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(19) **United States**(12) **Patent Application Publication**
Sugimoto(10) **Pub. No.: US 2009/0056043 A1**(43) **Pub. Date: Mar. 5, 2009**(54) **ELECTRIC TOOTHBRUSH****Publication Classification**(76) Inventor: **Ichiro Sugimoto, Osaka (JP)**(51) **Int. Cl.****A46B 9/04** (2006.01)**A46B 13/02** (2006.01)(52) **U.S. Cl. 15/22.1; 15/167.1**

(57)

ABSTRACT

Correspondence Address:

WENDEROTH, LIND & PONACK, L.L.P.**2033 K STREET N. W., SUITE 800****WASHINGTON, DC 20006-1021 (US)**

It is desired to realize designing of a light, compact body and improved brushing effect and massage effect without causing any inconvenience, and to prevent the tip of a brush formed by a bristle bundle from remaining curled.

A flexible diaphragm **13** which is displaced together with a reciprocative base **10** of a brush **9** is provided between a body space **2** and a brush guide passage **6**. An air introduction hole **15** having a valve **14** which opens only to the inside is formed in a midpoint of the brush guide passage **6**. When the diaphragm **13** is displaced toward the body space **2** with the reciprocation motion of the base **10**, air is introduced through the air introduction hole **15** into the brush guide passage **6**, which is now under negative pressure. When the diaphragm **13** is displaced toward the brush guide passage **6**, the introduced air is compressed and is ejected from the opening **6a** at the tip. Thus, the body can be designed lightly and compactly, and the brushing effect and the massage effect are improved without causing inconvenience.

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(2), (4) Date: **Nov. 12, 2008**(30) **Foreign Application Priority Data**

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Oct. 18, 2004 (JP) 2004-302875

