United States Patent

[11] **3,562,566**

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[54] **POWER OPERATED TOOTHBRUSH PRODUCING EITHER OSCILLATORY OR RECIPROCATORY MOTIONS**
7 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **310/80,** 310/50, 310/75, 310/83; 74/55
[51] **Int. Cl.** **H02k 7/06**
[50] **Field of Search** 310/80, 79, 75, 50, 47, 83; 74/55

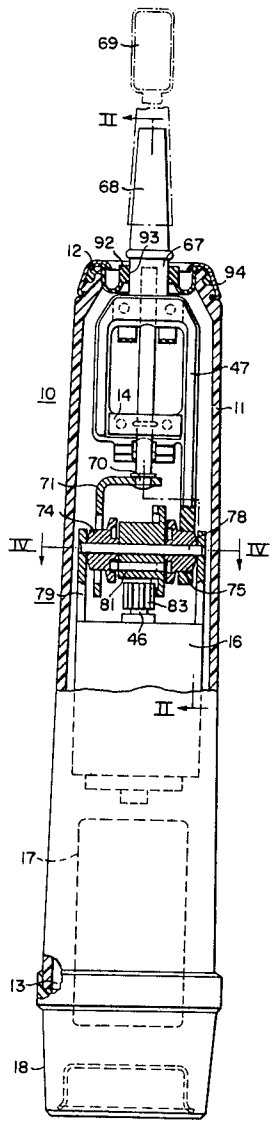
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ABSTRACT: A power operated toothbrush capable of providing two distinct modes of operation. An electrically reversible motor unit including an output shaft imparts movement to mode generating mechanism which produces either oscillatory or reciprocatory motion depending on the polarity of the motor unit which is controlled by means of a double-pole, double-throw switch supported in the outer wall of a casing of a size, shape and weight making it suitable for being handheld and for housing the mode generating mechanism and the power unit.



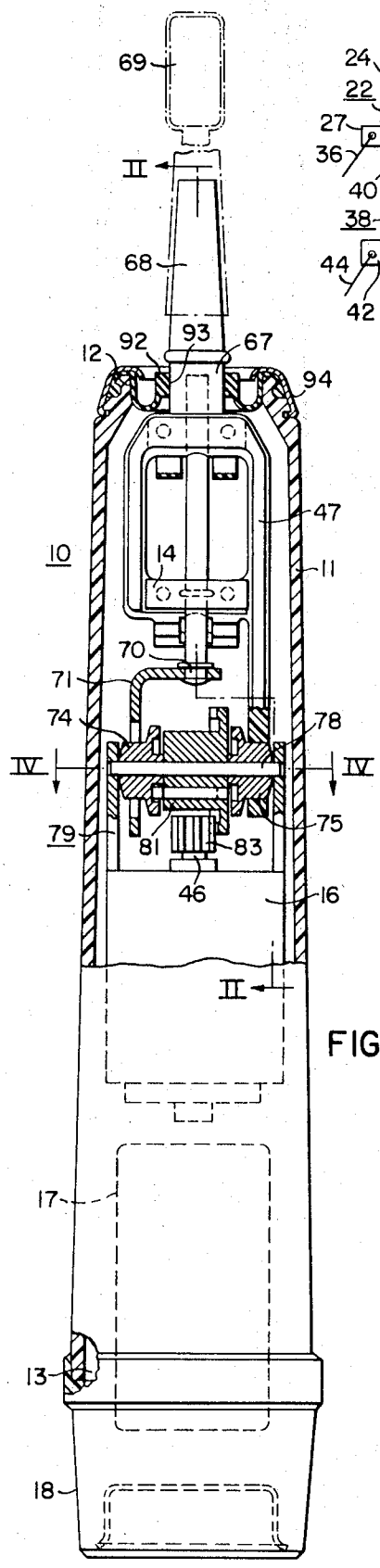


FIG.1.

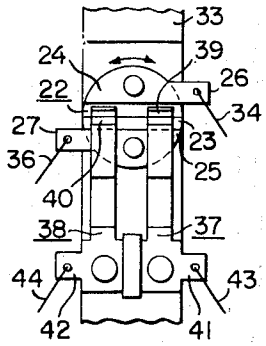


FIG.6.

