. In still yet other embodiments, the controller for the vibration inducer includes an on/off switch, and in some embodiments, the power source includes at least one primary battery or at least one secondary battery. In other embodiments, the handle includes a generally T-shape.

[0010] In further embodiments of the present invention, the plurality of brushes includes a U-shaped set of bristles, and the U-shaped set of bristles has a generally U-shaped cross-section, a generally V-shaped cross-section or combinations thereof.

[0011] In other embodiments, the vibration transfer plate is connected to the vibration isolation plate via at least one vibration damping means, and in some of these embodiments, the at least one vibration damping means is selected from the group consisting of: a spring, a bumper, a post and combinations thereof. In yet other embodiments, the vibration transfer plate further includes at least one bite stop, and in still yet further embodiments, the vibration transfer plate further includes a plurality of mounting features arranged to releasably secure the plurality of brushes in a plurality of locations.

[0012] In some embodiments, the vibration isolation plate includes a plurality of posts. In such embodiments, the plurality of posts are arranged to releasably engage the vibration transfer plate. In yet other embodiments, the vibration transfer plate further includes at least one rail adapted to receive the plurality of brushes and wherein a position of each of the plurality of brushes is modified by one or more of the following steps: moving each of the plurality of brushes along a length of the at least one rail; rotating each of the plurality of brushes about the at least one rail; moving each of the plurality of brushes about laterally relative to the at least one rail; bending at least a portion of the at least one rail upwardly or downwardly; and, bending at least a portion of the at least one rail laterally. In

some of these embodiments, the position of each of the plurality of brushes is modified automatically in response to contact between the plurality of brushes and the set of teeth to be cleaned. In still yet other embodiments, the vibration isolation plate is releasably securable to the handle and the vibration isolation plate secured to the handle form an integral assembly.

5 In yet another embodiment, the present invention tooth brushing system further includes means for adjusting a length of the plurality of brushes, at least one of the plurality of brushes is secured to the vibration isolation plate via a vibration damping connector and an integral assembly including the vibration inducer, the controller for the vibration inducer, the power supply, at least two of the plurality of brushes and the vibration transfer plate. In this
10 embodiment, the integral assembly is disposed within the handle and the means for adjusting a length of the plurality of brushes is adapted to modify a position of the integral assembly within the handle thereby modifying a distance between the at least one of the plurality of brushes secured to the vibration isolation plate and the at least two of the plurality of brushes of the integral assembly.

15 **[0013]** It is a general object of the present invention to provide a tooth brushing system that can be effectively used by a variety of different types of users to clean their teeth and thereby minimize tooth decay and gum disease.

[0014] It is another general object of the present invention to provide a tooth brushing system that can be used by health care workers to clean the teeth of patients or can be used by
20 individuals such as elderly, disabled or children to clean their own teeth, where these individuals have a disability that makes it difficult to use or an inability to effectively use a conventional tooth brush.

[0015] It is yet another general object of the present invention to provide a tooth brushing system that can simultaneously clean the entire set of maxilla teeth or the entire set
25 of mandible teeth.

[0016] It is a further general object of the present invention to provide a tooth brushing system that is easy to use and inexpensive to manufacture.

[0017] These and other objects and advantages of the present invention will be readily appreciable from the following description of preferred embodiments of the invention
30 and from the accompanying drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The nature and mode of operation of the present invention will now be more fully described in the following detailed description of the invention taken with the accompanying drawing figures, in which:

5 Figure 1 is a perspective view of an embodiment of the present invention tooth brushing system;

Figure 2 is a partial cross-sectional view of an embodiment of the present invention tooth brushing system positioned with the mouth of a person;

10 Figure 3 is an exploded perspective view of another embodiment of the present invention tooth brushing system;

Figure 4 is front perspective view of yet another embodiment of the present invention tooth brushing system;

Figure 5 is an enlarged front elevational view of a portion of the tooth brushing system shown in Figure 4;

15 Figure 6 is a perspective view of another embodiment of the present invention tooth brushing system having a partial cut-away handle;

Figure 7 is a front elevational view of the tooth brushing system shown in Figure 6 having a portion of the vibration isolation plate removed;

20 Figure 8 is a perspective view of an embodiment of a vibration transfer plate used in the tooth brushing system shown in Figure 6;

Figure 9 is a partial perspective view of yet another embodiment of the present invention tooth brushing system;

Figure 10 is a perspective view of an embodiment of a charging station for use with the present invention tooth brushing system;

25 Figure 11 is a perspective view of another embodiment of a charging station for use with the present invention tooth brushing system; and,

Figure 12 is a side elevational view of yet another embodiment of the present invention tooth brushing system.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

30 [0019] At the outset, it should be appreciated that like drawing numbers on different drawing views identify identical, or functionally similar, structural elements of the invention. While the present invention is described with respect to what is presently considered to be

the preferred aspects, it is to be understood that the invention as claimed is not limited to the disclosed aspects.

[0020] Furthermore, it is understood that this invention is not limited to the particular methodology, materials and modifications described and as such may, of course, vary. It is also understood that the terminology used herein is for the purpose of describing particular aspects only, and is not intended to limit the scope of the present invention, which is limited only by the appended claims.

[0021] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood to one of ordinary skill in the art to which this invention belongs. Although any methods, devices or materials similar or equivalent to those described herein can be used in the practice or testing of the invention, the preferred methods, devices, and materials are now described.

[0022] An embodiment of the present invention comprises tooth brushing system **100** adapted to simultaneously clean a set of maxilla teeth **102** or a set of mandible teeth **104**. The set of teeth may be that of user **106**, *i.e.*, the person using system **100** brushing their own teeth, may be that of a person having their teeth brushed by another, *e.g.*, a patient having their teeth brushed by a health care worker, or may be that of an animal having its teeth brushed by a veterinarian or pet owner. Tooth brushing system **100** comprises vibration inducer **108**, controller **110** for vibration inducer **108**, power source **112** and handle **114** adapted to enclose vibration inducer **108**, controller **110** and power source **112**. System **100** further comprises plurality of brushes **116** adapted to simultaneously contact the entire set of maxilla teeth **102** or the entire set of mandible teeth **104**, vibration transfer plate **118** connected to vibration inducer **108** and plurality of brushes **116** and vibration isolation plate **120** connected to vibration transfer plate **118**. In some embodiments of system **100**, handle **114** is adapted to be effectively held within hand **122** of user **106**, *e.g.*, a health care worker, a child, an elderly person, *etc.*, and vibration isolation plate **120** is adapted to isolate vibration from set of maxilla teeth **102** or set of mandible teeth **104** not contacted by plurality of brushes **116**.

[0023] It should be appreciated that there are a variety of embodiments of plurality of brushes **116**. For example, plurality of brushes **116** comprise a plurality of brush segments **124** wherein interface **126** arranged between each respective segment **124** permits the modification of the overall shape of plurality of brushes **116** thereby permitting matching its

overall shape to the shape of the user's set of teeth, *e.g.*, set of maxilla teeth **102** or set of mandible teeth **104**. Similarly, in an alternate embodiment of the present invention, *i.e.*, tooth brushing system **128**, plurality of brushes **130** comprise a plurality of brush segments **132** wherein interface **134** arranged between each respective segment **132** permits the
5 modification of the overall shape of plurality of brushes **130** thereby permitting matching its overall shape to the shape of the user's set of teeth. Additionally, in this alternate embodiment, the overall length of plurality of brushes **130** may be modified by removing as many segments **132** as is necessary to match the overall length of the user's set of teeth. It should be appreciated that in a preferred embodiment of the present invention, plurality of
10 brushes **116** and **130** are formed from a flexible material, *e.g.*, silicon. It should be further appreciated that that the foregoing arrangements of plurality of brush segments, being flexibly interconnected, are capable of automatically repositioning themselves according to the orientation of each respective tooth of the set of teeth being cleaned, *e.g.*, a brush segment aligned with a tooth reorients itself according to the interaction between this tooth, having a
15 rotational and/or angular position, and the segment. The general shape of the bristles arranged about plurality of brushes **116** and **130** and the manual reorientation of the plurality of brush segments are discussed *infra*.

[0024] System **100** comprises handle **114**. Similarly, system **128**, which is also arranged to simultaneously clean a set of maxilla teeth **102** or a set of mandible teeth **104**,
20 comprises handle **136**. Depending on the arrangement of vibration inducer **108**, it may be advantageous to vibrationally isolate vibration inducer **108** from handle **114** or **136**. For example, system **128** comprises vibration damping material **138** arranged between vibration inducer **108** and handle **136**. Damping material **138** may be formed of any material that is capable of damping vibration originating from vibration inducer **108**, for example, silicon,
25 natural rubber, *etc.*. Such an arrangement of vibration isolation will increase user comfort while the present invention tooth brushing system is in use. Thus, the vibration will be used to clean the contacted teeth and not to fatigue the user's hand. Moreover, the present invention may include a handle comprising a generally T-shape, *e.g.*, handle **139**. It should be appreciated that the shape of the handle will aid in the use of the present invention tooth
30 brushing system in that the handle provides means by which user **106** may grasp the device and that some embodiments of the handle may be more easily grasped by some users versus grasping other handles, *e.g.*, some users may easily grasp handles **114** or **136** having sizes

larger than traditional tooth brushes and some users may easily grasp handle **139** having a generally T-shape. Moreover, the handle may extend directly forward of the vibration isolation or transfer plates, such that the respective plates and handle are co-planar. Alternatively, the handle may extend outward at an angle relative to the plates and therefore
5 may be suitable for a health care provider to hold the present invention tooth brushing system while positioning the plurality of brushes in the mouth of a patient.

