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(54) **Toothbrush**

Zahnbürste

Brosse à dents

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Description

[0001] The invention relates generally to the field of oral care, and in particular to toothbrushes. More particularly, the invention relates to a toothbrushes with a three-dimensional bristle profile to provide improved cleaning of interproximal and gingival marginal regions of teeth.

[0002] Toothbrushing and flossing are fundamental steps in achieving good oral hygiene. The practice of flossing, unfortunately, has not met with widespread acceptance among the general populace even though it is acknowledged by the general populace that flossing is something that should be completed as part of good oral hygiene. Furthermore, even people who floss oftentimes do not perform adequate flossing in hard to reach areas of the mouth. Unfortunately, while most commercially available toothbrushes clean the outer buccal face of teeth adequately, they fail to provide improved cleaning of plaque and debris from the gingival margin, interproximal areas, lingual surfaces and other hard to reach areas of the mouth.

[0003] Some examples of prior art toothbrushes are disclosed in US-A-5446940, US-A-5628082, FR-A-2624360 and DE 4412301-A. US-A-5446940 discloses a toothbrush whose tufts comprise three distinct groups of rows, with each row oriented transversely to the longitudinal axis of the head. US-A-5628082 discloses a toothbrush with a handle formed with opposed gripping portions, a bristle arrangement, and a narrow and thin head for maximum access to the oral cavity. FR-A-2624360 discloses a device consisting of a handle with a rounded-profile head and a combination of tufts implanted on the head support. DE 4412301-A discloses an electric toothbrush with a brush section having inclined bristles.

[0004] One reason that such toothbrushes do not adequately clean the rear-most molars (e.g. wisdom teeth or second molars) is that the one or more tufts secured to the toothbrush head at a location most distal from the toothbrush handle are not angled towards a direction along which the head extends from the handle. As such, these tufts cannot extend far enough past the end of the head of the toothbrush to sufficiently clean the molar teeth in the back of the mouth.

[0005] Additionally, in those brushes having tufts of bristles which angle towards the handle and other tufts which angle away from the handle, all of such tufts are essentially essentially the same length and have the same cross-section. Consequently. while these angled tufts may clean one part of the teeth in a satisfactory manner, other parts of the teeth will not be cleaned sufficiently due to the homogeneous length, spacing and cross-section of the tufts.

[0006] Further, prior art toothbrushes disclose tufts of bristles having at most three different types of cross-sections. However, there are more than three parts of the teeth which need to be cleaned by a brush (e.g. the outer buccal face, gingival margin, interproximal areas, lingual surfaces and rearward most molars). As such, prior art brushes do not provide tufts of sufficiently varied cross-section specifically designed to clean all areas of the teeth.

[0007] In accordance with the present invention, there is provided a toothbrush comprising a handle, a head extending from the handle, and a plurality of tufts of bristles secured to the head, with three of the tufts each being at an acute angle relative to an imaginary line which is tangent to or co-planar with a surface of the head through which the three tufts are secured to the head, the three tufts being angled and aligned substantially toward the same direction, the direction being substantially parallel with the handle, the direction being substantially towards or away from the handle, a first one of the three tufts having a length, a second one of the three tufts being adjacent to the first tuft and having a length shorter than the length of the first tuft, and a third one of the three tufts being adjacent to the first tuft and having a length shorter than the length of the first tuft, a fourth tuft being secured to the head at a location such that no other tuft is secured to the head, at a location which is more distal from the handle than the location where the fourth tuft is secured to the head, the cross-sectional area of the fourth tuft being at least four times as large as the cross-sectional area of any other tuft secured to the head.

[0008] The present invention is directed to overcoming one or more of the problems set forth above. Briefly summarized, according to one aspect of the present invention, a toothbrush includes a handle, a head extending from the handle, and a plurality of tufts of bristles secured to the head. One of the tufts is secured to the head at a location such that no other tuft is secured to the head at a location which is more distal from the handle than the location where the one tuft is secured to the head. The one tuft is angled by about 81 degrees or less relative to an imaginary line which is tangent to or co-planar with a surface of the head through which the one tuft is secured to the head. The one tuft is tilted away from the handle towards a direction along which the head extends from the handle.

