TOOTHBRUSH DEVICE (NEKA BRUSH)

Abstract: The toothbrush device (10) has a handle (12) with an electric motor (14) disposed therein. An elongate extension (24) is in operative engagement with the electric motor (14). An end portion (26) is attached to the elongate extension (24). A brush unit (30) is attached to the end portion (26). The brush unit (30) has bristles (32) attached to an elongate rotatable member (33). The bristles (32) are attached at inner ends to the periphery of the elongate rotatable member (33) with end portions of the bristles (32) at said inner ends directed in a substantially radial direction outwards from the periphery of said elongate rotatable member (33). The brush unit can also be mounted to a handle to form a manual toothbrush device.
TOOTHBRUSH DEVICE (Neka Brush)

Technical Field

The present invention relates to a toothbrush device for brushing teeth. The toothbrush device comprises a handle having an electric motor disposed therein, an elongate extension in operative engagement with the electric motor, an end portion attached to the elongate extension, and a brush unit attached to the end portion.

Background of the Invention

Many toothbrush devices have been developed in the past for brushing teeth. Toothbrushes with odd shapes and customized bristles have been used in an attempt to improve the brushing effectiveness of the toothbrush. Both manual and electrical brushes have been used. However, the conventional toothbrushes fail to effectively reach the areas between teeth and the sensitive areas between the gum and the teeth particularly in the corners and along the critical lines of the teeth and the gum. The use of dental floss is cumbersome and it is difficult to reach all the areas especially the teeth in the rear that are prone to bacteria attacks. As a result, it is common to suffer from gum disease and cavities despite regular tooth brushing. Unclean teeth and gums may also lead to unpleasant breath.

There is a need for a toothbrush that effectively brushes and cleans the areas between the teeth and other hard to reach area around the teeth and gum areas.

Summary of the Invention

The toothbrush device of the present invention provides a solution to the above-outlined problems. More particularly, the toothbrush device of the present invention thus comprises a handle having an electric motor disposed
therein. An elongate extension is in operative engagement with the electric motor. An end portion is attached to the elongate extension. A brush unit is attached to the end portion. The brush unit has bristles attached at an inner end to an elongate rotatable member with end portions at said inner ends of the bristles directed in a substantially radial direction outwards from the periphery of the rotatable member. The elongate rotatable member is in rotatable engagement with the elongate extension.

The bristles can be soft or stiff. With soft bristles their outer ends may be hanging down from the elongate rotatable member due to the fact that they are exposed to gravitation. With soft bristles the user can reach hard to reach areas such as critical lines between the gum and the teeth and in narrow spaces between the teeth. The bristles perfectly form themselves to the shape of the tooth and to the areas between the gum and the teeth so that the bristles slide along those surfaces and clean all the surfaces of the teeth and the critical lines. It can also be unpleasant to use a brush with stiff bristles in case of micro cracks in the dental enamel, thus soft bristles are preferred in this case. On the other hand, it can be advantageous to use a brush with stiff bristles for user having tartar.

The brush unit is rotatable in clockwise direction and in counter clockwise direction and is movable back and forth by the user’s hand movement so that traces of the bristles on the tooth and the gum may follow a spiral path.

A mechanism can be provided at the output from the electric motor for transforming the rotational movement of the electric motor to a rotational oscillatory movement of the shaft. The frequency of said rotational oscillatory movement is preferably within the range of 50 - 60 Hz. For children it could be an advantage to have a toothbrush device with the brush unit all the time rotating in one and the same
direction, whereas in other cases a rotatable oscillatory brush unit could be more effective.

According to an advantageous embodiment of the device according to the invention a shock absorber is mounted on the shaft inside the elongate extension. In this way damages on the driving shaft and the electric motor is avoided if the brush unit is clamped up from rotating. Also damages on teeth and gum can be prevented.

According to still another advantageous embodiment of the device according to the invention the elongate extension is bendable, preferably in the range of 15-20°, in a plane perpendicular to the jaw to be brushed. This facilitates for the user to reach different spaces between the teeth and different parts of the surfaces of the teeth.

