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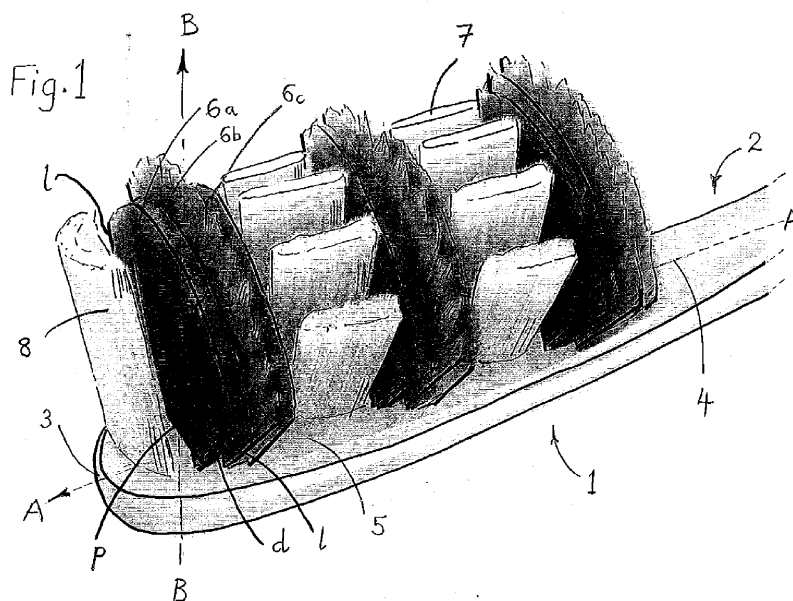
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(54) **Toothbrush**

(57) The invention provides a toothbrush having:
a handle with a first and second end;
a head with front and rear ends positioned along a longitudinal axis, the rear end being connected with the second end of the handle, the head having a lower surface, an upper surface opposite the lower surface, and side surfaces joining the lower and upper surfaces, and
at least one generally planar array composed of a continuous mass of bristles each with one end fixed into the upper surface of the head and a free end opposite the

fixed one, the array having a fan-shaped perimeter which is defined by a proximal edge which is formed by the fixed ends of the bristles and which extends across the upper surface of the head in a transverse direction relative to the longitudinal axis of the head, a distal edge which is formed by the free ends of the bristles, and generally straight lateral edges therebetween; characterised in that the lateral edges are each inclined at an angle of greater than 15° relative to an axis lying in the plane of the array which is perpendicular to the proximal edge of the array.



Description

[0001] This invention relates to toothbrushes, in particular to the bristle configuration of a toothbrush. More particularly this invention relates to improved toothbrush bristle configurations comprising fan-shaped bristle arrays.

[0002] As dental plaque is implicated in the aetiology of dental caries, gingivitis and periodontitis, regular tooth brushing plays a key role in the prevention of these oral diseases. With both manual and electrical-powered brushing, accurate technique is necessary to achieve optimal results. Dentists often recommend a brushing technique which involves a vertical movement, in which the brush should be moved out in the occlusal direction, which means upwards in the lower jaw and downwards in the upper jaw, to wipe out debris.

[0003] However, the vast majority of people have difficulty adopting or adhering to recommended tooth brushing technique. Instead they tend to employ a scrubbing action in which the handle is reciprocated, giving a brushing along the teeth which is mainly horizontal.

[0004] Accordingly there is a need for a toothbrush which helps to guide brushing movement and enable better conformity with recommended tooth brushing techniques during normal use.

[0005] The present invention achieves this objective through an improved toothbrush bristle configuration comprising a particular type of fan-shaped bristle array.

[0006] US 4,729,142 is concerned with the adaptation of a toothbrush for use in an approved tooth brushing method (modified Bass). The toothbrush in this case employs bristle tufts having a converging upward taper, in which the width of the mass of bristles at the top of the brush is substantially less than at the base.

[0007] WO 03/0757119 describes a toothbrush head with at least one fan-shaped bristle array, for improved cleaning to the interdental regions of the teeth. In the toothbrush depicted in this case, the bristles at the centre of the array are substantially vertical and the bristles at the edges of the array are each angled away from the vertical by an angle of about 11°.

