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**(54) TOOTHBRUSH HAVING A CLOSED-LOOP ARRANGEMENT OF CLEANING ELEMENTS**

ZAHNBÜRSTE MIT REINIGUNGSELEMENTEN, DEREN ANORDNUNG EINE GESCHLOSSENE SCHLEIFE BILDET

BROSSE À DENT COMPRENANT DES ÉLÉMENTS DE NETTOYAGE DES DENTS DISPOSÉS EN BOUCLE FERMÉE

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## Description

### Field of the Invention

[0001] The present invention relates generally to toothbrushes, either manual or powered, that have a handle and a head having cleaning elements for oral cleaning.

### Background of the Invention

[0002] A toothbrush is used to clean the teeth by removing plaque and debris from the tooth surfaces. Conventional toothbrushes provided with a flat bristle trim are limited in their ability to conform to the curvature of the teeth, to penetrate into the interproximal areas between the teeth, to sweep away the plaque and debris, and to clean along the gum line. Additionally, such toothbrushes have a limited ability to retain dentifrice for cleaning the teeth. During the brushing process, the dentifrice typically slips through the tufts of bristles and away from the contact between the bristles and the teeth. As a result, the dentifrice is often spread around the mouth, rather than being concentrated on the contact of the bristles with the teeth. Therefore, the efficiency of the cleaning process is reduced.

[0003] While substantial efforts have been made to modify the cleaning elements of toothbrushes to improve the efficiency of the oral cleaning process and to hold the dentifrice in place during brushing, the industry continues to pursue arrangements of cleaning elements that will improve upon the preceding technology.

[0004] In an early attempt at improving the cleaning elements, toothbrushes were developed having two or three circular brush sections which are arranged within holders that may be screwed into mating receptacles in the tooth brush handle so that they can be removed and replaced as needed. Each brush section contains stiff cleaning elements and is spaced from the other along the longitudinal axis of the handle at a distance less than the thickness of a tooth so that the brush operates on both the lingual (inside) and facial (outside) surfaces of the teeth.

[0005] Another existing toothbrush includes a head containing a flexible, rubber-like prophylaxis polishing cup or "prophy cup" similar to that used by dental personnel to professionally clean teeth. This prophyl cup is loaded with toothpaste by the user and applied to the teeth. The "soft rubber-like prophyl cup device follows the contours of teeth more effectively than bristles." A ring of cleaning elements ("bristle tufts") are placed about the periphery of the toothbrush head which co-act with the prophyl cups to clean the user's teeth and gums.

[0006] More recently, the strategic arrangement and combination of cleaning elements in the form of elastomeric prophyl cups and bristle tufts has become more common as a way of improving cleaning efficiency and maintaining the dentifrice in place during brushing. One example of the combined use and strategic arrangement

of elastomeric prophyl cups and bristle tufts is a toothbrush having a head portion comprising a plurality of inner loops formed by elastomeric walls. The central inner loop is surrounded by outer loops formed of bristles. A central cleaning element, formed as a bristle tuft, is located within the elastomeric inner loop.

[0007] Another example of the combined use and strategic arrangement of elastomeric prophyl cups and bristle tufts can be found in a toothbrush having a head portion comprising a plurality of soft elastomer prophyl cups surrounded by bristle rings. In another embodiment, a toothbrush exists wherein the centralized prophyl cups are formed by groups of densely packed cleaning elements that are surrounded by bristle rings. The bristle rings in this toothbrush are also disclosed as having one or more tufts at an inclination.

US 2008/0086827 A1 discloses an oral care implement comprising a handle and a head comprising a head frame with two connectors spaced apart from each other, a cleaning element assembly attached to the head frame and having a third and a fourth connector and further comprising a series of carriers and cleaning elements.

### Summary of the Invention

[0008] A toothbrush according to the present invention is defined in claim 1. Preferred features are defined in the dependent claims.

### Brief Description of the Drawings

[0009] This invention is capable of use in a broad array of oral care implements and hygiene products. The drawings illustrate one use of the invention and are not to be construed as the only embodiment of the invention.

Figure 1 is a perspective view of a toothbrush according to one embodiment of the present invention. Figure 2 is a front view of the toothbrush of Figure 1. Figure 3 is a left-side view of the toothbrush of Figure 1.

Figure 4 is a right-side view of the toothbrush of Figure 1.

Figure 5 is a top view of the toothbrush of Figure 1. Figure 6 is a close-up perspective view of the head of the toothbrush of Figure 1.

Figure 7 is a close-up front view of the head of the toothbrush of Figure 1.

Figure 8 is a cross-sectional view of the head of the toothbrush of Figure 1 along view VIII-VIII of Figure 7.

Figure 9 is a cross-sectional view of the head of the toothbrush of Figure 1 along view IX-IX of Figure 7.

Figure 10 is a left-side view of the toothbrush of Figure 1 wherein certain cleaning elements have been removed to clearly show a lateral side profile of the substantially closed-loop formed by the first set of cleaning elements.

### Detailed Description of the Drawings

**[0010]** In the following description, the invention is discussed in terms of a manual toothbrush incorporating the subject arrangement of cleaning elements. However, in other forms, the invention could be in the form of other oral care implements including a soft-tissue cleansing implement, a powered toothbrush, or other ansate implement designed for oral care.

**[0011]** Referring first to Figures 1-5 concurrently, a toothbrush **100** is illustrated according to one embodiment of the present invention. The toothbrush **100** generally comprises a handle **110** and a head **120**. The handle **110** provides the user with a mechanism by which he/she can readily grip and manipulate the toothbrush **100**. The handle **110** is generically illustrated and may be formed of many different shapes, sizes, materials and a variety of manufacturing methods that are well-known to those skilled in the art. If desired, the handle **110** may include a suitable textured grip (not shown) made of elastomeric material or can be a multi-part construction. Stated simply, the details of the handle **110** are not limiting of the present invention and, thus, require no further discussion for purposes of the present invention.

**[0012]** The toothbrush **100** extends from a proximal end **112** to a distal end **113** along a longitudinal axis **A-A** (illustrated in FIG. 2). The head **120** is operably connected to the handle **110**. The head **120** and handle **110** of the toothbrush are preferably formed as a single unitary structure using a molding, milling, machining or other suitable process. However, in other embodiments, the handle **110** and head **120** may be formed as separate components which are operably connected at a later stage of the manufacturing process by any suitable technique known in the art, including without limitation thermal welding, a tight-fit assembly, a coupling sleeve, adhesion, or fasteners. Whether the head **120** and handle **110** are of a unitary or multi-piece construction (including connection techniques) is not limiting of the present invention.

**[0013]** It should be noted at this time that relative terms such as distal, middle, proximal, upper, lower, top, bottom, left, right etc. are merely used to delineate relative positions of the components of the toothbrush **100** with respect to one another and are not intended to be in any further way limiting of the present invention.

**[0014]** The head **120** generally comprises a front surface **121** and a rear surface **122**. The front surface **121** and the rear surface **122** of the head **120** can take on a wide variety of shapes and contours, none of which are limiting of the present invention. For example, the front and rear surfaces **121, 122** can be planar, contoured or combinations thereof. Moreover, if desired, the rear surface **122** may also comprise additional structures for oral cleaning, such as a soft tissue cleanser. An example of a suitable soft tissue cleanser is disclosed in U.S. Patent 7,143,462, issued December 5, 2006 to the assignee of the present application. Furthermore, while the head **120**

is normally widened relative to the neck **111** of the handle **110**, it could in some constructions simply be a continuous extension or narrowing of the handle **110**.

**[0015]** The head **120** also comprises a distal periphery **124**, a first lateral periphery **125**, a second lateral periphery **126**, and a proximal periphery **127**. The distal periphery **124**, the first lateral periphery **125** and the second lateral periphery **126** are bound by a peripheral side surface **123** of the head **120**. The proximal periphery **127** is defined where the head **120** transitions into the neck **111**.

**[0016]** A collection **130** of cleaning elements are provided on the front surface of the head **120** for cleaning contact with an oral surface, preferably teeth. While the collection **130** of cleaning elements is particularly suited for brushing teeth, the collection **130** of cleaning elements can also be used to clean oral soft tissue, such as a tongue, gums, or cheeks instead of or in addition to teeth. As used herein, the term "cleaning element" is used in a generic sense to refer to any structure that can be used to clean or massage an oral surface through relative surface contact. Common examples of "cleaning elements" include, without limitation, filament bristles, fiber bristles, nylon bristles, spiral bristles, rubber bristles, elastomeric protrusions, flexible polymer protrusions, co-extruded filaments, flag bristles, crimped bristles, antibacterial bristles and combinations thereof and/or structures containing such materials or combinations.

**[0017]** The collection **130** of cleaning elements of the present invention can be connected to the head **120** in any manner known in the art. For example, anchor free tufting (AFT) could be used to mount the cleaning elements. In AFT, a plate or membrane is secured to the brush head such as by ultrasonic welding. The bristles (or other elastomeric elements) extend through the plate or membrane. The free ends of the bristles on one side of the plate or membrane perform the cleaning function. The ends of the bristles on the other side of the plate or membrane are melted together by heat to be anchored in place. Any suitable form of cleaning elements may be used in the broad practice of this invention. Alternatively, the bristles could be mounted to tuft blocks or sections by extending through suitable openings in the tuft blocks so that the base of the bristles is mounted within or below the tuft block.

**[0018]** Referring now to FIGS. 6 and 7 concurrently, the details of the head **120** and the collection **130** of cleaning elements extending therefrom will be described in accordance with an embodiment of the present invention. The head **120** of the toothbrush comprises a longitudinal axis **A-A** and a lateral axis **C-C**. Generally, the collection **130** of cleaning elements comprises a first set **140** of cleaning elements, a second set **150** of cleaning elements, a third set **160** of cleaning elements, and a plurality of prophylaxis cups **171-173**.

