

[DESCRIPTION]

[TITLE OF INVENTION]

REPLACEMENT BRUSH FOR ELECTRIC TOOTHBRUSH, AND ELECTRIC
TOOTHBRUSH

5 [Technical Field]

[0001]

The present invention relates to a replacement brush for an electric toothbrush
and an electric toothbrush.

Priority is claimed on Japanese Patent Application No. 2017-231177, filed
10 November 30, 2017, the content of which is incorporated herein by reference.

[Background Art]

[0002]

Electric toothbrushes can provide an excellent cleaning feeling that cannot be
obtained with ordinary hand brushing (for example, refer to Patent Literature 1). For
15 this reason, the use of electric toothbrushes is effective in brushing teeth.

[0003]

Electric toothbrushes are roughly classified into reversing vibration type electric
toothbrushes and sonic wave vibration type electric toothbrushes. Among them, the
sonic wave vibration type electric toothbrushes have a mechanism in which vibration
20 generated due to high-speed rotation of an eccentric weight directly connected to a motor
is transmitted to a head part to vibrate a bristle bundle (for example, refer to Patent
Literature 2). Furthermore, general electric toothbrushes have a replacement structure
in which a replacement brush including a neck part and a head part is attached to a handle
part configured to accommodate a cell and a motor in an attachable and detachable
25 manner.

[0004]

In sonic wave vibration type electric toothbrushes, distal ends of the bristle bundle (bristle tips of a brush) vibrate at high speed and minutely. Thus, there is an expectation that an actual feeling of cleaning teeth surfaces, inter-dental spaces, and cervical region portions will be improved. On the other hand, in ordinary toothbrushes using hand brushing, in order to improve the operability in oral cavities and to ensure a feeling of confined places such as the back teeth being cleaned, thicknesses of head parts have been reduced (for example, refer to Patent Literature 3).

[0005]

However, when the thicknesses of the head parts have been reduced in sonic wave vibration type electric toothbrushes, widths of vibration in directions perpendicular to the bristled surfaces of the head parts increase and users may feel uncomfortable with the vibration in the oral cavity in some cases. To be specific, as a main part in a oral cavity which may feel discomfort, a back surface of a head part coming into contact with oral cavity tissues (such as the inside of the cheek) may be exemplified. Particularly, in confined places such as the back teeth, back surfaces of head parts easily come into contact with oral cavity tissues, which tend to be more uncomfortable.

[0006]

Also, an increase in vibration width due to the reduced thickness of the head part affects not only the back surface of the head part but also contact of the bristle bundle implanted in the front surface (the bristled surface) of the head part with respect to the oral cavity tissues (such as gums). That is to say, if a part of the bristle bundle comes into contact with the gums, the user may feel uncomfortable due to the vibration transmitted to the gums depending on how the user applies the bristle bundle in some cases.

[0007]

Therefore, in an electric toothbrush having a reduced thickness of a head part, providing both of an “actual feeling of cleaning the back teeth” and “reduction of discomfort caused by vibration” described above is required.

5 [Citation List]

[Patent Literature]

[0008]

[Patent Literature 1]

Japanese Utility Model (Registered) Publication No. 3148337

10 [Patent Literature 2]

Japanese Unexamined Patent Application, First Publication No. H8-257043

[Patent Literature 3]

Japanese Unexamined Patent Application, First Publication No. 2011-4852

[Summary of Invention]

15 [Technical Problem]

[0009]

The present invention was proposed in view of such conventional circumstances, and is to provide a replacement brush for an electric toothbrush capable of reducing a thickness of a head part, thereby providing an excellent feeling of the back teeth being
20 cleaned and reducing discomfort due to vibration in the oral cavity and an electric toothbrush including such a replacement brush for an electric toothbrush.

[0010]

In order to accomplish the above-described object, the present invention provides the following means.

25 That is to say, the invention according to claim 1 is a replacement brush for an

electric toothbrush which includes a handle part, a neck part extending from a distal end of the handle part, and a head part provided at a distal end of the neck part and includes the neck part and the head part attached to a toothbrush main body in an attachable and detachable manner, the toothbrush main body including the handle part of an electric
5 toothbrush configured to clean an inside of an oral cavity using a plurality of bristle bundles implanted in a bristled surface of the head part while generating vibration through electric driving, wherein a maximum thickness T of the head part is 2 to 4 mm, a minimum thickness D of the neck part is 3 to 5 mm, and a relationship of $D \geq T$ is satisfied, and the head part is provided to be further biased from a back surface side toward a front
10 surface side than the neck part on the back surface side of the head part and the neck part opposite to the front surface side on which the bristled surface is provided.

[0011]

Also, the invention according to claim 2 is the replacement brush for an electric toothbrush according to claim 1, wherein a step H is provided between a back surface of
15 the head part and a back surface of the neck part, and the step H is 0.5 to 3 mm.

[0012]

The invention according to claim 3 is the replacement brush for an electric toothbrush according to claim 1 or 2, wherein the head part is provided to be inclined with respect to the neck part from the back surface side toward the front surface side, and
20 an angle formed by an axis line of the head part parallel to the bristled surface and an axis line of the neck part parallel to an attachment/detachment direction with respect to the handle part is preferably 1 to 5°.

[0013]

The invention according to claim 4 is the replacement brush for an electric
25 toothbrush according to any one of claims 1 to 3, wherein a distance between a distal end

of the head part and a distal end of a support shaft while attached to the distal end of the support shaft provided to protrude in an axial direction from the distal end of the handle part is 40 to 60 mm.

[0014]

5 The invention according to claim 5 is the replacement brush for an electric toothbrush according to any one of claims 1 to 4, wherein the head part is provided to be further biased from the back surface side toward the front surface side than the neck part on the front surface side of the head part and the neck part on a side on which the bristled surface is provided.

10 [0015]

 The invention according to claim 6 is the replacement brush for an electric toothbrush according to any one of claims 1 to 5 including: a vibration minimizing part partially connected from a distal end of the neck part to the back surface of the head part on the back surface side of the head part and the neck part.

15 [0016]

 The invention according to claim 7 is an electric toothbrush which includes a handle part, a neck part extending from a distal end of the handle part, and a head part provided at a distal end of the neck part and cleans an inside of an oral cavity using a plurality of bristle bundles implanted in a bristled surface of the head part while
20 generating vibration through electric driving, wherein a structure in which a replacement brush including the neck part and the head part is attached to a toothbrush main body including the handle part in an attachable and detachable manner is provided, and the electric toothbrush includes the replacement brush for an electric toothbrush according to any one of claims 1 to 6 provided as the replacement brush.

25 [Advantageous Effects of Invention]

[0017]

As described above, according to the present invention, it is possible to provide a replacement brush for an electric toothbrush in which a thickness of a head part is able to be reduced, thereby providing an excellent feeling of the back teeth and reducing discomfort due to vibration in an oral cavity and an electric toothbrush including such a replacement brush for an electric toothbrush.

