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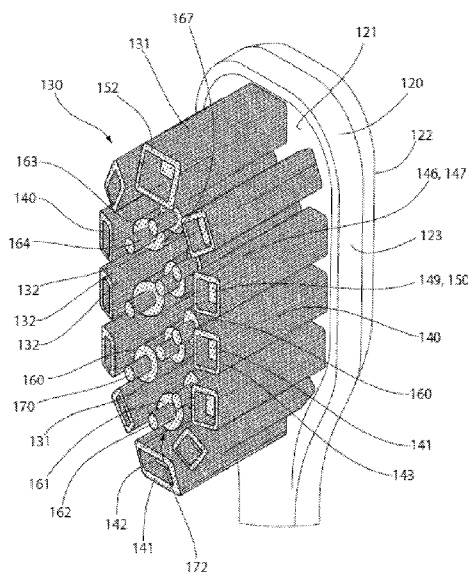


FIG. 2

(57) Abstract: An oral care implement (100) having a head (120) with a plurality of cleaning elements (130) coupled thereto and extending therefrom. In the exemplified embodiment, the cleaning elements (130) have a plurality of bristle tufts (131) each including a plurality of bristle filaments (132). In one aspect, the oral care implement (100) may include a first bristle tuft (140) having inner and outer filaments with the outer filaments (141) being taller than the inner filaments (142) and a second bristle tuft (160) having inner and outer filaments with the outer filaments (161) being shorter than the inner filaments (162). In another aspect, the oral care implement (100) may include a bristle tuft having inner and outer filaments with the inner filaments being either taller or shorter than the outer filaments, and whereby distal ends of the inner and outer filaments are angled relative to an axis of the bristle tuft.



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ORAL CARE IMPLEMENT

BACKGROUND

Myriad implements and devices for maintaining oral health are known. For example, toothbrushes of both the manual and powered variety, floss, dentifrices, applicators, agents, and the like are all known to provide different benefits in the oral cavity. The main components used for cleaning of the teeth are the cleaning elements of a toothbrush, which may include filament bristles as well as rubber elements known in the art as lamella. Different toothbrush users desire different mouthfeels during toothbrushing. Specifically, some people prefer a harder brush that provides the users with confidence that the cleaning elements are removing debris from the teeth. However, other people find such hard brushes to cause discomfort and prefer softer cleaning elements and a softer mouthfeel during brushing. Thus, a need exists for a tooth cleaning implement that provides the desired mouthfeel while also adequately cleaning plaque and other debris from the teeth and gums.

BRIEF SUMMARY

The present invention is directed to an oral care implement having a head with a plurality of cleaning elements coupled thereto and extending therefrom. In the exemplified embodiment, the cleaning elements comprise a plurality of bristle tufts each consisting of a plurality of filaments. In one aspect, the invention includes a first bristle tuft having inner and outer filaments with the outer filaments being taller than the inner filaments and a second bristle tuft having inner and outer filaments with the outer filaments being shorter than the inner filaments. In another aspect, the invention includes a bristle tuft having inner and outer filaments with the inner filaments being either taller or shorter than the outer filaments, and whereby distal ends of the inner and outer filaments are angled relative to an axis of the bristle tuft.

In one aspect, the invention may be an oral care implement comprising: a head comprising a front surface; a first bristle tuft extending from the front surface of the head, the first bristle tuft comprising a plurality of first outer filaments and a plurality of first inner filaments, the first outer filaments surrounding the first inner filaments, and wherein each of the first outer filaments is taller than each of the first inner filaments; and a second bristle tuft extending from the front surface of the head, the second bristle tuft comprising a plurality of

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second outer filaments and a plurality of second inner filaments, the second outer filaments surrounding the second inner filaments, and wherein each of the second outer filaments is shorter than each of the second inner filaments.

In another aspect, the invention may be an oral care implement comprising: a head comprising a front surface; a first bristle tuft coupled to the head and comprising a first longitudinal axis, the first bristle tuft comprising a plurality of first outer filaments that form a sheath portion of the first bristle tuft and a plurality of first inner filaments that form a core portion of the first bristle tuft, the sheath portion surrounding the core portion, and wherein either: (1) each of the first outer filaments is taller than each of the first inner filaments; or (2) each of the first outer filaments is shorter than each of the first inner filaments; and wherein a distal end of the sheath portion of the first bristle tuft collectively forms a first outer distal surface of the first bristle tuft and a distal end of the core portion of the first bristle tuft forms a first inner distal surface of the first bristle tuft; and wherein the first outer distal surface of the first bristle tuft is oriented at a first oblique angle relative to the first longitudinal axis of the first bristle tuft and the first inner distal surface of the first bristle tuft is oriented at a second oblique angle relative to the first longitudinal axis of the first bristle tuft.

In yet another embodiment, the invention may be an oral care implement comprising: a head comprising a front surface having a perimeter portion and a central portion that is surrounded by the perimeter portion; a plurality of first bristle tufts coupled to the head and located along the perimeter portion of the front surface of the head; a plurality of second bristle tufts coupled to the head and located along the central portion of the front surface of the head; and wherein each of the first bristle tufts extends from the front surface of the head to an inclined terminal end that slopes upwardly towards the plurality of second bristle tufts, and wherein each of the second bristle tufts extends from the front surface of the head to an inclined terminal end that slopes upwardly towards the plurality of first bristle tufts.

Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

FIG. 1 is perspective view of an oral care implement in accordance with a first embodiment of the present invention;

FIG. 2 is a close-up view of a head of the oral care implement depicted as area II of FIG. 1;

FIG. 3 is a front view of the head of the oral care implement of FIG. 1;

FIG. 4 is a perspective view of a first bristle tuft of the oral care implement of FIG. 1;

FIG. 5 is a cross-sectional view taken along line V-V of FIG. 4;

FIG. 6 is a perspective view of a second bristle tuft of the oral care implement of FIG. 1;

FIG. 7 is a cross-sectional view taken along line VII-VII of FIG. 6;

FIG. 8 is a cross-sectional view taken along line VIII-VIII of FIG. 3;

FIG. 9 is a cross-sectional view taken along line IX-IX of FIG. 3;

FIG. 10 is a perspective view of an oral care implement in accordance with a second embodiment of the present invention;

FIG. 11 is a close-up view of area XI of FIG. 10;

FIG. 12 is a cross-sectional view taken along line XII-XII of FIG. 11;

FIG. 13 is a perspective view of an oral care implement in accordance with a third embodiment of the present invention;

FIG. 14 is a close-up view of area XIV of FIG. 13; and

FIG. 15 is a cross-sectional view taken along line XV-XV of FIG. 14.

DETAILED DESCRIPTION

The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

The description of illustrative embodiments according to principles of the present invention is intended to be read in connection with the accompanying drawings, which are to be considered part of the entire written description. In the description of embodiments of the invention disclosed herein, any reference to direction or orientation is merely intended for convenience of description and is not intended in any way to limit the scope of the present

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invention. Relative terms such as “lower,” “upper,” “horizontal,” “vertical,” “above,” “below,” “up,” “down,” “top” and “bottom” as well as derivatives thereof (e.g., “horizontally,” “downwardly,” “upwardly,” etc.) should be construed to refer to the orientation as then described or as shown in the drawing under discussion. These relative terms are for convenience of description only and do not require that the apparatus be constructed or operated in a particular orientation unless explicitly indicated as such. Terms such as “attached,” “affixed,” “connected,” “coupled,” “interconnected,” and similar refer to a relationship wherein structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both movable or rigid attachments or relationships, unless expressly described otherwise. Moreover, the features and benefits of the invention are illustrated by reference to the exemplified embodiments. Accordingly, the invention expressly should not be limited to such exemplary embodiments illustrating some possible non-limiting combination of features that may exist alone or in other combinations of features; the scope of the invention being defined by the claims appended hereto.

As used throughout, ranges are used as shorthand for describing each and every value that is within the range. Any value within the range can be selected as the terminus of the range. In addition, all references cited herein are hereby incorporated by reference in their entireties. In the event of a conflict in a definition in the present disclosure and that of a cited reference, the present disclosure controls.

Referring first to FIGS. 1-3, an oral care implement 100 is illustrated in accordance with an embodiment of the present invention. In the exemplified embodiment, the oral care implement 100 is a manual toothbrush. However, the invention is not to be so limited in all embodiments and in other embodiments the oral care implement 100 could be a powered toothbrush that either vibrates the cleaning elements or moves them in a rotational or linear back-and-forth manner. The oral care implement 100 is generally intended for cleaning of a user's oral cavity, specifically the teeth and gums, although it could certainly have other uses as well such as general cleaning or the like.

The oral care implement 100 generally comprises a handle 110 and a head 120. The handle 110 and the head 120 may be formed as an integral, monolithic structure during an injection molding process. Thus, in some embodiments the handle 110 and the head 120 may be formed from a rigid plastic material, such as those mentioned below. Of course, the invention is

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not to be limited by this structure in all embodiments and in alternative embodiments the head 120 may be detachable from the handle 110 so that the head 120 is a refill head as that term is commonly known in the art. In such embodiments it may be possible to replace the head 120 with a new head while maintaining the same handle 110. The general shape of the handle 110 and the head 120 is not to be limited to that which is depicted in the drawings in all embodiments, with the drawings merely depicting one exemplary and non-limiting embodiment.

The handle 110 is an elongated structure that provides the mechanism by which the user can hold and manipulate the oral care implement 100 during use. In the exemplified embodiment, the handle 110 is generically depicted having various contours for user comfort. Of course, the invention is not to be so limited in all embodiments and in certain other embodiments the handle 110 can take on a wide variety of shapes, contours and configurations, none of which are limiting of the present invention unless so specified in the claims. In the exemplified embodiment, the handle 110 and the head 120 are formed of a rigid plastic material, such as, for example without limitation, polymers and copolymers of ethylene, propylene, butadiene, vinyl compounds, and polyesters such as polyethylene terephthalate. Of course, the handle 110 may include a resilient material, such as a thermoplastic elastomer, as a grip cover that is molded over portions of or the entirety of the handle 110 to enhance the gripability of the handle 110 during use. For example, portions of the handle 110 that are typically gripped by a user's palm during use may be overmolded with a thermoplastic elastomer or other resilient material to further increase comfort to a user. Moreover, the head 120 could also include a resilient material such as a thermoplastic elastomer on its rear surface to provide a tongue or cheek cleaning function.

The head 120 extends from a proximal end 128 to a distal end 129 and comprises a longitudinal axis A-A that extends between the proximal and distal ends 128, 129. The head 120 also comprises a transverse axis B-B that is perpendicular to the longitudinal axis A-A and equidistant to the proximal and distal ends 128, 129 of the head 120. The head 120 further comprises a front surface 121 and a rear surface 122 opposite the front surface 121. Furthermore, the head 120 comprises a lateral surface 123 that extends between the front and rear surfaces 121, 122. The transverse axis B-B of the head 120 is oriented so as to intersect the lateral surface 123 of the head 120 twice while being perpendicular to the longitudinal axis A-A.

