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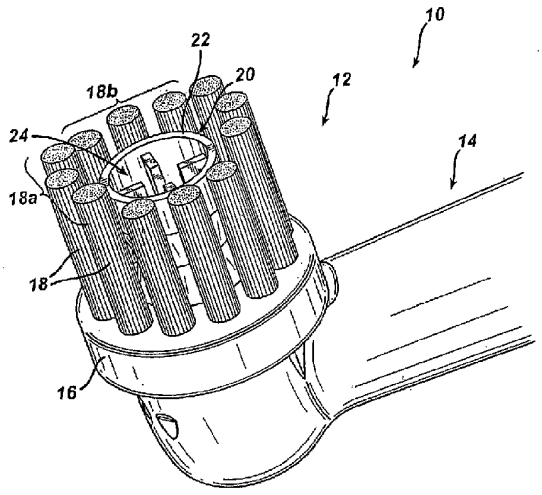

(57) Abstract: Toothbrush heads, e.g., for power toothbrushes, are provided. The toothbrush heads include a support member, a resilient member extending from the support member, and a plurality of tufts of bristles extending from the support member and at least partially surrounding the resilient member. The resilient member may be cup-shaped, fan-shaped, or textured.

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TOOTHBRUSHES

This invention relates to toothbrushes, and more particularly to power toothbrushes.

Power toothbrushes are well known and have been on the market for years. In typical power toothbrushes, tufts of bristles on the brush head extend generally perpendicularly from the top surface of the head. The head is oscillated, rotated and/or translated in order to provide enhanced tooth cleaning capability.

Summary of the Invention

The present invention provides a head for a toothbrush comprising:

a support member,

a resilient member extending from the support member, the resilient member comprising a first plurality of arcuate segments attached to the support member and a second plurality of arcuate segments attached to the support member, each of the first plurality of arcuate segments and the second plurality of arcuate segments having a top edge opposite a surface of the support member, wherein the first plurality of arcuate segments are defined by grooves between the arcuate segments, and wherein the first plurality of arcuate segments are connected to form a unitary structure, wherein the first plurality of arcuate segments are concentrically arranged on the support member, the second plurality of arcuate segments being defined by grooves between the second plurality of arcuate segments, and wherein the second plurality of arcuate segments are connected to form a unitary structure.

Preferably, the top edge is a wavy edge.

Preferably, the second plurality of arcuate segments are arranged concentrically.

Preferably, the height of bristle tufts is greater than the height of the resilient member.

Preferably, the resilient member comprises a material having texture-imparting particles embedded in its surface.

Preferably, the arcuate segments are formed of a thermoplastic elastomer.

Preferably, the arcuate segments have hardness of from 10 to 70 Shore A.

Preferably, the support structure is elliptical.

Preferably, the second plurality of arcuate segments are disposed within an open area in the first plurality of arcuate segments.

Preferably, the first and the second plurality of arcuate segments is surrounded by a plurality of bristle tufts.

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Preferably, each of the plurality of arcuate segments has a height of 5.5 to 10 mm from the surface of the support structure.

Preferably, the first plurality of arcuate segments is positioned off center of the support structure.

Preferably, a plurality of bristle tufts comprises a plurality of curved elongate interdental tufts.

The present invention also provides a tooth cleaning device comprising:

an elongated head sized to fit in an oral cavity, the elongated head having a distal end and a proximal end;

a neck extending from the head, the head having a first surface, the first surface having a midpoint located along a longitudinal axis of the head, the proximal end of the head being adjacent the neck;

a resilient structure having a plurality of curved segments arranged in a substantially circular pattern extending upward from the first surface, the plurality of curved segments being integrally joined to form a unitary structure, wherein a center point of the substantially circular pattern of curved segments is positioned off of the midpoint of the first surface;

a plurality of bristle tufts attached to the head and located outboard of the substantially circular pattern of curved segments.

Preferably, the tooth cleaning device further comprises a second plurality of curved segments arranged in a substantially circular pattern extending upward from the first surface.

Preferably, the plurality of curved segments and the second plurality of curved segments are concentric.

The present invention further provides a tooth cleaning device comprising:

a head sized to fit in an oral cavity, the head having an elongated first surface, the first surface having a midpoint along a longitudinal axis of the head;

a neck extending from the head;

a resilient structure having a plurality of first curved segments extending upward from the first surface and arranged in a substantially first circular pattern, wherein a center of the first substantially circular pattern is positioned off of the midpoint of the first surface, the resilient structure having a plurality of second curved segments extending upward from the first surface and arranged in a substantially second circular pattern, the resilient structure having a plurality of third curved segments extending upward from the first surface and arranged in a substantially third circular pattern, wherein the plurality of

first curved segments, second curved segments and third curved segments are integrally joined to form a single structure;

a plurality of round bristle tufts extending upward from the first surface and located outboard of at least one of the substantially circular patterns of curved segments;

a plurality of elongated bristle tufts extending upward from the first surface and located adjacent a first end of the elongate first surface away from the neck; and

a second plurality of elongated bristle tufts extending upward from the first surface located adjacent a second end of the elongate first surface near the neck.

Preferably, the center of the second circular pattern formed by the plurality of second curved segments is located at about the midpoint of the first surface.

Preferably, the plurality of elongated bristle tufts extending upward from the first surface and located on the end of the elongate first surface away from the neck comprise two bristle tufts having arcuate shaped cross-sections.

Preferably, the two bristle tufts having arcuate shaped cross-sections are separated by an open area.