[Brief Description of Drawings]

[0018]

Fig. 1 is a side view illustrating a constitution of an electric toothbrush including a replacement brush for an electric toothbrush according to an embodiment of the present invention.

Fig. 2 is a side view illustrating a constitution of the replacement brush for an electric toothbrush illustrated in Fig. 1.

Fig. 3 is a front view illustrating the constitution of the replacement brush for an electric toothbrush illustrated in Fig. 1.

Fig. 4 is a rear view illustrating the constitution of the replacement brush for an electric toothbrush illustrated in Fig. 1.

Fig. 5 is a front view of a head part of the replacement brush for an electric toothbrush illustrated in Fig. 1 when viewed from a bristled surface side.

Fig. 6 is a cross-sectional view of the head part taken along line X-X shown in Fig. 5.

Fig 7 is a front view illustrating another example of the arrangement of a bristle bundle on a bristled surface.

Fig. 8 is a side view illustrating a state in which the bristle bundle is implanted in the bristled surface of the head part illustrated in Fig. 7.

Fig. 9 is a front view illustrating another example of the arrangement of the bristle bundle on the bristled surface.

[Description of Embodiments]

[0019]

5 A replacement brush for an electric toothbrush and an electric toothbrush to which the present invention is applied will be described in detail below with reference to the drawings.

 In the drawings used in the following description, in order to facilitate the understanding of the characteristics, characteristic portions are schematically illustrated
10 for convenience in some cases and dimensional ratios or the like of constituent elements are not always the same as the actual ones. Furthermore, a bristle bundle is not illustrated and only a bristle implantation hole through which the bristle bundle is implanted is illustrated in some cases.

[0020]

15 Also, in the following description, a description will be provided assuming that a side of a head part 4 which will be described and on which a bristled surface 4a is provided is a front surface (a front face) side of a replacement brush 1B (an electric toothbrush 1) and a side opposite to the side of the head part 4 on which the bristled surface 4a is provided is a back surface (a back face) side of the replacement brush 1B
20 (the electric toothbrush 1).

[0021]

 As an embodiment of the present invention, for example, the electric toothbrush 1 illustrated in Fig. 1 includes a handle part 2, a neck part 3 extending in an axial direction from one end (a distal end) of the handle part 2, and the head part 4 provided at
25 a distal end of the neck part 3 and cleans the inside of an oral cavity using a plurality of

bristle bundles 5 implanted in the bristled surface 4a of the head part 4 while generating vibration using electric driving.

[0022]

Also, the electric toothbrush 1 in this embodiment has a replacement structure in which a replacement brush 1B for an electric toothbrush (hereinafter referred to as a “replacement brush”) including the neck part 3 and the head part 4 is attached to a toothbrush main body 1A including the handle part 2 in an attachable and detachable manner.

[0023]

Although the handle part 2 constituting the toothbrush main body 1A is a part to be gripped by a user and a shape thereof is not particularly limited, the handle part 2 has, for example, a substantially column shape. Although not illustrated in the drawings, a cell accommodation part configured to accommodate a cell (for example, an AA or AAA dry cell) serving as an internal power supply, a motor rotatably driven through electricity supplied from the cell, and an eccentric weight directly connected to the motor are disposed inside the handle part 2.

[0024]

The toothbrush main body 1A employs a sonic wave vibration type in which vibration is generated when the eccentric weight rotates at a high speed through driving of the motor and has a mechanism in which vibration is transmitted to a support shaft 6 provided to protrude in the axial direction from a distal end of the handle part 2.

[0025]

The number of rotations of the motor is preferably 6000 to 16000 rpm, and more preferably 7000 to 15000 rpm. If the number of rotations of the motor is less than 6000 rpm, the feeling of cleaning using the electric toothbrush 1 is insufficient. On the other

hand, if the number of rotations of the motor exceeds 16000 rpm, discomfort due to vibration is promoted.

[0026]

Although not illustrated in the drawings, in the toothbrush main body 1A, the
5 cell can be exchanged in the cell accommodation part by removing a cap attached to a bottom portion of the handle part 2 in an attachable and detachable manner.

Furthermore, in the toothbrush main body 1A, the user can operate a power supply button provided on the front surface of the handle part 2 to switch between supplying/cutting electric power (power supply ON/power supply OFF) from the cell to the motor.

10 [0027]

The toothbrush main body 1A is not limited to a constitution in which the above-described cell (a primary cell) is used as an internal power supply and may have, for example, a constitution in which a battery (a secondary cell) such as a nickel cadmium cell, a nickel hydride cell, and a lithium ion cell is used as an internal power
15 supply. When the battery is installed as an internal power supply, charging from an external power supply (a commercially available power supply) to an internal power supply via a battery charger be made possible. In this case, the use of a non-contact charging method has excellent ease of use and is desirable in view of safety.

[0028]

20 Also, in the toothbrush main body 1A, in addition to the constitution in which turning ON/OFF of the power supply is switched through the operation of the above-described power supply button, for example, a constitution in which the intensity of vibration is switched through an operation of an operation button may be provided.

[0029]

25 As illustrated in Figs. 1 to 4, the replacement brush 1B has the neck part 3 and

the head part 4 integrally formed of a thermoplastic resin and is integrally attached to a distal end of the toothbrush main body 1A by connecting a base end portion of the neck part 3 to the support shaft 6 of the toothbrush main body 1A. A shaft hole (not shown) into which the support shaft 6 of the toothbrush main body 1A is inserted is provided in the base end portion of the neck part 3 in the axial direction. A replacement structure in which the replacement brush 1B is attached to the toothbrush main body 1A in an attachable and detachable manner is not particularly limited and a conventionally known structure can be adopted.

[0030]

10 In the electric toothbrush 1, the vibration transmitted from the support shaft 6 is transmitted to the head part 4 via the neck part 3 in a state in which the replacement brush 1B is attached to the toothbrush main body 1A and each of the bristle bundles 5 can be vibrated.

[0031]

15 Here, it is desirable that a resin having a high mechanical strength (for example, polyacetal (POM), polypropylene (PP), or the like) be used for the replacement brush 1B (the neck part 3 and the head part 4). Thus an insertion strength by which the support shaft 6 is into the shaft hole described above become higher, and even when the thickness of the head part 4 is reduced, it is possible to minimize an increase in vibration width of the head part 4 in a direction perpendicular to that of the bristled surface 4a.

20 [0032]

Also, a flexural modulus of elasticity of a resin forming the neck part 3 and the head part 4 (JIS K 7171) is preferably 1000 to 3000 MPa, more preferably 1500 to 3000 MPa, and still more preferably 2000 to 3000 MPa.