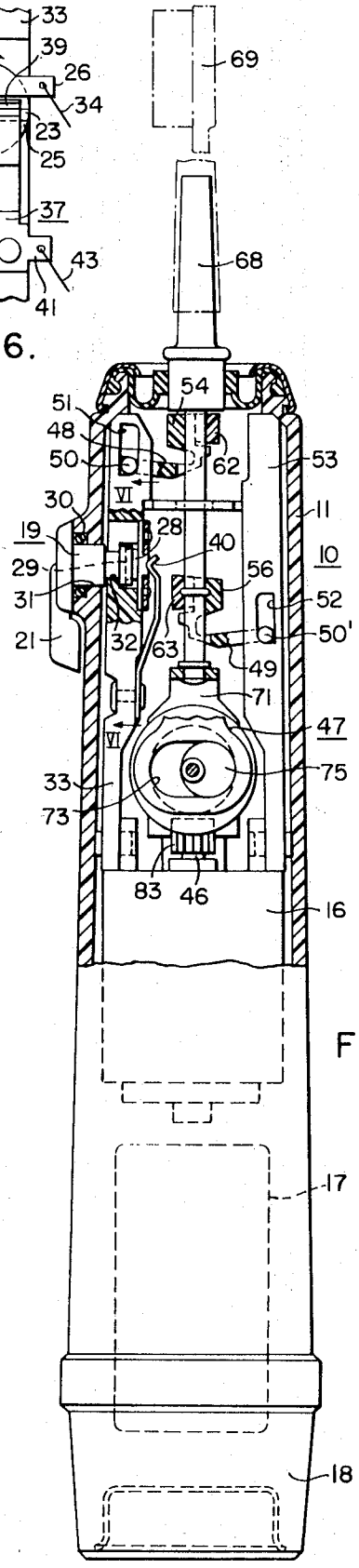


FIG.2.

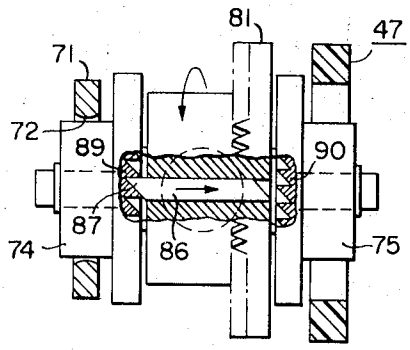


FIG. 4.

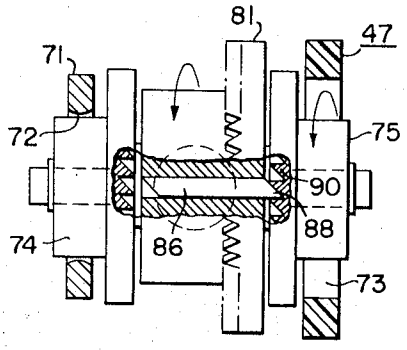


FIG. 5.

FIG. 3.

POWER OPERATED TOOTHBRUSH PRODUCING EITHER OSCILLATORY OR RECIPROCATORY MOTIONS

This invention relates, in general, to domestic appliances and, more particularly, to power operated toothbrushes.

In order to facilitate hygienic care of the teeth and gingival areas, a variety of power operated devices have been developed and are currently available to the consumer. The variety of such devices can be attributed to the long existing controversy as to the efficacy of one brushing motion versus another. The most generally accepted of these devices employ mechanisms for imparting either pure oscillatory or pure reciprocatory motion to the toothbrush, acceptance being with laymen and dentists alike.

Normally, only one or the other of the above-mentioned motions is produced by any one power unit, The one known exception to this is found in a power operated toothbrush which produces simultaneous oscillatory and reciprocatory motion. It will be apparent that this combination of motions neither satisfies the advocate of pure oscillatory motion nor the advocate of pure reciprocatory motion.

Since power operated toothbrushes can be purchased in accordance with one's preference as to motion, it is possible to satisfy all the members of a single family but only at the additional expense of buying a second, or even a third power toothbrush, if the preferences of all the members of the family do not coincide. For that matter, a single user may desire two separate power units if he brushes, for example, different portions of his teeth and gingival areas in different directions or by applying different motions thereto.