[0008] The present invention provides a toothbrush having:

a handle with a first and second end;

a head with front and rear ends positioned along a longitudinal axis, the rear end being connected with the second end of the handle, the head having a lower surface, an upper surface opposite the lower surface, and side surfaces joining the lower and upper surfaces, and

at least one generally planar array composed of a continuous mass of bristles each with one end fixed into the upper surface of the head and a free end opposite the fixed one, the array having a fan-shaped

perimeter which is defined by a proximal edge which is formed by the fixed ends of the bristles and which extends across the upper surface of the head in a transverse direction relative to the longitudinal axis of the head, a distal edge which is formed by the free ends of the bristles, and generally straight lateral edges therebetween;

characterised in that the lateral edges are each inclined at an angle of greater than 15° relative to an axis lying in the plane of the array which is perpendicular to the proximal edge of the array.

[0009] By "continuous mass of bristles" it is generally meant that the bristles are in contact or densely packed so as to present a substantially uninterrupted array surface along the transverse extent of the array (relative to the longitudinal axis of the head).

[0010] Typically the array is formed from a row of discrete bristle tufts, configured to provide a bristle array with the geometry as defined above (hereinafter termed a "fan-shaped array").

[0011] The bristle tufts which form the fan-shaped array may suitably be fixed to the head by so called anchor technology whereby the bristle tufts are bent in half by a strip of metal which is pressed into the wall surrounding the tuft hole.

[0012] Alternatively the tufts may be fixed to the brush head by in-mould welding. This is a technique which involves the moulding of the head around a fixed bristle tuft.

[0013] In a preferred embodiment, the lateral edges of the fan-shaped array are each inclined at an angle of greater than 30° relative to an axis lying in the plane of the array which is perpendicular to the proximal edge of the array. Most preferably the angle ranges from 30° to 60°, and is optimally about 45°.

[0014] In another preferred embodiment the distal edge of the fan-shaped array defines a generally continuous line which is most preferably of an arcuate shape when viewed from the front end of the head down the longitudinal axis thereof towards the handle. Most preferably the shape is arcuate in the sense that it extends furthest from the upper surface of the head at the longitudinal mid-point of the distal edge and gradually less so at the end-points of the distal edge.

[0015] Typically, each of the one or more fan-shaped arrays individually covers no more than 25% of the area of the upper surface of the head, for example no more than 20%, preferably less than 10% of the upper surface of the head.

[0016] Typically the toothbrush of the invention may have a series of fan-shaped arrays, running along the longitudinal axis of the head. For example, the toothbrush of the invention may have between 2 and 10 fan shaped arrays, which are spaced or grouped at generally regular intervals along the upper surface of the head. Preferably, the arrays are aligned so that their respective perimeter edges are generally in registration with one another when

viewed from the front end of the head down the longitudinal axis thereof towards the handle. In a particularly preferred embodiment, the fan shaped arrays are arranged in groups, each group typically containing from 2 to 4 arrays arranged face-to-face. Most preferably the groups are arranged in a "sandwich" type structure, such as a central array interposed between a pair of outer arrays. In such an arrangement, it is particularly preferred that the bristles forming the central array have a longer average length than those forming the outer arrays. For example, the bristles which form the central array may have an average length ranging from 1.05 to 1.5 L, where L denotes the average length of the bristles which form the outer arrays. It is also particularly preferred that the bristles forming the central array have a lesser average cross-sectional diameter than those of the two outer arrays. For example, the average cross-sectional diameter of the bristles which form the central array may range from 0.75 to 0.99 D, where D denotes the average cross-sectional diameter of the bristles which form the outer arrays. The longer and/or finer bristles of the central array enable enhanced interdental cleaning. Bristles of reduced average cross-sectional diameter suitable for use in this context may be produced for example by tapering. Generally there are two methods of producing such tapered bristles. One is to chemically erode the ends of the bristle filaments; the other is to mechanically abrade them to a taper.

[0017] In another preferred embodiment the toothbrush according to the invention comprises one or more secondary cleaning elements in addition to the one or more fan-shaped arrays.

[0018] For example, the secondary cleaning elements may be formed from bristles, each with one end fixed into the upper surface of the head and a free end opposite the fixed one. Generally such bristles are arranged in a pattern of discrete bristle tufts or tuft groups. The tufts may be fixed to the head by a suitable fixing process such as the anchor technology or in-mould welding described above. In a particularly preferred configuration, the bristle tufts or tuft groups forming the secondary cleaning elements are arranged into a shape which has a cross section perpendicular to the longitudinal axis of the bristles ("the bristle axis") which has a greater dimension in the direction generally parallel to the longitudinal axis of the head ("the long dimension") than in the direction generally perpendicular to the longitudinal axis of the head ("the width dimension"). Typically the ratio of long dimension to width dimension is 1.5:1 or more, preferably 2:1 or more. For example, the cross section of the secondary cleaning elements may be generally rectangular in shape over a substantial part of their cross-sectional area, having the long dimension of the rectangle aligned generally parallel to the longitudinal axis of the head. The term "generally rectangular" includes *inter alia* rectangular with rounded corners, lozenge-shaped (i.e. two generally parallel long sides and two rounded ends), parallelogram-shaped and trapezoidal-shaped.

