

Oct. 15, 1963

C. A. DAYTON ET AL
WORK-ACTUATED ROTARY BRUSH

3,106,732

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4 Sheets-Sheet 1

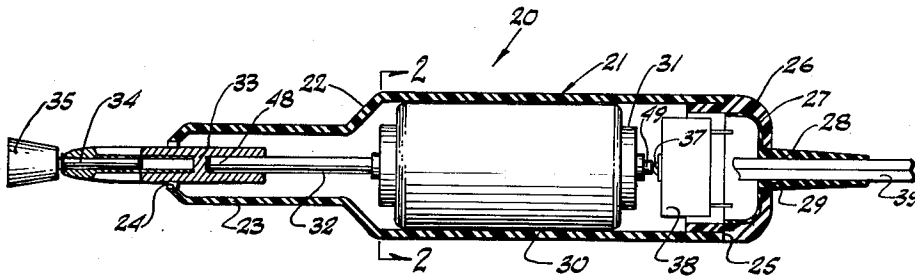


Fig. 1

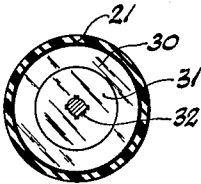


Fig. 2

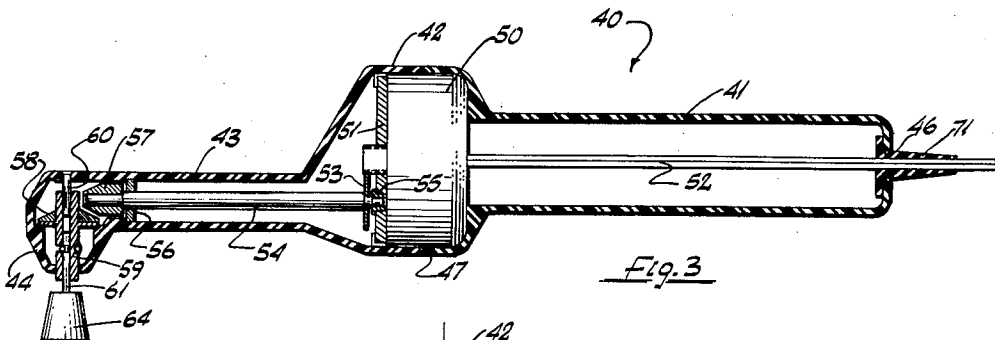


Fig. 3

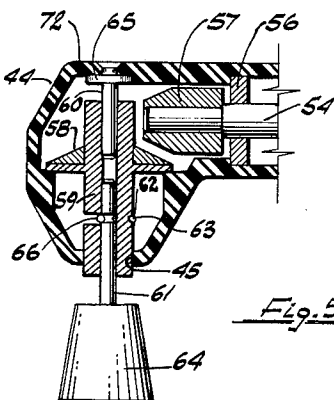


Fig. 5

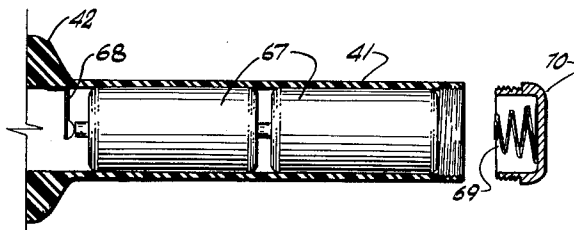


Fig. 4

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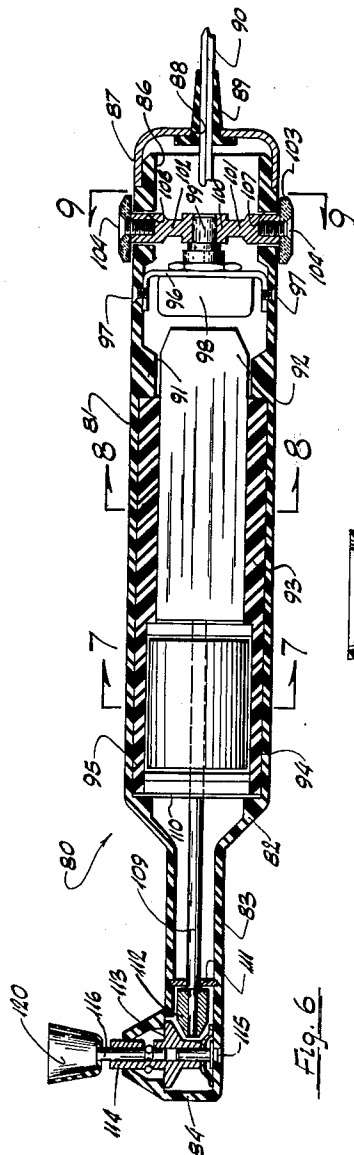


