PORTABLE ELECTRIC UNIT FOR TOOTHBRUSH OR THE LIKE

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The present invention relates to a power actuator to which a toothbrush may be releasably attached to cause vibratory or oscillatory movement of the toothbrush to thereby provide movement of the brush to effect proper brushing of a user's teeth and/or gums.

While it has heretofore been proposed to provide toothbrushes with a vibratory or oscillatory motion by means of electrical or mechanical power, such devices have not been found to be completely satisfactory. These devices have generally been intended to be used by more than one person with each person's toothbrush being capable of being easily attached and removed from the device. Where such devices required a specific connection on the toothbrush handle to enable the toothbrush to be used, there has generally been less variety of toothbrushes available to enable a user to select the most desirable toothbrush, as to bristle hardness, brush contour, handle color, etc., than the variety of toothbrushes available with manually graspable handles. A user accordingly had been deprived of being able to have a sufficient selection of brushes from which to choose that one most desirable to him. Furthermore, wherein such vibratory devices are to be used by more than one person, it has been found that each person has been unable to have the device produce the degree or amplitude of movement of the toothbrush that each person individually desired for proper brushing action.

It is accordingly an object of the present invention to provide a power operated actuator for a toothbrush in which a toothbrush having a handle of the usual rounded rectangular cross-sectional shape for manual grasping may be employed, thereby permitting a user to attach the same toothbrush in the device which he had been using for manual brushing.

Another object of the present invention is to provide a power actuator for a toothbrush which has an adjustment that enables the user to quickly and efficiently set the degree or amplitude of movement of the toothbrush.

A further object of the present invention is to provide a power actuator for a toothbrush which is electrically operated and may employ either a battery rechargeable by the usual household current or with minor changes utilize conventional dry cells.

An additional object of the present invention is to provide a power actuator for a toothbrush which achieves the above-noted objects and which is relatively economical to manufacture, composed essentially of few parts and durable in use.

In carrying out the present invention a feature thereof resides in the provision of an adjustment whereby the degree or amplitude of vibration of a toothbrush may be adjusted by each user to that found most preferable. As disclosed hereinafter in the specifically described embodiment, an electric motor having an eccentric weight is secured to a motor support with the support being resiliently mounted on a handle portion that is grasped by the user in such a manner that the motor support is capable of moving with respect to the handle portion. The motor support carries on the end opposite the motor carrying part a toothbrush such that movement of the motor support causes the oscillation of the brush. To control the amplitude of the oscillations, the present invention utilizes a resilient mounting of the motor support on the handle portion and enables the user to control the rigidity of the resilient mounting. Thus by increasing the rigidity of the mounting the degree of amplitude of movement of the toothbrush can be decreased while by increasing the resilience of the mounting the amplitude may be increased.

Another feature of the present invention provides for enabling a toothbrush having the conventional handle that is elongate and substantially rectangular in cross-section to be quickly and easily secured to the motor support. This is achieved according to the present invention by the use of a pair of chuck jaws having parallel sides, with the sides of the jaws being movable toward and away from each other upon movement of an easily grasped member. Thus by utilizing the member the jaws may be opened and is formed to thereby release or clamp respectively a toothbrush handle of conventional construction to the power actuator.

Other features and advantages will hereinafter appear.

In the drawing:
FIGURE 1 is an elevation of the power actuator for a toothbrush of the present invention having a toothbrush secured thereto.
FIG. 2 is an axial section, somewhat enlarged, of the power actuator.
FIG. 3 is a top view of the power actuator shown in FIG. 2.
FIG. 4 is a section taken on the line 4—4 of FIG. 2.
FIG. 5 is a section taken on the line 5—5 of FIG. 2.
FIG. 6 is a section taken on the line 6—6 of FIG. 2.
FIG. 7 is an elevation of the bottom portion of the power actuator for a toothbrush of the present invention.
FIG. 8 is an electrical schematic diagram of the electrical components of one embodiment of the power actuator of the present invention.
FIG. 9 is an electrical schematic diagram of electrical components, a further embodiment, wherein rechargeable batteries are employed in place of dry cells.
FIG. 10 is a partial vertical section similar to FIG. 2 of the embodiment of the power actuator for a toothbrush that utilizes rechargeable batteries.
FIG. 11 is a section taken on the line 11—11 of FIG. 10.
FIG. 12 is a section taken on the line 12—12 of FIG. 10.
FIG. 13 is a bottom view of the embodiment of the power actuator for a toothbrush shown in FIG. 10.