[0019] Typically, each of the one or more secondary cleaning elements individually covers no more than 25% of the area of the upper surface of the head, for example no more than 20%, preferably less than 10% of the upper surface of the head.

[0020] Typically the toothbrush of the invention may have between 5 and 15 secondary cleaning elements, which are spaced or grouped at generally regular intervals along the upper surface of the head.

[0021] Preferably, the secondary cleaning elements are arranged in rows running perpendicular to the longitudinal axis of the head, each row typically containing from 4 to 6 secondary cleaning elements arranged side-by-side.

[0022] Typically the toothbrush of the invention may have a series of such rows, running along the longitudinal axis of the head. For example, the toothbrush of the invention may have between 2 and 4 rows of secondary cleaning elements, which are spaced at generally regular intervals along the upper surface of the head.

[0023] In a preferred embodiment, the one or more secondary cleaning elements are formed from bristles which have an average length from their fixed to their free ends which is shorter than the corresponding average length of the bristles which form the one or more fan-shaped arrays. For example, the bristles which form the one or more fan-shaped arrays may have an average length ranging from 1.05 to 1.5 /, where / denotes the average length of the bristles of the one or more secondary cleaning elements from their fixed to their free ends. The shorter bristles of the secondary cleaning elements enable enhanced cleaning of the gum line and the tooth surface.

[0024] In a particularly preferred embodiment, rows of secondary cleaning elements (as described above) and groups of fan-shaped arrays (as described above) run along the longitudinal axis of the head in an alternating manner when viewed from the front end of the head down the longitudinal axis thereof towards the handle. Specific embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a perspective view of the head of a toothbrush according to the invention; and

Figure 2 is a plan view of the tuft pattern of the upper surface of the head of a toothbrush according to the invention.

[0025] Referring to Figures 1 and 2, a toothbrush head (1) is connected to an integral handle (2). The head (1) has a front end (3) and a rear end (4), positioned along a longitudinal axis indicated by the line A-A, and an upper surface (5). The upper surface (5) carries a series of 3 groups of 3 fan-shaped arrays (6a,6b,6c) running along axis A-A. Each array is composed of a continuous mass of bristles each with one end fixed into the upper surface

(5) and a free end opposite the fixed one. Each array has a fan-shaped perimeter, this perimeter being defined by a proximal edge p which is formed by the fixed ends of the bristles and which extends across the upper surface (5) in a transverse direction relative to axis A-A, an arcuate distal edge d which is formed by the free ends of the bristles, and two generally straight lateral edges / therebetween. Each lateral edge / is inclined at an angle of about 45° relative to an axis indicated by the line B-B, which is an axis lying in the plane of the array which is perpendicular to the proximal edge p of the array. Each group of 3 fan-shaped arrays (6a,6b,6c) is arranged in a "sandwich" type structure with a central array (6b) interposed between a pair of outer arrays (6a,6c). The bristles which form the central array (6b) are longer and finer than the bristles which form the outer arrays (6a,6c). The upper surface (5) also carries two rows of 5 lozenge-shaped secondary cleaning elements (7) running along axis A-A in an alternating manner with the groups of fan-shaped arrays (6a,6b,6c). The bristles which form the secondary cleaning elements (7) are shorter than the bristles forming the fan-shaped arrays (6a,6b,6c). An end tuft (8) is disposed at the front end (3) of upper surface (5). The end tuft (8) has a generally "D" shaped cross-section, with the rounded bend of the "D" facing the front end (3) of upper surface (5).

[0026] During brushing, the arcuate distal edges d of the fan-shaped arrays (6a,6b,6c) are able to sweep across the tooth surface at least 90°. This helps to guide brushing movement towards the recommended "top to bottom" action. In addition, the finer bristles of the central arrays (6b) enable enhanced penetration between the teeth for improved interdental cleaning, and the shorter bristles of the secondary cleaning elements enable enhanced cleaning of the gum line and the tooth surface. In this way, the toothbrush of the invention helps to guide brushing movement and enables better conformity with recommended tooth brushing techniques during normal use, for overall improved cleaning.