Preferably, the plurality of first curved segments are concentric with the plurality of second curved segments.

Preferably, the plurality of first curved segments, the plurality of second curved segments, and the plurality of third curved segments comprise twelve curved segments.

By "resilient member" we mean a unitary structure formed of a resilient material such as an elastomer or foam, the resilient member having a perimeter, when the resilient member is viewed from above (e. g., looking down the long axis of the bristles, if the bristles and resilient member are disposed perpendicular to the support member), which circumscribes an area greater than the surface area of the resilient member that will initially contact the teeth of a user of the toothbrush. By "initially contact the teeth", we mean the surface area that will contact the teeth and/or gums prior to any significant deformation of the resilient member resulting from the application of pressure against the teeth, i.e., the area that would contact the teeth if the toothbrush were lightly touched to the teeth with the power turned off. By "unitary structure", we mean that, if the resilient member includes a plurality of elements, such as fins, protrusions or lammelae, the elements are integrally joined to form a single structure that is mounted on the separate support member.

The term "cup-shaped", as used herein, refers to a shape that is generally elliptical, oval, ovoid, or circular in cross-section and that defines a central open area. The walls of the cup-shaped member may be continuous or discontinuous and may define a cylinder, cone, frustroconical shape, or other desired shape. The bottom of the central open area may be flat, concave, or any other desired shape.

The term "fan-shaped", as used herein, refers to a shape that is generally comprised of a central hub region and at least two protrusions, e.g., ribs, fins, or other types of protrusions, that extend substantially radially from the central hub region. The protrusions may form a helix, spiral, screw, or other pattern. The central hub region may be solid, hollow, or cup-shaped, and may be, for example, generally elliptical, oval, ovoid, or circular in cross-section.

The term "textured", as used herein, refers to a structure that has a macroscopic surface texture. For example, the textured member may be composed of a cluster of ribs, fins, columns, or other protrusions, or a combination of ribs, fins, columns, or other protrusions, that together form a unitary structure. As other examples, the texture can be imparted to the member by a manufacturing process such as injection molding, by embedding particles in the surface of the member, or by selecting a material for the member that inherently has a surface texture, e.g., an open cell foam.

Brief Description of the Drawings

Preferred embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings wherein:

Fig. 1 is a perspective view of a portion of a power toothbrush, according to a first embodiment of the invention.

Fig. 1A is similar to Fig. 1, with the front tufts of bristles removed to show the detail of the cup-shaped member.

Fig. 1B is a side view of Fig. 1A.

Figs. 2 is a perspective view of a toothbrush head according to an alternative embodiment of the invention. Fig. 2A is a side view of a toothbrush head similar to the one shown in Fig. 2 with the front tufts of bristles removed to show the detail of the cup-shaped member. Fig. 2B is a cross-sectional view of the toothbrush head shown in Fig. 2, taken along the long axis of the toothbrush.

Figs. 3-10 are perspective views of toothbrush heads according to various alternative embodiments of the invention, with the exception of Fig. 7A, which shows the toothbrush head shown in Fig. 7 with the front tufts of bristles removed to show the detail of the fan-shaped member.

Referring to Fig. 1, a power toothbrush 10 includes a head 12 and a neck 14. As is well known to those skilled in the art, head 12 is oscillated during brushing. An electric motor (not shown) oscillates the head through gearing, linkages, cranks, and/or other drive mechanisms as is well known. Electrical power may be supplied to the motor by rechargeable or single use (disposable) batteries. Further details as to how the head is oscillated will not be provided, as this aspect of the brush is not the focus of the invention.

Head 12 includes a generally circular support member 16, and, extending from the support member 16, a plurality of bristle tufts 18. Although each tuft is shown as a solid mass in the drawings, the tufts are actually each made up of a great mass of individual plastic bristles. The bristles may be made of any desired polymer, e. g. , nylon 6.12 or 6.10, and may have any desired diameter, e.g., 4-8 mil. The tufts are supported at their bases by the support member, and may be held in place by any desired tufting technique as is well known in the art, e.g., hot tufting or a stapling process. The tufts may also be mounted to move on the support member, as is

well known in the toothbrush art.

Head 12 further includes a cup-shaped member 20, which can be seen clearly in Fig. 1A, in which some of the bristle tufts have been omitted. Cup-shaped member 20 includes a side wall 22 that defines a central open area 24. Generally, the central open area 24 has a depth of from about 2 to 5 mm, measured from the highest point of the rim of the cup-shaped member to the lowest point of the central open area. Cup-shaped member 20 also includes a plurality of ribs 26 that extend inwardly into the open area 24. The cup-shaped member 20 is preferably formed of a resilient material such as an elastomer, e.g., a thermoplastic elastomer. The material hardness for such structures may range from 10 to 70 Shore A, with the preferred hardness selection depending on the design and dimensions of the cup-shaped member.

The cup-shaped member 20 may be fixedly mounted on the toothbrush head, or may be rotatably mounted, so that the cup-shaped member 20 can spin about its long axis while the toothbrush head is oscillated. The spinning motion may be driven by the same motor that oscillates the head, as would be understood by those skilled in the art. If the cup-shaped member is fixedly mounted, it may be mounted by any conventional technique, e.g., by screwing it in place or over-molding it onto the support member.

As shown in Fig. 1B, the height of bristle tufts 18 above the top surface S of support member 16 will generally be greater than the height of the cup-shaped member 20 from surface S. This height differential allows the head to contour around each tooth, enhancing the tooth-to-tooth indexing effect mentioned above.

