United States Patent [19]

Hills

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[45] **Mar. 27, 1973**

[54] **TOOTHBRUSH WITH CONCAVITY FORMED BY BRISTLE ENDS**

[76] Inventor: **Jeffrey Mark Hills,** 7820 Algon Avenue, Philadelphia, Pa. 19111

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[21] Appl. No.: **103,591**

[52] **U.S. Cl.** ..... **15/167 R**

[51] **Int. Cl.** **A46b 9/04**

[58] **Field of Search** ..... 15/167 R, 167 A, 159 A; 132/84 R; 32/1

[56] **References Cited**

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Primary Examiner—Leon G. Machlin
Attorney—Lilling & Siegel

[57] **ABSTRACT**

A toothbrush comprising a generally planar head portion having a plurality of bristles forming a concave surface. Some of the bristles are generally perpendicular to said head portion and some are laterally inclined outwardly. This bristle configuration removes food debris, plaque and bacteria ledged in the sulcus area with a minimum of operator manipulation.

10 Claims, 9 Drawing Figures

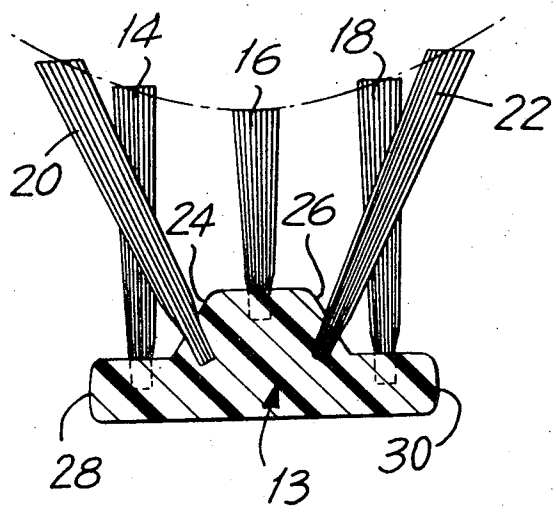


FIG. 1

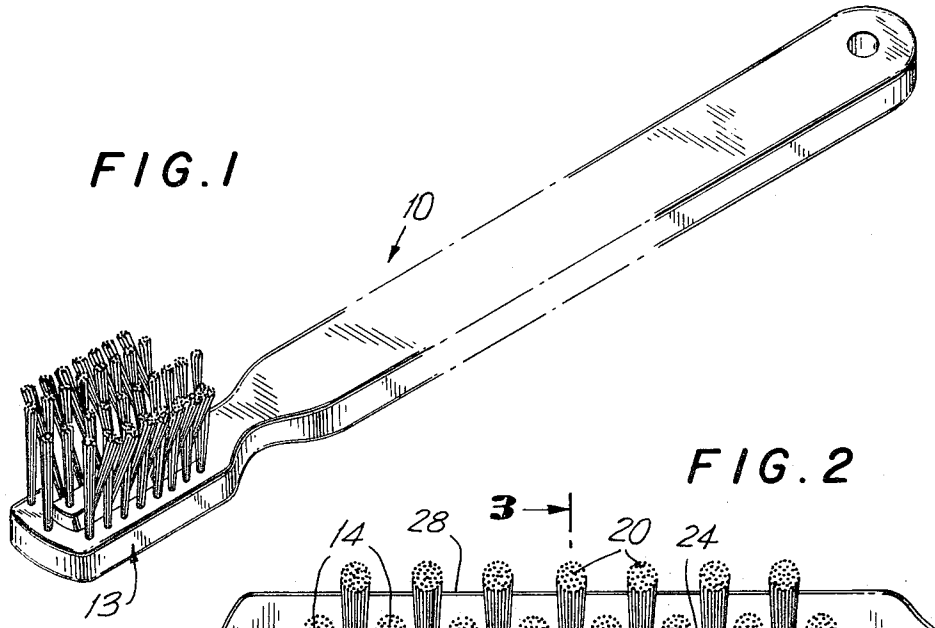


FIG. 2

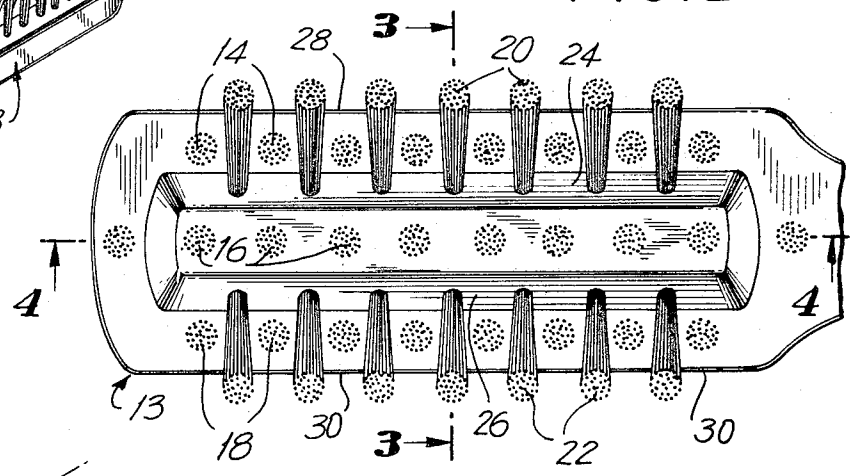


FIG. 3

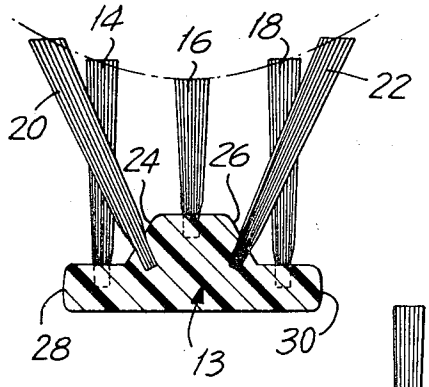
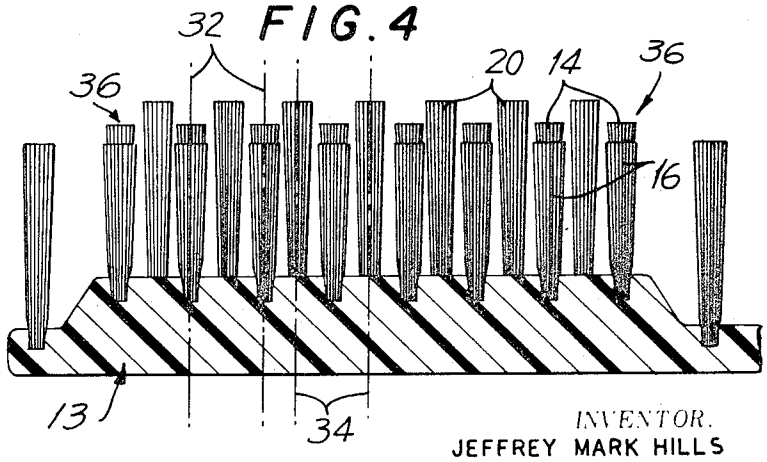