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The front surface 121 of the head 120 comprises a perimeter portion 124 and a central portion 125. The perimeter portion 124 of the front surface 121 of the head 120 surrounds the central portion 125 of the front surface 121 of the head 120. The perimeter portion 124 is an annular portion of the front surface 121 of the head 120 that extends from the lateral surface 123 to the central portion 125. In the exemplified embodiment, a dashed line marked RL is provided in FIG. 3 to represent the dividing line between the perimeter and central portions 124, 125 of the front surface 121 of the head 120. However, it should be appreciated that the perimeter and central portions 124, 125 of the front surface 121 of the head 120 do not have predetermined surface areas, and thus the exact location of the line RL could be changed from that illustrated and still fall within the scope of the invention set forth herein. Thus, the surface area, width, diameter, etc. of the perimeter and central portions 124, 125 are not to be particularly limited to the exemplified embodiment shown in the drawings. The perimeter portion 124 is described above as being an annular portion, but it is not limited to being circular in all embodiments and could take on other shapes. Similarly, the central portion 125 is illustrated in the drawings as being oval in shape, but it could be circular, square, triangular, or other shapes in other embodiments. Thus, various permutations are possible so long as the perimeter portion 124 is a portion of the front surface 121 of the head 120 that surrounds the central portion 125 of the front surface 121 of the head 120.

The oral care implement 100 further comprises a plurality of cleaning elements 115 coupled to and extending from the head 120. The plurality of cleaning elements 130 could be coupled to the head using any technique now known or later discovered, including staples, anchor-free tufting (AFT), in-mold tufting (IMT), PTt technology, or the like. In staple technology, the bristle tufts are folded into a U shape and then a staple is used to secure the bristle tufts within a tuft hole. In AFT technology, the bristle tufts are inserted through holes in a head plate and the ends of the tufts that extend from the back of the head plate are melted together to form a layer of bristle material that lies adjacent to the rear surface of the head plate. This prevents the bristle tufts from being pulled back through the tuft holes. The head plate is then secured to the head. In PTt technology, the bristle filaments are arranged in tufts and then melted together to form tufts having a mushroom shaped end. The tufts with the mushroom shaped ends are then inserted in pre-cored holes of a toothbrush head. Then, pressure and heat is applied to the toothbrush head, which causes the surface of the toothbrush head to reshape itself

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to enclose the mushroom-shaped ends of the tufts, holding them firmly. Thus, the invention is not intended to be particularly limited by the manner in which the cleaning elements 130 are coupled to the head 120. However, the cleaning elements 130 should be coupled to the head 120 in such a manner so that they extend from the front surface 121 of the head 120. The cleaning elements 130 could extend perpendicularly from the front surface 121 of the head 120 or at an angle relative to the front surface 121 of the head 120, or combinations thereof, as may be desired.

In the exemplified embodiment, the plurality of cleaning elements 130 comprises a plurality of bristle tufts 131, each of which comprises a plurality of filament bristles 132. Such filament bristles 132 may be end-rounded, tapered, spiral, bi-core, core-sheath, or of any other type now known or later developed. The filament bristles 132 may be formed from nylon or other well-accepted materials commonly used for forming toothbrush bristles. For example, the filament bristles 132 may be made from animal hair or other natural materials, nylon-polyester blends, or other plastic materials. The filament bristles 132 may also have any desired thickness/diameter or different filament bristles 132 may have different thicknesses/diameters, ranging from 4 mils to 9 mils, and more specifically 5 mils to 7 mils. It may also be possible for some of the cleaning elements 130 to be formed from a resilient material, such as rubber, thermoplastic elastomer, or the like. However, in some preferred embodiments the cleaning elements 130 do not include any such resilient or rubber elements, but rather all of the cleaning elements 130 are bristle tufts 131 comprising (or consisting of) filament bristles 132.

The plurality of bristle tufts 131 comprises a plurality of first bristle tufts 140 coupled to the head 120 and extending from the front surface 121 of the head 120 and a plurality of second bristle tufts 160 coupled to the head 120 and extending from the front surface 121 of the head 120. In the exemplified embodiment, the cleaning elements 130 of the oral care implement 100 consist entirely of the first bristle tufts 140 and the second bristle tufts 160, there being no other types of bristle tufts or cleaning elements provided on the head 120. Of course, in other embodiments the first and second bristle tufts 140 may be intermixed with other types of cleaning elements as noted herein. Although in the exemplified embodiment there are a plurality of each of the first and second bristle tufts 140, 160, the invention is not to be so limited and in other embodiments the oral care implement 100 may include one or more of the first bristle tufts 140 and one or more of the second bristle tufts 160. In still other embodiments, the oral care

implement 100 may include one or more of the first bristle tufts 140 and none of the second bristle tufts 160 and in yet other embodiments the oral care implement 100 may include one or more of the second bristle tufts 160 and none of the first bristle tufts 140.

In the exemplified embodiment, each of the first bristle tufts 140 is located or positioned along the perimeter portion 124 of the front surface 121 of the head 120. Furthermore, in the exemplified embodiment each of the second bristle tufts 160 is located or positioned along the central portion 125 of the front surface 121 of the head 120. In fact, in the exemplified embodiment there are only first bristle tufts 140 along the perimeter portion 124 and there are only second bristle tufts 160 along the central portion 125. Thus, the first bristle tufts 140 are positioned in such a way so as to surround the second bristle tufts 160. Specifically, the first bristle tufts 140 are positioned in a spaced apart manner along the perimeter portion 124 of the front surface 121 of the head 120 with the first bristle tufts 140 collectively surrounding the central portion 125. The second bristle tufts 160 are positioned in a spaced apart manner along the central portion 125 of the front surface 121 of the head 120 and are thereby surrounded by the first bristle tufts 140. Stated another way, the first bristle tufts 140 are arranged along a loop that surrounds the central portion 125 of the front surface 121 of the head 120 and surrounds the second bristle tufts 160 that are located along the central portion 125 of the front surface 121 of the head 120.

In the exemplified embodiment, some of the first bristle tufts 140 are directly adjacent to one of the second bristle tufts 160. Thus, despite the first bristle tufts 140 being located in the perimeter portion 124 and the second bristle tufts 160 being located in the central portion 125, the first and second bristle tufts 140, 160 are still positioned adjacent to one another. In some embodiments, at least one of the first bristle tufts 140 is directly adjacent to one of the second bristle tufts 160 with there being no other bristle tufts located therebetween. In fact, in the exemplified embodiment every single one of the first bristle tufts 140 is directly adjacent to one of the second bristle tufts 160, although this is not required in all embodiments and variations may be possible within the scope of the invention described herein.

In other embodiments, the positioning of the first and second bristle tufts 140, 160 may be flipped, as shown and described in greater detail below with reference to FIGS. 10-12. In still other embodiments, the first and second bristle tufts 140, 160 could be intermixed along the perimeter and central portions 124, 125 of the front surface 121 of the head 120 such that both of

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the perimeter and central portions 124, 125 may have one or more of the first and second bristle tufts 140, 160 located therealong, as shown and described in greater detail below with reference to FIGS. 13-15.

Referring to FIGS. 2-5, the first bristle tufts 140 will be described. Each of the first bristle tufts 140 has a similar structure to one another, said structure being described herein below. Other features of the first bristle tufts 140, such as their heights/lengths, diameters/thicknesses, the style or type of filament bristles included therein, the thickness or diameter of the filament bristles included therein, the specific angle of the distal end, or the like may differ from one another, but the description provided below is applicable to each of the first bristle tufts 140. Thus, although the description below will be directed to one of the first bristle tufts 140, it should be appreciated that it is applicable to each of the first bristle tufts 140.

The first bristle tufts 140 comprise a plurality of first outer filaments 141 and a plurality of first inner filaments 142. The plurality of first outer filaments 141 collectively surround the plurality of first inner filaments 142. Thus, the plurality of first outer filaments 141 collectively form a sheath portion 143 of the first bristle tufts 140 and the plurality of first inner filaments 142 collectively form a core portion 144 of the first bristle tufts 140. In the exemplified embodiment, the sheath portion 143 of the first bristle tufts 140 has a rectangular ring-like shape and the core portion 144 of the first bristle tufts 140 has a rectangular cross-sectional shape. However, the invention is not to be so limited in all embodiments and the sheath portion 143 may have a circular ring-like shape, a triangular ring-like shape, or any other desired geometry with the core portion 144 having a similar cross-sectional shape that fits within the open area defined by the sheath portion 143. Thus, the overall shape and transverse cross-sectional shape of the first bristle tufts 140 and the sheath and core portions 143, 144 thereof is not to be limiting of the present invention for all embodiments.

In the exemplified embodiment, there is no gap or spacing between the first outer filaments 141 and the first inner filaments 142 (or between an inner surface of the sheath portion 143 and an outer surface of the core portion 144), other than the natural spacing that occurs between bristle filaments in a bristle tuft. Thus, in some embodiments the only distinguishing feature between the sheath portion 143 and the core portion 144 is the length or height of the bristle filaments within that particular portion of the first bristle tuft 140, as described in more detail below. Thus, although different hatch line styles are used to illustrate the sheath portion

143 and the core portion 144, it should be appreciated that the first outer filaments 141 that form the sheath portion 143 and the first inner filaments 142 that form the core portion 144 may be identical other than their heights/lengths as described herein. In other embodiments, the first outer filaments 141 and the first inner filaments 142 may differ in other ways, such as thickness/diameter, color, material, or the like.

The sheath portion 143 of the first bristle tuft 140 extends from a bottom end 145 that is located within a tuft hole in the head 120 in the completed oral care implement 100 to a distal end 146. The distal end 146 of the sheath portion 143 of the first bristle tuft 140 forms a first outer distal surface 147 of the first bristle tuft 140. The core portion 144 of the first bristle tuft 140 extends from a bottom end 148 that is located within a tuft hole in the head 120 in the completed oral care implement 100 to a distal end 149. The distal end 149 of the core portion 144 of the first bristle tuft 140 forms a first inner distal surface 150 of the first bristle tuft 140.

In the exemplified embodiment, each of the first outer filaments 141 is taller than each of the first inner filaments 142. Thus, in the exemplified embodiment the sheath portion 143 of the first bristle tuft 140 is taller than the core portion 144 of the first bristle tuft 140. Stated another way, the first outer distal surface 147 of the first bristle tuft 140 is axially offset from the first inner distal surface 150 of the first bristle tuft 140. This is true despite the fact that in the exemplified embodiment the first outer filaments 141 are not all the same height and the first inner filaments 142 are not all the same height. Thus, in the exemplified embodiment the tallest of the first inner filaments 142 is still shorter than the shortest of the first outer filaments 141 so that each of the first inner filaments 142 is shorter than each of the first outer filaments 141. Thus, no portion of the first inner distal surface 150 of the first bristle tuft 140 extends beyond the first outer distal surface 147 of the first bristle tuft 140. The height of the various filaments for purposes of determine which filaments are taller or shorter when compared to one another is measured from the front surface 121 of the head 120 to a distal end of the filament, which is the portion of the filament located furthest from the front surface 121 of the head 120.

