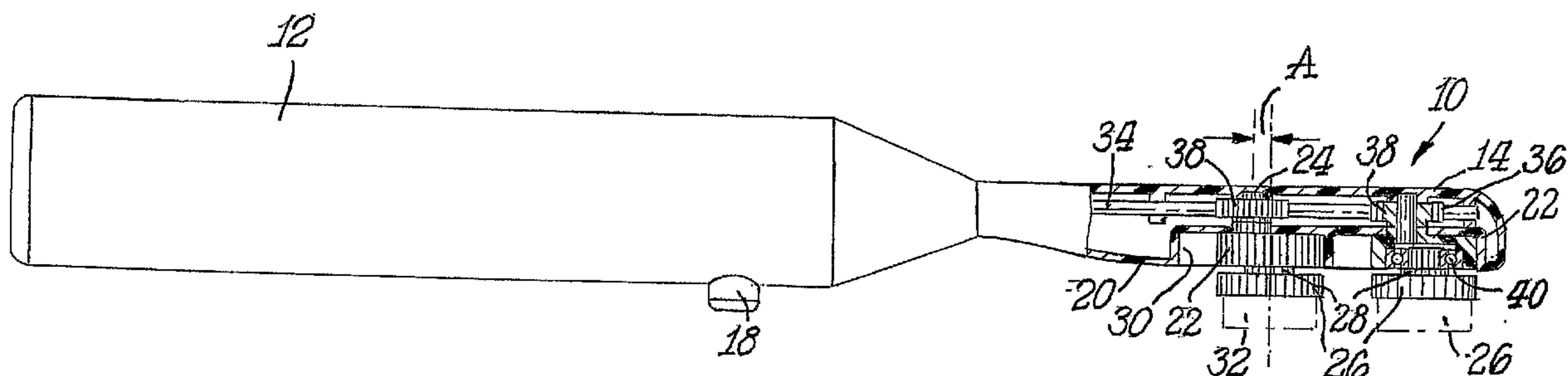




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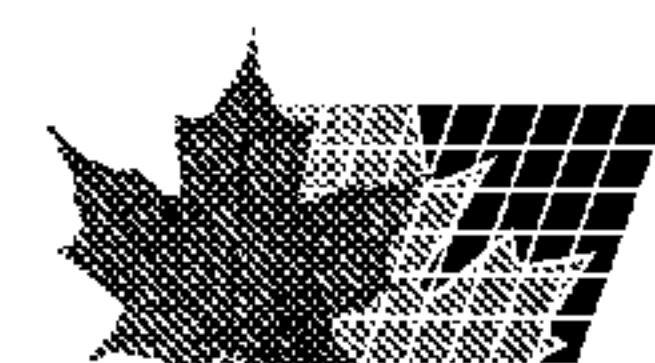
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(54) Title: RANDOM ORBITAL TOOTHBRUSH



(57) **Abrégé/Abstract:**

A toothbrush (10) includes a support member (22) mounted on a first shaft (24) in the head (14) of the toothbrush (10). A carrier member (26) is mounted on a second shaft (28) to the support member (22). The support member (22) is eccentrically mounted so that when its first shaft (24) is rotated the carrier member (26) is moved in an orbital path during the rotation of the support member (22). The carrier member (26) is freely mounted on its second shaft (28) so that during this orbital movement the carrier member (26) rotates in a random manner. Cleaning elements (32) such as bristles extend outwardly from the carrier member (26).



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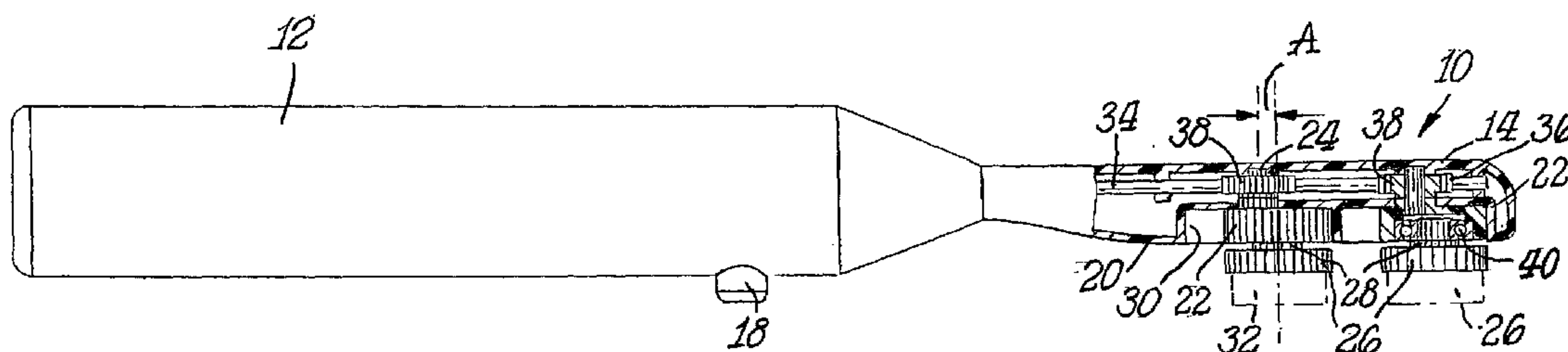
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(54) Title: RANDOM ORBITAL TOOTHBRUSH