FIG. 4



INVENTOR.
JEFFREY MARK HILLS

BY
Lilling and Siegel
ATTORNEYS

FIG. 6A
PRIOR ART

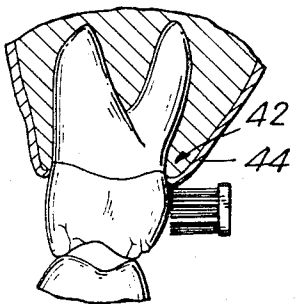


FIG. 5

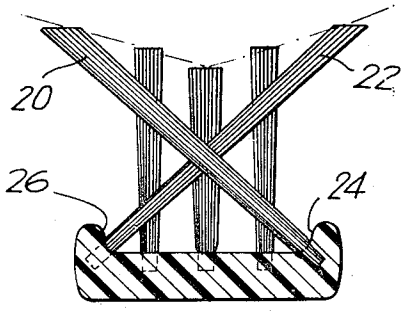
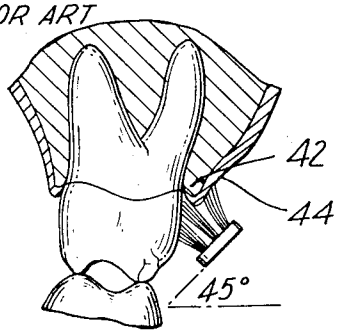


FIG. 6B
PRIOR ART



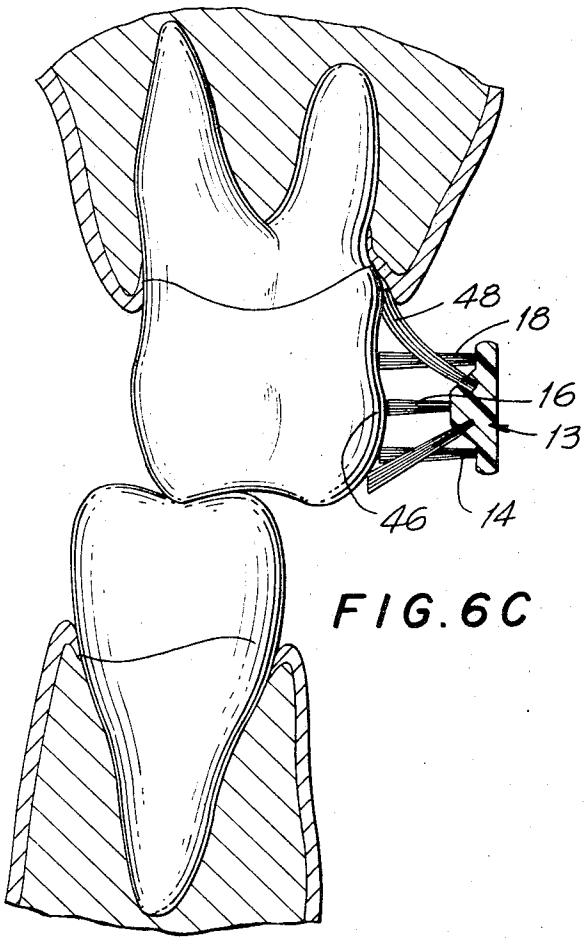


FIG. 6C

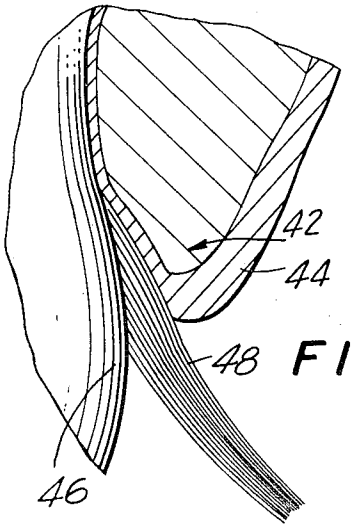


FIG. 7

INVENTOR.
JEFFREY MARK HILLS

BY
Lilling and Siegel
ATTORNEYS

TOOTHBRUSH WITH CONCAVITY FORMED BY BRISTLE ENDS

The invention described herein relates generally to toothbrushes and in particular to an improved toothbrush head configuration which may be used on hand, electrical or mechanical toothbrushes.

BACKGROUND OF THE INVENTION

The diseases of gingivitis and periodontitis afflict large segments of our population. Such diseases are caused by the failure of the individual to remove food, bacteria and plaque lodged in the sulcus area between the teeth and the gingivae using presently available toothbrushes. The severity and pervasiveness of these diseases must be appreciated.