[0009] By angling the one tuft as described in the previous paragraph, the tuft is able to extend past the end of the head of the toothbrush and thus clean molars in the back of the mouth in a more sufficient manner.

[0010] According to another aspect of the invention, a toothbrush includes a handle, a head extending from the handle, and a plurality of tufts of bristles secured to the head. Two of the tufts are each at an acute angle relative to an imaginary line which is tangent to or co-planar with a surface of the head through which the two tufts are secured to the head. The two tufts have a different characteristic from each other selected from the group of characteristics consisting of length, cross-section, color, material and combinations thereof.

[0011] Providing angled tufts which vary in their length, cross-section, color, materials or combinations thereof, allows such angled tufts to clean more than one part of

the teeth. For example, one type of angled tuft will clean the buccal face of teeth while another type of angled tuft will clean the interproximal areas of the teeth.

[0012] According to a third aspect of the invention, a toothbrush includes a handle, a head extending from the handle, and, a multiplicity of tufts of bristles secured to the head. The multiplicity of tufts include tufts with at least five different types of cross-sections.

[0013] By providing tufts with at least five types of cross-sections, these tufts can clean all areas of the teeth (e.g. the outer buccal face, gingival margin, interproximal areas, lingual surfaces and rearward most molars) properly.

[0014] These and other aspects, objects, features and advantages of the present invention will be more clearly understood and appreciated from a review of the following detailed description of the preferred embodiments and appended claims, and by reference to the accompanying drawings.

FIG. 1 is a perspective view of a toothbrush according to the present invention;
FIG. 2 is a top view of the toothbrush of FIG. 1;
FIG. 3 is a side view of the toothbrush of FIG. 1;
FIGS. 4 and 5 are partial side views of the head an respective portions of the tufts of the toothbrush of FIG. 1;
FIG. 6 is a partial sectional view of the head of the toothbrush taken along the lines of 6-6 of FIG. 3; and
FIG. 7 is a perspective view of the head and a portion of the handle of the toothbrush of FIG. 1.

[0015] Beginning with FIGS> 1-3, a toothbrush 10 includes a handle portion 12 and a head portion 14 which extends from the handle in a direction D. The overall length of toothbrush 10 is preferably about 19.558 cm (7.7 inches) while the width of head 14 at its widest portion is preferably about 1.27 cm (0.5 inches). A main portion o16 of handle 12, and head 14 are made of a unitary piece of polypropylene. Remaining portions of handle 12, including thumb gripping portion 18, optional Trademark 24 (preferably about 2.0182 cm (0.83 inches) long) and finger gripping portion 20 are preferably made of a thermoplastic elastomer, preferably kraton rubber (a hydrogenated or unhydrogenated oil filled block co-polymer of styrene and butadiene or isoprene having a shore A hardness of between about 5 and about 70). Thumb gripping portion 18 and a portion of finger gripping portion 20 have a series of seventeen raised ribs 22 which aid in the gripability of the handle. Ribs 22 are preferably 0.127 cm (0.05 inches) in width.

[0016] With reference to FIGS. 3-7, a plurality of tufts 26 of bristles are secured to head 14 of the toothbrush. Each tuft is made up of a large number of bristles, and all of the bristles are preferably end-rounded. There are five different types of tufts secured to the head each tuft type having a cross-section which differs in both area and shape to the other tuft types.

[0017] A first type of tuft, type 28, is made up of bristles formed of poly-butylene-terephthalate (PBT) with an abrasive such as kaolin clay particles mixed throughout the PBT. These bristles are between about 0.0127 to 0.0229 cm (0.005 to 0.009 inches) in diameter, preferably 0.0178 cm (0.007 inches) in diameter. The length of these bristles, measured from surface 30 of head 14, is about 1.1176 cm (0.440 inches). The cross-sectional tufted area for tuft 28 is about 0.0947 square cm (0.0373 square inches), providing a tuft volume measured from the head surface of about 0.0417 cubic cm (0.0164 cubic inches), preferably this volume is between about 0.0381 and 0.0457 cubic cm (0.015 and 0.018 cubic inches). There is only one type 28 tuft secured to head 14 and it is located more distal from handle 14 than any other tuft.

