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D. P. GROVER

2,662,239

ROTARY TOOTHBRUSH

Filed Nov. 9, 1946

FIG. 1

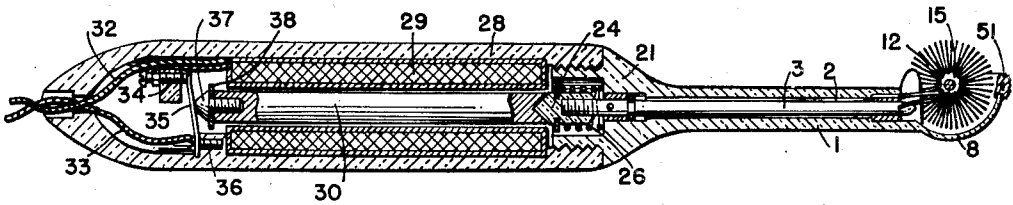


FIG. 2

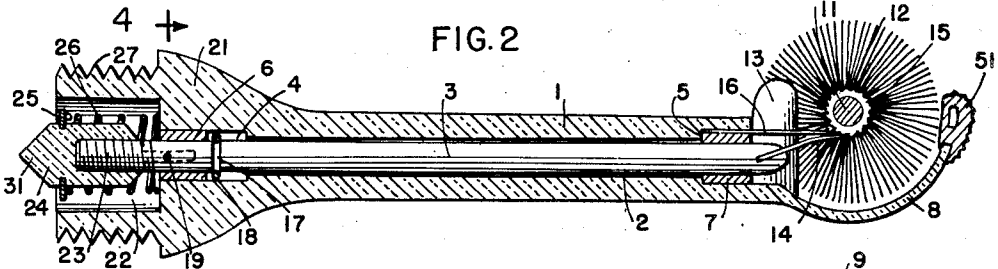


FIG. 4

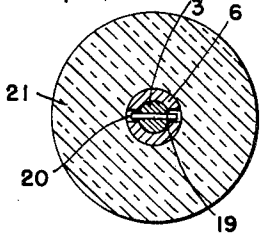


FIG. 3

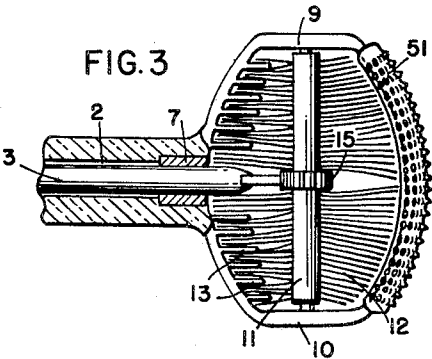


FIG. 5

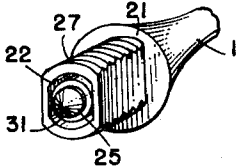


FIG. 6

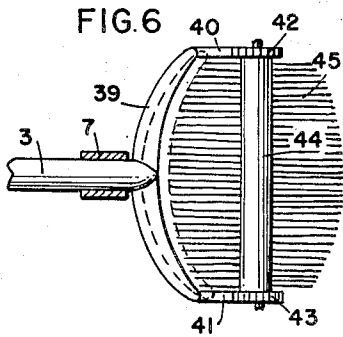
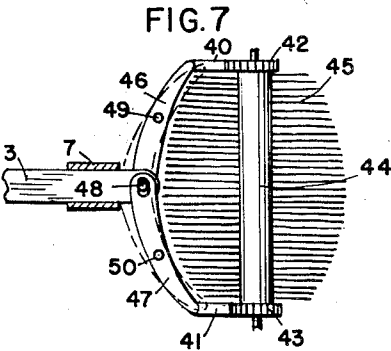


FIG. 7



INVENTOR:

DONALD P. GROVER

BY

Spencer Johnston, Cook & Root.

ATT'YS

UNITED STATES PATENT OFFICE

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ROTARY TOOTHBRUSH

Donald P. Grover, Chicago, Ill.

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3 Claims. (Cl. 15-23)

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This invention relates in general to power operated toothbrushes and particularly to the rotary type which may be used by individuals at home as distinguished from those in professional use by dentists.

In power driven toothbrushes of the rotary type heretofore known it has been customary to provide an electric motor embodied as a part of the handle portion of the brush or other similar types of driving mechanism to rotate the brush element. The present invention contemplates, as one advantage thereof, the use of novel driving means primarily adapted to transmit an intermittent rotation to the brush element, but which can easily be modified whereby a substantially constant rotation of the brush element may take place.