The first inner distal surface 150 of the first bristle tuft 140 formed by the core portion 144 of the first bristle tuft 140 is recessed relative to the first outer distal surface 147 of the first bristle tuft 140 formed by the sheath portion 143 of the first bristle tuft 140. This forms a small pocket or cavity within the first bristle tuft 140 between the first inner distal surface 150 of the first bristle tuft 140 and an inner surface 159 of the portion of the sheath portion 143 that extends

from the first inner distal surface 150 of the first bristle tuft to the first outer distal surface 147 of the first bristle tuft 140. In some aspects, the first bristle tuft 140, or a portion thereof, may be cup-shaped due to this difference in height between the sheath portion 143 and the core portion 144.

The first bristle tuft 140 extends from a bottom end 151 (formed by the bottom ends 145, 148 of the sheath and core portions 143, 144) to a terminal end 152 along a longitudinal axis C-C. In the exemplified embodiment, the terminal end 152 of the first bristle tuft 140 is formed by the first outer distal surface 147 of the first bristle tuft 140 because the first inner distal surface 150 of the first bristle tuft 140 is recessed relative to the first outer distal surface 147 of the first bristle tuft 140. Thus, the terminal end 152 of the first bristle tuft 140 is formed by the distal ends of the filament bristles 141 that extend furthest from the head 120.

In the exemplified embodiment, the first outer distal surface 147 of the first bristle tuft 140 is oriented at an oblique angle relative to the longitudinal axis C-C of the first bristle tuft 140. Similarly, in the exemplified embodiment the first inner distal surface 150 of the first bristle tuft 140 is oriented at an oblique angle relative to the longitudinal axis C-C of the first bristle tuft 140. In the exemplified embodiment, the first outer distal surface 147 of the first bristle tuft 140 is parallel to the first inner distal surface 150 of the first bristle tuft 140. Thus, in the exemplified embodiment the first inner distal surface 150 of the first bristle tuft 140 and the first outer distal surface 147 of the first bristle tuft 140 are oriented at the same oblique angle relative to the longitudinal axis C-C. The exact oblique angle is not to be limiting of the present invention in all embodiments, but could be in a range of 70-89° in some embodiments, 75-89° in some embodiments, 80-89° in some embodiments, 80-85° in some embodiments, or the like. In alternative embodiments, the first inner and outer distal surfaces 147, 150 of the first bristle tuft 140 may be oriented at different oblique angles relative to the longitudinal axis C-C. In still other embodiments, at least one, or both, of the first inner and outer distal surfaces 147, 150 of the first bristle tuft 140 may be oriented perpendicular to the longitudinal axis C-C.

In the exemplified embodiment, the first outer distal surface 147 of the first bristle tuft 140 is planar, meaning that it lies in a plane. Similarly, the first inner distal surface 150 of the first bristle tuft 140 is planar, meaning that it lies in a plane. These planes are parallel in the exemplified embodiment but need not be in all embodiments as described herein above. Of

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course, the first outer and inner distal surfaces 147, 150 of the first bristle tuft 140 may not be planar in all embodiments, but may instead be rounded, wavy, or the like.

Referring to FIGS. 2, 3, 6, and 7, the second bristle tufts 160 will be described. Each of the second bristle tufts 160 has a similar structure to one another, said structure being described herein below. Other features of the second bristles tufts 160 may differ from one another, but the description provided below is applicable to each of the second bristle tufts 160. Thus, although the description below will be directed to one of the second bristle tufts 140, it should be appreciated that it is applicable to each of the second bristle tufts 160.

The second bristle tufts 160 comprise a plurality of second outer filaments 161 and a plurality of second inner filaments 162. The plurality of second outer filaments 161 collectively surround the plurality of second inner filaments 162. Thus, the plurality of second outer filaments 162 collectively form a sheath portion 163 of the second bristle tufts 160 and the plurality of second inner filaments 162 collectively form a core portion 164 of the second bristle tufts 160. In the exemplified embodiment, the sheath portion 163 of the second bristle tufts 160 has a circular ring-like shape and the core portion 164 of the second bristle tufts 160 have a circular cross-sectional shape. However, the invention is not to be so limited in all embodiments and the sheath portion 163 may have a rectangular ring-like shape, a triangular ring-like shape, or any other desired geometry with the core portion 164 having a similar cross-sectional shape that fits within the open area defined by the sheath portion 163. Thus, the overall shape and transverse cross-sectional shape of the second bristle tufts 160 and the sheath and core portions 163, 164 thereof is not to be limiting of the present invention for all embodiments.

In the exemplified embodiment, there is no gap or spacing between the second outer filaments 161 and the second inner filaments 162 (or between an inner surface of the sheath portion 163 and an outer surface of the core portion 164), other than the natural spacing that occurs between bristle filaments in a bristle tuft. Thus, in some embodiments the only distinguishing features between the sheath portion 163 and the core portion 164 of the second bristle tuft 160 is the length of height of the bristle filaments within that particular portion of the second bristle tuft 160, as described in more detail below. Thus, although different hatch line styles are used to illustrate the sheath portion 163 and the core portion 164, it should be appreciated that the second outer filaments 161 that form the sheath portion 163 and the second inner filaments 162 that form the core portion 164 may be identical other than their

heights/lengths as described herein. In other embodiments, the second outer filaments 161 and the second inner filaments 162 may differ in other ways, such as thickness/diameter, color, material, or the like.

The sheath portion 163 of the second bristle tuft 160 extends from a bottom end 165 that is located within a tuft hole in the head 120 in the completed oral care implement 100 to a distal end 166. The distal end 166 of the sheath portion 163 of the second bristle tuft 160 forms a second outer distal surface 167 of the second bristle tuft 160. The core portion 164 of the second bristle tuft 160 extends from a bottom end 168 that is located within a tuft hole in the head 120 in the completed oral care implement 100 to a distal end 169. The distal end 169 of the core portion 164 of the second bristle tuft 160 forms a first inner distal surface 170 of the second bristle tuft 160.

In the exemplified embodiment, each of the second outer filaments 161 is shorter than each of the second inner filaments 162. Stated another way, the second outer distal surface 167 of the second bristle tuft 160 is axially offset from the second inner distal surface 170 of the second bristle tuft 160. This is true despite the fact that in the exemplified embodiment the second outer filaments 161 are not all the same height and the second inner filaments 162 are not all the same height. Thus, in the exemplified embodiment the tallest of the second outer filaments 161 is still shorter than the shortest of the second inner filaments 162 so that each of the second outer filaments 161 is shorter than each of the second inner filaments 161. Thus, no portion of the second outer distal surface 167 of the second bristle tuft 160 extends beyond the second inner distal surface 170 of the second bristle tuft 160.

The second inner distal surface 170 of the second bristle tuft 160 formed by the core portion 164 of the second bristle tuft 160 extends further from the front surface 121 of the head 120 than the second outer distal surface 167 of the second bristle tuft 160 formed by the sheath portion 163 of the second bristle tuft 160. The second bristle tuft 160 extends from a bottom end 171 (formed by the bottom ends 165, 168 of the sheath and core portions 163, 164) to a terminal end 172 along a longitudinal axis D-D. In the exemplified embodiment, the terminal end 172 of the second bristle tuft 160 may be considered to be formed by the second inner distal surface 170 of the second bristle tuft 160 because it extends furthest from the head 120. In other embodiments, the terminal end 172 of the second bristle tuft 160 may be used to refer to the

combination of the second inner distal surface 170 and the second outer distal surface 167 of the second bristle tuft 160.

In the exemplified embodiment, the second outer distal surface 167 of the second bristle tuft 160 is oriented at an oblique angle relative to the longitudinal axis D-D of the second bristle tuft 160. Similarly, in the exemplified embodiment the second inner distal surface 170 of the second bristle tuft 160 is oriented at an oblique angle relative to the longitudinal axis D-D of the second bristle tuft 160. In the exemplified embodiment, the second outer distal surface 167 of the second bristle tuft 160 is parallel to the second inner distal surface 170 of the second bristle tuft 160. Thus, in the exemplified embodiment the second inner distal surface 170 of the second bristle tuft 160 and the second outer distal surface 167 of the second bristle tuft 160 are oriented at the same oblique angle relative to the longitudinal axis D-D. The exact oblique angle is not to be limiting of the present invention in all embodiments, but could be in a range of 70-89° in some embodiments, 75-89° in some embodiments, 80-89° in some embodiments, 80-85° in some embodiments, or the like. In alternative embodiments, the second inner and outer distal surfaces 167, 170 of the second bristle tuft 160 may be oriented at different oblique angles relative to the longitudinal axis D-D. In still other embodiments, at least one, or both, of the second inner and outer distal surfaces 167, 170 of the second bristle tuft 160 may be oriented perpendicular to the longitudinal axis D-D.

In the exemplified embodiment, the second outer distal surface 167 of the second bristle tuft 160 is planar, meaning that it lies in a plane. Similarly, the second inner distal surface 170 of the second bristle tuft 160 is planar, meaning that it lies in a plane. These planes are parallel in the exemplified embodiment but need not be in all embodiments as described herein above. Of course, the second outer and inner distal surfaces 167, 170 of the second bristle tuft 160 may not be planar in all embodiments, but may instead be rounded, wavy, or the like.

Referring to FIGS. 8 and 9, cross-sectional views of the head 120 of the oral care implement 100 are provided taken along the longitudinal axis A-A and the transverse axis B-B. As noted above, in this embodiment the first bristle tufts 140 are positioned along the perimeter portion 124 of the front surface 121 of the head 120 and the second bristle tufts 160 are positioned along the central portion 125 of the front surface 121 of the head 120. Furthermore, the heights of the first bristle tufts 140 are varied so that the terminal ends 152 of the first bristle tufts 140 (or, alternatively, the first outer distal surfaces 147 of the first bristle tufts 140)

collectively form a convex side profile. Thus, when viewed from the side of the head 120 as depicted in FIG. 8, the terminal ends 152 of the first bristle tufts 140 collectively have a convex shape. Moreover, the heights of the second bristle tufts 150 are varied so that the terminal ends 172 of the second bristle tufts 160 (or, alternatively, the first outer distal surfaces 167 of the second bristle tufts 160, the first inner distal surfaces 170 of the second bristle tufts 160, or a combination thereof) collectively form a concave side profile. Thus, when viewed from the side of the head 120 as depicted in FIG. 8, the terminal ends 172 of the second bristle tufts 160 collectively have a concave shape. The terminal ends 172 of the second bristle tufts 160 may also form a concave shape when viewed in a transverse side profile, such as that depicted in FIG. 9.