Fig. 6

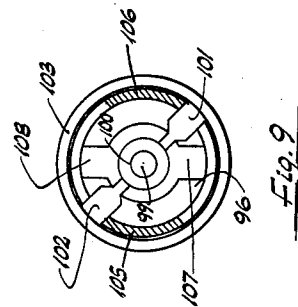


Fig. 9

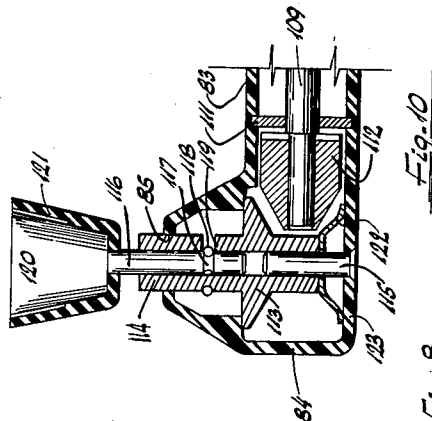


Fig. 8

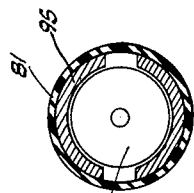


Fig. 7

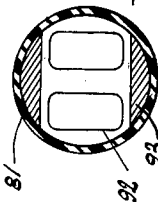


Fig. 10

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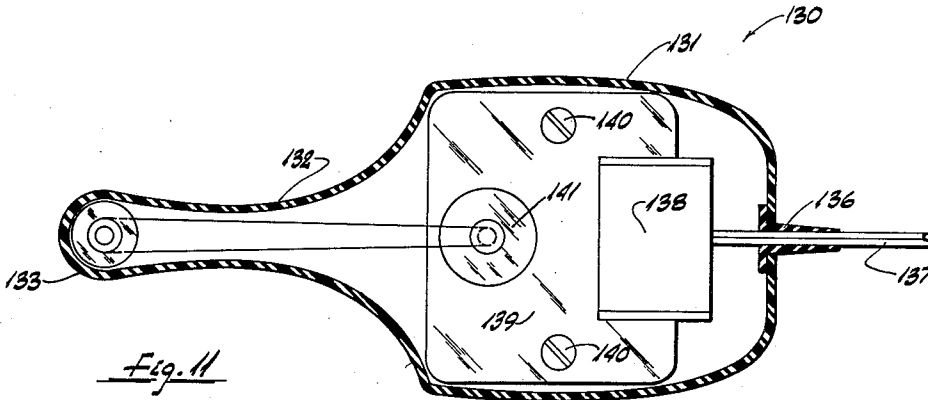