**[0019]** The first set **140** of cleaning elements generally comprises a distal par-elliptical wall **141** of cleaning elements, two arcuate rows **142-143** of cleaning elements, and a proximal par-elliptical wall **144**. The distal par-el-

liptical wall **141** is formed by the cleaning elements **141a-b**. The proximal par-elliptical wall **144** is formed by the cleaning elements **144a-d**. The first arcuate row **142** is formed by cleaning elements **142a-c** while the second arcuate row **143** is formed by cleaning elements **143a-c**.

[0020] The second set **150** of cleaning elements are arranged in a row along the lateral periphery **125** of the head **120**. Similarly, the third set **160** of cleaning elements are arranged in a row along the lateral periphery **126** of the head **120**. Specifically, the row formed by the first set **150** of cleaning elements comprises cleaning elements **150a-e** while the row formed by the second set **160** of cleaning elements comprises cleaning elements **160a-e**.

[0021] Preferably, all of the cleaning elements of the distal par-elliptical wall **141**, the two arcuate rows **142-143**, and the proximal par-elliptical wall **144** are formed by densely packed bristles. However, the invention is not so limited and one, a few, or all of these cleaning elements can be formed of another material, such as an elastomer, etc. Moreover, while the distal par-elliptical wall **141**, the two arcuate rows **142-143**, and the proximal par-elliptical wall **144** are illustrated as being formed by two, three and four cleaning elements respectively, each of the distal par-elliptical wall **141**, the two arcuate rows **142-143**, and the proximal par-elliptical wall **144** can be formed by more or less cleaning elements than the illustrated embodiment. Moreover, it is even possible that the distal par-elliptical wall **141**, the two arcuate rows **142-143**, and the proximal par-elliptical wall **144** be formed as a single cleaning element wall.

[0022] The prophylaxis cup **171** is formed by three arcuate elastomeric wall sections **171a-c**. Similarly, the prophylaxis cup **173** is formed by three arcuate elastomeric wall sections **172a-c**. The central prophylaxis cup **172** is formed by two arcuate elastomeric wall sections **172a-b**. Of course, each of the prophylaxis cups **171-173** can be constructed by more or less sections than the illustrated embodiment and can be constructed of other materials, such as densely packed bristles. Suitable elastomeric materials include any biocompatible resilient material suitable for uses in an oral hygiene apparatus. To provide optimum comfort as well as cleaning benefits, the elastomeric material preferably has a hardness property in the range of A10 to A40 Shore hardness, and preferably A25 Shore hardness. One preferred elastomeric material is styrene-ethylene/butylene-styrene block copolymer (SEBS) manufactured by GLS Corporation. Nevertheless, SEBS material from other manufacturers or other materials within and outside the noted hardness range could be used.

[0023] All of the prophylaxis cups **171-173** are arranged within a loop, which is preferably a substantially closed loop, formed by the first set of cleaning elements **140** (which will be discussed in greater detail below). The prophylaxis cups **171-173** are also arranged along the longitudinal axis **A-A** of the head. The prophylaxis cup **172** is also located on the lateral axis **C-C** of the head **120**.

[0024] In further relation to the first set of cleaning el-

ements **140**, the prophylaxis cup **171** is located within the distal par-elliptical wall **141** and the prophylaxis cup **173** is located within the proximal par-elliptical wall **144**. The prophylaxis cup **172** is centrally located between the two arcuate rows **142-143**.

[0025] An elongated central cleaning element **181-183** is located within each of the prophylaxis cups **171-173** and extends upward from the first surface **121** of the head **120** in a substantially normal manner. Specifically, the central cleaning element **181** is located within the prophylaxis cup **171** and extends along a central axis **X-X** of the prophylaxis cup **171**. The central cleaning element **182** is located within the prophylaxis cup **172** and extends along a central axis **Y-Y** of the prophylaxis cup **172**. The central cleaning element **183** is located within the prophylaxis cup **173** and extends along a central axis **Z-Z** of the prophylaxis cup **173**. Each of the elongated cleaning elements **181-183** is preferably taller than its respective prophylaxis cup **171-173** and extends above its top surface. Each of the elongated central cleaning elements **181-183** terminate in a cleaning end that is preferably a cone-like tip. Of course, the invention is not so limited and the cleaning ends of the central cleaning elements **181-183** can take on other shapes. The central cleaning elements **181-183** are preferably densely packed bristle tufts but can be elastomeric fingers if desired. In some embodiments of the invention, the elongated cleaning elements **181-183** may be omitted all together.

[0026] A first pair of elongated cleaning elements **191a-b** is also located within the substantially closed loop formed by the first set **140** of cleaning elements. The first pair of elongated cleaning elements **191a-b** is located between the first prophylaxis cup **171** and the second prophylaxis cup **172**. Similarly, a second pair of elongated cleaning elements **192a-b** is located within the substantially closed loop formed by the first set **140** of cleaning elements. The second pair of elongated cleaning elements **192a-b** is located between the second prophylaxis cup **172** and the second prophylaxis cup **173**.

[0027] Referring solely now to FIG. 7, the details of the front profile of the first set **140** of cleaning elements will be discussed. Collectively, the distal par-elliptical wall **141** of cleaning elements, the two arcuate rows **142-143** of cleaning elements, and the proximal par-elliptical wall **144** form a substantially closed-loop that extends from the distal periphery **124** of the head **120** to the proximal periphery **127** of the head **120**. The substantially closed-loop formed by the distal par-elliptical wall **141** of cleaning elements, the two arcuate rows **142-143** of cleaning elements, and the proximal par-elliptical wall **144** is also symmetrically located along the longitudinal axis **A-A** of the head **120**. As best visible in FIG. 7, the substantially closed-loop resembles a racetrack in shape. Of course, other shapes can be utilized in certain alternative embodiments.

[0028] The distal par-elliptical wall **141** circumferentially extends from a first end **241a** to a second end **241b**. The distal par-elliptical wall **141** circumferentially extends

at least 180 degrees, and in the illustrated embodiment extends about 180 degrees. The proximal par-elliptical wall **144** circumferentially extends from a first end **244a** to a second end **244b**. The proximal par-elliptical wall **144** circumferentially extends at least 180 degrees, and in the illustrated embodiment extends about 180 degrees.

**[0029]** The first arcuate row **142** extends from the first end **241a** of the distal par-elliptical wall **141** to the first end **244a** of the proximal par-elliptical wall **144**. Similarly, the second arcuate row **143** extends from the second end **241b** of the distal par-elliptical wall **141** to the second end **244a** of the proximal par-elliptical wall **144**. The first and second arcuate rows **142**, **143** are arranged on the head **120** so as to be symmetrically located about both the longitudinal axis **A-A** and the lateral axis **C-C** of the head. The first and second arcuate rows **142**, **143** are separated by a distance **D** that increases with distance from the lateral axis **C-C**. The arcuate rows **142**, **143** are arranged so that their convex peripheral surfaces oppose one another.

**[0030]** Referring now to FIGS. 7-9 concurrently, the details of the second and third sets **150**, **160** of cleaning elements will be discussed, along with their relationship to the first set **140** of cleaning elements and the head **120**. As mentioned above, the third and second sets **150**, **160** of cleaning elements are arranged in rows along the first and second lateral peripheries **125**, **126** of the head **120** respectively. The cleaning elements **160a-e** extend from the first surface **121** of the head **120** at a non-normal angle  $\Theta$  so that the cleaning elements **160a-e** extend from the first surface **121** of the head **120** so as to diverge from the second row **143** of cleaning elements (which preferably extend from the first surface **121** at a substantially normal angle). Similarly, the cleaning elements **150a-e** extend from the first surface **121** of the head **120** at a non-normal angle  $\Theta$  so that the cleaning elements **150a-e** extend from the first surface **121** of the head **120** so as to diverge from the first row **142** of cleaning elements (which preferably extend from the first surface **121** at a substantially normal angle). Preferably, the angle  $\Theta$  is in the range of 1 to 15 degrees, and most preferably 4 degrees.

**[0031]** A longitudinal channel **165** is formed between the third set **160** of cleaning elements **160a-e** and the third row **143** of cleaning elements **143a-c**. Similarly, a longitudinal channel **155** is formed between the second set **150** of cleaning elements **150a-e** and the second row **142** of cleaning elements **142a-c**. The longitudinal channels **155**, **165** provides a cavity for receiving and retaining dentifrice during oral care.

**[0032]** The cleaning elements **160a-e** of the third set **160** terminate in cleaning ends **161a-e**. The cleaning ends **161a-e** are preferably tapered so as to form a longitudinal edge **162** along the row formed by the third set **160** of cleaning elements **160a-e**. Similarly, the cleaning elements **150a-e** of the second set **150** terminate in cleaning ends **151a-e**. The cleaning ends **151a-e** are

preferably tapered so as to form a second longitudinal edge **152** along the row formed by the third set **150** of cleaning elements **150a-e**. The tapered and inclined nature of the second and third rows **150**, **160** of cleaning elements **150a-e**, **160a-e** not only affords increased cleaning of the teeth along the gum line during brushing but also provides a means by which to direct dentifrice into those areas.

**[0033]** As best visible in FIG. 9, the second and third sets **150**, **160** of cleaning elements **150a-e**, **160a-e** are taller than the second and third rows **142**, **143** of cleaning elements **142-c**, **143a-c** respectively. Stated another way, the second and third sets **150**, **160** of cleaning elements **150a-e**, **160a-e** have a height that is greater than the height of the second and third rows **142**, **143** of cleaning elements **142-c**, **143a-c** respectively. As used herein, a height is the normal distance from the first surface **121** of the head **120** to the uppermost portion of the subject element.

**[0034]** Referring now to FIGS. 7 and 9 concurrently, as discussed above, the prophylaxis cup **171** is located within the distal par-elliptical wall **141** and the prophylaxis cup **173** is located within the proximal par-elliptical wall **144**. As a result an annular channel **195** exists between the prophylaxis cup **171** and the distal par-elliptical wall **141**. Similarly, an annular channel **196** exists between the prophylaxis cup **173** and the proximal par-elliptical wall **144**. These annular channels **195**, **196** provide cavities for receiving and further retaining dentifrice during oral care.