Referring to the drawing, the power actuator for a toothbrush of the present invention is generally indicated by the reference numeral 29 and, as shown in FIG. 1, has a toothbrush 21 releasably secured thereto so that the actuator may impart oscillatory movement to the toothbrush. The actuator 29 is formed into a tubular handle by an enclosed bottom part 22, a hollow lower casing 23 and a hollow upper casing 24 that are secured together. Additionally, forming the exterior of the actuator is a vibratory amplitude adjusting nut 25 and a toothbrush handle clamping nut 26. Preferably, as will hereinafter be appreciated, the bottom part 22 is only releasably secured to the lower casing 23 with the casings 23 and 24 being permanently joined together and each of these parts is formed to the shape shown of plastic material.

Referring to FIG. 2, there is positioned within the upper casing 24 the D.C. electric motor 27 of the rotary type that has at its lower end an eccentric weight 28 such that rotational movement caused by the motor rotates the eccentric weight to produce vibrations. The motor is rigidly secured in a motor support 29 which is preferably formed of plastic to the shape shown to provide a lower
cylindrical recess 30 and an upper cylindrical recess 31, the recesses being defined by cylindrical walls 32 and 33 respectively. The motor 27 is secured in the lower recess 30, as by for example a press fit between the exterior of the motor and the interior surface of the wall 32.

In accordance with the present invention, the motor support 29 is resiliently mounted on the upper casing 24 for vibratory movement with respect thereto so that the vibrations of the support 29 caused by the motor 27 and weight 28 are transmitted to the toothbrush 22 that is releasably held in the upper recess 31. The resilient mounting includes a somewhat spiral spring 24 having one end 25 secured in a flange 36 formed in the motor support between the upper and lower recesses and its other end 27 is secured in an internal annular rib 38 formed at the upper portion of the casing 24. With this construction it will be appreciated that the motor support 29 is only spring mounted in the casing 24 and hence may move with respect thereto against the action of the spring 25.

For adjusting the vibration of the vibratory movement of the motor support and hence the amplitude of vibration of the toothbrush 21, an outer portion of the wall 33 is threaded as at 39 for threading engagement with an internally threaded portion 40 of the adjusting nut 41. The nut 25 further includes an end portion 41 that abuts an end 42 of the casing 24. In addition, positioned between the nut and the upper casing and the motor support 29 is a resilient rubber sleeve 43 that provides an elastic pivot between the motor support and the upper casing 24. With this structure of mounting the motor support, it will be appreciated that amplitude of vibration may be adjusted by manipulation of the adjustment nut 25. Thus if the nut is turned so that the spring 24 is compressed, i.e., in effect moves the motor housing outwardly or upwardly from the casing, then the rigidity of the spring is increased which resists the oscillation of the support produced by the rotating eccentric weight 28. The maximum outward movement is limited by a snap ring 39a secured on the wall 33. On the other hand, rotation of the nut 24 in the opposite direction, which in effect enables the spring 24 to pull the motor support within the casing, increases the resilience of the spring 4 and thereby permitting the motor support to vibrate with a higher amplitude.

The toothbrush 21 that is releasably secured to the actuator 20 is of conventional type having a handle 23a of substantially rectangular cross-sectional which is inserted within the upper recess 31 and is grasped by a pair of jaws 44 and 45 that have a connecting bit 46 portion. The jaws are moved with respect to each other to open and close by moving them in and out of the recess 31 so that a flaring exterior surface 47 and 48 of the jaws 44 and 45 respectively abuts and is moved by the end 49 of the wall 33. The jaws are normally biased to open position by the bit portion 46. For maintaining the jaws in position and to facilitate the movement thereof, the collet nut 26 is formed with a threaded portion 50 that threadedly engages a threaded portion 51 on the wall 33. In addition, the collet nut has an inwardly directed annular tongue 52 that cooperates with grooves 53 and 54 formed in the chuck jaws. Accordingly, by rotative movement of the collet nut, the jaws are moved in and out of the upper recess 31 to effect their movement toward and away from each other respectively will be appreciated that the interior surface of the chuck jaws 44a and 45a are planar or flat in the embodiment shown and thus they may grasp the sides of a conventional toothbrush handle having the usual rectangular cross-section with the remainder of the handle being positioned in the recess 31. Thus the toothbrush of the present invention may utilize presently available toothbrushes that have handles designed for hand grasping.

