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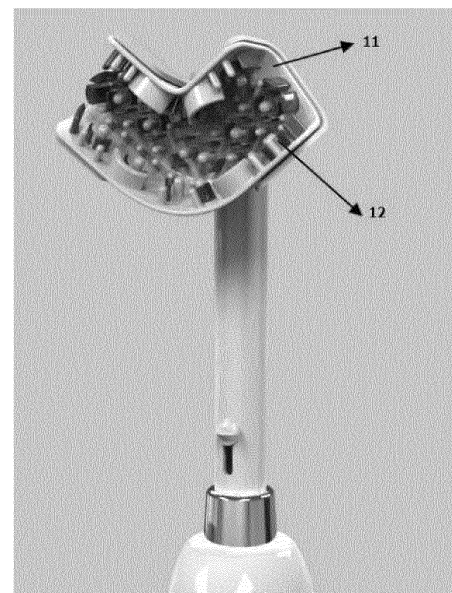
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(54) **MULTI-SIDED VIBRATING AND CLEANSING TOOTHBRUSH**

(57) The present invention relates to a multi-sided cleaning toothbrush using vibration, which includes a bottom part (11) made of a resilient material and a bristle fixing part (13) for fixing bristles (12) on an upper surface of the bottom part (11). A plurality of bristles (12) are arranged in multiple rows on the bottom part (13), and the bottom part (11) is divided into three parts in a longitudinal direction and is folded in a C-shape to form a head part (14). A grip part (16) of the toothbrush is coupled to the rear surface of the bottom part (11), and the head part (14) folded in C-shape is in close contact with teeth. The head part has an I-shape mode where it is unfolded in an elongated shape and in a U-shape mode where it is bent in a round shape according to the arrangement form of the teeth to easily brush the teeth. The grip part (16) of the toothbrush can be coupled to the head part (14).

[FIG. 4]



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**Description**

## [FIELD OF THE INVENTION]

5 **[0001]** The present invention relates to a multi-sided cleaning toothbrush using vibration.

## [BACKGROUND OF THE INVENTION]

10 **[0002]** The present invention relates to a multi-sided cleaning toothbrush using vibration, wherein vibration refers to a means for moving bristles, including ultrasonic waves and sound waves. In order to maintain the dental health of a person, it is important to remove foreign substances stuck between his/her teeth by brushing the teeth. In addition, it is very important how to brush teeth when brushing the teeth. Since teeth are successively arranged while a plurality of teeth form each group, if each corner of teeth is not brushed carefully, foreign substances cannot be removed in spite of brushing the teeth and remaining foreign substances become tartar to cause inflammation. Moreover, if brushing teeth improperly, the teeth can get a cavity.

15 **[0003]** There is a conventional way of brushing teeth vertically with respect to the direction where the teeth are erected, which has been often used. If using this way, a person, who is brushing his/her teeth, gets some feeling of brushing the teeth properly, but in fact, it has much less effect of removing foreign substances stuck between the teeth. To increase an effect of removing foreign substances stuck between teeth, it is necessary to brush teeth in the same direction as the teeth are erected. Moreover, it is desired to brush teeth by allowing bristles to enter each space between the teeth and also to use a tool such as an interdental brush.

20 **[0004]** In addition, because teeth are polyhedral, it is desired to carefully brush the back sides, upper sides, etc. of teeth. However, it is very difficult to brush even the back sides of teeth due to an oral structure. Especially, it is more difficult to brush the back side of a front tooth or a part where the innermost molar and the gum meet each other with a typical toothbrush because the direction of a toothbrush and the direction of user's arm are different from each other.

25 **[0005]** A vibrating toothbrush has been recently used to remove foreign substances stuck between teeth by using vibration. Although the vibration toothbrush has some effect of removing foreign substances, it also has the same difficulty in brushing the back side of each front tooth, the innermost molar, the back sides of other teeth, etc. because it has the same structure as an existing toothbrush except for a vibrator.

30 **[0006]** 'Multi-Sided Cleaning Toothbrush' previously registered as Korean Utility Model Registration No. 200391922 has allowed a user to brush the three sides of each tooth. There has been 'Sonic Vibration Tooth Washer' registered as Korean patent registration No. 10-1661108, which has no need to form a mouse piece-shape allowing teeth to be individually inserted according to the structure of the teeth. This sonic vibration tooth washer allows bristles to be easily replaced, allowing a user to brush three sides of each tooth, and cleaning his/her teeth by using vibration. However, with the former, a user needs to make a lot of effort to brush each tooth. Since a human has teeth arranged in a curved line and teeth arranged in a straight line, with the latter, he/she has a difficulty in brushing straightly arranged teeth. Moreover, the latter has a disadvantage that it is difficult to put it into his/her mouth because of its large size.

## [DETAILED DESCRIPTION OF THE INVENTION]

## [TECHNICAL OBJECTIVES]

40 **[0007]** The present invention has been invented in order to overcome the above mentioned problems. The object of the present invention is to provide a multi-sided cleaning toothbrush, which allows a user to carefully brush each corner of teeth positioned inside his/her mouth by using vibration.

## [TECHNICAL SOLUTION]

50 **[0008]** To achieve the above object, a multi-sided cleaning toothbrush by using vibration is provided.

**[0009]** A plurality of bristles (12) are arranged in multiple rows on a bottom part (11) made of a resilient material. The bottom part (11) is divided into three parts in the length direction and is folded with a  $\sqsubset$ -shape to form a head part (14). A grip part (16) of the toothbrush is coupled to the rear side of the bottom part (11), and the head part (14) folded in the  $\sqsubset$ -shape is in close contact with teeth. In order to easily brush teeth according to an arrangement shape of the teeth, the head part is in an I-mode where it is unfolded in an elongated shape and in a U-shape mode where it is bent in a curved shape. The grip part (16) of the toothbrush can be coupled to the head part (14).

55 **[0010]** A first wing (17) and a second wing (18) are assembled with the end of the grip part (16). The two wings can be unfolded in the same direction as the longitudinal direction of the grip part (16) in the I-shape mode, and the first wing (17) and the second wing (18) can be far away from each other at an acute angle in the U-shape mode.

**[0011]** The first wing (17) and the second wing (18) are rotated about the same axial, and a first locking-axial groove (21) and a second locking-axial groove (22) are formed beside each axial groove of the wings. The first locking-axial groove has a long oval shape and has a recess part formed inside the oval shape, and the second locking-axial groove (22) has a circular shape. When being pushed by the a locked part (23) of a switch (16), the second locking-axial groove (22) is pushed by the locked part (23) to be rotated, the locked part (23) bumps against the inside of the first locking-axial groove (21) once, and then, is in contact with the end to allow the first wing (17) and the second wing (18) to have each different movement distance such that the I-shape mode can be converted into the 'U'-shape mode.

**[0012]** The multi-sided cleaning toothbrush includes a bristle fixing part (13) for fixing bristles (12) on an upper surface of the bottom part (11) and includes a vibration generator to clean teeth through shaking of bristles due to vibration. The toothbrush can be variously positioned depending on the shapes of the first locking-axial groove (21) and the second locking-axial groove.

**[0013]** The first wing (17) and the second wing (18) are moved by being connected to gears, respectively. According to the density of the threads of the gears, which are positioned at the center, the gears have each different degree of movement such that the first wing and the second wing can be moved between the I-shape mode and the U-shape mode.

**[0014]** The first wing (17) and the second wing (18) can be converted from the I-shape mode into the U-shape mode by a restoring force by a spring.