It is, accordingly, the primary object of this invention to provide a new and improved power handle for toothbrushes.

A more particular object of this invention is to provide, in a power handle for toothbrushes, mechanism for imparting different motions to the brush thereof as desired by the user.

Another object of this invention is to provide new and improved mechanism capable of producing dual motion, which mechanism is simple in construction and inexpensive to manufacture.

Briefly, the above-cited objects are accomplished by providing a casing of the size, shape and weight making it suitable for being handheld. Supported within the casing, adjacent one end thereof, is a carriage having a shank rotatably supported thereby and with an end thereof extending through an opening in the above-mentioned end of the casing. A post member for supporting a toothbrush is affixed to the protruding end of the shank. A pair of hinge members having one end attached to the carriage and the other end secured adjacent opposite sidewall portions of the casing interior serve to support the frame for translational or reciprocating movement along or about the longitudinal axis of the casing. The frame is provided with a slot the longitudinal axis of which is perpendicular to the longitudinal axis of the casing. A first eccentric mounted for rotation within this slot imparts the above-mentioned motion to the frame end, consequently, to the brush.

A bracket attached to the shank at its end remote from the post member is provided with a slot the longitudinal axis of which is parallel to the longitudinal axis of the casing.

A second eccentric mounted for rotation within the last-mentioned slot and supported by the shaft supporting the first eccentric effects rotation of the shank and, in turn, the post member and toothbrush about the longitudinal axis of the casing.

Supported within the casing below the above discussed motion imparting mechanism is a conventional toothbrush motor which may be energized by means of a battery or by means of household power supply which has been suitably stepped down and rectified to provide approximately 1.5 VDC. The rotor of the motor has affixed thereto an output pinion which meshes with an idler gear adapted for rotation about an axis which is perpendicular to the axis of rotation of the motor and supported on a common shaft with the two eccentrics and intermediate thereof. A shuttle bar having a noncircular cross section is supported within a similarly shaped bore in the idler gear. The shuttle bar is beveled at both ends thereof so that it either engages ratchet teeth provided in one of the eccentrics or is moved by the teeth, depending on the direction of rotation of the idler gear. Each of the eccentrics is provided with ratchet teeth so as to act in a similar manner depending on rotation of the idler gear.

The motor which is energized through a double-pole, double-throw switch which serves to reverse the polarity of the motor and thereby direction of rotation of the idler gear to ultimately transmit motion to one or the other of the eccentrics thereby effecting reciprocating or oscillating movement of the toothbrush.

Other objects and advantages of the present invention will become apparent when considered in view of the following description, reference being had with respect to the accompanying drawings in which:

FIG. **1** is an elevational view, partly broken away, of a power handle representing the invention;

FIG. **2** is an elevational view, partly broken away, of the device shown in FIG. **1**, but rotated 90° clockwise relative to the position shown in FIG. **1**;

FIG. **3** is an enlarged and exploded perspective view of the motion producing mechanism of the power handle shown in FIGS. **1** and **2**;

FIG. **4** is a cross-sectional view, including broken away portions, taken on the line IV–IV of FIG. **2**;

FIG. **5** is a view similar to that shown in FIG. **4**, but illustrating the relative orientations of the same elements for a different mode of operation; and

FIG. **6** is a cross-sectional view taken on the line VI–VI of FIG. **2**.

Referring now to the drawings, especially FIG. **1**, reference character **10** designates generally a power handle, made from any suitable material, for example, plastic. The handle **10** comprises a hollow casing **11** which is longitudinally tapered from the bottom to the top thereof. The casing **11** is provided with an opening **12** at the top thereof and has an opening **13** at the bottom thereof through which a dual motion producing mechanism generally indicated at **14** may be inserted. Supported within the casing **11** subadjacent the mechanism **14** are a conventional DC motor **16** and a rechargeable battery **17**. It will be understood that other power sources, for example, hydraulic or mechanical, in lieu of the motor **16** may be utilized. Once all of the components adapted to be housed in the casing **11** have been inserted a snap-on end cap **18** may be put in place.

The power handle **10** is provided with a double-throw, double-pole rotary switch **19** (see FIGS. **2** and **6**). The switch **19** comprises an actuator knob **21**, made from any suitable material, for example, plastic, which cooperates with a contact carrier member **22** the underside **23** of which carries spaced apart electrical conductors **24** and **25** having terminal portions **26** and **27**, respectively, extending to opposite sides of the underside **23**.

