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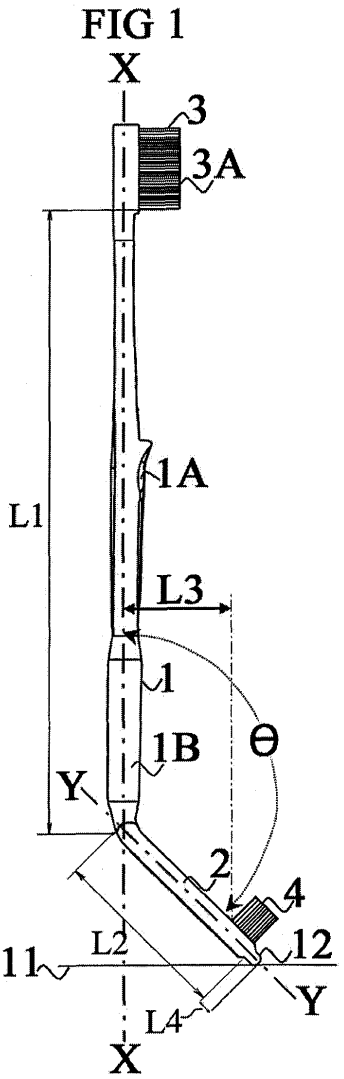
(54) Improvements in the design of toothbrushes

(57) A toothbrush is formed with an angled extension (2) at one end carrying a small brush for cleaning lingual tooth surfaces. By designing the geometry of the brush handle (1) and extension (2) so that they define an angle of between 100 and 150 degrees and so that the brush is displaced from the handle axis by at least 20mms, it becomes possible to clean effectively the surfaces which are rarely cleaned well using a conventional brush. Other tooth surfaces are cleaned using a conventional brush (3) at the opposite end of the handle.

FIG 1



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Description

[0001] This invention relates to a new principle for the design of toothbrushes.

[0002] Tooth loss occurs either as a result of tooth decay or as a result of gum disease. 90% of tooth loss is currently due to gum disease.

[0003] Gum disease is as a process whereby plaque (a mixture of food debris, bacteria and several other constituents) collects on the tooth surface, adjacent to the gum margin. Over a period of time, if not effectively removed, this plaque undermines the tissue attachment of the tooth to the body.

[0004] Put simply, if one can effectively and regularly remove the collected plaque deposits, tooth loss due to gum disease will not occur.

[0005] It has long been recognised by dental experts that the lingual surfaces (i.e. the surfaces of the lower teeth facing the tongue) are rarely effectively cleaned; and this invention arose from a study of this problem and of possible solutions.

[0006] Over many years, different devices have been designed to enable the effective cleaning of teeth. These include conventional toothbrushes, electric toothbrushes and products to assist in the cleaning of inter-dental spaces. Some such devices have included an articulated joint eg as described in US patent specification 4796325 to allow the brush to reach different parts of the mouth. However, this arrangement is too complex and difficult to manipulate.

[0007] Other proposals have employed the use of double-ended toothbrushes. For example, patent specification US3934298 describes a toothbrush, one end of which has a normal brush-head; whilst the other end has a brush-head with a pointed shape for cleaning inter-dental surfaces. This however does not address the problem of cleaning the lingual tooth surfaces.

[0008] It is also common for brush handles to be designed with a slight bend or loop to help to reach different parts of the mouth. Examples of this are described in patent specification US1132326, US5315730, US2084873, US4150457 and US 2668308. However, whilst some of those arrangements may give slightly improved access to the lingual surfaces of the lower canines as compared with an entirely straight brush, they are not sufficiently easy to manoeuvre so as to provide effective access to all lingual tooth surfaces.

[0009] According to the invention there is provided a toothbrush comprising a handle and a brush carried by a relatively narrow extension at one end of the handle, the extension being arranged at an angle of between about 95° and 150° to an axis of the handle so that the brush is offset laterally by a distance of at least 20mms from the handle to facilitate access to lingual surfaces of the user's teeth.