Another advantage which the present invention provides over those heretofore known is the adaptability of the toothbrush for simultaneously massaging the gums as the teeth are being cleaned. The very nature of the novel driving mechanism of this invention will cause a slight vibration of the entire device which can be transmitted to a suitable gum massaging element for the purpose of massaging the gums.

I have disclosed in my earlier filed co-pending applications, Ser. No. 691,273 filed August 17, 1946, now Patent No. 2,533,106, issued December 5, 1950; Ser. No. 691,979 filed August 21, 1946, now Patent No. 2,533,107 issued December 5, 1950; and Ser. No. 692,270 filed August 22, 1946, now Patent No. 2,533,108 issued December 5, 1950, certain novel and advantageous improvements in rotary toothbrushes in the form of lip guards for protecting the lip of a user against irritation and laceration by the rotating brush element. The basic reasons and advantages of such a protective means are adequately set forth in said applications and it is to be understood that suitable forms of lip guards such as those disclosed therein are equally adapted for use in the present invention.

I have also disclosed in my earlier filed co-pending applications bearing Ser. No. 700,315 filed September 30, 1946 and Ser. No. 702,535 filed October 10, 1946, various modified forms of toothbrushes having multiple heads or more than one brush element whereby the inner and outer sides of the teeth may be cleaned simultaneously. The novel drive means disclosed herein may be adapted for use in the type of rotary toothbrush disclosed in all of said applications as well as in the single head type illustrated herein.

One of the principal objects of the present in-

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vention is to provide a shank or handle portion for a rotary toothbrush which embodies a longitudinally reciprocable shaft for rotating the brush element, and novel driving means for reciprocating the shaft.

A still further object of the invention is to provide a rotary toothbrush with novel electrical means for intermittently rotating the brush element thereof.

Still another object is to provide a rotary toothbrush wherein novel electrical means are provided for longitudinally reciprocating a shaft which is so connected with the brush element thereof as to rotate the same during reciprocation of the shaft.

Another and more specific object of the invention is to provide a rotary toothbrush wherein the handle portion thereof contains a solenoid which may be intermittently energized and de-energized to draw the armature thereof inwardly each time the solenoid is energized thus reciprocating the armature. Connecting means are also provided between the armature and brush element whereby said reciprocating motion is converted to a rotary motion of the brush element.

Other objects and advantages of the invention will become apparent upon reading the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a longitudinal vertical sectional view through a rotary toothbrush embodying the features of the present invention;

Fig. 2 is an enlarged longitudinal vertical section through the shank of the toothbrush shown in Fig. 1;

Fig. 3 is a fragmentary plan view, partly in section, of the brush end of the shank shown in Fig. 2;

Fig. 4 is a vertical transverse section through the shank taken substantially along the plane of line 4-4 of Fig. 2;

Fig. 5 is a fragmentary perspective view of one end of the shank shown in Fig. 2;

Fig. 6 is a fragmentary plan view of the brush end of the toothbrush showing a modified form of connecting means between the shaft and the brush element; and

Fig. 7 is a view similar to Fig. 6 but showing a still further modified form of connecting means for rotating the brush element.

While the present invention as disclosed herein illustrates the use of a single reciprocating shaft for rotating the brush element, it will be understood that the use of two or more such reciprocating shafts may be utilized if so de-

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sired without in any way departing from the spirit of the invention.

Referring now more particularly to the drawing and especially to Fig. 2, the toothbrush unit is composed of a shank portion indicated by the numeral 1 which has an elongated opening 2 extending throughout the length thereof and adapted to receive a shaft 3. Each end of the opening 2 is preferably provided with slightly enlarged portions 4 and 5 for the purpose of receiving the bearing members 6 and 7 within which the shaft 3 is adapted to longitudinally reciprocate. The forward end of the shank 1 terminates in a hollow shell-like portion comprising a shield 8 having the ends 9 and 10 thereof suitably constructed to removably receive the spindle 11 of the brush element 12. The specific form of mounting means for the brush element spindle forms no part of the present invention and may include any suitable type of supporting means such as those disclosed in my earlier filed co-pending application bearing Ser. No. 705,282 filed October 24, 1946.

As stated hereinbefore, any suitable form of lip guard may also be combined for use in the present invention such as those disclosed in any of the first three co-pending applications above referred to. The form of lip guard illustrated herein comprises a plurality of teeth or partitions 13 extending along one side of the shield 8 and preferably along that side toward which the brush element rotates so as to protect the lip of a user from being drawn inwardly against the bristles of the brush and between the bristles and the edge of the shield. It will be evident that the brush element can be caused to rotate in the opposite direction from that shown, in which event the lip guard would be located on the opposite side of the shield.