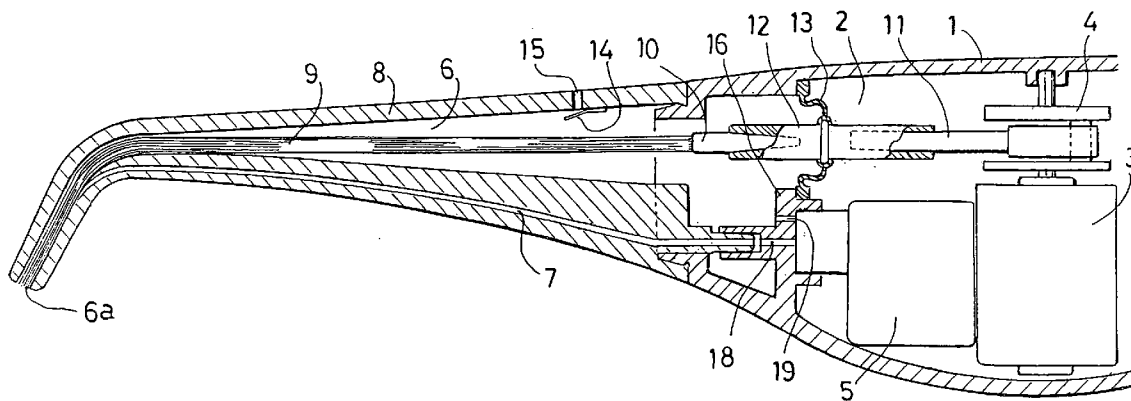


Fig.1

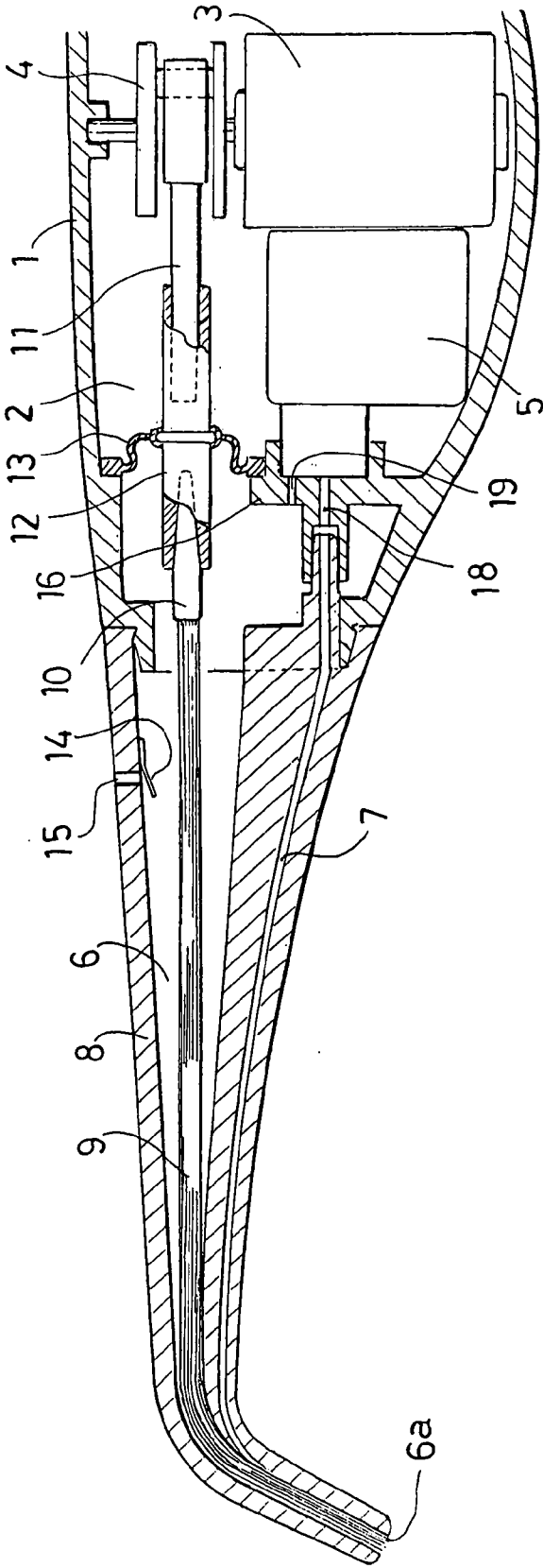


Fig.2

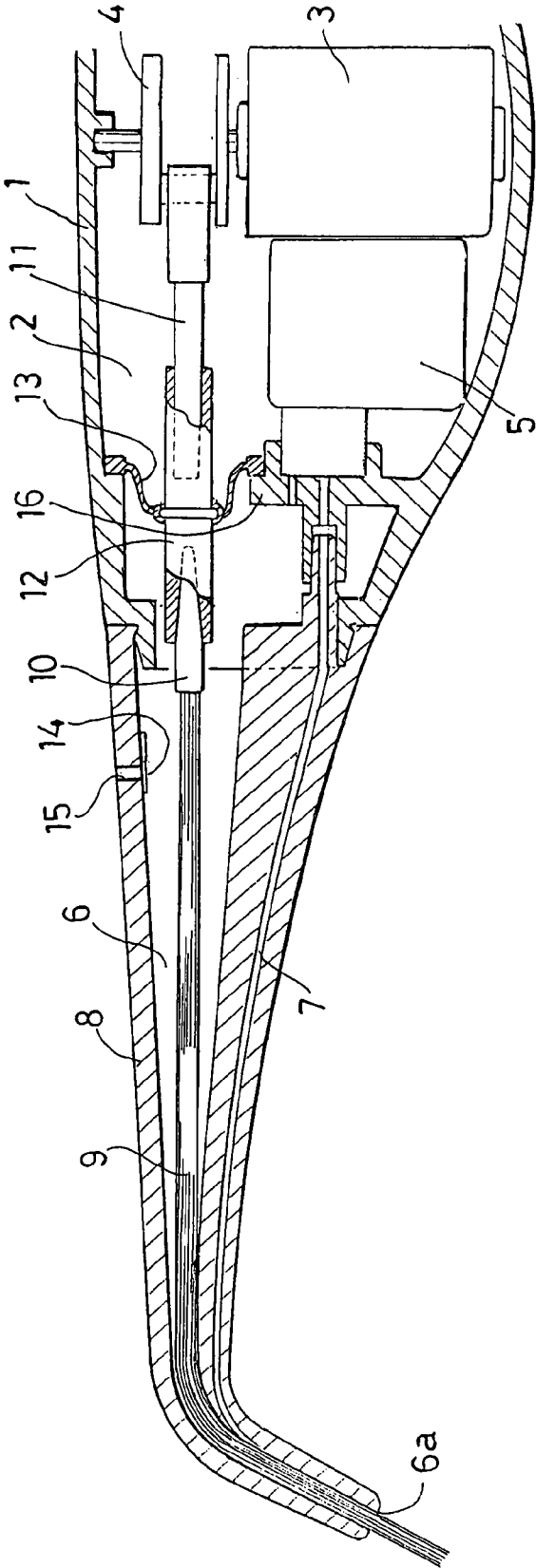


Fig.3

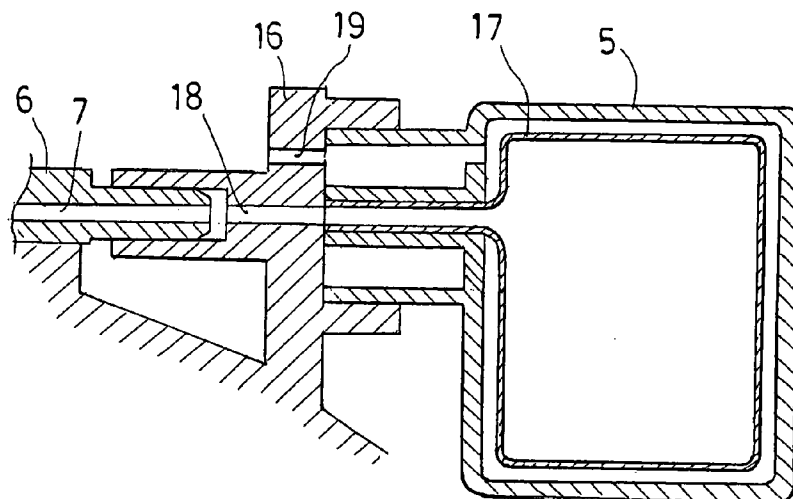


Fig.4

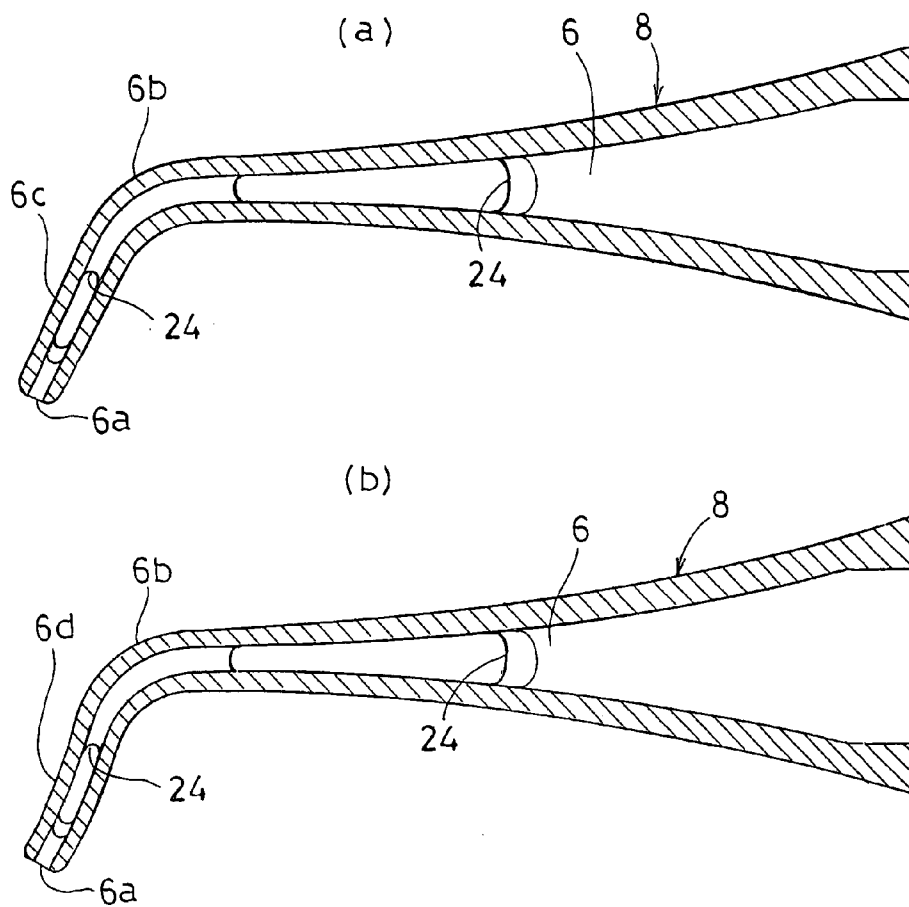