[0010] It will be appreciated that there is a balance between the angle of bend and the offset distance referred to above. If the angle is too large, the toothbrush becomes effectively straight and the lingual surfaces cannot be effectively cleaned without the handle being obstructed by the upper teeth or nose of the user. If the angle is too small, the offset distance needs to be increased in order that the extension should have sufficient reach to clean teeth towards the back of the mouth, and this in turn causes obstruction by the user's upper teeth and nose when used towards the front of the mouth. Previous angled toothbrush designers have failed to appreciate the sensitive trade-off between these two geometrical considerations. It has been found that, by using an angled extension with geometry as conceived by this invention, it becomes possible to remove plaque from all lingual tooth surfaces relatively easily whilst holding the handle of the brush at a convenient angle, un-obstructed by the anatomy of the mouth or face. Furthermore, the position of the brush can be moved so as to clean different lingual tooth surfaces simply by rotating the handle about its axis, without significantly moving the attitude of the handle from a range of positions where it is comfortable to use.

[0011] The brush referred to above preferably has a flat working plane; i.e. the ends of at least some of the bristles terminate at an imaginary flat or slightly rounded plane rather than being formed into a point as would be appropriate had the brush been intended for inter-dental cleaning. The aforementioned "bundle" of bristles is preferably relatively small as compared with a conventional brush, being no more than 15 or 16 mms across at its maximum dimension.

[0012] The extension to the handle should not be so long as to cause difficulty of manipulation and for that reason a length of less than 70mms is preferred. However, it needs to have sufficient length to allow the brush to reach all lingual surfaces. Lengths between 25 and 50mms are considered to be suitable, preferably between 35 and 50 mms.

[0013] Although there is preferably a well defined transition between the handle and the extension, this is not essential and it would be possible to design a product which gradually diminishes in width or cross-sectional area towards its free end. Also, neither the extension nor the handle itself need be perfectly straight and they could both be formed by a series of suitably shaped curves. A common essential feature of all such variations is that the whole of the brush should be held at a position displaced laterally from a notional axis of the handle, this axis being formed by a line connecting the most forward and rearward points where it makes contact with the user's hand and fingers. This displacement needs to be at least 20mms to have the desired effect and is preferably between 20 and 40mms. Because of this feature, the brush can be steered to any desired lingual tooth surface by rotating the brush around the aforementioned axis using the thumb and forefinger acting on a part of the handle adjacent the extension. This feature contrasts with existing designs of curved toothbrushes which assume, wrongly, that it is necessary for the brush head to be in

line with the axis of the handle.

[0014] Some toothbrush handles have a curved shape and therefore may not have a clearly defined axis of symmetry. In such cases, the term "axis" as used in this specification is to be construed as referring to a median line passing through the handle or that part of it which is held in the hand when in use.

[0015] In a preferred form of the invention, the handle and the extension are made as one moulded component. However, an alternative possibility is for the extension to be removable so that it can be replaced when the brush is worn. Where two brushes are included they could both be replaceable.

[0016] To clean the outer surfaces of the teeth, a second brush is preferably included at the opposite end of the handle and this can be more conventional in size and shape. The length of the handle needs to be sufficiently long to allow that brush which is not currently in use to be held clear of the user's hand. However it must not be so long as to be unwieldy. A range of between 55 and 250 mms is considered suitable. For an adult a range from 120 to 200mms and preferably 140 to 180 would be appropriate; whereas for a child a range from 55 to 130mms and preferably 80 to 150 mms would be more suitable.

[0017] Three embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Fig 1 is a side elevation of a toothbrush constructed in accordance with the invention;

Fig 2 is a front elevation of the same toothbrush;

Fig 3 illustrates the brush of Figs 1 and 2 in use, the user's mouth being shown in cross-section and the handle of the brush being shown partly broken away;

Figs 4 and 5 are equivalent to Figs 1 and 2 but show an alternative design variant; and

Fig 6 illustrates a third embodiment of the invention, in use, illustrating how the features of the invention allow the lower lingual tooth surfaces to be effectively cleaned.

[0018] Referring to Figs 1 and 2, the illustrated toothbrush comprises a handle 1 having an axis X - X and an extension 2 having an axis Y - Y. The handle and the extension are formed as a single moulding of synthetic plastics material. The handle is of generally rectangular cross-section and is enlarged and contoured at 1A to form a thumb grip. A lower part 1B is of rounded, elliptical, almost circular, cross-section for a purpose to be explained later.

[0019] The extension 2 is of considerably reduced width compared with the handle, this being best seen on Fig 2. It is of circular cross-section and its axis Y - Y forms an angle θ of about 135 degrees with the axis X - X.

