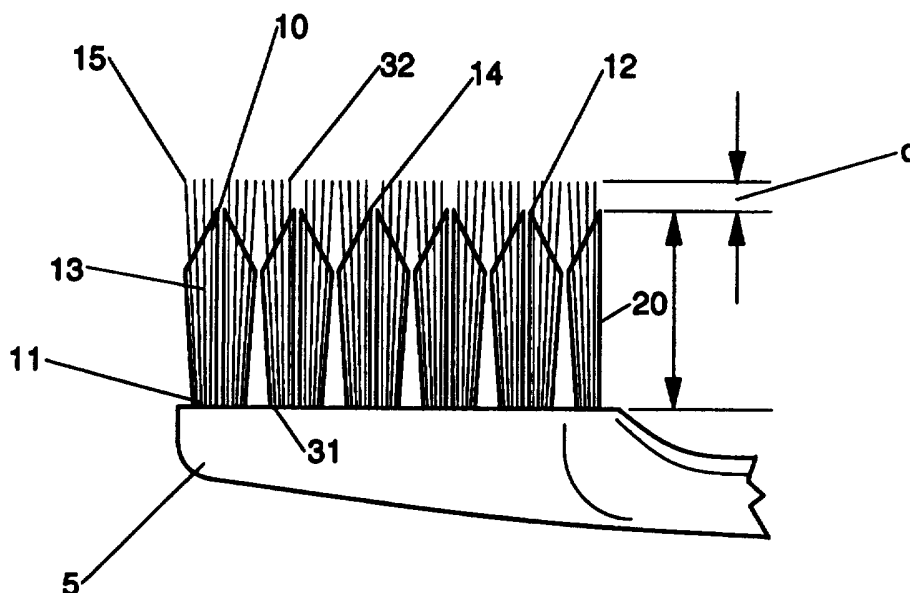




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<p>(21) International Application Number: PCT/US95/14877</p> <p>(22) International Filing Date: 15 November 1995 (15.11.95)</p> <p>(30) Priority Data: 08/347,624 1 December 1994 (01.12.94) US</p> <p>(71) Applicant: THE PROCTER & GAMBLE COMPANY [US/US]; One Procter & Gamble Plaza, Cincinnati, OH 45202 (US).</p> <p>(72) Inventor: VOLPENHEIN, Daniel, William; 3469 Wildwood Drive, Maineville, OH 45039 (US).</p> <p>(74) Agents: REED, T., David et al.; The Procter & Gamble Company, 5299 Spring Grove Avenue, Cincinnati, OH 45217 (US).</p>		<p>(81) Designated States: CA, CN, JP, MX, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>

(54) Title: TOOTHBRUSH HAVING EXTENDED BRISTLES



(57) Abstract

A toothbrush which provides superior cleaning as well as gum and inter dental stimulation. The toothbrush has an elongated member extending between two ends. The elongate member has a head at one of its ends. The head has a plurality of tufts comprising a multiplicity of bristles. The tufts have proximal ends attached to the head, distal ends extending outwardly from the head and sides extending between the distal and proximal ends. The distal ends of the tufts are angled downwardly from a peak so that adjacent tufts form a V shaped profile when looking at the side of the tufts. The head further includes a number of additional bristles attached thereto and extending above the peaks of the tufts.

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TOOTHBRUSH HAVING EXTENDED BRISTLES

5

FIELD OF THE INVENTION

The present invention relates to toothbrushes, and more particularly, to toothbrushes having extended bristles. Moreover, the present invention also relates to toothbrushes which exhibit a three-dimensional bristle profile.

10

BACKGROUND OF THE INVENTION

The fundamental purpose of toothbrushes is to remove plaque and debris from tooth surfaces, both along their outer surfaces and in the inter proximal areas as well as provide gum and inter dental stimulation. There is a continuing desire to improve the inter proximal cleaning of toothbrushes, especially since many consumers do not floss. Moreover there is an additional desire to provide a toothbrush which will signal to the user that the bristles are reaching inter-proximally so that the consumer can immediately notice the improved cleaning properties of the toothbrush. While most commercially available toothbrushes clean the outer surfaces of teeth adequately toothbrushes having a three-dimensional or "V" shaped profile, when viewed from the side, render the toothbrush particularly adept at cleansing and stimulation.