Fig.5

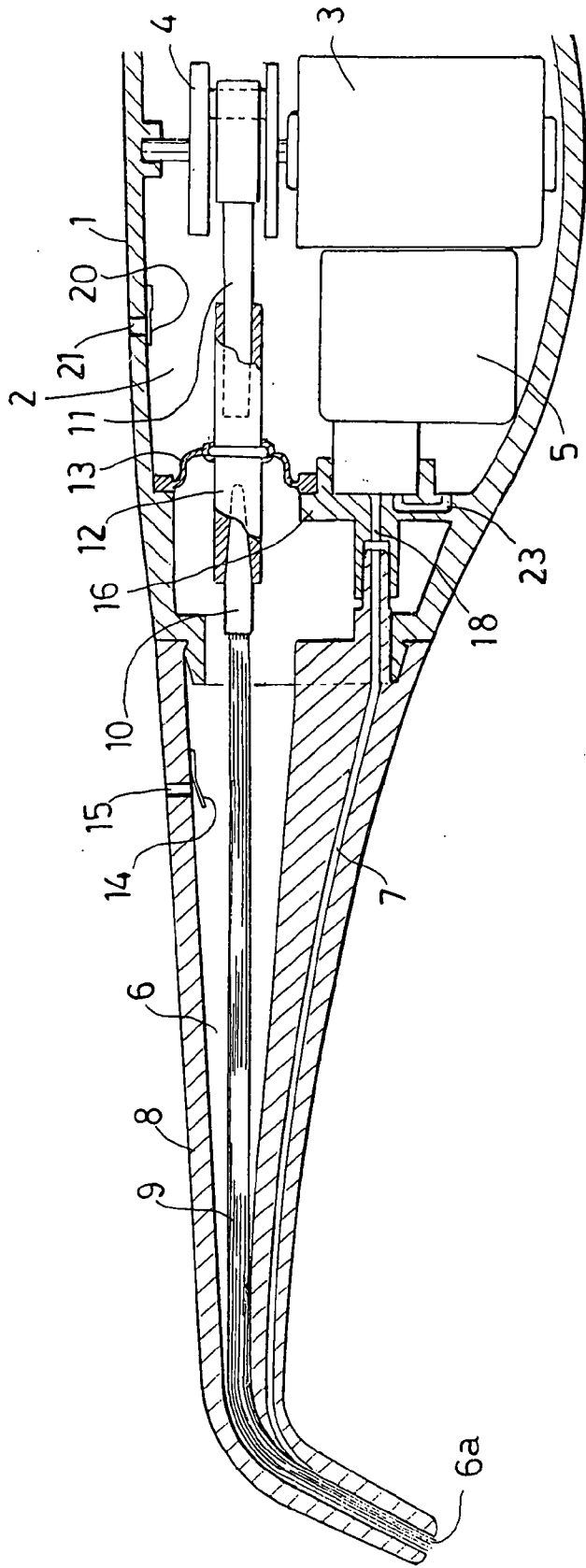


Fig.6

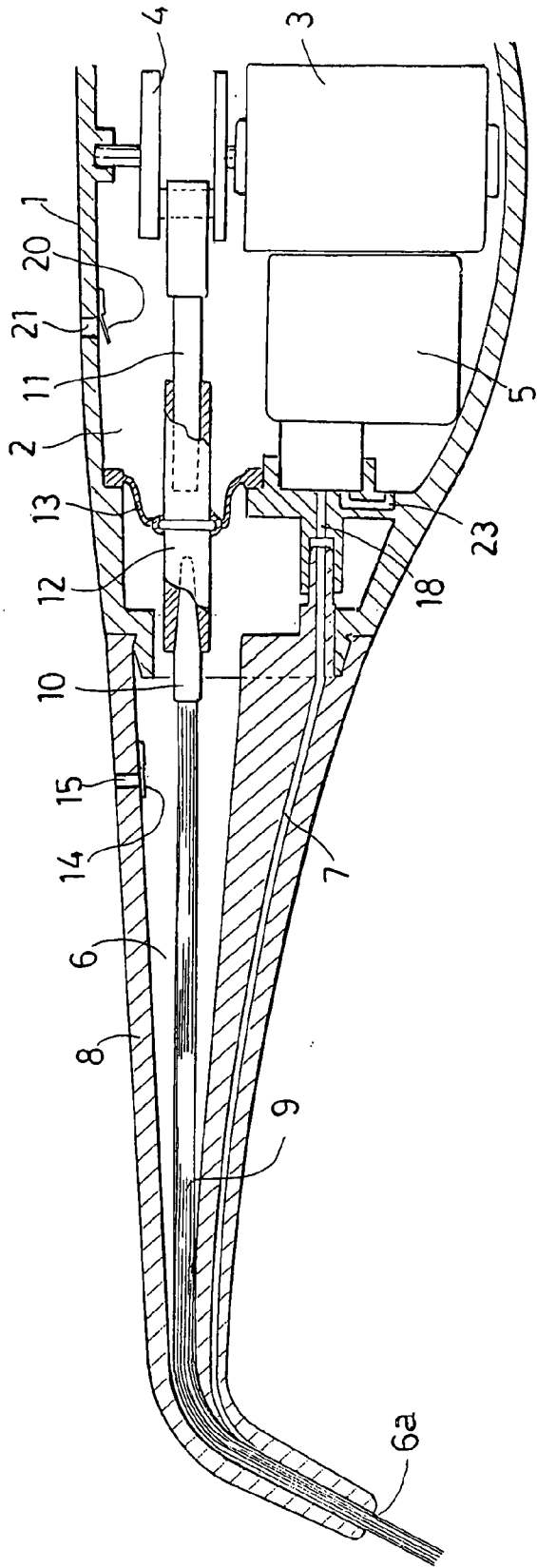
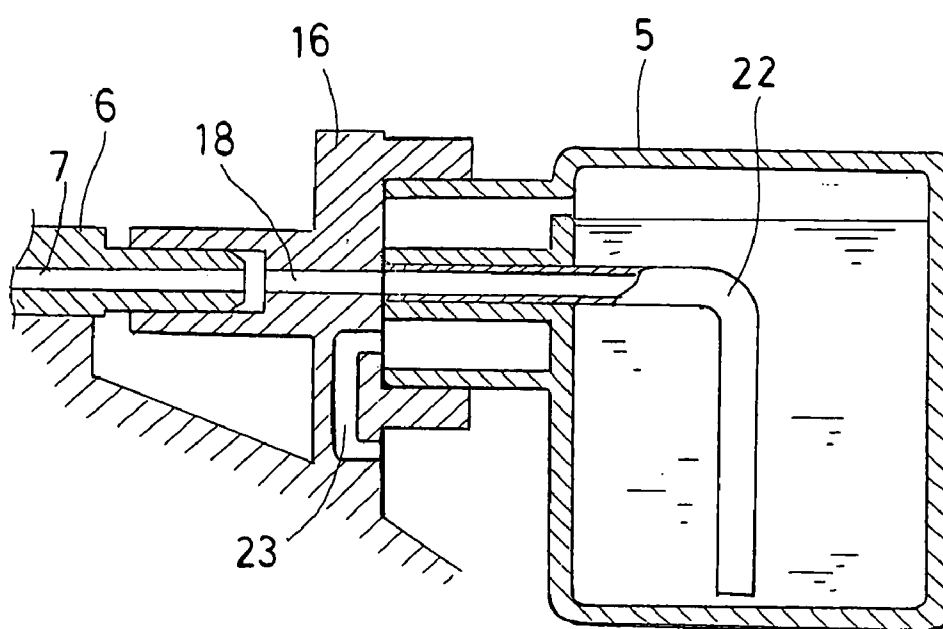


Fig.7



ELECTRIC TOOTHBRUSH

TECHNICAL FIELD

[0001] The present invention relates to an electric toothbrush having a base in which brush formed by a bristle bundle is implanted and which is reciprocated so that the tip of the brush moves in and out of an opening directed to the mouth.