As can be seen in FIG. **2**, the knob **21** and the carrier **22** are mated by means of a tongue **28** and a groove **29** through apertures **31** and **32** in the casing **10** and an electrically nonconducting frame member **33**. To prevent leakage into the casing **11** an O-ring seal **30'** is disposed intermediate a portion of the knob **21** and the casing **11**. Affixed to the terminals **26** and **27**, as by soldering, are electrical leads **34** and **36** which are ultimately, although not shown, connected to the motor **16** in a conventional manner. A pair of electrical conductors **37** and **38** secured to the frame member **33** comprise, respectively, finger portions **39** and **40** which rest intermediate the conductors **24** and **25** when the switch **21** is in the OFF position. Each of the fingers **39'** and **40** is adapted to contact either of the conductors **24** or **25** depending on the direction of rotation of the knob **21** (i.e. either clockwise or counterclockwise as viewed in FIG. **6**). The electrical conductors **36** and **38** also comprise terminal portions **41** and **42**, respectively, to which electrical leads **43** and **44** are connected. The leads **43** and **44** are ultimately, although not shown, connected to the negative

and positive sides of the battery **17**, respectively. With the leads connected as discussed, the output shaft **46** of the motor **16** will rotate counterclockwise, or as viewed in FIG. **3**, when the knob **21** is rotated counterclockwise as viewed in FIG. **6** or clockwise as viewed from the left of FIG. **2**. In this position the finger **39** engages the conductor **29** and the finger **40** engages the contact **24**. Reverse rotation of the knob, of course, will reverse the polarity of the motor **16** thus producing clockwise rotation of the shaft **46** as viewed in FIG. **3**.

Supported within the casing **10**, adjacent the opening **12**, is a carriage **47**, best shown in FIG. **3**. The carriage **47** is supported for translational movement along this longitudinal axis of the casing **10** by means of a pair of hinges **48** and **49** (see FIG. **2**). To this end corresponding ends **50** and **50'** of the hinges **48** and **49** are captivated in suitable slots **51** and **52** provided, respectively, in the frame member **33** and a similar frame member **53**, the frame members being disposed adjacent opposed portions of the interior of the casing **11**. Opposite ends **54** and **56** of the hinge members are attached to opposite sides of the carriage **47**.

The ends **54** ad **56** of the hinges are provided with substantially semicircular recesses **57**, only are shown (see FIG. **3**). Each of the recesses **57** serves as one-half of a journal for receiving bearing surfaces or annular bosses **58** and **59** of a shank **61**. The other half of the journal is provided by block members **62** and **63** having substantially semicircular recesses **64** (only one shown in FIG. **3**). The block members are secured to the ends **54** and **56** by means of pin members **66**.

The shank **61** is rotatably supported in the journals provided by the semicircular recesses **57** and **64** and an end **67** thereof extends through the opening **12** and has affixed thereto a post member **68** adapted to carry a toothbrush indicated at **69**. The lower end **70** of the shank **61** is received in a bracket **71** and is rigidly affixed thereto. The bracket **71** is provided with an elongated slot **72** (see particularly FIGS. **1** and **3**) the longitudinal axis of which extends in the same direction as the longitudinal axis of the casing **10**.

The carriage **47** has an elongated slot **73** the longitudinal axis of which as can plainly be seen in FIG. **3** is in a direction perpendicular to the corresponding axis of the slot **72**.

The slots **72** and **73** are adapted to receive, respectively, eccentrics **74** and **75** provided with elongated bores **76** and **77** for rotatably mounting thereof on a shaft **78** which is supported above the motor **16** by means of a shaft support member **79** attached to the top thereof.