**[0035]** As can be seen in FIG. 9, the distal-most portion of the first par-elliptical wall **141** extends upward from the first surface **121** of the head **120** in an inclined manner at an angle  $\beta$  away from the handle **110**. Preferably, the angle  $\beta$  is in the range of 1 to 15 degrees, and most preferably 4 degrees. Conversely, the proximal-most portion of the second par-elliptical wall **144** extends upward from the first surface **121** of the head **120** in an inclined manner at an angle  $\Phi$  toward the handle **110**. Preferably, the angle  $\Phi$  is in the range of 1 to 15 degrees, and most preferably 4 degrees.

**[0036]** Referring now to FIGS. 7 and 10 concurrently, the contour of the substantially closed-loop formed by the first set **140** of cleaning elements will be discussed. FIG. 10 illustrates a simplified longitudinal side profile of the top surface of the substantially closed-loop formed by distal par-elliptical wall **141**, the two arcuate rows **142-143**, and the proximal par-elliptical wall **144**. As can be seen, the top surface **149** has a lateral side profile comprising a concave section **40** that extends from a peak **P** at a distal-most point of the distal par-elliptical wall **141** to a transition point **T** at a middle-portion of the two arcuate rows **142-143**. The lateral side profile also comprises a convex section **50** that extends from the transition point **T** to a proximal-most point **F** of the second par-elliptical wall **144**. The longitudinal side profile is essentially a stretched out S-shape.

**[0037]** Described another way, the first par-elliptical

wall 141 has a first height H1 at the first and second ends 241a,b and a peak height HP at the location where the first par- elliptical wall 144 intersects (or hypothetically would intersect) the longitudinal axis A-A. The first par- elliptical wall 144 slopes upward from the first height H1 to the peak height HP moving from the first and second ends 241a,b to the location P where the first par- elliptical wall intersects the longitudinal axis A-A. When moving from the first par- elliptical wall 141 to the second par- elliptical wall 144, the height of the first and second rows 142, 143 slopes downward for first a portion until a height H2 is reached. After this, the height of the first and second rows 142, 143 then slopes upward for a second portion until a height H3 is reached. At all points, the second par- elliptical wall 144 preferably has a height that is greater than the height H2 and less than the peak height HP.

**[0038]** While a number of embodiments of the current invention have been described and illustrated in detail, various alternatives and modifications will become readily apparent to those skilled in the art without departing from the scope of the invention. As various changes could be made in the above methods, compositions and structures without departing from the scope of the invention, it is intended that all matter contained in this application, including all mechanisms and/or modes of interaction described above, shall be interpreted as illustrative only and not limiting in any way the scope of the appended claims.

## Claims

### 1. A toothbrush (100) comprising:

a handle (110):

a head (120) connected to the handle (110), the head (120) having a proximal periphery (127), a distal periphery (124), a first surface (121), a longitudinal axis (A-A) and a lateral axis (C-C);

a first set (140) of cleaning elements forming a loop that extends from the distal periphery (124) of the head (120) to the proximal periphery (127) of the head (120), the first set (140) of cleaning elements comprising:

a first par-elliptical wall (141) of cleaning elements located at the distal periphery (124) of the head (120), the first par-elliptical wall (141) terminating in a first end (241a) and a second end (241b);

a second par-elliptical wall (144) of cleaning elements located at the proximal periphery (127) of the head (120), the second par-elliptical wall (144) terminating in a first end (244a) and a second end (244b);

a first row (142) of cleaning elements extending from the first end (241a) of the first par-elliptical wall (141) to the first end (244a) of the second par-elliptical wall (144); and

a second row (143) of cleaning elements extending from the second end (241b) of the first par-elliptical wall (141) to the second end (244b) of the second par-elliptical wall (144);

a third row (150) of cleaning elements extending adjacent to the first row (142) and located along a first lateral periphery (125) of the head (120), the third row (150) located outside of the loop, the third row (150) extending upward from the first surface (121) at an incline so as to diverge from the first row (142); and

a fourth row (160) of cleaning elements extending adjacent to the second row (143) and located along a second lateral periphery (126) of the head (120), the fourth row (160) located outside of the loop, the fourth row (160) extending upward from the first surface (121) at an incline so as to diverge from the second row (143),

**characterized in that** the first and second rows (142, 143) of cleaning elements have convex peripheral surfaces that oppose one another, the third row (150) having a height that is greater than a height of the first row (142), and the fourth row (160) having a height that is greater than a height of the second row (143).

**2.** The toothbrush (100) of claim 1 wherein the first and second rows (142, 143) are symmetrically arranged about the longitudinal axis (A-A) and the lateral axis (C-C) of the head (120), the first and second rows (142, 143) separated by a first distance that increases with distance from the lateral axis (C-C).

**3.** The toothbrush (100) of claim 1 further comprising:

wherein the first par-elliptical wall (141) has a first height (H1) at the first and second ends (241a,b) of the first par-elliptical wall (141) and a peak height (HP) at a location where the first par-elliptical wall (144) intersects the longitudinal axis (A-A), the first par-elliptical wall (141) sloping upward from the first height (H1) to the peak height (HP) moving from the first and second ends (241a,b) of the first par-elliptical wall (141) to the location where the first par-elliptical wall (141) intersects the longitudinal axis (A-A); wherein moving from the first par-elliptical wall (141) to the second par-elliptical wall (144), the

- height of the first and second rows (142, 143) slopes downward for a first portion and then slopes upward for a second portion; and wherein the second par-elliptical wall (144) has a height that is less than the peak height (HP). 5
4. The toothbrush (100) of claim 3 wherein the third and fourth rows (150, 160) of cleaning elements have top surfaces that are tapered so as to form a first and second lateral edges respectively. 10
5. The toothbrush (100) of claim 1 wherein the first and second rows (142, 143) are arcuate walls and wherein the third and fourth rows (150, 160) are symmetrically arranged about the longitudinal and lateral axes (A-A, C-C) of the head (120), optionally wherein a first channel (155) is formed between the first and third rows (142, 150) and a second channel (165) is formed between the second and fourth rows (143, 160). 15  
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6. The toothbrush (100) of claim 1 further comprising:
- wherein the third row (150) has a first end and as second end, the third row (150) extending so that the first end of the third row (150) is adjacent an outer surface of the first par-elliptical wall (141) and the second end of the third row (150) is adjacent an outer surface of the second par-elliptical wall (144); and 25  
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- wherein the fourth row (160) has a first end and as second end, the fourth row (160) extending so that the first end of the fourth row (160) is adjacent an outer surface of the first par-elliptical wall (141) and the second end of the fourth row (160) is adjacent an outer surface of the second par-elliptical wall (144). 35
7. The toothbrush (100) of claim 1 wherein the first and second par-elliptical walls (141, 144) are at least 180 degrees in circumference. 40
8. The toothbrush (100) of claim 1 further comprising:
- a first prophylaxis cup (171) located within the first par-elliptical wall (141); 45  
a second prophylaxis cup (172) located between the first and second rows (142, 143); and  
a third prophylaxis cup (173) located within the second par-elliptical wall (144). 50
9. The toothbrush (100) of claim 8 further comprising a first annular gap (195) between the first prophylaxis cup (171) and the first par-elliptical wall (141) and a second annular gap (195) between the second prophylaxis cup (172) and the second par-elliptical wall (144). 55
10. The toothbrush (100) of claim 8 wherein the first, second and third prophylaxis cups (171-173) are located along the longitudinal axis (A-A) of the head (120).
11. The toothbrush (100) of claim 8 further comprising:
- a first elongated cleaning element (181) extending along a central axis of the first prophylaxis cup (171) that is taller than the first prophylaxis cup (171);  
a second elongated cleaning element (182) extending along a central axis of the second prophylaxis cup (172) that is taller than the second prophylaxis cup (172); and  
a third elongated cleaning element (183) extending along a central axis of the third prophylaxis cup (173) that is taller than the third prophylaxis cup (173).
12. The toothbrush (100) of claim 11 wherein the first and third prophylaxis cups (171, 173) are formed by three arcuate wall sections (171a-c, 173a-c), and the second prophylaxis cup (172) is formed by two arcuate wall sections (172a, b).
13. The toothbrush (100) of claim 8 further comprising a first pair of elongated cleaning elements (191a, b) located between the first and second prophylaxis cups (171, 172) within the loop and a second pair of elongated cleaning elements (192a, b) located between the second and third prophylaxis cups (172, 173) within the loop.
14. The toothbrush (100) of claim 1 further comprising wherein the loop is substantially closed.
15. The toothbrush (100) of claim 1 wherein a distal-most portion of the first par-elliptical wall (141) of cleaning elements extends upward from the first surface (121) of the head (120) in an inclined manner away from the handle (110); and wherein a proximal-most portion of the second par-elliptical wall (144) of cleaning elements extends upward from the first surface (121) of the head (120) in an inclined manner toward the handle (110).