25 [0033]

The neck part 3 has a tapered shape in which a diameter of the neck part 3 gradually decreases from a base end side thereof toward a distal end side thereof. Thus, the distal end of the neck part 3 is a portion having a most-reduced diameter.

Furthermore, with regard to a shape of the neck part 3, in order to easily brush the back teeth, at least a front surface 3a side of the neck part 3 may be formed to have a gentle curved (curve) shape.

[0034]

A minimum thickness D of the neck part 3 is preferably 3 to 5 mm, and more preferably 3.5 to 4.5 mm. A thickness of the neck part 3 refers to a thickness between the front surface 3a and a back surface 3b of the neck part 3. Therefore, the minimum thickness D of the neck part 3 adopts a thickness of the distal end of the neck part 3 having a most-reduced diameter (a thickness of a cross section in a direction perpendicular to a direction in which the neck part 3 extends with respect to a point P on the back surface 3b side on which a corresponding place is formed in Fig. 2).

[0035]

If the minimum thickness D of the neck part 3 is less than 3 mm, a vibration width of the head part 4 in a direction perpendicular to that of the bristled surface 4a of the head part 4 and the vibration transmitted from the neck part 3 to the head part 4 also increases. Thus, discomfort accompanied by the vibration increases. On the other hand, if the minimum thickness D of the neck part 3 exceeds 5 mm, at the time of brushing the teeth, the opening of the mouth becomes larger, the operability in the oral cavity cannot be ensured, and the feeling of cleaning the back teeth is reduced.

[0036]

As illustrated in Figs. 5 and 6, the head part 4 is a part in which the inside of the oral cavity is brushed using the plurality of bristle bundles 5 and it is possible to enhance

a plaque removal effect particularly on a tooth surface, a cervical region portion, and an inter-dental space portion by vibrating the plurality of bristle bundles 5 at the time of toothbrushing.

[0037]

5 The head part 4 may have any shape and size as long as it easily brushes the inside of the oral cavity and the shape thereof is not particularly limited. However, generally, the head part 4 has a substantially rectangular parallelepiped shape and a shape in which corner portions of the head part 4 have a rounded shape. Furthermore, the head part 4 may have a shape in which a width of the head part 4 gradually decreases
10 from a base end side thereof toward a distal end side thereof. The bristled surface 4a and a back surface 4b of the head part 4 together form flat surfaces.

[0038]

 The back surface 4b of the head part 4 may have a tapered shape in which a thickness of the back surface 4b gradually decreases from the base end side thereof
15 toward the distal end side thereof or may have a rounded shape in which a center of the head part 4 on the back surface 4b side is raised.

[0039]

 When viewed in a front view, the head part 4 in this embodiment has a shape in which the head part 4 spreads in a width direction from the distal end thereof toward the
20 neck part 3, extends with the same width, extends with a width decreasing in the width direction, and then reaches a boundary R with the neck part 3.

[0040]

 The boundary R is an end point of a curve forming a corner cut from the neck part 3 in a shape of the head part 4 when viewed in a front view, that is, a position in
25 which a bending direction of the curve forming the corner cut changes. To be more

specific, the boundary R is a position in which the bending direction changes from curves or straight lines forming both edges at which a width of the corner cut portion of the neck part 3 in the head part 4 when viewed in a front view to a curve or a straight line in which a width increases or a straight line in which a width remains the same. Furthermore, in 5 the case of the electric toothbrush 1 in which a width of the neck part 3 increases toward the handle part 2 when viewed in a front view, the boundary R coincides with a position in which widths of the head part 4 and the neck part 3 when viewed in a front view is smallest.

A minimum width of the neck part 3 when viewed in a front view is preferably 3 10 to 5 mm, and more preferably 3.5 to 4.5 mm.

[0041]

A plurality of bristle implantation holes 7 having the same diameter are arranged on the bristled surface 4a of the head part 4 side by side in a staggered shape. Each of the bristle bundles 5 is implanted in one of the bristle implantation holes 7 by bundling a 15 plurality of brushes (filaments), folding the bundled brushes (filaments) in half, disposing a metal stopping tool (not shown) called a flat wire at a portion folded in half, and inserting them into one of the bristle implantation holes 7. Fig. 5 does not illustrate the bristle bundles 5 and illustrates only the bristle implantation holes 7.

[0042]

20 The bristle implantation holes 7 are not limited to a constitution in which the plurality of bristle implantation holes 7 are arranged side by side in a staggered shape and can have a constitution in which a plurality of bristle implantation holes 7 are arranged side by side in a lattice shape. Furthermore, since an inner diameter of the bristle implantation hole 7 has a correlation with the number of bristle bundles 5 to be implanted, 25 the inner diameter affects the hardness and the feeling of use of the bristle bundles 5.

However, although the feeling of use can be adjusted to a certain extent depending on thicknesses and bristle lengths of the bristle bundles 5 used at the time of implanting, generally, the inner diameter is preferably in the range of 1.0 to 3.0 mm.

[0043]

5 Although a material of the brush of the bristle bundle 5 is not particularly limited, examples of the material include synthetic resin materials such as polyamides (for example: 6-12 nylons and 6-10 nylons), polyesters (for example: polyethylene terephthalates, polybutylene terephthalates, and polytrimethylene terephthalates), polyolefins (for example: polypropylene), and elastomers (for example: olefin types and
10 styrene types). Furthermore, a plurality of these resin materials may be combined and used. For example, different resin materials can also be used for a core part and a sheath part such as a core-sheath structure.

[0044]

 A cross-sectional shape of the brush is usually circular, but is not limited to such
15 a shape. In addition, for example, any shape such as an elliptical shape, a triangular shape, a quadrangular shape, a hexagonal shape, a star shape, a three-leaf clover shape, or a four-leaf clover shape can be used.

[0045]

 A bristle length of the bristle bundle 5 is preferably 8 mm to 13 mm for adults
20 and 6 mm to 9 mm for children from the bristled surface 4a of the head part 4. The thickness (a maximum diameter) of the brush is preferably 0.12 mm to 0.26 mm in view of the usability and the feeling of use in the oral cavity. Furthermore, a plurality of brushes having different thicknesses may be arbitrarily combined and used in consideration of the feeling of use, the feeling of toothbrushing, a cleaning effect,
25 durability, and the like.

[0046]

As a method for implanting the bristle bundle 5, in addition to a flat wire implantation method for implanting the bristle bundle 5 of the brush described above into each of the bristle implantation holes 7 by folding the bristle bundle 5 in half and
5 arranging the flat wire at the portion folded in half, a thermal fusion method for press-fitting a lower end of the bristle bundle 5 into a molten resin to be the head part 4 and fixing it, an in-mold method for heating the lower end of the bristle bundle 5 to form a molten mass and then filling a cavity of a mold with the molten resin to mold integrally with the head part 5, and the like can be used.