[0025] The present invention may include one of a variety of different vibration inducing means, and several of these vibration inducing means are discussed herein but are not intended to limit the scope of the claims to only these types of vibration inducing means
10 as a variety of other means are also possible. For example, system **100** comprises ultrasonic transducer **140**, while system **128** comprises motor **142** arranged to rotate asymmetric mass **144**. Depending on the needs of user **106** and/or the person or animal having their teeth cleaned, one vibration inducer may be more appropriate than another. Transducer **140** can provide ultrasonic vibration which is beneficial under some cleaning conditions, while motor
15 **142** can provide vibrations having fewer cycles per unit time which is beneficial under different cleaning conditions. Controller **110** is arranged to control the frequency at which transducer **140** or motor **142** vibrates, and such controller includes the necessary electronic components to affect such control. Controller **110** may also provide a timer arranged to control how long the vibration inducer **108** provides vibration and/or may include on/off
20 switch **145** whereby system **100** or system **128** may be turned on or off. In view of the foregoing, one of ordinary skill in the art will recognize that plurality of brushes **116** and **130** move in a vibrating and/or reciprocating manner to simultaneously brush and clean an entire set of teeth.

[0026] The present invention comprises power source **112** wherefrom vibration
25 inducer **108** and controller **110** receive power. Power source **112** may comprise at least one primary battery **146** or alternatively at least one secondary battery **148**. It should be appreciated that the term “primary battery” is intended to mean a battery that can produce current immediately on assembly, *e.g.*, zinc-carbon or alkaline batteries, and that the term “secondary battery” is intended to mean a battery that must be charged prior to use, *e.g.*,
30 nickel-cadmium, nickel metal hydride or lithium-ion batteries. It should be further appreciated that power source **112** may comprise a transformer plugged directly into an

electrical outlet and arranged to provide power to vibration inducer **108** and controller **110**, and that such variations are within the spirit and scope of the claimed invention.

[0027] Plurality of brushes **116** and **130** show two embodiments of bristle arrangements for use with the present invention tooth brushing system. Plurality of brushes **116** comprises a U-shaped set of bristles **150**, and the overall set of bristles **150** comprises a generally U-shaped cross-section (*See* Figure 3). Alternatively, plurality of brushes **130** comprises a U-shaped set of bristles **154**, and the overall set of bristles **154** comprises a generally V-shaped cross-section (*See* Figure 7). Furthermore, bristles **150** and **154** may be coated with tooth paste or other tooth cleaning compound and may be formed from any material suitable and safe for use in cleaning teeth, *e.g.*, nylon.

[0028] The present invention tooth brushing system further comprises a vibration transfer plate. The vibration transfer plate may take a variety of forms, for example, vibration transfer plates **118** and **158**. In some embodiments, *e.g.*, system **100**, vibration transfer plate **118** forms the means by which bristles **150** are connected to vibration inducer **108**, *i.e.*, bristles **150** are attached to plurality of brushes **116** which also forms vibration transfer plate **118** and in turn vibration transfer plate **118** is connected to vibration inducer **108**. In other embodiments, *e.g.*, system **128**, vibration transfer plate **158** acts as an interface between plurality of brushes **130** and vibration inducer **108**, *i.e.*, bristles **154** are connected to plurality of brushes **130**, which is in turn connected to vibration transfer plate **158**, and which is itself in turn connected to vibration inducer **108**. In the former embodiment, vibration transfer plate **118** is connected to vibration isolation plate **120** via at least one vibration damping means **160**, while in the latter embodiment, vibration transfer plate is connected to vibration isolation plate **162** via at least one damping means **164**. It should be appreciated that in each embodiment at least one damping means **160** and **164** may be selected from a group of suitable damping means; however the group discussed *infra* is not considered limiting and the at least one damping means may be formed by any suitable material. In some embodiments, the at least one damping means may comprise spring **166**, may comprise bumper **168** or alternatively may comprise post **170**. Furthermore, a combination of damping means may also be included, for example, several springs in combination with several posts, and such variations are within the spirit and scope of the claimed invention. It should be appreciated that the various damping means provide lower and lateral support to the vibration transfer plate and allow the vibration transfer plate to move in a vibrating and reciprocating

manner to brush a set of teeth on which the present invention is applied. Thus, the damping means isolate the vibration isolation plate from the vibration and reciprocal movement of the vibration transfer plate. The damping means may also be used to align plurality of brushes **116** with vibration isolation plate **120**. In such embodiments, the damping means, *e.g.*, springs **166**, may be seated in openings or recesses **171**. By seating the damping means in the openings or recesses, plurality of brushes **116** can be reliably aligned in vibration isolation plate **120**.

[0029] Additionally, in some embodiments, the vibration transfer plate may further comprise a plurality of mounting features, *e.g.*, slots **172**, arranged to releasably secure the plurality of brushes in a plurality of locations. Thus, it will be apparent to one having ordinary skill in the art that the position of plurality of brushes **130** may be modified by altering the location of connecting posts **174** within slots **172**, thereby permitting user **106** to position plurality of brushes **130** in the most comfortable position based on the shape of the respective set of teeth being cleaned.

[0030] In some embodiments, the vibration transfer plate, *e.g.*, vibration transfer plate **156**, may include at least one bite stop **176**. Bite stops **176** are arranged to limit the depth within the bristles, and therefore the plurality of brushes, that user **106**, or the person or animal having their teeth cleaned, may position their teeth. Thus, without any special training or skill level, user **106** can properly align the plurality of brushes relative to her teeth or another's teeth thereby maximizing the effectiveness of the present invention tooth brushing system.

[0031] As can be seen in the figures, the present invention may include different embodiments of the vibration isolation plate, *e.g.*, vibration isolation plates **120** and **162**. In the embodiment shown by system **100**, vibration isolation plate **120** is integrally formed, *e.g.*, molded, with handle **114** and is therefore stationary relative to handle **114**, while in the embodiment shown by system **128**, vibration isolation plate **162** is releasably securable to handle **136** via releasable locking means, *e.g.*, locking tabs within openings, variable shaped slots having complimentary posts disposed therein, *etc.*. Vibration isolation plate **162** further comprises a plurality of posts, *i.e.*, posts **170**. Posts **170** and vibration isolation plate **162** may be formed from a compliant material which also provides vibration isolation characteristics, for example, silicon. It should be appreciated from the figures that the plurality of posts **170** are arranged to releasably engage with vibration transfer plate **158**.

Thus, as user **106** uses the embodiment shown in system **128**, the set of teeth to be cleaned are in contact with the vibrating plurality of brushes **130**, while the set of teeth not being cleaned are in contact with the non-vibrating vibration isolation plate **162**. This isolation of the mouth and non-brushed set of teeth provides comfort to user **106** and avoids unnecessary irritation of the mouth and teeth. It should be appreciated that the vibration isolation plate may further include bite pads on the surface opposite the vibration transfer plate, and the bite pads may be formed from a deformable material thereby increasing the isolation of vibration transmitted to the teeth not being cleaned.

[0032] A further embodiment of the present invention tooth brushing system is shown in Figure 9. Tooth brushing system **180** comprises handle **182** having vibration isolation plate **184** fixedly secured thereto. Vibration isolation plate **184** includes vibration damping means, *e.g.*, pads **186**, arranged to minimize the amount of vibration transferred from vibration transfer plate **188** to vibration isolation plate **184**. In this embodiment, vibration transfer plate **188** comprises rails **190** and **192**; however, it should be appreciated that vibration transfer plate **188** may comprise only one rail or alternatively may comprise more than two rails and such variations are within the spirit and scope of the claimed invention. Vibration is transferred via connection **194** to vibration transfer plate **188**, from vibration transfer plate **188** to plurality of brushes **196** and subsequently to the teeth being cleaned by plurality of brushes **196**. As can be seen in the figure, plurality of brushes **196** comprises brush elements **198** having substantially V-shaped cross-sections and brush elements **200** having substantially U-shaped cross-sections, and further includes bite stop **202**. Each of brush elements **198** and **200** includes bristles **204**; however, for clarity bristles **204** have been shown in only one of each type of brush element.