[0018] A second type of tuft, type 32, is made up of nylon Indicators™ type bristles which are formed of 6.12 nylon and colored blue on their external surface. As is well known in the art, the blue coloring on these bristles is slowly worn away as the brush is used over time to indicate the extent to which the toothbrush is worn. These bristles are between about 0.0127 to 0.0229 cm (0.005 to 0.009 inches) in diameter, preferably 0.0178 cm (0.007 inches) in diameter. The length of these bristles, measured from surface 30 of head 14, is about 0.889 cm (0.350 inches). The cross-sectional area of each tuft 32 is about 0.0114 square cm (0.0045 square inches). As shown in FIG. 6, type 32 tufts have a round cross-section. There are between 8 and 12 type 32 tufts secured to head 14.

[0019] A third type of tuft, type 34, is made up of bristles formed of PBT with an abrasive such as kaolin clay particles mixed throughout the PBT. These bristles are between about 0.0127 to 0.0229 cm (0.005 to 0.009 inches) in diameter, preferably 0.0178 cm (0.007 inches) in diameter. The length of these bristles, measured from surface 30 of head 14, is about 1.1176 cm (0.440 inches). The cross-sectional area of each tuft 34 is about 0.0069 square cm (0.0027 square inches). There are between eight and twelve type 34 tufts secured to head 14. As shown in FIG. 6, type 34 tufts are rectangular in shape with rounded ends.

[0020] A fourth type of tuft, type 36, is made up of bristles formed of PBT with an abrasive such as kaolin clay particles mixed throughout the PBT. These bristles are between about 0.0127 to 0.0229 cm (0.005 to 0.009 inches) in diameter, preferably 0.0178 cm (0.007 inches) in diameter. The length of these bristles, measured from surface 30 of head 14, is about 1.1176 cm (0.440 inches). The cross-sectional area of each tuft 36 is about 0.0102 square cm (0.0040 square inches). There are between four and six type 36 tufts secured to head 14. As shown in FIG. 6, type 36 tufts are rectangular in shape with rounded ends, and are wider across the head than type 34 tufts.

[0021] A fifth and final type of tuft, type 38, is made up of bristles formed of PBT with an abrasive such as kaolin clay particles mixed throughout the PBT. These bristles are between about 0.0127 to 0.0229 cm (.005 to .009

inches) in diameter, preferably 0.0152 cm (0.006 inches) in diameter. The length of these bristles, measured from surface 30 of head 14, is about 0.889 cm (0.350 inches). The cross-sectional area of each tuft 38 is about 0.0213 square cm (0.0084 square inches). There are between four and six type 38 tufts secured to head 14. As shown in FIG. 6, type 36 tufts are rectangular in shape with rounded ends, and are wider than type 36 tufts.

[0022] Based on the cross-sectional areas of the various tufts described above, tuft type 28 has a cross-section which is more than four times as large as any other tuft secured to head 14. Although specific materials were described above from which the bristles of each tuft are made, other materials can be used. As such, any of the bristles attached to head 14 could be made from, for example, PBT with or without an abrasive such as kaolin clay, 6.12 nylon with or without an abrasive, or nylon Indicator™ material with or without an abrasive.

[0023] Additionally, the bristles within a tuft and between tufts can have varying lengths, diameters, cross-sectional shapes, cross-sectional areas, colors and be made of differing materials.

[0024] As best seen in FIGS. 2, 4, 5 and 7, all of the tufts on head 14 are angled either towards direction D or towards the direction opposite of direction D by preferably less than about 81 degrees, more preferably between about 69 degrees to about 81 degrees, and most preferably by about 75 degrees, relative to an imaginary straight line 40 which is tangent to surface 30 of head 14. If surface 30 was flat, rather than curved, then line 40 would be co-planar with surface 30. Two outer rows of tufts 42 are angled towards direction D away from handle 12. An inner row of tufts 44 are angled opposite direction D towards handle 12 with the exception of large tuft 28 which is tilted towards direction D away from handle 12.

[0025] Toothbrush 10 can be made by the following process which is generally understood by those skilled in the art. Each of the tufts of bristles are formed by gathering together a desired amount of bristles of a selected material, length and diameter. The tufts are then inserted into apertures in part of a mold of an injection molding machine. An end of the tuft which is or will project into the mold cavity is then melted to join the bristles together in a fused mass or ball at that end of the tuft.