10 [0047]

As illustrated in Fig. 3, a width W of the head part 4 is preferably 6 to 16 mm, more preferably 8 to 15 mm, and still more preferably 10 to 12 mm. If the width W is an upper limit or less, it is possible to cause the head part 4 to approach confined places such as the back teeth without causing discomfort due to vibration. When the width W
15 of the head part 4 is reduced, the discomfort caused by the vibration of the head part 4 is reduced. Furthermore, if the width W is a lower limit or more, a sufficient amount of bristle bundles 5 can be implanted. Thus, it is possible to secure the feeling of cleaning the back teeth or the like. In addition, even if the head part 4 vibrates, it is possible to cause the brush to firmly touch a cleaning portion and it is possible to perform stable oral
20 cavity cleaning.

[0048]

As illustrated in Fig. 3, a length V of the head part 4 is preferably 20 to 35 mm, and more preferably 20 to 30 mm. If the length V is an upper limit or less, the displacement of the distal end of the head due to the vibration of the head part 4 is not
25 large, which leads to a reduction in discomfort. Furthermore, if the length V is a lower

limit or more, a sufficient amount of bristle bundles 5 can be implanted, and the feeling of cleaning the back teeth or the like can be secured.

[0049]

When the width W of the head part 4 is 12 to 16 mm, the discomfort caused by the vibration of the head part 4 can be reduced by setting the length V of the head part 4 to 28 to 33 mm. For example, in the case of a wide head having a large width, the above discomfort can be further reduced while securing an advantage of efficiently brushing a cleaning portion over a wide range by shortening the length V of the head part 4.

10 [0050]

Incidentally, in the replacement brush 1B in this embodiment, the maximum thickness T of the head part 4 is equal to the minimum thickness D of the neck part 3 ($D=T$) or smaller than the minimum thickness D of the neck part 3 ($D>T$) due to reducing the thickness of the head part 4.

15 [0051]

The maximum thickness T of the head part is preferably 2 to 4 mm, and more preferably 2.5 to 3.5 mm. The thickness of the head part 4 refers to a thickness between the front surface (the bristled surface) 4a and the back surface 4b of the head part 4. It is possible to improve the operability in the oral cavity and it is possible to secure the feeling of cleaning a confined place such as the back teeth by reducing the thickness of the head part 4.

[0052]

The head part 4 is provided to be further biased (shifted) from the back surface side toward the front surface side than the neck part 3 on the back surface side of the head part 4 and the neck part 3. That is to say, in the replacement brush 1B in this

embodiment, as illustrated in Fig. 2, an extension line L1 in the axial direction along the back surface 4b of the head part 4 is positioned further toward the front surface side than an extension line L2 passing through a distal end P of the back surface 3b of the neck part 3 and parallel to the extension line L1.

5 [0053]

The distal end P of the neck part 3 represents a starting point (an inflection point) when the back surface 3b of the neck part 3 is biased from the back surface side toward the front surface side. That is to say, the distal end P of the neck part 3 is positioned at a position at which its inclination changes from a straight line or a curved
10 line forming the back surface 3b of the neck part 3 toward a straight line or a curved line forming the back surface 4b of the head part 4. Furthermore, when the back surface 4b of the head part 4 forms a curved line, the extension line L1 may adopt an extension line passing through a point on the head part 4 on the back surface 4b side forming the maximum thickness T and parallel to the bristled surface 4a.

15 [0054]

Also, a step H is provided between the back surface 4b of the head part 4 and the back surface 3b of the neck part 3. The step H corresponds to an amount of biasing (shifting) of the extension line L1 with respect to the extension line L2.

[0055]

20 The step H is preferably 0.5 to 3.0 mm, and more preferably 0.5 to 2.0 mm. Thus, it is possible to secure a space between the back surface 4b of the head part 4 and the oral cavity tissue (such as the inside of the cheek), the back surface 4b of the head part 4 is prevented from coming into contact with the oral cavity tissue, and it is possible to reduce discomfort due to vibration.

25 [0056]

On the other hand, if the step H is less than 0.5 mm, the effect obtained by making the back surface 4b side of the head part 4 thinner than the back surface 3b side of the neck part 3 described above is insufficient. On the other hand, if the step H exceeds 2.0 mm, the head part 4 is positioned on the front surface side excessively with respect to an axis line of the handle part 2, the operability in the oral cavity is reduced, and the feeling of cleaning of the back teeth is reduced.

[0057]

Also, a distance A between a distal end of the head part 4 and a distal end of the support shaft 6 is preferably 40 to 60 mm, and more preferably 45 to 55 mm. The distance A refers to a length of a line segment connecting a distal end of the head part 4 to a distal end of the support shaft 6. If the distance A is less than 40 mm, vibration is strongly transmitted to the head part 4, which leads to discomfort due to excessive vibration. On the other hand, if the distance A exceeds 60 mm, the vibration transmitted to the head part 4 is weakened. Thus, the feeling of cleaning is insufficient.

[0058]

In the replacement brush 1B in this embodiment, it is possible to secure a space between the back surface 4b of the head part 4 and the oral cavity tissue (such as the inside of the cheek) at the time of toothbrushing by reducing a thickness of the head part 4 on the back surface 4b side.

Thus, the back surface 4b of the head part 4 is prevented from coming into contact with the oral cavity tissue and it is possible to reduce discomfort due to vibration.

[0059]

Also, the head part 4 is provided on the front surface side of the head part 4 and the neck part 3 to be further biased (shifted) from the back surface side toward the front surface side than the neck part 3. That is to say, in the replacement brush 1B in this

embodiment, as illustrated in Fig. 2, the extension line L3 in the axial direction along the bristled surface 4a of the head part 4 is positioned further on the front surface side than an extension line L4 passing through a distal end Q of the front surface 3a of the neck part 3 and parallel to the extension line L3. The distal end Q represents a starting point
5 (an inflection point) when the front surface 3a of the neck part 3 is biased from the back surface side toward the front surface side.

[0060]

Also, an amount of biasing (shifting) of the extension line L3 with respect to the extension line L4 is preferably more than 0 mm and 1 mm or less, and more preferably
10 more than 0 mm and 0.5 mm or less. In the replacement brush 1B in this embodiment, vibration can be prevented from being transmitted from the neck part 3 to the head part 4 by causing the bristled surface 4a of the head part 4 to be biased toward the front surface side as compared with a case in which the bristled surface 4a is not biased.

[0061]

15 Thus, even when the thickness of the head part 4 is reduced, it is possible to reduce a vibration width of the head part 4 in a direction perpendicular to the bristled surface 4a of the head part 4 and it is possible to reduce discomfort due to the vibration in the oral cavity. On the other hand, if an amount of biasing (shifting) is larger than necessary, the head part 4 is excessively far from the axis line angle of the handle part 2.
20 Thus, the operability in the oral cavity is reduced and the feeling of cleaning of the back teeth is reduced.