The forward end of the shaft 3 is provided with actuating means in the form of a pawl 14 which is adapted to be in contact with the teeth of a ratchet wheel 15 mounted centrally of the spindle 11. Thus it will be evident that longitudinal reciprocation of the shaft 3 will impart a rotary movement to the brush element 12 in a counter-clockwise direction each time a forward movement of the shaft takes place. A stop member 16 may be suitably provided in the form of an elongated finger to prevent rotation of the brush element in the opposite direction by bearing against the teeth of the ratchet wheel 15.

Adjacent the inner end of the shaft 3 it has an annular groove 17 within which a retaining ring 18 is located to normally retain the shaft within the shank. A small pin 19 extends transversely through the shaft 3 and into slots 20 of the bearing 6. This construction will prevent a rotation of the shaft and yet will permit a longitudinal sliding movement thereof.

The inner end of the shank 1 is preferably enlarged slightly as at 21 and has an opening 22 in the end thereof. The end 23 of the shaft 3 extends into the opening 22 and is externally threaded for the purpose of threadedly receiving the end member 24 thereon. This end member 24 is provided with an annular rib 25 which may take the form of a ring or which may be integral with the member 24 and provides a bearing for one end of a coiled compression spring 26 surrounding the member 24. The other end of said spring bears against the shank at the inner end of the opening 22. This construction will maintain the shaft 3 normally in a retracted position away from the brush ele-

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ment and in readiness for a sliding movement which will rotate the brush element.

The enlarged end 21 of the shank is preferably threaded as at 27 whereby it may be threadedly connected to the main handle portion 28. While many forms of driving means may be utilized to impart a reciprocating movement to the shaft 3, one of the forms illustrated herein comprises a solenoid 29 suitably located within the handle portion 28 and is adapted to receive a plunger or armature 30 for reciprocating movement therein. The outer end of the member 24 is preferably formed in the shape of a cone as indicated at 31 whereby it may be received within a complementary opening or recess in one end of the armature 30 as shown in Fig. 1. This will maintain the armature 30 and shaft 3 in substantial alignment and will also impart a reciprocating movement to the two members. That is, a movement of the armature toward the brush end of the device when the solenoid is energized will urge the shaft 3 in the same direction to rotate the brush, and a movement in the opposite direction of the shaft 3, due to the action of the coiled spring 26, will also urge the armature 30 in that direction.

The solenoid may be energized by suitable conductors 32 and 33 carrying current from a source of electrical energy, and novel means are provided to intermittently open and close the circuit between these two wires from the high to the low sides of the line. One form which this means may take includes a contact 34 connected to the solenoid and which is adapted to have a spring switch blade 35 bear thereagainst, which blade is suitably secured within the handle portion to the conductor 33 by means of the fastening means 36. The conductor 32 is connected directly to the solenoid and will carry current through the contact 34 and the spring switch blade 35 to the other side of the line through the conductor 33. The blade 35 constitutes a normally open switch which may be closed to complete the circuit through the solenoid by movement of the armature 30 thereagainst.

The outer end of the armature is provided with a suitable nose 37 adapted to bear against the spring switch blade 35 and has an annular rib 38 thereon to limit the inward movement of the armature by bearing against one end of the solenoid.

In the normal position of the various parts, the spring 26 will urge the shaft 3 and armature 30 in a direction away from the brush end of the device as shown in Fig. 1, whereupon the nose 37 of the armature bears against the spring switch blade 35 to normally close the circuit between the conductors 32 and 33. When these conductors are connected to a suitable source of electrical energy, such as the ordinary wall socket found in the home, electrical current will be carried through the solenoid, thus energizing the solenoid and drawing the armature 30 inwardly. The inward movement of the armature 30 will cause a forward movement of the shaft 3 to rotate the brush element through the pawl and ratchet mechanism indicated at 14 and 15. As soon as the armature is moved in this direction, the spring switch blade 35 will be moved away from the contact 34 to break the circuit between the two sides of the line and de-energize the solenoid. As soon as the solenoid has become de-energized, the spring 26 will act to move the shaft 3 and armature 30 in a direc-

tion away from the brush end of the device, whereupon the pawl 14 will be in a position for the next succeeding rotative movement of the brush element and the nose 37 of the armature will move the spring switch blade 35 against the contact 34 to again complete the circuit and energize the solenoid. As long as the conductors 32 and 33 are connected to a source of electrical energy, the above described action will take place continuously. The solenoid will be alternately energized and de-energized to thereby induce a rapid reciprocation of the armature 30 and the shaft 3 thus inducing a rapid intermittent rotation of the brush element 12.

It will be evident that two shafts and two solenoids could be used if desired in connection with two pawl and ratchet arrangements on the spindle 11, and if they are caused to reciprocate simultaneously in opposite directions, a substantially constant rotation of the brush element will take place instead of the intermittent one as explained above.