[0020] The upper end (as viewed in figs 1 and 2) of the handle carries a conventional brush 3 having parallel bristles extending perpendicularly to the axis X - X and terminating in a flat working surface 3A for cleaning the buccal surfaces (the surfaces facing the cheeks and lips) of the teeth.

[0021] The free end of the extension 2 carries a second brush 4, much smaller than the brush 3. It is formed from parallel bristles extending perpendicularly to the axis Y -Y and terminating in a flat working surface 4A for cleaning the lingual surfaces. The brush 3 is of elliptical cross-section having a major axis in direction Y - Y of about 10mms and a perpendicular minor axis of about 8mms.

[0022] Fig 3 shows the toothbrush in use cleaning the lingual surfaces of the lower incisors 5. The upper incisors are shown at 6, gums at 7, tongue at 8 and upper and lower lips at 9 and 10 respectively. As can be seen from this drawing, the working surface 4A of the brush 4 can be used approximately parallel to the tooth surface while the handle 1 is comfortably held at a near-horizontal position where movement is not obstructed by contact with the users lips or nose. At all times only the relatively narrow extension 2 need enter beyond the user's lips and this allows it to be easily and comfortably received inside the mouth. The user grips the near-cylindrical part 1B of the handle and, by rotating the latter about its axis X - X can steer the brush 4 to any desired lingual or palatial tooth surface whilst still holding the handle at a comfortable angle similar to that shown on Fig 3. This action is made possible because the whole of the brush 4 is offset from the axis X - X by a distance L3, as shown on Fig 1, which is at least 20mms; and because the angle θ is within the range of between about 95° and 150°; this range of angles allowing sufficient "bend" for the brush to engage the tooth surfaces correctly but not so great as to cause the handle to be obstructed by the upper teeth and nose. Brushing is performed using a reciprocating movement in the direction Y - Y.

[0023] Referring back to Figs 1 and 2, the toothbrush is shown resting on a horizontal surface 11, typically the bottom of a beaker used to store the brush. It will be seen that the extension 2 has a rounded nodule 12 at its free end which makes contact with the surface 11, and which has a length L4 ensuring that the brush 4 is kept well clear of any bacterial matter on that surface.

[0024] Figs 4 and 5 show a different toothbrush and parts similar to those of Figs 1 and 2 are denoted with identical reference numerals. In this design variant, the handle is slightly curved as shown whilst still generally following the line of the axis X - X. Instead of a cylindrical section 1B, this embodiment has recesses 1C lying at 90 degrees to the thumb-grip 1A. These recesses allow the small brush head 4 to be comfortably held between finger and thumb.

[0025] Fig 6 illustrates a third embodiment of the invention which has a shape slightly different to that of Figs 4 and 5 but which operates in an equivalent way. Fig 6

shows how, the angle of the extension, and the distance L3 are selected to allow the brush to be used effectively to remove plaque from the lingual surface of lower teeth on one side of the mouth, and how, by rotating the brush about its axis X-X, it can equally well be used on the other side as shown in broken lines, without changing the angle at which the handle is held. Angles of rotation in-between the two illustrated extremes are appropriate for cleaning the incisors. Some movement away from the centre-line is necessary to reach the back of the mouth If the angle θ of the extension were greater than about 150°, the brush would need to be manipulated so far away from the centre-line that effective removal of plaque from all tooth surfaces would be difficult or impossible on one side or the other of the mouth depending on the handedness of the user.

[0026] The illustrated embodiments of the invention have been described only by way of example and that many other variations in shape and dimensions are possible within the scope of the accompanying claims. However, in all variations, the use of the relatively slim extension at an angle of 95° to 150° creating a 20mm or greater offset between the brush and the handle, will, it is believed make the effective removal of plaque from lingual tooth surfaces much easier; and it is believed that those who use products employing this principle are likely to experience a significant improvement in dental health.

Claims

1. A toothbrush comprising a handle and a brush carried by an extension at one end of the handle, **characterised in that** the extension is arranged at an angle of between about 95° and 150° to an axis of the handle so that the brush is offset laterally by a distance of at least 20mms from the handle to facilitate access to lingual surfaces of the user's teeth.

2. A toothbrush according to any preceding Claim **characterised in that** the angle of the bend is between 125 and 140 degrees.

