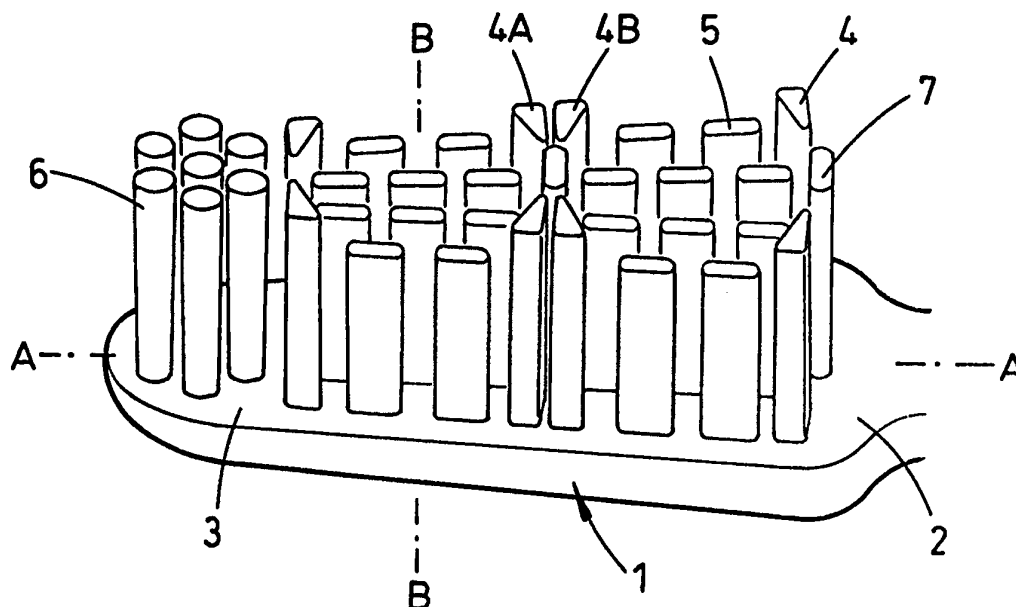




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/EP96/03104</p> <p>(22) International Filing Date: 10 July 1996 (10.07.96)</p> <p>(30) Priority Data: 9514408.5 14 July 1995 (14.07.95) GB 9524817.5 5 December 1995 (05.12.95) GB</p> <p>(71) Applicant (for all designated States except US): SMITHKLINE BEECHAM CONSUMER HEALTHCARE GMBH [DE/DE]; Hermannstrasse 7, D-77815 Bühl (DE).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): KRÄMER, Hans [DE/DE]; SmithKline Beecham Consumer Healthcare GmbH, Hermannstrasse 7, D-77815 Bühl (DE). TOPFER, Kirsten [DE/DE]; SmithKline Beecham Consumer Healthcare GmbH, Hermannstrasse 7, D-77815 Bühl (DE). JANITZ, Peter [DE/DE]; SmithKline Beecham Consumer Healthcare GmbH, Hermannstrasse 7, D-77815 Bühl (DE). GONSER, Frank [DE/DE]; SmithKline Beecham Consumer Healthcare GmbH, Hermannstrasse 7, D-77815 Bühl (DE).</p> <p>(74) Agent: WALKER, Ralph, Francis; SmithKline Beecham, Corporate Intellectual Property, SB House, Great West Road, Brentford, Middlesex TW8 9BD (GB).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report.</i></p>

(54) Title: TOOTHBRUSH



(57) Abstract

A toothbrush which has a head and a grip handle, with bristles extending from a bristle face of the head, in which at least some of the bristles are arranged in tufts which have a sectional shape, or are arranged in clusters of tufts which have a sectional shape, which tapers in a direction either away from, or in alternative embodiment towards, the outer edges of the bristle face toward the longitudinal axis, i.e. being respectively wider or narrower at the end towards the said outer edge.

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## Toothbrush

This invention relates to toothbrushes, particularly to hand held toothbrushes having a novel bristle configuration.