[0033] In this embodiment, rails **190** and **192** are adapted to receive brush elements **198** and **200** and the position of each respective brush element **198** and **200** may be independently modified. For example, the position of either type of brush element may be modified by: moving the brush elements along the length of rails **190** and **192**, *i.e.*, moved according to bi-directional arrow **206**; rotating the brush elements about rails **190** and **192**, *i.e.*, rotated according to bi-directional arrow **208**; moving the brush elements about laterally relative to rails **190** and **192**, *i.e.*, moving according to bi-directional arrow **210**; bending rails **190** and **192** upwardly or downwardly, *i.e.*, bending according to bi-directional arrow **212**; and/or, bending rails **190** and **192** laterally, *i.e.*, bending according to bi-directional arrow

214. It should be appreciated that rails **190** and **192** may be formed from a number of different materials, *e.g.*, spring steel or plastic, and that the foregoing modification of brush element position may occur manually, *e.g.*, a user physically moves the position of the respective brush elements, or the respective brush elements may move in response to the interaction of the teeth being cleaned and the complimentary brush elements as described *supra*.

[0034] It should be further appreciated that removal of the plurality of brushes allows for replacement and/or cleaning of the plurality of brushes. The plurality of brushes may be cleaned by being soaked in a cleaning fluid that also applies a tooth cleaning composition to the brushes. Similarly, the plurality of brushes may be soaked between brushings and removed from a soaking container for use in the present invention tooth brushing system.

[0035] In addition to the aforementioned vibration inducers, it should be appreciated that the present invention may also include other means of imparting vibration from the vibration inducer to the plurality of brushes. For example, the vibration inducer may further comprise rotary transmission or gearing **216** and linkage **218** coupling transmission or gearing **216** to plurality of brushes **116**. The rotation of transmission or gearing **216** is converted by linkage **218** to a reciprocating or vibratory movement that drives the movement of plurality of brushes **116**. Linkage **218** may be a reciprocating shaft extending through the handle and pivotably attached to the front of plurality of brushes **116**. Further, linkage **218** may include frame **220** that extends beneath plurality of brushes **116** and supports brushes **116**, similar to the embodiment including vibration transfer plate **158**.

[0036] In addition to the above described embodiments, the present invention may further comprise mount and battery charger **222** or **224**, which may include a generally inverted U-shaped saddle **226** arranged to receive the U-shaped portion of the present invention tooth brushing system, or may include recessed portion **228** arranged to receive base **230** of handle **114**. Conductive contacts **232** on the U-shaped portion of the present invention engage conductive contacts **234** on charger **224**, when the U-shaped portion is seated within saddle **226**. Similarly, conductive contacts **236** on base **230** engage conductive contacts **238** on charger **222**, when base **230** is seated within recessed portion **228**. Chargers **222** and **224** receive electrical power via electrical power cord **240**. The engagement of the contacts **232** with **234** and contacts **236** with **238** allows power source **112** in handle **114** to be recharged, *e.g.*, recharging secondary batteries **148**. In addition to the foregoing

arrangements of recharging systems, it should be appreciated that other recharging systems may also be incorporated within the present invention, *e.g.*, inductive chargers or a transformer plugged directly into the handle, and such charging systems are within the spirit and scope of the claimed invention. Housing **242** of mount and charger **222** or **224** may have
5 a simple form such as the rectangular housing shown in Figure 10 or a decorative form such as the tooth shaped housing shown in Figure 11.

[0037] It has been further contemplated that the length of the plurality of brushes may be modified differently than described in the embodiments *supra*. Figure 12 shows a side elevational view of yet another embodiment of the present invention tooth brushing system,
10 *i.e.*, tooth brushing system **244**. Tooth brushing system **244** comprises vibration inducer **246**, a controller (not shown) for vibration inducer **246**, a power source (not shown) and handle **248**. The controller and power source has been left out of Figure 12 for clarity; however, it should be appreciated that the arrangement of such components is similar to the embodiments of the present invention described above. System **244** further comprises plurality of brushes
15 **250**, vibration isolation plate **252** and vibration transfer plate **254**. It should be appreciated that the nature of operation of the foregoing components is similar to their respective functions set forth above. System **244** further comprises integral assembly **256** which includes vibration inducer **246**, the controller (not shown) for vibration inducer **246**, the power supply (not shown), at least two of plurality of brushes **250**, *e.g.*, brushes **250a**, **250b**
20 and **250c**, and vibration transfer plate **254**. Integral assembly **256** is disposed within handle **248**. Furthermore, at least one of plurality of brushes **250**, *e.g.*, brush **250d**, is secured to vibration isolation plate **252** via vibration damping connector **258**. Vibration damping connector **258** may be formed from any material suitable for damping vibration transmitted from vibration transfer plate **254** to vibration isolation plate **252**, *e.g.*, silicone or natural
25 rubber, and such variations are within the spirit and scope of the claimed invention. System **244** further comprises means for adjusting length **260** of plurality of brushes **250**, *e.g.*, the combination of knob **262**, threaded post **264** and threaded hole **266**. In this embodiment, as knob **262** is rotated, threaded post **264** is also rotated and the interaction of the threads of threaded post **264** with the threads of threaded hole **266** causes integral assembly **256** to
30 move within handle **248** according to the directions shown by bi-directional arrow **268**. As integral assembly **256** moves back and forth, vibration transfer plate **254** is permitted to move past brush **250d** as vibration damping connector **258** is disposed within slot **270**. Thus, slot

270 is formed within vibration transfer plate **254** in substantially the same direction as bi-directional arrow **268**. In view of the foregoing, it should be apparent that the means for adjusting length **260** is adapted to modify the position of integral assembly **256** within handle **248** thereby modifying the distance between the at least one of plurality of brushes **250** secured to vibration isolation plate **252**, *e.g.*, brush **250d**, and the at least two of plurality of brushes **250** of integral assembly **256**, *e.g.*, brushes **250a**, **250b** and **250c**. It should be appreciated that although the means for adjusting length **260** is depicted as the combination of knob **262**, threaded post **264** and threaded hole **266**, other embodiments are also possible, *e.g.*, a post having periodic grooves disposed along its length and a springed detent within handle **248** arranged to releasably secure the post at various positions by interacting with the respective grooves, and such variations are within the spirit and scope of the claimed invention.

[0038] Thus, it is seen that the objects of the present invention are efficiently obtained, although modifications and changes to the invention should be readily apparent to those having ordinary skill in the art, which modifications are intended to be within the spirit and scope of the invention as claimed. It also is understood that the foregoing description is illustrative of the present invention and should not be considered as limiting. Therefore, other embodiments of the present invention are possible without departing from the spirit and scope of the present invention.

CLAIMS

What I Claim Is:

1. A tooth brushing system adapted to simultaneously clean a set of maxilla teeth or a set
5 of mandible teeth, said system comprising:
 - a vibration inducer;
 - a controller for said vibration inducer;
 - a power source;
 - a handle adapted to enclose said vibration inducer, said controller for said
10 vibration inducer and said power source;
 - a plurality of brushes adapted to simultaneously contact said set of maxilla
teeth or said set of mandible teeth;
 - a vibration isolation plate integral with said handle; and,
 - a vibration transfer plate connected to said vibration inducer and said plurality
15 of brushes and releasably connected to said vibration isolation plate, wherein said handle is
adapted to be effectively held within a hand of a user and said vibration isolation plate is
adapted to isolate vibration from said set of maxilla teeth or said set of mandible teeth not
contacted by said plurality of brushes.
- 20 2. The tooth brushing system of Claim 1 wherein said vibration inducer is vibrationally
isolated from said handle.
3. The tooth brushing system of Claim 1 wherein said vibration inducer comprises a
motor arranged to rotate an asymmetric mass.
25
4. The tooth brushing system of Claim 1 wherein said vibration inducer comprises an
ultrasonic transducer.
5. The tooth brushing system of Claim 1 wherein said controller for said vibration
30 inducer comprises an on/off switch.

6. The tooth brushing system of Claim 1 wherein said power source comprises at least one primary battery or at least one secondary battery.

7. The tooth brushing system of Claim 1 wherein said handle comprises a generally T-shape.

8. The tooth brushing system of Claim 1 wherein said plurality of brushes comprises a U-shaped set of bristles, said U-shaped set of bristles comprising a generally U-shaped cross-section, a generally V-shaped cross-section or a combination thereof.

9. The tooth brushing system of Claim 1 wherein said vibration transfer plate is connected to said vibration isolation plate via at least one vibration damping means.

10. The tooth brushing system of Claim 9 wherein said at least one vibration damping means is selected from the group consisting of: a spring, a bumper, a post and combinations thereof.

11. The tooth brushing system of Claim 1 wherein said vibration transfer plate further comprises at least one bite stop.

12. The tooth brushing system of Claim 1 wherein said vibration transfer plate further comprises a plurality of mounting features arranged to releasably secure said plurality of brushes in a plurality of locations.