Fig. 6 illustrates a modified form of the invention where, instead of the pawl and ratchet arrangement described above, an arcuate arm 39 extends transversely of the shank and is secured to the outer end of the shaft 3 at substantially its midpoint. In this form of the invention the ends of the arcuate member 39 are provided with the pawls 40 and 41 adapted to be in engagement with the ratchets 42 and 43 located on each end of the spindle 44 of the brush element 45. The operation of this form of the invention is substantially the same as that described above and the arcuate member 39 is shown in its normal retracted position in full lines and its forward position in dotted lines. In the dotted line position thereof the pawls 40 and 41 will have rotated the ratchets 42 and 43 thereby causing a rotation of the brush element. The driving mechanism may be utilized with this modified form and will function in the same manner above described.

In Fig. 7 the arcuate member has been split and is divided into two portions 46 and 47 both of which are pivotally secured at their inner ends to the end of the shaft 3 by means of the pivot pin 48. The portion 46 is pivotally mounted at substantially its center by means of the pivot pin 49 to any suitable stationary part of the shank such as the shield 8. Likewise, the other portion 47 thereof may be pivotally mounted to the same member by means of the pivot pin 50. In this form of the invention the rotation takes place when the shaft 3 is moved away from the brush end of the device, which is opposite to the functioning thereof explained with regard to the other forms. As the shaft 3 is caused to reciprocate longitudinally and moves away from the brush end of the device, the pivotal arrangement thereof will cause the outer ends of the portions 46 and 47 to move forwardly and the pawls 40 and 41 mounted on said ends will thus rotate the ratchets 42 and 43 and the brush element 45.

As mentioned earlier herein, novel gum massaging means may be employed with this type of construction whereby the gums of a user may be massaged simultaneously with the cleaning of the teeth. Such a suitable gum massaging element is indicated by the numeral 51 and is adapted to be mounted on the forward or outer side of the shield 8. This element may, if desired, constitute an ordinary piece of rubber having the outer surface thereof roughened in any suitable manner. The rapid reciprocation of the

shaft and armature of the solenoid will induce a certain amount of vibration to the entire device. This vibration can be advantageously utilized through the gum massaging element, which will also have imparted thereto a vibratory movement. When the teeth are being cleaned, the massaging element may be placed against the gums thereof and while the rotating brush element is cleaning the teeth, the vibration of the massaging element will be massaging the gums. As in all of my earlier filed applications above referred to, the driving means is preferably arranged to rotate the brush element in a direction away from the gums, so that the cleaning will begin on or near the gums and will move toward the biting surface of the teeth.

From the foregoing description it will be evident that the invention disclosed herein embodies certain novel ideas in driving means for imparting a rotary movement to a power driven toothbrush. It will be clear that certain changes may be made in the form, construction and arrangement of parts from that disclosed herein without in any way departing from the spirit of the invention or sacrificing any of the attendant advantages thereof, provided, however, that such changes fall within the scope of the claims appended hereto.

Having thus described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. A rotary toothbrush of the class described comprising a handle portion, a brush element rotatably mounted thereon, said brush element including an elongated spindle, a ratchet wheel on each end of said spindle, a pawl located adjacent each ratchet wheel, and means to move said pawls to thereby rotate said ratchet wheels and said brush element intermittently in one direction.

2. A rotary toothbrush of the class described comprising a handle portion, a brush element rotatably mounted thereon, said brush element including an elongated spindle, a ratchet wheel on said spindle, an elongated shaft located within said handle portion having an inner end and an outer end and extending longitudinally thereof, pawl means fixed to the outer end of said shaft, extending in the same direction as said shaft, and in contact with said ratchet wheel, and electrical means to reciprocate said shaft and pawl means longitudinally thereby to rotate said brush element upon each movement of said shaft in a direction toward its outer end.

3. A rotary toothbrush of the class described comprising a handle portion, a brush element rotatably mounted thereon, said brush element including an elongated spindle, a ratchet wheel on said spindle intermediate the ends thereof, an elongated shaft having an inner end and an outer end located within said handle portion and extending longitudinally thereof, pawl means fixed to the outer end of said shaft, extending in the same direction as said shaft, and in contact with said ratchet wheel, electrical means to reciprocate said shaft and pawl means longitudinally thereby to rotate said brush element upon each movement of said shaft in a direction toward its outer end, and a fixed stop member mounted in said handle adjacent the outer end of said shaft and in contact with said ratchet wheel to prevent rotation of said ratchet wheel when said shaft is moved in the opposite direction.

DONALD P. GROVER.

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