5 Toothbrushes generally comprise a head and a grip handle disposed along a longitudinal axis. Bristles extend from a bristle face of the head in a general bristle direction. Generally the bristles are arranged in tufts which are circular in section across the general bristle direction at their base on the bristle face, although some toothbrushes are known having tufts of other sectional shapes, for example as  
10 disclosed in WO95/06420. US 4617695 discloses a toothbrush with all its tufts of a hexagonal section. GB 705725 discloses a toothbrush with tufts of rectangular section. WO 91/19437 discloses a toothbrush having all its tufts of an elongated oval shape with the long axis of the oval across the longitudinal axis of the head.

Circular section tufts are sometimes not able to reach into the interdental  
15 spaces, or otherwise adapt themselves to the shape of the teeth and adjacent areas of the gums, resulting in a reduced cleaning efficiency. It is an object of this invention to provide a toothbrush having a novel bristle configuration which in part at least solves this problem.

According to one form of this invention, a toothbrush has a head and a grip  
20 handle disposed along a longitudinal axis, with bristles extending from a bristle face of the head in a general bristle direction generally perpendicular to the longitudinal axis, *characterised* in that at least some of the bristles are arranged in tufts which have a sectional shape, or are arranged in clusters of tufts which have a sectional shape, across the general bristle direction, which tapers in a direction away from  
25 the outer edges of the bristle face toward the longitudinal axis, being wider at the end towards the said outer edge.

In a second form of this invention, a toothbrush has a head and a grip handle disposed along a longitudinal axis, with bristles extending from a bristle face of the head in a general bristle direction generally perpendicular to the longitudinal axis,  
30 *characterised* in that at least some of the bristles are arranged in tufts which have a sectional shape, or are arranged in clusters of tufts which clusters have a sectional shape, across the general bristle direction, which tapers in a direction away from the longitudinal axis towards the outer edges of the bristle face, being narrower at the end towards the said outer edge, said tapering section tufts being combined with  
35 tufts of other sectional shapes in the tuft pattern.

The toothbrush of this invention may be provided with a combination of tufts or clusters of both of the above-described sectional shapes, i.e. one or more tufts or clusters which taper in a direction away from the longitudinal axis, and one or more tufts or clusters which taper in a direction toward the longitudinal axis.

Examples of sectional shapes which taper in the above-described ways are triangles, with an apex towards the longitudinal axis and a base facing, suitably substantially parallel to, the outer edge, or with an apex toward the outer edge and a base facing, suitably substantially parallel to, the longitudinal axis.

5 Such triangles may be equiangular, i.e with all three angles and sides the same, or may be irregular, i.e with all three angles and sides different. Such triangles may be isosceles triangles, i.e with two sides and their respective angles with the base being the same, for example with their base generally aligned with the longitudinal axis of the toothbrush. Such triangles may be right-angled triangles, for  
10 example with a first side substantially parallel to the longitudinal axis and a second side perpendicular to the first side.

Suitably the tufts themselves are of the said tapering sectional shape.

The above described triangular sectioned tufts may themselves be arranged in clusters of various numbers of tufts in various shapes, particularly in triangular  
15 clusters. For example two such right-angled triangle sectioned tufts may be arranged back-to-back to produce an isosceles triangle shaped cluster. For example three such triangular sectioned tufts may be arranged with their apexes pointing inwardly to form a triangular cluster.

The above mentioned tapering sectional-shaped clusters may alternatively be  
20 made up of tufts which have a conventional rounded shape, e.g made up into a triangle shaped cluster. For example three or more circular section tufts may be arranged in a triangle shaped cluster.

Other examples of such sectional shapes which taper in the above-described ways are pear shapes and ogival shapes, and semi circles or semi ellipses. Also the  
25 tufts may have shapes which are bisected by the longitudinal axis, each half of the bisected shape forming one of the above-described shapes. Examples of such shapes include diamond shapes and butterfly shapes. For example bisection of a diamond shape by an axis passing through two opposed apexes generates two triangle shapes on either side of the axis, and bisection of a diamond shape by an  
30 axis passing through its waist generates two triangle shapes on either side of the axis.

Suitably tufts and clusters of tufts having sectional shapes which taper have a point or a base, as appropriate, which lies at or along the outer edge of the tuft pattern on the bristle face, to enable the said tufts to easily come into contact with  
35 the teeth during brushing.

