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(54) POWERED TOOTHBRUSH WITH VIBRATING SECTION

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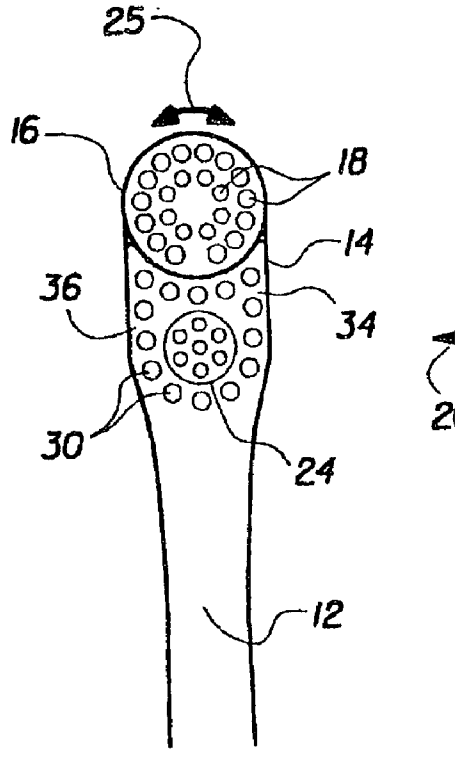
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(57) **ABSTRACT**

The head of a toothbrush includes a tuft block having bristles wherein the tuft block is moved in a direction parallel to the outer surface of the head. A second tuft block having bristles is a vibrating section which is moved in and out in a direction perpendicular to the outer surface of the head. If desired, the head may also include a fixed section with fixed bristles. The movement of the first tuft block may be an oscillating rotational movement.



