June 2, 1964 M. A. FRÉSARD 3,135,881

ELECTRICALLY-OPERATED HAND APPLIANCES

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FIG. 1

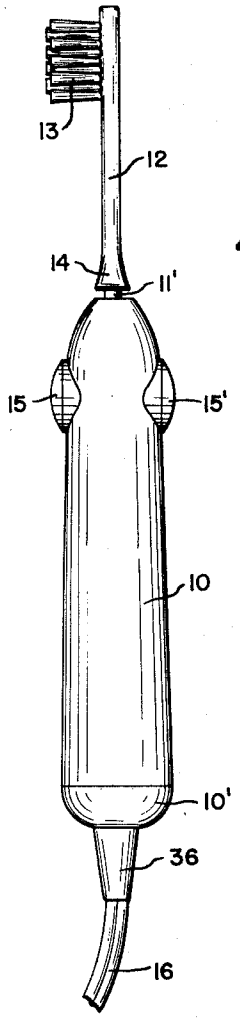

FIG. 2

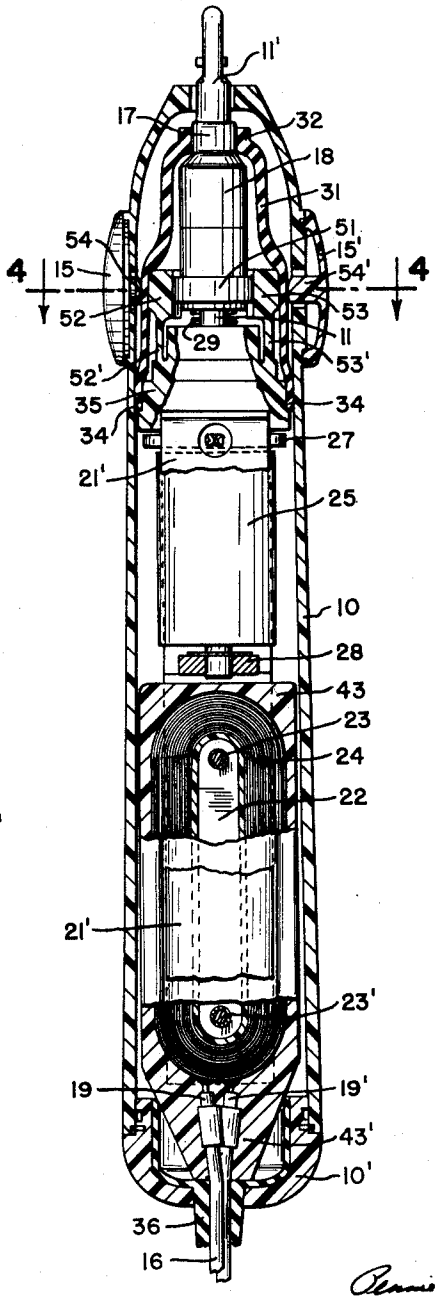

FIG. 3

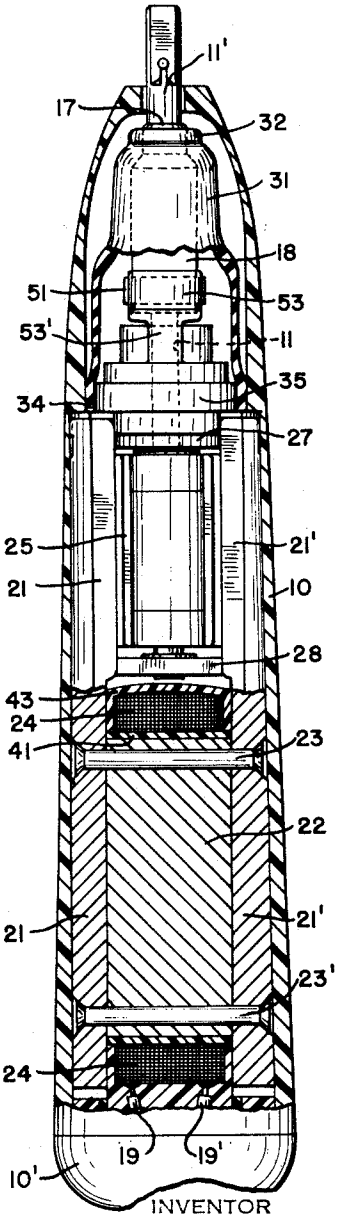

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FIG. 4

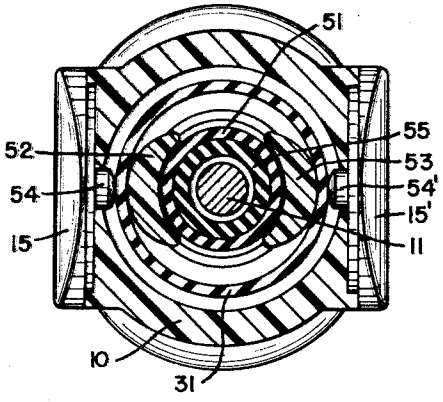


FIG. 7

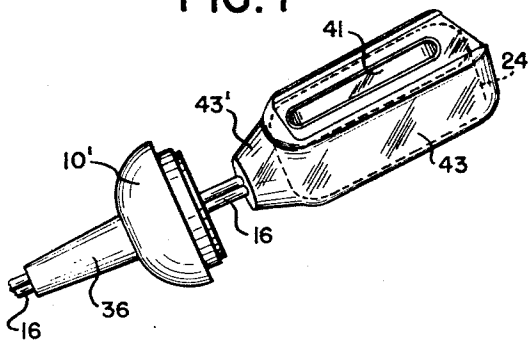


FIG. 5

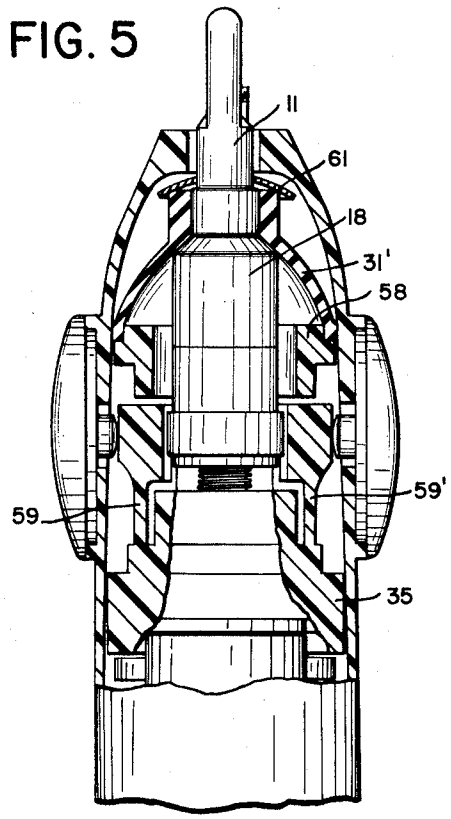