The above mentioned tufts and clusters having a sectional shape which tapers (respectively "first tufts and clusters") may be combined in a tuft pattern with tufts of other sectional shapes to enhance the cleaning effect. The said first tufts and clusters tufts have the advantage of improved conformation to the concavity of the

curve of the gumline where the teeth meet the gums, and the combination of these tufts with tufts of other sectional shapes can enhance the cleaning effect, for example if such other sectional shaped tufts are suited to clean other areas of the tooth or gum surface, the gumline or interdental spaces.

5           Such tufts of other sectional shapes may be of a conventional circular section shape, but in one such embodiment of this invention first tufts are combined with tufts (termed herein "second tufts"), having a sectional shape across the general bristle direction, which is elongated in a direction generally aligned with the longitudinal axis. Examples of such shapes are rectangular or lozenge shapes  
10 elongated in a direction generally parallel to the longitudinal axis.

          At the end of the head extreme from the handle, there may be a rounded, e.g. circular, oval or polygonal pattern of tufts for example in the form of a polygon of tufts optionally surrounding a central tuft, or alternatively a single large section tuft of rounded or polygonal shape (all herein termed "third tuft(s)"). The  
15 term "rounded" used in the context of these third tuft(s) means an imaginary closed curved line can be drawn through the tufts at the perimeter of the cluster, e.g. through the corners of a polygon.

          In another embodiment the said first tufts may be combined with one or more tufts (termed "fourth tufts") which have a sectional shape across the general  
20 bristle direction which is longer in a direction generally perpendicular to the longitudinal axis than along this axis. For example the shape may be an oval, rectangular or lozenge shape elongated in a direction generally perpendicular to the longitudinal axis.

          Also, when two of the said first tufts or clusters are arranged opposite each other on opposite sides of the longitudinal axis, between them, i.e. on or disposed  
25 about the longitudinal axis there may be one or more tufts situated between them.

          In one embodiment of this invention the said first, second, third and fourth tufts may be arranged on the toothbrush head in an arrangement comprising a  
30 pattern of third tufts at the end of the head remote from the handle, then a sequence of sets of first tufts evenly disposed on either side of the longitudinal axis optionally with one or more fourth tufts between them, longitudinally alternating with a pattern of second tufts. Suitably in this embodiment there are first tufts longitudinally adjacent to the third tufts, adjacent the base end of the head, and at or near the longitudinal midpoint of the head.

35           In another embodiment of this invention the said first, second and third tufts may be arranged on the toothbrush head in an arrangement comprising a pattern of third tufts at the end of the head remote from the handle, then in sequence towards the handle a sequence of one or more transverse rows of second tufts, then sets of first tufts of triangular section evenly disposed on either side of the longitudinal

axis, optionally with one or more fourth tufts between them, then a further sequence of one or more rows of second tufts, then adjacent the base of the head a further set of first tufts of triangular section evenly disposed on either side of the longitudinal axis.

5 In the above described embodiments the said first, second, third and fourth tufts may all extend to the same distance from the bristle face, or they may vary in length so that the ends of the bristles remote from the bristle face lie in an undulating surface. Suitably the said first, and optionally also the said third, tufts may be longer than the said second tufts.

10 The tufts of bristles, of all types, may be fixed into the toothbrush head by conventional means, for example conventional small metal clips retaining them in socket holes in the head, or alternatively they may be fused into the material of the head by known processes, e.g. as disclosed in US 4637660 or EP 0142885A.

15 The head and handle of the toothbrush may be made of plastics materials which are conventional in the toothbrush industry, using a conventional injection moulding process. Alternatively the head and handle may be made by the novel process disclosed in GB 9513883.0 (filed 7 July 1995 and continued as a PCT application claiming priority therefrom, the contents of which are included herein by way of reference), in which the head is made first with a first engagement part and the handle is then formed with a second engagement part in engagement with  
20 the first engagement part.

The head and handle may include known features of toothbrushes, for example elastomeric grip mats on the handle, and regions which modify flexibility, for example folded regions or cut-outs containing an elastomeric material. The head  
25 may have an undulating surface as disclosed in PCT/EP96/00714, the contents of which are included herein by way of reference. The bristles may be made of conventional materials, for example known nylon filaments.