## Patentansprüche

1. Zahnbürste (100), umfassend:  
einen Griff (110):

einen Kopf (120), der mit dem Griff (110) verbunden ist, wobei der Kopf (120) einen proximalen Umfang (127), einen distalen Umfang (124), eine erste Oberfläche (121), eine Längsachse (A-A) und eine Querachse (C-C) aufweist;

einen ersten Satz (140) Reinigungselemente, die eine Schleife bilden, die sich vom distalen Umfang (124) des Kopfes (120) zum proximalen Umfang (127) des Kopfes (120) erstreckt, wobei der erste Satz (140) Reinigungselemente umfasst:

eine erste teilelliptische Wand (141) von Reinigungselementen, die am distalen Umfang (124) des Kopfes (120) angeordnet ist, wobei die erste teilelliptische Wand (141) an einem ersten Ende (241a) und an einem zweiten Ende (241b) endet;

eine zweite teilelliptische Wand (144) von Reinigungselementen, die am proximalen Umfang (127) des Kopfes (120) angeordnet ist, wobei die zweite teilelliptische Wand (144) an einem ersten Ende (244a) und an einem zweiten Ende (244b) endet;

eine erste Reihe (142) Reinigungselemente, die sich vom ersten Ende (241a) der ersten teilelliptischen Wand (141) zum ersten Ende (244a) der zweiten teilelliptischen Wand (144) erstreckt; und

eine zweite Reihe (143) Reinigungselemente, die sich vom zweiten Ende (241b) der ersten teilelliptischen Wand (141) zum zweiten Ende (244b) der zweiten teilelliptischen Wand (144) erstreckt;

eine dritte Reihe (150) Reinigungselemente, die sich neben der ersten Reihe (142) erstreckt und entlang einem ersten Seitenumfang (125) des Kopfes (120) angeordnet ist, wobei sich die dritte Reihe (150) außerhalb der Schleife befindet, wobei sich die dritte Reihe (150) von der ersten Oberfläche (121) schräg nach oben erstreckt, so dass sie von der ersten Reihe (142) absteht; und eine vierte Reihe (160) Reinigungselemente, die sich neben der zweiten Reihe (143) erstreckt und entlang einem zweiten Seitenumfang (126) des Kopfes (120) angeordnet ist, wobei sich die vierte Reihe (160) von der ersten Oberfläche (121) schräg nach oben erstreckt, so dass sie von der zweiten Reihe (143) absteht,

**dadurch gekennzeichnet, dass** die erste und die zweite Reihe (142, 143) Reinigungselemente einander gegenüberliegende konvexe Umfangsflächen haben, wobei die Höhe der dritten Reihe (150) größer ist als die Höhe der ersten Reihe (142) und wobei die Höhe der vierten Reihe (160) größer ist als die Höhe der zweiten Reihe (143).

2. Zahnbürste (100) nach Anspruch 1, wobei die erste und die zweite Reihe (142, 143) symmetrisch um die

Längsachse (A-A) und die Querachse (C-C) des Kopfes (120) angeordnet sind, und die erste und die zweite Reihe (142, 143) um einen ersten Abstand getrennt sind, der sich mit dem Abstand zur Querachse (C-C) vergrößert.

3. Zahnbürste (100) nach Anspruch 1, weiter umfassend:

wobei die erste teilelliptische Wand (141) eine erste Höhe (H1) am ersten und am zweiten Ende (241a, b) der ersten teilelliptischen Wand (141) hat, und eine Spitzenhöhe (HP) an einer Stelle, wo die erste teilelliptische Wand (144) die Längsachse (A-A) schneidet, wobei die erste teilelliptische Wand (141) von der ersten Höhe (H1) zur Spitzenhöhe (HP) schräg nach oben vom ersten und zweiten Ende (241a, b) der ersten teilelliptischen Wand (141) bis zu der Stelle, an der die erste teilelliptische Wand (141) die Längsachse (A-A) schneidet, verläuft;

wobei die Höhe der ersten und der zweiten Reihe (142, 143) von der ersten teilelliptischen Wand (141) zur zweiten teilelliptischen Wand (144) über einen ersten Abschnitt schräg nach unten und dann über einen zweiten Abschnitt schräg nach oben verläuft; und

wobei die Höhe der zweiten teilelliptischen Wand (144) kleiner ist als die Spitzenhöhe (HP).

4. Zahnbürste (100) nach Anspruch 3, wobei die dritte und die vierte Reihe (150, 160) Reinigungselemente obere Oberflächen haben, die konisch geformt sind, so dass sie einen ersten bzw. einen zweiten Seitenrand bilden.

5. Zahnbürste (100) nach Anspruch 1, wobei die erste und die zweite Reihe (143, 143) bogenförmige Wände sind, und wobei die dritte und die vierte Reihe (150, 160) symmetrisch um die Längs- und die Querachse (A-A, C-C) des Kopfes (120) angeordnet sind, wobei wahlweise ein erster Kanal (155) zwischen der ersten und der dritten Reihe (142, 150) und ein zweiter Kanal (165) zwischen der zweiten und der vierten Reihe (143, 160) ausgebildet ist.

6. Zahnbürste (100) nach Anspruch 1, weiter umfassend:

wobei die dritte Reihe (150) ein erstes Ende und ein zweites Ende hat, wobei die dritte Reihe (150) sich so erstreckt, dass das erste Ende der dritten Reihe (150) neben einer Außenoberfläche der ersten teilelliptischen Wand (141) liegt, und wobei das zweite Ende der dritten Reihe (150) neben einer Außenoberfläche der zweiten teilelliptischen Wand (144) liegt; und wobei die vierte Reihe (160) ein erstes Ende und

- ein zweites Ende hat, wobei die vierte Reihe (160) sich so erstreckt, dass das erste Ende der vierten Reihe (160) neben einer Außenoberfläche der ersten teilelliptischen Wand (141) liegt, und wobei das zweite Ende der vierten Reihe (160) neben einer Außenoberfläche der zweiten teilelliptischen Wand (144) liegt.
7. Zahnbürste (100) nach Anspruch 1, wobei die erste und die zweite teilelliptische Wand (141, 144) sich an ihrem Umfang über mindestens 180° erstrecken.
8. Zahnbürste (100) nach Anspruch 1, weiter umfassend:
- einen ersten Prophylaxe-Napf (171) in der ersten teilelliptischen Wand (141);  
einen zweiten Prophylaxe-Napf (172) zwischen der ersten und der zweiten Reihe (142, 143);  
und  
einen dritten Prophylaxe-Napf (173) in der zweiten teilelliptischen Wand (144).
9. Zahnbürste (100) nach Anspruch 8, die weiter einen ersten Ringspalt (195) zwischen dem ersten Prophylaxe-Napf (171) und der ersten teilelliptischen Wand (141) und einen zweiten Ringspalt (195) zwischen dem zweiten Prophylaxe-Napf (172) und der zweiten teilelliptischen Wand (144) umfasst.
10. Zahnbürste (100) nach Anspruch 8, wobei der erste, der zweite und der dritte Prophylaxe-Napf (171 bis 173) entlang der Längsachse (A-A) des Kopfes (120) angeordnet sind.
11. Zahnbürste (100) nach Anspruch 8, weiter umfassend:
- ein erstes längliches Reinigungselement (181), das sich entlang einer Mittelachse des ersten Prophylaxe-Napfes (171) erstreckt und höher ist als der erste Prophylaxe-Napf (171);  
ein zweites längliches Reinigungselement (182), das sich entlang einer Mittelachse des zweiten Prophylaxe-Napfes (172) erstreckt und höher ist als der zweite Prophylaxe-Napf (172);  
und  
ein drittes längliches Reinigungselement (183), das sich entlang einer Mittelachse des dritten Prophylaxe-Napfes (173) erstreckt und höher ist als der dritte Prophylaxe-Napf (173).
12. Zahnbürste (100) nach Anspruch 11, wobei der erste und der dritte Prophylaxe-Napf (171, 173) aus drei bogenförmigen Wandabschnitten (171a-c, 173a-c) gebildet sind und der zweite Prophylaxe-Napf (172) aus zwei bogenförmigen Wandabschnitten (172a, b) gebildet ist.
13. Zahnbürste (100) nach Anspruch 8, die weiter ein erstes Paar länglicher Reinigungselemente (191a, b) umfasst, das in der Schleife zwischen dem ersten und dem zweiten Prophylaxe-Napf (171, 172) angeordnet ist, und ein zweites Paar länglicher Reinigungselemente (192a, b) umfasst, das in der Schleife zwischen dem zweiten und dem dritten Prophylaxe-Napf (172, 173) angeordnet ist.
14. Zahnbürste (100) nach Anspruch 1, wobei die Schleife im Wesentlichen geschlossen ist.
15. Zahnbürste (100) nach Anspruch 1, wobei sich ein am weitesten distal angeordneter Abschnitt der ersten teilelliptischen Wand (141) von Reinigungselementen von der ersten Oberfläche (121) des Kopfes (120) vom Griff (110) weg schräg nach oben erstreckt; und wobei sich ein am weitesten proximal angeordneter Abschnitt der zweiten teilelliptischen Wand (144) von Reinigungselementen von der ersten Oberfläche (121) des Kopfes (120) zum Griff (110) weg schräg nach oben erstreckt.

## 25 Revendications

### 1. Brosse à dents (100) comprenant :

un manche (110) ;  
une tête (120) connectée au manche (110), la tête (120) ayant une périphérie proximale (127), une périphérie distale (124), une première surface (121), un axe longitudinal (A-A) et un axe latéral (C-C) ;  
un premier ensemble (140) d'éléments de nettoyage formant une boucle qui s'étend de la périphérie distale (124) de la tête (120) jusqu'à la périphérie proximale (127) de la tête (120), le premier ensemble (140) d'éléments de nettoyage comprenant :

une première paroi par-elliptique (141) d'éléments de nettoyage située au niveau de la périphérie distale (124) de la tête (120), la première paroi par-elliptique (141) aboutissant dans une première extrémité (241a) et une deuxième extrémité (241b) ;  
une deuxième paroi par-elliptique (144) d'éléments de nettoyage située au niveau de la périphérie proximale (127) de la tête (120), la deuxième paroi par-elliptique (144) aboutissant dans une première extrémité (244a) et une deuxième extrémité (244b) ;  
une première rangée (142) d'éléments de nettoyage s'étendant de la première extrémité (241a) de la première paroi par-elliptique (141) jusqu'à la première extrémité (244a) de la deuxième paroi par-