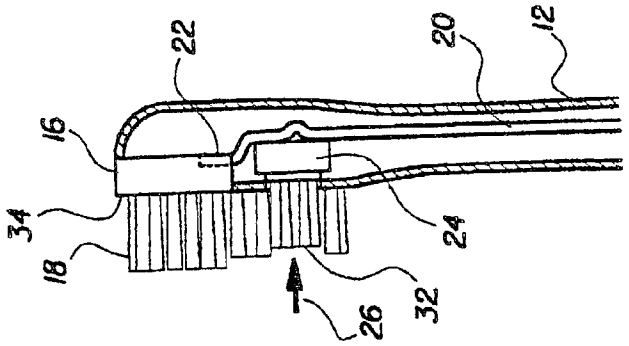


FIG. 4

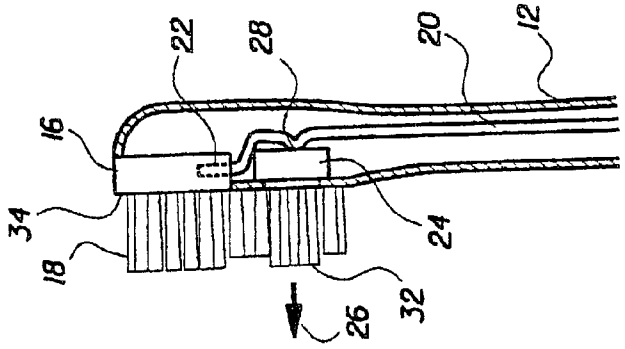


FIG. 3

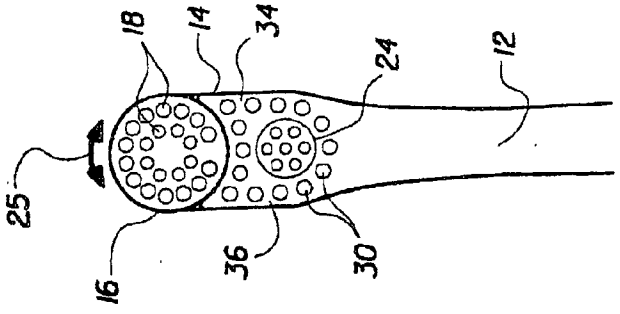


FIG. 2

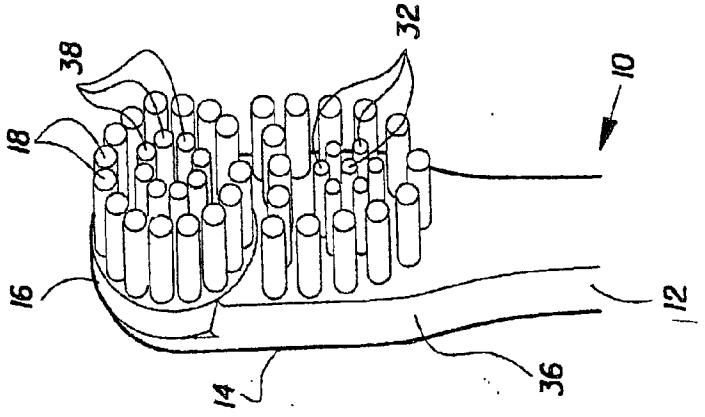


FIG. 1

POWERED TOOTHBRUSH WITH VIBRATING SECTION

FIELD OF THE INVENTION

[0001] The present invention relates to toothbrushes which include a vibrating section in the head.

BACKGROUND OF THE INVENTION

[0002] The present invention is directed to a powered toothbrush and in particular to a toothbrush head having movably mounted bristles. Various types of powered toothbrushes are generally known in the art. Reference is made to U.S. Pat. No. 5,625,916 which relates to an electrically driven toothbrush having a motor drive for rotating a drive shaft. The drive shaft is connected to a bristle holder on the head of the toothbrush in such a manner that rotation of the drive shaft causes the bristle holder to rotationally oscillate back and forth. Various other arrangements are known for oscillating a bristle holder mounted to the head of an electric toothbrush.

[0003] U.S. Pat. No. Re 35,941 discloses a power driven mechanical toothbrush which includes a plurality of side by side tuft blocks extending adjacent to each other in a lateral direction with regard to the longitudinal axis of the toothbrush head. A rotatable motor driven cam shaft extends longitudinally through the head below the sets of tufts blocks. The cam shaft includes a cam surface located at each tuft block. When the cam shaft is rotated the cam surfaces cause the tuft blocks to reciprocate in a direction perpendicular to the cam shaft.

[0004] U.S. Pat. No. 3,110,918 discloses a toothbrush having its bristles mounted on a plate which is engaged by a gear mounted on a rotatable rod. Rotation of the rod causes the bristles to move vertically in and out to adjust the effective length of the bristles. The tufts of bristles do not reciprocate during use of the toothbrush. Neither U.S. Pat. No. 3,110,918, nor U.S. Pat. No. Re 35,941 discloses a toothbrush having a second section with movable bristles.

SUMMARY OF THE INVENTION

[0005] An object of this invention is to provide a powered toothbrush which includes at least two separate moving sections to deliver a cleaning, polishing, whitening action in addition to the cleaning efficiency of a typical powered toothbrush.

[0006] A further object of this invention is to provide such a toothbrush which includes fixed bristles in addition to the different sections having moving bristles.

[0007] In accordance with this invention the toothbrush head includes a first tuft block which is mounted for oscillating back and forth in a plane generally parallel to the toothbrush head. At least on additional tuft block is provided for oscillating in a direction generally perpendicular to the tuft head to provide a vibrating section in addition to the first oscillating section. Such a toothbrush may have a replacement, i.e. refill head or a head permanently attached to a handle.

[0008] In a preferred practice of this invention the oscillating section is moved back and forth in a rotational direction. The toothbrush head may also include a fixed section having fixed bristles or bristles embedded in an elastomeric material to be independently movable in addition to the bristles on the vibrating head and on the rotationally oscillating head.

[0009] In a preferred practice of this invention a single drive shaft is utilized for rotationally oscillating the first tuft block and also for causing the other tuft block to vibrate in a direction perpendicular to the direction of movement of the first tuft block.

THE DRAWINGS

[0010] **FIG. 1** is a perspective view of a toothbrush head in accordance with this invention;

[0011] **FIG. 2** is a front elevational view of the head shown in **FIG. 1**; and

[0012] FIGS. **3-4** are side elevational views partly in section of the head shown in FIGS. **1-2** in different phases of operation.

DETAILED DESCRIPTION

[0013] FIGS. **1-4** illustrate one practice of this invention wherein a toothbrush **10** includes a neck section **12** of a handle (not shown) and a head **14**. The head **14** may be a replaceable, i.e. refill head or may be permanently attached to the brush handle without departing from this invention.