Furthermore, the terminal ends 152 of the first bristle tufts 140 are inclined so that they slope upwardly in a direction towards the central portion 125 of the front surface 121 of the head 120. Thus, the terminal ends 152 of the first bristle tufts 140 are inclined to slope upwardly in a direction towards the second bristle tufts 160 that are located within the central portion 125 of the front surface 121 of the head 120. This means that the height of the first bristle tufts 140 increases when moving in a direction from the lateral side 123 of the head 120 towards the central portion 125 of the front surface 121 of the head 120. Because both the outer distal surfaces 147 and the inner distal surfaces 150 of the first bristle tufts 140 are angled as described above, both the outer distal surfaces 147 and the inner distal surfaces 150 are inclined and slope upwardly towards the central portion 125 and towards the second bristle tufts 160. Stated still another way, the terminal end 152 of each of the first bristle tufts 140 is inclined and slopes upwardly in a direction towards the longitudinal axis A-A of the head 120 and/or towards the transverse axis B-B of the head 120.

The terminal ends 172 of the second bristle tufts 160 are inclined so that they slope upwardly in a direction towards the perimeter portion 124 of the front surface 121 of the head 120. Thus, the terminal ends 172 of the second bristle tufts 160 are inclined to slope upwardly in a direction towards the first bristle tufts 140 that are located within the perimeter portion 124 of the front surface 121 of the head 120. This means that the height of the second bristle tufts 160 increases when moving in a direction from the central portion 125 of the front surface 121 of the head 120 towards the lateral side 123 of the head 120. Because both the outer distal surfaces 167 and the inner distal surfaces 170 of the second bristle tufts 160 are angled as described above,

both the outer distal surfaces 167 and the inner distal surfaces 170 are inclined and slope upwardly towards the perimeter portion 124 (or towards the lateral side 123) and towards the first bristle tufts 140. Stated still another way, the terminal end 172 of each of the second bristle tufts 160 is inclined and slopes upwardly in a direction away from the longitudinal axis A-A of the head 120 and away from the transverse axis B-B of the head 120.

Referring to FIGS. 10-12, an alternative embodiment of an oral care implement 200 will be briefly described. The oral care implement 200 is very similar to the oral care implement 100 described above, and thus features that are the same will not be described herein in detail in the interest of brevity. Features of the oral care implement 200 that are similar to the oral care implement 100 will be described using the same reference numerals except in the 200-series of numbers rather than the 100-series of numbers. Thus, the description above can be referenced for certain details of the features of the oral care implement 200 that are not provided below.

The oral care implement 200 comprises a handle 210 and a head 220. The head 220 comprises a front surface 221 having a perimeter portion 224 and a central portion 225, the perimeter portion 224 surrounding the central portion 225. The oral care implement 200 comprises a plurality of cleaning elements 230 coupled to the head 220 and extending from the front surface 221 of the head 220. The cleaning elements 230 comprises a plurality of first bristle tufts 240 and a plurality of second bristle tufts 260.

The first bristle tufts 240 are identical to the first bristle tufts 140 of the oral care implement 100 described above the second bristle tufts 260 are identical to the second bristle tufts 160 of the oral care implement 100 described above. Thus, the first bristle tufts 240 comprise a plurality of first outer filaments 241 that surround a plurality of first inner filaments 242 whereby the first outer filaments 241 are taller than the plurality of first inner filaments 241. The second bristle tufts 260 comprise a plurality of second outer filaments 261 that surround a plurality of second inner filaments 262 whereby the second outer filaments 261 are shorter than the plurality of second inner filaments 262. The difference is that in this embodiment the plurality of first bristle tufts 240 are positioned along the central portion 225 of the front surface 221 of the head 220 and the plurality of second bristle tufts 260 are positioned along the perimeter portion 224 of the front surface 221 of the head 220.

Another difference is that in this embodiment the first bristle tufts 240 have a circular transverse cross-sectional shape and the second bristle tufts 260 have a rectangular transverse

cross-sectional shape, whereas in the previous embodiment the first bristle tufts 140 have a rectangular transverse cross-sectional shape and the second bristle tufts 160 have a circular transverse cross-sectional shape. These shapes are merely exemplary and are not intended to be limiting of the invention. In some embodiments all of the bristle tufts may have a circular transverse cross-sectional shape, a square or rectangular transverse cross-sectional shape, a triangular transverse cross-sectional shape, or the like.

Referring to FIGS. 13-15, another alternative embodiment of an oral care implement 300 will be briefly described. The oral care implement 300 is very similar to the oral care implement 100 described above, and thus features that are the same will not be described herein in detail in the interest of brevity. Features of the oral care implement 300 that are similar to the oral care implement 100 will be described using the same reference numerals except in the 300-series of numbers rather than the 100-series of numbers. Thus, the description above can be referenced for certain details of the features of the oral care implement 300 that are not provided below.

The oral care implement 300 comprises a handle 310 and a head 320. The head 320 comprises a front surface 321 having a perimeter portion 324 and a central portion 325, the perimeter portion 324 surrounding the central portion 325. The oral care implement 300 comprises a plurality of cleaning elements 330 coupled to the head 320 and extending from the front surface 321 of the head 320. The cleaning elements 330 comprises a plurality of first bristle tufts 340 and a plurality of second bristle tufts 360.

The first bristle tufts 340 are identical to the first bristle tufts 140 of the oral care implement 100 described above the second bristle tufts 360 are identical to the second bristle tufts 160 of the oral care implement 100 described above. Thus, the first bristle tufts 340 comprise a plurality of first outer filaments 341 that surround a plurality of first inner filaments 342 whereby the first outer filaments 341 are taller than the plurality of first inner filaments 342. The second bristle tufts 360 comprise a plurality of second outer filaments 361 that surround a plurality of second inner filaments 362 whereby the second outer filaments 361 are shorter than the plurality of second inner filaments 362.

The difference is that in this embodiment the some of the first bristle tufts 340 are located along the perimeter portion 324 of the front surface 321 of the head 320 and some of the first bristle tufts 340 are located along the central portion 325 of the front surface 321 of the head 320.

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Moreover, in this embodiment some of the second bristle tufts 360 are located along the perimeter portion 324 of the front surface 321 of the head 320 and some of the second bristle tufts 360 are located along the central portion 325 of the front surface 321 of the head 320. In this embodiment, the bristle tufts having the shorter core portion (i.e., the first bristle tufts 340 and the bristle tufts having the taller core portion (i.e., the second bristle tufts 360) may be arranged or positioned in a random way along the front surface 321 of the head 320.

While the invention has been described with respect to specific examples including presently preferred modes of carrying out the invention, those skilled in the art will appreciate that there are numerous variations and permutations of the above described systems and techniques. It is to be understood that other embodiments may be utilized and structural and functional modifications may be made without departing from the scope of the present invention. Thus, the spirit and scope of the invention should be construed broadly as set forth in the appended claims.

CLAIMS

1. An oral care implement comprising:

a head comprising a front surface;

a first bristle tuft extending from the front surface of the head, the first bristle tuft comprising a plurality of first outer filaments and a plurality of first inner filaments, the first outer filaments surrounding the first inner filaments, and wherein each of the first outer filaments is taller than each of the first inner filaments; and

a second bristle tuft extending from the front surface of the head, the second bristle tuft comprising a plurality of second outer filaments and a plurality of second inner filaments, the second outer filaments surrounding the second inner filaments, and wherein each of the second outer filaments is shorter than each of the second inner filaments.

2. The oral care implement according to claim 1 wherein the front surface of the head comprises a perimeter portion and a central portion that is surrounded by the perimeter portion, wherein the first bristle tuft is located along the perimeter portion and the second bristle tuft is located along the central portion.

3. The oral care implement according to claim 2 further comprising a plurality of the first bristle tufts and a plurality of the second bristle tufts, wherein each of the first bristle tufts is located along the perimeter portion of the front surface of the head and each of the second bristle tufts is located along the central portion of the front surface of the head.

4. The oral care implement according to claim 3 wherein terminal ends of the first bristle tufts collectively form a convex side profile and wherein terminal ends of the second bristle tufts collectively form a concave side profile.

5. The oral care implement according to any one of claims 3 to 4 wherein each of the first bristle tufts comprises an inclined terminal end that slopes upwardly in a direction towards the central portion of the front surface of the head, and wherein each of the second bristle tufts comprises an

inclined terminal end that slopes upwardly in a direction towards the perimeter portion of the front surface of the head.

6. The oral care implement according to claim 1 wherein the front surface of the head comprises a perimeter portion and a central portion that is surrounded by the perimeter portion, and further comprising a plurality of the first bristle tufts and a plurality of the second bristle tufts, and wherein each of the second bristle tufts is located along the perimeter portion of the front surface of the head and each of the first bristle tufts is located along the central portion of the front surface of the head.

7. The oral care implement according to any one of claims 1 to 6 further comprising a plurality of the first bristle tufts extending from the front surface of the head and a plurality of the second bristle tufts extending from the front surface of the head, wherein each of the first bristle tufts has a different height than at least one of the other of the first bristle tufts, and wherein each of the second bristle tufts has a different height than at least one of the other of the second bristle tufts.

8. The oral care implement according to any one of claims 1 to 7 wherein the first bristle tuft comprises a first longitudinal axis, wherein the first outer filaments collectively form a sheath portion of the first bristle tuft and the first inner filaments collectively form a core portion of the first bristle tuft that is surrounded by the sheath portion of the first bristle tuft, a distal end of the sheath portion of the first bristle tuft forming a first outer distal surface of the first bristle tuft and a distal end of the core portion of the first bristle tuft forming a first inner distal surface of the first bristle tuft, and wherein the first inner distal surface and the first outer distal surface of the first bristle tuft are oriented at an oblique angle relative to the first longitudinal axis of the first bristle tuft.

9. The oral care implement according to claim 8 wherein the first inner distal surface and the first outer distal surface of the first bristle tuft are parallel to one another and oriented at the same oblique angle relative to the first longitudinal axis of the first bristle tuft.

10. The oral care implement according to any one of claims 1 to 9 wherein the second bristle tuft comprises a second longitudinal axis, wherein the second outer filaments collectively form a sheath portion of the second bristle tuft and the second inner filaments collectively form a core portion of the first bristle tuft that is surrounded by the sheath portion of the second bristle tuft, a distal end of the sheath portion of the second bristle tuft forming a second outer distal surface of the second bristle tuft and a distal end of the core portion of the second bristle tuft forming a second inner distal surface of the second bristle tuft, wherein the second inner distal surface and the second outer distal surface of the second bristle tuft are oriented at an oblique angle relative to the second longitudinal axis of the second bristle tuft.

11. The oral care implement according to claim 10 wherein the second inner distal surface and the second outer distal surface of the second bristle tuft are parallel to one another and oriented at the same oblique angle relative to the second longitudinal axis of the second bristle tuft.

12. The oral care implement according to any one of claims 1 to 11 wherein the head comprises a longitudinal axis that extends between proximal and distal ends of the head and a transverse axis that is perpendicular to the longitudinal axis and equidistant from the proximal and distal ends of the head, and further comprising a plurality of the first bristle tufts each extending from the front surface of the head to a terminal end and a plurality of the second bristle tufts each extending from the front surface of the head to a terminal end, wherein the terminal end of each of the first bristle tufts is inclined and slopes upwardly in a direction towards the longitudinal axis of the head and/or towards the transverse axis of the head, and wherein the terminal end of each of the second bristle tufts is inclined and slopes upwardly in a direction away from the longitudinal axis of the head and/or away from the transverse axis of the head.