Uncomplicated chronic marginal gingivitis is the most common disease of the gingivae. It is the initial stage of the pocket formation and is always caused by local irritation, generally in the sulcus area. Gingivitis afflicts 65 percent the the nation's school children. Periodontal disease is generally considered to be a disease of adults and its prevalence and severity increase with age. The incidence in the 19 to 25 year age group is from 10 to 29 percent. While by age 45, 95 to 100 percent have periodontal disease. The early stage of periodontal disease is gingivitis. At this stage, the gums become tender, swell, bleed and begin to recede. Later, the gingivae recede permanently. The teeth then become loose due to loss of supporting bone. There is formation of bacteria-laden pockets containing pus. Eventually the supporting structure for the teeth become so destroyed that extraction and replacement of teeth are required.

The recommended procedure for prevention and treatment of gingivitis and periodontitis is oral physiotherapy, the most important aspect of which is the use of a toothbrush for cleansing tooth surfaces, especially those in contact with the gingivae. Toothbrushing performed shortly after each meal, keeps bacterial activity and irritation from plaque and food debris to a minimum.

The toothbrushing technique appropriate for use with the conventional toothbrush requires a great deal of operator manipulation which most people fail to do. Some of the figures of the drawings presented herein will shown and reference thereof will illustrate the incorrect manner in which most people brush, and the proper method for use with a conventional toothbrush. The error most people make is that the toothbrush bristle ends are placed substantially squarely against the tooth face. By such method, the sulcus area between the tooth face and the gingivae is not cleaned when the brush is moved vertically or crosswise. In the proper method, the brush is inclined towards the gingivae by a rotation of approximately 45° from the incorrect substantially square position. With such method, the bristles flex and some find their way into the sulcus area. Then, an arcuate motion of the brush head while keeping the bristle ends in place provides a cleansing action. This motion may also be supplemented by a motion of the brush in a direction perpendicular to the plane of view (shown in FIGS. 6A and 6B). This angulation and mechanical manipulation is often not possible by the operator particularly in the molar areas of the mouth and on the inner sides of the teeth. Furthermore, improper use of this method may do more harm than good. Excessive pressure and/or improper angle of the brush may cause the bristle ends to pierce the gingivae and thereby traumatize them.

There thus remains a need for a toothbrush which will effectively remove food, bacteria and plaque lodged in the sulcus area with a minimum of operator manipulation, and the primary object of the present invention is to satisfy this need.

More specifically, but still in a broad sense, it is an object of the invention to effectively clean the sulcus area when the toothbrush is manipulated in the manner in which most people brush. That is, the cleaning action of the sulcus area should be effective when the brush is held substantially squarely against the tooth face and moved either vertical or crosswise.

It is a further object of the present invention that the cleaning action of the sulcus area be effective over a wide range of type of operator motion.

It is an additional object of the present invention that in accomplishing the prior stated objects, the risk of traumatizing the gingivae is greatly minimized.

SUMMARY OF THE INVENTION

These objects as well as other objects and advantages which will become apparent as the description proceeds, are implemented by the instant invention which comprises a toothbrush having a generally planar head portion affixed to which are a plurality of rows of bristles. Some of the said bristle rows are generally perpendicular upstanding from said head portion and are to be positioned substantially squarely against a tooth face. Some of said bristle rows are inclined and project laterally preferably beyond the sides of said head portion. The inclined bristles are longer than the generally perpendicular upstanding bristles. They find their way into the sulcus area automatically at the proper angle and with the proper flexure necessary to achieve a cleansing action while also avoiding piercing of the gingivae. The sulcus area is then effectively cleaned by motion of the brush in any fashion.