13. The tooth brushing system of Claim 1 wherein said vibration isolation plate comprises a plurality of posts, said plurality of posts arranged to releasably engage said vibration transfer plate.

14. The tooth brushing system of Claim 1 wherein said vibration transfer plate further comprises at least one rail adapted to receive said plurality of brushes and wherein a position of each of said plurality of brushes is modified by one or more of the following steps: moving each of said plurality of brushes along a length of said at least one rail; rotating each of said

plurality of brushes about said at least one rail; moving each of said plurality of brushes about laterally relative to said at least one rail; bending at least a portion of said at least one rail upwardly or downwardly; and, bending at least a portion of said at least one rail laterally.

- 5 15. The tooth brushing system of Claim 14 wherein said position of each of said plurality of brushes is modified automatically in response to contact between said plurality of brushes and said set of teeth to be cleaned.

- 10 16. The tooth brushing system of Claim 1 wherein said vibration isolation plate is releasably securable to said handle and said vibration isolation plate secured to said handle form an integral assembly.

17. The tooth brushing system of Claim 1 further comprising:

means for adjusting a length of said plurality of brushes;

- 15 at least one of said plurality of brushes is secured to said vibration isolation plate via a vibration damping connector; and,

- an integral assembly comprising said vibration inducer, said controller for said vibration inducer, said power supply, at least two of said plurality of brushes and said vibration transfer plate, wherein said integral assembly is disposed within said handle and
20 said means for adjusting a length of said plurality of brushes is adapted to modify a position of said integral assembly within said handle thereby modifying a distance between said at least one of said plurality of brushes secured to said vibration isolation plate and said at least two of said plurality of brushes of said integral assembly.