In the embodiment of the invention shown in FIG. 2, the electric motor 27 is powered by a pair of dry cells 55 or non-chargeable batteries confined within the lower casing 53 by ribs 23a having the shape shown. To this end, a lead 57 extends from the motor through a connecting clip 58 to one end of the battery 55 while the other end of the battery 55 engages a connecting rivet 59 secured in a disk 60 forming a part of the bottom part 22. The adjacent end of the battery 56 is also in engagement with a contact rivet 61 secured to the disk 60 while the upper end of the battery 56 is connected to a connecting clip 62 which in turn, through a cap 63 formed in the upper part of the lower casing 23, connects to a lead 64 engaging a contact rivet 65. Positioned within the bottom part 22 is a manually operable switch for controlling the conduction of current between the motor 27 and the batteries 55 and 56. The switch includes a pivot pin 66 secured to the disk 60 and which pivots an arm 66 having a knob portion 67 extending through an aperture 68 formed in the bottom part for enabling manipulation thereof by a user. The contact rivet 61 has secured thereto a resilient conductor 69 having the shape shown that has an end 69a positioned in alignment with the end of the contact rivet 59. The end 69a is normally biased away from the contact rivet 59 and movement thereof to cause electrical engagement therebetween is facilitated by the arm 66 that forces the end 69a against the contact rivet 59. With the arm 66 in the dotted line position shown in FIG. 6, the cam surface 70 permits the end 69a to be away from the contact rivet 59.

As shown in FIG. 2, the bottom part 22 is preferably molded of plastic material to have accurate threads 71 that cooperate with accurate threads 72 formed in the lower casing 23 to thereby only releasably secure the bottom part to the lower casing and thus permit changing of the dry cells 55 and 56. In addition, the bottom part has a disk 73 that closes off the bottom part.

In the embodiment shown in FIG. 9 through 13 inclusive the power for supplying the motor instead of being from dry cells is from a battery that is capable of being recharged by ordinary household electric current.

The only change necessary in the heretofore described structure of a power actuator is to substitute the lower casing shown in FIGS. 9 through 13 for the lower casing and bottom part shown in the previously described embodiment. Referring to the electrical schematic diagrams, FIGS. 8 and 9, FIG. 8 of the first described embodiment discloses a motor placed in series with the dry cells and the switch. In the embodiment using the rechargeable batteries, hereinafter generally indicated by the reference numeral 74, the motor 27 is also placed in series with a switch 75 and rechargeable battery 76. In addition, there is provided a one-way valve 77 connected to one terminal 78 with the switch being connected to another terminal 79. According to the present invention the terminals 78 and 79 are adapted to be connected to a source of household current and thereby effect charging of the battery 76.

In the embodiment shown in FIG. 10, the lower casing is generally indicated by the reference numeral 80 and is hollow to contain the rechargeable battery 76. The lower end of the battery 76 is supported by and in electrical engagement with a bracket 81 mounted on a supporting disk 82 with the bracket extending against a spring 83 that abuts a closing plate 84 integrally formed with the lower casing 80. The supporting disk 82 has the terminals 78 and 79 secured therein to extend downwardly with the terminal 79 being connected to the bracket 81, the latter being electrically connected to the lower end of the battery. In addition the one-way valve 77 is connected to the other terminal 78 and to a common junction 85, while the electric toothbrush of the present invention may utilize presently available toothbrushes that have handles designed for hand grasping.