The invention will be better understood, and the advantages and objects other than those set forth above will become apparent after reading the following detailed description. Such description makes reference to the annexed drawings presenting preferred and illustrative embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the toothbrush, the head portion thereof being shown with the bristles pointing upwardly;

FIG. 2 is a plan view of the head portion of the toothbrush looking down into the bristles;

FIG. 3 is a cross-sectional view along the line 3—3 of FIG. 1;

FIG. 4 is a longitudinal sectional view along the line 4—4 of FIG. 2;

FIG. 5 is a cross-sectional view similar to that shown in FIG. 3, but of an alternate embodiment;

FIGS. 6A and 6B are fragmentary sectional views illustrating the prior art operation of the conventional toothbrush;

FIG. 6C is a view similar to that of FIGS. 6A and 6B, but illustrating the brush of the invention in operation; and

FIG. 7 is a fragmentary view, greatly enlarged of the sulcus area shown being brushed in FIG. 6C.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown a toothbrush **10** having a handle **12**, preferably integral therewith, and an end head portion **13** having a plurality of surfaces, and being of generally planar shape containing preferably three rows of tufts of bristles **14, 16, 18** which are substantially perpendicular upstanding. There is also shown a row of tufts of bristles **20** and **22** inclined upwardly and laterally out of each side of said toothbrush head portion. FIG. 3, showing the brush in cross-section makes the new features of the brush of the invention more apparent. Bristle rows **20** and **22** are inclined upwards and cross bristle rows **14** and **18**, respectively. The combination of the three rows of bristles **14, 16, 18** which are substantially perpendicular upstanding from the toothbrush head portion **12** provide a surface which seats against and is generally conforming to a tooth face. Since the inclined bristles preferably originate on inclined surfaces **24** and **26** near the central row of bristles and extend upwards and laterally, preferably beyond the sides of head side surface portions **28** and **30**, they are longer and in operation experience a large component of force perpendicular to them. For this reason only the bristles which are substantially perpendicular upstanding determine the seating position of the brush against the tooth face. The width of the toothbrush head portion is approximately 10 millimeters. The bristle rows **14** and **18** are approximately 10 millimeters high. The height of the bristle ends above the toothbrush head preferably lies on a laterally concave curve in order to closely conform to a tooth face. The bristle rows **14** and **18** are approximately 1 millimeter higher than the central bristle row **16**. The vertical projections of bristle rows **20** and **22** are approximately an additional 1 millimeter higher. These inclined bristle rows **20** and **22** should preferably extend beyond the sides **28** and **30** of the head portion approximately 1 millimeter. Such a construction is uniquely novel in that a toothbrush so constructed performs superbly in achieving the objects of the invention.

It has been found that the angle of elevation of the bristle rows **20** and **22** which are laterally inclined outwardly as measured from the horizontal should preferably be in the range of from about 50° to about 60°. However, angles in the range of from about 35° to about 75° will present the inclined bristles to the sulcus area with an appropriate angle and flexure to both achieve a cleaning action and avoid traumatizing the gingivae.

Referring now to FIGS. **2** and **4**, the bristles which are substantially perpendicular upstanding preferably lie in an imaginary plane numbered **32** in FIG. **4** while the inclined bristles lie in another imaginary plane numbered **34** in FIG. **4**. These two types of planes or rows of bristles preferably alternate along the longitudinal direction of the toothbrush head. The first and last longitudinal rows **36** should preferably be of those bristles which are substantially vertically upstanding from the toothbrush head portion in order to give additional stability to the seating of the brush against the teeth. The additional bristle tufts in the central row and at opposite ends of the head portion also lend additional stability.

In FIG. **5**, the cross-sectional view of an alternate embodiment, shows the inclined bristles **20** and **22** originating on preferably inclined surfaces **24** and **26**, respectively, and crossing over to the opposite sides. The height of the various longitudinal rows lies on a similar laterally concave curve, as best shown by the dot-dash lines in both FIGS. **3** and **5**. In the FIG. **5** modification, the inclined bristles **20** and **22** are longer than in the embodiment of FIG. **2** and are, therefore, even less of a factor in determination of the seating position of the brush against the tooth face.