#### [EFFECTS OF THE INVENTION]

**[0015]** The multi-sided cleaning toothbrush as described above has an effect of brushing each corner of teeth and has an effect of allowing the third party to easily bush the teeth of other person.

#### [BRIEF DESCRIPTION OF THE DRAWINGS]

**[0016]** FIGs 1 to 17 illustrate an embodiment according to the present invention.

#### [BEST MODE FOR CARRYING OUT THE INVENTION]

**[0017]** A multi-sided cleaning toothbrush using vibration has a plurality of bristles (12) arranged in multiple rows on a bottom part (11) made of a resilient material. The bottom part (11) is divided into three parts in a longitudinal direction and is folded in a  $\sqsubset$ -shape to form a head part (14). A grip part (16) of the toothbrush is coupled to the rear surface of the bottom part (11), and the head part (14) folded in a  $\sqsubset$ -shape is in close contact with teeth and has a I-shape mode where it is unfolded in a long shape and in a U-shape mode where it is bent in a curved shape in order to easily brush teeth according to the arrangement shape of the teeth. The grip part (16) of the toothbrush is coupled to the head part (14).

#### [MODE FOR THE INVENTION]

**[0018]** Hereinafter, the present invention is described in detail with reference to the accompanying drawings. FIG.1 illustrates an embodiment of a toothbrush part of a multi-sided cleaning toothbrush using vibration according to the present invention. The drawing shows the shape of only an exemplary embodiment, and the shape also has color with clear contrast, which has been selected to be distinguished from other components, which does not limit the scope of the invention.

**[0019]** Bristles (12) are planted upward on a bottom part (11) in such a manner that they are planted on a bristle fixing part (13) to be fixed. The bottom part (11) is made of a resilient material and has a structure similar to that of bellows, which can be bent from an I-shape into a rough 'U'-shape when it is pulled frontward or backward. Also, the structure can have a shape to be unfolded in the U-shape mode.

**[0020]** The bristles (12) are fixed to the bristle fixing part (13) because it is difficult to directly plant the bristles (12) on the bottom part (11). In addition to silicone, the bristle fixing part (13) can use any material that can be used for teeth, a toothbrush, etc. and can fix bristles. Moreover, it is preferable to use a material having a certain degree of elasticity to allow the bristle fixing part (13) to be also deformed in accordance with the movement of the bottom part (12).

**[0021]** In the embodiment, bristle-bundles in two rows (12) are planted in six rows. The number of bristles can be changed depending on whether a user is an adult, child, or infant or the purpose of use.

**[0022]** Furthermore, the bristles shown on the drawings are also similar to typical bristles of a toothbrush. It is possible to use the type of bristles used for an interdental brush, which can be further easier to remove foreign substances stuck between teeth. In addition, all other types of bristles can be applied.

**[0023]** According to a type of bristle, bristles can be planted on the upper surface of the bottom part (11) without the bristle fixing part (13). To this end, it is desirable that the bottom part is made of a material having excellent flexibility and elasticity. In addition, it is possible to have a shape formed by attaching the ends of bristles, which are melted at a

high temperature, to the bottom part (11).

**[0024]** In order to brush three sides of a tooth, the bottom part (11) is folded into three parts. This shape is shown in FIG.2. The number and the type of bristles (12) formed on each side of the bottom part (11) folded into three parts can vary, and the folded part of the bottom part (11) and a folding angle can vary if necessary.

**[0025]** In this state, a user operates a vibrator to clean teeth rather than manually brushing them. The operation and structure of the vibrator are omitted on the drawing since they have been already disclosed and been also described in other application of the applicant or other documents. However, when the vibrator is operated, the bristles (12) attached to the three sides are vibrated to remove foreign substances on teeth in close contact therewith or foreign substances stuck between the teeth.

**[0026]** However, the elongated head part is used even in the folded state shown in FIG. 2 when cleaning teeth arranged in a straight line, and when cleaning front teeth, it is preferable that the toothbrush part is bent according to the shape of the front teeth.

**[0027]** FIG.3 shows a model of teeth. Since front teeth are arranged in a curved line and molars are arranged in a straight line, it is important that the shape of the toothbrush varies according to the arrangement of the teeth in order to brush each tooth.

**[0028]** FIGs. 4 and 5 illustrate an embodiment according to the present invention, which is further closer to an actual product. Bristles (12) are directly planted on a bottom part (11) using a resilient material to be bent in a U-shape.

**[0029]** FIG. 4 illustrates the bottom part (11) bent according to the shape of the front tooth. The bottom part (11) can be bent as illustrated because it uses a resilient material. Even in the state of being bent, the bristles are actuated by the vibrator such that it can be possible to brush each corner between teeth.

**[0030]** FIG. 5 illustrates the form of the bottom part (11) in an I-shape. The bristles show on FIGs. 4 and 5 is only an embodiment of the present invention, so conventional bristles such as typically used bristles, an interdental brush, etc. can be used. Particularly, the type of interdental brush has an advantage to allow bristles to enter each space between teeth.

**[0031]** FIG.6 illustrates a structure for allowing the toothbrush part to have a round shape. In Fig. 6, a structure where the switch (16) of the grip part (15) has been pulled is shown on the left side of the drawing, and a structure where the switch of the grip part (15) has been pushed is shown on the right side of the drawing. The first wing (17) and the second wing (18) are aligned in a straight line when the switch part (15) is pulled. When the switch is pushed, the first wing (17) is rotated slightly to the right, and the second wing (18) is rotated more than the first wing, thereby forming a V-shape. The head part (14) shown in FIGs 2 and 3 is coupled to the first wing (17) and the second wing (18). The head part (14) is shaped in a straight line when the first wing (17) and the second wing (18) are unfolded and is shaped in the U-shape as shown in FIG. 3 when the wings form the V-shape. As such, the head part is converted between two kinds of modes as pulling and pushing the switch positioned on the lower part of the grip part (16), the structure of the head part is shown in FIG.5.

**[0032]** FIG.7 shows the first wing (17) and the second wing (18), which may be the same as shown in FIG. 6, or a means to be coupled to each wing shown in FIG. 6. A first rotary-axial groove (19) and a first locking-axial groove (21) are formed on the first wing (17). A second rotary-axial groove (20) and a second locking-axial groove (22) are formed on the second wing (18). The first rotary-axial groove (19) and the second rotary-axial groove (20) are rotated about the same rotary axis and are rotated about a rotary groove formed in the grip part (16). On the other hand, the first locking-axial groove (21) and the second locking-axial groove (22) are operated by a locked part (23) formed at an end of the switch (15). When pushing or pulling the locked part (23) in a state of being locked into the first locking-axial groove (21) and the second locking-axial groove (22), the second locking-axial groove (22) is pushed or pulled successively due to its round shape without any portion to be locked. On the other hand, the first locking-axial groove (21) is divided into an upper part and a lower part and has a protruding portion in the center thereof, thereby having an oval shape with a recessed center. When pushing the switch (15), the locked part (23) bumps against the protruding portion, not against the inner uppermost end of the first locking-axial groove (21), and the locked part (23) bumps the inside of the second locking-axial groove (22), thereby rotating the second wing (18). When the locked part (23) bumps against the inner end of the first locking-axial groove (21) when further pushing the switch to the inside, the first wing (17) is finally rotated. That is, the first wing (17) is rotated later than the second wing (18) to have a shorter movement distance, thereby forming the V-shape. When pulled, the wings are operated in a manner opposite to the manner described above, thereby again forming the I-shape.

**[0033]** The head part of the toothbrush is deformed into an I-shape or a U-shape through this structure. In each case, the toothbrush shaped in accordance with the shapes of front teeth or molars is put into the mouth, and then, the vibrator is operated, thereby cleaning the surfaces of the teeth. The head part of the toothbrush can be replaced anytime and can have reduced manufacturing costs because it can be manufactured due to it's a simple structure.