However, the search for a toothbrush having superior inter proximal cleaning has not ended. There has been a desire to improve the cleaning properties of both ordinary, i.e. flat, toothbrushes and toothbrushes having a "V" shaped profile toothbrush.

25

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a toothbrush which provides superior cleaning as well as superior gum and inter dental stimulation. The toothbrush has an elongate member extending between two ends. The elongate member has a head at one of its ends. The head has a plurality of tufts comprising a multiplicity of primary bristles. The primary bristles have proximal ends attached to the head and distal ends extending outwardly from the head. The head further includes a predetermined number of extended bristles having proximal ends attached to the head and distal ends extending from the head at a distance at least 0.5 mm above all of the distal ends of the primary bristles.

BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims which particularly point out and distinctly claiming the invention, it is believed the present invention will be better
5 understood from the following description of several particularly preferred embodiments taken in conjunction with the accompanying drawings, in which like reference numerals identify similar elements and wherein;

Figure 1 is a perspective view of a preferred embodiment of the present invention.

10 Figure 2 is a simplified side view of the head of the brush shown in Figure 1.

Figure 3 is a top view of the head shown in Figure 2.

Figure 4 is a view similar to that of Figure 2 but showing an alternative embodiment.

15 Figure 5 is a view similar to that of Figure 2 but showing yet another alternative embodiment.

Figure 6 is a top view of the head shown in Figure 5.

Figures 7A - 7D are schematic figures of an apparatus for making the toothbrush of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

20 In a particularly preferred embodiment, shown in Figure 1, the present invention comprises a toothbrush 1, for achieving improved inter proximal cleaning and gum and inter dental stimulation. Toothbrush 1 includes an elongate member 30 extending between two ends 2 and 3. End 2 comprises a handle portion 4 and end 3 comprises a
25 head 5. For applications such as electric toothbrushes, the handle portion 4 may comprise suitable attachment means (not shown) for securing the brush to the driving means. Head 5 has a plurality of tufts 10 comprising a multiplicity of primary bristles 20. As seen from Figure 2 primary bristles 20 have proximal ends 11 attached to the head, distal ends 12 extending outwardly from head 5, and sides 13 extending between
30 proximal end 11 and distal end 12. As seen from the figure, primary bristles 20 of tufts 10 are angled downwardly from peaks 14 so that adjacent tufts form a "V" shaped profile when looking at the sides 13. Head 5 further includes a number of extended bristles 15. Extended bristles 15 have proximal ends 31 attached to the head and distal ends 32 extending outwardly from the head. Distal ends 32 of extended bristles 15
35 extend at least 0.5 mm above all of the distal ends 12 of primary bristles 20. That is extended bristles 15 extend at least 0.5 mm above the highest primary bristle of each peak 14. Extended bristles 15 can be bundled together with tufts 10. Bristles 15

provide for improved gum and inter dental stimulation. All of the bristles are preferably end rounded to protect gum tissue.

The present invention, however, is not limited to toothbrushes having tufts which form a "V" shaped profile. As seen from Figure 4, there is shown an ordinary flat toothbrush head 105. Head 105 has a plurality of tufts 110 comprising a multiplicity of primary bristles 120. Primary bristles 120 have proximal ends 111 attached to the head, distal ends 112 extending outwardly from head 105, and sides 113 extending between proximal end 111 and distal end 112. Distal ends 112 extend away from the head 105 at substantially the same distance. Head 105 further includes a number of extended bristles 115. Extended bristles 115 have proximal ends 131 attached to the head and distal ends 132 extending outwardly from the head. Distal ends 132 of extended bristles 115 extend at least 0.5 mm above all of the distal ends 112 of primary bristles 120.