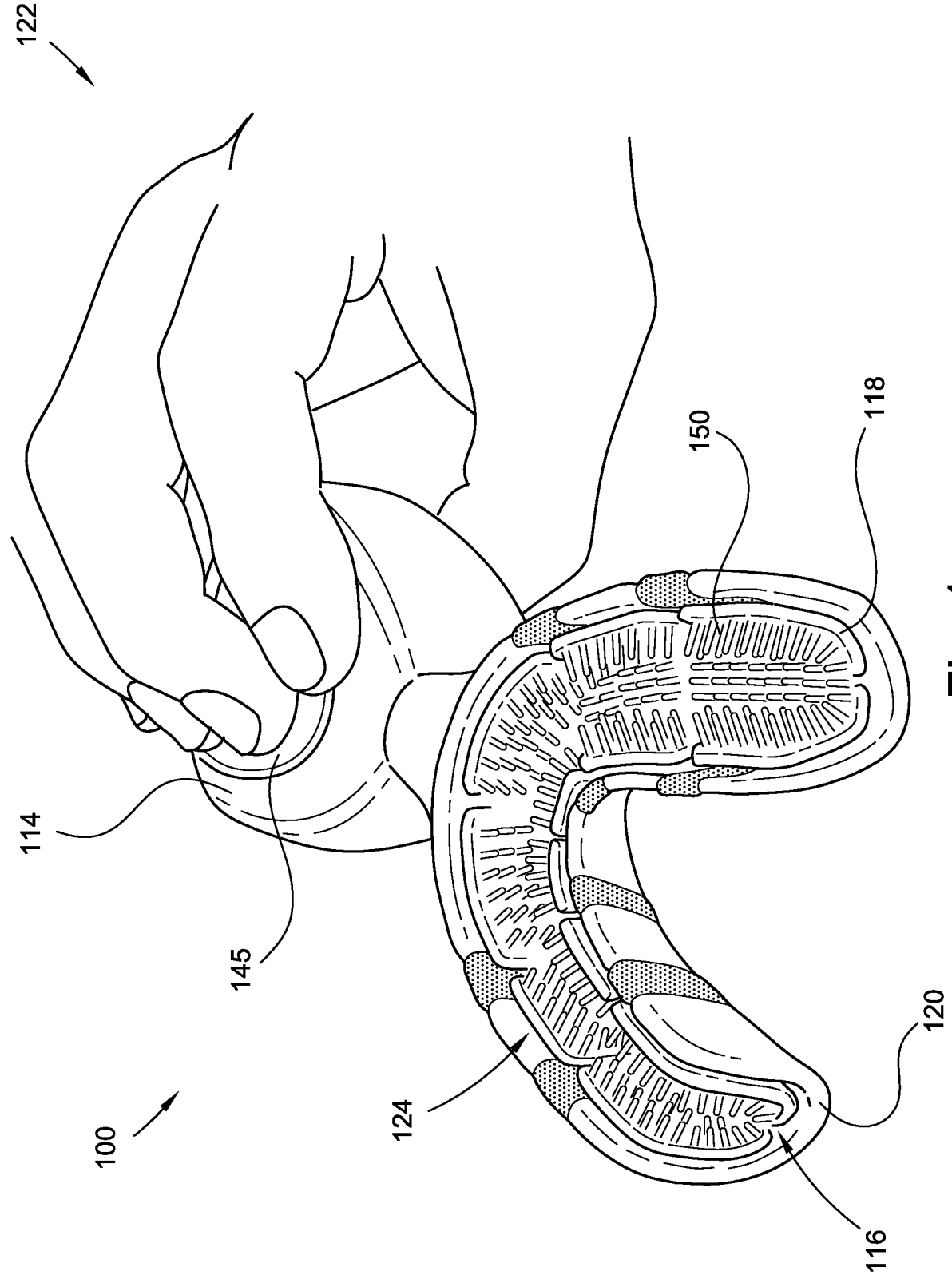


Fig. 1

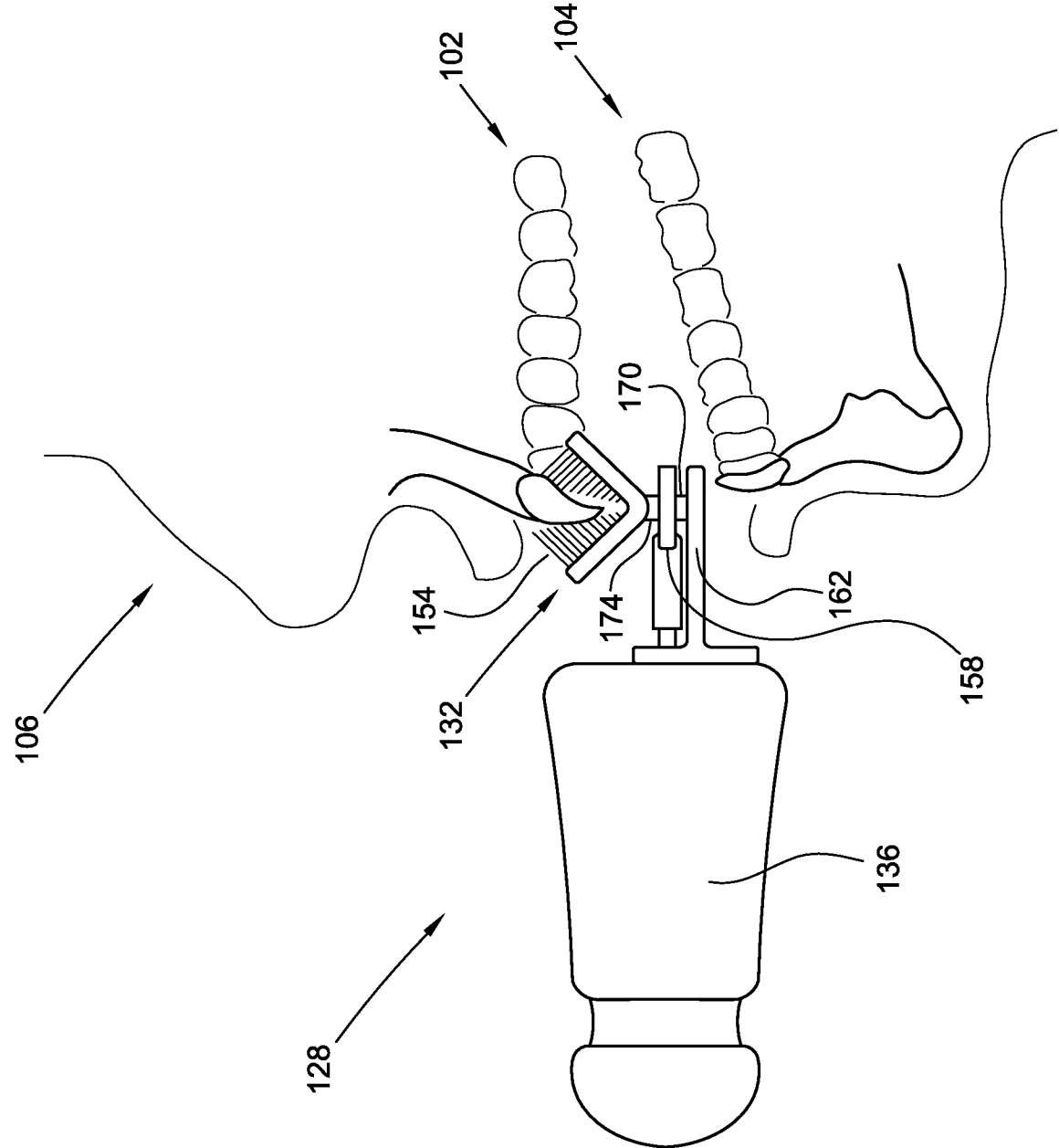


Fig. 2

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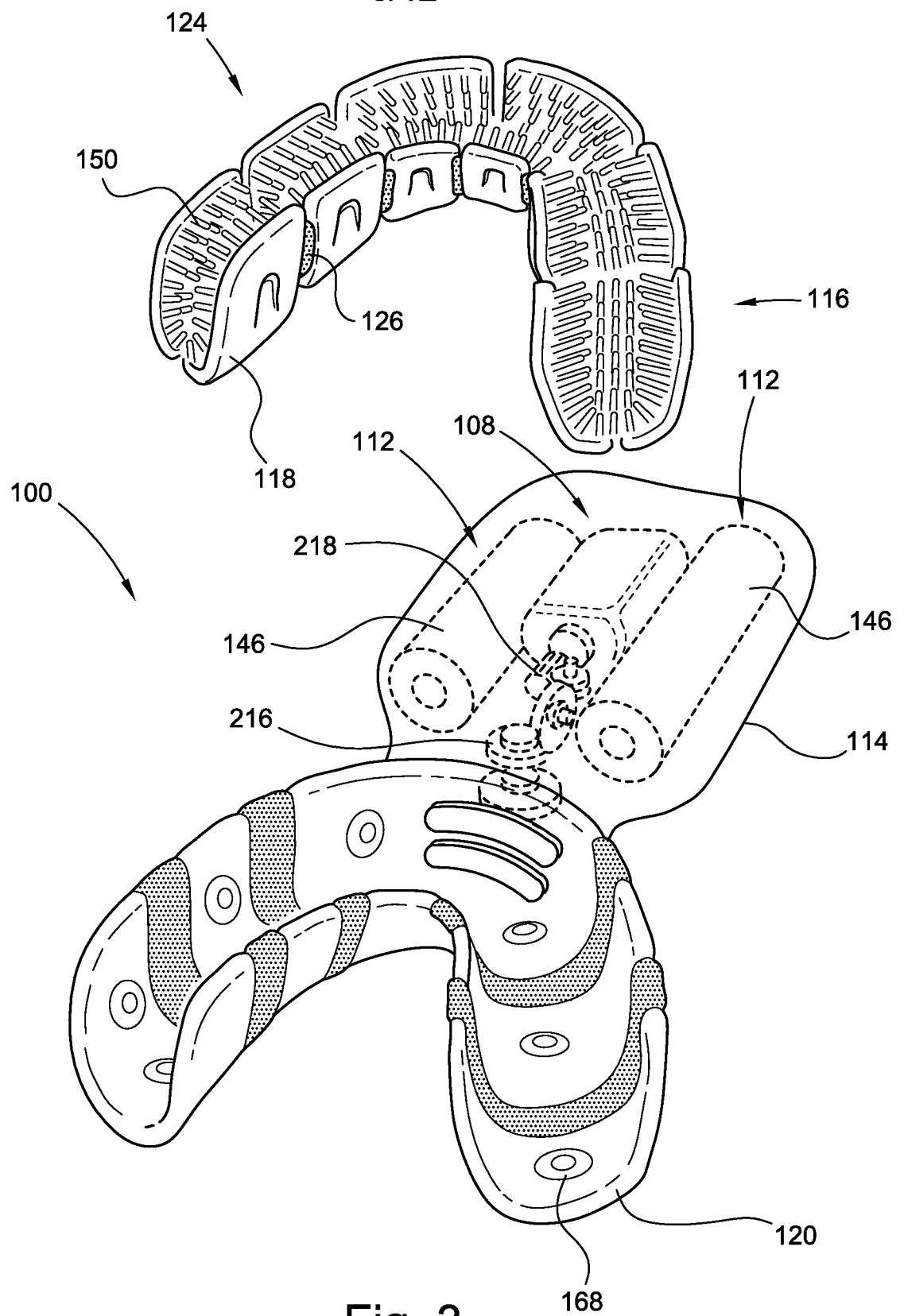