**[0034]** FIG. 8 illustrates another embodiment of the present invention, in which a first locking-axial groove and a second locking-axial groove have each shape different from those shown in FIG.6. As shown in FIG. 3, if assuming that a human brushes his/her teeth from the left to the right, it is preferred that the shape of a toothbrush is converted in the order of

an I-shape, a U-shape and an I-shape in order to clean the teeth properly. To this end, it is preferred that the first wing moves while pointing at 12 o'clock-2 o'clock-6 o'clock, and the second wing moves while pointing at 6 o'clock-10 o'clock-12 o'clock. Such a motion varies according to each shape of the first locking-axial groove (21) and the second locking-axial groove (22). When the first locking-axial groove (21) and the second locking-axial groove (22) are pulled or pushed as described above, the motion can vary in accordance with how long force is applied to the inner walls of the grooves. In order to have three kinds of positions, each of the first locking-axial groove (21) and the second locking-axial groove (22) is divided into three parts, and the first wing (17) and the second wing (18) have each different movement distance in accordance with time of reaching each of the three parts. If the first locking-axial groove (21) and the second locking-axial groove (22) have different shapes, it is possible to allow movement at various positions as necessary.

**[0035]** FIG. 9 illustrates another embodiment of the present invention, in which a bottom part (11) is coupled to a first wing (17) and a second wing (18). A switch is embedded in a grip part to move the first wing (17) and the second wing (18), and the switch can be deformed in various shapes to be used.

**[0036]** FIG. 10 illustrates another embodiment of the present invention, in which a bristle part is moved further freely by using a bearing, not in a manner that the first and second wings are moved by using the switch. However, if using the bearing, there can be a case that the bristle part is excessively moved to cause improper brushing.

**[0037]** FIG. 11 illustrates another embodiment of the present invention, in which a gear is used to allow a first wing (17) and a second wing (18) to have each different movement distance when the first wing (17) and the second wing (18) are operated. A gear assembled with the first wing (17) and a gear assembled with the second wing (18) have each different size or the number of revolutions. When the number of revolutions of the second gear (25) is bigger than that of the first gear (24), the second wing (18) is moved more, thereby forming the shape shown in FIG. 4. According to the present invention, in the case that gears are used to move the first wing (17) and the second wing (18), the wings can have each different movement distance due to the dense or sparse threads of the gears, which are positioned at the center. As such, it is possible to change an angle formed by the wings.

**[0038]** FIG. 12 illustrates another embodiment of the present invention, in which the first wing (17) and the second wing (18) are moved by using a spring. As described above, in the case that each of the first wing (17) and the second wing (18) is reciprocally moved between only two positions, when removing the pushing or pulling force after pushing or pulling the wings by using the spring as illustrated, it is possible to allow each wing to return to its original position by a restoring force. In FIG. 7, the left second wing (18) is pulled in a normal state, and when the switch holding the second wing (18) is retracted, the second wing is moved upward by a restoring force. The first wing can also be moved in the same manner. If the spring is operated in a reverse direction, a position where a restoring force occurs can be changed.

**[0039]** FIG. 13 illustrates another embodiment of the present invention, in which head parts are attached up and down to each other. Since human's teeth are formed in such a manner that upper teeth face lower teeth, if two head parts are assembled to face each other as shown in FIG. 13, it is possible to brush the lower and upper teeth together, and the head parts can move independently from each other.

**[0040]** FIG. 14 illustrates another embodiment of the present invention, in which a first wing (17) and a second wing (18) have a first locking-axial groove (21) and a second locking-axial groove (22) formed thereon, respectively. A first rotary-axial groove (19) and a second rotary-axial groove (20) are close to each other to be rotated about a rotary groove. The second wing (18) is placed on the first wing (17), and the first wing (17) and the second wing (18) are divided into a bottom part where bristles are planted and a rotary part where the first rotary-axial groove (19) and the first locking-axial groove (21) are formed. The rotary part is formed at a lower side stepped from a bottom part, and a boundary part between the rotary part and the bottom part has a round shape allowing the second wing (18) placed thereon to be rotated. The first locking-axial groove (21) has an arc-shape formed along the rotary groove, and the second locking-axial groove (22) has a hole-shape. The second wing (18) is rotated while being placed on the first wing. An adjusting end (31) capable of rotating left and right is formed on an end of the switch (15) such that the adjusting end (31) can be moved in an empty space of the first locking-axial groove while being locking into the second locking-axial groove (22). When the adjusting end (31) is moved left and right at the end of the switch, the second wing (18) is moved while being placed on the first wing. The first wing (17) and the second wing (18) can be located at each different position in accordance with a degree of the adjusting end (31) being locked into the first locking-axial groove (21). As the first wing (17) is moved, the position of the first locking-axial groove (21) is changed. Since the first locking-axial groove (21) has a long shape, it has a degree of movement different from that of the second wing (18). FIG. 14 illustrates only the first wing, the second wing, the switch, and the adjusting end (31). The rotary part can be formed on either the first wing or the second wing.

**[0041]** FIGs 15, 16 and 17 illustrate the first wing (17) and the second wing (18) moving according to the movement of the switch and the adjusting end (31). The positions of the first wing (17) and the second wing (18) can be changed in accordance with the shapes of the first locking-axial groove (21) and the second locking-axial groove (22).

11: Bottom part

12: Bristles

13: Bristle fixing part

14: Head part

(continued)

15: Grip part	16: Switch
17: The first wing	18: The second wing
19: The first rotary-axial groove	20: The second rotary-axial groove
21: The first locking-axial groove	22: The second locking-axial groove
23: Locked part	24: The first gear
25: The second gear	

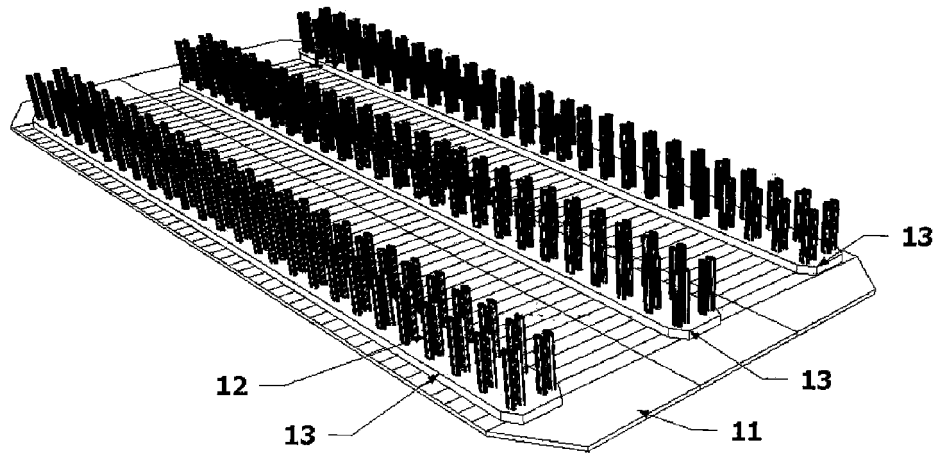
## [INDUSTRIAL APPLICABILITY]

**[0042]** The multi-sided cleaning toothbrush as described above has an effect of brushing each corner of teeth and has an effect that the third party can easily brush other person's teeth.