However, a particularly preferred embodiment is the one shown in Figures 1 and 2. As seen from Figure 2 tufts 10 of toothbrush 1 form a straight-"V" shaped side profile having peaks 14. For an adult sized toothbrush, the total number of V's preferably ranges from about three to about seven. The distance from the top of one V to another preferably ranges from about 0.16 inches to about 0.30 inches, and even more preferably, from about 0.19 inches to about 0.25 inches. The distance from the bottom to the top of the "V" is preferably about 0.14 inches with a range of from about 0.10 inches to about 0.17 inches. It is preferred that the tufts of each row are preferably aligned. The longitudinal row spacing, the longitudinal distance between adjacent tufts 18, as measured in a direction parallel to the length of elongate member 2 preferably ranges from about 0.02 inches to about 0.08 inches, and even more preferably from about 0.04 inches to about 0.07 inches.

The bristles 20 in combination have a bristle stiffness which can be characterized numerically by the following equation:

$$\text{Bristle Stiffness} = \frac{D^2 E * (\# \text{ Bristles})}{X^2 \quad 1 \times 10^6}$$

where; D = bristle diameter, in inches

E = modulus of elasticity of the bristle material

when wet, e.g. for nylon this is a constant, 460,000 psi

X = average bristle length across the head 16 of the brush in inches

bristles = total number of bristles on head 5

The bristle stiffness preferably ranges from about 0.2 to about 0.8.

The diameter "D" bristles 20 preferably ranges from about 0.006 inches to about 0.009 inches. Average bristle length of the primary bristles preferably ranges

from about 0.30 inches to about 0.55 inches and even more preferably from about 0.34 inches to about 0.44 inches. The total number of bristles 20 in the head 5 preferably from about 1,200 to about 5,000, and even more preferably from about 1,600 to about 3,500.

5 Buttressing is the tendency of adjacent bristles to support or buttress each other. The Buttress Factor of the brush, is achieved by dividing the cross-sectional area taken up by the bristles 20 by the total cross sectional area of the tufts 10 at the base. Numerically, the preferred Buttress Factor for brushes of the present invention ranges from about 0.8 to about 0.96.

10 A preferred method of achieving end rounded bristles 20 in a "V" shaped format is to first square cut or shear a group of bristles perpendicular to the length of the bristles. The cut ends of the bristles are then ground while in a common plane to remove any sharp or protruding edges from each bristle. The bristles are then moved relative to each other to produce a desired three-dimensional shape at the exposed end
15 of the tuft. The attachment end of the bristles are then preferably square cut or sheared to the appropriate length. This method is further described in German Patent Application 3820372 which published on December 20, 1989, which is hereby incorporated herein by reference. The attachment end of the bristles is discussed below.

20 As mentioned above head 5 further includes additional bristles 15 which provide for gum and inter dental stimulation. These additional bristles provide a soft sparse upper profile in combination with the lower V-shaped or flat profile. This dual layering provides superior mouth feel and bristle penetration. For the embodiment of Figure 2 each tuft 10 has from about 40 to about 80 primary bristles, depending on the stiffness,
25 and each tuft has 1-10 extended bristles 15 which extend between about 1 mm to about 2 mm above the peak 14 of the tuft. The ratio of extended bristles to primary bristles preferably ranges from about 1:4 to about 1:40. With too many extended bristles the extended bristles will behave like an ordinary brush and will not exhibit their independent movement and penetration.