Fig. 3

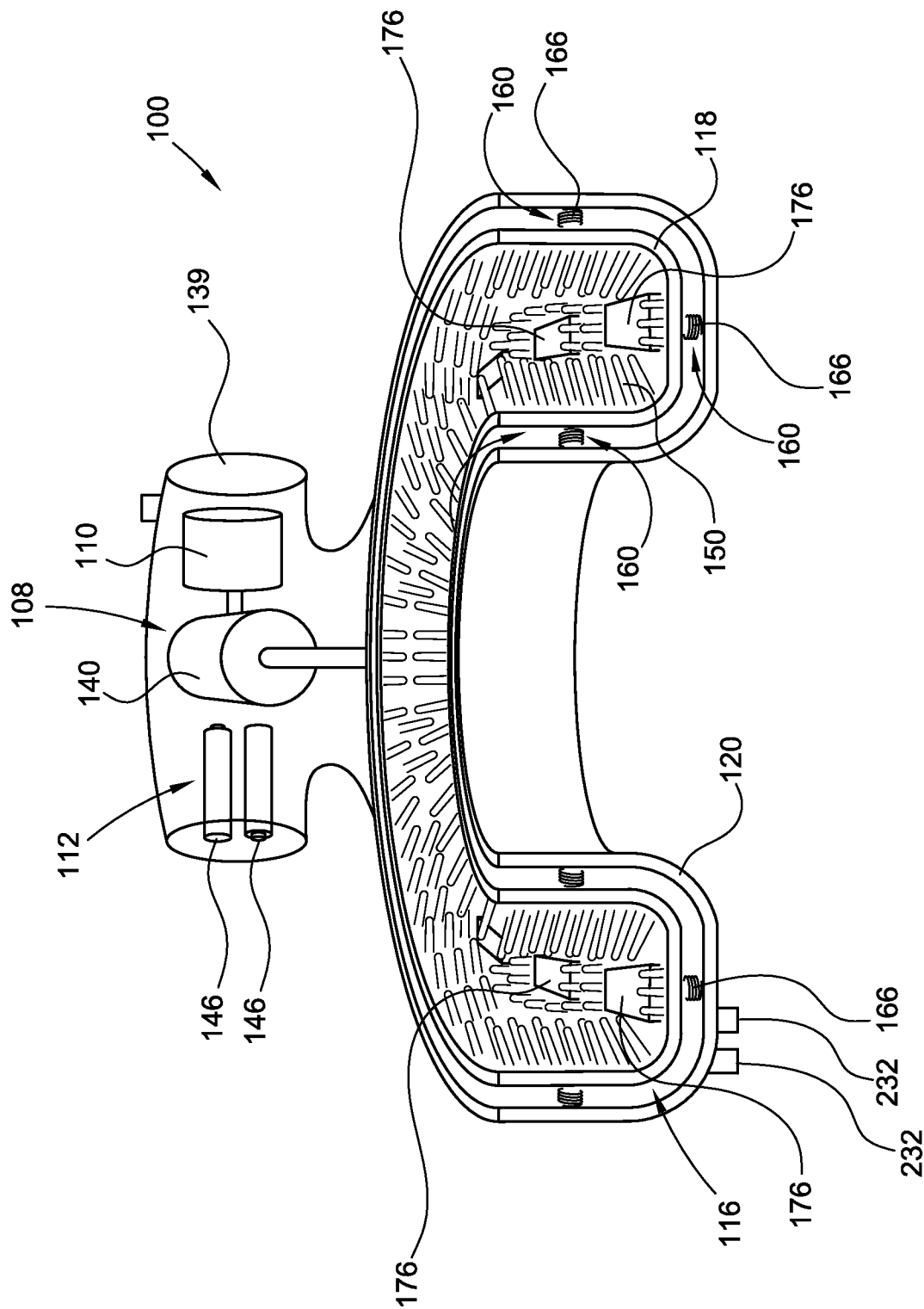


Fig. 4

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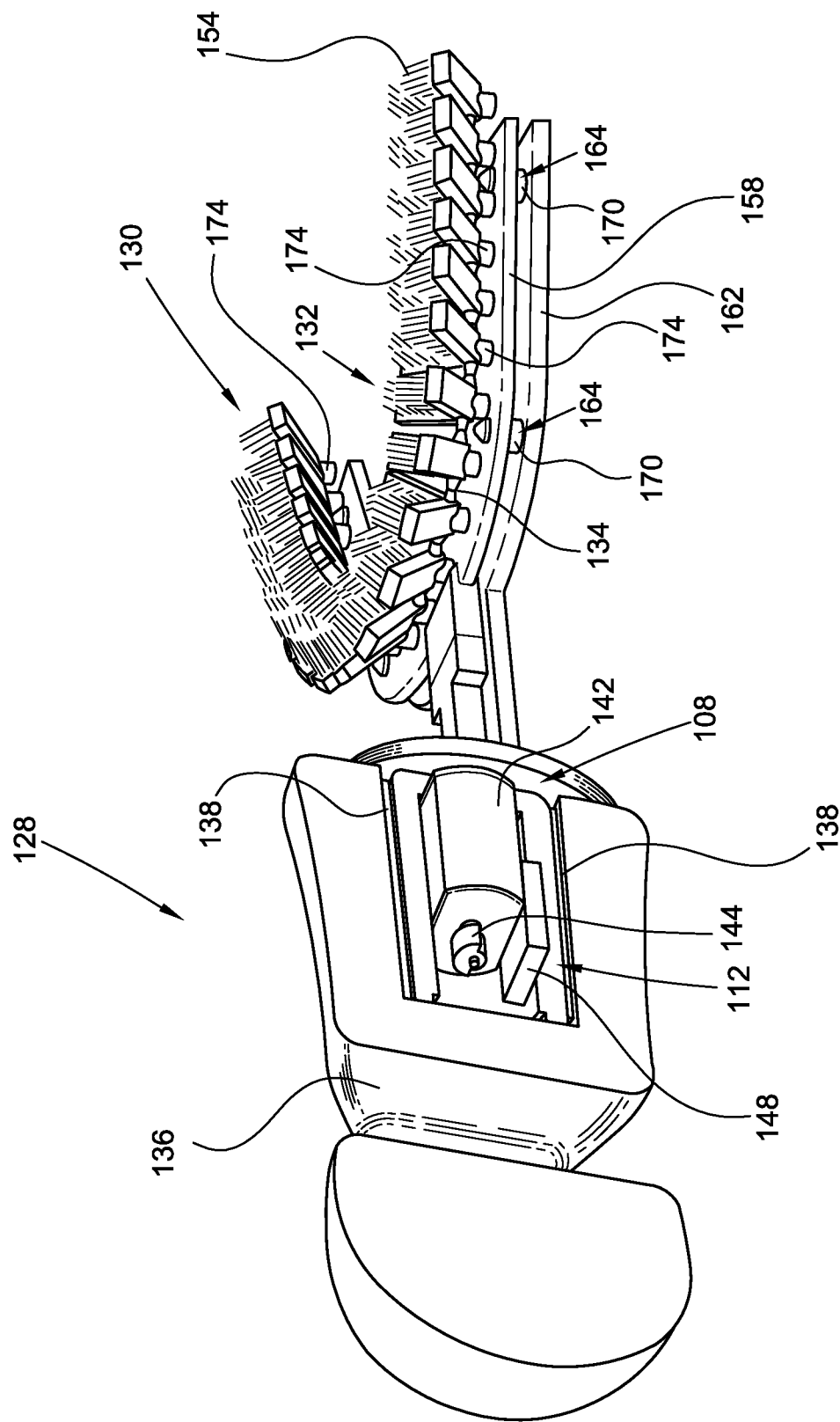