Claims

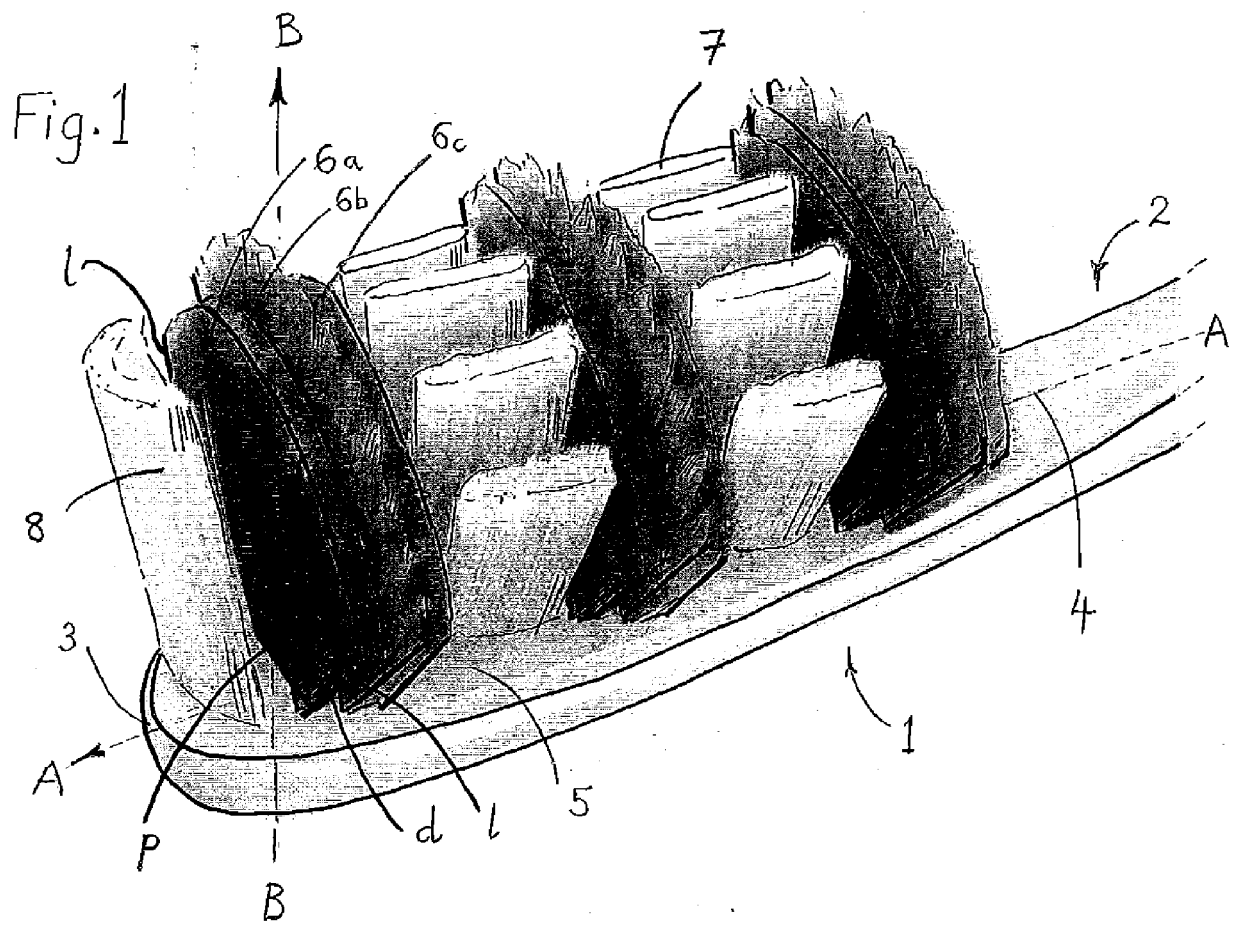
1. A toothbrush having:

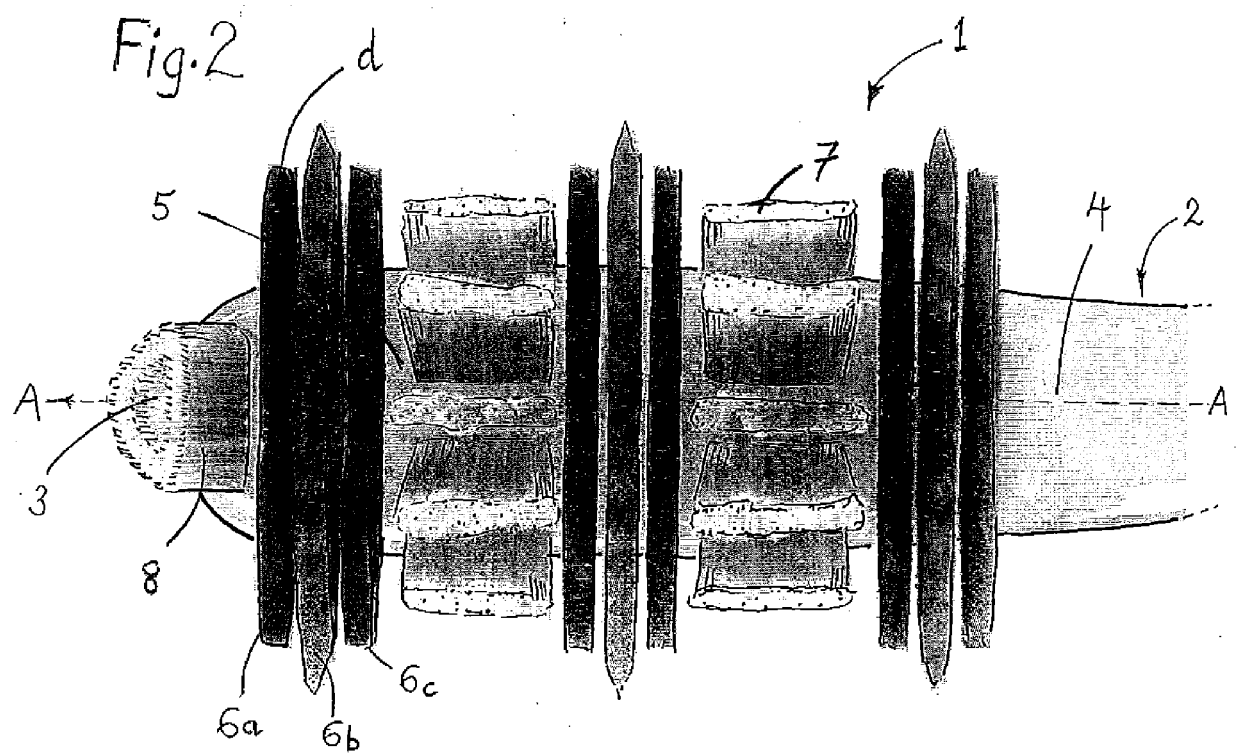
a handle with a first and second end;
 a head with front and rear ends positioned along a longitudinal axis, the rear end being connected with the second end of the handle, the head having a lower surface, an upper surface opposite the lower surface, and side surfaces joining the lower and upper surfaces, and
 at least one generally planar array (hereinafter termed a "fan-shaped array") composed of a continuous mass of bristles each with one end fixed into the upper surface of the head and a free end opposite the fixed one, the array having a fan-shaped perimeter which is defined by a

proximal edge which is formed by the fixed ends of the bristles and which extends across the upper surface of the head in a transverse direction relative to the longitudinal axis of the head, a distal edge which is formed by the free ends of the bristles, and generally straight lateral edges therebetween;

characterised in that the lateral edges are each inclined at an angle of greater than 15° relative to an axis lying in the plane of the array which is perpendicular to the proximal edge of the array.

2. A toothbrush according to claim 1, in which the lateral edges of the fan-shaped array are each inclined at an angle ranging from 30° to 60° relative to an axis lying in the plane of the array which is perpendicular to the proximal edge of the array.
3. A toothbrush according to claim 1 or 2, in which between 2 and 10 fan shaped arrays are spaced or grouped at generally regular intervals along the upper surface of the head, the arrays being aligned so that their respective perimeter edges are generally in registration with one another when viewed from the front end of the head down the longitudinal axis thereof towards the handle.
4. A toothbrush according to any preceding claim, which comprises one or more secondary cleaning elements in addition to the one or more fan-shaped arrays.
5. A toothbrush according to claim 4, in which the secondary cleaning elements are formed from bristles, each with one end fixed into the upper surface of the head and a free end opposite the fixed one, and in which the bristles are arranged in a pattern of discrete bristle tufts or tuft groups, and in which the bristle tufts or tuft groups are arranged into a shape which has a cross section perpendicular to the longitudinal axis of the bristles ("the bristle axis") which has a greater dimension in the direction generally parallel to the longitudinal axis of the head ("the long dimension") than in the direction generally perpendicular to the longitudinal axis of the head ("the width dimension").







EUROPEAN SEARCH REPORT

Application Number
EP 11 15 6748

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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