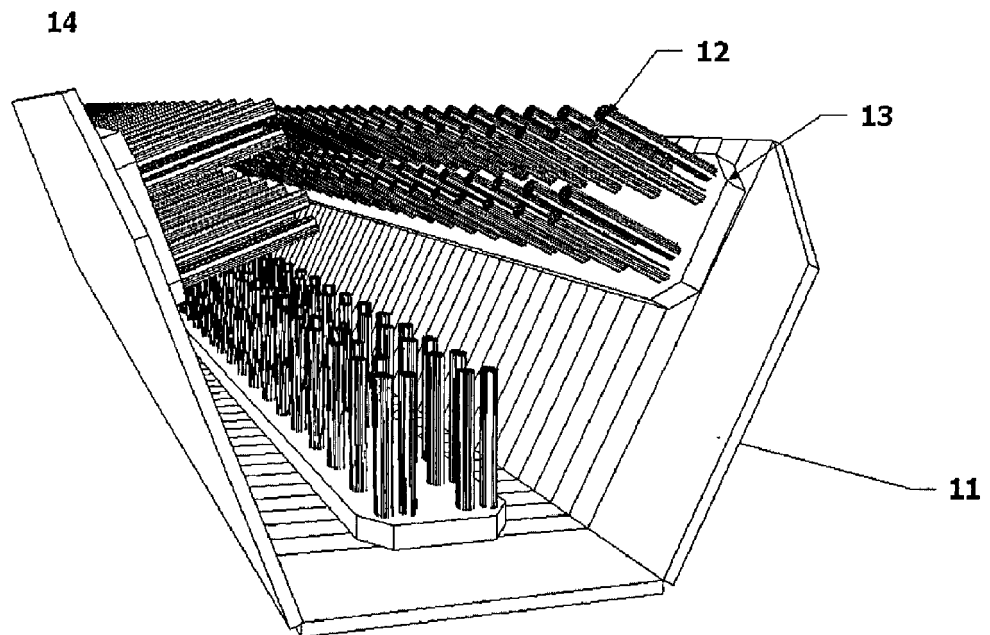
**Claims**

1. A multi-sided cleaning toothbrush using vibration, in which a plurality of bristles (12) are arranged in multiple rows on a bottom part (11) made of a resilient material, the bottom part (11) is divided into three parts in a longitudinal direction and is folded in a  $\sqsubset$ -shape to form a head part (14), a grip part (16) is coupled to a rear surface of the bottom part (11), the head part (14) folded in the  $\sqsubset$ -shape is in close contact with teeth and has an I-shape mode where the head part is unfolded in an elongated shape and a U-shape mode where the head part is bent in a round shape according to an arrangement shape of the teeth to easily clean the teeth, and a grip part (16) of the toothbrush is coupled to the head part (14).
2. The multi-sided cleaning toothbrush using vibration as claimed in claim 1, wherein a first wing (17) and a second wing (18) are assembled with an end of the grip part (16) such that the two wings are unfolded in a direction equal to a longitudinal direction of the grip part (16) in the I-shape mode, and the first wing (17) and the second wing (18) move far away from each other at an acute angle in the U-shape mode.
3. The multi-sided cleaning toothbrush using vibration as claimed in claim 2, wherein the first wing (17) and the second wing (18) are rotated by using the same rotary axial, a first locking-axial groove (21) and a second locking-axial groove (22) are formed near each rotary groove of the wings, the first locking-axial groove (21) has a long oval shape and has a part recessed inside the oval shape, and the second locking-axial groove (22) has a circular shape such that, when pushed by a locked part (23) of the switch (16), the second locking-axial groove (22) is successively pushed by the locked part (23) to be rotated, the locked part is in contact with an end of the first locking-axial groove after bumping against an inside of the first locking-axial groove (21) once to allow the first wing (17) and the second wing (18) to have each different distance, thereby making conversion from the I-shape mode into the U-shape mode.
4. The multi-sided cleaning toothbrush using vibration as claimed in claim 3, which includes a bristle fixing part (13) for fixing bristles (12), which is formed on an upper surface of the bottom part (11), and a vibration generator to clean teeth by shaking of the bristles due to vibration and allows various positions in accordance with shapes of the first locking-axial groove (22) and the second locking-axial groove.
5. The multi-sided cleaning toothbrush using vibration as claimed in claim 3, wherein the first wing (17) and the second wing (18) are connected to each gear to be moved, and the gears have each different degree of movement in accordance with density of threads of the gears, which are positioned on the center, thereby allowing movement between the I-shape mode and the U-shape mode.
6. The multi-sided cleaning toothbrush using vibration as claimed in claim 3, wherein the first wing (17) and the second wing (18) are converted from the I-shape mode into the U-shape mode by a restoring force of a spring.