30 Another alternative embodiment of a head for the toothbrush of the present invention is shown in Figures 5 and 6. Figures 5 and 6 shows head 205 which is very similar to head 5. Head 205 has a plurality of tufts 210 comprising a multiplicity of primary bristles 220. Head 205 also has a predetermined number of extended bristles 215 extending therefrom. The tufts 210 are disposed on the head so as to define outer
35 tufts 218, adjacent the outer perimeter 206 of head 205, and inner tufts 219. As seen from the figure primary bristles 220 have proximal ends 211 attached to the head, distal ends 212 extending outwardly from head 205, and sides 213 extending between

proximal end 211 and distal end 212. As seen from the figure distal ends 212 of tufts 210 are angled downwardly from peaks 214 so that adjacent tufts form a "V" shaped profile when looking at the sides 213. A predetermined number of outer tufts 218 have peaks 214 which extend outwardly from the head a greater distance than the all of the peaks of the inner tufts 219. The tufts with extended peaks are shown as being shaded in Figure 6. This provides for improved inter proximal penetration, especially at the gum line. As seen from Figure 6 the outer perimeter 206 of head 205 is oblong and forms sides 251 and 252, a back 253 and a front 254. There are preferably 22 outer tufts, of which for each side the 6 tufts closest to the back 253 of the head are the ones which have peaks that extend above all of the peaks of the inner tufts. However, extended bristles 215 still extend at least 0.5 mm about the extended peaks.

The extended outer tufts preferably have peaks that are from about 0.5 mm to about 2 mm higher than the peaks of the inner tufts and they are most preferably about 1 mm higher peak than the inner tufts. Preferably the inner tufts have a peak height of about 11.5 mm. The ratio of the peak height of the inner tufts versus the peak height of the extended outer tufts ranges from about 0.85 to about 0.96.

The embodiment shown in Figures 1-3 and 5-6 disclose an adult full size head. However, often adults prefer a compact head where the two rows of tufts are removed leaving 18 outer tufts of which for each side the 6 tufts closest to the back 153 of the head are the ones which have peaks that extend above all of the peaks of the inner tufts.

One preferred method of forming the brush is similar to the method disclosed in U.S. Patent 4,979,782 issued to Weihrauch on December 25, 1990, which is hereby incorporated herein by reference. How this process can be modified to make the brush of the present invention can best be described by referring to Figures 7A - 7D, which show equipment which corresponds to Figures 1a-1i of the above incorporated reference. Figure 7A shows tufts 10 in clamping device 505, having canals 515, after the bristles in the tufts have been end rounded. Negative form 518 is then introduced to the rear 517 of clamping device 505 and carrier 520 having pins 521 is introduced to the front 516 of clamping device 505 as shown in Figure 7B. Clamping device 505 then releases its grip on tufts 10. Pins 521 then move into canals 515 pushing bristles into negative form 518 and forming the profile of the tuft as shown in Figure 7C. Another set of pins can be used instead of negative form 518. Negative form 518 is removed and extended bristles 15 are inserted into the tufts as shown in Figure 7D. Clamping device 505 can then grip the tufts 10 and the extended bristles 15 can be trimmed and end rounded. Thereafter the tufts can be attached to head 5 by any known method including the one described in U.S. Patent 4,637,660 issued to Weihrauch on January 20, 1987, which is hereby incorporated herein by reference.

Although particular embodiments of the present invention having been shown and described, modification may be made to the toothbrush without departing from the teachings of the present invention. Accordingly, the present invention comprises all embodiments within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. A toothbrush having an elongate member extending between two ends, the elongate member having a head at one of the ends, the head has a plurality of tufts comprising a multiplicity of primary bristles, the primary bristles have proximal ends attached to the head, distal ends extending outwardly from the head and sides extending between the distal and proximal ends, the toothbrush characterized by:

the head having a predetermined number of extended bristles having proximal ends attached to the head and distal ends extending from the head a distance at least 0.5 mm above all of the distal ends of the primary bristles.

2. A toothbrush according to Claim 1 wherein the distal ends of the tufts are angled downwardly from a peak so that adjacent tufts form a V shaped profile when looking at the side of the tufts.

3. A toothbrush according to any of the previous claims wherein the head has an outer perimeter and wherein the tufts are arranged on the head so as to define outer tufts, adjacent the outer perimeter of the head, and inner tufts, wherein a predetermined number of the outer tufts have their peaks extending further away from the head than all of the peaks of the inner tufts.