According to yet other advantageous embodiments of the device according to the invention the end portion comprises a stationary cover to protect the lips of the user from contact with moving parts of the end portion when entering the brush unit into the mouth. The tip of the rotatable member is coated by a soft material, like elastic plastics. Both these embodiments make the use of the toothbrush device more comfortably. It is often experienced as unpleasant if the rotating brush unit is touching the lips and gum and teeth enamel can be damaged by the tip of the rotatable member, which is made of a solid material. Both these inconveniences are eliminated by the measures mentioned.

According to another advantageous embodiment of the device according to the invention said elongate extension is provided with a flushing channel for cleaning the interior of the elongate extension by flushing water. Rests of tartar and other deposits removed from the teeth as well as saliva can penetrate into the elongate extension. For avoiding disturbances in the functioning of the device and for hygienic
reasons a flushing channel is therefore provided for cleaning the interior of the elongate extension.

The invention also relates to a brush unit for a toothbrush device as described above or for mounting to a handle for forming a manual toothbrush device. The bristles of the brush unit are attached at their inner ends to the periphery of an elongate member with end portions of said bristles at the inner ends directed in a substantially radial direction outwards from the periphery of the elongate member.

Brief Description of the Drawing

Fig. 1 is a side view of the toothbrush device of the present invention;

Fig. 2 is a schematic top view of the area between two adjacent teeth;

Fig. 3 is a side view of the brush unit of the present invention;

Fig. 4 is a front view of the brush unit shown in Fig. 3 during rotation of the brush unit;

Fig. 5 is a side view of an alternative embodiment of the toothbrush of the present invention;

Fig. 6 is a side view of the area between two adjacent teeth, as shown in Fig. 2; and

Fig. 7 is a side and a front view of the elongate extension.

Detailed Description of Embodiments

With reference to Figs. 1-4, the toothbrush device 10 of the present invention has a water tight handle 12 that includes an electric motor 14 for rotating a brush unit 30 in a left and right manner with a frequency of typically 50-60 times per second or hertz. The handle 12 has an on/off button 16 and a connection 18 for charging a battery 20 disposed inside the handle 12. An upper end of the handle 12 has a
connection 22 for operatively connecting the motor 14 to an elongate extension 24. This extension can be flexible or stiff. A flexible extension can be bendable in a plane perpendicular to the jaw, preferably an angle within the range of 15-20°. The motor 14 produces rotational or oscillatory movements that are equivalent to about 50-60 rotations or oscillations per second. Of course, the motor 14 could simply rotate the brush unit in an eternal circular manner also for simpler brushing e.g. for children.

For starting the movement of the brush unit 30 the button 16 on the handle is pushed to an on-position and for stopping the movement the button 16 is pushed to its off-position. The button 16 has also a third position, in which the button 16 is movable between an on- and an off-state, the button 16 being spring biased towards the off-state. Thus, in this third position of the button 16 the brush unit is rotated only when the button 16 is held in the on-state while overcoming the spring force. It is an advantage to be able, in an easy way, to enter the brush unit into narrow spaces between the teeth with the brush unit not rotating and start the rotation of the brush unit not until it has reached the desired position. To enter the brush unit into such narrow spaces with the brush unit rotating or oscillating could be difficult and unpleasant for the user of the toothbrush device and may result in damages to the gum.

The elongate extension 24 is replaceable and has an end portion 26 with a stationary cover 75, which end portion is perpendicular to the elongate extension 24 and converts the rotational oscillatory movement from the extension 24 to the brush unit 30. The end portion 26 has an opening 28 defined therein for receiving the brush unit 30. The end portion 26 has an engagement unit 31 for engaging and releasing the brush unit 30 when it is necessary to replace the brush unit. The elongate extension 24 can be bendable relative to the handle
so that the end portion 26 may be turned, as mentioned above. This makes it easier to adjust the reach in different directions within the mouth of the user.

Alternatively the elongate extension 24 can be rigid.