In the embodiment shown in FIG. 2, the electric motor 27 is powered by a pair of dry cells 55 or non-chargeable batteries confined within the lower casing 33 by ribs 23a having the shape shown. To this end, a lead 57 extends from the motor through a connecting clip 58 to one end of the battery 55 while the other end of the battery 55 engages a connecting rivet 59 secured in a disk 60 forming a part of the bottom part 22. The adjacent end of the battery 56 is also in engagement with a contact rivet 61 secured to the disk 60 while the upper end of the battery 56 is connected to a connecting clip 62 which in turn, through a cap 63 formed in the upper part of the lower casing 23, connects to a lead 64 engaging a contact rivet 65. Positioned within the bottom part 22 is a manually operable switch for controlling the conduction of current between the motor 27 and the batteries 55 and 56. The switch includes a pivot pin 66 secured to the disk 60 and which pivots an arm 66 having a knob portion 67 extending through an aperture 68 formed in the bottom part for enabling manipulation thereof by a user. The contact rivet 61 has secured thereto a resilient conductor 69 having the shape shown that has an end 69a positioned in alignment with the end of the contact rivet 59. The end 69a is normally biased away from the contact rivet 59 and movement thereof to cause electrical engagement therebetween is facilitated by the arm 66 that forces the end 69a against the contact rivet 59. With the arm 66 in the dotted line position shown in FIG. 6, the cam surface 70 permits the end 69a to be away from the contact rivet 59.

As shown in FIG. 2, the bottom part 22 is preferably molded of plastic material to have accurate threads 71 that cooperate with accurate threads 72 formed in the lower casing 23 to thereby only releasably secure the bottom part to the lower casing and thus permit changing of the dry cells 55 and 56. In addition, the bottom part has a disk 73 that closes off the bottom part.

In the embodiment shown in FIG. 9 through 13 inclusive the power for supplying the motor instead of being from dry cells is from a battery that is capable of being recharged by ordinary household electric current.

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In the embodiment shown in FIG. 10, the lower casing is generally indicated by the reference numeral 80 and is hollow to contain the rechargeable battery 76. The lower end of the battery 76 is supported by and in electrical engagement with a bracket 81 mounted on a supporting disk 82 with the bracket extending against a spring 83 that abuts a closing plate 84 integrally formed with the lower casing 80. The supporting disk 82 has the terminals 78 and 79 secured therein to extend downwardly with the terminal 79 being connected to the bracket 81, the latter being electrically connected to the lower end of the battery. In addition the one-way valve 77 is connected to the other terminal 78 and to a common junction 85, while the motor leads 86 and 87 extend through the closing plate 84 to be secured to a contact rivet 88 and the common junction 85 respectively. The
supporting disk 82 further has connected thereto a contact rivet 89 connected to the bracket 81 and extending beneath the supporting disk and a pivot pin 90 on which a switch actuating arm 91 is mounted. The arm 91 has a cam surface 92 which, as in the previously described embodiment, engages a flexible conductor 93 having one portion secured to the contact rivet 88 while its other end 94 is movable by the cam surface 92 into and out of engagement with the contact rivet 89. Enclosing the bottom of the lower casing 75 is a circular plate 95 having an opening 96 through which an electric plug (not shown) may extend to be in electrical contact with the terminals 78 and 79. Additionally, the switch arm has a portion 97 that extends from the casing for manipulation by the user.

In accordance with the present invention the switch arm foretells the energizing of the motor from the battery whenever the terminals have an electric plug connected thereto for energizing the battery. Accordingly the switch arm is formed to have an abutment 98 that partially encircles, as shown by the dotted line position of the switch arm in Fig. 12, the terminal 78 when the switch arm is in the motor energizing position. Thus if a portion supported by a contact rivet 89 is connected to the terminals the switch arm cannot be moved to its motor energizing position while if the motor is energized, a plug cannot be secured to the terminals.

It will accordingly be appreciated that there has been disclosed a power actuator for a toothbrush which provides for the control of the amplitude of vibration of a toothbrush carried thereby. In addition, the power actuator is so constructed and arranged that it is capable of receiving the normal conventional toothbrush handle and to grasp the same and cause it to be vibrated by the power actuator. The power actuator may utilize either dry cells, as in the first described embodiment, or it may use rechargeable batteries, as described in the second embodiment. In both embodiments, however, the only change is in the lower casing which does not require alteration of the other parts so that in both embodiments many parts are common and hence may be economically manufactured.

Variations and modifications may be made within the scope of the claims and portions of the improvements may be used without others.