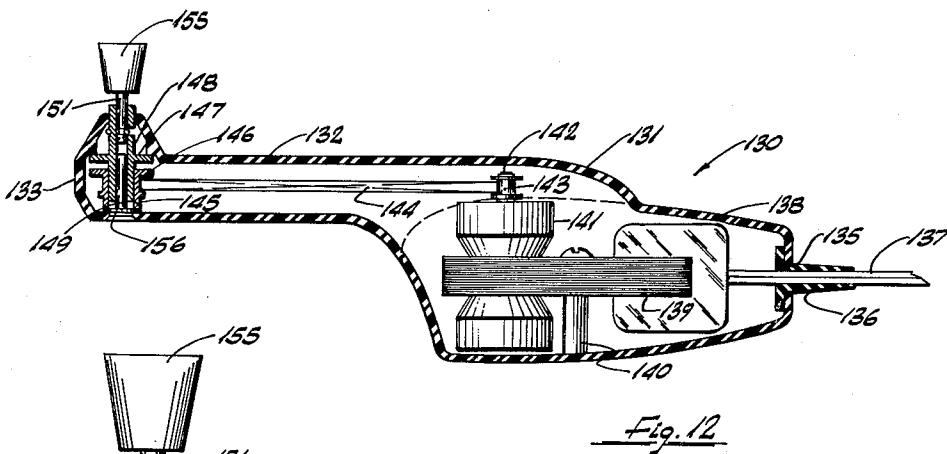
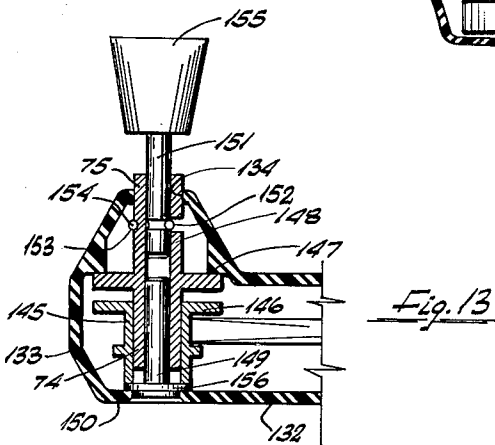
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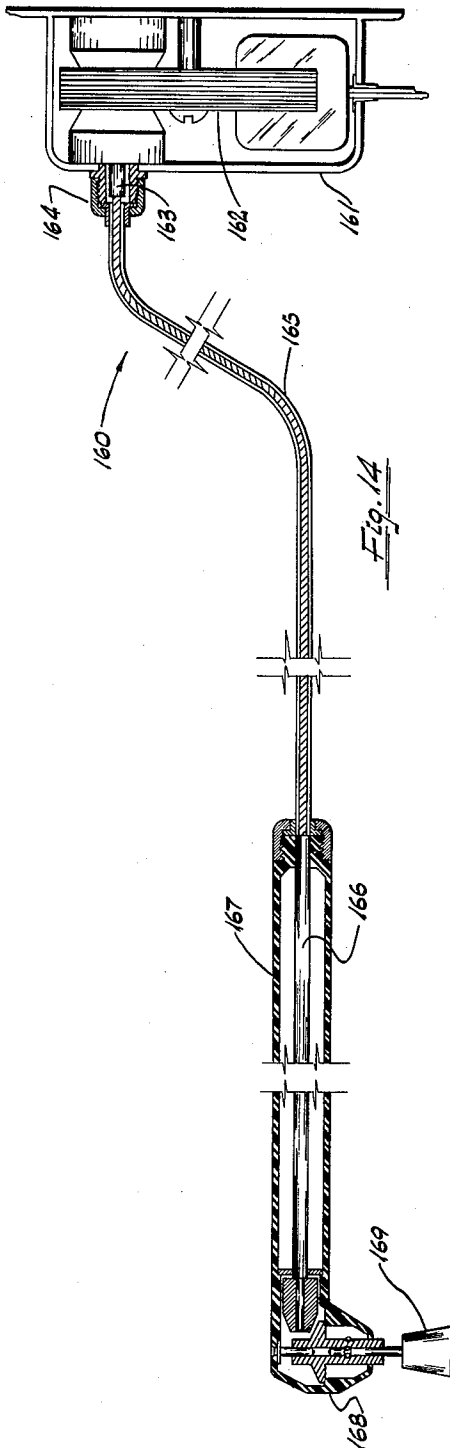
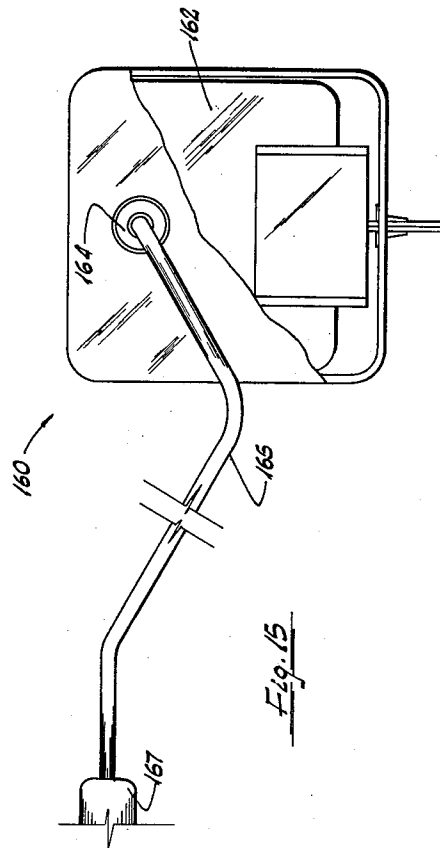
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3,106,732