The cover 75 is stationary to prevent the moving brush unit 30 to touch the lips of the user when entering the brush unit 30 into the mouth. Contact between the moving brush unit 30 and lips is often experienced as unpleasant by the user.

In the embodiment shown in the figures 1 and 7 the end portion 26 and the cover 75 has a cylindrical shape. The end portion and the cover can, however, alternatively have a conical or semi-conical shape with the brush unit mounted at the tip or the smaller end surface of the cone. An embodiment with a semi-conical end portion 26 with associated cover 75 is shown to the right in figure 1.

Inside the elongate extension 24 a rotating or oscillating shaft 76 is extending from the electric motor 14 to the end portion 26 for driving the brush unit 30 from the electric motor 14. In case of a flexible elongate extension 24, also this shaft 76 is flexible. A shock absorbing means or a shock absorber 77 is provided on the shaft 76 to stop the movement of the brush unit 30 if it is clamped up between two teeth. In this way damages to the shaft 76 and the electric motor 14 is avoided if the brush unit 30 is clamped up, and also damages to gum and possibly teeth are prevented. The crossing arrows beside reference numeral 77 in figure 1, and also in figure 7, indicate that the shock absorber 77 is constructed for absorbing shocks both in radial and axial directions. Since such absorbers are known in the art and do not directly form any part of the invention, it will not be described in greater details here.

The part of the upper surface 78 in figure 1 of the handle 12, situated outside the elongate extension 24, is
inclined in the direction away from the elongate extension 24 to drain water and possible other liquids. An indicator lamp 79 is provided on the inclined surface 78 indicating when the device is in operation. A timer (not shown in the figures) is provided to control the indicator lamp 79 to start flashing after a predetermined time of operation of the device, thus indicating that the brushing has been going on for this predetermined time.

Fig. 2 is a schematic top view of two adjacent teeth 42 and 44 with a gap 46 therebetween that has a gum area 48. The tooth 42 has a front side 50 and corner lines 52, 54 and gum contact area or critical line 56 at a bottom of the front side 50. The tooth 42 also has an outside 58, inside 60 and upper side and chewing face 62. The other teeth have similar areas and only the tooth 42 is described in detail as an illustrative example. The size of the gap 46 is exaggerated to more clearly show the various details thereof.

In Fig. 3 an embodiment is shown with the brush unit 30 having a plurality of soft bristles 32 and stiff bristles 32 respectively. The soft bristles 32 are soft enough for hanging down when exposed to gravitational forces. The bristles are attached at inner ends to an elongate member 33, preferably along a major part of the length of the elongate rotatable member with the inner end portions of the bristles 32 directed in a substantially radial direction outwards from the periphery of the rotatable member 33. Bristles 32 can be provided over a length of the rotating member of typically 5 - 15 millimeters. The soft bristles 32 can be soft enough for hanging down from the elongate member 33 with all the outer ends 35 disposed below the elongate member 33, when the elongate member is in a horizontal position. Preferably, all the bristles have the same length so that the brush unit 30 is cylindrical in shape when rotating or oscillating. Thus the bristles adjacent an outer end 37 have substantially the same
length as the bristles adjacent to the connection end 34 of the rotating member 33. The bristles may have a length of about 0.2 - 4.0 millimeters or any other suitable length.

The connection end 34 of the rotating member is inserted into the opening 28 of the end portion 26 to connect the brush unit 30 to the rest of the device 10. The length of the rotating member 33 outside the opening 28 can be varied by inserting a longer or short part of the connection end 34 into a coupling device for connection to the shaft 76.

The tip of the rotating member 33 is coated by a soft material 37, e.g. elastic plastics, to avoid prick damages to the gum and possible on the teeth.