13. An oral care implement comprising:

a head comprising a front surface;

a first bristle tuft coupled to the head and comprising a first longitudinal axis, the first bristle tuft comprising a plurality of first outer filaments that form a sheath portion of the first bristle tuft and a plurality of first inner filaments that form a core portion of the first bristle tuft, the sheath portion surrounding the core portion, and wherein either: (1) each of the first outer

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filaments is taller than each of the first inner filaments; or (2) each of the first outer filaments is shorter than each of the first inner filaments; and

wherein a distal end of the sheath portion of the first bristle tuft forms a first outer distal surface of the first bristle tuft and a distal end of the core portion of the first bristle tuft forms a first inner distal surface of the first bristle tuft; and

wherein the first outer distal surface of the first bristle tuft is oriented at a first oblique angle relative to the first longitudinal axis of the first bristle tuft and the first inner distal surface of the first bristle tuft is oriented at a second oblique angle relative to the first longitudinal axis of the first bristle tuft.

14. The oral care implement according to claim 13 wherein the first and second oblique angles are the same.

15. The oral care implement according to any one of claims 13 to 14 wherein each of the first outer filaments is taller than each of the first inner filaments, and further comprising a second bristle tuft coupled to the head and comprising a second longitudinal axis, the second bristle tuft comprising a plurality of second outer filaments that form a sheath portion of the second bristle tuft and a plurality of second inner filaments that form a core portion of the second bristle tuft, the second outer filaments surrounding the second inner filaments and each of the second outer filaments being shorter than each of the second inner filaments.

16. The oral care implement according to claim 15 wherein a distal end of the sheath portion of the second bristle tuft forms a second outer distal surface of the second bristle tuft, wherein a distal end of the core portion of the second bristle tuft forms a second inner distal surface of the second bristle tuft, and wherein the second outer distal surface of the second bristle tuft and the second inner distal surface of the second bristle tuft are oriented at an oblique angle relative to the second longitudinal axis of the second bristle tuft.

17. The oral care implement according to claim 16 wherein the front surface of the head comprises a central portion and a perimeter portion that surrounds the central portion, and further comprising a plurality of the first bristle tufts located along the perimeter portion of the front

surface of the head and a plurality of the second bristle tufts located along the central portion of the front surface of the head, terminal ends of the first bristle tufts collectively forming a convex side profile and terminal ends of the second bristle tufts collectively forming a concave side profile.

18. An oral care implement comprising:

a head comprising a front surface having a perimeter portion and a central portion that is surrounded by the perimeter portion;

a plurality of first bristle tufts coupled to the head and located along the perimeter portion of the front surface of the head;

a plurality of second bristle tufts coupled to the head and located along the central portion of the front surface of the head; and

wherein each of the first bristle tufts extends from the front surface of the head to an inclined terminal end that slopes upwardly towards the plurality of second bristle tufts, and wherein each of the second bristle tufts extends from the front surface of the head to an inclined terminal end that slopes upwardly towards the plurality of first bristle tufts.

19. The oral care implement according to claim 18 wherein each of the first bristle tufts comprises a first plurality of outer filaments and a first plurality of inner filaments, the first plurality of outer filaments surrounding the first plurality of inner filaments and being taller than the first plurality of inner filaments, and wherein each of the second bristle tufts comprises a second plurality of outer filaments and a second plurality of inner filaments, the second plurality of outer filaments surrounding the second plurality of inner filaments and being shorter than the second plurality of inner filaments.

20. The oral care implement according to any one of claims 18 to 19 wherein the inclined terminal ends of the plurality of first bristle tufts collectively form a convex side profile and wherein the inclined terminal ends of the plurality of second bristle tufts collectively form a concave side profile.