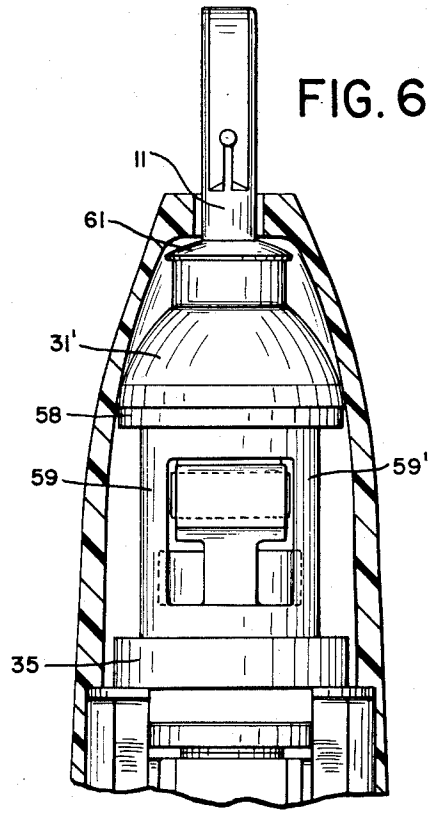


FIG. 6



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ELECTRICALLY-OPERATED HAND APPLIANCES

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Claims priority, application Switzerland Dec. 2, 1960
4 Claims. (Cl. 310—36)

This invention relates to electrically-operated hand appliances for corporal care, and particularly to electrically-operated toothbrushes. The invention is particularly directed to the provision of an electrically safe appliance of this character.