4. The toothbrush according to Claim 3 wherein the head is oblong and defines a back, adjacent to the elongated member, a front and two sides and wherein there are 22 outer tufts of which the 6 tufts on each side closest to the back of the head have their peaks extending further away from the head than the peaks of the inner tufts.

5. The toothbrush according to Claim 3 wherein the head is oblong and defines a back, adjacent to the elongated member, a front and two sides and wherein there are 18 outer tufts of which the 6 tufts on each side closest to the back of the head have their peaks extending further away from the head than the peaks of the inner tufts.

6. The toothbrush according to any of the previous Claims wherein the extended bristles are bundled together with the tufts.

7. The toothbrush according to any of the previous Claims wherein each tuft has from about 40 to about 80 primary bristles and from about 1 to about 10 extended bristles.

8. The toothbrush according to any of the previous Claims wherein the ratio of extended bristles to primary bristles ranges from about 1:4 to about 1:40.

9. The toothbrush according to any of the previous Claims wherein all of the distal ends of said extended bristles extend from the head at substantially the same distance.

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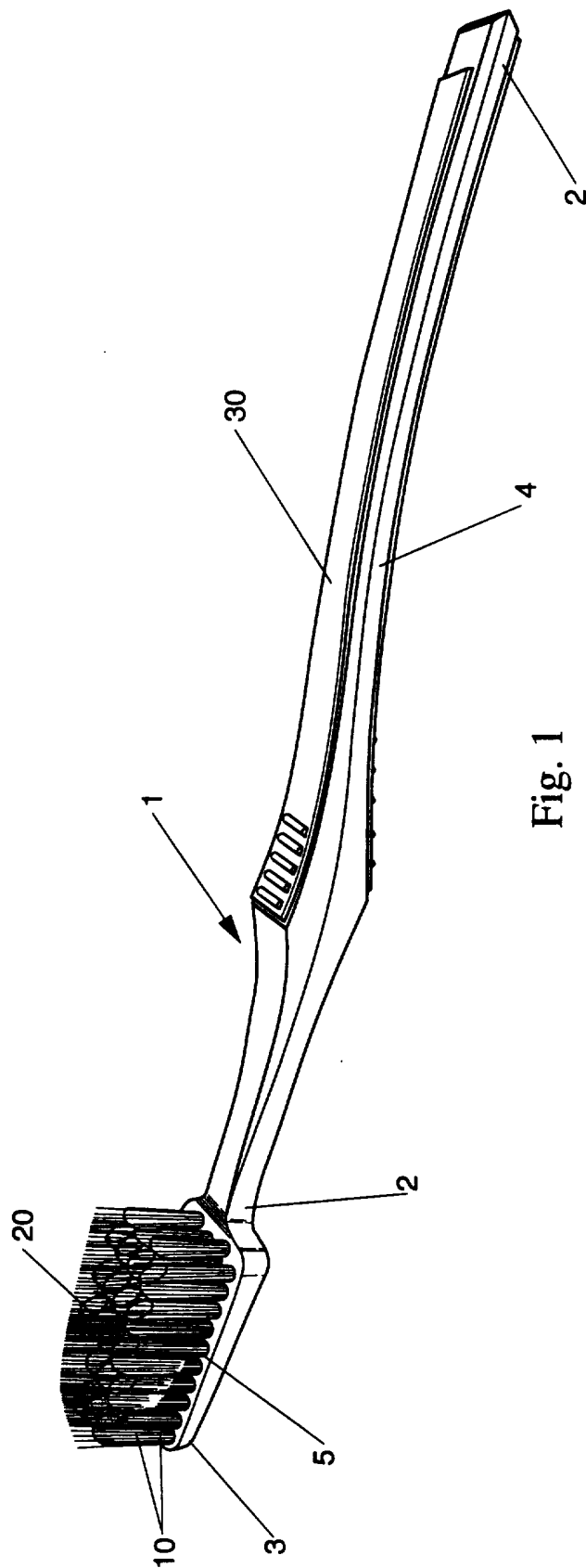