FIGURES

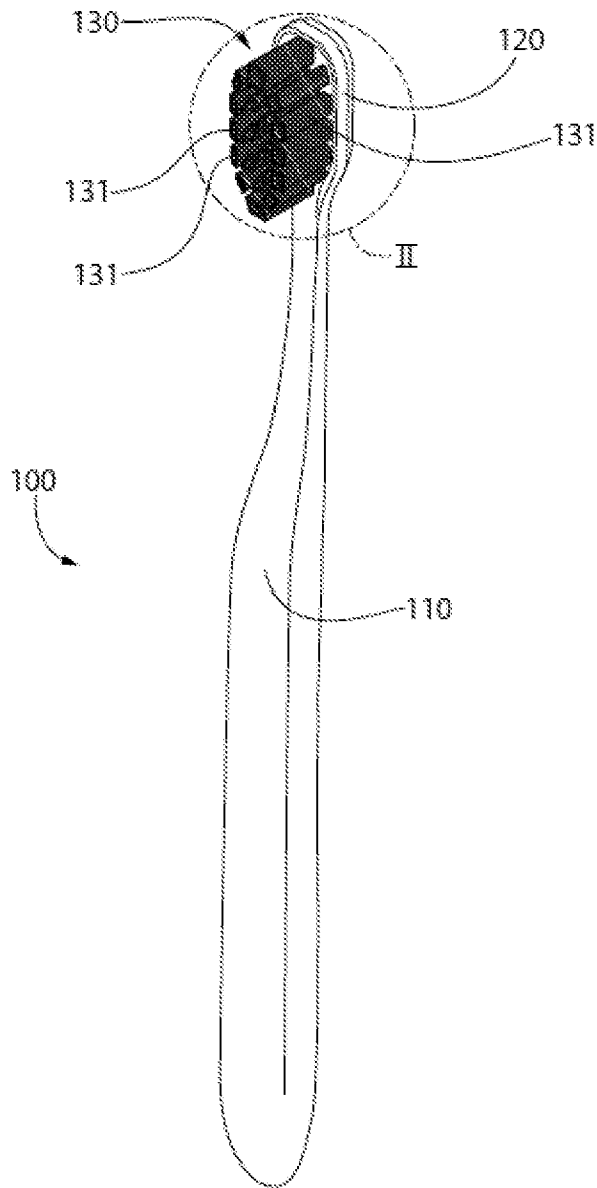


FIG. 1

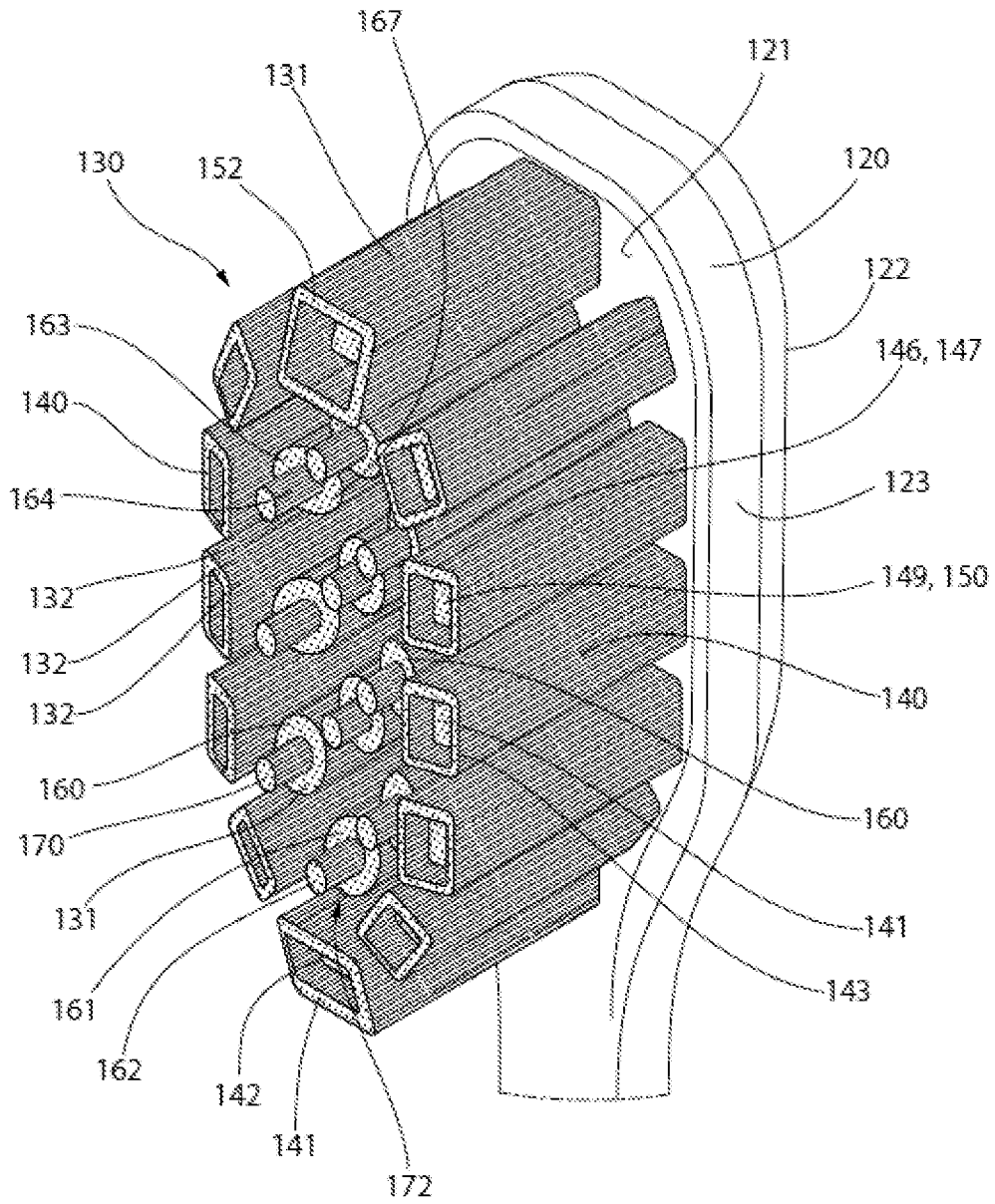


FIG. 2

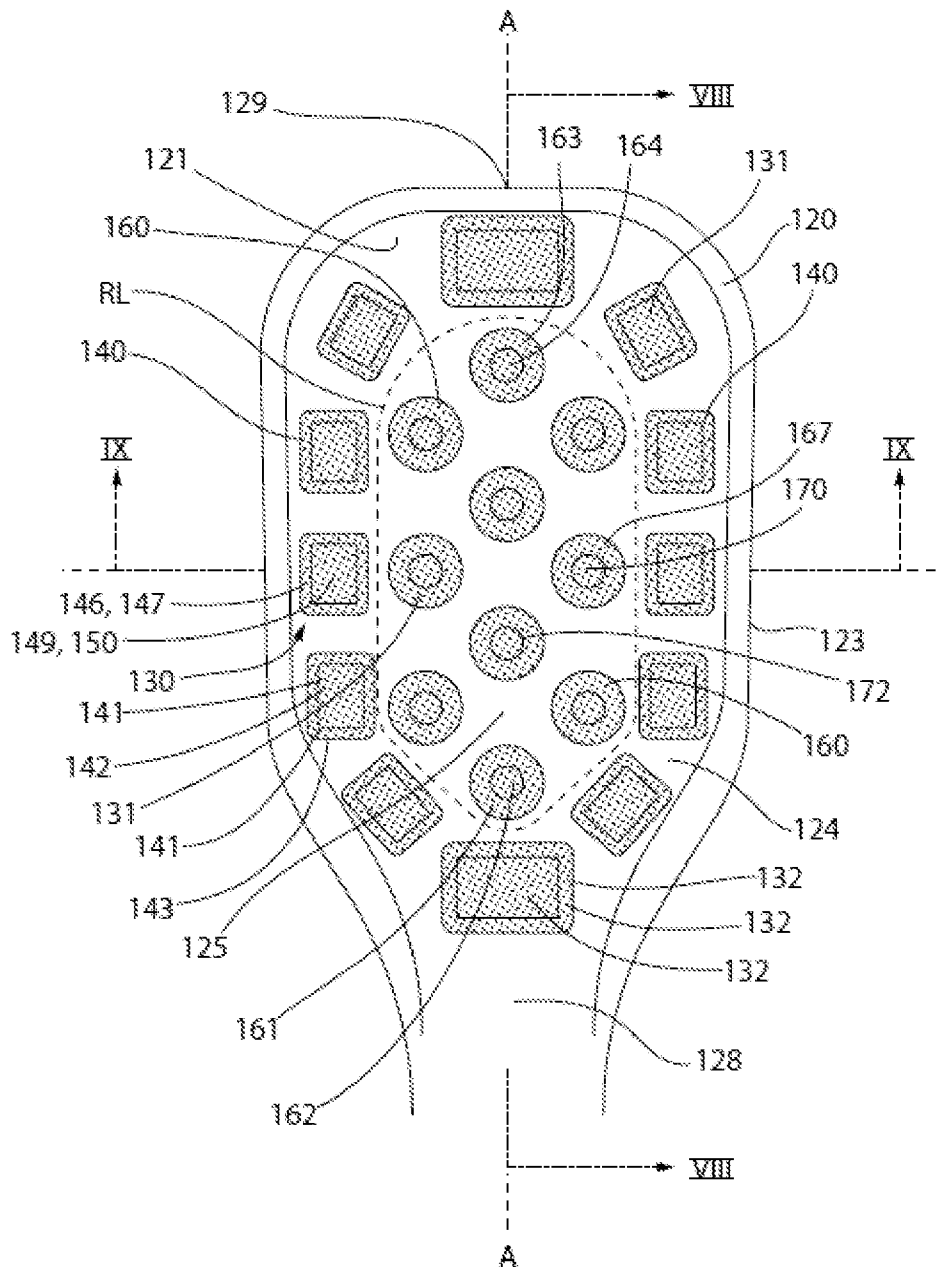
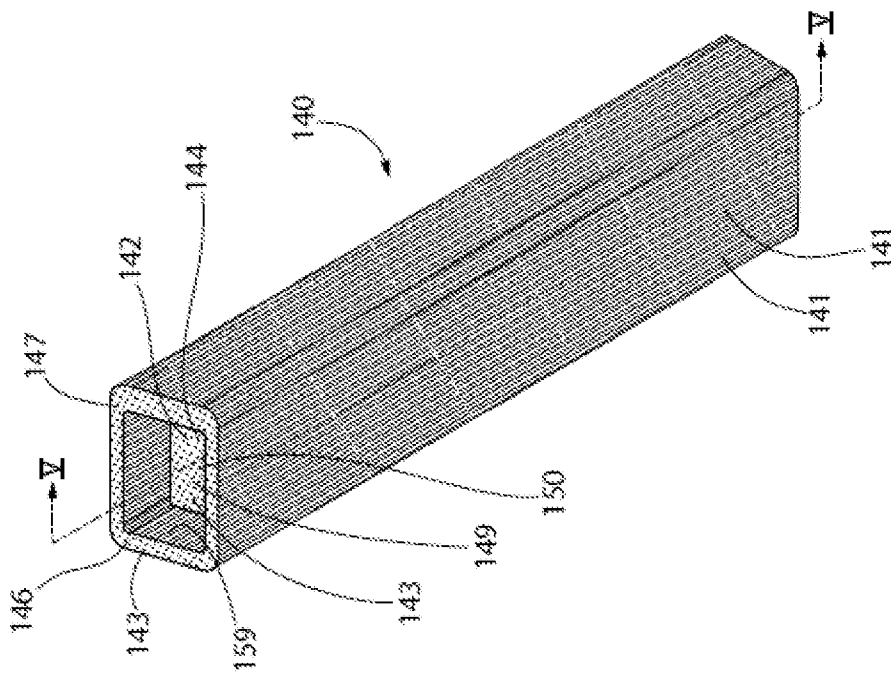
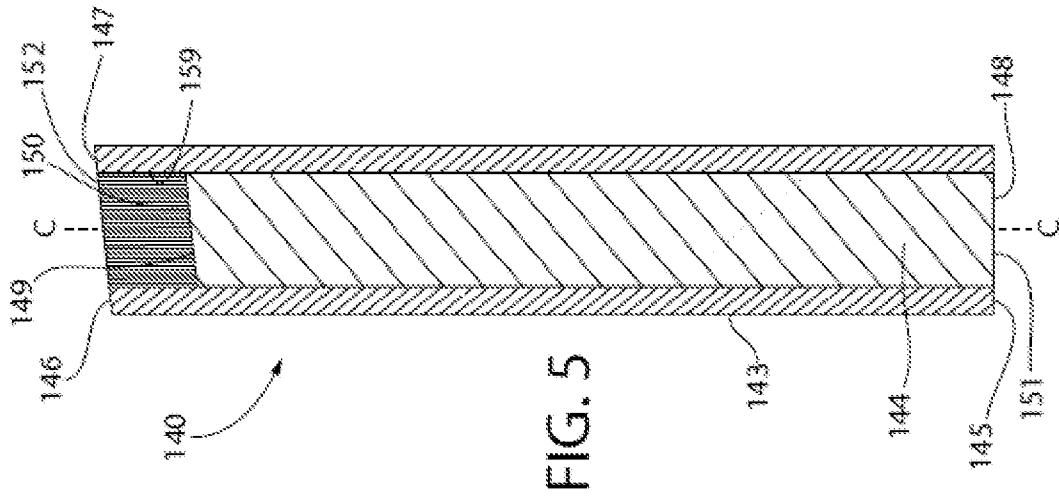