(57) Abstract: A toothbrush (10) includes a support member (22) mounted on a first shaft (24) in the head (14) of the toothbrush (10). A carrier member (26) is mounted on a second shaft (28) to the support member (22). The support member (22) is eccentrically mounted so that when its first shaft (24) is rotated the carrier member (26) is moved in an orbital path during the rotation of the support member (22). The carrier member (26) is freely mounted on its second shaft (28) so that during this orbital movement the carrier member (26) rotates in a random manner. Cleaning elements (32) such as bristles extend outwardly from the carrier member (26).

WO 2004/041114 A1

62301-2501

1

RANDOM ORBITAL TOOTHBRUSH

Background of the Invention

Various attempts have been made to provide
5 toothbrushes with cleaning elements such as bristles movably
mounted to enhance the cleaning action. U.S. Patent No.
5,504,959 discloses an electric toothbrush having circular
brush bases which engage rotating bases. The rotating bases
move linearly while they are rotating. The brush head it-
10 self is capable of rotating about its axis during these
movements. U.S. Patent Nos. 4,175,299, 4,276,672 and
4,336,622 all relate to toothbrushes which are characterized
as having an orbital brush action. During operation the
brush head moves in contact with the teeth and then in its
15 return stroke is angled out of contact with the teeth. As a
result of this orbital motion the brush by being retracted
does not contact the teeth and gums or at least lessens the
pressure during the return stroke. U.S. Patent No.
6,347,425 discloses a powered toothbrush having three dimen-
20 sional rotational head movement.

It would be desirable if a toothbrush could be
provided having enhanced rotational movements which differs
from the type of movements disclosed in the above patents.

Summary of the Invention

25 An object of some aspects of this invention is to
provide a toothbrush wherein the cleaning elements, such as the
bristles, move in a random orbital path.

62301-2501

2

A further object of some aspects of this invention is to provide such a toothbrush which is electrically powered to cause the random orbital path movement.

5 In accordance with some embodiments of this invention the head of a toothbrush includes at least one carrier member from which the cleaning elements extend outwardly. The carrier member is mounted to the front face of the head in such a manner that the carrier member and the cleaning elements move in a random orbital path.

10 In a preferred practice of some embodiments of the invention the carrier member is mounted to a support member. The support member is eccentrically mounted on a shaft so that when the support member rotates the carrier member moves in an orbital path. The carrier member itself is freely mounted for rotation with respect to the support member so that the carrier member rotates in a random fashion while it is moving through the orbital path.

15 According to one aspect of the invention, there is provided a random orbital toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, and a drive structure mounting said carrier member to said front face for moving said carrier member and said cleaning elements in a
20 random orbital path, wherein said at least one carrier member is a disk mounted to a support member, said support member being eccentrically mounted to a first shaft, said drive structure being engaged with said first shaft to rotate said first shaft, a second shaft mounted to said support member offset from said first shaft, and said disk being mounted to said second shaft.

25 According to another aspect of the invention, there is provided a random orbital toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, and a drive structure mounting said carrier member to said front face for moving said carrier member and said
30 cleaning elements in a random orbital path, wherein at least one said carrier member is mounted to a support member, said support member being

62301-2501

2a

eccentrically mounted to a first shaft, said drive structure being engaged with said first shaft to rotate said first shaft, a second shaft mounted to said support member offset from said first shaft, and said carrier member being mounted to said second shaft.

