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71 Applicant: **THE PROCTER & GAMBLE
COMPANY**
One Procter & Gamble Plaza
Cincinnati,
Ohio 45202 (US)

72 Inventor: **Graham, Margaret Anne**
35 Heatside,
Hangerhill

Weybridge,
Surrey KT13 9YJ (GB)
Inventor: **Harbison, Fiona Baillie**
44 Quincy Road
Egham TW20 9NW (GB)
Inventor: **Manhart, Michael Dunn**
5537 Squirrel run Lane
Cincinnati,
Ohio 45247 (US)

74 Representative: **Canonici, Jean-Jacques et al**
Procter & Gamble European Technical
Center N.V.
Temselaan 100
B-1853 Strombeek-Bever (BE)

54 **Toothbrush with non-circular cross section filaments.**

57 The invention concerns a toothbrush having a handle and a brush head wherein the brush head comprises non-circular cross-section filaments. The filaments have a trilocular, tetralocular, trilobular, rectangular or hexagonal cross-section. These toothbrushes offer a much better cleaning efficiency c.q. better plaque removal from the tooth surface.

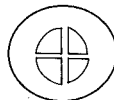
FIGURE 1

Diagrams of filament types used in the present application.

Trilocular



Tetralocular



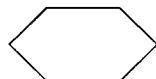
Trilobular



Rectangular



Hexagonal



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The present invention relates to a brush head especially a toothbrush head comprising filaments having a non-circular cross-section.

A toothbrush includes a handle and a brush head attached to the handle. The brush head has a longitudinal axis and terminates in a free end remote from the handle; the head has a surface from which the tufts extend generally upwardly. In a conventional toothbrush the head and the handle are usually made in one part, whereas in electronic toothbrushes the brush head usually has to be fixed by the consumer to the handle - before use . The brushing head includes brushing filaments. A group of filaments are so-called tufts.

Toothbrush filaments to date use of circular cross-section. However, normal brushes using these type of filaments do not remove all plaque from the tooth surfaces. Also a number of toothbrush constructions are known, however, none appears to exhibit a good cleaning efficiency. Often specific brushing techniques on leaflets included in the package are set out by the manufacturer. However normal practice is that a purchaser does not pay attention to the instructions offered by the manufacturer, so less than optimum teeth cleaning is obtained.

Therefore a continuing need exists for improvement of toothbrushes providing better cleaning. We have now found that toothbrushes containing different cross-sections of filaments vs the standard circular filaments surprisingly give a better cleaning efficiency.

The filaments according to the invention have a trilocular, tetralocular, trilobular, rectangular or hexagonal cross-section.(see Figure 1: showing diagrams of these filament types)

Furthermore part of the invention is a brush head comprising said filaments wherein a certain group of filaments a so-called tuft have a trilocular cross-section whereas the other tufts have a tetralocular, trilobular, rectangular, hexagonal or circular cross-section or any combination thereof.

A toothbrush tufted completely with tetralocular, rectangular, trilocular, trilobular or hexagonal filaments cleans surprisingly and unexpectedly better than a toothbrush comprising standard conventional circular filaments.

The toothbrushes according to the invention are made by exactly the same process as conventional brushes - only replacing the filament material with either tetralocular, rectangular, trilocular, trilobular or hexagonal filaments.

Also the tufting, cutting of filaments flat and the endrounding of filament tips is performed by processes known in the art: for instance a preferred process for enrounding is described in USP 4,979,782.

The filaments are preferably placed substantially perpendicular to the brush head and spaced longitudinal extending across the entire width of the brush head whereas the filaments extend generally upwardly from the brush head. In another embodiment the filaments are placed under an angle with respect to the brush head; for instance as described in EP 449,655.

The filaments can be used in the toothbrush head in combination with normal circular filaments; the filaments can be used in different bristle configurations whereas the material of the filaments can be of polyester, nylon or any other material suitable for use.

Furthermore the diameter of the cross-section of the filaments may vary within the usual dimensions known by a person skilled in the art. The brush head according to the invention can be part of a conventional toothbrush or part of an electronic and ultrasonic toothbrush as well.

In order to demonstrate the better cleaning efficiency of a toothbrush having the filaments according to the invention, a description of the cleaning test method used is given hereafter.