There is also a height differential between the different bristle tufts. The end bristle tufts 18A, i.e., the tufts that are adjacent the long axis of the toothbrush neck 14 when the head 12 is at rest, are taller than the side tufts 18b. For example, the height of the cup-shaped member may be from about 5.5 to 10 mm, with the end tufts 18A being about 20 to 30% taller than the cup-shaped member, e.g., from about 6.6 to 13 mm in height, and the side tufts 18b being about 5 to 15% taller than the cup-shaped member, e.g., about 5.8 to 11.5 mm in height. Making the side tufts shorter than the end tufts allows the longer tufts to reach in between the teeth, while the shorter tufts clean along the gumline.

Toothbrush heads according to other embodiments are shown in Figs. 2-10. In each of these embodiments, the support members 116 are generally elliptical, rather than circular as shown in Fig. 1. The elliptical shape provides more room for additional bristle tufts, and thus these toothbrush heads further include curved, elongated interdental tufts 28. In these embodiments, the cup-shaped member and bristle tufts are generally shorter than in the embodiment discussed above. In an elliptical head, the reduced height will tend to make the brush more comfortable and less "bulky" feeling in a user's mouth. As in the embodiment discussed above, the bristle tufts are generally taller than the cup-shaped member. As shown in Fig. 2A, the interdental tufts 28 are also taller than the cup-shaped member, e.g., by about 30 to 40%.

Each of the embodiments shown in Figs. 2-7 includes a different type of cup-shaped member.

In head 112, shown in Fig. 2, cup shaped member 120 includes a side wall 122, and extending inwardly from the side wall, a plurality of ribs 30 that converge at a generally cylindrical central hub 32. In alternate embodiments (not shown) the central hub may be conical or cup-shaped. In this design, as shown in Fig. 2B, the ribs are at the same height as the cup at the outer perimeter, and decrease in height as they approach the center. This arrangement allows the ribs to act as "squeegees" to clean the tooth surface. The addition of the central hub adds strength to the total structure and the ribs. If this additional strength is not required for a particular design, the central hub may be omitted, and the ribs may simply intersect each other, or may stop short of intersecting. In head 212, shown in Fig. 3, cup-shaped member 220 includes a side wall 222 and, extending inwardly from the side wall, a plurality of larger ribs 34 and smaller ribs 36. The larger ribs are longer (i.e., extend further into the center), and may have a different thickness and/or height than the smaller ribs.

In the embodiments shown in Figs. 4 and 5, the cup-shaped member is segmented, i.e., it has a discontinuous side wall that includes a plurality of arcuate segments. The segmented structure imparts flexibility to the cup-shaped member, and may allow the cup-shaped member to conform better to the tooth surface. As can be seen in Fig. 5, in these embodiments the segments are defined by grooves 42 that do

not extend to the bottom of the cup-shaped member. As a result, the segments are connected to form a unitary structure.

In head 312, shown in Fig. 4, cup-shaped member 320 includes a segmented side wall that includes four arcuate segments 40 having grooves 42 therebetween. Within the open center area defined by the cup-shaped member 320 are disposed two concentrically arranged smaller inner cup-shaped members 44 and 46. These inner cup-shaped members have the same segmented structure as the outer cup-shaped member 320. The concentric members provide a large surface area for contact with the tooth surface, which may provide improved cleaning.

In head 412, shown in Fig. 5, cup-shaped member 420 again includes a segmented side wall comprised of four arcuate segments. In this embodiment, ribs 126 extend inwardly from the side wall, as in the embodiment shown in Fig. 1.

In the embodiment shown in Fig. 6, head 612 includes a cup-shaped member 620 that has a wavy fringe 54 extending above its upper edge 56. The wavy fringe is relatively soft and flexible, so that it will lay flat when pressed against the surface of the teeth. This may allow the fringe to slide under the gums and between the teeth, providing plaque removal and gum stimulation which may reduce gingivitis. Generally, the fringe has a thickness of about 0.15 to 0.25 mm, measured at its top edge, and about 0.4 to 0.8 mm measured at its base (where the fringe joins the rim of the cup-shaped member). While four relatively large waves are shown in Fig. 6, if desired more waves and/or smaller waves may be used. The number and size of the waves are selected to provide desired product attributes.

Head 612 also differs from the designs described above in that the cup-shaped member 620 includes ribs 60 that are inclined with respect to the longitudinal axis of the cup-shaped member.

In the embodiment shown in Fig. 7, head 512 includes a fan-shaped member 520 that has a plurality of ribs 50 extending radially from an outer surface of its side wall 52 in a fan-like arrangement. In this embodiment, the side wall 52 is generally conical. Alternatively, if desired, the side wall may be cylindrical (not shown). In this embodiment, the fan-like structure of the cup-shaped member may enhance the foaming action of some toothpastes. The ribs may also act as "squeegees",

enhancing tooth-cleaning action.

In the embodiment shown in Fig. 8, head 712 includes a textured member 720 that is comprised of a plurality of lammelae 722 that extend from a common base 724 together define a unitary structure. The lammelae 722 are arranged in different directions to give a "textured" feel. In this embodiment, the lammelae define a generally circular member, and are arranged in groups that are at right angles to each other in a "woven" pattern. However, the textured member may have any desired shape and arrangement of lamellae. It is generally preferred that the lammelae be relatively closely spaced, e.g., that spaces 726 be less than about 0.75 mm wide, more preferably about 0.5 mm or less.