WORK-ACTUATED ROTARY BRUSH

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5 Claims. (Cl. 15—28)

The present invention relates generally to electric power-driven rotary brushes for cleaning and polishing a workpiece such as teeth or artificial dentures, and more particularly to a brush of this type having rotatable bristles which are maintained in a stationary inoperative condition until the bristles are pressed against the workpiece.

Basically, the invention comprises a casing shaped and dimensioned as a handle for convenient grasping, an electric motor within the casing, rotatable bristle means extending outside of the casing and normally maintained in a stationary condition, and means responsive to a predetermined pressure exerted against the bristle means when the latter is pressed into contact with the workpiece for actuating and rotating the bristle means to clean and polish the workpiece.

In the absence of this work-actuated feature the bristle means would rotate when they were not in contact with the workpiece, thereby causing abrasive compounds, such as toothpaste or toothpowder, to be flung off the bristle means because of the centrifugal force generated by the bristle means as it rotates. This would cause waste of the abrasive compound, as well as creating a mess in the surrounding area. On the other hand, with the work-actuated brush of the present invention, little or no abrasive compound is flung off the bristle means because the bristle means will not rotate unless pressed against the workpiece, which, accordingly, will receive virtually all of the abrasive compound. Thus the subject work-actuated brush is less messy and provides superior cleaning and polishing per unit of abrasive compound in comparison with a brush which operates continuously even while the bristles are out of contact with the workpiece.

Among the several embodiments of the subject work-actuated brush are those in which the rotatable bristles are in axial alignment with the motor and enclosing casing-handle as well as those in which the bristle means extends angularly to the main axis of the motor and casing. This latter arrangement is similar to the relationship existing between the reflecting element and handle in a dental mirror, said arrangement providing better access for the bristle means into areas of the workpiece otherwise difficult to reach.

In other embodiments the motor and casing are mounted on a wall and connected to the bristle means by flexible shaft means, thereby reducing the weight to be manipulated by the operator during the cleaning and polishing operation.

Other features and advantages are inherent in the structure claimed and disclosed, as will become apparent to those skilled in the art from the following detailed description in conjunction with the accompanying drawings wherein:

FIGURE 1 is a longitudinal sectional view of one embodiment of a work-actuated rotary brush constructed in accordance with the present invention;

FIGURE 2 is a transverse sectional view taken along line 2—2 of FIGURE 1;

FIGURE 3 is a longitudinal sectional view of a second embodiment of a work-actuated rotary brush constructed in accordance with the present invention;

FIGURE 4 is a fragmentary longitudinal sectional view showing a modification of the embodiment illustrated in FIGURE 3;

FIGURE 5 is an enlarged fragmentary sectional view of a portion of the embodiment illustrated in FIGURE 3;

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FIGURE 6 is a longitudinal sectional view of a third embodiment of the subject work-actuated rotary brush;

FIGURE 7 is a transverse sectional view taken along line 7—7 in FIGURE 6;

FIGURE 8 is a transverse sectional view taken along line 8—8 in FIGURE 6;

FIGURE 9 is a transverse sectional view taken along line 9—9 in FIGURE 6;

FIGURE 10 is an enlarged fragmentary sectional view of a portion of the brush illustrated in FIGURE 6;

FIGURE 11 is a plan view, in section, of a fourth embodiment of the subject brush;

FIGURE 12 is a longitudinal sectional view of the embodiment illustrated in FIGURE 11;

FIGURE 13 is an enlarged fragmentary sectional view of the embodiment illustrated in FIGURE 12;

FIGURE 14 is a longitudinal sectional view illustrating a fifth embodiment of the subject brush; and

FIGURE 15 is a top plan view of the embodiment illustrated in FIGURE 14.