- elliptique(144) ; et  
une deuxième rangée (143) d'éléments de nettoyage s'étendant de la deuxième extrémité (241b) de la première paroi par-elliptique (141) jusqu'à la deuxième extrémité (244b) de la deuxième paroi par-elliptique(144) ;
- une troisième rangée (150) d'éléments de nettoyage s'étendant adjacente à la première rangée (142) et située le long d'une première périphérie latérale (125) de la tête (120), la troisième rangée (150) située à l'extérieur de la boucle, la troisième rangée (150) s'étendant vers le haut depuis la première surface (121) à une certaine inclinaison de façon à diverger de la première rangée (142) ; et  
une quatrième rangée (160) d'éléments de nettoyage s'étendant adjacente à la deuxième rangée (143) et située le long d'une deuxième périphérie latérale (126) de la tête (120), la quatrième rangée (160) située à l'extérieur de la boucle, la quatrième rangée (160) s'étendant vers le haut depuis la première surface (121) à une certaine inclinaison de façon à diverger de la deuxième rangée (143),  
**caractérisée en ce que** les première et deuxième rangées (142, 143) d'éléments de nettoyage présentent des surfaces périphériques convexes qui s'opposent l'une à l'autre, la troisième rangée (150) ayant une hauteur qui est supérieure à la hauteur de la première rangée (142), et la quatrième rangée (160) ayant une hauteur qui est supérieure à la hauteur de la deuxième rangée (143).
2. Brosse à dents (100) selon la revendication 1, dans laquelle les première et deuxième rangées (142, 143) sont agencées symétriquement autour de l'axe longitudinal (A-A) et de l'axe latéral(C-C) de la tête (120), les première et deuxième rangées (142, 143) séparées par une première distance qui augmente avec une distance à l'axe latéral(C-C).
  3. Brosse à dents (100) selon la revendication 1, comprenant en outre :  
dans laquelle la première paroi par-elliptique (141) a une première hauteur (H1) au niveau des première et deuxième extrémités (241a, 241b) de la première paroi par-elliptique (141) et une hauteur maximale (HP) à un emplacement où la première paroi par-elliptique (144) coupe l'axe longitudinal (A-A), la première paroi par-elliptique (141) étant inclinée vers le haut depuis la première hauteur (H1) jusqu'à la hauteur maximale (HP) en passant des première et deuxième extrémités (241a, 241b) de la première paroi par-elliptique (141) jusqu'à l'endroit où la première paroi par-elliptique (141) coupe l'axe longitudinal (A-A) ;  
dans laquelle en passant de la première paroi par-elliptique (141) à la deuxième paroi par-elliptique (144), la hauteur des première et deuxième rangées (142, 143) s'incline vers le bas pour une première partie, puis s'incline vers le haut pour une deuxième partie ; et  
dans laquelle la deuxième paroi par-elliptique (144) a une hauteur qui est inférieure à la hauteur maximale (HP).
  4. Brosse à dents (100) selon la revendication 3, dans laquelle les troisième et quatrième rangées (150, 160) d'éléments de nettoyage ont des surfaces supérieures qui sont effilées de manière à former respectivement, des premier et deuxième bords latéraux.
  5. Brosse à dents (100) selon la revendication 1, dans laquelle les première et deuxième rangées (142, 143) sont des parois en arc et dans laquelle les troisième et quatrième rangées (150, 160) sont disposées symétriquement par rapport aux axes longitudinal et latéral (A-A, C-C) de la tête (120), éventuellement dans laquelle un premier canal (155) est formé entre les première et troisième rangées (142, 150) et un deuxième canal (165) est formé entre les deuxième et quatrième rangées (143, 160).
  6. Brosse à dents (100) selon la revendication 1 comprenant en outre :  
dans laquelle la troisième rangée (150) a une première extrémité et comme deuxième extrémité, la troisième rangée (150) s'étendant de sorte que la première extrémité de la troisième rangée (150) est adjacente à une surface externe de la première paroi par-elliptique (141) et la deuxième extrémité de la troisième rangée (150) est adjacente à une surface externe de la deuxième paroi par-elliptique (144) ; et  
dans laquelle la quatrième rangée (160) a une première extrémité et comme deuxième extrémité, la quatrième rangée (160) s'étendant de sorte que la première extrémité de la quatrième rangée (160) est adjacente à une surface externe de la première paroi par-elliptique (141) et la deuxième extrémité de la quatrième rangée (160) est adjacente à une surface externe de la deuxième paroi par-elliptique (144).
  7. Brosse à dents (100) selon la revendication 1, dans laquelle les première et deuxième parois par-elliptiques (141, 144) ont une circonférence d'au moins 180 degrés.

8. Brosse à dents (100) selon la revendication 1, comprenant en outre :
- une première cupule de prophylaxie (171) située à l'intérieur de la première paroi par-elliptique (141) ;
  - une deuxième cupule de prophylaxie (172) située entre les première et deuxième rangées (142, 143) ; et
  - une troisième cupule de prophylaxie (173) située à l'intérieur de la deuxième paroi par-elliptique (144).
9. Brosse à dents (100) selon la revendication 8, comprenant en outre un premier espace annulaire (195) entre la première cupule de prophylaxie (171) et la première paroi par-elliptique (141) et un deuxième espace annulaire (195) entre la deuxième cupule de prophylaxie (172) et la deuxième paroi par-elliptique (144).
10. Brosse à dents (100) selon la revendication 8, dans laquelle les première, deuxième et troisième cupules de prophylaxie (171 à 173) sont situées le long de l'axe longitudinal (A-A) de la tête (120).
11. Brosse à dents (100) selon la revendication 8 comprenant en outre :
- un premier élément de nettoyage allongé (181) s'étendant le long d'un axe central de la première cupule de prophylaxie (171) qui est plus haut que la première cupule de prophylaxie (171) ;
  - un deuxième élément de nettoyage allongé (182) s'étendant le long d'un axe central de la deuxième cupule de prophylaxie (172) qui est plus haut que la deuxième cupule de prophylaxie (172) ; et
  - un troisième élément de nettoyage allongé (183) s'étendant le long d'un axe central de la troisième cupule de prophylaxie (173) qui est plus haut que la troisième cupule de prophylaxie (173).
12. Brosse à dents (100) selon la revendication 11, dans laquelle les première et troisième cupules de prophylaxie (171, 173) sont formées par trois sections de paroi en arc (171a à c, 173a à c) et la deuxième cupule de prophylaxie (172) est formée par deux sections de paroi en arc (172a, 172b).
13. Brosse à dents (100) selon la revendication 8, comprenant en outre une première paire d'éléments de nettoyage allongés (191a, 191b) située entre les première et deuxième cupules de prophylaxie (171, 172) à l'intérieur de la boucle et une deuxième paire d'éléments de nettoyage allongés (192a, 192b) située entre les deuxième et troisième cupules de prophylaxie (172, 173) à l'intérieur de la boucle.
14. Brosse à dents (100) selon la revendication 1, comprenant en outre dans laquelle la boucle est sensiblement fermée.
15. Brosse à dents (100) selon la revendication 1, dans laquelle une partie la plus distale de la première paroi par-elliptique (141) d'éléments de nettoyage s'étend vers le haut depuis la première surface (121) de la tête (120) d'une manière inclinée à l'écart du manche (110) ; et dans laquelle une partie la plus proximale de la deuxième paroi par-elliptique (144) d'éléments de nettoyage s'étend vers le haut depuis la première surface (121) de la tête (120) d'une manière inclinée vers la manche (110).