FIG. 3



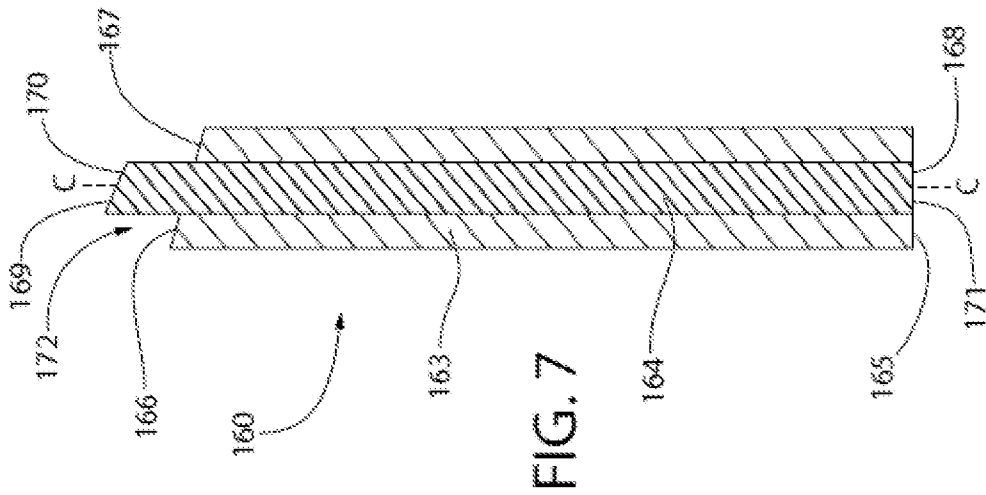


FIG. 7

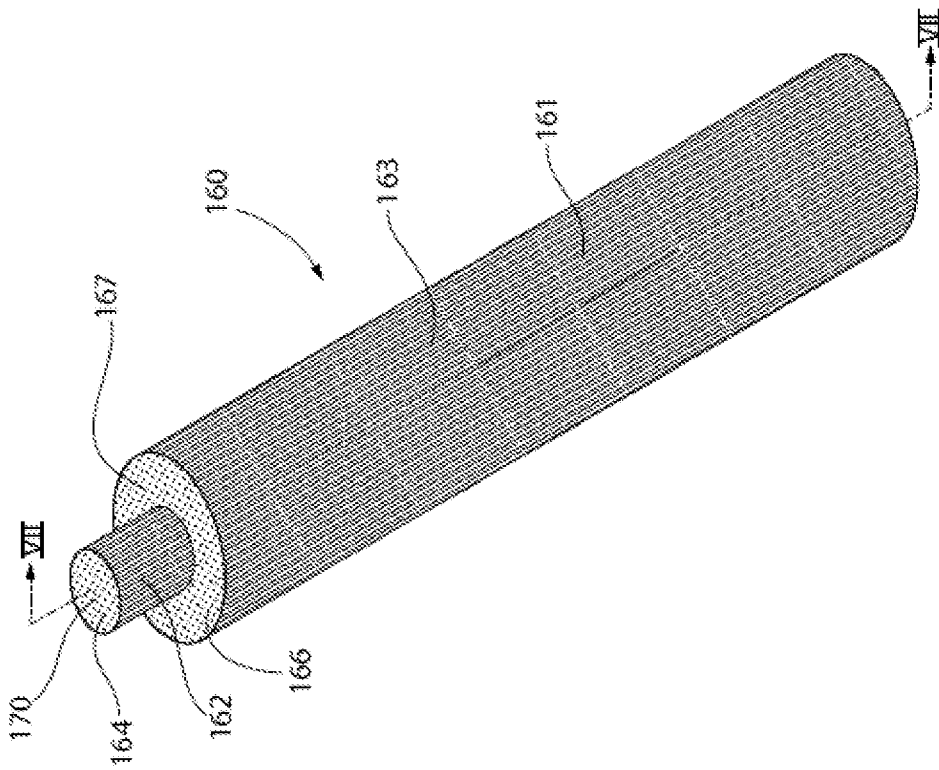


FIG. 6

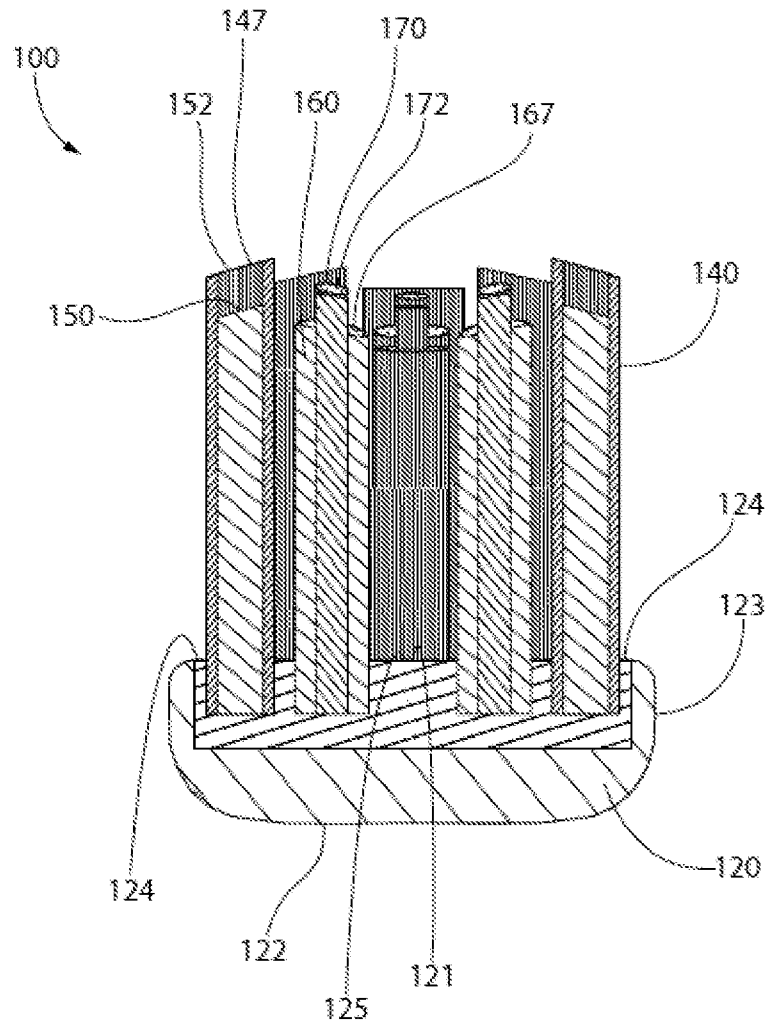


FIG. 9

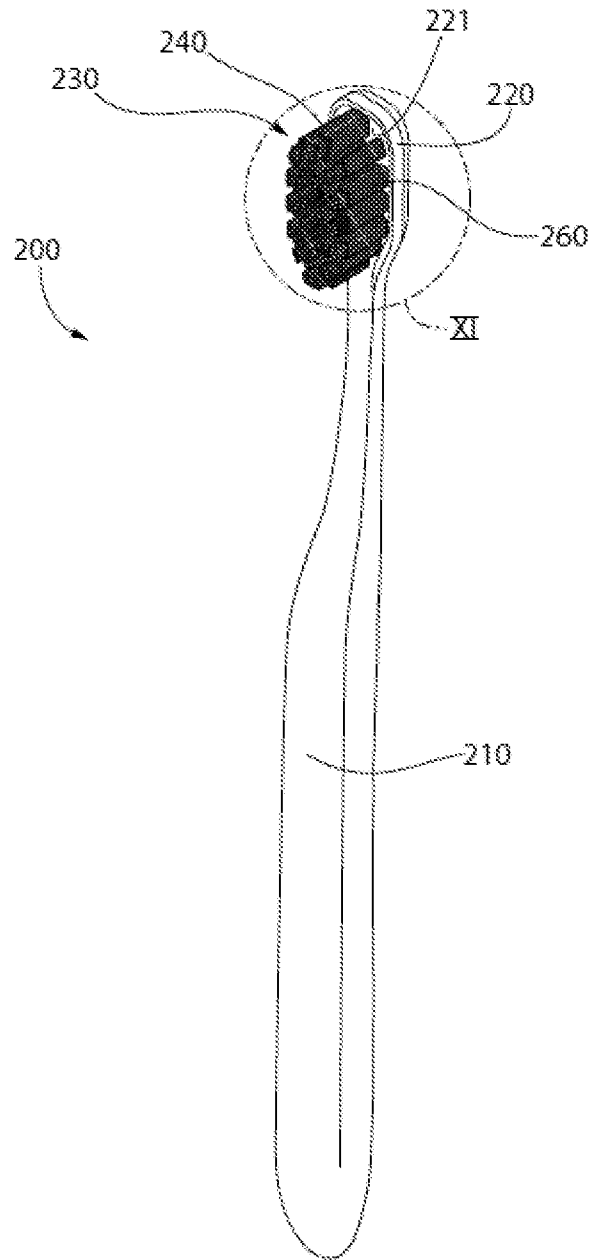


FIG. 10

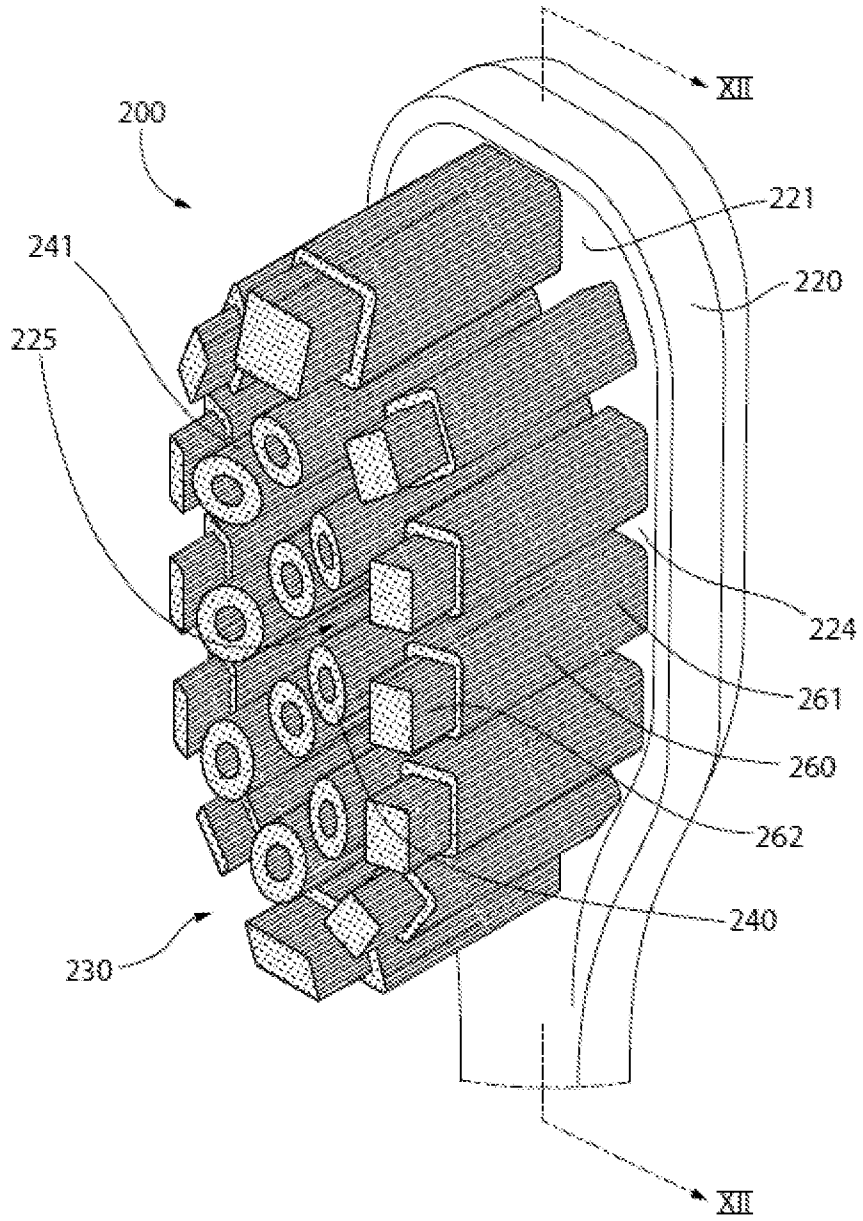


FIG. 11

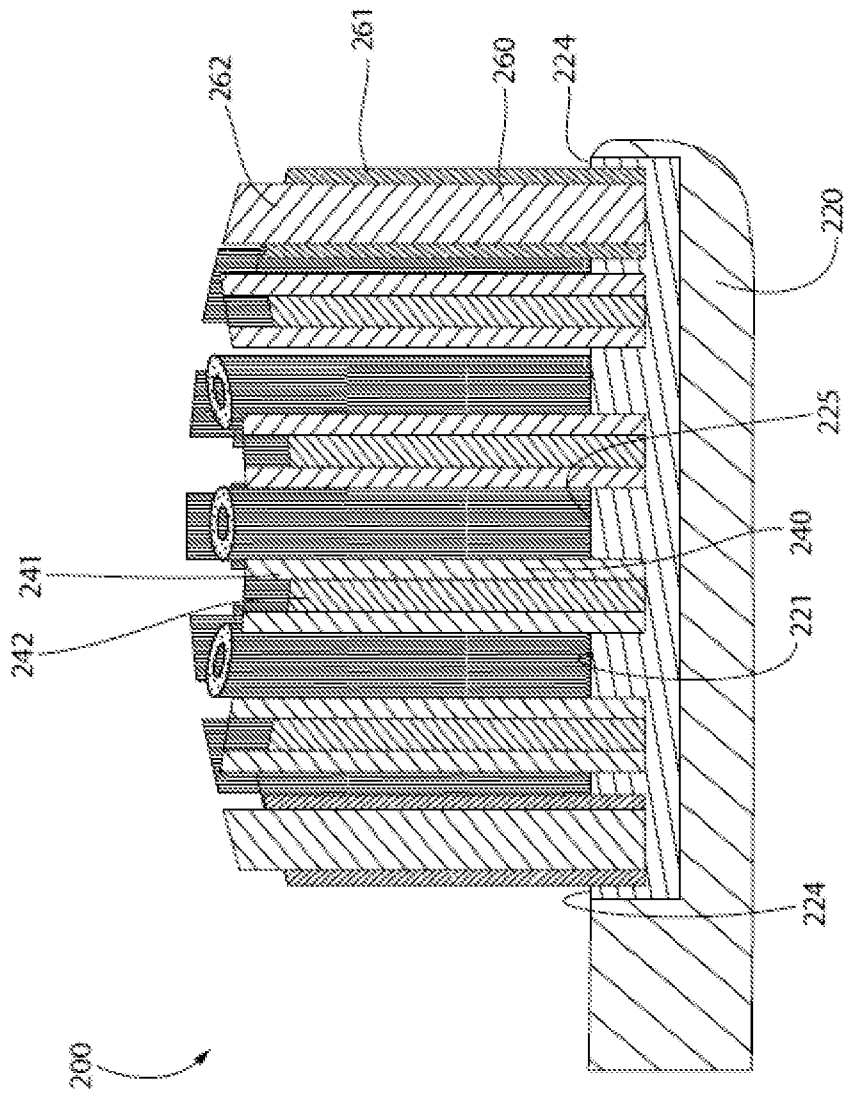


FIG. 12

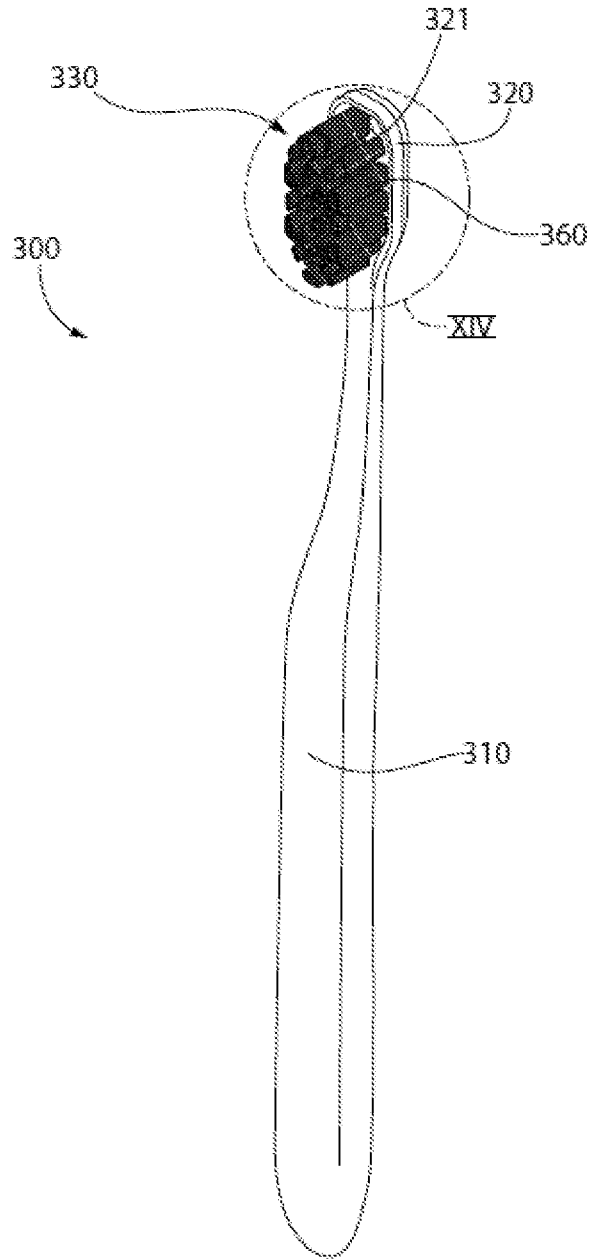


FIG. 13

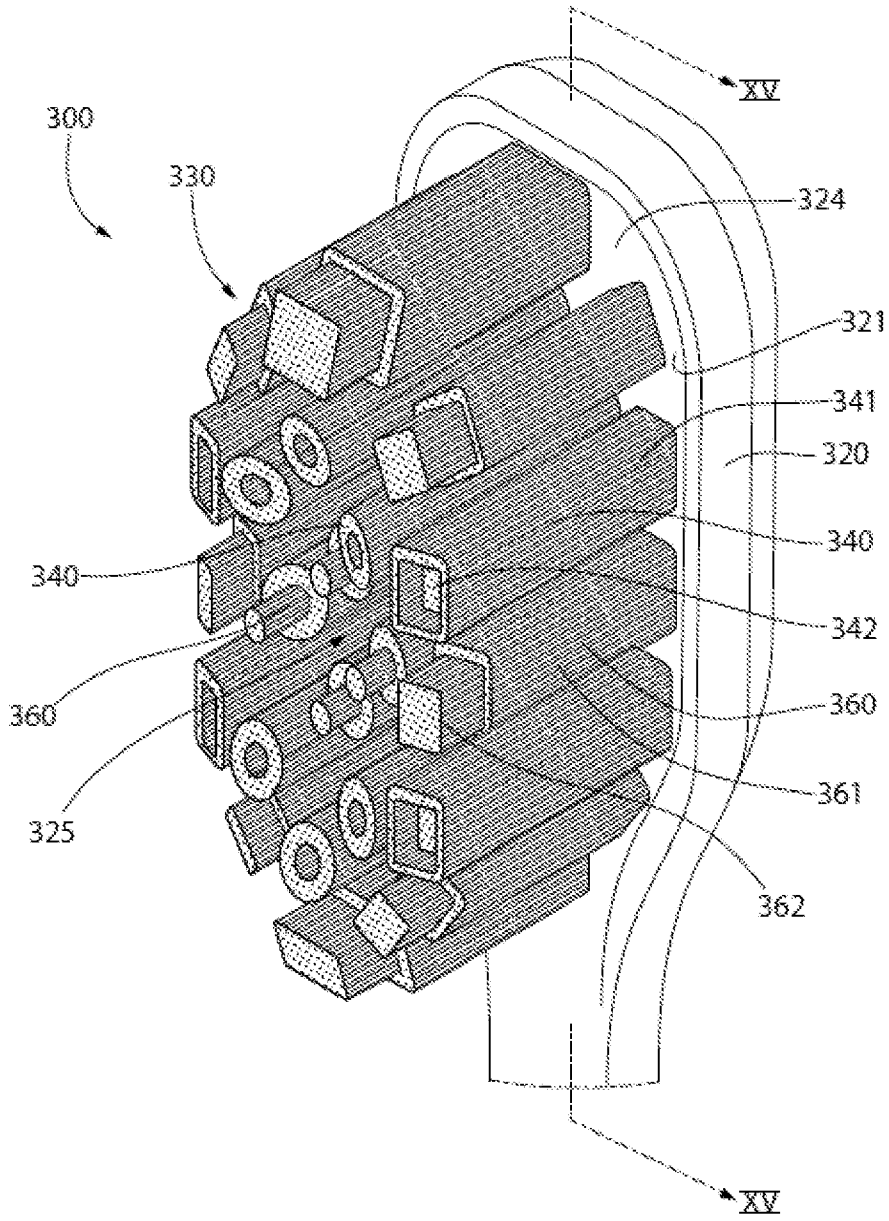


FIG. 14

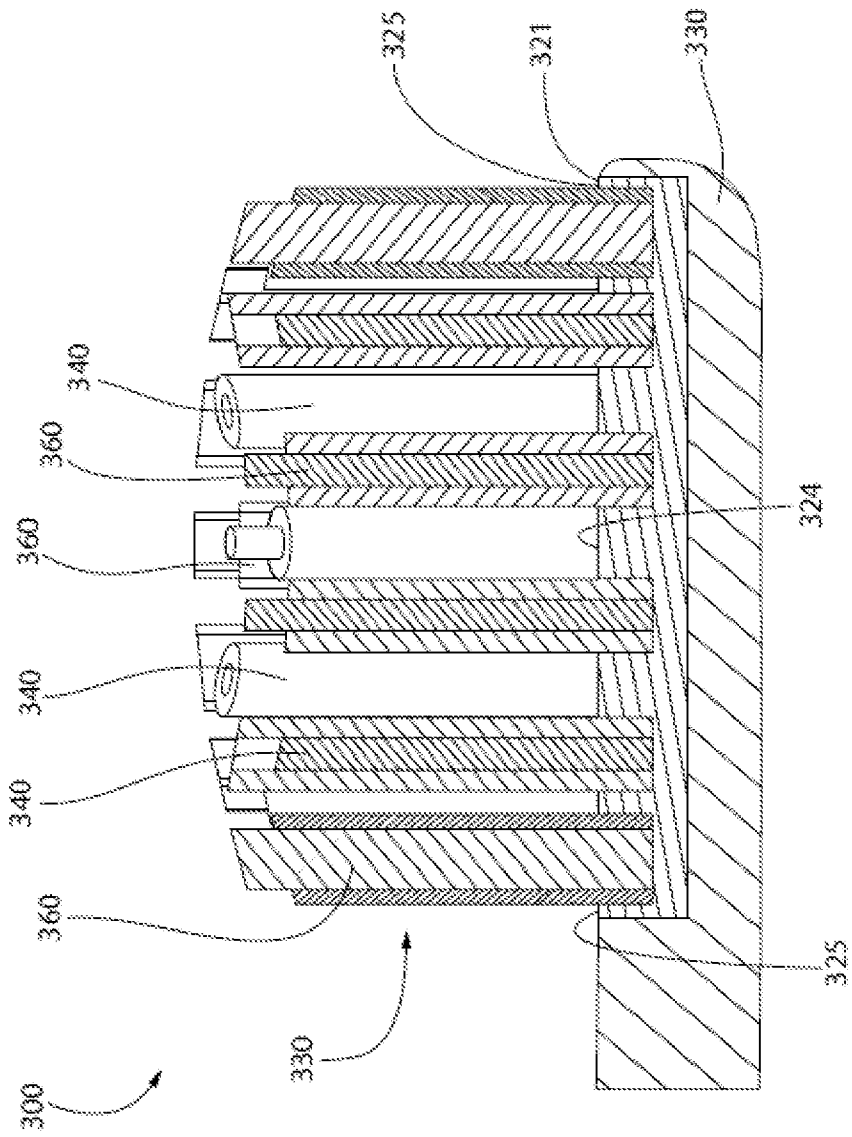


FIG. 15

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2018/120836

| A. CLASSIFICATION OF SUBJECT MATTER | | |
|--|---|--|
| A46B 9/04(2006.01)i; A46B 9/06(2006.01)i; A46B 9/02(2006.01)i; A46D 1/00(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) | | |
| A46 | | |
| Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched | | |
| Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) | | |
| CNPAT,WPI,EPODOC,CNKI:toothbrush,first,second,inner,outer,bristle?,portion,region,tuft?,sheath,taller,shorter,core,resin,wall,ring+ | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| X | US 2015150366 A1 (LG HOUSEHOULD & HEALTHCARE LTD. ET AL) 04 June 2015 (2015-06-04) description paragraphs [0037]-[0046], figs. 1-7 | 18、 20 |
| Y | US 2015150366 A1 (LG HOUSEHOULD & HEALTHCARE LTD. ET AL) 04 June 2015 (2015-06-04) description paragraphs [0037]-[0046], figs. 1-7 | 1-17、 19 |
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| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex. | | |
| * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family | | |
| Date of the actual completion of the international search | | Date of mailing of the international search report |
| 22 August 2019 | | 18 September 2019 |
| Name and mailing address of the ISA/CN | | Authorized officer |
| National Intellectual Property Administration, PRC 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088 China | | ZHAO,Yi |
| Facsimile No. (86-10)62019451 | | Telephone No. 86-(10)-53962591 |

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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| Patent document cited in search report | | | Publication date (day/month/year) | Patent family member(s) | | | Publication date (day/month/year) |
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| | | | | VN | 42142 | | 25 May 2015 |
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