Referring initially to FIGURES 1 and 2, there is illustrated one embodiment of a work-actuated rotary brush constructed in accordance with the present invention and useful for cleaning and polishing a workpiece such as teeth or artificial dentures. Brush 20 comprises a casing including a portion 21 shaped and dimensioned as a handle for convenient grasping and integral with a tapered portion 22 in turn integral with a narrow neck portion 23 shaped and dimensioned for ready entrance into the mouth of a person whose teeth are being cleaned and polished. At opposite ends of brush 20 are a pair of openings, 24 in neck portion 23, and 25 in handle portion 21. Covering opening 25 is a cap 26 inside of which is located a cup-shaped member 27 integral with a tapered tubular grommet-like portion 28 extending outwardly from brush 20 through an opening 29 in cap 26.

Located concentrically within handle portion 21 is an electric motor comprising a field 30, an armature 31 and a splined first shaft or axially elongated means 32 rotatably connected to armature 31 and slidable therethrough. Spline shaft 32 has an end portion 48 extending from armature 31 into casing neck portion 23 where it is drivingly connected to one end of a coupling 33, the other end of which is drivingly connected to a detachable second shaft 34 extending outwardly from coupling 33 and mounting bristles 35 at its outer extremity. Spline shaft 32 has another end portion 49, opposite coupling 33, engageable with a spring loaded, outwardly urged depressible button 37 on a normally open switch 38 mounted on cup-shaped member 27 and connected by a power line 39 extending through grommet 29 to an exterior power source (not shown). When bristles 35 are pressed against the workpiece (e.g. human teeth) the second shaft 34, coupling 33 and first shaft 32 are pushed in an axially inward direction (to the right as viewed in FIGURE 1). As a result, spline shaft end portion 49 engages and depresses button 37 thereby closing switch 38 and electrically connecting the motor in handle portion 21 to the exterior power source. This actuates the motor and rotates armature 31 which rotates spline shaft 32 which rotates coupling 33, shaft 34 and bristles 35.

When bristles 35 are disengaged from contact with the workpiece, the axial pressure normally urging spline shaft 32 to the right, as viewed in FIGURE 1, is released; the spring-loaded depressible button 37 returns to its normal open position; and the electrical circuit to the motor is broken. This stops armature 31 from rotating, which in turn stops the rotation of spline shaft 32, coupling 33, shaft 34 and bristles 35. Because bristles 35 do not rotate when they are disengaged from the workpiece, abrasive compound on bristles 35 will not be flung off into the surrounding area. All of the abrasive compound on bristles

35 is thus used for cleaning and polishing the workpiece and none of the compound is wasted.

Bristles 35 and shaft 34 are frictionally received within coupling 33 and may be removed therefrom merely by pulling bristles 35 and shaft 34 outwardly (to the left in FIGURE 1). In this manner various individual bristle means may be used interchangeably with coupling 33 so that the same casing and motor may be used with the individual toothbrushes of several persons.

FIGURES 3, 4 and 5 illustrate an embodiment 40 in which the bristle means of the work-actuated rotary brush are arranged at an angle to the handle of the brush to facilitate access of the bristles into portions of the workpiece otherwise not readily accessible. More specifically, embodiment 40 comprises a casing including a handle portion 41 integral with an enlarged motor housing portion 42 integral with a narrow neck portion 43 integral with a clutch housing portion 44 extending angularly to neck portion 43. For purposes of assembly or disassembly the casing may be divided at the motor housing portion 42 along a line indicated at 47.

The casing of embodiment 40 contains a pair of openings at opposite ends thereof, one opening 45 being in clutch housing portion 44 with the axis of opening 45 extending at an angle to the axis of neck portion 43, and the other opening 46 being at one extremity (to the right in FIGURE 3) of handle portion 41 with the axis of opening 46 being in alignment with the axis of handle portion 41. Extending through opening 46 is a tapered tubular grommet 71 for receiving a power line 52 extending from an external power source through handle portion 41 to a motor 50 mounted on a base 51 located within motor housing portion 42.