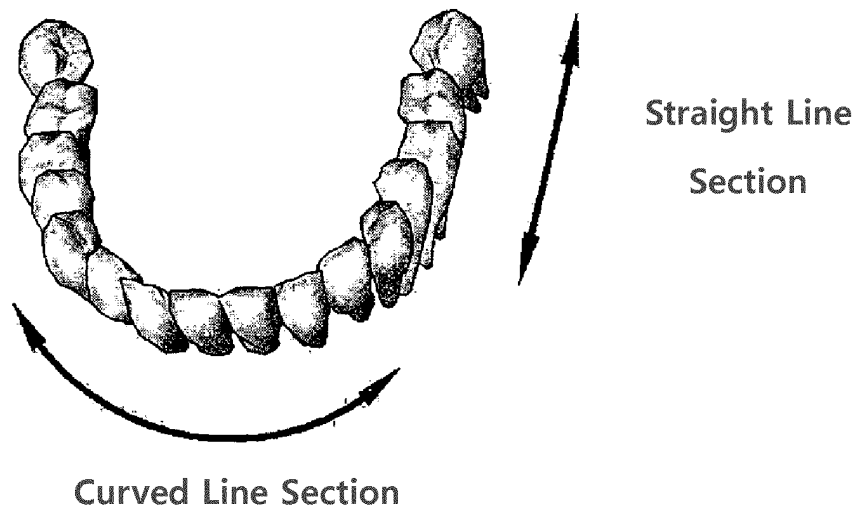
【FIG. 1】



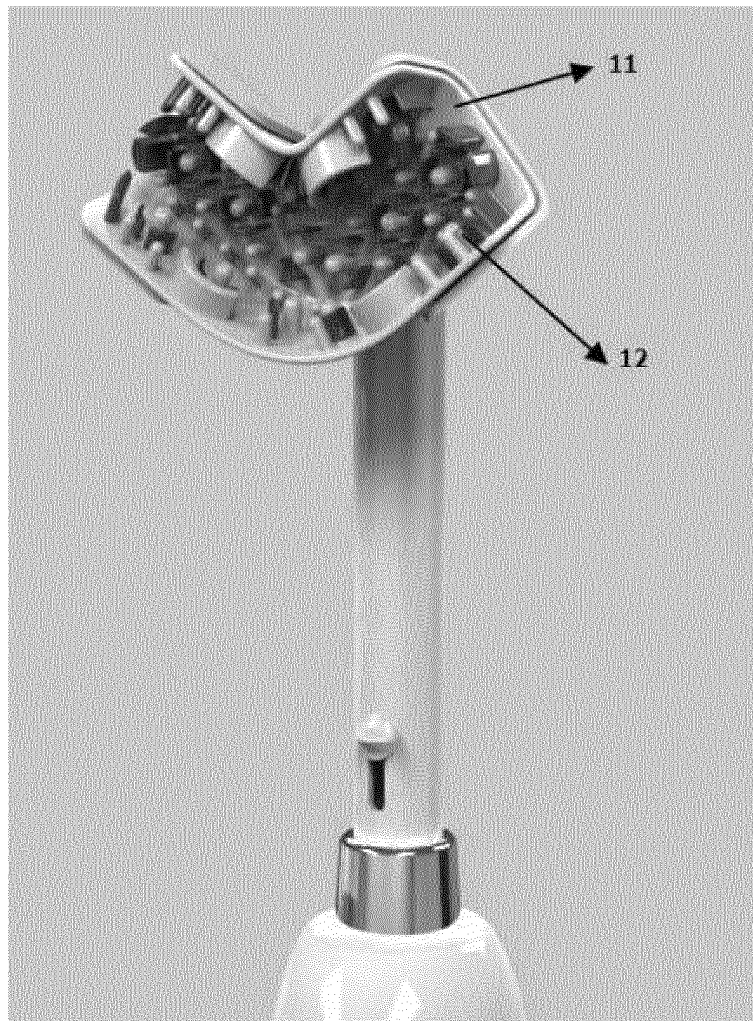
【FIG. 2】



【FIG. 3】

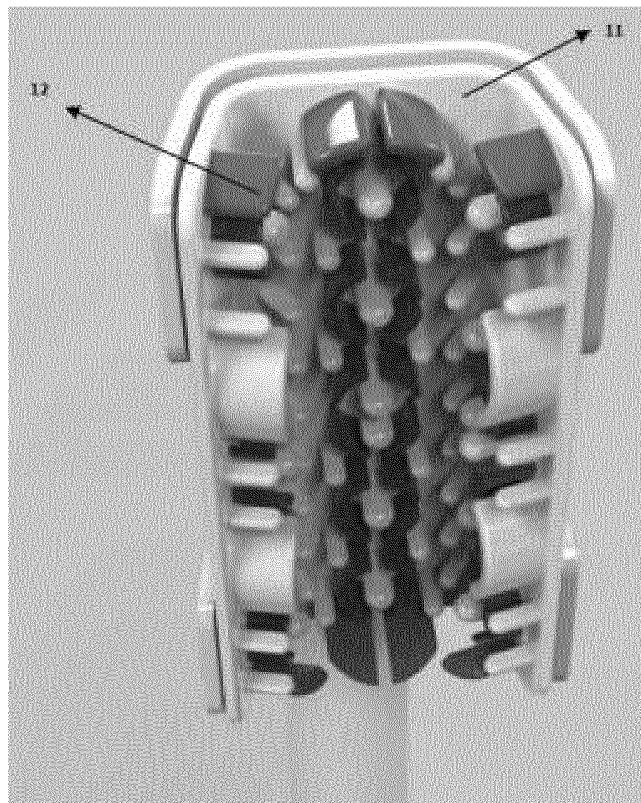


【FIG. 4】

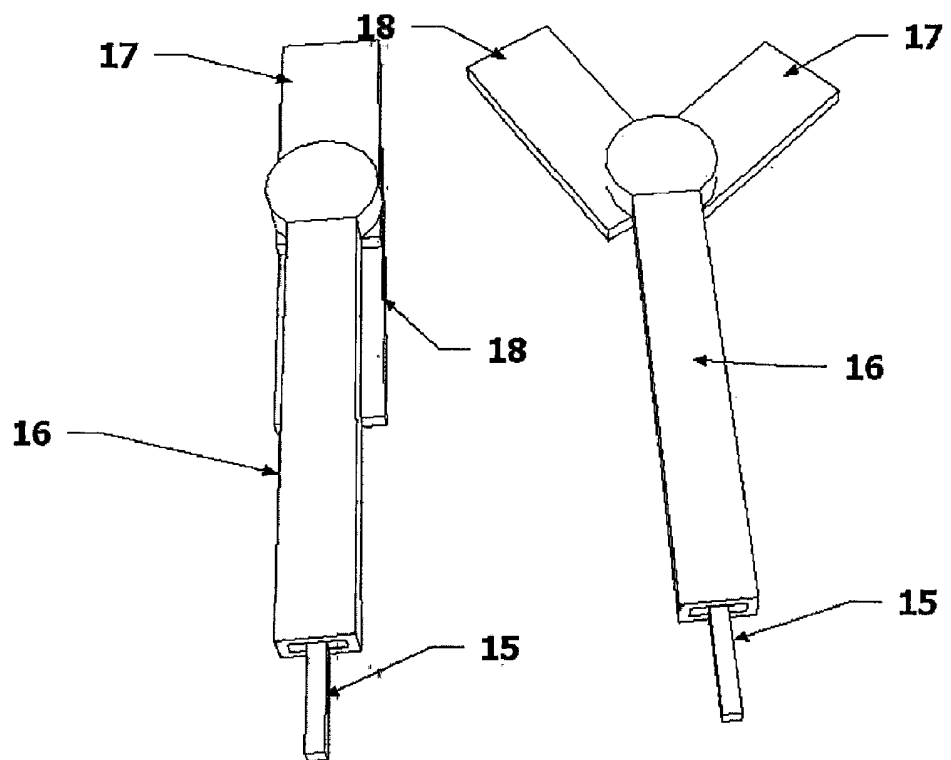




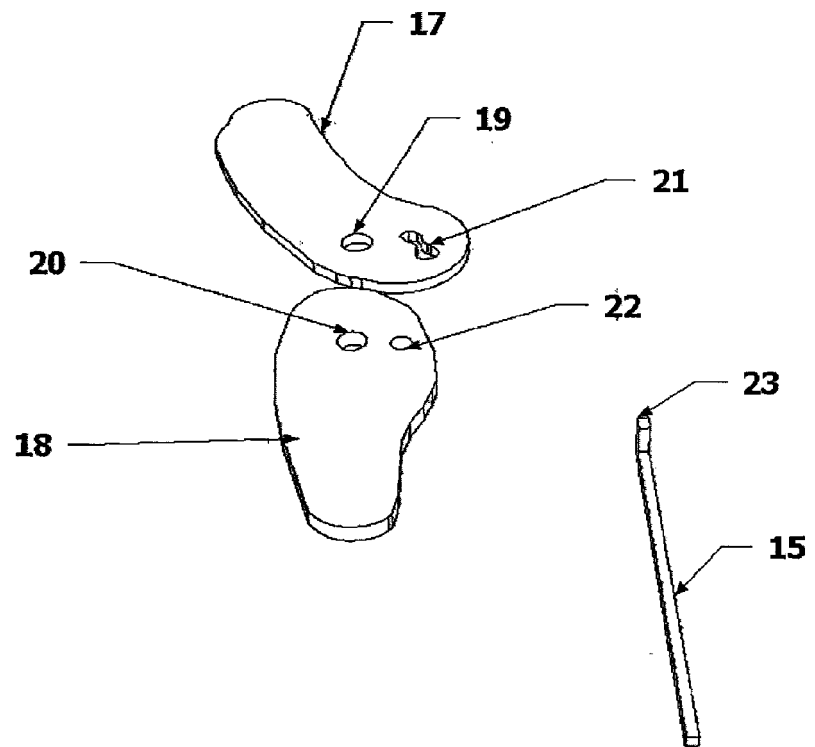
【FIG. 5】



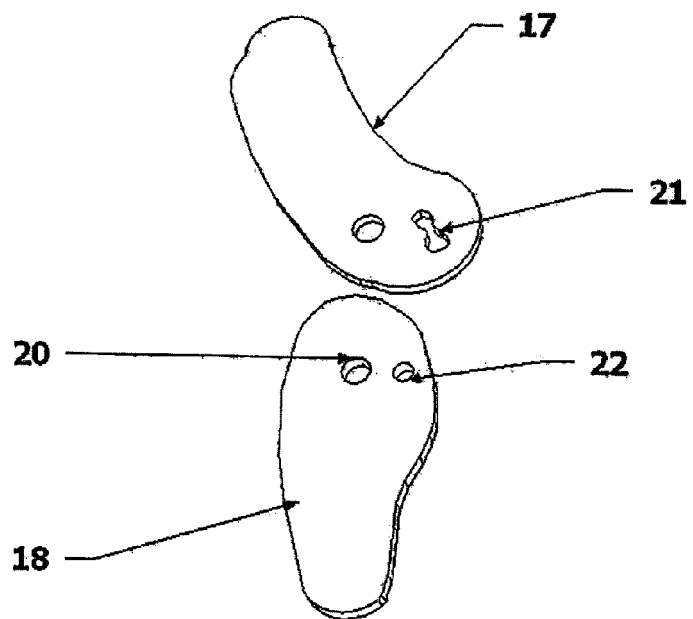
【FIG. 6】



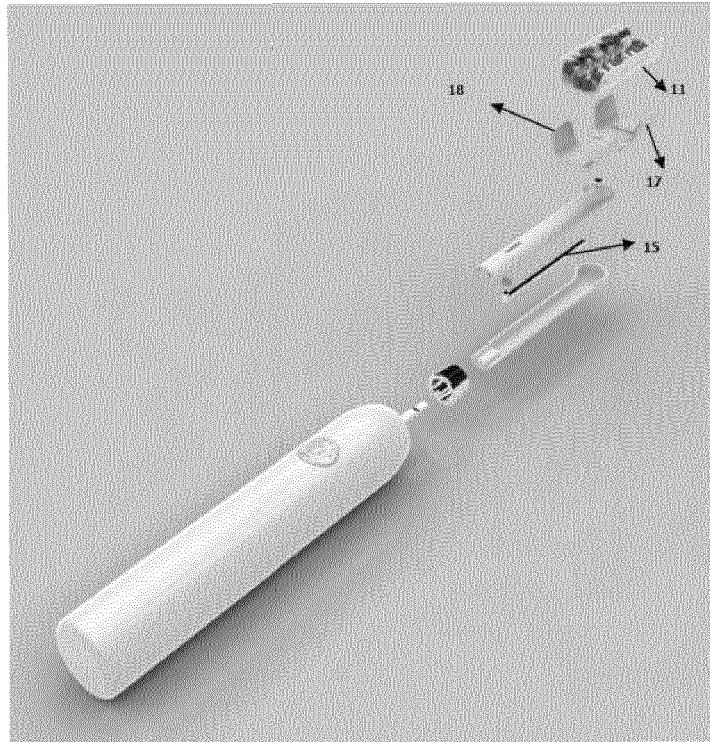
【FIG. 7】



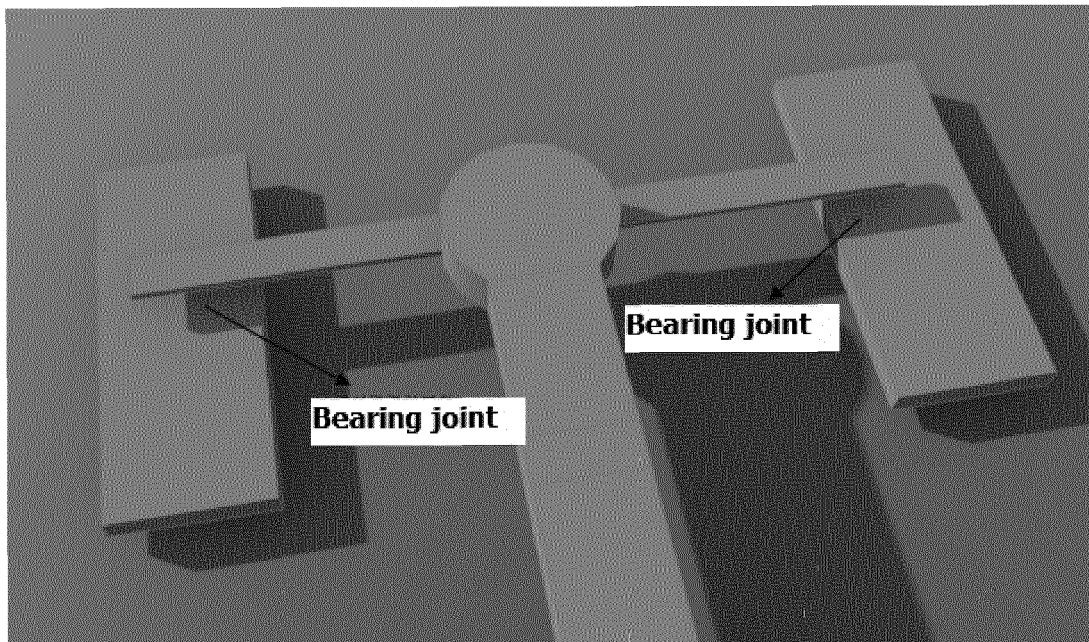
【FIG. 8】



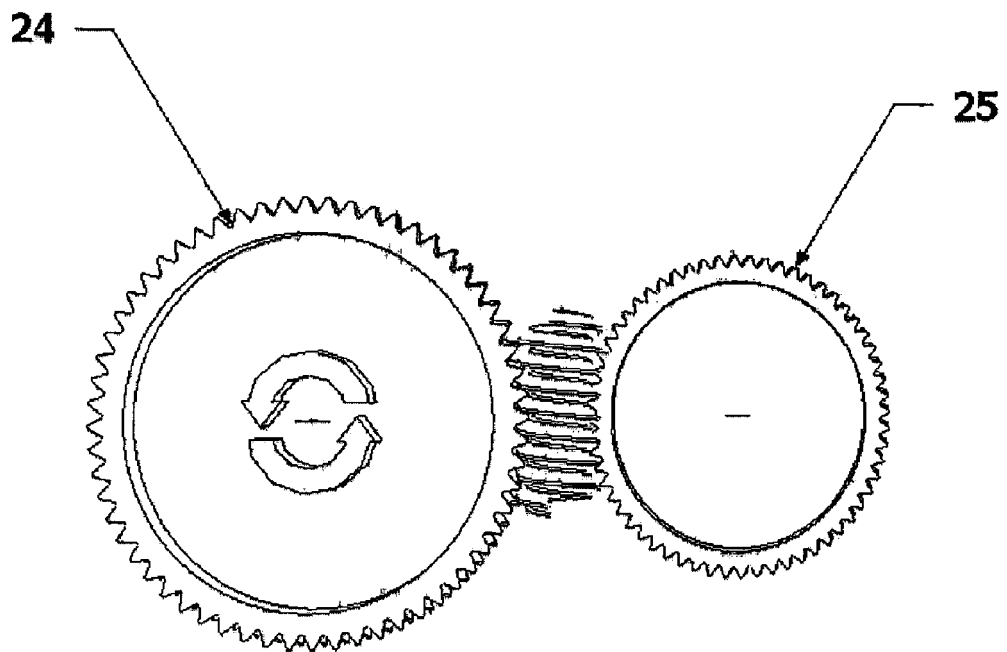
【FIG. 9】



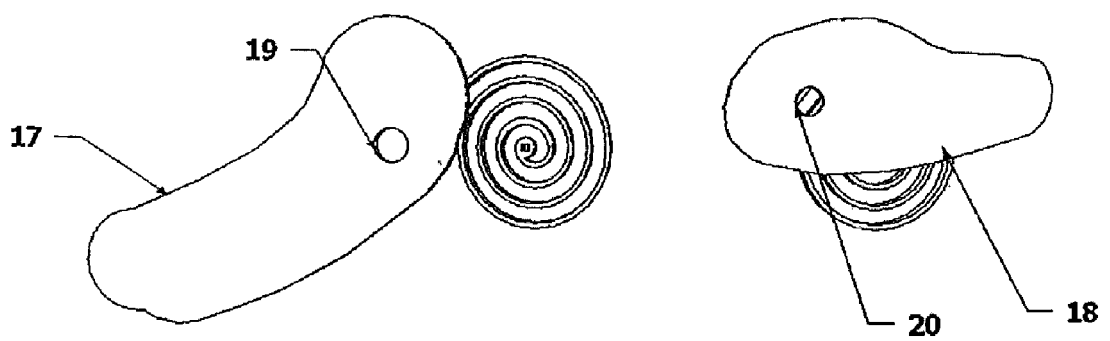
【FIG. 10】



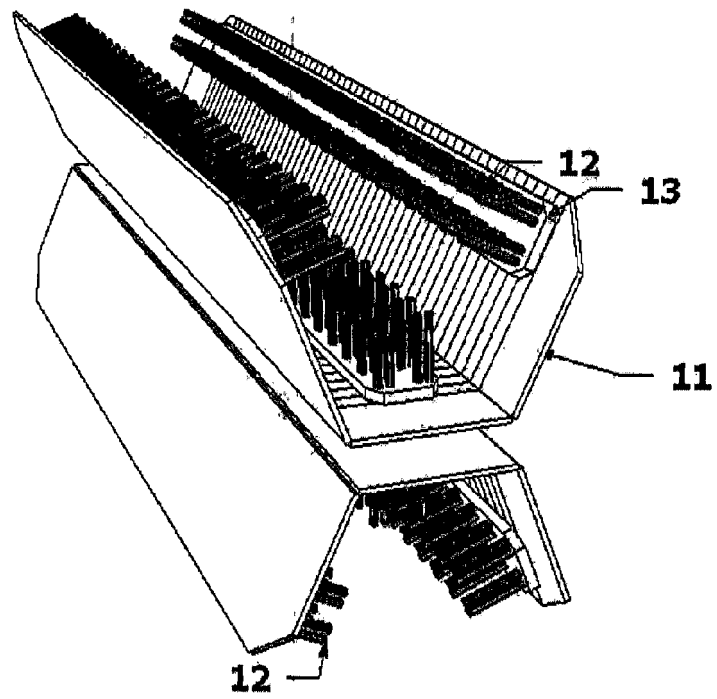
【FIG. 11】



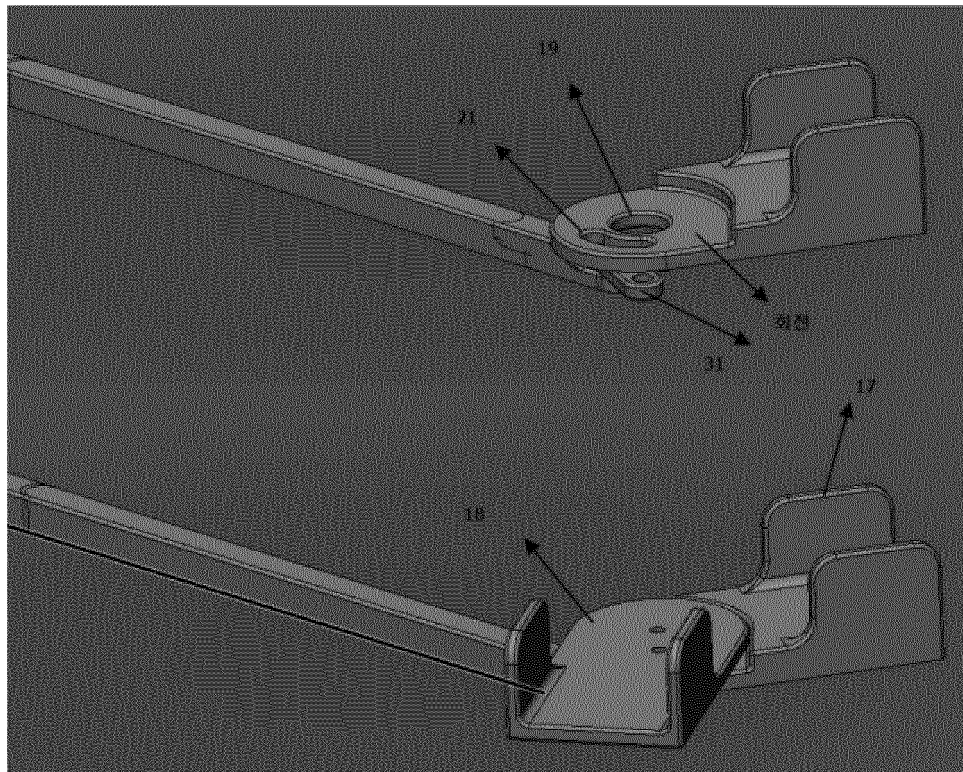