The invention will now be illustrated by way of example only, with reference to the accompanying drawings.

30 Fig 1 shows a plan view of a toothbrush head of this invention.

Fig 2 shows a perspective view of the toothbrush head of Fig 1.

Fig 3 shows a plan view of an alternative toothbrush head of this invention.

Fig 4 shows a plan view of another alternative toothbrush head of this invention.

35 Referring to Figs 1 and 2, the head 1 of a toothbrush is shown in a plan view. At one end the head 1 connects to a grip handle (not shown) via neck 2 in a conventional manner, the head 1 and handle being integrally made of plastics material. The head 1 and handle lie along a longitudinal axis A--A.

From a bristle face 3 of the head 1 extend bristles 4, 5, 6, 7 arranged in tufts. The view of Fig 1 (and Fig. 3) is down the general bristle direction B--B in which the bristles extend.

5 Some of the tufts 4 are arranged in tufts which have a section, across the general bristle direction, which is a right-angled triangle, with one of the right angled sides generally perpendicular to the longitudinal axis A--A, and the other generally parallel to it. The cross section of these triangles taper in a direction away from the outer edge of the bristle face 3, with their base toward the outer edge. At about the longitudinal mid-point along the edge, two such tufts on each side of the longitudinal axis A--A, 4A, 4B are arranged back-to-back to form an isosceles triangle. The triangular section tufts 4 are disposed such that one of their edges lies at the outer edge of the tuft pattern, with an apex toward the longitudinal axis A--A.

15 Alternating with the triangular section tufts 4 is a pattern of second tufts 5, which have a sectional shape, across their bristle direction, which is elongated in a direction generally parallel to the longitudinal axis A--A, being substantially lozenge shaped.

At the end of the head 1 remote from the neck 2 are third tufts 6 in the form of a polygonal pattern arranged around a central tuft.

20 Where some of the first tufts 4 are opposite each other across the longitudinal axis A--A there are fourth tufts 7 between them, on the longitudinal axis A-A of the head 1, having a sectional shape across their bristle direction which is elongated in a direction across the longitudinal axis A--A, being of oval section.

25 As shown in Fig. 2 the first, third and fourth tufts 4, 6, 7 extend further from the bristle face 3 than the second tufts 5, so that the surface in which the ends of the bristles remote from the bristle face 3 is undulating.

Referring to Fig. 3 an alternative construction of toothbrush head is shown, in which features corresponding to the toothbrush of Figs 1 and 2 are correspondingly numbered. In the toothbrush of Fig 3 the first tufts 8, 8A, 8B are right angled triangle shaped in section across the bristle direction, but taper in a direction away from the longitudinal axis A-A, such that the base of the triangle faces the longitudinal axis and the apex is toward the outer edge of the tuft pattern.

35 Referring to Fig. 4 another alternative construction of toothbrush head is shown. First 4, second 5 and third 6 tufts are arranged on the toothbrush head 1 in an arrangement comprising a pattern of third tufts 6, in the form of a polygonal pattern arranged around a central tuft, at the end of the head 1 remote from the neck 2. In sequence towards the neck 2 is firstly a sequence of three rows of second tufts 5A. This is followed by a set of first tufts 4A of triangular section, in two clusters each of three triangular sectioned tufts 4A, the section of each of which tapers in a

direction away from the outer edge of the bristle face 3, being in a triangular pattern, itself with its base towards the edge of the bristle face 3, being evenly disposed on either side of the longitudinal axis A-A. Then there is a further sequence of rows of second tufts 5B. Then adjacent the base of the head 1 is a  
5 further set of first tufts 4 of triangular section, in two clusters each of three triangular sectioned tufts 4, the section of each of which tapers in a direction away from the outer edge of the bristle face 3, being in a triangular pattern, itself with its base towards the edge of the bristle face 3, being evenly disposed on either side of the longitudinal axis A-A.