5 According to another aspect of the invention, there is provided a random orbital toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, and a drive structure mounting said carrier member to said front face for moving said carrier member and said
10 cleaning elements in a random orbital path, wherein said drive structure includes a motor and a drive transmitting member driven by said motor and extending into said head; wherein said carrier member is mounted to a support member, said support member being mounted to said front face, said carrier member being movable with respect to said support member, and said support member being
15 movable with respect to said front face; wherein each of said carrier member and said support member is rotatably movable; wherein said support member is eccentrically mounted to a first shaft mounted to said front face for rotational movement in an orbital path; wherein said support member is drivably mounted for movement in said orbital path; and wherein said carrier member is freely rotatably
20 mounted on a second shaft mounted on said support member for random rotation.

 According to another aspect of the invention, there is provided a random orbital toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, and a drive structure mounting said
25 carrier member to said front face for moving said carrier member and said cleaning elements in a random orbital path; wherein said carrier member is mounted to a support member and movable thereto, each of said carrier member and said support member is rotatably movable, the support member being eccentrically mounted to a first shaft mounted to the front face for rotational
30 movement of the support member in an orbital path; wherein the carrier member is rotatably mounted on a second shaft mounted on the support member for random rotation.

62301-2501

2b

According to another aspect of the invention, there is provided a random orbital toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, a drive structure mounting said carrier member to said front face for moving said carrier member and said cleaning elements in a random orbital path; wherein said carrier member is mounted to a support member, said support member being eccentrically mounted to a first shaft, said drive structure including drive transmitting members engaged with said first shaft to rotate said first shaft, a second shaft mounted to said support member offset from said first shaft, and said carrier member being mounted to said second shaft.

According to another aspect of the invention, there is provided a toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, and a drive structure mounting said carrier member to said front face for moving said carrier member and said cleaning elements, said drive structure being engaged with a first shaft to rotate said first shaft, wherein said at least one said carrier member is mounted to a support member, said support member being eccentrically mounted to the first shaft, a second shaft mounted to said support member offset from said first shaft, and said carrier member being mounted to said second shaft to freely rotate about said second shaft, said carrier member rotationally moving in an orbital path about said first shaft when said first shaft is rotated whereby the toothbrush is an orbital toothbrush.

The Drawings:

Figure 1 is a side elevational view partly in section of a toothbrush in accordance with this invention;

Figure 2 is a front elevational view of the toothbrush shown in Figure 1; and

Figure 3 is a side elevational view partly in section of the toothbrush shown in Figures 1-2 in a different phase of the operation.

62301-2501

2c

Detailed Description:

The present invention is in general directed to an electric toothbrush with a head that orbits in a random man-

ner so as to remove more plaque and debris with less effort. By moving in such a path the toothbrush should be move efficient at removal of plaque and debris than a standard orbit head of an electric toothbrush.

5 Figures 1-3 illustrate a toothbrush 10 in accordance with this invention. As shown therein the toothbrush 10 includes a hollow handle 12 and a head 14. Handle 12 would house the power drive for the toothbrush. This could include, for example, a motor 16 controlled by switch 18.

10 Actuation of the motor which is part of a drive structure causes later described drive transmitting members to effect a random orbital motion in the head 14. More particularly, head 14 has a front face 20 which includes a support member 22 rotationally mounted on a first shaft 24. As illustrated

15 support member 22 is eccentrically mounted on shaft 24. A carrier member 26 is mounted on a second shaft 28 to support member 22. Second shaft 28 is displaced from first shaft 24 by the distance "A". As a result, when support member 22 is rotated on its first shaft 24 carrier member 26 is driven in

20 an orbital path. Front face 20 includes a recessed receiving area 30 which defines the limits of that orbital path.

As best illustrated in Figures 1 and 3 support member 22 is mounted below the outer surface of face 20 in the recess 30. Carrier member 26, however, extends outwardly from the outer surface of face 20. Carrier 26 is provided with cleaning elements 32 extending outwardly from the outer face of carrier member 26. Carrier member 26 is freely mounted on its second shaft 28. As a result, when

carrier member 26 is driven in its orbital path carrier member 26 also freely or randomly rotates about its own shaft 28. In the illustrated embodiment carrier member 26 is axially mounted on shaft 28. If desired, however, carrier member 26 could be eccentrically mounted so as to increase the random orbital path that carrier member 26 and its cleaning elements 32 take. In the preferred illustrated practice of this invention carrier member 26 is a disk having a circular outer surface from which the cleaning elements 32 extend.

During operation of toothbrush 10 the carrier members 26 and their cleaning elements 32 would move in the orbital path which is transcribed by the outer wall of recess 30. Thus, Figures 1 and 2 show the carrier members 26 in one position located furthest from the handle 12. Figure 3 shows the carrier members moved to the opposite end of the path where the carrier members are closest to handle 12.