Electrically-operated toothbrushes are now known including a casing forming a handle, a shaft extending through one end of the casing for carrying a toothbrush head, and electrical means mounted within the casing for oscillating the shaft. One particular type is disclosed in U.S. Patent 2,917,758, issued December 22, 1959, to Held et al. In this toothbrush the shaft is rotationally oscillated so as to impart a corresponding motion to a toothbrush head attached thereto and brush the teeth in the lengthwise direction thereof. Other types are known in which a longitudinal oscillation is imparted to the shaft.

By using different types of heads, the appliance can be used for other types of corporal care, such as massage, beauty treatment, etc.

When such appliances are arranged to be connected to an external power supply such as the power mains, it is highly important to provide complete protection against the danger of an electric shock. They are commonly employed in the bathroom where the appliance or the hands of the user may be wet, so that even small amounts of electrical leakage could be dangerous. In the case of a toothbrush, water and toothpaste are commonly used on the brush and, when inserted in the mouth, a fairly good electrically conducting path exists for any leakage current from the device.

With an oscillating shaft, it is difficult to achieve watertightness, while at the same time permitting oscillations of sufficient amplitude to be obtained with the limited power available. Further, even though initially obtained, over an extended period of use the watertightness may become impaired.

Commonly devices of this type are provided with electric switches so that they can be turned off without unplugging the cord from the electric outlet. Also, in many instances an electric motor or other electrical driving means is used which involves the making and breaking of an electrical circuit during normal operation. In such devices, if watertightness should fail, serious shock could result.

In copending application Serial No. 155,365, filed November 28, 1961, by Michel Moret and entitled "Electrically-Operated Hand Appliances for Corporal Care, Particularly Toothbrushes," a motor or other electrical driving means is employed of a type including an actuating coil which, when supplied with alternating current, will produce oscillation of the shaft without requiring the making and breaking of an electrical circuit internally of the device. The motor described in the above U.S. patent is of this type. The actuating coil is fixedly connected to the conductors of an electric cord provided for connecting the appliance to a suitable source of alternating current such as a house electric outlet. Then, the actuating coil and the insulation of the electric cord adjacent thereto are encapsulated in a waterproof insulating material. This assures freedom from electrical leakage in a highly reliable manner.

In order to enable the user to stop operation, as for

example when applying toothpaste to the brush head and inserting it into his mouth, means are provided which are manually controllable through the casing for substantially stopping oscillation of the shaft with the coil still energized from the power supply.

The specific embodiments described in that application employ a movable magnetic shunting member to shunt flux around the structure actuated thereby during normal operation. It is difficult to produce a shunting path of sufficiently low reluctance to completely stop oscillation or reduce it to a negligible amplitude in the small space available in a handle of desirably small size.

The present invention is an improvement on that of the aforesaid copending application and provides a mechanical brake actuable by pressure on the casing to stop oscillation. It has been found that adequate braking can be obtained with sufficiently low pressure to permit convenient actuation by the user.

The invention will be more fully understood from the following description of specific embodiments thereof, taken in conjunction with the drawings, in which:

FIG. 1 is an overall view of an electrically-operated toothbrush including handle and attached stem-brush;

FIGS. 2 and 3 are cross-sections of the handle, taken at right angles to each other, showing one mechanical brake arrangement;

FIG. 4 is a cross-section along the line 4—4 of FIG. 2;

FIGS. 5 and 6 are cross-sections of a portion of the handle, taken at right angles to each other, showing a modified mechanical braking arrangement; and

FIG. 7 is a detail showing the encapsulated coil and adjacent portion of the electric cord.

Referring to FIG. 1, a casing **10** forms a handle and shaft end **11'** projects from the front end thereof. In this embodiment the brush head is detachable from the handle and comprises a stem **12** with bristles **13** mounted thereon, with a coupling at **14** enabling the brush-stem to be conveniently attached and removed. The coupling may be of the type described in application Serial No. 103,482, filed April 17, 1961, by Moret for "Toothbrush Attachment," now Patent No. 3,088,148.