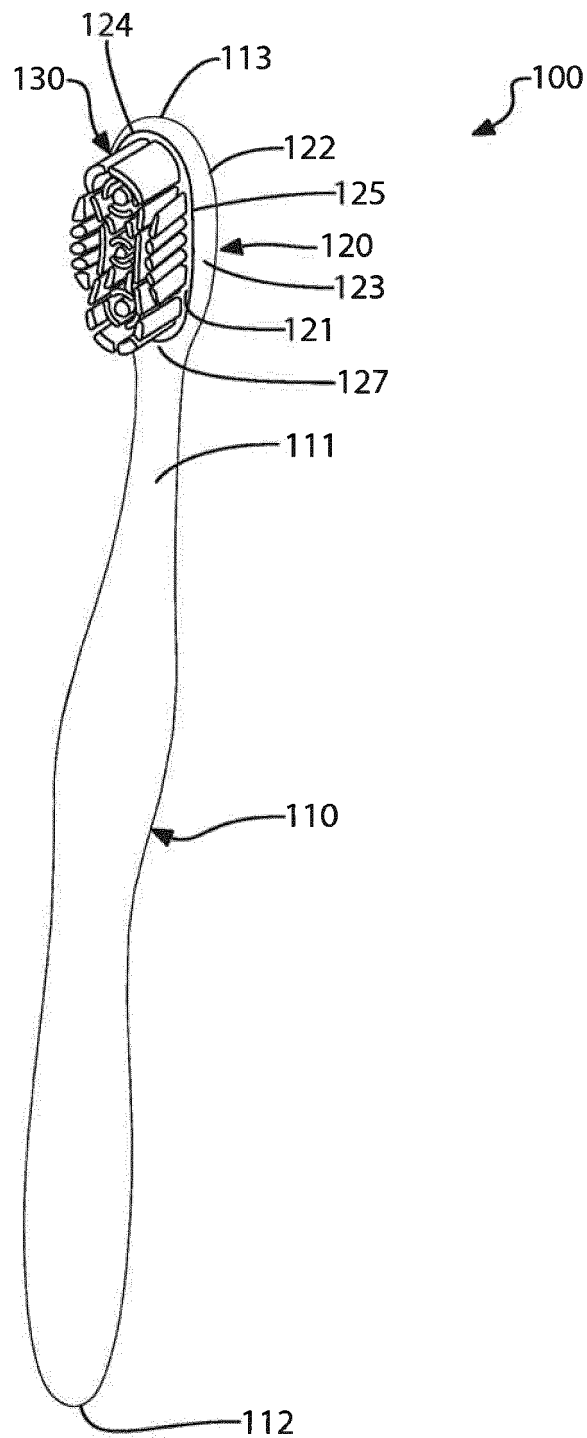


FIG. 1

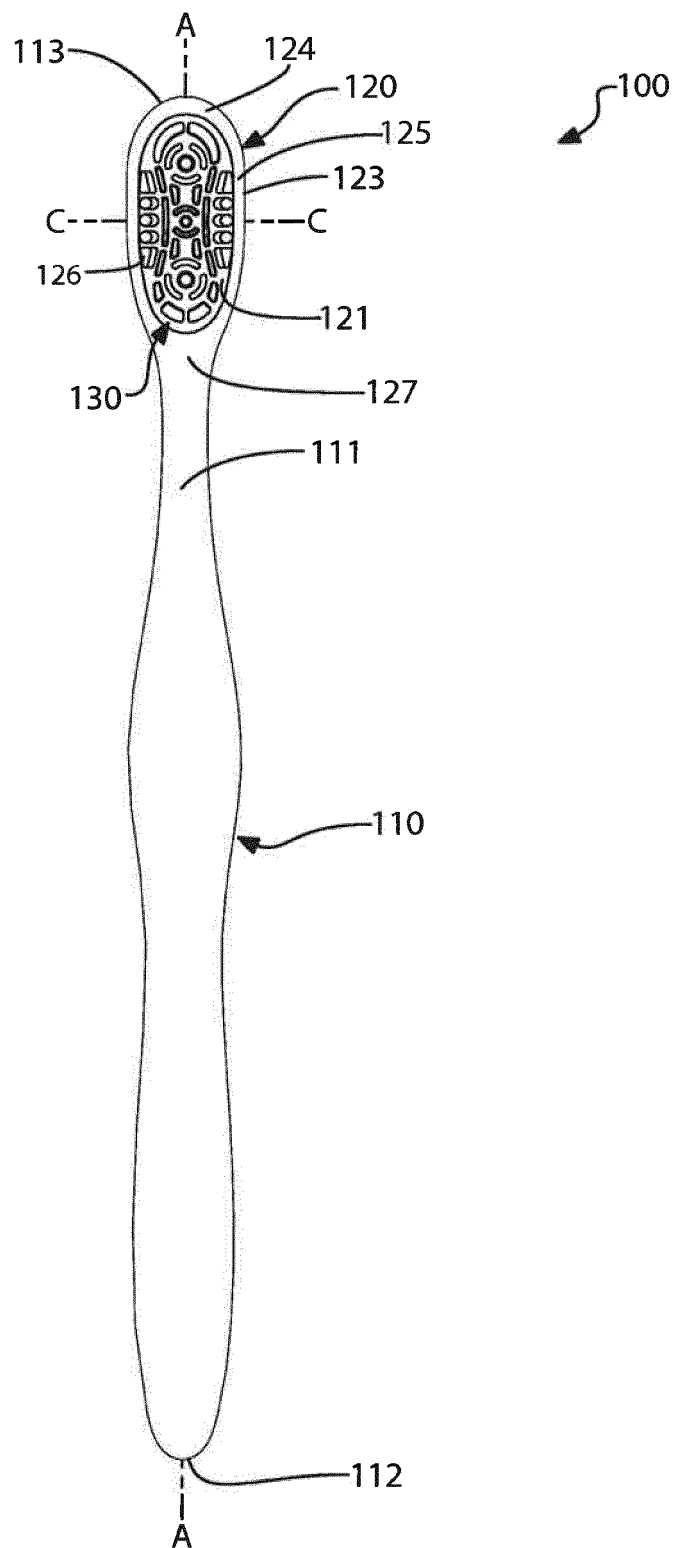


FIG. 2

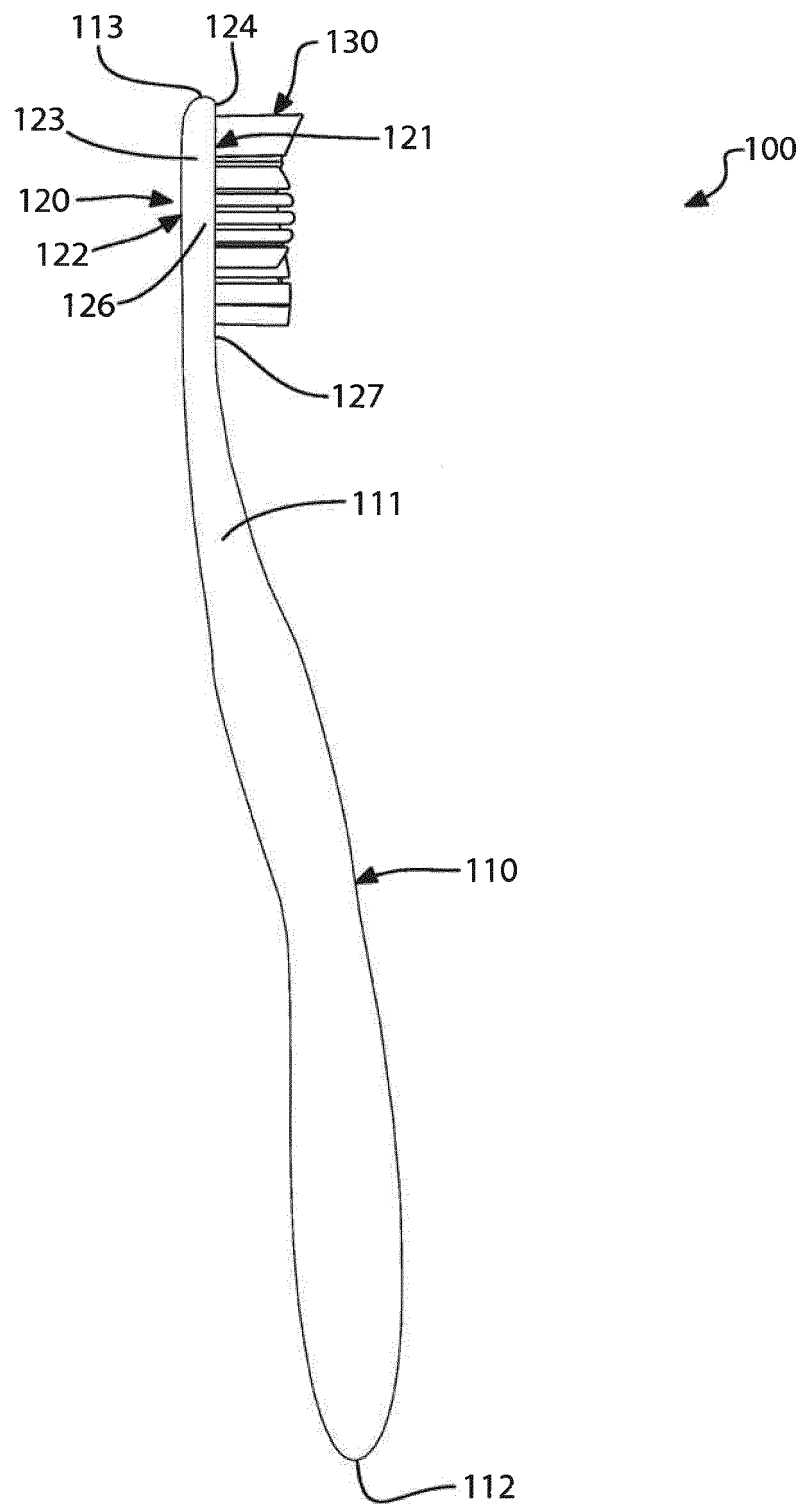


FIG. 3

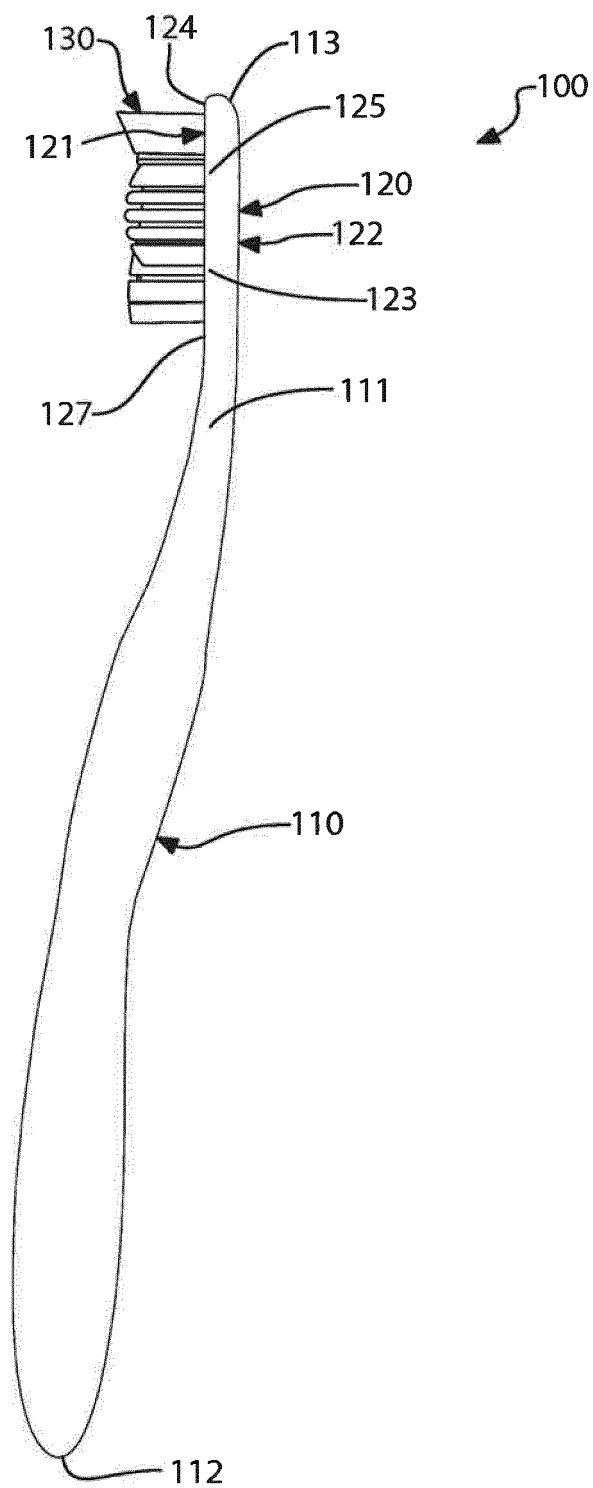


FIG. 4