Example

Toothbrush cleaning efficiency machine tester

The machine operating parameters are based on consumer habits. Additionally, the artificial plaque stain was developed based on the physical characteristics of plaque.

The machine uses a model (plastic teeth and gums of average adult dentition/size) of the upper left quadrant of the mouth (pre-molar/molar teeth) to evaluate the efficiency of a particular brush at removing artificial plaque from the model teeth surface. The angle of brushing and the force used to brush the teeth are the average observed for consumers. The brushing motion is controlled by an electric motor. The efficacy of a test toothbrush is measured by calculating the difference between initial artificial plaque area minus the remaining artificial plaque after brushing. This is measured using video imaging and computer software.

Key Parameters used in the testing are known by persons skilled in the art like:

1. Brushing Motion - back and forth

- 2. Teeth - molars & premolars
- 3. Brush Angle
- 4. Brushing time
- 5. Brush stroke length
- 5 6. Brush Speed
- 7. Brush force

The result of above-mentioned in-vitro experiment is outlined in the following table :

	% not removed plaque
Novel filament shapes according to the invention	8 - 10
Circular cross-section filaments	13 - 16

15 The % of non-removed plaque for all filaments according to the invention is substantial lower than the standard circular cross-section filaments.

Claims

- 20 1. Brush head comprising filaments characterized in that the filaments have a non-circular cross-section.
- 2. Brush head according to claim 1 wherein the brush head is part of a toothbrush.
- 3. Brush head according to claim 1 or 2 wherein the filaments have a trilocular, tetralocular, trilobular,
- 25 rectangular or hexagonal cross-section.
- 4. Brush head according to claim 3 wherein a group of filaments making up a tuft have a trilocular cross-section whereas other groups of filaments making up a tuft have a tetralocular, trilobular, rectangular, hexagonal or circular cross-section or any combination thereof.
- 30 5. Brush head according to claim 1-4 wherein the filaments are made of polyester material, nylon or any other material suitable for use.
- 6. Brush head according to any of the preceding claims wherein the filaments are placed substantially perpendicular to the brush head and spaced longitudinal extending across the entire width of the brush head.
- 35 7. Brush head according to claim 1-5 wherein the filaments are placed under an angle with respect to the brush head.
- 40 8. Brush head according to claim 6 or 7 wherein part of the filaments are placed substantially perpendicular to the brush head and another part of the filaments are placed under an angle with respect to the brush head.

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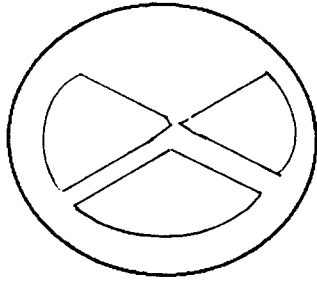
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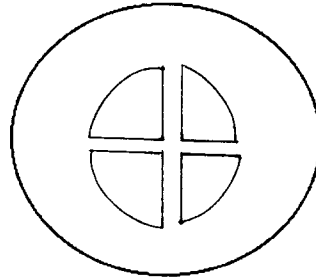
FIGURE 1

Diagrams of filament types used in the present application.

Trilocular



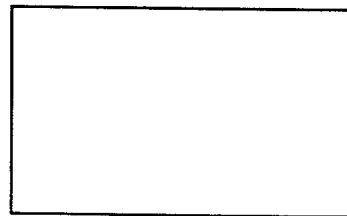
Tetralocular



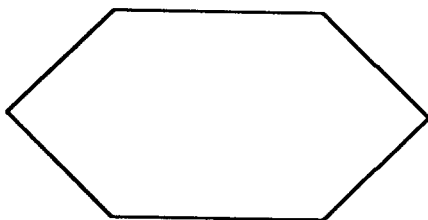
Trilobular



Rectangular



Hexagonal





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	US-A-2 876 477 (STEWART) * column 1, line 15 - line 20 * * column 1, line 56 - line 67; figures 1,2,5 *	1-3,5,6	A46D1/00
Y	---	6-8	
Y	US-A-4 852 202 (LEDWITZ) * abstract; figure 1 *	6-8	
A	---	3	
A	US-A-3 233 944 (SHAW) * figures 2A,3A *	3	
A	US-A-3 239 865 (PLUMMER C. MUNT) -----		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A46D
Place of search		Date of completion of the search	Examiner
THE HAGUE		15 June 1994	Papone, F
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