BACKGROUND ART

[0002] There are various forms of electric toothbrushes. In one of such electric toothbrushes, in a casing having a brush guide passage extending from a body space in which a reciprocating motion source is disposed to one end side, a base in which a brush formed by a bristle bundle directed to the tip of the brush guide passage is implanted is reciprocated by predetermined strokes toward the brush guide passage by the reciprocating motion source so that the tip of the brush moves in and out of an opening formed at the end of the brush guide passage having a bent portion. With the brush moving in and out of the opening directed to the mouth, teeth are brushed and also the gums can be massaged (see Patent Document 1).

[0003] The electric toothbrush disclosed in Patent Document 1 is provided with a cleaning fluid tank storing a cleaning fluid. The cleaning fluid in the cleaning fluid tank is discharged by an electric or manual pump and is ejected from the opening, through which the brush moves in and out, thereby increasing the brushing effect and the massage effect.

Patent Document 1: Japanese Unexamined Patent Publication 9-322823

DISCLOSURE OF THE INVENTION

Problems to be Solved by the Invention

[0004] In order to eject cleaning fluid from the opening which is directed to the mouth and through which the brush moves in and out, the electric toothbrush of Patent Document 1 needs a pump for discharging cleaning fluid in the cleaning fluid tank in addition to the reciprocating motion source for reciprocating the base of the brush. Consequently, the electric toothbrush has a problem that the body is heavy and large.

[0005] When the electric toothbrush is used in a washroom, a bathroom or the like, the cleaning fluid ejected into the mouth can be discharged into its drainage system such as a washstand. But if the electric toothbrush is used in a place where there is no drainage system, such as in a living room, it is inconvenient for the user since he/she cannot discharge the cleaning fluid from the mouth.

[0006] Further, when the electric toothbrush is repeatedly used, due to the influence of the bent portion in the brush guide passage, the tip of the brush formed by a bristle bundle remains curled. A problem occurs that the brushing effect and the massage effect deteriorate.

[0007] An object of the present invention is therefore to realize designing of a light, compact body and improved brushing effect and massage effect without causing any inconvenience, and to prevent the tip of a brush formed by a bristle bundle from being curled.

Means for Solving the Problems

[0008] To solve the problems, the present invention provides an electric toothbrush comprising a casing having therein a brush guide passage extending from one end side of a body space, a reciprocating motion source mounted in the

body space, and a base mounted in the casing and coupled to the reciprocating motion source, the base being planted with a brush formed by a bristle bundle and extending toward a tip of the brush guide passage, the base being reciprocated toward the brush guide passage so that the tip of the brush moves in and out of an opening formed at the tip of the brush guide passage, characterized in that a flexible diaphragm which is displaced together with the reciprocative base is provided between the body space and the brush guide passage, and that an air introduction hole provided with a valve which opens only to the inside is formed in a midpoint of the brush guide passage, whereby when the diaphragm is displaced toward the body space with the reciprocating motion of the base, air is introduced into the brush guide passage, which is now under negative pressure, and when the diaphragm is displaced toward the brush guide passage, air introduced into the brush guide passage is compressed, and the compressed air is injected from the opening formed at the tip of the brush guide passage.

[0009] That is, the flexible diaphragm which is displaced together with the reciprocative base is provided between the body space and the brush guide passage. An air introduction hole provided with a valve which opens only to the inside is formed in a midpoint of the brush guide passage. When the diaphragm is displaced toward the body space with the reciprocating motion of the base, air is introduced into the brush guide passage, which is now under negative pressure, through the air introduction hole. When the diaphragm is displaced toward the brush guide passage, the air introduced into the brush guide passage is compressed, and the compressed air is injected through the opening formed at the tip of the brush guide passage. With this arrangement, air can be injected into the mouth without providing a separate pump. The body can be designed lightly and compactly. Even when the electric toothbrush is used in a place where there is no drainage system, there is no inconvenience. The brushing effect and the massage effect can be increased.

[0010] The electric toothbrush may further comprise a cleaning fluid tank mounted in the casing and storing a cleaning fluid, and means for discharging the cleaning fluid in the cleaning fluid tank into the brush guide passage. With this arrangement, the cleaning fluid discharged into the brush guide passage is injected together with air from the opening formed at the tip of the brush guide passage, thereby enabling the brushing effect and the massage effect to be further increased.

[0011] By discharging the cleaning fluid into a portion of the brush guide passage near its tip, the force of injecting the cleaning fluid from the opening formed at the tip of the brush guide passage can be enhanced.

[0012] The means for discharging the cleaning fluid in the cleaning fluid tank may be configured to discharge the cleaning fluid in the cleaning fluid tank by introducing air in the brush guide passage, which is compressed when the diaphragm is displaced toward the brush guide passage, into the cleaning fluid tank. With this arrangement, the cleaning fluid in the cleaning fluid tank can be ejected without providing a separate pump.

[0013] In another arrangement, the body space is hermetically closed, an air introduction hole provided with a valve which opens only to the inside is formed in a wall forming the body space, and the means for discharging the cleaning fluid in the cleaning fluid tank discharges the cleaning fluid in the cleaning fluid tank by introducing air from the air introduc-

tion hole to the body space, which is under negative pressure, when the diaphragm is displaced toward the brush guide passage, and by compressing air introduced into the body space and introducing the compressed air into the cleaning fluid tank when the diaphragm is displaced toward the body space. cleaning fluid tank. With the arrangement too, the cleaning fluid in the cleaning fluid tank can be ejected without providing a separate pump.