[0062]

Although the above-described constitution in which the bristled surface 4a of the head part 4 is provided to be further biased (shifted) from the back surface side toward
25 the front surface side than the front surface 3a of the neck part 3 in the replacement brush

1B in this embodiment is provided, the present invention is not necessarily limited to such a constitution. In some cases, a constitution in which the bristled surface 4a of the head part 4 is continuously (straightly) connected to the front surface 3a of the neck part 3 can be also provided.

5 [0063]

Also, the head part 4 is provided to be inclined with respect to the neck part 3 from the back surface side toward the front surface side. That is to say, in the replacement brush 1B in this embodiment, as illustrated in Fig. 2, an axis line T1 of the head part 4 parallel to the bristled surface 4a (an extension line of the extension line L3) is inclined toward the front surface side with respect to the axis line T2 (an extension line along a central axis of the shaft hole) of the neck part 3 parallel to an attachment/detachment direction with respect to the handle part 2.

[0064]

In this case, an angle (hereinafter referred to as an “inclination” of the head part 4) α formed between the axis line T1 of the head part 4 and the axis line T2 of the neck part 3 is preferably 1 to 5°, and more preferably 2 to 4°. Thus, it is possible to prevent the back surface 4b of the head part 4 from coming into contact with the oral cavity tissue (such as the inside of the cheek) as well as to improve the feeling of cleaning the back teeth and the back side of the teeth.

20 [0065]

On the other hand, if the inclination α of the head part 4 is less than 1°, the above-described effect is insufficient as well as the vibration from the brush main body 1A is easily transmitted to the head part 2. Thus, a vibration width in a direction perpendicular to that of the bristled surface 4a increases and discomfort due to vibration at the time of using is promoted. On the other hand, if the inclination α of the head part

4 exceeds 5° , the accessibility of the head part 4 to the back teeth is reduced as well as the position of the head part 4 is too far from the axis line of the handle part 2. Thus, the vibration width in the direction perpendicular to that of the bristled surface 4a increases and discomfort due to vibration at the time of using is promoted.

5 [0066]

Although the above-described constitution in which the head part 4 is provided to be inclined from the back surface side toward the front surface side with respect to the neck part 3 is provided in the replacement brush 1B in this embodiment, the present invention is not necessarily limited to such a constitution. In some cases, a constitution
10 in which the axis line T1 of the head part 4 is parallel to the axis line T2 of the neck part 3 ($\alpha=0^\circ$) can be also provided.

[0067]

As illustrated in Figs. 2 and 4, the replacement brush 1B in this embodiment has a vibration minimizing part 8 partially connected from the distal end of the neck part 3 to
15 the back surface 4b of the head part 4 on the back surface side of the head part 4 and the neck part 3.

[0068]

The vibration minimizing part 8 is formed integrally with the head part 4 and the neck part 3 and has a shape in which a width of the vibration minimizing part 8 gradually
20 decreases and a height of the vibration minimizing part 8 gradually decreases from the distal end P of the back surface 3b of the neck part 3 toward the back surface 4b of the head part 4. Furthermore, the vibration minimizing part 8 forms an inclined surface which smoothly connects the back surface 4b of the head part 4 to the back surface 3b of the neck part 3 described above. In addition, a distal end of the vibration minimizing
25 part 8 is positioned above a line in the width direction passing through a rear end of the

second bristle bundle 5b positioned on a rearmost end (a base end) side of an outer bristled region S2 which will be described later.

[0069]

The vibration minimizing part 8 prevents excessive vibration in a direction
5 perpendicular to that of the bristled surface 4a of the head part 4.

Also, the vibration minimizing part 8 can increase the strength of a connection portion between the head part 4 and the neck part 3 while keeping the above-described thickness of the head part 4 on the back surface 4b side thin. Thus, it is possible to reduce discomfort due to vibration while preventing the back surface 4b of the head part
10 4 from coming in contact with the oral cavity tissue (such as the inside of the cheek).

[0070]

As illustrated in Fig. 5, the bristled surface 4a of the head part 4 includes a central bristled region S1 formed by arranging a plurality of bristle implantation holes 11 in a central portion side by side in a length direction of the head part 4 and an outer
15 bristled region S2 formed by arranging the plurality of bristle implantation holes 11 on both sides of the central bristled region S1 side by side in the length direction of the head part 4.

[0071]

In this embodiment, for example, the central bristled region S1 is formed by
20 three rows of bristle implantation holes 11 arranged in a central portion of the bristled surface 4a in the length direction of the head part 4 among the plurality of bristle implantation holes 11 arranged on the bristled surface 4a of the head part 4 side by side in a staggered manner. On the other hand, a pair of outer bristled regions S2 are formed on both sides of the central bristled region S1 by two rows of bristle implantation holes
25 11 arranged side by side in the length direction of the head part 4.

[0072]

As illustrated in Fig. 6, a bristle bundle 5 (hereinafter referred to as a “first bristle bundle 5a”) constituted of tapered-shaped brushes (hereinafter referred to as “first taper bristles”) whose diameters decrease toward bristle tips is implanted in each of the
 5 bristle implantation holes 11 of the central bristled region S1. On the other hand, bristle bundles 5 (hereinafter referred to as “second bristle bundles 5b”) constituted of tapered-shaped brushes (hereinafter referred to as “second taper bristles”) having distal end diameters smaller than those of the first taper bristles are implanted in the bristle implantation holes 11 of the outer bristled region S2.

10 [0073]

Also, the second bristle bundles 5b are implanted in bristle implantation holes 7a and 7b positioned on a distal end side and a rear end side of the central bristled region S1. Thus, the second bristle bundles 5b implanted on the distal end side and the rear end side of the central bristled region S1 and the second bristle bundles 5b implanted in the outer
 15 bristled region S2 are arranged on the bristled surface 4a of the head part 4 to surround the periphery of the first bristle bundles 5a implanted in the central bristled region S1. That is to say, the plurality of second bristle bundles 5b implanted in the outer bristled region S2 and an outer circumferential bristled region S3 in which the plurality of second bristle bundles 5b are implanted to be arranged around the central bristled region S1 side
 20 by side in a circumferential direction of the head part 4 are provided on the bristled surface 4a of the head part 4.

[0074]

In addition, a bristling density of the first bristle bundles 5a implanted in the central bristled region S1 is set higher than a bristling density of the second bristle
 25 bundles 5b implanted in the outer bristled region S2. The “bristling density” mentioned

herein is a value obtained by [a total sum of areas of bristle implantation holes]÷[a
bristled area], the “total sum of areas of bristle implantation holes” is a value obtained by
adding areas of the bristle implantation holes 11 forming bristled regions S1 and S2, and
the “bristled area” is based on “JIS S 3016-1995” and is represented by an area of a
5 surrounding region obtained by connecting an outer portion of the bristle implantation
holes 11 positioned on outer circumferences of the bristled regions S1 and S2 using a
straight line.