In the embodiment shown in Fig. 9, head 812 includes a textured member 820. Textured member 820 includes a generally cylindrical base 822 and, extending from the base, a contact portion 824 that includes a central hub 826 and a plurality of ribs 828 extending radially from the hub. Textured member 820 may be formed of a foam, as shown, to provide a surface texture.

In the embodiment shown in Fig. 10, head 912 includes a textured member 920, including a generally cylindrical base 922 and, extending from the base, a plurality of small nubs 924 that provide the member with a textured feel.

A textured feel may be provided in many ways, for example by forming a resilient member of any desired shape of a material having a macroscopic surface texture, e.g., an open celled foam, or a material having texture-imparting particles embedded in its surface.

Other embodiments are within the scope of the following claims.

For example, while the cup-shaped member is shown in the drawings as centrally-located on the toothbrush head, if desired it may be positioned off-center.

Moreover, while various embodiments are shown in the drawings and described above, many other types of cup-shaped members may be used, as will be well understood by those skilled in the art. For example, the side wall of the cup-shaped member may have a tapered outer surface, or may be straight sided or have any other desired design.

Additionally, which the cup-shaped member is described above as

being surrounded on all sides by bristle tufts, if desired the cup-shaped member may be only partially surrounded by bristle tufts. For example, if desired the side tufts 18B in Figs. 1 could be omitted.

Moreover, while heads for power toothbrushes have been described above, resilient members having the features described above may be used on manual toothbrushes, if desired.

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The claims defining the invention are as follows:

1. A head for a toothbrush comprising:

a support member,

a resilient member extending from the support member, the resilient member comprising a first plurality of arcuate segments attached to the support member and a second plurality of arcuate segments attached to the support member, each of the first plurality of arcuate segments and the second plurality of arcuate segments having a top edge opposite a surface of the support member, wherein the first plurality of arcuate segments are defined by grooves between the arcuate segments, and wherein the first plurality of arcuate segments are connected to form a unitary structure, wherein the first plurality of arcuate segments are concentrically arranged on the support member, the second plurality of arcuate segments being defined by grooves between the second plurality of arcuate segments, and wherein the second plurality of arcuate segments are connected to form a unitary structure.

2. A toothbrush head according to claim 1, wherein the top edge is a wavy edge.

3. A toothbrush head according to claim 1, wherein the second plurality of arcuate segments are arranged concentrically.

4. A toothbrush head according to claim 1, wherein the height of bristle tufts is greater than the height of the resilient member.

5. A toothbrush head according to claim 1, wherein the resilient member comprises a material having texture-imparting particles embedded in its surface.

6. A toothbrush head according to claim 1, wherein the arcuate segments are formed of a thermoplastic elastomer.

7. A toothbrush head according to claim 1, wherein the arcuate segments have hardness of from 10 to 70 Shore A.

8. A toothbrush head according to claim 1, wherein the support structure is elliptical.

9. A toothbrush head according to claim 1, wherein the second plurality of arcuate segments are disposed within an open area in the first plurality of arcuate segments.

10. A toothbrush head according to claim 1, wherein the first and the second plurality of arcuate segments is surrounded by a plurality of bristle tufts.

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11. A toothbrush head according to claim 1, wherein each of the plurality of arcuate segments has a height of 5.5 to 10 mm from the surface of the support structure.

12. A toothbrush head according to claim 1, wherein the first plurality of arcuate segments is positioned off center of the support structure.

13. A toothbrush head according to claim 1, wherein a plurality of bristle tufts comprises a plurality of curved elongate interdental tufts.

14. A tooth cleaning device comprising:

an elongated head sized to fit in an oral cavity, the elongated head having a distal end and a proximal end;

a neck extending from the head, the head having a first surface, the first surface having a midpoint located along a longitudinal axis of the head, the proximal end of the head being adjacent the neck;

a resilient structure having a plurality of curved segments arranged in a substantially circular pattern extending upward from the first surface, the plurality of curved segments being integrally joined to form a unitary structure, wherein a center point of the substantially circular pattern of curved segments is positioned off of the midpoint of the first surface;

a plurality of bristle tufts attached to the head and located outboard of the substantially circular pattern of curved segments.

15. The tooth cleaning device of claim 14, further comprising a second plurality of curved segments arranged in a substantially circular pattern extending upward from the first surface.

16. The tooth cleaning device of claim 15, wherein the plurality of curved segments and the second plurality of curved segments are concentric.

17. A tooth cleaning device comprising:

a head sized to fit in an oral cavity, the head having an elongated first surface, the first surface having a midpoint along a longitudinal axis of the head;

a neck extending from the head;

a resilient structure having a plurality of first curved segments extending upward from the first surface and arranged in a substantially first circular pattern, wherein a center of the first substantially circular pattern is positioned off of the midpoint of the first surface, the resilient structure having a plurality of second curved segments extending upward from the first surface and arranged in a substantially second circular pattern, the resilient structure having a plurality of third curved segments extending upward from the first surface and arranged in a substantially third circular pattern, wherein the plurality of

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first curved segments, second curved segments and third curved segments are integrally joined to form a single structure;

a plurality of round bristle tufts extending upward from the first surface and located outboard of at least one of the substantially circular patterns of curved segments;

a plurality of elongated bristle tufts extending upward from the first surface and located adjacent a first end of the elongate first surface away from the neck; and

a second plurality of elongated bristle tufts extending upward from the first surface located adjacent a second end of the elongate first surface near the neck.