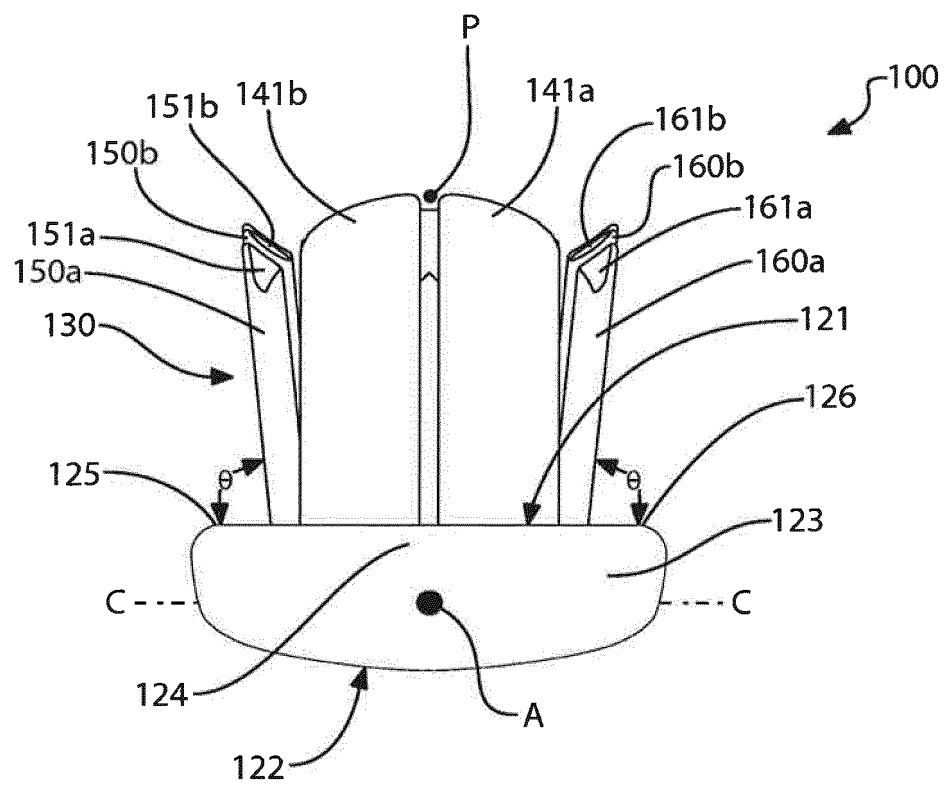


FIG. 5

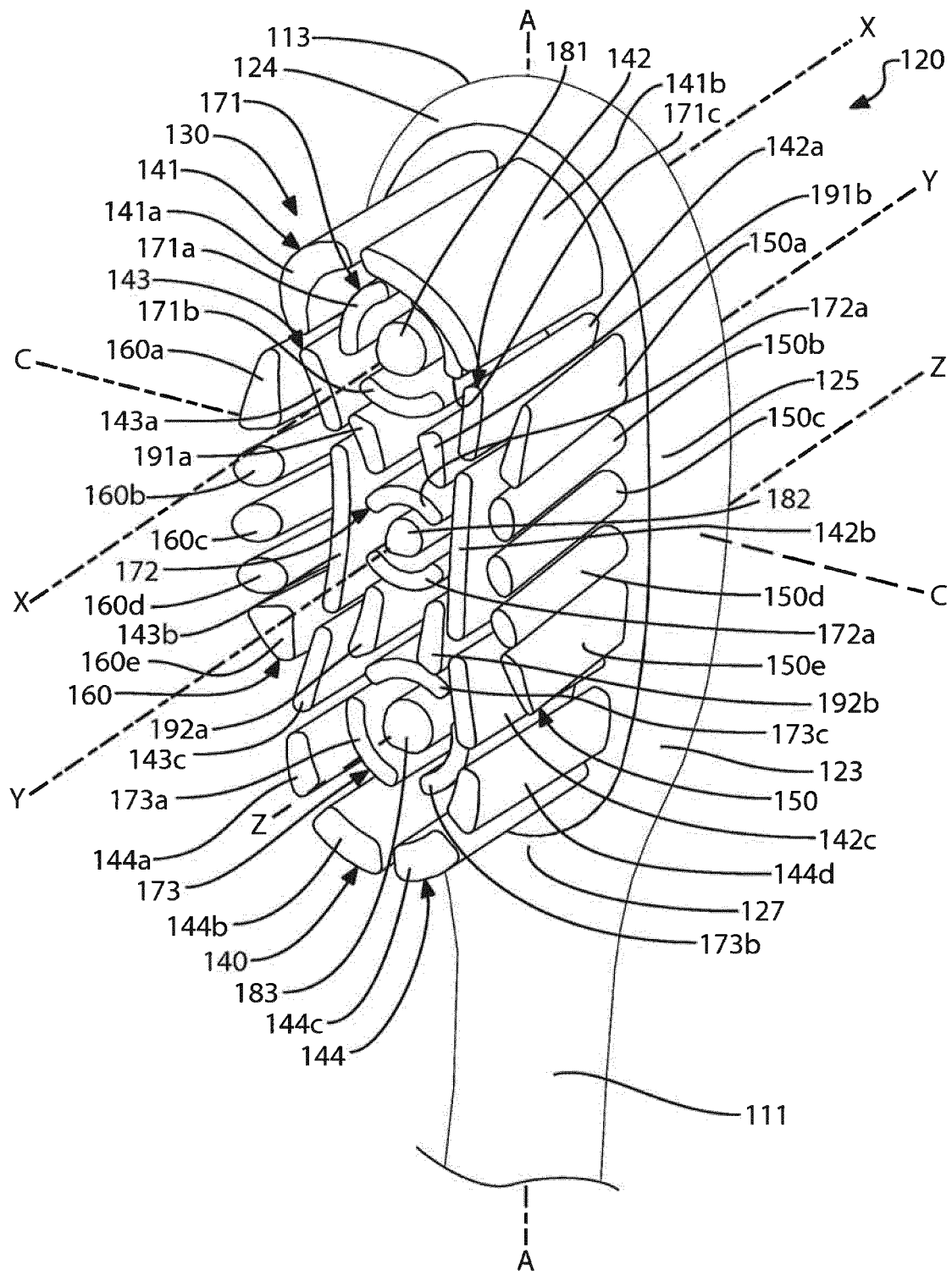


FIG. 6

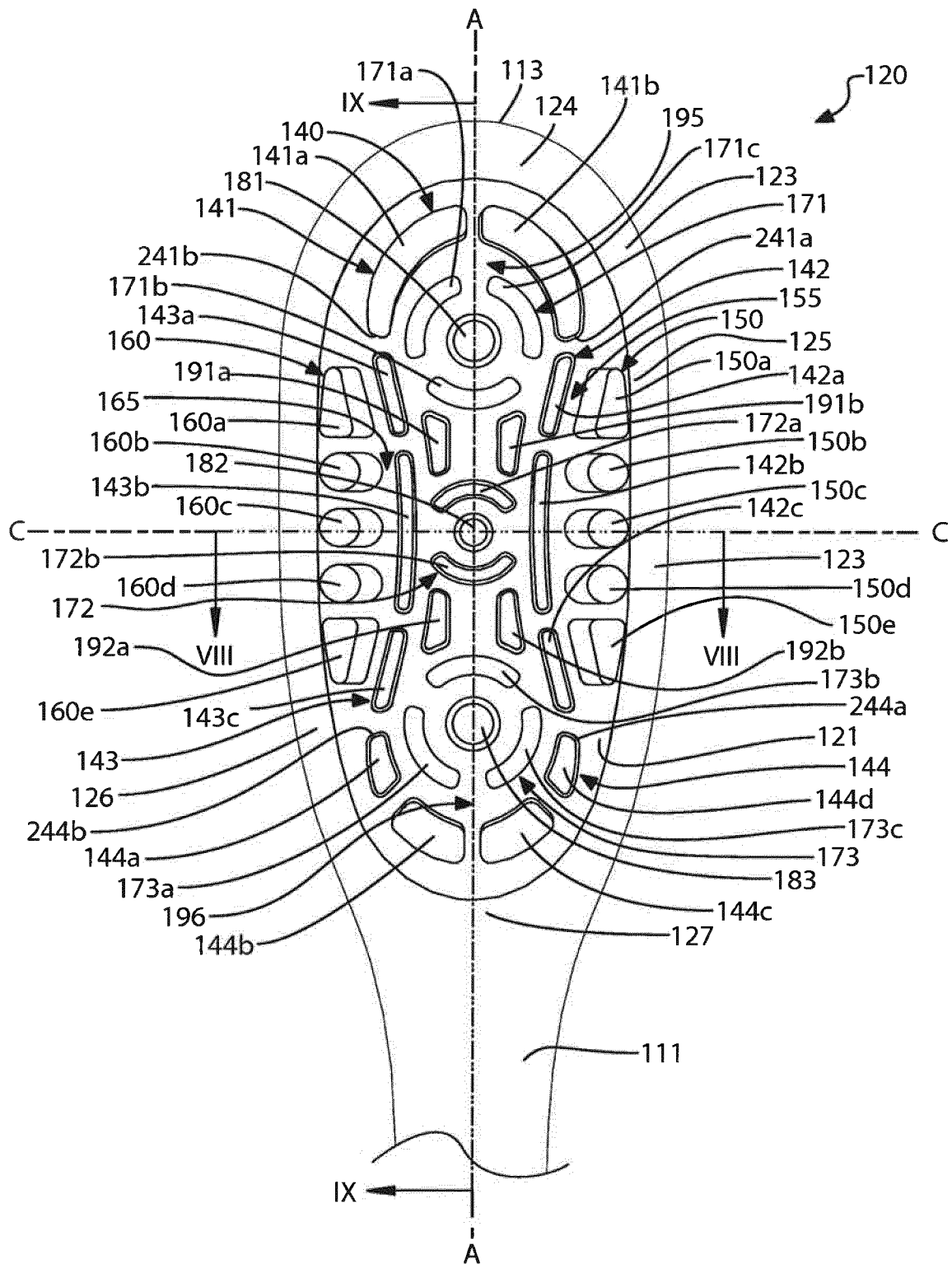


FIG. 7

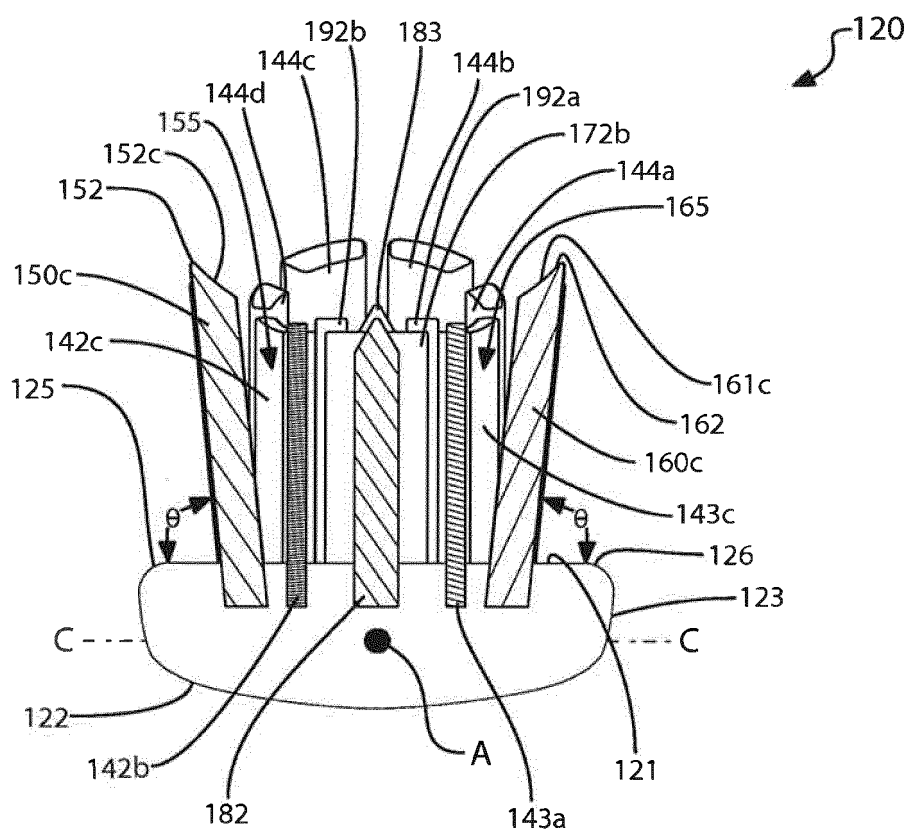