Fig. 4 shows a front view of the brush unit 30 when it is performing a rotational oscillatory movement of about 50 - 60° in each direction. This means the bristles are first rotated 50 - 60° in a first rotational direction 36 and then rotated 50-60° degrees in a second rotational direction 38 that is opposite the first direction 36. The rotation angle can, however, have any suitable angle between 50 and 180°. Due to the centrifugal forces the bristles flare out and form a circular shape 39. In an embodiment where the bristles 32 are soft enough, the bristles adjust their shape and conform to the shape of the teeth surfaces. In this way, the bristles 32 conform and become shaped to perfectly conform to the shape between the gum 48 and the tooth sides such as the tooth side 50 to reach the hard to reach critical line 56 between the gum and the tooth and the corner edge 52. The critical line is an area that is prone to attacks from bacteria and is hard to reach with conventional toothbrushes. For example, Fig. 6 is side view between the teeth 42, 44 that shows the bristle 32 bent to a perpendicular shape to perfectly conform to the shape of the gum 48 and the tooth side 50 to reach the critical line 56. With sufficiently soft bristles they are
conforming to the shape of the tooth similar to the cleaning brushes of a carwash machines.

In operation the user may put some suitable additives such as a fluoride containing toothpaste on the bristles 32 and insert the brush unit 30. The user may then turn on the motor 14 by pushing the on/off button 16 so that the bristles 32 are rotated left and right according to the directions 36, 38. This means the sensitive areas 52, 56 in the gap 46 are cleaned and exposed to additives and fluoride. Because the bristles have substantially the same length and are soft, the user may easily insert the brush unit 30 through the gap 46 so that corner lines 52, 54 are also cleaned. In this way, the bristles reach and brushes even very hard to reach areas around the teeth.

According to an alternative embodiment of the device according to the invention the bristles are stiff as mentioned above, such that they are standing out from the periphery of the elongate rotatable member. For some applications such an embodiment is advantageous.

Fig. 5 shows an example of a manual brush unit 70 that has the brush unit 30 removably attached to a handle 72 for mechanical brushing without the aid of an electric motor.

Fig. 6 shows how a bristle 32 reaches a hard to reach area between two adjacent teeth, see especially the critical line 56, and conforms to the shape of the tooth side to clean the tooth and this area. The cleaning becomes very efficient by the rotational oscillatory movement of the bristles combined with a manual back and forth movement, in and out of the mouth.

Fig 7 shows a part of a flexible elongate extension 24, in side view and in front view. The elongate extension 24 is bendable by an angle of typically 15 - 20° in a plane perpendicular to the jaw. In this manner gaps 46 between the teeth 44 can be easily reached by the brush unit 30. As
described above a shaft 76 is provided inside the elongate extension 24 for transmitting rotational or oscillatory movements from the motor 14 to the end portion 26 and the brush unit 30. A shock absorber 77 is mounted on the shaft for protecting both the device and the user's gum and teeth from damages, as explained above.

The electric motor 14 is preferably driven by a rechargeable battery 20, a connection for charging the battery being indicated at 18 in figure 1.

While the present invention has been described in accordance with preferred compositions and embodiments, it is to be understood that certain substitutions and alterations may be made thereto without departing from the spirit and scope of the following claims.
Claims

1. A toothbrush device, comprising: a handle (12) having an electric motor (14) disposed therein; an elongate extension (24) in operative engagement with the electric motor (14); an end portion (26) attached to the elongate extension (24); a brush unit (30) attached to the end portion (26), characterized in that the brush unit (30) has bristles (32) attached to an elongate rotatable member (33) in rotatable engagement with the elongate extension (24), and in that said bristles (32) are attached at inner ends to the periphery of said elongate rotatable member (33) with end portions of said bristles (32) at said inner ends directed in a substantially radial direction outwards from the periphery of said elongate rotatable member (33).

2. The device according to claim 1, wherein said bristles (32) are soft enough to have their outer ends (35) hanging down from the elongate rotatable member (33) when said elongate rotatable member is not rotating.

3. The device according to claim 1, wherein said bristles (32) are stiff.

4. The device according to any one of the preceding claims, wherein said bristles (32) are attached to said elongate rotatable member (33) around its periphery along a major part of the length of said elongate rotatable member (33).

5. The device according to any one of the preceding claims, wherein said bristles (32) are of equal length.

6. The device according to any one of the preceding claims, wherein an inner shaft (76) is provided in the elongate
extension (24) to transmit the movement from the electric motor (14) to the end portion (26) and to the brush unit (30).