18. The tooth cleaning device of claim 17, wherein the center of the second circular pattern formed by the plurality of second curved segments is located at about the midpoint of the first surface.

19. The tooth cleaning device of claim 17, wherein the plurality of elongated bristle tufts extending upward from the first surface and located on the end of the elongate first surface away from the neck comprise two bristle tufts having arcuate shaped cross-sections.

20. The tooth cleaning device of claim 19, wherein the two bristle tufts having arcuate shaped cross-sections are separated by an open area.

21. The tooth cleaning device of claim 17, wherein the plurality of first curved segments are concentric with the plurality of second curved segments.

22. The tooth cleaning device of claim 17, wherein the plurality of first curved segments, the plurality of second curved segments, and the plurality of third curved segments comprise twelve curved segments.

23. A head for a toothbrush substantially as hereinbefore described with reference to any one of the embodiments as that embodiment is shown in the accompanying drawings.

24. A tooth cleaning device substantially as hereinbefore described with reference to any one of the embodiments as that embodiment is shown in the accompanying drawings.

Dated 16 July 2010

The Gillette Company

Patent Attorneys for the Applicant/Nominated Person

SPRUSON & FERGUSON

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FIG. 1

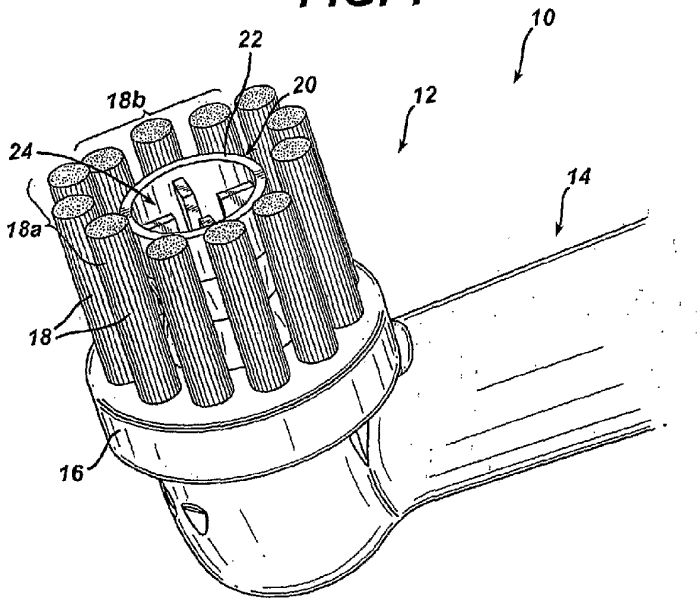


FIG. 1A

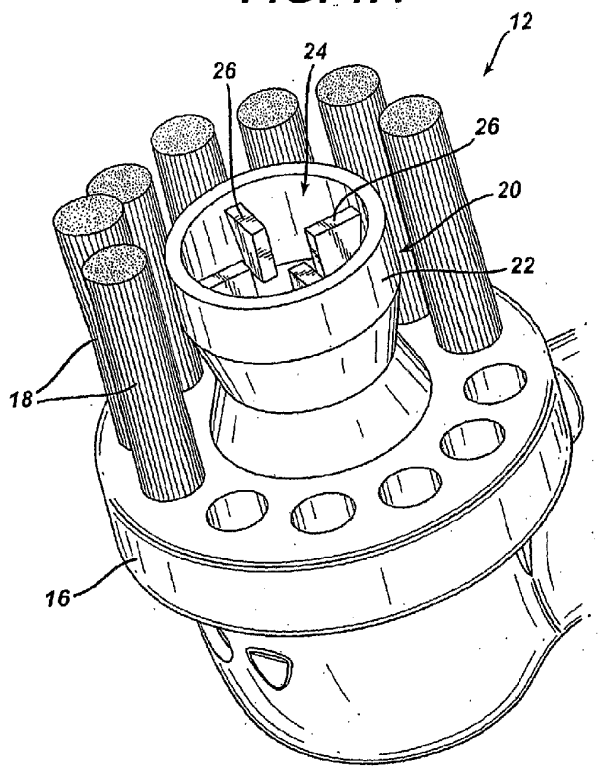


FIG. 1B

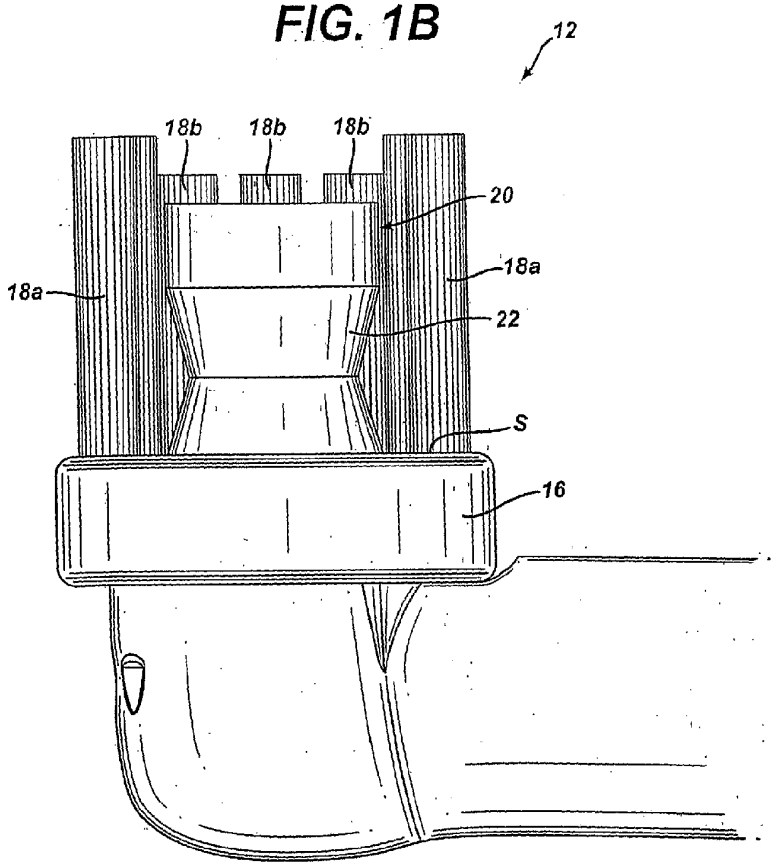
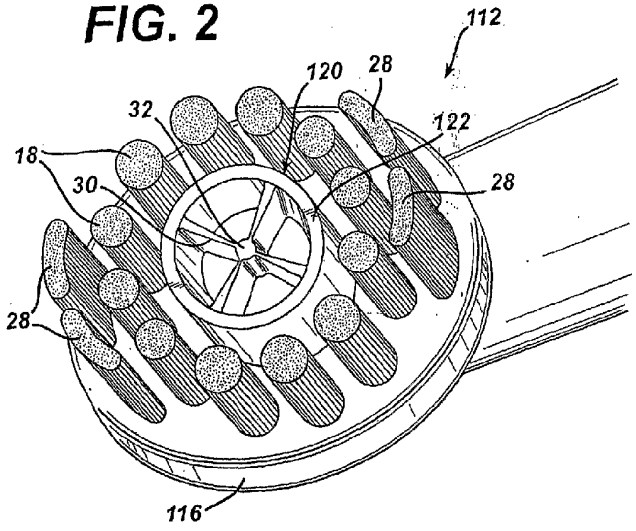


FIG. 2



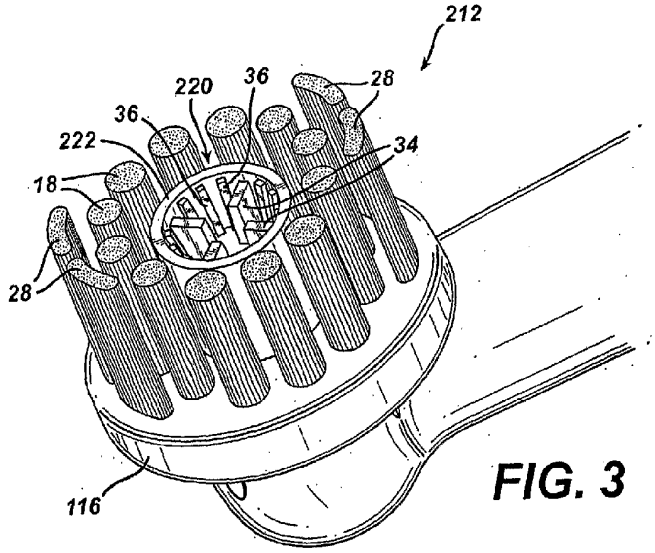


FIG. 3

FIG. 2A

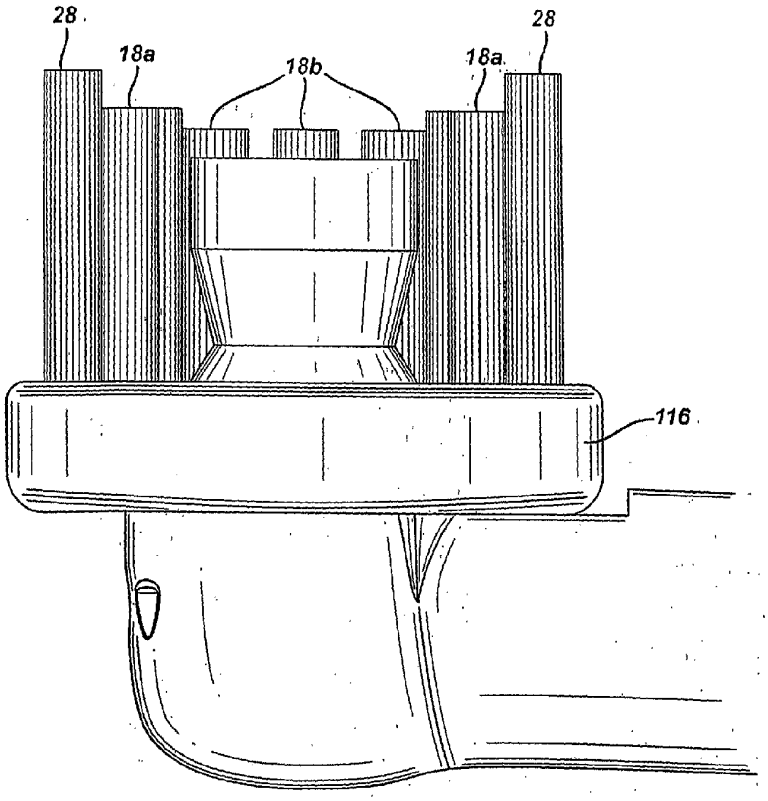
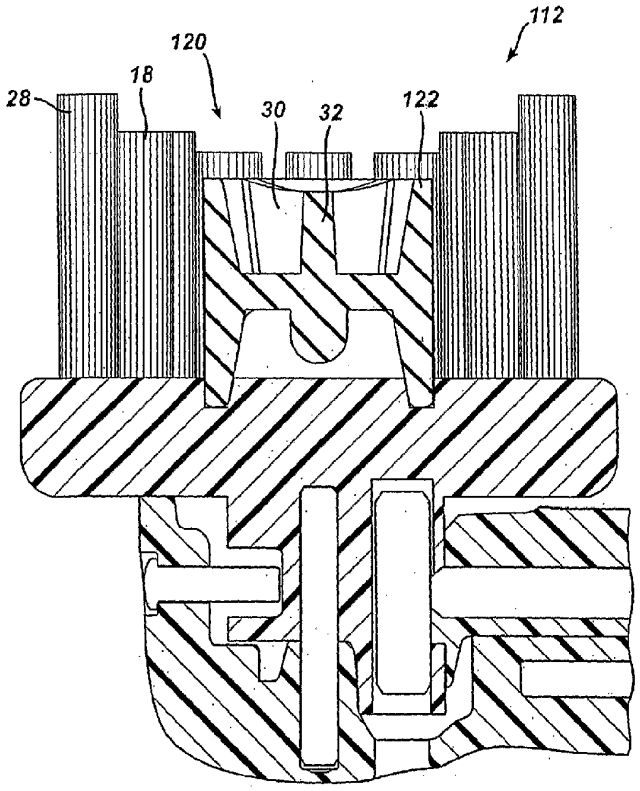