The mold part bearing the tufts is then joined with another portion of the mold which together define a cavity used to form main portion 16 of the toothbrush. The fused masses of the tufts are located just within the cavity.

[0026] Polypropylene is then injected into the cavity to form portion 16 of toothbrush 10. The polypropylene is then cooled at which point the partially finished toothbrush is moved to a second injection molding station. The cooled, hardened polypropylene secures the fused masses of the tufts to head 14 of the toothbrush. At the second molding station, the partially finished brush is put into a second mold having cavities to form the thumb gripping portion 18, trademark 24 and finger gripping portion 20. A thermoplastic elastomer is then injected into the mold after which the elastomer is cooled and finished toothbrush 10 is removed from the mold. The toothbrush is then packaged.

Claims

1. A toothbrush (10) including a handle (12), a head (14) extending from the handle (12), and a plurality of tufts (26) of bristles secured to the head (14), **characterized by** three of the tufts (26) each being at an acute angle relative to an imaginary line (40) which is tangent to or co-planar with a surface of the head (14) through which the three tufts (26) are secured to the head (14), the three tufts (26) being angled in a direction, the direction being substantially parallel with the handle (12), the direction being substantially towards or away from the handle (12), a first tuft (32) of the three tufts (26) having a length, a second tuft (34) of the three tufts (26) being adjacent to the first tuft (32) and having a length greater than the length of the first tuft (32), and a third tuft (36) of the three tufts (26) being adjacent to the first tuft (32) and having a length greater than the length of the first tuft (32), a fourth tuft (28) being secured to the head (14) at a location such that no other tuft is secured to the head (14), at a location which is more distal from the handle (12) than the location where the fourth tuft (28) is secured to the head (14), the cross-sectional area of the fourth tuft (28) being at least four times as large as the cross-sectional area of any other tuft secured to the head (14), and in that the first one (32) of the three tufts (26) incorporates an abrasive.

2. A toothbrush according to claim 1, **characterized in that** the fourth tuft (28) is angled by between 69 to 81 degrees from the imaginary line (40).

3. A toothbrush according to claim 2, **characterized in that** the fourth tuft (28) is angled by 75 degrees from the imaginary line (40).

4. A toothbrush according to claim 1, **characterized in that** the fourth tuft (28) is angled by 81 degrees or less relative to the imaginary line (40) and tilted away from the handle (12) towards a general direction from which the head (14) extends from the handle (12).

5. A toothbrush according to any of claims 1 to 4, **characterized in that** one or more of the bristles has a characteristic which is different from the other bristles, the characteristic being length, diameter, cross-sectional area, cross-sectional shape, color, material or a combination of any two or more of said characteristics.

6. A toothbrush according to any of claims to 5, **characterized in that** the three tufts (32, 34, 36) are an-

gled by between 69 to 81 degrees from the imaginary line (40).

7. A toothbrush according to any of the proceeding claims, **characterized in that** the third tuft (36) of the three tufts (26) incorporates an abrasive.

8. A toothbrush (10) according to any of the preceding claims, wherein the first tuft (32), the second tuft (34), and the fourth tuft (28) are angled away from the handle (12).

9. A toothbrush (10) according to any of the preceding claims, wherein the tufts comprise a melted end forming a fused mass which is captured in the head (14).

Patentansprüche

1. Zahnbürste (10), einen Griff (12), einen Kopf (14), der vom Griff (12) ausgeht, und mehrere Büschel (26) von Borsten, die an dem Kopf (14) befestigt sind, aufweisend, **dadurch gekennzeichnet, dass** drei der Büschel (26) jeweils in einem spitzen Winkel relativ zu einer gedachten Linie (40) stehen, die tangential zu oder koplanar mit einer Oberfläche des Kopfes (14) ist, durch die die drei Büschel (26) an dem Kopf (14) befestigt sind, wobei die drei Büschel (26) in einer Richtung abgewinkelt sind, wobei die Richtung im Wesentlichen parallel zu dem Griff (12) verläuft, wobei die Richtung im Wesentlichen hin zu oder weg von dem Griff (12) verläuft, wobei ein erstes Büschel (32) der drei Büschel (26) eine Länge aufweist, ein zweites Büschel (34) der drei Büschel (26) an das erste Büschel (32) angrenzt und eine Länge aufweist, die größer ist als die Länge des ersten Büschels (32), und ein drittes Büschel (36) der drei Büschel (26) an das erste Büschel (32) angrenzt und eine Länge aufweist, die größer ist als die Länge des ersten Büschels (32), wobei ein viertes Büschel (28) an dem Kopf (14) an einer solchen Stelle befestigt ist, dass kein anderes Büschel an dem Kopf (14) an einer Stelle befestigt ist, die von dem Griff (12) weiter entfernt ist als die Stelle, an der das vierte Büschel (28) an dem Kopf (14) befestigt ist, wobei die Querschnittsfläche des vierten Büschels (28) mindestens vier Mal so groß ist wie die Querschnittsfläche jedes anderen Büschels, das an dem Kopf (14) befestigt ist, und **dadurch gekennzeichnet, dass** das erste (32) der drei Büschel (26) ein Schleifmittel aufweist.