[0014] As illustrated the head **14** includes a first tuft block **16** which is illustrated as being at the outermost or distal portion of head **14**. Tuft block **16** is preferably a disk of circular cross-section since it is intended to oscillate in a rotational manner. If desired, however, other shapes may be used such as oval or various regular or irregular shapes. A circular shape is preferred since it requires the least amount of clearance to accommodate the oscillating movement.

[0015] **FIGS. 1 and 2** illustrate a plurality of tufts of bristles **18** mounted on tuft block **16**. As shown in **FIG. 2** the tufts of bristles **18** are arranged in two sets of coarcuate rows. It is to be understood, however, that other arrangements may also be used.

[0016] While FIGS. **1-4** illustrate the bristles to be of conventional fiber form, the term "bristles" is intended to be used in a generic sense as cleaning elements or massage elements and could include, for example, elastomeric fingers or walls arranged in a circular cross-section shape or any type of desired shape, including straight portions or sinusoidal portions.

[0017] The bristles could be mounted to the various tuft blocks or sections of head **14** by extending through suitable openings in the tuft block so that the base of the bristles is mounted within or below the tuft block. If desired, the bristles could be embedded in an elastomeric material which would permit the bristles to have an independent motion in addition to the motion imparted by the oscillating tuft block **16** and later described tuft block **24**. Similarly, the bristles **30** on other sections of the head **14**, such as section **36** could have independent movement, instead of being fixed bristles as on an alternative fixed third section **36**, as later described. Such various forms of bristles may thus be used for the bristles referred to or any of the sections of the head **14**.

[0018] It is to be understood that the specific illustration of the bristles is merely for exemplary purposes. The invention

can, however, be practiced with various combinations of the same or different bristle configurations secured to the brush by known technology including staple technology or in-mold tufting technology using the same or different bristle materials (such as nylon bristles, spiral bristles, rubber bristles, etc.) Similarly, while FIGS. **1-4** illustrate the bristles to be generally perpendicular to the outer surface of head **14**, some or all of the bristles may be angled at various angles with respect to the outer surface of the bristle head. It is thereby possible to select the combination of bristle configurations, bristle materials and bristle orientations to achieve specific intended results, such as to create as much movement from the oscillating tuft heads to deliver additional oral health benefits like enhanced cleaning, tooth polishing, tooth whitening and/or massaging of the gums.

[**0019**] It is to be understood that the invention can be practiced by locating tufts of bristles in any otherwise open area of the toothbrush head. Such tufts of bristles could be fixed bristles perpendicularly mounted or mounted at an angle to the exposed outer surface **34** of the head **14** or could be bristles mounted on an elastomeric base so as to be independently movable when pressure is applied. Such bristles in their normal condition could be either perpendicular or at an angle to the exposed outer surface of the toothbrush head. Different sets of bristles could be of different colors.

[**0020**] Where a portion of the head contains an outer set of bristles **18** and an inner set of bristle **38**, the outer set of bristles may extend further from the tuft block than the inner set of bristles to create a cup-like effect which would facilitate retaining toothpaste on that portion of the head.

[**0021**] As best shown in FIGS. **3-4** a drive shaft **20** extends through handle neck **12**. Drive shaft **20** is intended to impart a rotational oscillation to tuft block **16**. In a preferred practice of this invention a drive structure could incorporate the type of drive structure illustrated and described in U.S. Pat. No. 5,625,916, all of the details of which are incorporated herein by reference thereto. As described in that patent the drive shaft **20** is rotated by a motor drive. The drive shaft **20** terminates in an offset crank end **22** which is located in a slot or opening in tuft block **16** so that the 3600 rotational movement of shaft **20** is transmitted into an oscillating back and forth rotational movement of tuft block **16**, as indicated by the arrow **25** in **FIG. 2**.

[**0022**] FIGS. **1-4** illustrate a further tuft block **24** mounted on head **14** having bristles **32**. In the illustrated form only a single tuft block **24** is shown, which is generally circular. In the practice of the present invention, multiple tuft blocks can be used as well as the single tuft block **24**, and these blocks or block can be of any other suitable shape as for example egg shape or oval. As later described such multiple blocks or a single block such as tuft block **24** is a moving section which moves in a direction generally perpendicular to the outer surface of the head **14** as illustrated by the arrow **26** in FIGS. **3-4**. This in and out reciprocal movement creates a vibrating section that moves in a direction generally perpendicular to the plane of movement of tuft block **16**. The vibrating in and out oscillation may be accomplished by providing a raised or cam surface **28** on shaft **20**. The raised surface can be a bent portion of shaft **20** or could be a cam member mounted to shaft **20**. **FIG. 3** shows the tuft block **24** in its maximum extended condition where cam surface **28** is disposed against tuft block **24**. The tuft block **24** slides in a bore in the section **36** of head **14**. A shoulder on the tuft block **24** retains the tuft block **24** in the head **14**. **FIG. 4** shows tuft block **24** in its retracted condition.