[0075]

In this embodiment, a tooth surface is efficiently brushed using the first bristle
10 bundles 5a in the central bristled region S1 having a bristling density higher than that of
the outer bristled region S2 and including the first taper bristles having the distal end
diameter larger those of the second taper bristles, and it is possible to reduce the intensity
of the vibration transmitted to the gums at the time of toothbrushing and it is possible to
reduce discomfort due to vibration in the oral cavity by implanting the second bristle
15 bundles 5b formed of the second taper bristles having a bristling density smaller than that
of the central bristled region S1 and having a distal end diameter smaller than those of
the first taper bristles in the outer bristled region S2 which relatively easily comes into
contact with the gums.

[0076]

20 Also, since the first bristle bundles 5a in the central bristled region S1 having the
high bristling density are constituted of the first taper bristles having a distal end
diameter larger than those of the second taper bristles, the strength of a bristle waist due
to the first bristle bundles 5a produces good vibration transmission, and it is possible to
improve the feeling of cleaning due to vibration.

25 [0077]

Also, in this embodiment, the second bristle bundles 5b are implanted in the outer circumferential bristled region S3 surrounding the periphery of the first bristle bundles 5a implanted in the central bristled region S1. Thus, at the time of brushing the back teeth, the second bristle bundle 5b can easily come into contact with the gums in all direction and it is possible to further improve comfort when the bristle tips touch the gums.

[0078]

In addition, in this embodiment, a bristle length of the second bristle bundles 5b implanted in the outer bristled region S2 is longer than a bristle length of the first bristle bundles 5a implanted in the central bristled region S1. To be specific, when it is assumed that a maximum height of the first bristle bundles 5a is t_1 [mm] and a maximum height of the second bristle bundles 5b is t_2 [mm], it is desirable that a relationship of $0.5 \text{ mm} \leq t_2 - t_1 \leq 3.0 \text{ mm}$ be satisfied.

[0079]

That is to say, by making the maximum height t_2 of the second bristle bundle 5b higher than the maximum height t_1 of the first bristle bundle 5a, it is possible to improve an approaching performance of bristle tips of each of the second bristle bundles 5b with respect to a cervical region portion and an inter-dental space portion. Furthermore, when the bristle tips touch the tooth surface, the second bristle bundles 5b having a long bristle length are naturally bent in an open form and the bristle tips are fitted into the cervical region portion. Thus, it is possible to improve the toothbrushing effect of the cervical region portion by a simple operation without worrying about an angle at which the bristle tips touch the cervical region portion. In addition, when the second bristle bundles 5b having a long bristle length are brought into contact with the gums, it is possible to reduce vibration and reduce comfort due to vibration in the oral cavity by the

second bristle bundles 5b serving as a cushion.

[0080]

Therefore, it is possible to improve the cleaning performance of the tooth surface and the comfort of contacting the gums by setting a bristle length difference $t_2 - t_1$ between the first bristle bundles 5a in the central bristled region S1 and the second bristle bundles 5b in the outer bristled region S2 described above preferably in the range of 0.5 to 3.0 mm, more preferably in the range of 0.5 to 2.0 mm, and still more preferably in the range of 0.5 to 1.0 mm.

[0081]

Also, in this embodiment, it is possible to achieve a good balance between the cleaning performance of the tooth surface and the cleaning performance in gaps between the teeth by setting the distal end diameter of the first taper bristles to 40 to 80 μm and setting the distal end diameter of the second taper bristle to 5 to 30 μm . Furthermore, it is possible to achieve both cleaning of the tooth surface and reduction of discomfort due to vibration.

[0082]

In addition, in this embodiment, it is desirable that a plurality of bristle implantation holes 11 constituted of at least two rows or more of bristle implantation holes 11 be provided in the central bristled region S1 side by side in the length direction of the head part 4. Thus, by implanting two rows or more of first bristle bundles 5a in the central bristled region S1 in the length direction of the head part 4, it is possible to obtain a sufficient plaque removing ability against the tooth surface and a sufficient cleaning feeling through vibration using the first bristle bundles 5a.

[0083]

Furthermore, in this embodiment, when it is assumed that the bristling density of

the first bristle bundles 5a implanted in the central bristled region S1 is ρ_1 and the bristling density of the second bristle bundle 5b implanted in the outer bristled region S2 is ρ_2 , it is desirable that relationships of $0.40 \leq \rho_1 \leq 0.70$, $0.20 \leq \rho_2 \leq 0.40$, and $1.2 \leq \rho_1/\rho_2 \leq 2.4$ be satisfied.

5 [0084]

In this embodiment, by setting the bristling density ρ_1 of the central bristled region S1 preferably in the range of $0.40 \leq \rho_1 \leq 0.70$, and more preferably in the range of $0.50 \leq \rho_1 \leq 0.60$, it is possible to appropriately strengthen the bristle waist of the first bristle bundles 5a in the central bristled region S. On the other hand, by setting the bristling
10 density ρ_2 of the outer bristled region S2 preferably in the range of $0.20 \leq \rho_2 \leq 0.40$, and more preferably in the range of $0.30 \leq \rho_2 \leq 0.40$, it is possible to appropriately bend the second bristle bundles 5b in the outer bristled region S2.

[0085]

Also, when a ratio of the bristling density ρ_2 of the second bristle bundles 5b
15 implanted in the outer bristled region S2 to the bristling density ρ_1 of the first bristle bundles 5a implanted in the central bristled region S1 (hereinafter referred to as a “bristling density ratio”) ρ_1/ρ_2 is in the range of 1.2 to 2.4, the tooth surface is efficiently brushed using the first bristle bundles 5a in the central bristled region S1 having a bristling density larger than that of the outer bristled region S2 and the cervical region
20 portion and the inter-dental space portion are efficiently brushed using the second bristle bundles 5b in the outer bristled region S2 having a bristling density lower than that of the central bristled region S1. Thus, it is possible to improve a plaque removing ability in minute details such as the tooth surface, the cervical region portion, and the inter-dental space portion.

25 [0086]

Although the above-described constitution in which the second bristle bundles 5b are implanted in the bristle implantation holes 7a and 7b positioned on the distal end side and the rear end side of the central bristled region S1 is provided in this embodiment, a constitution in which the first bristle bundles 5a are implanted instead of the second
5 bristle bundles 5b may be provided. Furthermore, the first bristle bundles 5a and the second bristle bundles 5b are not limited to the above-described constitution using the tapered bristles and any brushes such as straight bristles having a constant diameter toward bristle tips can be used for the first bristle bundles 5a and the second bristle bundles 5b.