2. Zahnbürste nach Anspruch 1, **dadurch gekennzeichnet, dass** das vierte Büschel (28) 69 bis 81 Grad von der gedachten Linie (40) abgewinkelt ist.

3. Zahnbürste nach Anspruch 2, **dadurch gekennzeichnet, dass** das vierte Büschel (28) 75 Grad von der gedachten Linie (40) abgewinkelt ist.

4. Zahnbürste nach Anspruch 1, **dadurch gekennzeichnet, dass** das vierte Büschel (28) 81 Grad oder weniger relativ zu der gedachten Linie (40) abgewinkelt ist und weg von dem Griff (12) und hin zu einer allgemeinen Richtung, in der der Kopf (14) von dem Griff (12) ausgeht, geneigt ist.

5. Zahnbürste nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** eine oder mehrere der Borsten eine Eigenschaft aufweist, die sich von den anderen Borsten unterscheidet, wobei die Eigenschaft die Länge, der Durchmesser, die Querschnittsfläche, die Querschnittsform, die Farbe, das Material oder eine Kombination beliebiger zwei oder mehr dieser Eigenschaften ist.

6. Zahnbürste nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die drei Büschel (32, 34, 36) 69 bis 81 Grad von der gedachten Linie (40) abgewinkelt sind.

7. Zahnbürste nach einem der vorstehenden Ansprüche, **dadurch gekennzeichnet, dass** das dritte Büschel (36) der drei Büschel (26) ein Schleifmittel aufweist.

8. Zahnbürste (10) nach einem der vorstehenden Ansprüche, wobei das erste Büschel (32), das zweite Büschel (34) und das vierte Büschel (28) weg von dem Griff (12) abgewinkelt sind.

9. Zahnbürste (10) nach einem der vorstehenden Ansprüche, wobei die Büschel ein zerlaufenes Ende umfassen, das eine verschmolzene Masse bildet, die in dem Kopf (14) verankert ist.

Revendications

1. Brosse à dents (10) incluant un manche (12), une tête (14) s'étendant à partir du manche (12), et une pluralité de touffes (26) de poils fixées à la tête (14), **caractérisée par** trois des touffes (26) qui sont chacune selon un angle aigu par rapport à une ligne imaginaire (40) qui est tangente à ou co-planaire avec une surface de la tête (14) à travers laquelle les trois touffes (26) sont fixées à la tête (14), les trois touffes (26) étant inclinées dans une direction, la direction étant essentiellement parallèle au manche (12), la direction étant essentiellement en direction de ou à l'écart du manche (12), une première touffe (32) des trois touffes (26) ayant une longueur, une deuxième touffe (34) des trois touffes (26) étant adjacente à la première touffe (32) et ayant une longueur plus grande que la longueur de la première touffe (32), et une troisième touffe (36) des trois touf-

fes (26) étant adjacente à la première touffe (32) et ayant une longueur plus grande que la longueur de la première touffe (32), une quatrième touffe (28) étant fixée à la tête (14) à un emplacement tel qu'aucune autre touffe n'est fixée à la tête (14), à un emplacement qui est plus distal du manche (12) que l'emplacement où la quatrième touffe (28) est fixée à la tête (14), l'aire en coupe transversale de la quatrième touffe (28) étant au moins quatre fois plus grande que l'aire en coupe transversale de n'importe quelle autre touffe fixée à la tête (14), et en ce que la première (32) des trois touffes (26) incorpore un abrasif.