[**0023**] If desired, a resilient structure such as a spring could be mounted against tuft block **24** to urge the tuft block in a direction opposite the arrow **26** as shown in **FIG. 3**, thus urging the tuft block against shaft **20**. For example, the head **14** would have a bore in which tuft block **24** would freely slide. Head **14** could also have a counterbore for receiving a shoulder on tuft block **24**. The spring could be located in the counterbore and act against the shoulder. As a result, as shaft **20** rotates the rotating cam surface **28** would function to overcome the bias of tuft block **24** to move in the direction of arrow **26** in **FIG. 3** and the cam surface **28** would thereby cause the tuft block **24** to move in the direction of arrow **26** in **FIG. 4**.

[**0024**] Although the vibrating section **24** could include some form of spring or biasing means to urge the tuft block **24** in a direction opposite to arrow **26**, such positive biasing means is not necessary. Thus, for example, a vibrating affect would still be achieved by use of the cam surface **28** urging the tuft block **24** in the direction of arrow **26** in **FIG. 3** and then the tuft block **24** would tend, on its own, to move in a direction opposite arrow **26** when no longer being urged by cam surface **28**.

[**0025**] The provision of a cam surface such as cam surface **28** as part of the shaft **20** may utilize the same type of structure as disclosed in U.S. Pat. No. Re 35,941, all of the details of which are incorporated herein by reference thereto. Alternatively, a separate drive mechanism could be provided for each oscillating tuft block **16, 24**. The use of the same shaft, however, is advantageous in minimizing parts and space requirements as well as costs.

[**0026**] In operation as shaft **20** rotates its drive end **22** by engagement with a slot (not shown) in tuft block **16** causes the tuft block to oscillate back and forth in the direction of arrow **25** in a plane generally parallel to the outer surface **34** of head **14**. While this oscillation occurs cam surface or bent portion **28** of shaft **20** makes initial contact with tuft block **24** and upon continued rotation of shaft **20** the cam surface **28** assumes the position shown in **FIG. 3** which urges tuft block **24** to its outermost position in the direction of arrow **26**. Continued rotation of shaft **20** causes cam surface **28** to rotate away from tuft block **24** until cam surface **28** no longer contacts tuft block **24**. During this continued rotation of cam **20** tuft block **24** is permitted to move back to a position in a direction of arrow **26** shown in **FIG. 4**.

[**0027**] The invention can also be practiced where multiple or a single tuft block, such as tuft block **24**, is a movable tuft block by being free floating. In that regard, shaft **20** would not include any cam surface. Instead, tuft block **24** would be free to move in the direction of arrow **26** between extended and retracted conditions as shown in **FIGS. 3 and 4** without any positive drive urging such movement. An advantage of a free floating moving tuft block would be less strain on the motor which drives shaft **20**.

[**0028**] As also illustrated the head **14** includes a fixed section **36** having a plurality of non-movable or fixed tufts of bristles **30** which are illustrated as surrounding vibrating

tuft block **24**. It is again to be understood that such bristles **30** could also be movable by, for example, mounting some or all of the tufts of bristles in an elastomeric material which would cause movement both in response to the bristles contacting the user's teeth, as well as by the vibration caused by the electric brush motor. As also previously described instead of bristles **30** being of normal standard bristle tuft construction, the bristles could be elastomeric fingers, walls, etc. of any desirable size and shape.

[**0029**] In the illustrated embodiment the oscillating tuft block **16** is oscillated back and forth in a rotational direction. The invention could, however, be practiced with other forms of oscillation such as by lateral movement in a direction transverse to the longitudinal axis or the direction of shaft **20** or in a direction parallel to shaft **20**. Further, as mentioned above, additional moving sections could be provided separate from or operatively connected to the tuft block **16** so that in addition to the vibrating section **24** there would be at least one further section with moving bristles associated with the oscillating tuft block **16**.