Motor 50 is drivingly connected to a gear 53 fixedly mounted on a first shaft 54 having one end journaled in a bearing 55 mounted on motor base 51 and another end journaled in a journal plate 56 located in neck portion 43 adjacent clutch housing portion 44. That end of shaft 54 extending through journal plate 56 into clutch housing portion 44 fixedly mounts a driving clutch portion 57 engageable with a driven clutch portion 58 constituting a part of an axially elongated tubular element or bushing 59 slidably and rotatably mounted on a stud shaft 60 secured against axial movement within clutch housing portion 44 opposite opening 45 therein.

Extending axially into bushing 59 is a detachable second shaft 61, in axial alignment with stud shaft 60, and terminating at bristles 64, said second shaft 61 being drivingly connected to bushing 59 by a ring-like spring clip 63 received within grooves 66, 62 in shaft 61 and bushing 59, respectively. Clip 63 and grooves 62, 66 detachably connect shaft 61 and bristles 64 to bushing 59 so that various individual bristle means may be used interchangeably with the rest of embodiment 40.

Mounted coaxial to stud shaft 60 and fixed adjacent a part 72 of clutch housing portion 44, directly opposite opening 45, is a ring-shaped element 65. Element 65 and axially elongated bushing 59 have like magnetic charges so that bushing 59 is magnetically repelled from fixed element 65. This magnetic repulsion normally maintains bushing 59 in the deactuated position shown in FIGURE 5 in which the clutch portions 57, 58 are drivingly disengaged.

When the bristles 64 are pressed against a workpiece to clean and polish the latter, bristles 64, shaft 61, and element 65 move axially in an inward direction towards element 65 against the magnetic repulsion exerted by the latter relative to bushing 59. This inward movement continues until clutch portions 57, 58 are in frictional driving engagement, whereupon the bristles 64 rotate to clean and polish the workpiece. When the bristles 64 are removed from contact with the workpiece, the normal magnetic repulsion between element 65 and bushing 59 returns bushing 59 to the deactuated position shown in FIGURE 5, thereby drivingly disengaging clutch portions 57, 58, and

stopping the rotation of the bristles 64. In embodiment 40 the motor 50 continues to operate as long as the power line 52 is connected to the power source (not shown). Operation of motor 50 can be stopped merely by disconnecting the line 52 from the power source.

FIGURE 4 illustrates a modification of embodiment 40 in which the motor is driven by a pair of batteries 67 electrically connectable to motor 50 by a first terminal 68 located adjacent motor housing portion 42 and a springable second terminal 69 located in a cap 70 threadably engageable with handle portion 41 at an end thereof opposite motor housing portion 42.

FIGURES 6 to 10, inclusive, illustrate a third embodiment 80 comprising a housing including a handle portion 81 integral with a tapered portion 82 integral with a narrow neck portion 83 integral with a clutch housing portion 84. At opposite ends of the casing are a pair of openings 85 in clutch housing 84 (FIGURE 10) and 86 at one extremity of handle portion 81 (to the right in FIGURE 6), said opening 86 being covered by a cap 87 having a centrally disposed opening 88 through which extends a tapered tubular grommet 89 receiving a power line 90 extending into the interior of the casing.

Located within handle portion 81 is an annular divider 91 to one side of which is located the motor of embodiment 80 (to the left in FIGURE 6), said motor comprising a field 92 around which is located electromagnetic poles 93. In axial alignment with field 92 is an armature 94 surrounded by extensions 95 of poles 93. Armature 94 and field 92 of the motor of embodiment 80 are arranged in axial alignment to provide a more compact, narrow handle portion 81 than could be obtained if the armature and field were positioned in a concentric arrangement.

The speed of the motor of embodiment 80 may be adjusted by means now to be described. Located adjacent interior annular divider 91 (to the right thereof in FIGURE 6) is a bracket 96 fastened to the walls of handle portion 81 by screws 97. Mounted on bracket 96 is a potentiometer 98 from which extends an adjusting shaft 99 fixedly secured to a hub 100 from which extend a pair of spokes 101, 102, each spoke extending outwardly through a slot 107, 108, respectively, in casing handle portion 81. Connected to the outermost extremities of spokes 101, 102, by screws 104, is a ring 103 located around the periphery of handle portion 81 adjacent cap 87.