Fig. 1

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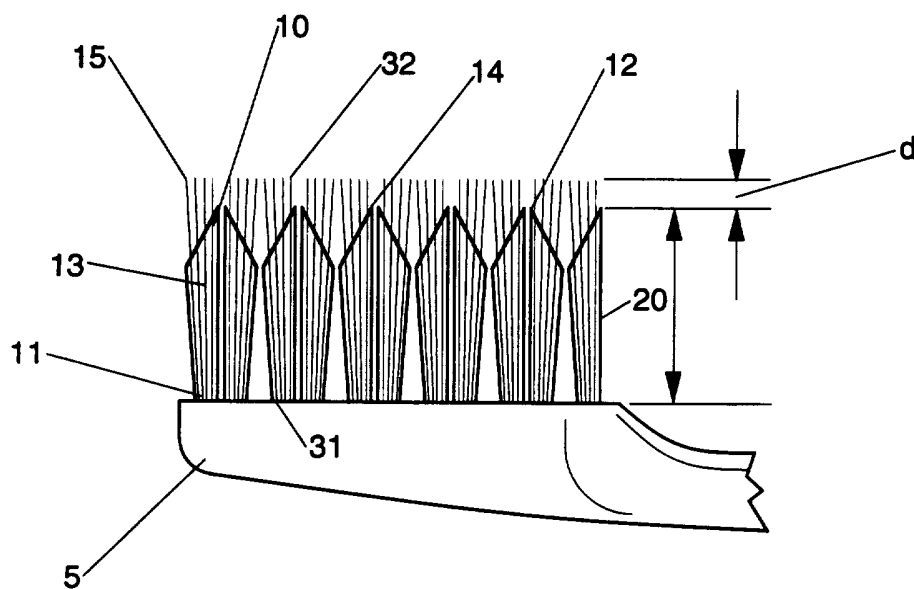


Fig. 2

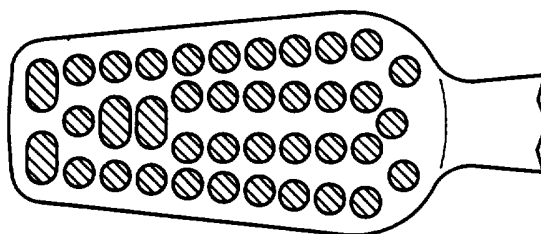


Fig. 3

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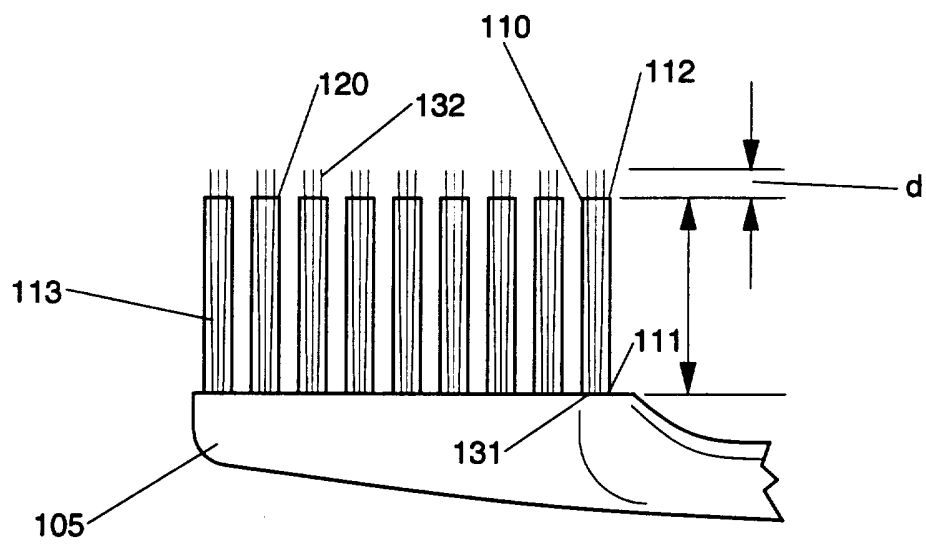