[**0030**] In the illustrated embodiment tuft block **16** is a disk of circular cross-section, as is tuft block **24**. Tuft block **24** could have an outwardly extending shoulder, such as shown in **FIG. 3**. As previously noted, the shoulder would confine tuft block **24** within head **14** to prevent the tuft block **24** from escaping from head **14** and being accidentally swallowed. The bristles **18** on tuft block **16** are shown to extend outwardly the same distance as the bristles **32** on tuft block **24** so that these moving bristles terminate in the same plane when tuft block **24** is urged to its outermost position. Fixed bristles **30** on the fixed portion **36** of head **14** are shown to terminate a shorter distance away from the outer surface **34** of the head **14**. The outer surface **34** of head **14** is generally coplanar in all of its sections comprising oscillating tuft block **16**, fixed section **36**, as well as vibrating section **24** when vibrating section **24** is in its outermost position. The invention may be practiced where portions of the outer surface **34** extend outwardly a lesser or greater amount than other portions. Similarly, bristles **18** may extend outwardly from outer surface **34** a different length than bristles **32**. Likewise, bristles **30** may extend the same distance as bristles **18** and **32** or may extend a longer distance from the outer surface **34** than other bristles. The invention may also be practiced where the bristles in each section, namely, oscillating tuft block **16**, vibrating tuft block **24** and fixed section **36** have bristles of different heights and/or different inclinations to other bristles in those sections. Thus, although the drawings illustrate all of the bristles to be generally perpendicular to outer surface **34** one or more tufts of bristles may be at a non-perpendicular angle to outer surface **34** on any or all of the different sections of head **14**.

[**0031**] In practice of the invention the fixed section **36** may have its tufts of bristles in various arrangements including completely or partially surrounding the bristles **32** of vibrating tuft block **24**. If desired, fixed section **36** may have no bristles at all. The invention could also be practiced where the bristles in one section such as the fixed bristles **30** are in the form of rubber fingers for massage purposes and/or such elastomeric bristles could be provided in other sections of the head instead of or in addition to the more conventional bristle structure.

[**0032**] As described, tuft block **16** is driven in a back and forth oscillating rotational manner as indicated by the arrow **25** in **FIG. 2**. The invention may be practiced, however, where other forms of movement are utilized for tuft block **16**, including a complete **3600** rotational movement without any oscillation. Such practice of the invention whether tuft block **16** oscillates, rotates or moves linearly would still result in a movement in a plane generally parallel to the outer surface **34** of head **14**. This parallel type movement in conjunction with the vibrating movement generally perpendicular to outer surface **34** comprises the basic practice of the invention.

[**0033**] Although the drawings illustrate the fixed section **36** and the vibrating section or tuft block **24** to be located between the handle neck **12** and the oscillating tuft block **16** the invention could also be practiced where the tuft block **16** is located closer to the handle neck **12** than the fixed section **36** and/or vibrating tuft block **24**. Similarly, the fixed section **36** or a separate fixed section could also extend completely or partially around oscillating tuft block **16** either by reversing the location of tuft block **16** and tuft block **24** and/or extending the length of head **14**.

[**0034**] **FIG. 2** illustrates the bristles **18** in tuft block **16** to be arranged in two parallel coarcuate rows. The invention may be practiced where the tuft block is in the form of two separate tuft blocks with one row of bristles on each of the tuft blocks. Accordingly, the outer tuft block having the outer row of bristles **18** might be considered a first tuft block while the inner row of bristles might be mounted on a separate or third tuft block in addition to the second tuft block **24**. The two tuft blocks having bristles **18** could be mounted for independent movement with respect to each other, to supplement the action of the tuft block **24** which has the vibrating or in and out moving bristles **32**. For example, the first and third tuft blocks could oscillate in a rotational manner in directions opposite to each other by any suitable drive such as by the drive arrangement shown in U.S. Pat. No. 5,146,942 all of the details of which are incorporated herein by reference thereto.