2. Brosse à dents selon la revendication 1, **caractérisée en ce que** la quatrième touffe (28) est inclinée selon un angle compris entre 69 et 81 degrés par rapport à la ligne imaginaire (40).

3. Brosse à dents selon la revendication 2, **caractérisée en ce que** la quatrième touffe (28) est inclinée selon un angle de 75 degrés par rapport à la ligne imaginaire (40).

4. Brosse à dents selon la revendication 1, **caractérisée en ce que** la quatrième touffe (28) est inclinée selon un angle de 81 degrés ou moins par rapport à la ligne imaginaire (40) et inclinée à l'écart du manche (12) en direction d'une direction générale à partir de laquelle la tête (14) s'étend du manche (12).

5. Brosse à dents selon l'une quelconque des revendications 1 à 4, **caractérisée en ce qu'**un ou plusieurs des poils ont une caractéristique qui est différente des autres poils, la caractéristique étant la longueur, le diamètre, l'aire en coupe transversale, la forme en coupe, la couleur, le matériau ou une combinaison de n'importe quelles deux desdites caractéristiques ou plus.

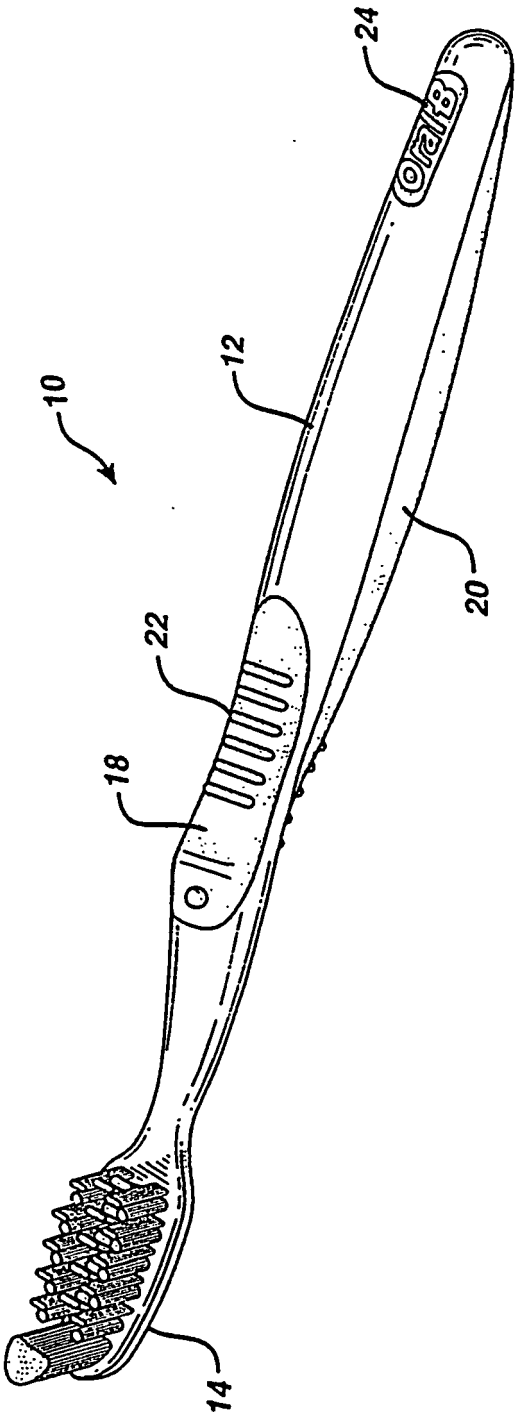
6. Brosse à dents selon l'une quelconque des revendications 1 à 5, **caractérisée en ce que** les trois touffes (32, 34, 36) sont inclinées selon un angle compris entre 69 et 81 degrés par rapport à la ligne imaginaire (40).