Fig. 4

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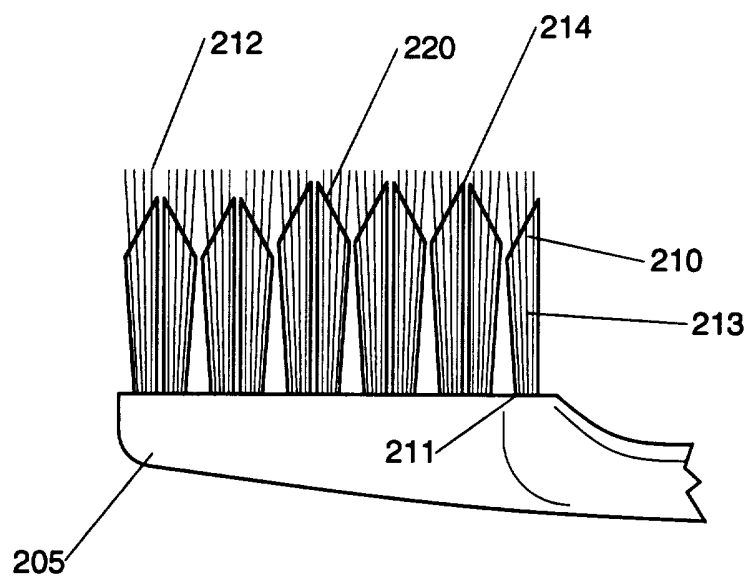