[**0035**] A further variation of the invention could provide for a drive arrangement wherein the tuft block **24** oscillates or rotates in the same plane or in a parallel plane as tuft block **16**, whether tuft block **16** is formed of two separate counter-oscillating tuft blocks or of a single tuft block. A rotational movement of tuft block **24** rather than the in and out movement, could be accomplished in any suitable manner such as by the provision of suitable gearing between shaft **20** and tuft block **24** so that as the shaft **20** rotates, a gear on shaft **20** would engage a gear on tuft block **24** to transmit the rotational movement of shaft **20** into a uni-directional rotational movement of tuft block **24** perpendicular to the rotational movement of shaft **20**. Alternatively, tuft block **24** could be oscillated in a rotational manner similar to tuft block **16** by any suitable drive mechanism, such as by a second shaft similar to shaft **20**, wherein the second shaft would drive tuft block **24** in a rotational oscillating manner while the shaft **20** also drives tuft block **16** in a rotational oscillating manner. The amplitude and/or speed of both rotational oscillating movements can differ or be the same. If desired, the sets of counter-oscillating bristles could be provided by a tuft block around tuft block **24** similar to that previously described with regard to tuft block **16** instead of, or in addition to, the counter-oscillating bristles **18** as previously described.

1. A powered toothbrush comprising a handle with a neck, a head mounted to said neck, said head having an exposed outer surface, a first tuft block mounted to said head, means for moving said first tuft block in a plane generally parallel to said outer surface, a second tuft block mounted to said head, said second tuft block being mounted for moving in a direction generally perpendicular to said outer surface.

2. The toothbrush of claim 1 wherein said second tuft block oscillates in an in and out direction perpendicular to said outer surface to comprise a vibrating section.

3. The toothbrush of claim 2 wherein said second tuft block is free floating.

4. The toothbrush of claim 2 including means connected to said second tuft block for moving said second tuft block.

5. The toothbrush of claim 2 wherein said first tuft block is moved back and forth in an oscillating manner.

6. The toothbrush of claim 5 wherein said first tuft block is oscillated in a rotational direction.

7. The toothbrush of claim 6 wherein said head includes a fixed section having bristles.

8. The toothbrush of claim 7 wherein said fixed section completely surrounds said second tuft block.

9. The toothbrush of claim 8 wherein said bristles on said fixed section completely surround said second tuft block.

10. The toothbrush of claim 4 wherein said means for moving said first tuft block and said second drive means are part of the same drive mechanism.

11. The toothbrush of claim 10 wherein said drive means includes a motor driven shaft, said shaft having a drive end which drives said first tuft block, and said shaft having a cam surface which drives said second tuft block.

12. The toothbrush of claim 7 wherein said first bristle block and said second bristle block both have extending therefrom filament or elastomeric bristles or a combination thereof.

13. The toothbrush of claim 12 wherein said first tuft block has a circular outer surface.

14. The toothbrush of claim 13 wherein said second tuft block is a disc with a circular outer surface and an outwardly extending shoulder.

15. The toothbrush of claim 1 wherein said head includes a fixed section having bristles.

16. The toothbrush of claim 15 wherein said fixed section completely surrounds said second tuft block, and said bristles on said fixed section completely surround said second tuft block.

17. The toothbrush of claim 15 wherein at least some of said bristles on said fixed section are fixed bristles.

18. The toothbrush of claim 15 wherein at least some of said bristles on said fixed section are embedded in an elastomeric material to have independent motion.

19. The toothbrush of claim 1 wherein said bristles on said first tuft block extend outwardly from said outer surface the same distance as said bristles on said second tuft block when said second tuft block is in its outermost position.

20. The toothbrush of claim 1 wherein at least some of said bristles are natural bristles.

21. The toothbrush of claim 20 wherein at least some of said bristles made of elastomeric material are in the form of fingers.

22. The toothbrush of claim 1 wherein a third tuft block is mounted within and separate from said first tuft block, and said third tuft block being moved in a direction generally parallel to said outer surface.

23. A powered toothbrush having a handle with a neck, a head mounted to said neck, said head having an exposed outer surface, a first tuft block mounted to said head, said first tuft block having bristles extending outwardly from said exposed outer surface, a first drive structure operatively connected to said first tuft block for moving said first tuft block in a plane generally parallel to said outer surface, a fixed section on said head containing a plurality of fixed tufts of bristles, a second tuft block mounted within and separate from said fixed section, said second tuft block having bristles extending outwardly from said outer surface, said fixed tufts of bristles at least partially surrounding said second tuft block, and second drive structure operatively connected to said second tuft block for moving said second tuft block in a plane generally parallel to said outer surface.

24. The toothbrush of claim 23 including a third tuft block mounted to said head, said third tuft block having bristles extending outwardly from said exposed outer surface, and said third tuft block being movable in a direction generally parallel to said outer surface.

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