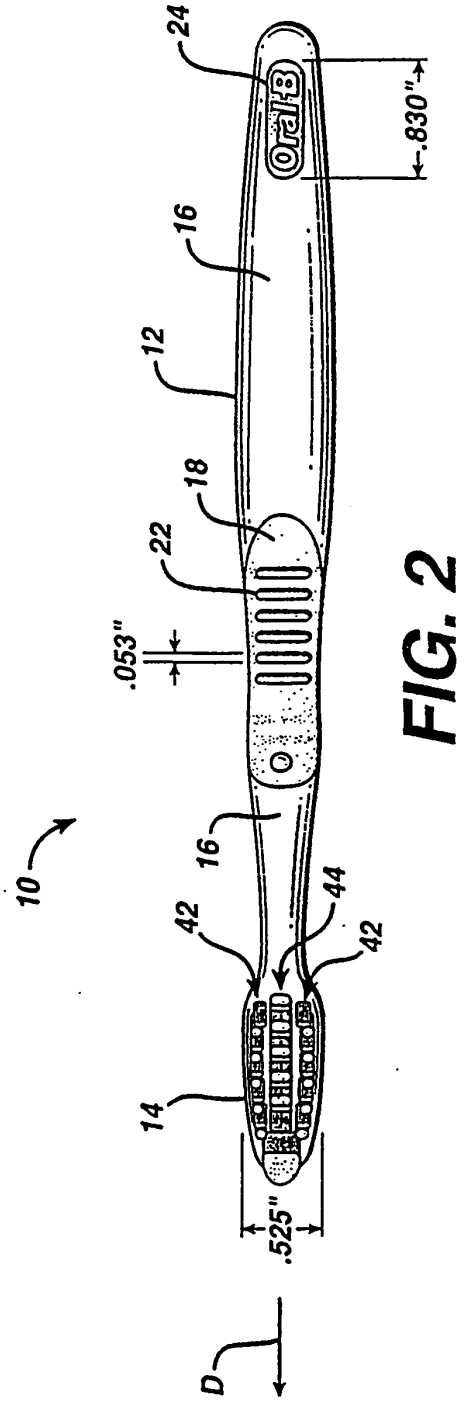
7. Brosse à dents selon l'une quelconque des revendications précédentes, **caractérisée en ce que** la troisième touffe (36) des trois touffes (26) incorpore un abrasif.

8. Brosse à dents (10) selon l'une quelconque des revendications précédentes, dans laquelle la première touffe (32), la deuxième touffe (34), et la quatrième touffe (28) sont inclinée à l'écart du manche (12).

9. Brosse à dents (10) selon l'une quelconque des revendications précédentes, dans laquelle les touffes comprennent une extrémité fondue formant une masse fusionnée qui est capturée dans la tête (14).

FIG. 1

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12
18
22
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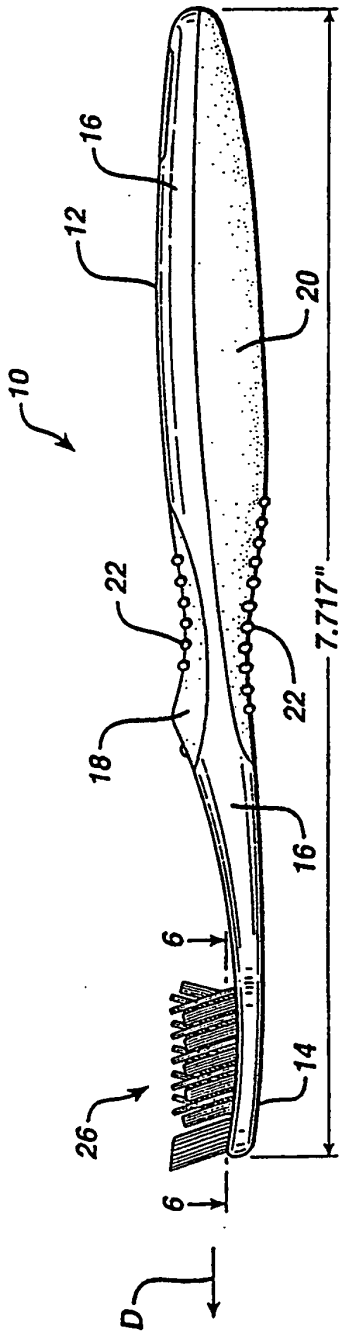
.830"
16
42
44
42
14
.525"
D

FIG. 2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12
20
22
18
22
7.717"
16
6
14
26
6
D