The invention could be practiced with a single carrier member and a single support member. As illustrated, however, a pair of such carrier members 26,26 and support members 22,22 is provided. The invention can also be practiced where there are more than two sets of carrier members and support members.

The drawings illustrate the cleaning elements 32 in a schematic manner. Any suitable cleaning elements may be used such as bristles or elastomeric members including massage elements.

Any suitable drive structure can be utilized for creating the random orbital path. Such type of path, for

62301-2501

5

example, is known from random-orbital sanders. Reference is made to U.S. Patent No. 4,120,084.

The

'084 patent describes a type of drive structure that could
5 be adapted for creating the random orbital path of the
cleaning elements 32. Such structure, in general, includes
a drive shaft 34 which would be driven by motor 16. Drive
shaft 34 rotates in a longitudinal direction. A worm gear
36 is mounted at spaced locations on shaft 34 in accordance
10 with the number of sets of carrier members and support mem-
bers. Worm gear 36 drives gear 38 (see Figure 1) which in
turn drives first shaft 24. Second shaft 28 is displaced
from first shaft 24 by the distance A. As a result, during
the driven rotation of support member 22, carrier member 26
15 moves in an orbital path. Second shaft 28 may be mounted in
roller bearings 40 as described in the '084 patent.

Although reference has been made to U.S. Patent
No. 4,102,084 for an exemplary type of drive mechanism other
types of drive mechanisms may also be used such as known for
20 random-orbit sanders. Reference is also made to U.S. Patent
No. 4,854,085.

In general, a drive mechanism would be used
wherein the drive structure includes a motor, preferably lo-
cated in the handle of the toothbrush. The motor actuates
25 drive transmitting members which cause a first shaft to ro-
tate. A support member which could be in the form of a disk
or block is eccentrically mounted on the first shaft. A
second shaft is mounted to the outer surface of the support

member. A carrier member which is preferably a disk is freely mounted on the second shaft. Thus, when the drive structure is actuated the support member is directly driven by the drive structure which creates an orbital path. Because the carrier member is freely rotatably mounted on the support member the carrier member would rotate in a random fashion while being moved in the orbital path.

62301-2501

7

CLAIMS:

1. A random orbital toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, and a drive structure mounting
5 said carrier member to said front face for moving said carrier member and said cleaning elements in a random orbital path, wherein said at least one carrier member is a disk mounted to a support member, said support member being eccentrically mounted to a first shaft, said drive structure being engaged with said first shaft to rotate said first shaft, a second shaft mounted to said support member
10 offset from said first shaft, and said disk being mounted to said second shaft.
2. The toothbrush of claim 1 wherein said disk is freely mounted to said second shaft.
3. The toothbrush of claim 2 wherein said cleaning elements are bristles.
- 15 4. The toothbrush of claim 3 wherein said disk has a circular outer face from which said bristles extend.
5. The toothbrush of claim 1 including a plurality of carrier members mounted to a plurality of support members.
- 20 6. A random orbital toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, and a drive structure mounting said carrier member to said front face for moving said carrier member and said cleaning elements in a random orbital path, wherein at least one said carrier member is mounted to a support member, said support member being
25 eccentrically mounted to a first shaft, said drive structure being engaged with said first shaft to rotate said first shaft, a second shaft mounted to said support member offset from said first shaft, and said carrier member being mounted to said second shaft.

62301-2501

8

7. The toothbrush of claim 6 wherein, said support member being mounted to said front face, said carrier member being movable with respect to said support member, and said support member being movable with respect to said front face.

5 8. The toothbrush of claim 7 wherein each of said carrier member and said support member is rotatably movable.

9. The toothbrush of claim 8 wherein said support member is mounted to said front face for rotational movement in an orbital path.

10 10. The toothbrush of claim 9 wherein said support member is drivably mounted for movement in said orbital path.

11. The toothbrush of claim 7 including a plurality of said carrier members and said support members.

12. The toothbrush of claim 6 wherein said cleaning elements are bristles.

15 13. The toothbrush of claim 6 wherein said carrier member is a disk having a circularly shaped outer surface from which said cleaning elements extend.

20 14. The toothbrush of claim 6 wherein said handle is hollow, said drive structure is mounted in said handle and includes a drive transmitting member which extends from said handle and into said head.

15. The toothbrush of claim 6 wherein said drive structure includes a motor and a drive transmitting member driven by said motor and extending into said head.