To adjust the speed of the motor of embodiment 80, the operator merely rotates the ring 103 which rotates adjusting shaft 99 of potentiometer 98, which varies the speed of the motor. The angle through which shaft 99 may be rotated is determined by a pair of stop means 105, 106 against which ribs 101, 102 abut. The angular position of shaft 99 in turn determines the speed of the motor of embodiment 80. For example, when shaft 99 is in the angular position shown in FIGURE 9 wherein ribs 101, 102 abut stop elements 106, 105 respectively, the motor is off. On the other hand, if shaft 99 is rotated to a position in which ribs 101, 102 abut stop elements 105, 106 respectively, then the motor is operating at maximum speed. When the shaft 99 is rotated to a position in which the ribs 101, 102 are in intermediate positions between stop elements 105, 106 the motor is operating at an intermediate speed.

The motor's rotating armature 94 drives a shaft 109 extending through a plate 110, located adjacent casing tapered portion 82, and through a journal element 111 located in narrow neck portion 83, and terminating at a conical clutch driving portion 112. Clutch portion 112 is engageable with a conical clutch driven portion 113 constituting a part of an axially elongated element or bushing 114 rotatably and slidably mounted on a stud shaft 115 extending from a part 123 of clutch housing portion 84. Bushing 114 extends outwardly through opening 85 in clutch housing portion 84, and extending outwardly from bushing 114 is a shaft 116 detachably con-

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nected to bushing 114 by means of a pair of grooves 117, 119 in shaft 116 and bushing 114 respectively, and a ring-like spring clip 118 received in both of said grooves. The outer extremity of shaft 116 terminates at bristles 120. Around the bristles is a rubber casing 121 which can be used to massage the gums of a person when the bristles are disposed parallel to the teeth. The teeth are cleaned or polished by the tops of bristles 120 when the bristles are disposed perpendicular to the teeth.

Bristles 120 are normally in a stationary inoperative condition, and clutch portions 113 and 112 are normally maintained in the disengaged position shown in FIGURE 10 by spring means 122 located adjacent part 123 of clutch housing portion 84. However, when bristles 120 are pressed against a workpiece, bristles 120, shaft 116, and bushing 114 are pushed axially inwardly against the urging of spring means 122 to frictionally engage the driven clutch portion 113 with the driving clutch portion 112, thereby causing rotation of bushing 114, shaft 116, and bristles 120. When bristles 120 are disengaged from contact with the workpiece, spring means 122 returns bushing 114 to its normal deactuated position shown in FIGURE 10, thereby disengaging driven clutch portion 113 from driving clutch portion 112 and stopping rotation of bristles 120.

The fourth embodiment 130 of the subject brush is illustrated in FIGURES 11 to 13. Embodiment 130 comprises a casing having a handle portion 131 integral with a narrow neck portion 132 integral with a clutch housing portion 133 extending angularly to neck portion 132. The casing includes a pair of openings, one opening 134 in clutch housing portion 133, and another opening 135 in handle portion 131, at one extreme of the casing opposite opening 134. Extending through opening 135 is a tapered tubular grommet 136 through which extends a power line 137 connected to the motor inside the casing, said motor comprising a field 138, poles 139 supported by posts 140 extending from the walls of the handle portion 131, and an armature 141 which drives a shaft 142, around which is rotatably mounted a pulley 143. Rotation of pulley 143 drives a belt 144 extending through neck portion 132 and trained around pulley means 145 constituting a tubular first axially elongated element and located in clutch housing portion 133. Pulley means 145 includes a driving clutch portion 146 engageable with a driven clutch portion 147 constituting a part of a second axially elongated element or bushing means 148 rotatably and slidably mounted on a stud shaft 149 extending from a part 150 of clutch housing portion 133.

One end portion 74 of bushing 148 is received within pulley means 145 and the other end portion 75 of bushing 148 extends outwardly through opening 134 in clutch housing portion 133. Extending outwardly from bushing 148 is a shaft 151 detachably connected to bushing 148 by means of a pair of grooves 152, 153 in shaft 151 and bushing 148 respectively and a circular spring clip 154, said detachable connecting arrangement being similar to those described previously with reference to embodiments 80 and 40. Bristles 155 for cleaning and polishing a workpiece are mounted at the outer extremity of shaft 151 and are normally maintained in a stationary inoperative condition by means now to be described.