FIG. 8

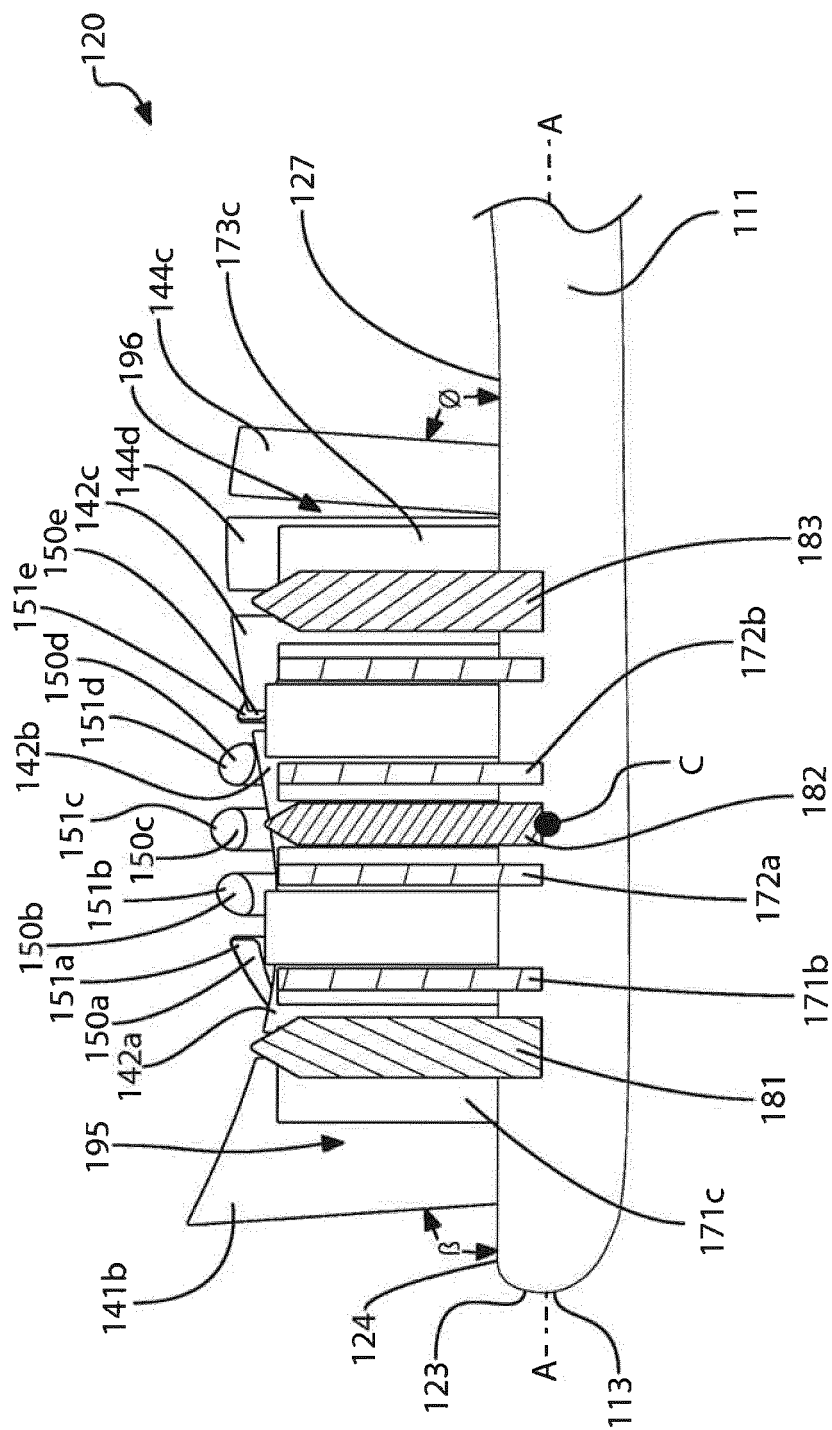


FIG. 9

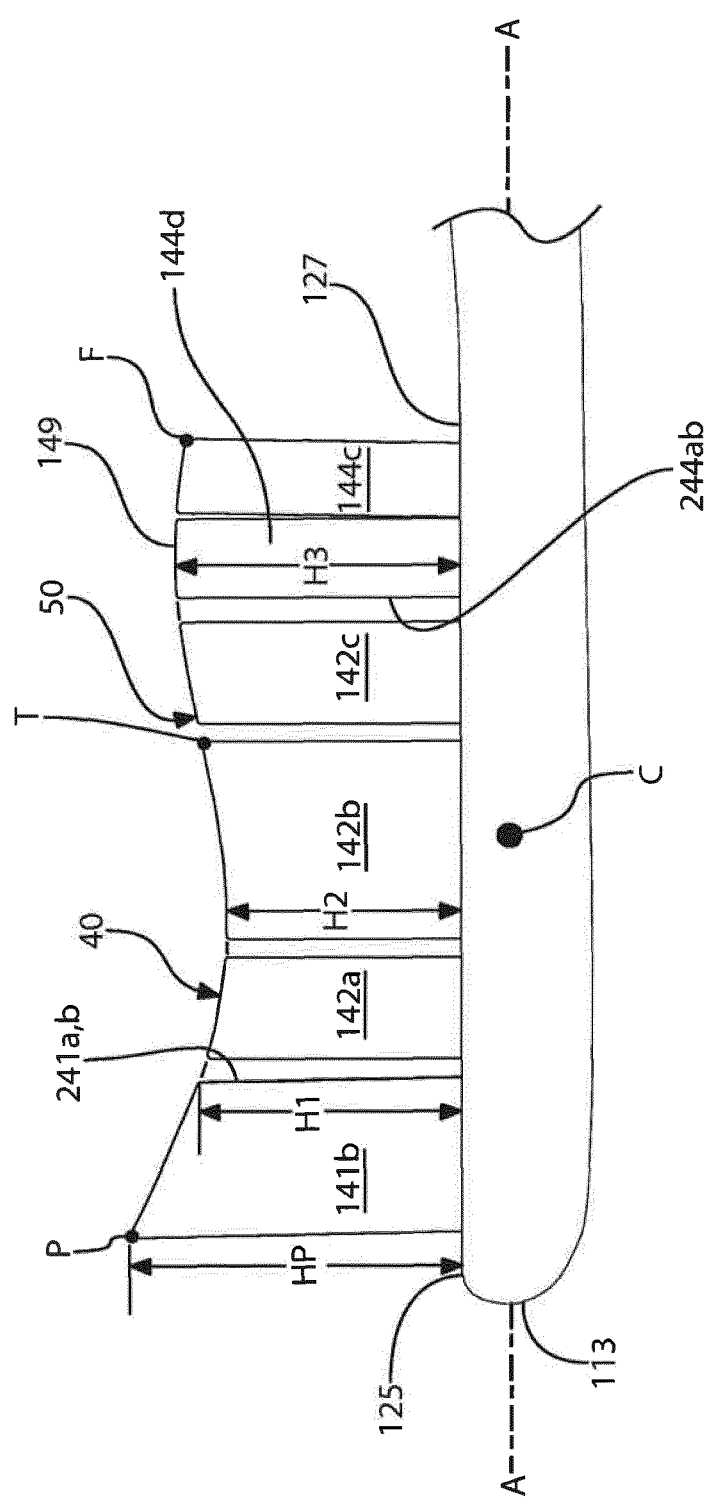


FIG. 10

**REFERENCES CITED IN THE DESCRIPTION**

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