The remaining FIGS. **6**(A, B and C) and **7** as generally mentioned hereinbefore compare the incorrect and correct use of the prior art toothbrush with the operation of the brush of the invention. Thus, FIG. **6A** shows that most people incorrectly brush their teeth by holding the bristles **40** substantially squarely against the tooth **42**. They, therefore, fail to clean the sulcus area **10** by a motion either perpendicular to the plane of view or vertical. The appropriate method, FIG. **6B**, requires angulation (approximately at 45° with a horizontal) of the brush and an arcuate motion. Here, some bristles find their way into the sulcus area **42**, while others tend to pierce the gingivae **44** and thus traumatize them. Furthermore, as previously stated, this angulation and arcuate motion is not always possible. In comparing FIGS. **6C** and **7**, it will be noted that in the brush of the invention, the longitudinal bristle rows **14, 16, 18** are generally vertically upstanding from the generally planar head portion **13** and preferably form a laterally concave surface generally conforming to and seating against the tooth face **46** while the inclined bristle row **48** readily cleans the sulcus area of plaque, bacteria and food debris with any motion at all, longitudinal, vertical or arcuate. The angle and flexure of the inclined bristle row which tends to enter the sulcus area is automatically determined by the seating of the bristles which are substantially perpendicular upstanding. Thus, the risk of piercing the gingivae **44** is greatly minimized.

After reading the foregoing detailed description, it should be apparent that the objects set forth at the outset of the specification have been successfully achieved. Thus, while the invention has been shown, illustrated, described and disclosed in terms of embodiments or modifications which it has assumed in practice, the scope of the invention should not be deemed to be limited by the precise embodiments or modifications herein shown, illustrated, described and disclosed, such other embodiments or modifications intended to be reserved especially as they fall within the scope of the claims here appended.

What is claimed is:

1. A toothbrush, comprising: a head portion having a top surface, a plurality of bristles each extending from one end thereof which is secured to said head portion through said surface to a free end thereof, said bristles being disposed in a number of rows, the locus of substantially all of said free ends defining a generally concave plane, at least one of said rows of bristles extending substantially perpendicularly with respect to said top surface and being disposed intermediate at least two of said rows of bristles each extending at an oblique

angle with respect to said perpendicular row, and said two rows of bristles further defining an angle less than 180° therebetween.

2. A toothbrush according to claim 1, wherein said substantially perpendicular row of bristles comprises means for locating the toothbrush against tooth face surfaces, and at least one of said oblique rows of bristles comprising means for cleaning sulcus tooth areas.

3. A toothbrush according to claim 1, wherein said head portion is formed with a lower substantially planar surface, a raised substantially planar surface extending substantially parallel with respect to said lower surface, and first and second inclined surfaces joining said lower and raised surfaces, said perpendicularly extending row of bristles extending from said raised surface, a row of said obliquely extending bristles further extending from each of said inclined surfaces, respectively, and said toothbrush further including a row of said bristles extending substantially perpendicularly from each of said lower surfaces.

4. A toothbrush, according to claim 1, wherein the magnitude of said angle is in the range of from 35° to 75°.

5. A toothbrush, according to claim 3, wherein said obliquely extending bristles are longer than said perpendicular bristles.

6. A toothbrush, according to claim 5, wherein said obliquely extending bristles further extend laterally with respect to the general direction of said rows beyond side surfaces of said head portion.

7. A toothbrush, according to claim 2, wherein said sulcus cleaning means will engage a user's tooth areas normally in contact with gingivae tissue while said locating means is in contact with face surfaces of said same tooth.

8. A toothbrush, according to claim 2, wherein said number of rows is five.

9. A toothbrush, according to claim 8, wherein said rows of bristles comprise two oblique rows and three perpendicular parallel rows.

10. A toothbrush, according to claim 3, wherein each of said oblique rows of bristles extend at an angle from and with respect to the plane of their respective inclined surface.

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