Fig. 6

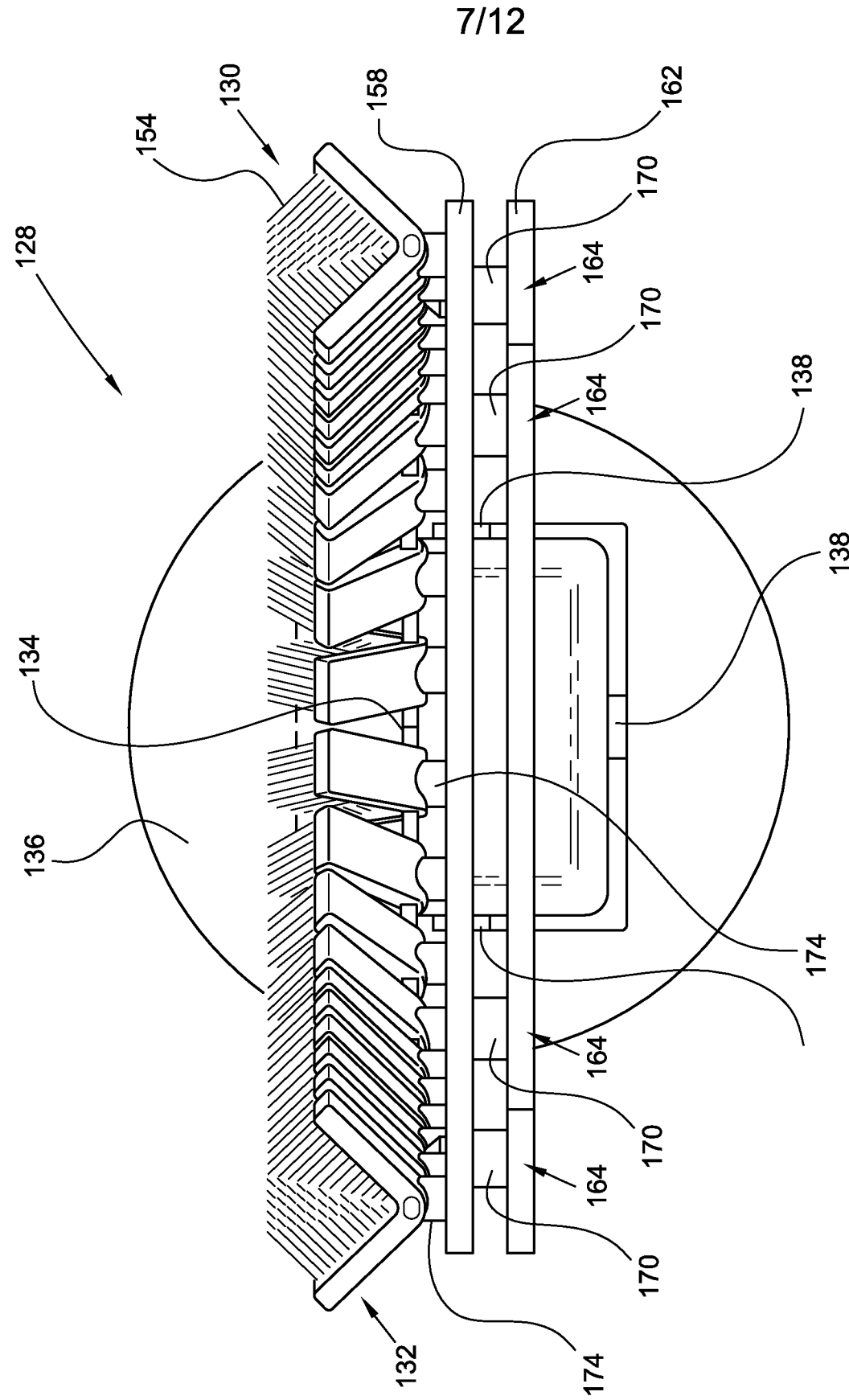


Fig. 7

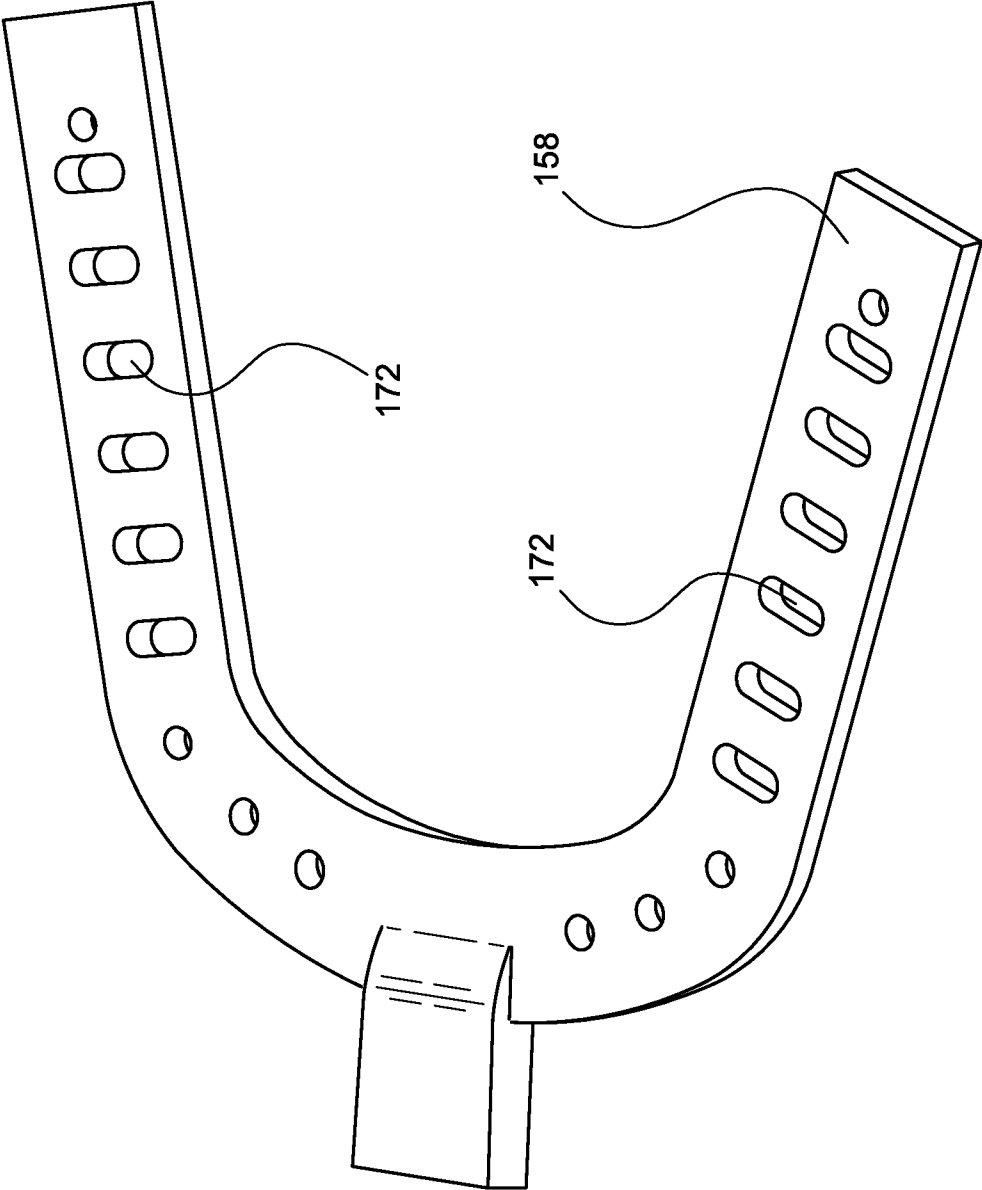
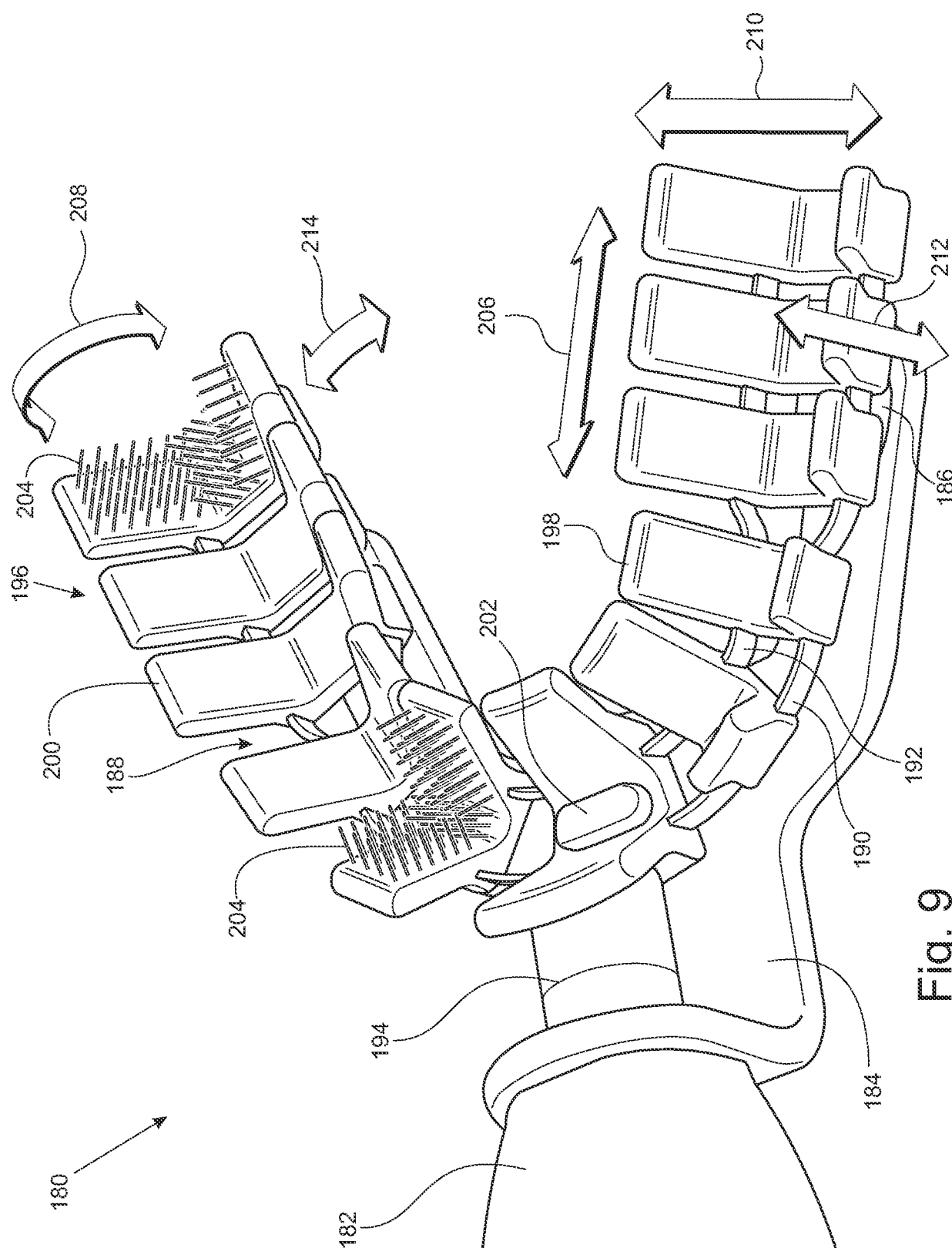


Fig. 8

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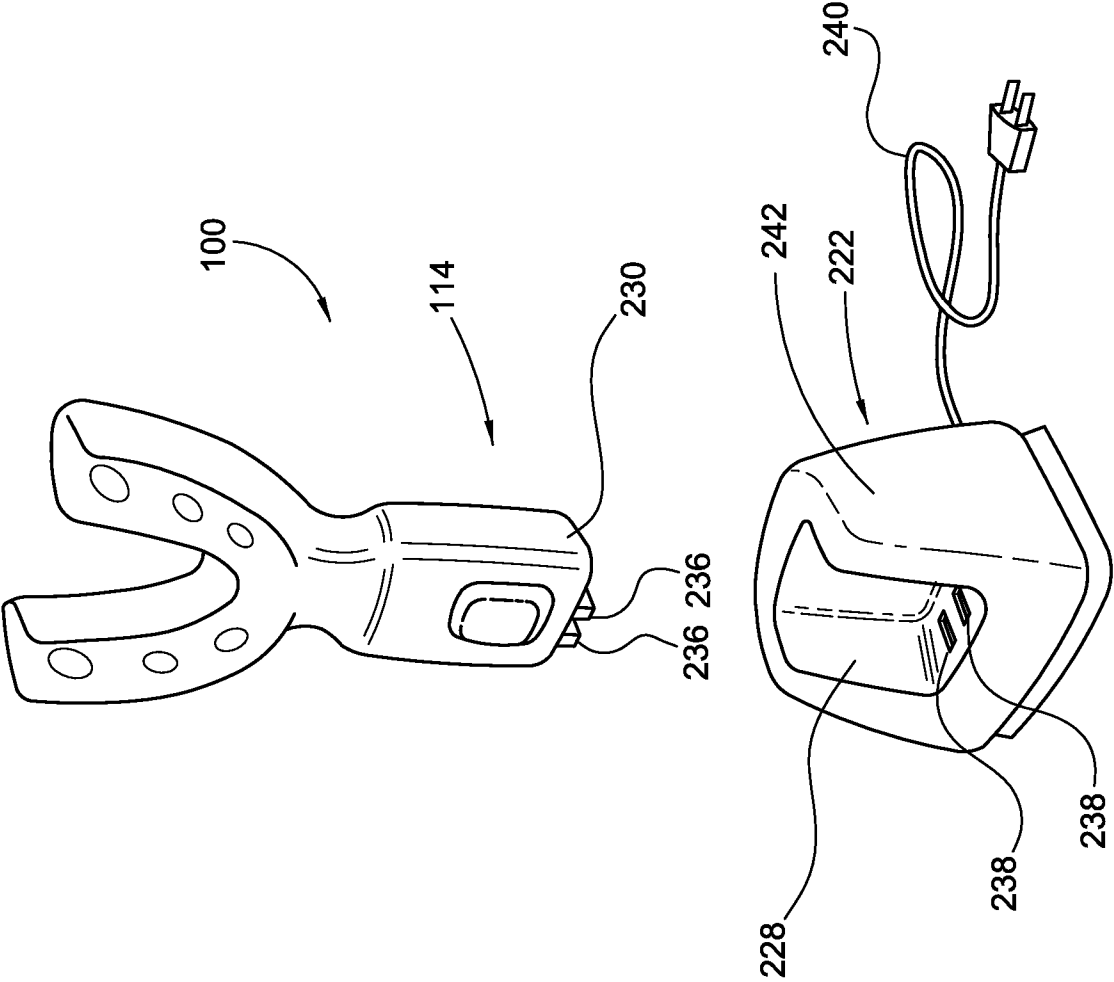