1. A power actuator for a toothbrush comprising a hollow tubular handle, electric motor vibrating means in said handle and adapted upon energization to produce vibrations, a motor support to which said motor means is secured, means resiliently mounting the motor support on said handle for vibratory movement with respect thereto, and means in said handle and adapted upon energization to produce vibrations, a motor support to which said motor means is secured, means resiliently mounting the motor support on said handle for vibratory movement with respect thereto and including a spring connected between the motor support and the handle, means for adjusting the degree of resilience of said support by varying the tension of said spring to thereby provide adjustment of the amplitude of vibratory movement and toothbrush handle grasping means carried by said motor support whereby said toothbrush is vibrated by said vibrating means.

5. The invention as defined in claim 4 in which the resilient mounting means of the motor support further includes a resilient member positioned between the handle and the motor support.

6. A power actuator for a toothbrush comprising a hollow tubular handle, electric motor vibrating means in said handle and adapted upon energization to produce vibrations, a motor support to which said motor means is secured, means resiliently mounting the motor support on said handle for vibratory movement with respect thereto and including a spring connected between the motor support and the handle and a resilient member positioned between the handle and the motor support, means for adjusting the degree of resilience of said support and including a manually movable act engaging the motor support and the handle for moving the motor support with respect to the handle to thereby provide adjustment of the amplitude of vibratory movement by varying the tension of said spring and toothbrush handle grasping means carried by said motor support whereby said toothbrush is vibrated by said vibrating means.

7. A power actuator for a toothbrush comprising a hollow tubular handle, electric motor vibrating means in said handle and adapted upon energization to produce vibrations, a motor support having a portion extending within the handle to which said motor is secured and a projecting portion extending beyond the handle, a pair of jaws carried by said portion, adjusting means engaging the jaws and motor support for moving the jaws to grasp a toothbrush handle positioned therebetween, and means resiliently mounting the motor support on said handle for vibratory movement with respect thereto whereby said toothbrush is vibrated by said vibrating means.

8. A power actuator for a toothbrush comprising a hollow tubular handle, electric motor vibrating means in said handle and adapted upon energization to produce vibrations, a motor support having a portion extending within the handle to which said motor is secured and a projecting portion extending beyond the handle and having a wall portion defining a substantially deep recess, and having a pair of jaws carried by said portion, said jaws being positioned adjacent the opening of the recess and having planar faces for engaging opposite side portions of a toothbrush handle extending into the recess, adjusting means engaging the jaws and motor support for moving the jaws to grasp the toothbrush handle portion positioned therebetween, and means resiliently mounting the motor support on said handle for vibratory movement with respect thereto whereby said toothbrush is vibrated by said vibrating means.

9. A power actuator for a toothbrush comprising a hollow tubular handle, electric motor vibrating means in said handle and adapted upon energization to produce vibrations, a motor support having a portion extending within the handle to which said motor is secured and a projecting portion extending beyond the handle, a pair of jaws carried by said portion, adjusting means engaging the jaws and motor support for moving the jaws to grasp a toothbrush handle positioned therebetween, and means resiliently mounting the motor support on said handle for vibratory movement with respect thereto whereby said toothbrush is vibrated by said vibrating means.

10. The invention as defined in claim 9 in which each jaw has a flaring portion engaging the end of the wall and the adjustable means for moving the jaws causes...
said end to engage the flaring portion to effect grasping movement of the jaws.

11. A power actuator for a toothbrush comprising a hollow tubular handle, electric motor vibrating means in said handle and adapted upon energization to produce vibrations, a motor support to which said motor means is secured, means resiliently mounting the motor support on said handle for vibratory movement with respect thereto, toothbrush handle grasping means carried by said motor support, said handle including a lower casing, a battery positioned with said casing and connected to the motor means to supply electrical energy thereto, a fixed contact and a movable contact in series circuit with said battery and motor and a pivoted switch arm for effecting electrical connections between said fixed and movable contacts.

12. The invention as defined in claim 11 in which the battery is of the rechargeable type, a pair of terminals electrically connected thereto and adapted to be connected to a source of electrical energy for recharging the battery and means for preventing electrical connection between said fixed and movable contacts when the battery is being recharged.

13. The invention as defined in claim 11 in which the battery is of the rechargeable type, a pair of terminals electrically connected thereto and adapted to be connected to a source of electrical energy and an abutment on said switch arm moveable in the contact closing position to partially encircle at least one of said terminals.

No references cited.

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