Fig. 5

5/6

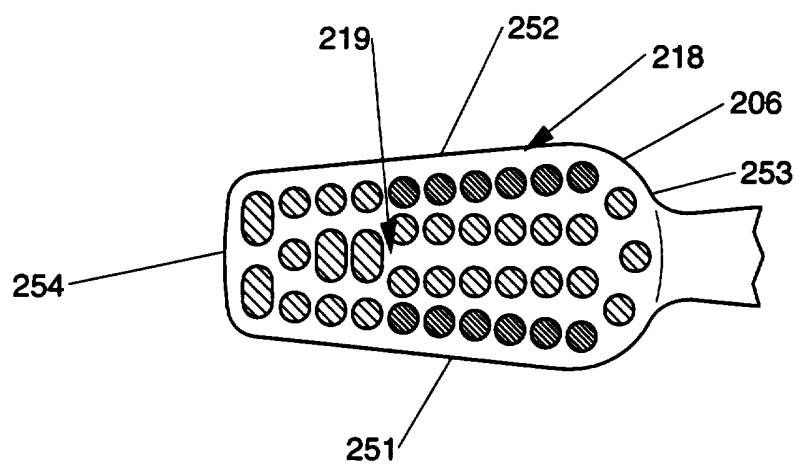


Fig. 6

6/6

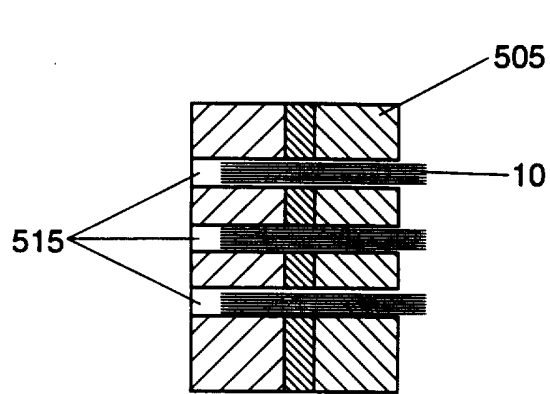


Fig. 7A

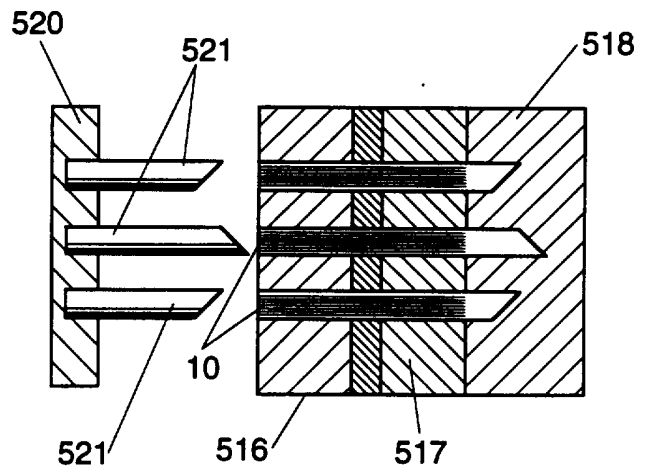


Fig. 7B

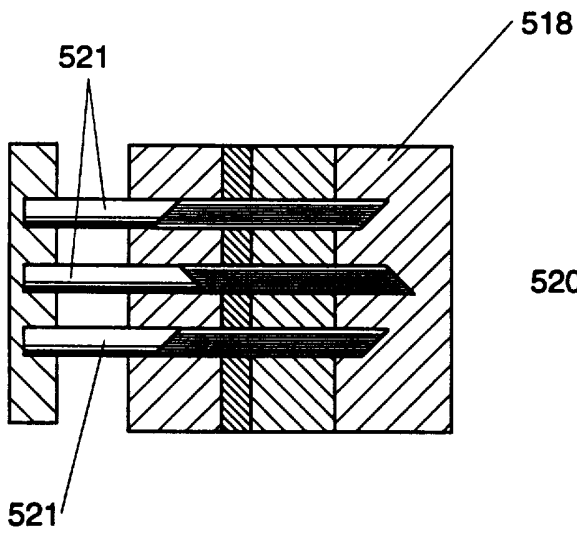


Fig. 7C

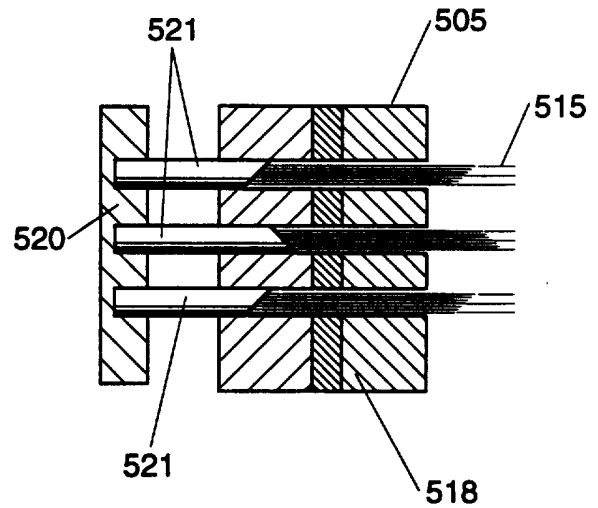


Fig. 7D

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 95/14877

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A46B9/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	EP,A,0 247 224 (KAO CORP.) 2 December 1987 see page 3, line 10 - page 4, line 19; figures; example ---	1,6 2,3,5
Y	WO,A,91 19437 (PROCTER & GAMBLE) 26 December 1991 see figures ---	2
Y	WO,A,94 09678 (GILLETTE CANADA) 11 May 1994 see figures 1-6 ---	3,5
A	US,A,5 249 327 (HING) 5 October 1993 see column 2, line 47 - column 3, line 24; figures --- -/--	1

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

26 April 1996

Date of mailing of the international search report

10. 05. 96

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 95/14877

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>EP,A,0 471 312 (KAO CORP.) 19 February 1992 see page 5, line 34 - page 7, line 8; figures 4-9 -----</p>	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 95/14877

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		PL-A- 308672	21-08-95
		ZA-A- 9307969	30-01-95

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EP-A-0471312	19-02-92	NONE	