3. A toothbrush according to Claim 1 or 2 **characterised in that** there is a distinct bend between the extension and the handle.

4. A toothbrush according to Claim 2 **characterised in that** the said length of the extension is between 25 and 60mms.

5. A toothbrush according to Claim 3 **characterised in that** the length is between 35 and 50mms.

6. A toothbrush according to any preceding Claim **characterised in that** a second, larger, brush carried by the opposite end of the handle.

7. A toothbrush according to any preceding Claim **characterised by** a nodule at the free end of the extension so that, when the toothbrush is stored upright, with that free end resting on a horizontal surface, the brush is held above that surface by the nodule.

8. A toothbrush having a supporting body and a brush associated with each end of the supporting body, **characterised by** a nodule at one end of the body such that, when the toothbrush is stored in an upright position on a horizontal surface, the brush closest at the bottom of the supporting body is held spaced above any contaminants on that surface.

FIG 1

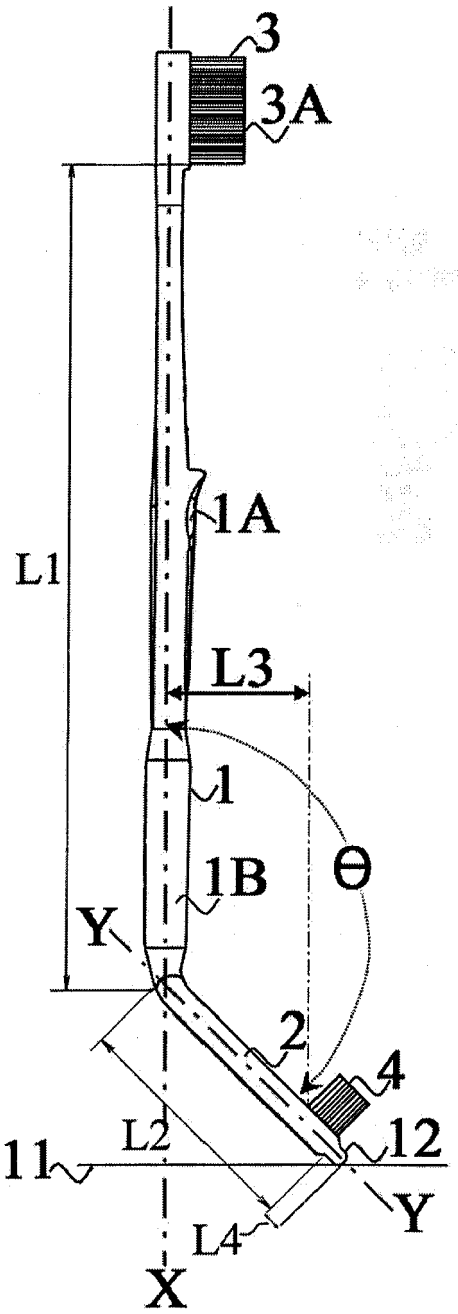

FIG 2

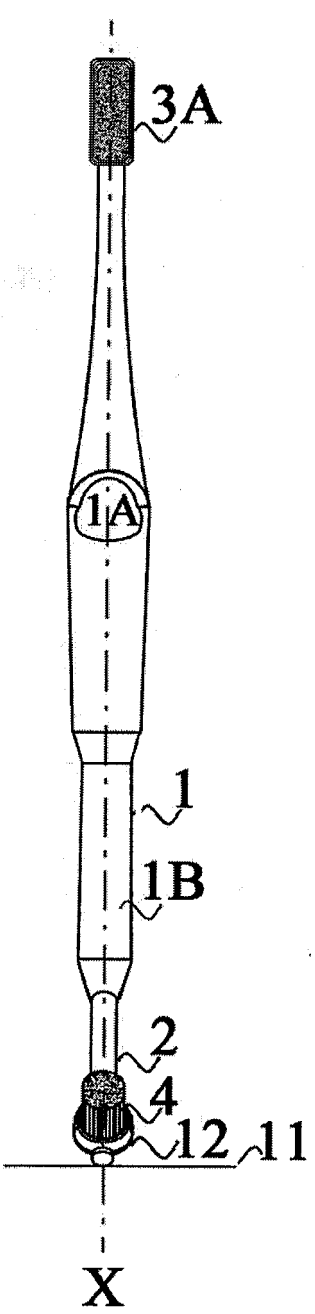

FIG 3

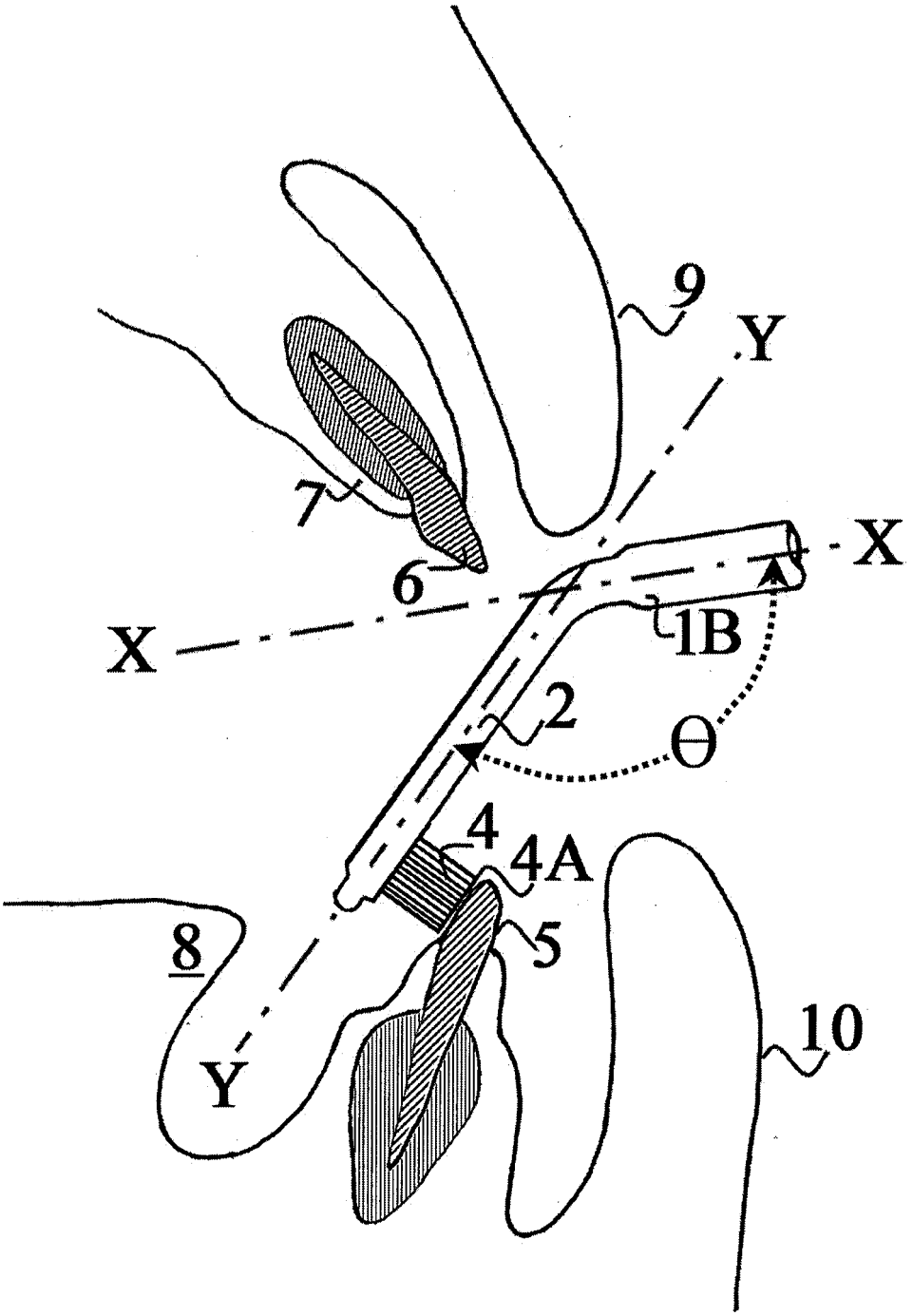

FIG 4

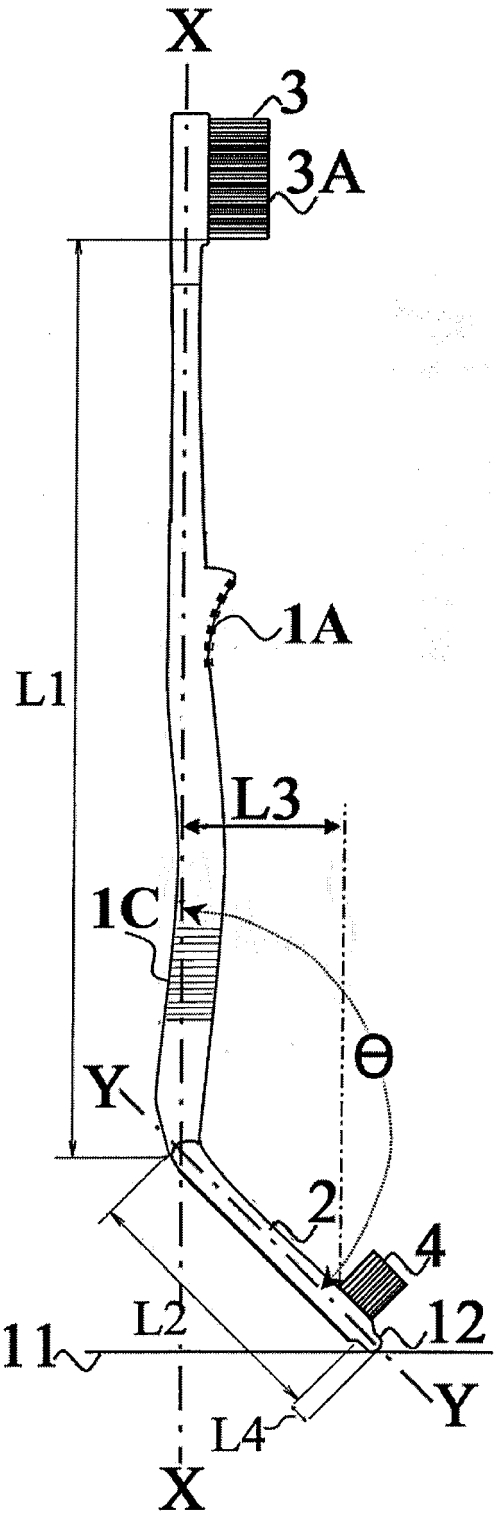

FIG 5

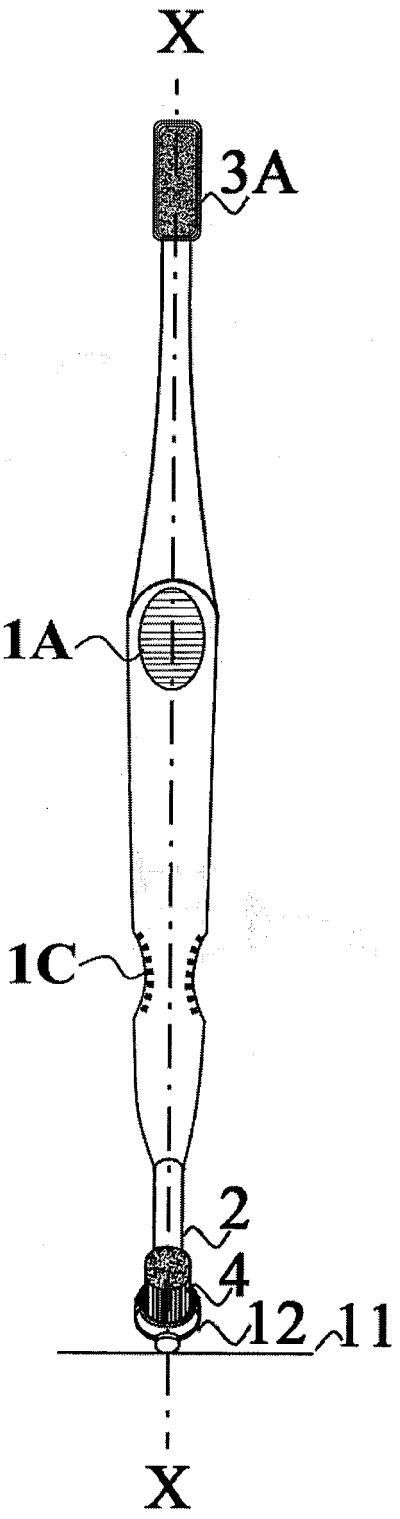

FIG 6