[0014] The invention also provides an electric toothbrush comprising a brush formed by a bristle bundle and reciprocated by a predetermined stroke along a brush guide passage having a bent portion so that the tip of the brush moves in and out of an opening formed at the tip of the brush guide passage, characterized in that a straight portion or a reverse bent portion which is bent in the direction opposite to the bent portion is provided on the tip side of the bent portion in the brush guide passage.

[0015] Specifically, by forming a straight portion or a reverse bent portion which is bent in the direction opposite to the bent portion on the tip side of the bent portion in the brush guide passage, curling of the tip of the brush formed in the bent portion is corrected by the straight portion or the reverse bent portion formed at the tip of the bent portion, so that the tip of the brush does not remain curled.

[0016] By setting the straight portion or the inverse bent portion in the brush guide passage to a length equal to or larger than the stroke of the brush, a sufficient curl correcting effect can be obtained.

[0017] By forming a cleaning hole for cleaning the brush in the passage in a midpoint of the brush guide passage, the base portion of the brush in the brush guide passage can be easily washed by injecting tap water or the like from the cleaning hole.

Effects of the Invention

[0018] In the electric toothbrush of the invention, a flexible diaphragm which is displaced together with the reciprocative base is provided between the body space and the brush guide passage. An air introduction hole provided with a valve which opens only to the inside is formed in a midpoint of the brush guide passage. When the diaphragm is displaced toward the body space side the reciprocating motion of the base, air is introduced into the brush guide passage, which is now under negative pressure, through the air introduction hole. When the diaphragm is displaced toward the brush guide passage, the air introduced into the brush guide passage is compressed, and the compressed air is injected through the opening formed at the tip of the brush guide passage. With this arrangement, air can be injected into the mouth without providing a separate pump. The body can be designed lightly and compactly. Even when the electric toothbrush is used in a place where there is no drainage system, there is no inconvenience. The brushing effect and the massage effect can be increased.

[0019] By mounting a cleaning fluid tank storing a cleaning fluid in the body space, and providing means for discharging the cleaning fluid in the cleaning fluid tank into the brush guide passage is provided, the cleaning fluid discharged into the brush guide passage is injected together with air through the opening formed at the tip of the brush guide passage, thereby enabling the brushing effect and the massage effect to be further increased.

[0020] By discharging the cleaning fluid into a portion of the brush guide passage near its tip, the force of injecting the

cleaning fluid from the opening formed at the tip of the brush guide passage can be enhanced.

[0021] The means for discharging the cleaning fluid in the cleaning fluid tank may be configured to discharge the cleaning fluid in the cleaning fluid tank by introducing air in the brush guide passage, which is compressed when the diaphragm is displaced toward the brush guide passage, into the cleaning fluid tank. With this arrangement, the cleaning fluid in the cleaning fluid tank can be ejected without providing a separate pump.

[0022] In another arrangement, the body space is hermetically closed, an air introduction hole provided with a valve which opens only to the inside is formed in a wall forming the body space, and the means for discharging the cleaning fluid in the cleaning fluid tank discharges the cleaning fluid in the cleaning fluid tank by introducing air from the air introduction hole to the body space, which is under negative pressure, when the diaphragm is displaced toward the brush guide passage, and by compressing air introduced into the body space and introducing the compressed air into the cleaning fluid tank when the diaphragm is displaced toward the body space. cleaning fluid tank. With the arrangement too, the cleaning fluid in the cleaning fluid tank can be ejected without providing a separate pump.

[0023] The present invention also provides an electric toothbrush including a brush formed by a bristle bundle and reciprocated by a predetermined stroke along a brush guide passage having a bent portion so that the tip of the brush moves in and out of an opening formed at the tip of the brush guide passage, wherein a straight portion or a reverse bent portion which is bent in the direction opposite to the bent portion is provided on the tip side of the bent portion in the brush guide passage. Consequently, curling of the tip of the brush formed in the bent portion is corrected by the straight portion or the reverse bent portion formed at the tip of the bent portion, so that the tip of the brush does not remain curled. Thus, the brushing effect and the massage effect can be maintained for a long period.

[0024] By setting the straight portion or the inverse bent portion in the brush guide passage to a length equal to or larger than the stroke of the brush, a sufficient curl correcting effect can be obtained.

[0025] By forming a cleaning hole for cleaning the brush in the passage in some midpoint in the brush guide passage, the base portion of the brush in the brush guide passage can be easily washed by injecting service water or the like from the cleaning hole.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] FIG. 1 is a partly omitted longitudinal section of an electric toothbrush of a first embodiment.

[0027] FIG. 2 is a partly omitted longitudinal section showing a state where a base of FIG. 1 is in a forward position.

[0028] FIG. 3 is an enlarged longitudinal section of a cleaning fluid tank in FIG. 1 and its mounting portion.

[0029] FIG. 4A is a longitudinal section of a cylindrical member of FIG. 1, and FIG. 4B is a longitudinal section of a modification of the cylindrical member of FIG. 4A.

[0030] FIG. 5 is a partly omitted longitudinal section of an electric toothbrush of a second embodiment.

[0031] FIG. 6 is a partly omitted longitudinal section showing a state where a base of FIG. 5 is in a forward position.

[0032] FIG. 7 is an enlarged longitudinal section of a cleaning fluid tank of FIG. 5 and its mounting portion.