Fig. 10

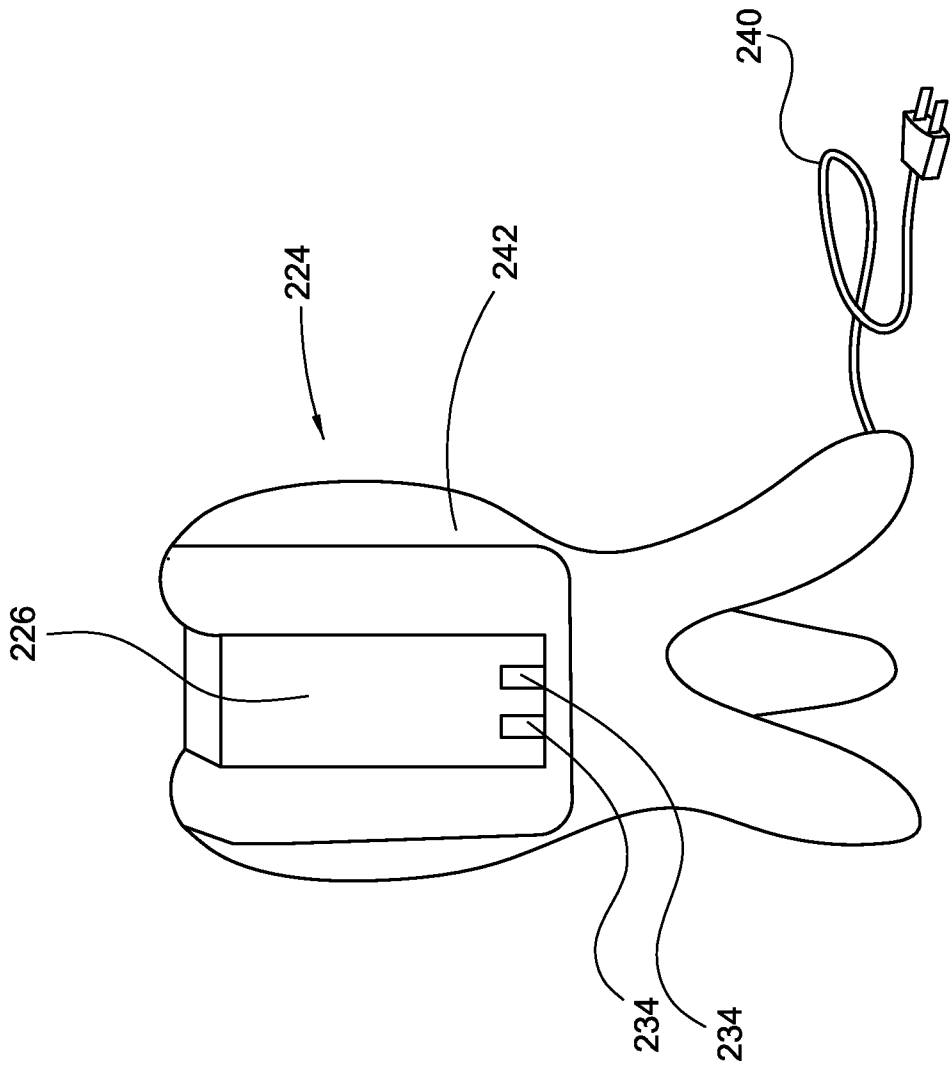


Fig. 11

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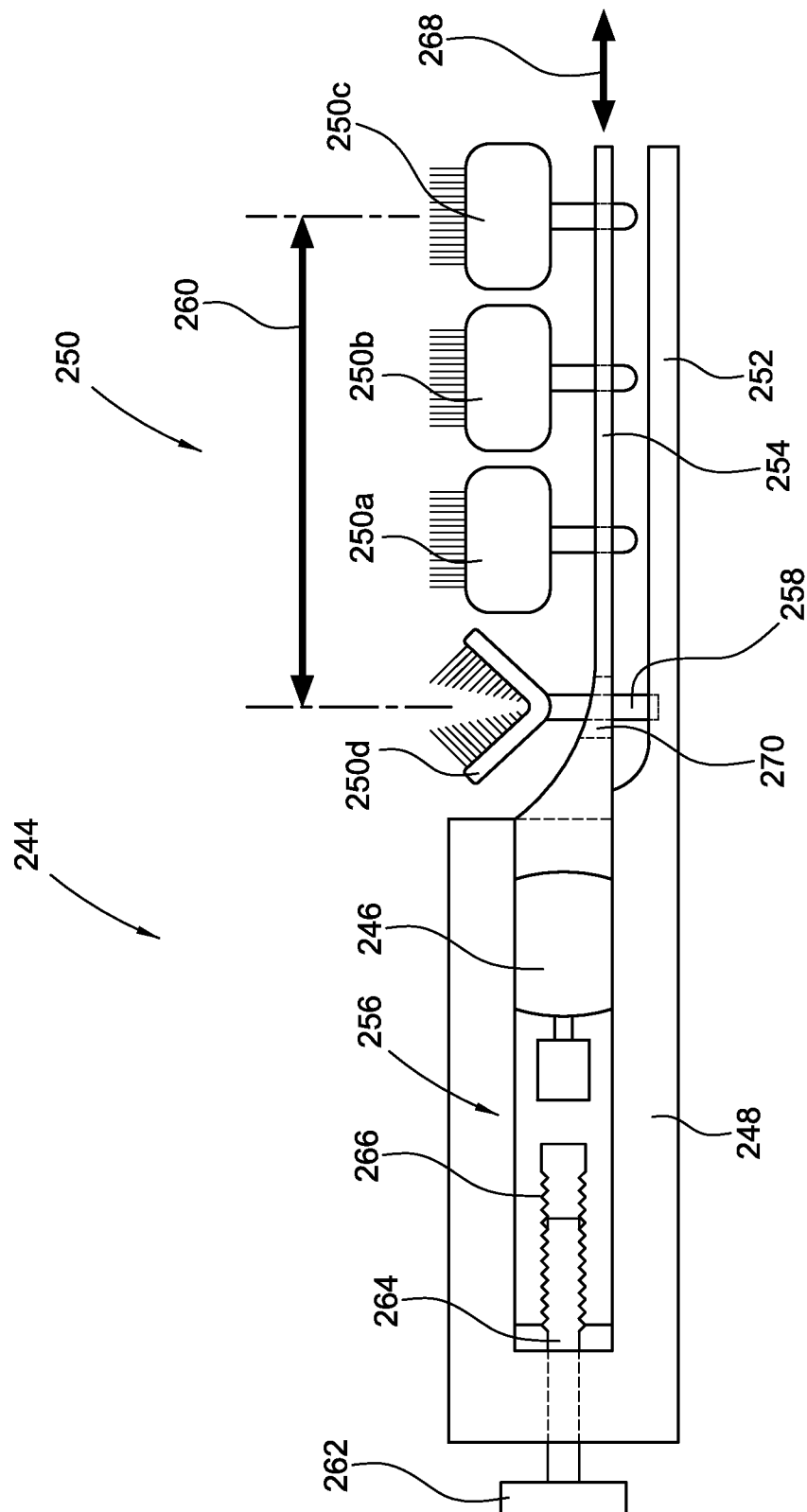


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2009/043137

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A46B 13/00 (2009.01)

USPC - 15/22.1

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)

IPC(8) - A46B 13/00 (2009.01)

USPC - 15/22.1

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 15/167.2, 606/234, 236

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

PubWEST(USPT,PGPB,EPAB,JPAB); Google Scholar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,223,376 B1 (LEE) 01 May 2001 (01.05.2001) entire document	1-17
Y	US 6,353,956 B1 (BERGE) 12 March 2002 (12.03.2002) entire document	1-17
Y	US 2006/0156496 A1 (HAFLIGER et al) 20 July 2006 (20.07.2006) entire document	3, 6, 9, 10
Y	US 7,082,638 B2 (KOH) 01 August 2006 (01.08.2006) entire document	11, 14, 15, 17
Y	US 5,337,435 A (KRASNER et al) 16 August 1994 (16.08.1994) entire document	13
Y	US 5,836,036 A (IVORY) 17 November 1998 (17.11.1998) entire document	14, 15
Y	US 5,305,491 A (HEGEMANN) 26 April 1994 (26.04.1994) entire document	15

☐ Further documents are listed in the continuation of Box C.

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

18 June 2009

Date of mailing of the international search report

06 JUL 2009

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