10 [0087]

As described above, in the electric toothbrush 1 including the replacement brush 1B in this embodiment, by reducing the thickness of the head part 4, it is possible to obtain an excellent feeling of the back teeth being cleaned and it is possible to prevent excessive vibration caused by reducing the thickness of the head part 4. Thus, it is
15 possible to reduce discomfort due to vibration in the oral cavity.

[0088]

The present invention is not necessarily limited to the above-described embodiment and various changes can be made without departing from the gist of the present invention.

20 For example, the arrangement of the bristle bundles 5 on the bristled surface 4a is not necessarily limited to the constitution illustrated in Figs. 5 and 6 described above and can be changed as appropriate.

[0089]

For example, in another arrangement example illustrated in Fig. 7, a central
25 bristled region S1 is formed of three rows of bristle implantation holes 11 arranged side

by side in the length direction of a head part 4 in a central portion of a bristled surface 4a among the plurality of bristle implantation holes 11 arranged in the bristled surface 4a of the head part 4 side by side in a staggered manner. On the other hand, a pair of outer bristled regions S2 are formed of one row of bristle implantation holes 11 arranged side
5 by side in the length direction of the head part 4 are on both side of the central bristled region S1.

[0090]

Also, a diameter of each of the bristle implantation holes 11 in the outer bristled region S2 is larger than a diameter of each of the bristle implantation holes 11 in the
10 central bristled region S1. Thus, as illustrated in Fig. 8, a bristle bundle diameter of a second bristle bundle 5d implanted in each of the bristle implantation holes 11 in the outer bristled region S2 is larger than a bristle bundle diameter of a first bristle bundle 5c implanted in each of the bristle implantation holes 11 in the central bristled region S1.

[0091]

15 Furthermore, a bristle length of the first bristle bundle 5c is longer than a bristle length of the second bristle bundle 5d. Taper bristles can be used for the first bristle bundles 5c and the second bristle bundles 5d. The first bristle bundle 5c and the second bristle bundle 5d are not limited to the above-described constitution using the taper bristles and any brushes such as straight bristles having a constant diameter toward bristle
20 tips can be used for the first bristle bundle 5c and the second bristle bundle 5d.

[0092]

In addition, although not illustrated in the drawings, a constitution in which the plurality of second bristle bundles 5d implanted in the outer bristled region S2 and the outer circumferential bristled region having the plurality of second bristle bundles 5d
25 implanted in the head part 4 arranged side by side in the circumferential direction to

surround the periphery of the first bristle bundle 5c implanted in the central bristled region are provided in the bristled surface 4a of the head part 4 may be provided.

[0093]

When such a constitution is provided, by making the bristle bundle diameter of the second bristle bundles 5d larger than the bristle bundle diameter of the first bristle bundles 5c, the second bristle bundles 5d easily come into contact with the gums. Thus, it is possible to reduce the pressure caused by the second bristle bundle 5d on the gums and it is possible to obtain a gentle touch on the gums. Furthermore, it is possible to reduce the discomfort of vibration transmitted to the gums at the time of toothbrushing. In addition, by making the bristle length of the first bristle bundles 5c longer than the bristle length of the second bristle bundles 5d, it is possible to achieve both a gentle contact with the gums and the cleaning performance of the cervical region.

[0094]

Also, for example, in another arrangement example illustrated in Fig. 9, a central bristled region S1 having a plurality of first bristle bundles 5e implanted on a distal end side of a central portion of a bristled surface 4a arranged side by side in a length direction of a head part 4, a central bristleless region S4 having no bristle bundle on a base end side of the central portion of the bristled surface 4a, and an outer bristled region having a plurality of second bristle bundles 5f implanted on both sides of the central bristled region and the central bristleless region S4 arranged side by side in the length direction of the head part 4 are provided.

[0095]

Taper bristles can be used for the first bristle bundle 5e and the second bristle bundle 5f. The first bristle bundle 5e and the second bristle bundle 5f are not limited to the above-described constitution using the taper bristles and any brushes such as straight

bristles having a constant diameter toward bristle tips can be used for the first bristle bundle 5e and the second bristle bundle 5f.

[0096]

When such a constitution is provided, the second bristle bundles 5f on both sides
 5 of the central bristleless region S4 are easily bent and an approaching performance of
 bristle tips with respect to the cervical region portion is improved. On the other hand, it
 is possible to minimize a reduction in stiffness of the first bristle bundle 5e and the
 second bristle bundle 5f and the bristle removal. Thus, it is possible to sufficiently
 secure the plaque scraping properties. Furthermore, by bending the second bristle
 10 bundles 5f on both sides of the central bristleless region, it is possible to reduce vibration
 and reduce the discomfort due to vibration in the oral cavity.

[Examples]

[0097]

The effects of the present invention will be more clearly described below using
 15 examples. The present invention is not limited to the following examples and can be
 implemented with appropriate modifications without changing the gist of the present
 invention.

[0098]

(Examples 1 to 12 and Comparative Examples 1 to 4)

20 In these examples, as illustrated in Table 1 below, replacement brushes of
 Examples 1 to 12 and Comparative Examples 1 to 4 in which different “maximum
 thicknesses T [mm] of head parts,” “minimum thicknesses D [mm] of neck parts,” “steps
 H [mm],” “distances A [mm] between distal ends of the head parts and distal ends of
 support shafts,” “inclinations α [°] of the head parts,” “amounts of biasing [mm] of L3
 25 with respect to L4,” “materials of the head parts and the neck parts,” “head widths W

[mm],” and “head lengths V [mm]” were provided were prepared. All of the numbers of rotations of a motor were set to 9000 rpm. Furthermore, in all of Examples 1 to 12 and Comparative Examples 1 to 4, a “flat wire implantation method” was used.

Also, an arrangement in which a “diameter” of a bristle implantation hole of the head part was 1.6 mm, a “row pitch” was 2.5 mm, and a “column pitch” was 2.2 mm (all thereof are distances between implantation hole centers) was performed. Based on the above pitch, the number of columns and the number of rows were set in accordance with each head width and head length, 4 to 6 columns were provided in the width direction, and 7 to 9 rows were provided in the length direction.

Bristles were ST bristles made of a PBT resin and had implanted 23 bristles with a base portion diameter of 7.5 mil per one bristle implantation hole. Since the bristles were flat wire bristles, 46 bristles were actually provided. Furthermore, a bristle length was 12 mm.

[0099]

Moreover, with regard to electric toothbrushes using the replacement brushes of Examples 1 to 12 and Comparative Examples 1 to 4, an evaluation test for the “feeling of cleaning the back teeth” and the “discomfort due to vibration” was performed. The evaluation results are illustrated in Table 1 below.

[0100]

With regard to the evaluation test of the “feeling of cleaning the back teeth,” a sensory evaluation was performed by 10 specialized panelists and the feeling of cleaning the back teeth (second molars) was evaluated in accordance with the following criteria.