DESCRIPTION OF REFERENCE NUMERALS

[0033]	1 Casing
[0034]	2 Body space
[0035]	3 Motor
[0036]	4 Crankshaft
[0037]	5 Cleaning fluid tank
[0038]	6 Brush guide passage
[0039]	6a Opening
[0040]	6b Bent portion
[0041]	6c Straight portion
[0042]	6d Reverse bent portion
[0043]	7 Cleaning fluid passage
[0044]	8 Cylindrical member
[0045]	9 Brush
[0046]	10 Base
[0047]	11 Arm member
[0048]	12 Coupling member
[0049]	13 Diaphragm
[0050]	14 Valve
[0051]	15 Air introduction hole
[0052]	16 Mounting wall
[0053]	17 Inner bag
[0054]	18 Fluid hole
[0055]	19 Air hole
[0056]	20 Valve
[0057]	21 Air introduction hole
[0058]	22 Fluid filling pipe
[0059]	23 Air hole
[0060]	24 Cleaning hole

BEST MODE FOR CARRYING OUT THE INVENTION

[0061] Embodiments of the present invention will be described hereinbelow with reference to the drawings. FIG. 1 to FIGS. 4A and 4B show the first embodiment. In the electric toothbrush of the first embodiment, as shown in FIG. 1, a motor 3 as a reciprocating motion source, a crankshaft 4 provided for the output shaft of the motor, and a cleaning fluid tank 5 storing cleaning fluid are disposed in a body space 2 of a casing 1. A cylindrical member 8 is attached to the casing 1. The cylindrical member 8 includes a brush guide passage 6 extending from one end of the body space 2 and having an opening 6a at its tip and a cleaning fluid passage 7 that extends along the brush guide passage 6 and opens to the brush guide passage 6 near its tip. In the brush guide passage 6, a base 10 in which a brush 9 formed by a bristle bundle directed to the tip side of the brush guide passage 6 is implanted is coupled via a coupling member 12 to an arm member 11 attached to the crankshaft 4. Therefore, by rotating the motor 3, the base 10 reciprocates in a predetermined stroke in the direction of the brush guide passage 6, and the tip of the brush 9 moves in and out of the opening 6a.

[0062] To the coupling member 12, a flexible diaphragm 13 separating between the body space 2 and the brush guide passage 6 is attached. An air introduction hole 15 attached with a tongue-shaped valve 14 which opens only to the inside is formed in a midpoint of the brush guide passage 6. The outer periphery of the diaphragm 13 is attached to the inner wall of the casing 1 and a mounting wall 16 of the cleaning fluid tank 5 extending radially inwardly into the body space 2.

[0063] Therefore, as shown in FIG. 1, when the reciprocating base 10 moves backward, the diaphragm 13 is displaced toward the body space 2, and air is introduced from the air introduction hole 15 into the brush guide passage 6 because the brush guide passage 6 is now under negative pressure. As shown in FIG. 2, when the base 10 moves forward, the diaphragm 13 is displaced toward the brush guide passage 6, the air introduced into the brush guide passage 6 is compressed, and the compressed air is ejected through the opening 6a.

[0064] As shown in FIG. 3, a flexible inner bag 17 is housed in the cleaning fluid tank 5 and is filled with cleaning fluid. The mouth of the inner bag 17 is connected to the cleaning fluid passage 7 of the cylindrical member 8 via a fluid hole 18 formed in the mounting wall 16. In the mounting wall 16, an air hole 19 for passing air to the side of the diaphragm 13 facing the brush guide passage 6 is formed. The air hole 19 communicates with the interior of the cleaning fluid tank 5 outside the inner bag 17.

[0065] Therefore, as shown in FIG. 2, when the diaphragm 13 is displaced toward the brush guide passage 6 and air introduced into the brush guide passage 6 is compressed, compressed air is introduced into the cleaning fluid tank 5 via the air hole 19, and the cleaning fluid in the inner bag 17 passes through the fluid hole 18 and the cleaning fluid passage 7 and is discharged into a portion of the brush guide passage 6 near its tip. The discharged cleaning fluid is ejected together with compressed air through the opening 6a.

[0066] As shown in FIG. 4A, the brush guide passage 6 of the cylindrical member 8 has a bent portion 6b and, at its tip side, a straight portion 6c. The length of the straight portion 6c is substantially equal to the stroke of the brush 9. In midpoints of the brush guide passage 6, two ellipsoidal cleaning holes 24 are formed through which e.g. tap water is injected to clean the brush 9.

[0067] FIG. 4B shows a modified brush guide passage 6 of the cylindrical member 8. The modified brush guide passage 6 has a reverse bent portion 6d which is bent in the direction opposite to a bent portion 6b similar to that of the embodiment at the tip side of a bent portion 6b. The length of the reverse bent portion 6d is substantially equal to the stroke of the brush 9.

[0068] FIGS. 5 to 7 show the second embodiment. The basic configuration of an electric toothbrush of the second embodiment is the same as that of the first embodiment, but the following points are different. As shown in FIG. 5, in place of the air hole 19 in the mounting wall 16, an air introduction hole 21 attached with a tongue-shaped valve 20 which opens only to the inside is formed in the wall of the casing 1 forming the body space 2. Although not shown, the rear end side of the body space 2 is hermetically closed. As shown in FIG. 7, the cleaning fluid tank 5 is provided with a fluid supply pipe 22 whose tip opens near the bottom of the fluid and which is continued to the fluid hole 18 in the mounting wall 16. The interior of the cleaning fluid tank 5 communicates with the body space 2 via an air hole 23. Otherwise, this embodiment is the same as the first embodiment.