FIG. 2B



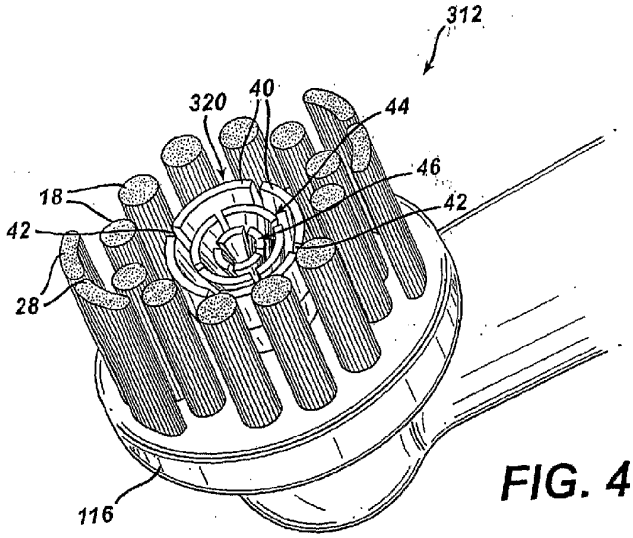


FIG. 4

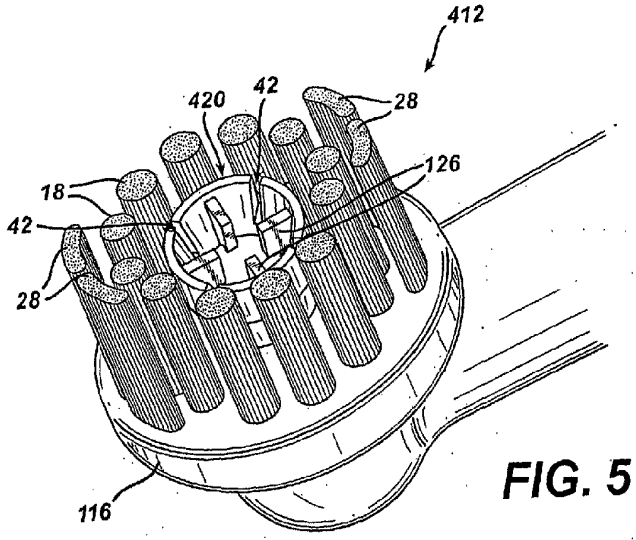


FIG. 5

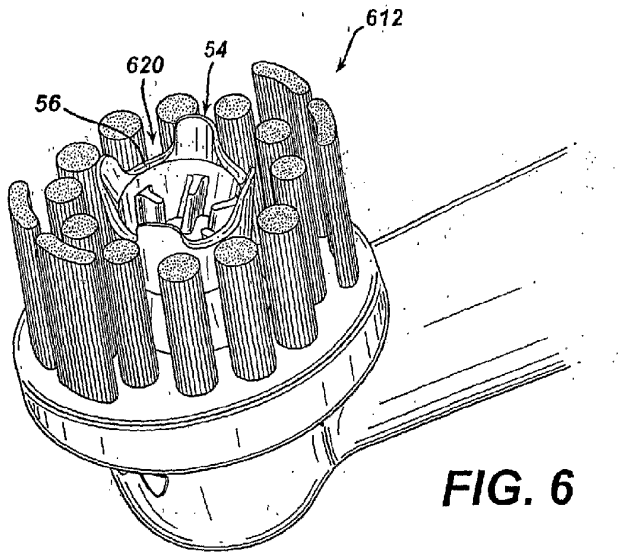


FIG. 6

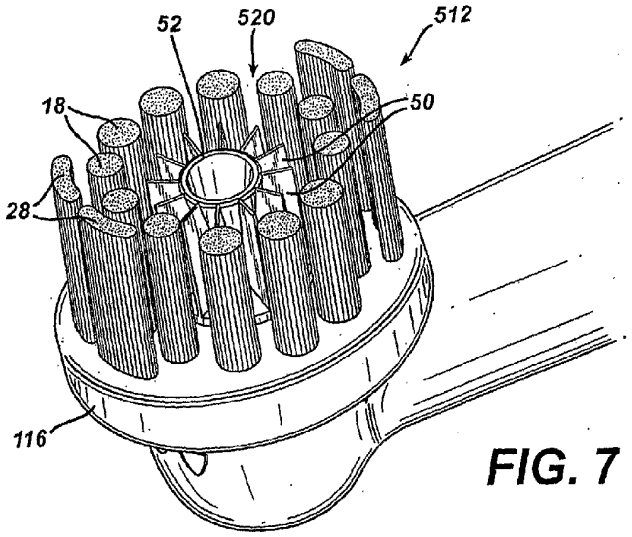