5: Very easy to brush

4: Easy to brush

3: Neither

2: Somewhat difficult to brush

1: Very difficult to brush

[0101]

Also, an average value of the evaluation scores by 10 specialized panelists was
5 obtained and the evaluation was performed in the following four stages.

A: 4.5 or more and 5.0 or less

B: 3.5 or more and less than 4.5

C: 2.5 or more and less than 3.5

D: less than 2.5

10 [0102]

Furthermore, with regard to the evaluation test of the “discomfort due to
vibration,” a sensory evaluation was conducted by 10 specialized panelists and the
discomfort due to vibration at the time of toothbrushing was evaluated in accordance
with the following criteria.

15 5: Vibration does not cause discomfort at all

4: Vibration causes almost no discomfort

3: Neither

2: Vibration causes slight discomfort

1: Vibration causes very noticeable discomfort

20 [0103]

Also, an average value of the evaluation scores by 10 specialized panelists was
obtained and the evaluation was performed in the following four stages.

A: 4.5 or more and 5.0 or less

B: 3.5 or more and less than 4.5

25 C: 2.5 or more and less than 3.5

D: less than 2.5

[0104]

[Table 1]

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Example 8	Example 9	Example 10	Example 11	Example 12	Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4
Maximum thickness T [mm] of head part	2.6	3.0	3.0	3.0	3.0	3.0	3.0	3.5	3.0	3.0	3.0	3.0	5.0	4.0	4.0	3.0
Minimum thickness D [mm] of neck part	3.5	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.5	5.5	3.5	4.0
Step H [mm]	1.3	1.1	1.1	1.1	2.1	1.1	1.1	0.8	1.1	1.1	1.1	1.1	0.0	1.6	0.5	0.6
Inclination α [°] of head part	3	3	0	6	3	3	3	3	3	3	3	3	3	3	3	3
Amount of biasing [mm] of L3 with respect to L4	0.5	0.5	0.5	0.5	1.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.9	0.5	1.4	0
Distance A [mm] between distal end of head part and distal end of support shaft	50	50	50	50	50	35	65	50	50	50	50	50	50	50	50	50
Material of head part and neck part	POM	POM	POM	POM	POM	POM	POM	POM	PP	POM	POM	POM	POM	POM	POM	POM
Head width W [mm]	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	10.4	14.9	14.9	10.4	10.4	10.4	10.4
Head length V [mm]	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	35.2	35.2	31.3	26.2	26.2	26.2	26.2

Feeling of cleaning back teeth	A4.8	A4.5	B4.2	B4.0	B4.2	A4.5	B3.8	B4.0	A4.5	B4.2	B3.7	B4.0	C2.6	C2.9	B3.8	B4.2
Discomfort due to vibration	B4.0	A4.5	B4.0	B4.3	A4.5	B3.5	A4.7	A4.7	B4.3	B4.2	B3.6	B4.3	A4.9	A4.6	C3.4	C3.4

[0105]

From the evaluation results illustrated in Table 1, the electric toothbrushes of Examples 1 to 12 showed the good results in both the evaluation of the “actual feeling of cleaning the back teeth” and the “discomfort due to vibration” as compared with the electric toothbrushes of Comparative Examples 1 to 4. Thus, the good results were obtained for the overall evaluation.

The arrangement pattern of the bristle implantation holes in the head part was set in accordance with the head width and the head length and the same evaluation results were obtained with any arrangement pattern.

10 [Reference Signs List]

[0106]

- 1 Electric toothbrush
- 1A Toothbrush main body
- 1B Replacement brush (for electric toothbrush)
- 15 2 Handle part
- 3 Neck part
- 4 Head part
- 4a Bristled surface
- 5 Bristle bundle
- 20 5a, 5c, 5e First bristle bundle
- 5b, 5d, 5f Second bristle bundle
- 6 Support shaft
- 7 Bristle implantation hole
- 8 Vibration minimizing part
- 25 S1 Central bristled region

S2 Outer bristled region

S3 Outer circumferential bristled region

S4 Central bristleless region

[CLAIMS]

[Claim 1]

A replacement brush for an electric toothbrush, comprising:

a handle part;

5 a neck part extending from a distal end of the handle part; and

a head part provided at a distal end of the neck part and includes the neck part and the head part attached to a toothbrush main body in an attachable and detachable manner, the toothbrush main body including the handle part of an electric toothbrush configured to clean an inside of an oral cavity using a plurality of bristle bundles
10 implanted in a bristled surface of the head part while generating vibration through electric driving,

wherein a maximum thickness T of the head part is 2 to 4 mm, a minimum thickness D of the neck part is 3 to 5 mm, and a relationship of $D \geq T$ is satisfied, and

the head part is provided to be further biased from a back surface side toward a
15 front surface side than the neck part on the back surface side of the head part and the neck part opposite to the front surface side on which the bristled surface is provided.

[Claim 2]

The replacement brush for an electric toothbrush according to claim 1, wherein a step H is provided between a back surface of the head part and a back surface of the neck
20 part, and

the step H is 0.5 to 3 mm.

[Claim 3]

The replacement brush for an electric toothbrush according to claim 1 or 2,
wherein the head part is provided to be inclined with respect to the neck part from the
25 back surface side toward the front surface side, and

an angle formed by an axis line of the head part parallel to the bristled surface and an axis line of the neck part parallel to an attachment/detachment direction with respect to the handle part is preferably 1 to 5°.

[Claim 4]

5 The replacement brush for an electric toothbrush according to any one of claims 1 to 3, wherein a distance between a distal end of the head part and a distal end of a support shaft while attached to the distal end of the support shaft provided to protrude in an axial direction from the distal end of the handle part is 40 to 60 mm.

[Claim 5]

10 The replacement brush for an electric toothbrush according to any one of claims 1 to 4, wherein the head part is provided to be further biased from the back surface side toward the front surface side than the neck part on the front surface side of the head part and the neck part on a side on which the bristled surface is provided.

[Claim 6]

15 The replacement brush for an electric toothbrush according to any one of claims 1 to 5, comprising:

a vibration minimizing part partially connected from a distal end of the neck part to the back surface of the head part on the back surface side of the head part and the neck part.

20 [Claim 7]

An electric toothbrush, comprising:

a handle part;

a neck part extending from a distal end of the handle part; and

a head part provided at a distal end of the neck part and cleans an inside of an

25 oral cavity using a plurality of bristle bundles implanted in a bristled surface of the head

part while generating vibration through electric driving,

wherein a structure in which a replacement brush including the neck part and the head part is attached to a toothbrush main body including the handle part in an attachable and detachable manner is provided, and

- 5 the electric toothbrush includes the replacement brush for an electric toothbrush according to any one of claims 1 to 6 provided as the replacement brush.