10 The toothbrush of Figs. 1, 2, 3 and 4 is used in the same way as known toothbrushes, preferably in a manner as recommended by dental practitioners. The triangular sectional shape of the first tufts 4 and 8 enable the bristles in these tufts to accommodate themselves better to the shape of the teeth, particularly the gumline. The second, third and fourth tufts 5, 6 and 7 facilitate cleaning of  
15 other areas of the teeth and the interdental spaces. The overall combination of tufts on the toothbrush of the invention therefore results in an advantageous tooth cleaning effect.



**Claims:**

1. A toothbrush which has a head (1) and a grip handle (2) disposed along a longitudinal axis, with bristles (4, 5, 6, 7) extending from a bristle face (3) of the head (1) in a general bristle direction generally perpendicular to the longitudinal axis, *characterised* in that at least some of the bristles are arranged in tufts (4) which have a sectional shape, or are arranged in clusters of tufts which have a sectional shape, across the general bristle direction, which tapers in a direction away from the outer edges of the bristle face (3) toward the longitudinal axis, being wider at the end towards the said outer edge.
2. A toothbrush which has a head (1) and a grip handle (2) disposed along a longitudinal axis, with bristles extending from a bristle face (3) of the head (1) in a general bristle direction generally perpendicular to the longitudinal axis, *characterised* in that at least some of the bristles are arranged in tufts (8) which have a sectional shape, or are arranged in clusters of tufts which clusters have a sectional shape, across the general bristle direction, which tapers in a direction away from the longitudinal axis towards the outer edges of the bristle face (3), being narrower at the end towards the said outer edge, said tapering section tufts being combined with tufts (5, 6, 7) of other sectional shapes in the tuft pattern.
3. A toothbrush according to claim 1 or claim 2 *characterised* in that it is provided with a combination of one or more tufts (8) or clusters which taper in a direction away from the longitudinal axis, and one or more tufts (4) or clusters which taper in a direction toward the longitudinal axis.
4. A toothbrush according to any one of claims 1 to 3 *characterised* in that the said sectional shapes which taper are triangles.
5. A toothbrush according to any one of claims 1 to 4 *characterised* in that the tufts themselves are of the said tapering sectional shape.
6. A toothbrush according to claim 5 *characterised* in that triangular sectioned tufts are themselves arranged in triangular clusters (4B, 8A, 8B).
7. A toothbrush according to claim 6 *characterised* in that two right-angled triangle sectioned tufts (8A, 8B) are arranged back-to-back to produce an isosceles triangle shaped cluster.

8. A toothbrush according to claim 6 *characterised* in that three triangular sectioned tufts are arranged with their apexes pointing inwardly to form a triangular cluster (4B).
- 5 9. A toothbrush according to any one of claims 1 to 4 *characterised* in that tapering sectional-shaped clusters are made up of tufts which have a rounded shape and are arranged in a triangle shaped cluster.
- 10 10. A toothbrush according to any one of the preceding claims *characterised* in that tufts and clusters of tufts having sectional shapes which taper have a point or a base, as appropriate, which lies at or along the outer edge of the tuft pattern on the bristle face.
- 15 11. A toothbrush according to any one of the preceding claims *characterised* in that the tufts (4) and/or clusters having a sectional shape which tapers (respectively "first tufts and clusters") are combined in a tuft pattern with tufts (5) ("second tuft(s)") having a sectional shape across the general bristle direction, which is elongated in a direction generally aligned with the longitudinal axis.
- 20 12. A toothbrush according to any one of the preceding claims *characterised* in that at the end of the head (1) extreme from the handle (2), there is a rounded, or polygonal pattern of tufts (6) or alternatively a single large section tuft of rounded or polygonal shape ("third tufts").
- 25 13. A toothbrush according to any one of the preceding claims *characterised* in that the said first tufts (4) are combined with one or more tufts (7) which have a sectional shape across the general bristle direction which is longer in a direction generally perpendicular to the longitudinal axis than along this axis ("fourth tufts").
- 30 14. A toothbrush according to any one of the preceding claims *characterised* in that two of the said first tufts or clusters (8A, 8B,) are arranged opposite each other on opposite sides of the longitudinal axis and there are one or more tufts (7) situated between them.
- 35 15. A toothbrush according to any one of the preceding claims *characterised* in that the said first, second, third and fourth tufts (4, 5, 6, 7) vary in length so that the ends of the bristles remote from the bristle face lie in an undulating surface.