7. The device according to any one of the preceding claims, wherein said brush unit (30) is rotatable in clockwise direction and in counter clockwise direction.

8. The device according to claims 6 or 7, wherein a mechanism is provided at the output from the electric motor (14) for transforming the rotational movement of the electric motor (14) to a rotational oscillatory movement of the shaft (76).

9. The device according to claim 8, wherein the frequency of said rotational oscillatory movement is within the range of 50 - 60 Hz.

10. The device according to claims 8 or 9, wherein said rotational oscillatory movement extends over an angle of rotation in the range of 50-180°.

11. The device according to any one of the claims 6 - 10, wherein a shock absorber (77) is mounted on the shaft (76).

12. The device according to any one of the preceding claims, wherein the elongate extension (24) is bendable, preferably in the range of 15-20°, in a plane perpendicular to the jaw to be brushed.

13. The device according to any one of the preceding claims 1-11, wherein the elongate extension (24) is rigid.

14. The device according to any one of the preceding claims, wherein the elongate shaft (24) is removably attached to the handle (12).
15. The device according to any one of the preceding claims, wherein the part outside the elongate extension (24) of the surface of the handle (12), at which surface the elongate extension is mounted, is inclined in the direction away from the elongate extension (24) to drain water and possible other liquids.

16. The device according to claim 15, wherein an indicator lamp (79) is provided on said inclined surface (78) to indicate when the device is in operation, said lamp being controlled by a timer to start flashing after a predetermined time of operation of the device.

17. The device according to any one of the preceding claims, wherein the end portion (26) has an engagement unit (31) for releasing the brush unit (30).

18. The device according to any one of the preceding claims, wherein the end portion (26) has an opening (28) defined therein for receiving the brush unit (30).

19. The device according to any one of the preceding claims, wherein the end portion (26) is perpendicular to the elongate extension (24).

20. The device according to claim 16, wherein the end portion (26) is adapted to transmit the movement of the shaft (76) to the brush unit (30).

21. The device according to any one of the preceding claims, wherein the end portion comprises a stationary cover (75) to protect the lips of the user from contact with moving parts of
the end portion (26) when entering the brush unit (30) into the mouth.

22. The device according to any one of the preceding claims, wherein the tip of the rotatable member (33) is coated by a soft material, like elastic plastics (37).

23. The device according to any one of the preceding claims, wherein the bristles (32) are bent in a perpendicular shape to conform to a tooth side (50) and to a gum area (48) to slide over and clean a critical area (56) and a corner line (52) of the tooth.

24. The device according to any one of the preceding claims, wherein an on/off-button (16) is provided on said handle (12) for starting the movement of the brush unit (30) by pushing the button (16) to an on-position and for stopping the movement by pushing the button (16) to and off-position, which button (16) has a third position in addition to said on- and off-positions, said button (16) being spring biased in said third position towards an off-state and said brush unit (30) being rotated only with said button (16) pressed to an on-state in said third position while overcoming the spring force.

25. The device according to any one of the preceding claims, wherein said handle (12) is water tight.

26. The device according to any one of the preceding claims, wherein said elongate extension is provided with a flushing channel for cleaning the interior of the elongate extension (24) by flushing water.
27. The device according to any one of the preceding claims, wherein a rechargeable battery (20) is provided inside the handle (12) as a power source for the electric motor (14).

28. Brush unit for a toothbrush device according to any of the preceding claims or for mounting to a handle (72) for forming a manual toothbrush device, wherein bristles (32) are attached at their inner ends to the periphery of an elongate member with end portions of said bristles (32) at said inner ends directed in a substantially radial direction outwards from the periphery of said elongate member (33).
### A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A46B 9/04, A61C 17/22, A61C 17/34  
According to International Patent Classification (IPC) or to both national classification and IPC

### B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A46B, A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

### EPO-INTERNAL, WPI DATA, PAJ

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents

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**INTERNATIONAL SEARCH REPORT**

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