[0069] Therefore, in this embodiment, as shown in FIG. 6, when the base 10 moves forward and the diaphragm 13 is displaced toward the brush guide passage 6, air is introduced from the air introduction hole 21 into the body space 2, which is now under negative pressure. As shown in FIG. 5, when the base 10 moves backward and the diaphragm 13 is displaced toward the body space 2, the introduced air is compressed, and the compressed air is introduced into the cleaning fluid

tank **5** via the air hole **23**. The interior of the cleaning fluid tank **5** is thus pressurized, and cleaning fluid therein is discharged via the fluid hole **18** and the cleaning fluid passage **7** into a portion of the brush guide passage **6** near its tip. The discharged cleaning fluid is ejected from the opening **6a** together with the compressed air in a manner similar to the first embodiment.

[0070] Although in the embodiments, a motor provided with a crankshaft on its output shaft is used as the reciprocating motion source of the base, the reciprocating motion source is not limited to that in the embodiments. An arbitrary drive source for giving the reciprocating motion to the base can be employed.

[0071] Although the casing in which the body space is formed and the cylindrical member having the brush guide passage are separate members in the embodiments, the cylindrical member may be integrally formed with the casing. The shapes of the casing and the cylindrical member are not limited to those of the embodiments.

1. An electric toothbrush comprising a casing having therein a brush guide passage extending from one end side of a body space, a reciprocating motion source mounted in the body space, and a base mounted in said casing and coupled to the reciprocating motion source, said base being planted with a brush formed by a bristle bundle and extending toward a tip of the brush guide passage, said base being reciprocated toward the brush guide passage so that the tip of the brush moves in and out of an opening formed at the tip of the brush guide passage, characterized in that a flexible diaphragm which is displaced together with the reciprocative base is provided between the body space and the brush guide passage, and that an air introduction hole provided with a valve which opens only to the inside is formed in a midpoint of the brush guide passage, whereby when the diaphragm is displaced toward the body space with the reciprocating motion of the base, air is introduced into the brush guide passage, which is now under negative pressure, and when the diaphragm is displaced toward the brush guide passage, air introduced into the brush guide passage is compressed, and the compressed air is injected from the opening formed at the tip of the brush guide passage.

2. The electric toothbrush according to claim 1 further comprising a cleaning fluid tank mounted in the casing and storing a cleaning fluid, and means for discharging the cleaning fluid in the cleaning fluid tank into the brush guide passage.

3. The electric toothbrush according to claim 2 wherein the cleaning fluid is discharged into the brush guide passage near its tip.

4. The electric toothbrush according to claim 2 wherein said means for discharging the cleaning fluid in the cleaning fluid tank discharges the cleaning fluid in the cleaning fluid

tank by introducing air in the brush guide passage, which is compressed when the diaphragm is displaced toward the brush guide passage, into the cleaning fluid tank.

5. The electric toothbrush according to claim 2 wherein the body space is hermetically closed, an air introduction hole provided with a valve which opens only to the inside is formed in a wall forming the body space, and the means for discharging the cleaning fluid in the cleaning fluid tank discharges the cleaning fluid in the cleaning fluid tank by introducing air from the air introduction hole to the body space, which is under negative pressure, when the diaphragm is displaced toward the brush guide passage, and by compressing air introduced into the body space and introducing the compressed air into the cleaning fluid tank when the diaphragm is displaced toward the body space.

6. An electric toothbrush comprising a brush formed by a bristle bundle and reciprocated by a predetermined stroke along a brush guide passage having a bent portion so that the tip of the brush moves in and out of an opening formed at the tip of the brush guide passage, characterized in that a straight portion or a reverse bent portion which is bent in the direction opposite to the bent portion is provided on the tip side of the bent portion in the brush guide passage.

7. The electric toothbrush according to claim 6 wherein the straight portion or the inverse bent portion in the brush guide passage has a length equal to or larger than the stroke of the brush.

8. The electric toothbrush according to claim 6 wherein a cleaning hole for cleaning the brush in the passage is formed in a midpoint of the brush guide passage.

9. The electric toothbrush according to claim 3 wherein said means for discharging the cleaning fluid in the cleaning fluid tank discharges the cleaning fluid in the cleaning fluid tank by introducing air in the brush guide passage, which is compressed when the diaphragm is displaced toward the brush guide passage, into the cleaning fluid tank.

10. The electric toothbrush according to claim 3 wherein the body space is hermetically closed, an air introduction hole provided with a valve which opens only to the inside is formed in a wall forming the body space, and the means for discharging the cleaning fluid in the cleaning fluid tank discharges the cleaning fluid in the cleaning fluid tank by introducing air from the air introduction hole to the body space, which is under negative pressure, when the diaphragm is displaced toward the brush guide passage, and by compressing air introduced into the body space and introducing the compressed air into the cleaning fluid tank when the diaphragm is displaced toward the body space.

11. The electric toothbrush according to claim 7 wherein a cleaning hole for cleaning the brush in the passage is formed in a midpoint of the brush guide passage.

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