16. A toothbrush according to claim 15 *characterised* in that the said first (4), and optionally also the said third (6), tufts are longer than the said second tufts (5).

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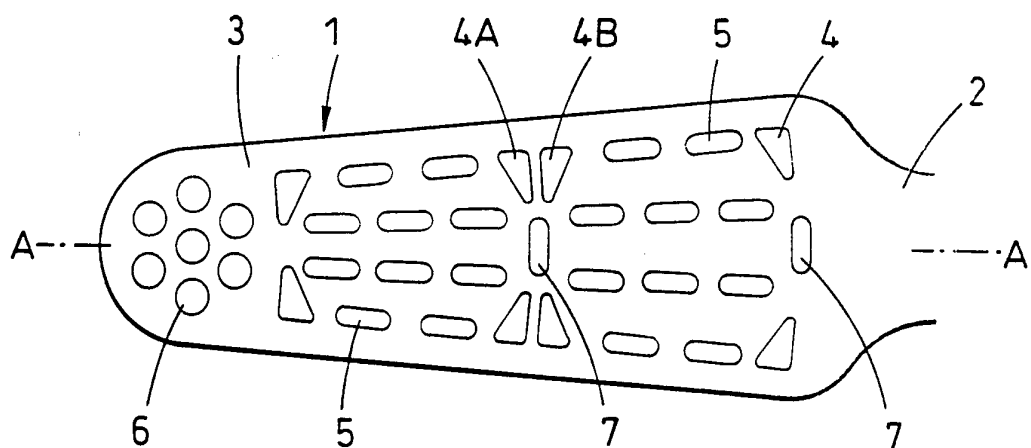