FIG. 3

FIG. 4

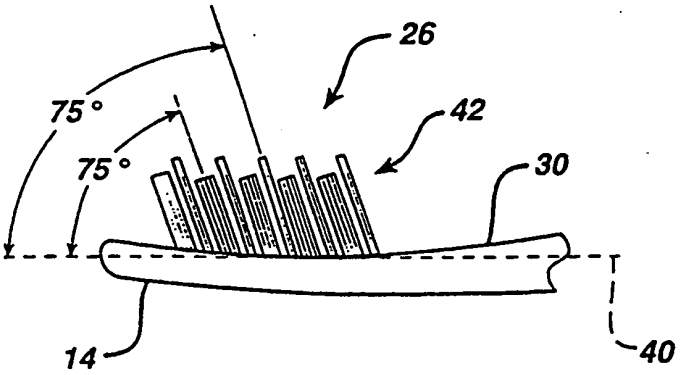


FIG. 5

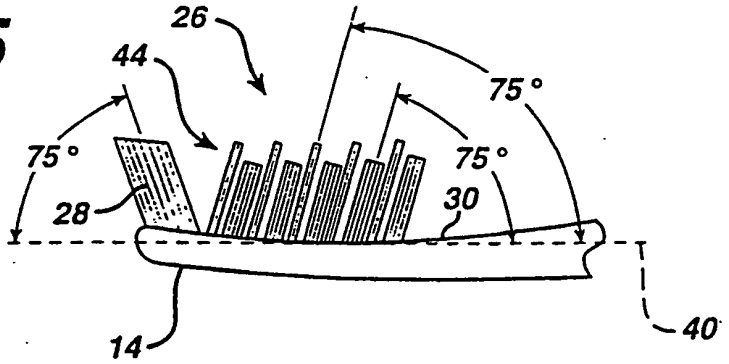


FIG. 6

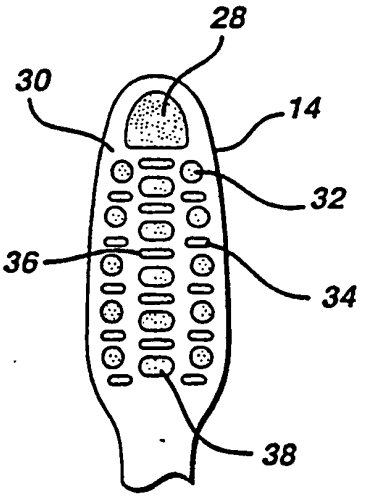
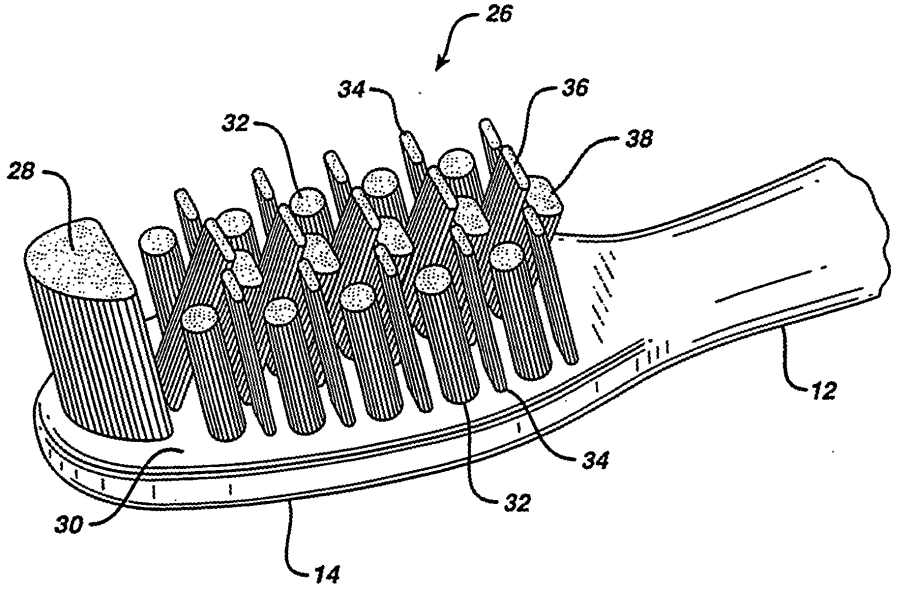


FIG. 7



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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