FIG. 7

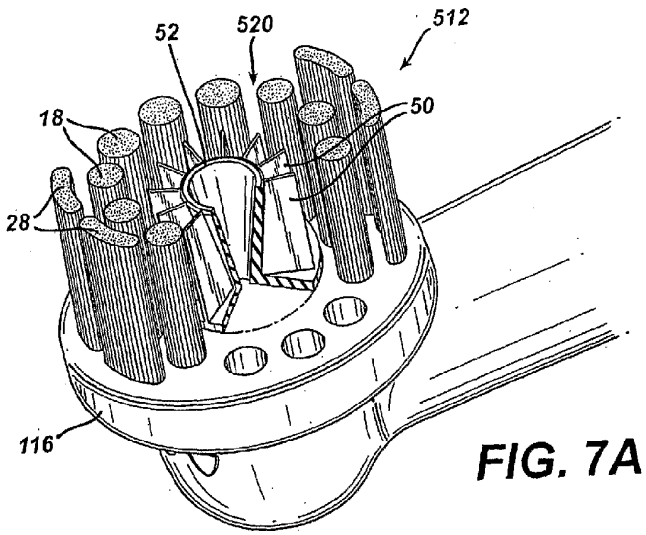
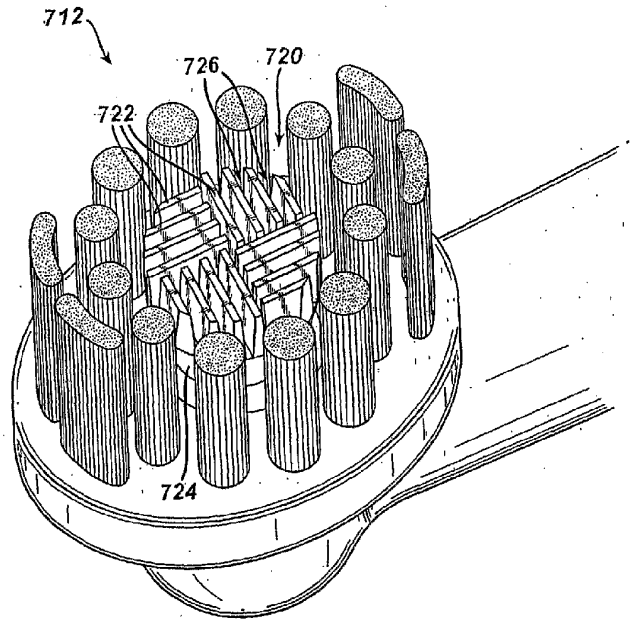


FIG. 7A

FIG. 8



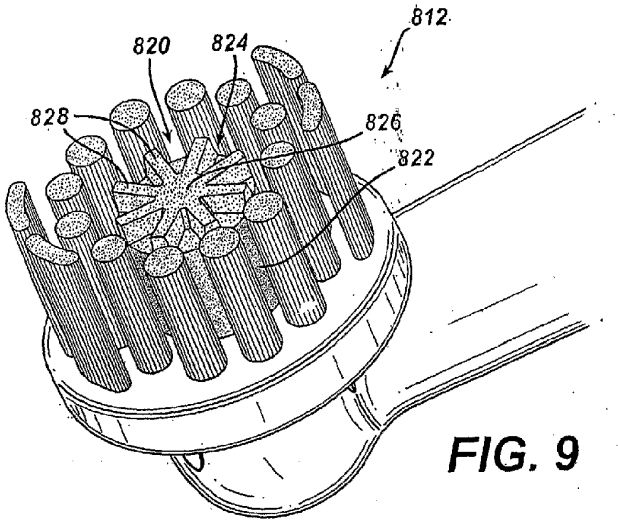


FIG. 9

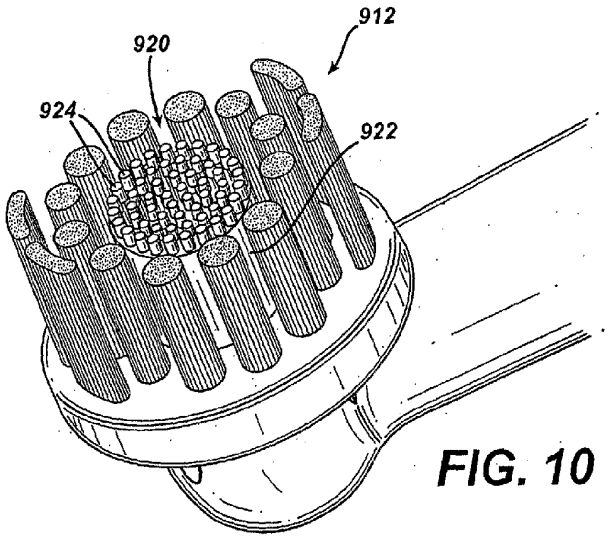


FIG. 10