25 16. A random orbital toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, and a drive structure mounting said carrier member to said front face for moving said carrier member and said cleaning elements in a random orbital path, wherein said drive structure includes a

62301-2501

9

motor and a drive transmitting member driven by said motor and extending into said head; wherein said carrier member is mounted to a support member, said support member being mounted to said front face, said carrier member being movable with respect to said support member, and said support member being movable with respect to said front face; wherein each of said carrier member and said support member is rotatably movable; wherein said support member is eccentrically mounted to a first shaft mounted to said front face for rotational movement in an orbital path; wherein said support member is drivably mounted for movement in said orbital path; and wherein said carrier member is freely rotatably mounted on a second shaft mounted on said support member for random rotation.

17. The toothbrush of claim 16 wherein said carrier member is axially mounted on said second shaft.

18. The toothbrush of claim 16 wherein said carrier member is eccentrically mounted on said second shaft.

19. The toothbrush of claim 16 including a plurality of said carrier members and said support members.

20. The toothbrush of claim 16 wherein said cleaning elements are bristles.

21. The toothbrush of claim 16 wherein said carrier member is a disk having a circularly shaped outer surface from which said cleaning elements extend.

22. A random orbital toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, and a drive structure mounting said carrier member to said front face for moving said carrier member and said cleaning elements in a random orbital path; wherein said carrier member is mounted to a support member and movable thereto, each of said carrier member and said support member is rotatably movable, the support member being eccentrically mounted to a first shaft mounted to the front face for rotational movement of the support member in an orbital path; wherein the carrier member is

62301-2501

10

rotatably mounted on a second shaft mounted on the support member for random rotation.

23. The toothbrush of claim 22 wherein said support member is drivably mounted for movement in said orbital path.

5 24. The toothbrush of claim 22 wherein said carrier member is axially mounted on said second shaft.

25. The toothbrush of claim 22 including a plurality of said carrier members and said support members.

10 26. The toothbrush of claim 25 wherein said cleaning elements are bristles.

27. The toothbrush of claim 22 wherein said carrier member is a disk having a circularly shaped outer surface from which said cleaning elements extend.

15 28. The toothbrush of claim 22 wherein said cleaning elements are bristles.

29. The toothbrush of claim 22 wherein said handle is hollow, said drive structure including a motor mounted in said handle, and said drive structure including a drive transmitting member driven by said motor and extending from said handle and into said head.

20 30. A random orbital toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, a drive structure mounting said carrier member to said front face for moving said carrier member and said cleaning elements in a random orbital path; wherein said carrier member is
25 mounted to a support member, said support member being eccentrically mounted to a first shaft, said drive structure including drive transmitting members engaged with said first shaft to rotate said first shaft, a second shaft mounted to said support member offset from said first shaft, and said carrier member being mounted to said second shaft.

62301-2501

11

31. The toothbrush of claim 30 wherein said carrier member is freely mounted to said second shaft.

32. The toothbrush of claim 31 wherein said cleaning elements are bristles.

5 33. The toothbrush of claim 32 wherein said carrier member is a disk that has a circular outer face from which said bristles extend.

10 34. A toothbrush comprising a handle, a head secured to one end of said handle, said head having a front face, at least one carrier member having outwardly extending cleaning elements, and a drive structure mounting said carrier member to said front face for moving said carrier member and said cleaning elements, said drive structure being engaged with a first shaft to rotate said first shaft, wherein said at least one said carrier member is mounted to a support member, said support member being eccentrically mounted to the first shaft, a second shaft mounted to said support member offset from said first shaft, and said carrier member being mounted to said second shaft to freely rotate about said second shaft, said carrier member rotationally moving in an orbital path about said first shaft when said first shaft is rotated whereby the toothbrush is an orbital toothbrush.

15 35. The toothbrush of claim 34 wherein said carrier member is axially mounted on said second shaft.

20 36. The toothbrush of claim 34 wherein said carrier member is eccentrically mounted on said second shaft.

25 37. The toothbrush of claim 34 wherein said carrier member is a disk having a circularly shaped outer surface from which said cleaning elements extend.

38. The toothbrush of claim 34 wherein said handle is hollow, said drive structure is mounted in said handle, and further comprising a drive transmitting member extending from said handle and into said head.

62301-2501

12

39. The toothbrush of claim 34 wherein said cleaning elements are bristles.

40. The toothbrush of claim 39 wherein said carrier member has a circular outer face from which said bristles extend.

5 41. The toothbrush of claim 34 including a plurality of carrier members mounted to a plurality of support members.

