

PATENT SPECIFICATION

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(19)



(54) TOOTHBRUSHES

(71) We, UNILEVER LIMITED, a company organised under the laws of Great Britain, of Unilever House, Blackfriars, London E.C.4., England, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed, to be particularly described in and by the following statement:

10 The present invention relates to toothbrushes.

Periodontal disease is strongly correlated with the presence of bacterial plaque in the mouth. Good hygiene care is essential to prevent and control this, and to this end the toothbrush is the most widely used dental aid. Thus the toothbrush should be capable of reaching into and removing dental plaque from the inter-dental areas and also from gingival margins.

20 Various brushing methods can be identified, but none is recommended above all others by dentists; and in practice methods used differ depending on manual dexterity and personal preference with the aim of removing plaque as effectively as possible. Thus, with the variety of methods possible, the toothbrush must be designed to be effective irrespective of specific brushing techniques employed.

30 It is recognised that vigorous use of a hard toothbrush can result in permanent injury to the gums and teeth, and that with a soft filament brush the filaments are less effective and rapidly become permanently deformed due to the pressures exerted during use.

40 There is therefore a requirement for a toothbrush whose structure enables a relatively soft filament to be used more effectively without unduly reducing the resistance to wear and deformation.

45 Thus, an improved brush should at least satisfy the two requirements of firstly being effective whatever brushing techni-

que is used and of secondly relying on an effective use of soft, or not unduly hard, filaments.

Accordingly the invention provides a toothbrush having a brush head with a substantially flat rectangular surface from which the tufts of filaments extend in at least two longitudinal rows in which in one of said rows the filaments are perpendicular to the surface of the brush head and in the other row the filaments while substantially lying in a longitudinal plane parallel to the plane of the perpendicular filaments are inclined to the perpendicular filaments each in the same direction when viewed in a direction normal to the longitudinal plane.

When more than one row of inclined filaments are provided the filaments of each inclined row are preferably inclined in the same direction.

65 Preferably there will be four such rows in which the inner two rows are perpendicular and the outer two are inclined. The converse, with the outer rows perpendicular and the inner rows inclined is also possible.

70 Preferably most of the filaments are inclined in the same direction, for example the direction away from a handle of the brush.

75 With such an arrangement two immediate advantages are obtained. When brushing transversely to the longitudinal (or handle) direction the inclined filaments provide support to prevent overflexing of the perpendicular filaments. Whereas when brushing longitudinally in the direction of inclination of the inclined filaments, the effect of brushing is to force these inclined brush filaments to a more upright position. The restorative force of reaction acts in such a direction as to lift plaque from the dental surface more effectively. Furthermore in this condition the

filaments increase in height during the flexure and can therefore penetrate more effectively into the inter-dental and gingival regions.

5 A further advantage is that in use the brush gives the feeling to the user of a greater stiffness than would be anticipated in a conventional brush with filaments of similar diameter and length. In practice
10 therefore a brush can be used with fine diameter filaments which will therefore not lacerate the soft gingival tissues, and such a brush becomes acceptable to the consumer.

15 With such a brush other known criteria should be used, for example the tufts should form a closely packed array and filaments be chosen to produce the desired textural stiffness.

20 Thus, said brushes can be constructed using nylon, or other synthetic filaments whose diameters range from 180 to 350 micro meters and whose length is between 10 and 14 mm. Preferred brushes contain
25 filaments having filaments 200-250 micro meters in diameter and 10-14 mm in length, and these may be all of one nominal stiffness, or filaments of different stiffness (e.g. dual texture) may be mixed in
30 each tuft of filaments.

Preferably the ends of the filaments are finished to a constant height (flat upper surface) but with changes of filament stiffness it is possible to contour the ends of
35 the filaments to provide either a contoured overall upper surface or a contoured surface at the ends of individual tufts.

An embodiment of the invention will now be described by way of an example with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a perspective of a brush head according to the invention;

45 Figure 2 shows longitudinal flexing of filaments in the brush head;

Figure 3 shows similar flexing in a conventional brush; and

Figure 4 shows a side elevation of a brush head according to the invention.

50 The brush comprises a handle having at one end a brush head 1 containing two inner rows of tufts of filaments 2 which are anchored vertically. The outer rows 3 comprise tufts of filaments which are
55 inclined at about 20° in a forward direction away from the brush handle.

60 The tufts consist of filaments having diameters approximately 200 micro meters and 12 mm in length, the inclined filaments being slightly longer than the perpendicular filaments. The tufts are packed closely together (separation 2.0 to 2.5 mm centre to centre).

65 The external rectangular appearance of the brush is maintained by replacing some

inclined tufts by vertically anchored (i.e. perpendicular) tufts in the tip of the head. The tips of the filaments are finished to a constant height above the brush head, so that the inclined filaments are in fact
70 slightly longer than the perpendicular filaments.

Alternative designs are possible in which the outer tufts are angled in the opposite direction, or one outer row inclined forwards and one backwards, or the positions of the perpendicular and inclined rows are reversed.

In construction, the holes in the brush head to take the inclined tufts of filaments need to have a similar inclination. Also, the tufts of filaments should be inserted into these holes by use of a tufting machine modified to provide the correct angled direction of insertion.

85 The filaments (both perpendicular and inclined) can have their tips polished in conventional fashion and the ends of the tufts or groups of tufts can be profiled if desired.

90 Reference to Figure 2 and 3 shows the resultant brushing force F on a tooth 4, when brushing in the longitudinal direction L away from the handle. In the Figure 2 example the inclined filament 3 is flexed into a position where the direction of the resultant force F is most effective for plaque removal, while in Figure 3 perpendicular filaments are flexed to a position where the direction is less favourable.

100 Further reference to Figure 2 shows that the inclined filaments 3 are flexed into a position where they are proud of the overall filament tip surface and can therefore reach more easily into crevices. In practice 20° inclined tufts increase in height by about 5% during such flexure while the perpendicular tufts correspondingly decrease in height, resulting in about 10% effective increase overall.

110 Reference to Figure 4 shows a side elevation of a brush head from which it can be seen that when brushing takes place laterally to the handle, each row is supported against undue flexure by the row behind it.

WHAT WE CLAIM IS:

1. A toothbrush having a brush head with a substantially flat rectangular surface from which the tufts of filaments extend in at least two longitudinal rows in which in one of said rows the filaments are perpendicular to the surface of the brush head and in the other row the filaments while substantially lying in a longitudinal plane parallel to the plane of the perpendicular filaments are inclined to the perpendicular filaments each in the same direction when viewed in a direction normal to the longitudinal plane.

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10 therefore a brush can be used with fine diameter filaments which will therefore not lacerate the soft gingival tissues, and such a brush becomes acceptable to the consumer.

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2. A toothbrush according to Claim 1 comprising more than one row of inclined filaments, the filaments of each inclined row being inclined in the same direction.

3. A toothbrush according to Claim 2 comprising four rows of filaments in which the two inner rows are perpendicular and the two outer rows are inclined to the perpendicular.

4. A toothbrush according to Claim 3 in which the outer rows are inclined away from a handle of the brush.

5. A toothbrush according to Claim 4 in which in each outer inclined row an upright tuft of filaments is included at the end farthest from the handle.

6. A toothbrush according to any one of the preceding claims in which the free ends of the filaments are finished to a constant height above the brush head.

7. A toothbrush according to any one of the preceding claims in which the angle of inclination is substantially 20° .

8. A toothbrush according to Claim 1 substantially as herein described with reference to Figures 1, 2 and 4 of the accompanying drawings.

For the Applicants

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