【FIG. 12】



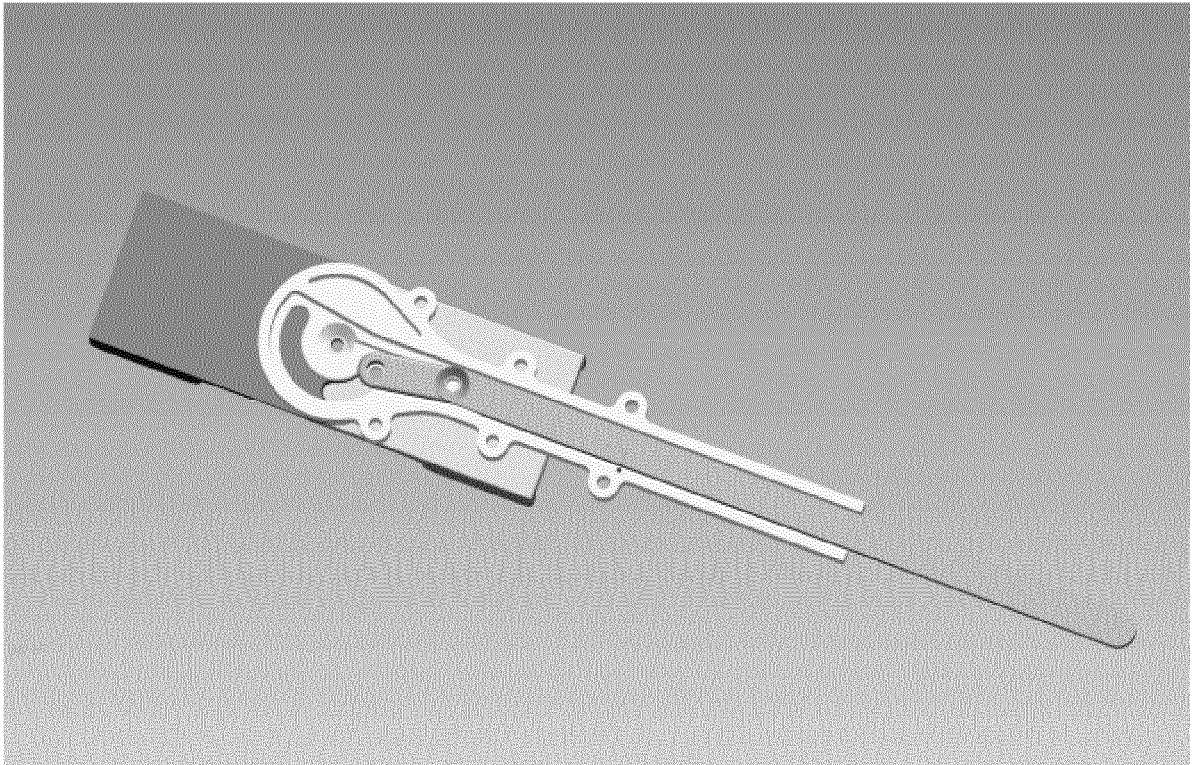
【FIG. 13】



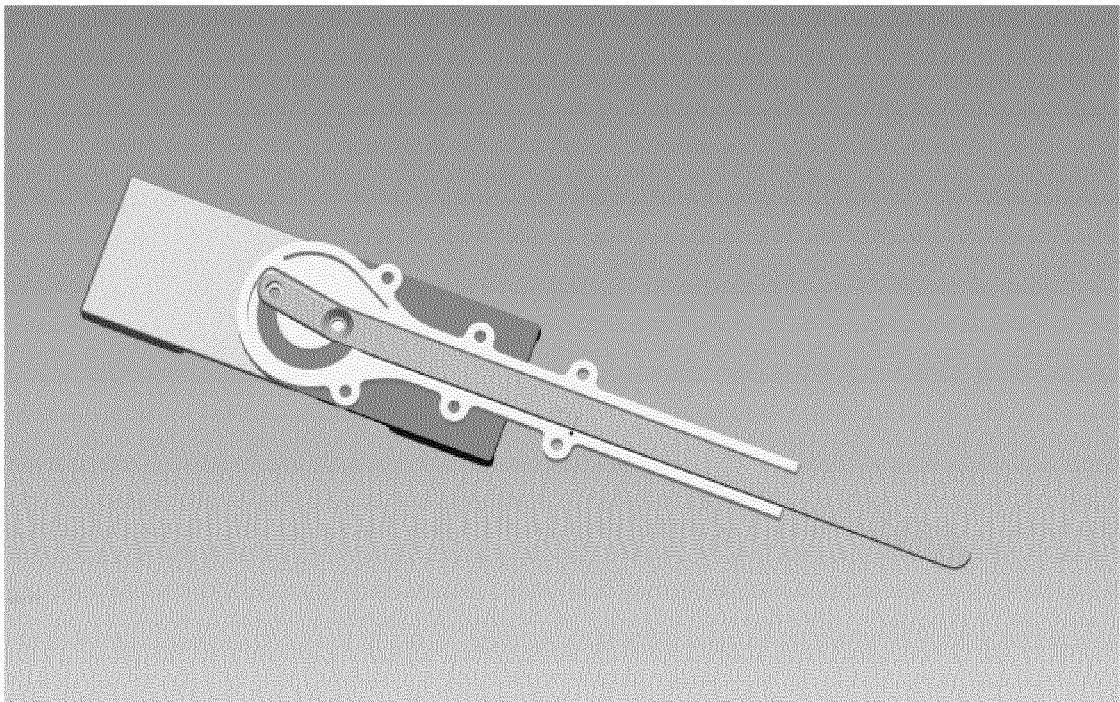
【FIG. 14】



【FIG. 15】

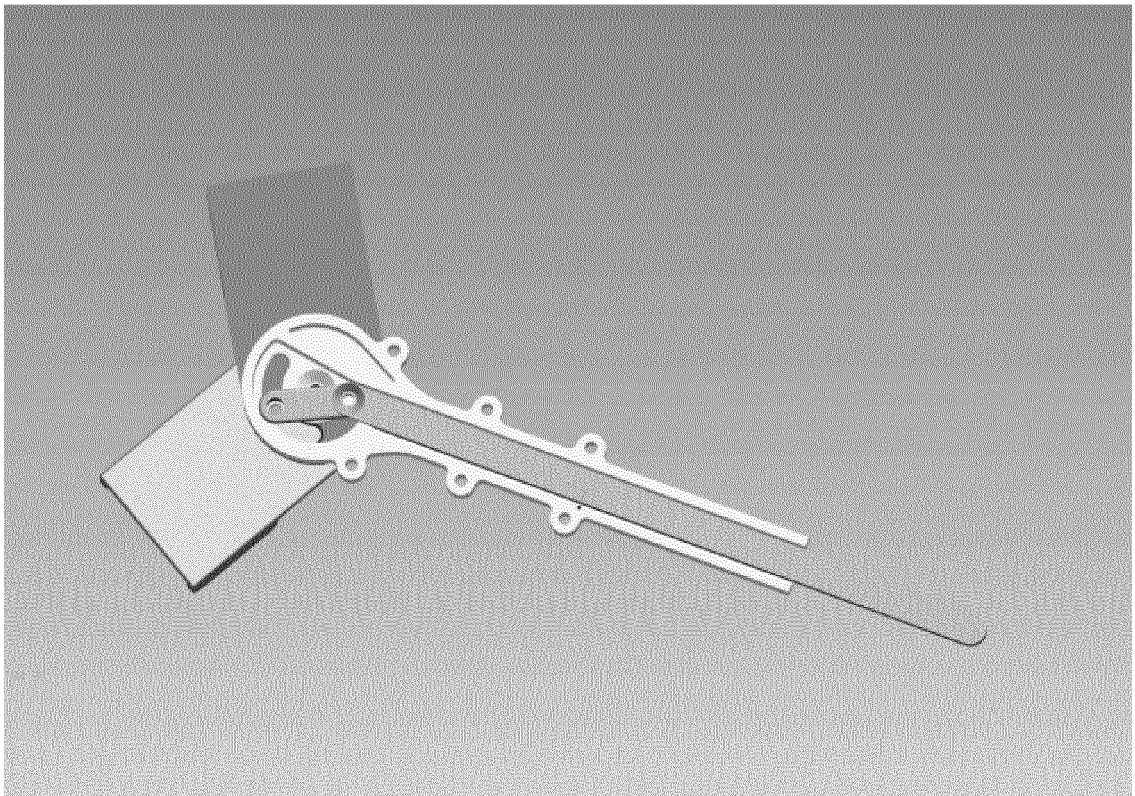


【FIG. 16】





【FIG. 17】



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2016/013736

## A. CLASSIFICATION OF SUBJECT MATTER

*A46B 13/02(2006.01)i, A46B 9/04(2006.01)i, A46B 9/02(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)

A46B 13/02; A61C 17/00; A46B 9/04; A46B 9/00; A46B 7/00; A46B 13/00; A46B 7/06; A61C 19/06; A46B 9/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

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

eKOMPASS (KIPO internal) &amp; Keywords: multi side toothbrush, brush, transformation, wing, folding, vibration

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009-0229062 A1 (FILBY, E.) 17 September 2009 See claims 1-3; paragraphs [0021]-[0024]; figures 1-3.	1
Y		2
A		3-6
Y	KR 10-2012-0133420 A (HA, Myoung Hoon) 11 December 2012 See claims 4-5; figure 3.	2
A	KR 10-1592857 B1 (LEE, Yun Jeong) 26 February 2016 See the entire document.	1-6
A	KR 10-2012-0082905 A (LIANGCO, Michael) 24 July 2012 See the entire document.	1-6
A	KR 10-0983504 B1 (HONG, Hyung Pyo) 24 September 2010 See the entire document.	1-6
A	US 2010-0062397 A1 (BREWER, G. K.) 11 March 2010 See the entire document.	1-6

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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“&amp;” document member of the same patent family

Date of the actual completion of the international search

10 AUGUST 2017 (10.08.2017)

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

**PCT/KR2016/013736**

Patent document cited in search report	Publication date	Patent family member	Publication date
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**REFERENCES CITED IN THE DESCRIPTION**

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