Located adjacent part 105 of clutch housing portion 133 and around stud shaft 149 is a fixed element 156 having a magnetic charge the same as a magnetic charge on bushing 148. Accordingly, there is a magnetic repulsion normally existing between element 156 and bushing 148 which urges slidably mounted bushing 148 along stud shaft 149 away from fixed element 156 to the position illustrated in FIGURE 13. When bristles 155 are pressed against a workpiece, the pressure exerted against the bristles causes the shaft 151 and bushing 148 to move axially inwardly thereby effecting a driving frictional engagement between the bushing's driven clutch portion 147 and the driving clutch portion 146 on pulley means 75

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145. This in turn rotates bristles 155. When the bristles are removed from contact with the workpiece, the pressure exerted thereagainst is released, thereby allowing the normal magnetic repulsion existing between element 156 and bushing 148 to return the bushing 148, the shaft 151, and bristles 155 to the inoperative position shown in FIGURE 13.

The fifth embodiment 160 of the subject brush is illustrated in FIGURES 14 and 15. Embodiment 160 comprises a wall mounted housing 161 containing a motor indicated generally at 162 and substantially identical to the motor described in conjunction with embodiment 130 (FIGURES 11 and 12). Motor 162 drives a shaft 163 covered by enclosing means indicated generally at 164. Shaft 163 in turn drives flexible shaft means indicated generally at 165, in turn driving a shaft 166 contained within the handle portion 167 of a casing also comprising a clutch housing portion 168 extending angularly to handle portion 167. Extending outwardly from clutch housing portion 168 is bristle means 169 normally maintained in a deactuated inoperative condition by means identical with those illustrated in conjunction with embodiment 40 (FIGURE 5). The work-actuating features of embodiment 160 are identical with those of embodiment 40 and accordingly need not be described here. Separation of motor 162 from the rest of embodiment 160 and mounting the motor on a wall substantially lessens the weight to be manipulated by the brush operator during the cleaning and polishing operation.

There have thus been described several embodiments of a power driven rotary brush for cleaning and polishing a workpiece such as teeth or dentures, said brush being normally maintained in an inoperative condition and being actuated only when the bristles of the brush are pressed against the workpiece.

It should be understood that work actuated attachments other than bristles may be utilized with the subject invention. For example, to facilitate removal of stains from teeth a conventional rubber cup may be used at the end of the shaft which ordinarily carries the bristles. As a portable instrument for dentists to use in treating patients confined to bed in their homes or in a hospital, the subject invention may be used with a complete line of conventional dental attachments such as burrs, cups, bristles, and the like.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

What is claimed is:

1. A work-actuated rotary brush comprising:
 - a elongated handle-type casing;
 - a motor within said casing;
 - a stud shaft fixed in said casing and extending axially in a direction substantially perpendicular to the lengthwise direction of the casing;
 - a tubular element having a first end slidably and rotatably mounted on said stud shaft;
 - a second shaft coaxial with and axially spaced from said stud shaft, said second shaft having one end removably mounted in said tubular element at an end of the latter opposite its first end for rotation therewith;
 - bristles at the other end of said second shaft and located outside said casing;
 - a driving clutch portion drivingly connected to said motor;
 - a driven clutch portion on said tubular element;
 - said tubular element being slidably mounted on said stud shaft for axial movement, with said second shaft and said driven clutch portion, between a first position in which the driven clutch portion is disengaged from the driving clutch portion and a sec-

ond position in which the two clutch portions are drivingly engaged;
and means normally urging said tubular element to said first position.

2. A work-actuated rotary brush as recited in claim 1 wherein said last recited means comprises spring means adjacent said stud shaft between the casing and said first end of the tubular element.

3. A work-actuated rotary brush as recited in claim 1 wherein said last recited means comprises:
a metallic element adjacent said stud shaft and in facing relation to said first end of the tubular element;

said tubular element being metallic;
both of said elements having like magnetic charges.

4. A work-actuated rotary brush as recited in claim 1 wherein said driving clutch portion is mounted on a shaft extending perpendicularly to said stud shaft and drivingly connected to said motor.

5. A work-actuated rotary brush as recited in claim 1 wherein:
said driving clutch portion is mounted on a second

tubular element rotatably mounted on said first tubular element;
said first tubular element being slidable within said second tubular element.

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