Mounted for rotation on the shaft **78** intermediate the eccentrics **74** and **75** is an idler gear **81** provided with teeth **82** adapted to mesh with a prior gear **83** affixed to the motor shaft **46** and to thereby be driven either clockwise or counterclockwise depending on the direction of rotation of the pinion **83**. The idler gear has an elongated substantially square bore **84** therethrough for receiving a shuttle bar **86** having a substantially square configuration in cross section. The bar **86** has ends **87** and **88** which are beveled at approximately 45° angles. The eccentrics **74** and **75** are provided with sets **89** and **90** of ratchet or saw-shaped teeth which cooperate with the beveled ends **87** and **88** to transfer motion from the pinion **83** to either the eccentric **74** or the eccentric **75** depending on the direction of rotation of the idler gear **81** which, in turn, depends on the direction of rotation of the pinion.

As noted hereinbefore with respect to the switch **19** the pinion **83** will rotate CCW (so as viewed in FIG. **3**) when the switch **19** is rotated CCW as viewed in FIG. **6**. In this instance the idler gear will rotate clockwise as viewed in FIG. **3** and CCW as viewed from the right of FIGS. **4** and **5** in which case the end **88** of the shuttle bar **86** will effect rotation of the eccentric **75** which, in turn, effects reciprocating movement of the carriage **47** and, therefore, of the brush **69**. This reciprocating movement represents a first mode of operation. The interaction of the end **87** with the teeth **89** will produce a camming effect therebetween which will insure shifting of the shuttle bar to the position shown in FIG. **5** in the event that it was initially in the position shown in FIG. **4**. It should be apparent that exactly the reverse will take place if the switch **21** is rotated clockwise as viewed in FIG. **6**. In this position the polarity of the motor **16** will be reversed, the result being to effect rotation of the bracket **71** to produce oscillatory or a second mode of operation to the brush **69** while the carriage **47** has no effect on the movement of the brush **69**.

A flexible apron or sealing gasket **92** FIG. **1**) provided with an aperture **93** is held in place across the opening **12** by means of a retainer ring **94** which is snapped in place after the gasket **92** is installed. The post member **68** fits tightly in the aperture **93** to prevent water leakage into the casing **10**.

Since numerous changes may be made in the above-described apparatus and different embodiments of the invention may be made without departing from the spirit thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawings, shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A power handle for a toothbrush comprising:

a hollow casing;

toothbrush support means protruding from one end of said casing;

means connected to said support means and mounted within said casing for imparting first and second modes of operation to a toothbrush mounted on said support means, said mode imparting means comprising a first member for providing translational movement along the longitudinal axis of said casing and a second member for providing oscillatory movement about said longitudinal axis with said support means affixed to one of said members;

first and second eccentrics mounted within said casing on a common shaft for rotation about an axis perpendicular to said longitudinal axis and wherein each of said first and second member is provided with an elongated slot for receiving one of said eccentrics and the longitudinal axis of which lie in perpendicular planes;

power means operatively connected to said mode imparting means; and

means for selectively effecting one mode of operation or the other when said power means is energized.

2. Structure as specified in claim **1**, including rotary means carried by said common shaft intermediate said eccentrics, means carried by said rotary means for effecting rotation of one of said eccentrics when said rotary means rotates in a first direction and for effecting rotation of the other of said eccentrics when said rotary means moves in the reverse direction.

3. Structure as specified in claim **1**, wherein said eccentrics are provided with sets of sawteeth on the faces thereof adjacent said rotary means and wherein said means carried by said rotary means comprises an element adapted to be automatically moved into and out of engagement with one or the other of the sets of sawteeth.

4. Structure as specified in claim **3**, wherein the inclined surfaces of the teeth of one of said sets extend in opposite direction from the inclined surfaces of the other of said sets of teeth and wherein said element carried by said rotary means has beveled ends the inclined surfaces of which extend in opposite directions whereby one of said beveled ends engages the teeth of one of said eccentrics to thereby rotate said one of said eccentrics when said rotary means moves in said first direction and said element is shifted by cam action so that the other of said beveled ends engages the other of said eccentrics when said rotary means moves in the opposite direction to thereby effect rotation of the other of said eccentrics.

5. Structure as specified in claim **4**, wherein said power means comprises an electric motor having a pinion affixed to the output shaft thereof and positioned so that it engages gear teeth provided on said rotary means.

6. Structure as specified in claim **4**, wherein said means for selectively effecting one mode of operation or the other comprises a double-pole, double-throw switch operatively connected to said motor reversing polarity thereof.

7. Structure as specified in claim **6**, wherein said switch is rotary.