Fig. 1

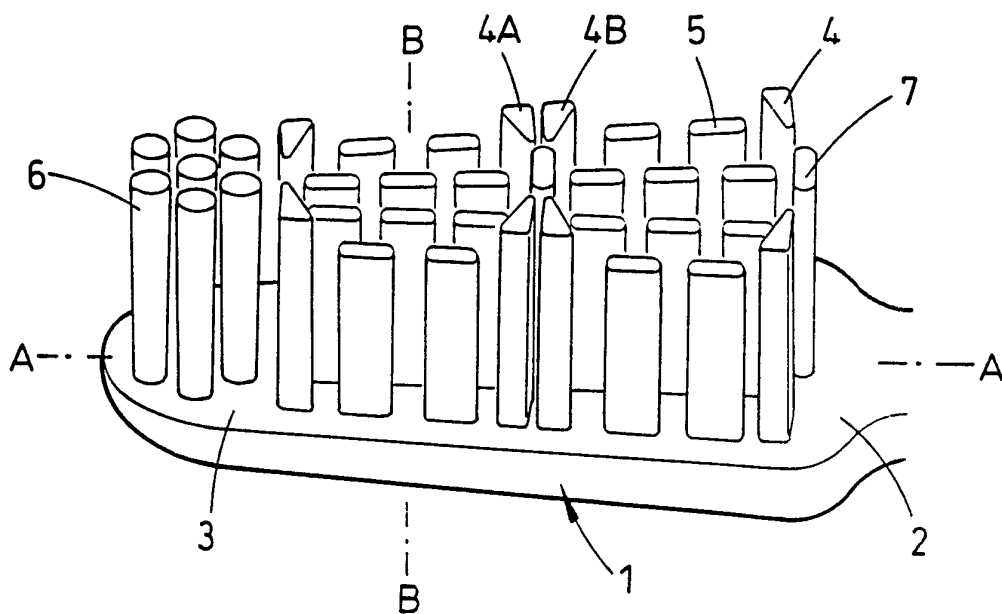
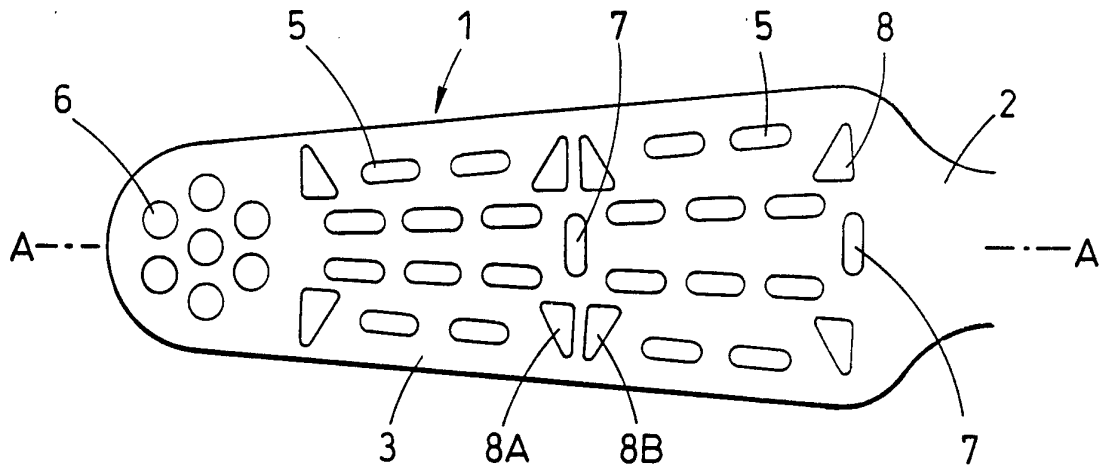
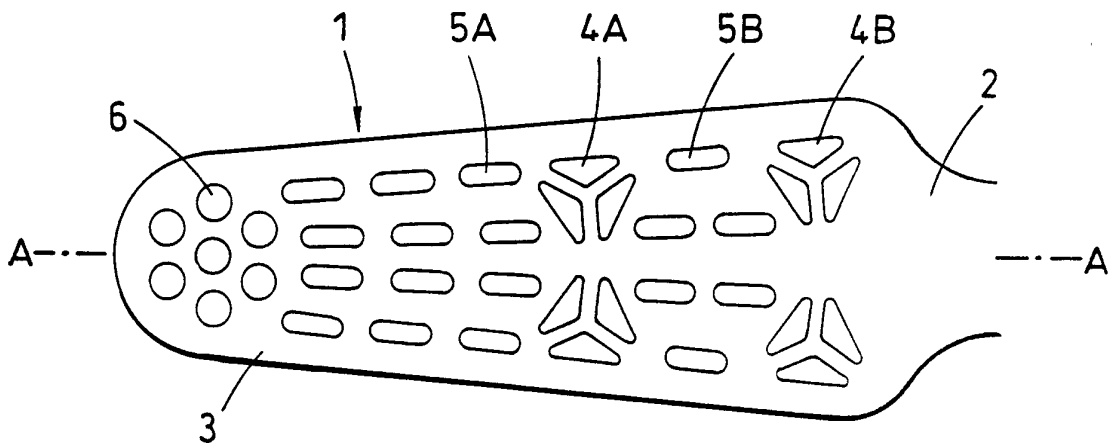


Fig. 2



**Fig. 3**



**Fig. 4**

# INTERNATIONAL SEARCH REPORT

Int. Application No  
PCT/EP 96/03104

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC 6 A46B9/04		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b>		
Minimum documentation searched (classification system followed by classification symbols) IPC 6 A46B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used)		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 1 981 657 A (MILLER) 20 November 1934 see the whole document ---	1,4,5,10 2
A	WO 95 06420 A (LINGNER + FISCHER) 9 March 1995 cited in the application see figures 5,8,9 ---	1,2
A	DE 40 10 671 A (VUKOSAVLJEVIC) 23 August 1990 see claims; figures 1,2 -----	1,2
<input type="checkbox"/> Further documents are listed in the continuation of box C. <span style="margin-left: 100px;"><input checked="" type="checkbox"/> Patent family members are listed in annex.</span>		
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Date of the actual completion of the international search  <div style="text-align: center; font-weight: bold;">17 October 1996</div>	Date of mailing of the international search report  <div style="text-align: center; font-weight: bold;">29.10.96</div>	
Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Authorized officer  <div style="text-align: center; font-weight: bold;">Ernst, R</div>	

INTERNATIONAL SEARCH REPORT

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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