The handle is preferably of an insulating material such as a plastic, and resilient buttons **15, 15'** are provided to enable actuation of the internal mechanism for stopping the oscillation of shaft **11**. Alternating current from an external power supply is supplied through an insulated multiple-conductor electric cord **16** extending through the end cap **10'** of the casing in watertight relationship therewith.

Referring to FIGS. 2 and 3, the electrical means for oscillating shaft **11** is here shown as similar to the motor of the aforesaid Patent 2,917,758. The motor has an electromagnetic stator structure including longitudinally extending pole pieces **21, 21'** connected at the rear ends thereof by a transverse section **22** of magnetic material, and suitably held together as by rivets **23, 23'**. Encircling transverse member **22** is a coil **24**. The ends of the coil are fixedly connected to the inner ends **19, 19'** of the conductors of the electric cord **16**, as by soldering thereto.

A rotor **25** is located between the front ends of pole pieces **21, 21'** and is mounted on a shaft **11** rotatably mounted in bearing plates **27** and **28** attached to the pole pieces. The rotor **25** has a permanent magnet forming part thereof which interacts with the alternating magnetic flux between the adjacent portions of pole pieces **21, 21'** to produce rotational oscillation. Spring biasing means **29** urges the rotor to a given position with respect to the stator, the rotor oscillating about this position in operation.

This type of motor is explained in detail in the aforesaid patent and further explanation here is unnecessary.

To prevent the entry of water, etc. into the portion of the casing containing the motor, a flaring sleeve 31 of flexible, water-impermeable material such as neoprene is provided. The front end 32 thereof encircles an enlarged section 17 of shaft end 11', and the unstretched diameter of the sleeve is made smaller than the diameter of 17 so that the elasticity produces a tight fit and insures water-tightness. Section 18 of the shaft end may be somewhat larger so as to provide an abutment for end 32 of the sleeve. Shaft end 11' is a molded section fitting over and attached to shaft 11, which may be of steel.

The rear end 34 of the sleeve is held tightly against the inside of the casing by a plastic fitting 35.

It is thus seen that sleeve 31 prevents entry of water to the rearward portion of the casing 10 where the motor is located. In operation, the front end 32 of the sleeve twists with respect to the rear end 34, the flexibility of the sleeve allowing this action to take place without impairing the watertight connections with shaft and casing.

The rearward portion of the casing is constructed so as to be watertight. To this end, casing 10 is advantageously made in one piece of an insulating plastic, with the resilient buttons 15, 15' either integral with the casing or firmly adhered thereto. In order to permit assembly, cap 10' is formed separately and then, after assembly, joined watertight to the rest of the casing by an adhesive, or by fusing, etc. A molded plastic insert 36 is employed to insure watertightness where the cord 16 passes through cap 10', and to provide additional strength against breaking the cord in normal use.

Although this construction has been found highly effective in obtaining waterightness, defects in manufacture, wear during use, eventual deterioration of the sleeve 31, etc. could result in impairment of the protection against electric shock. Accordingly, the coil 24 and the insulation of the cord adjacent thereto are encapsulated in a waterproof insulating material, for example a suitable plastic.

Referring to FIG. 7, coil 24 is formed around an elongated tube 41 of waterproof insulating material. Nylon has been employed with success. The cross-section of the elongated tube is shaped to accommodate the transverse member 22 which forms part of the magnetic circuit. The coil is then embedded in an insulating waterproof plastic 43 which extends over the adjacent ends of the insulation of electric cord 16 at 43' and firmly adheres thereto. The encapsulation has been accomplished, in practice, by molding with an epoxy resin.

In FIG. 7 cap 10' has been moved away from the encapsulated coil and cord for clarity of illustration. However, as shown in FIG. 2, when the toothbrush is assembled the cap is adjacent molded end 43'.

It will therefore be understood that all elements within the casing carrying an electric current are encapsulated in a waterproof insulating material and are fixedly mounted in the handle. Thus, freedom from danger of electric shock is obtained in a highly reliable manner.

The structure described so far is similar to that in the aforesaid application.

In accordance with the present invention, brake means are mounted within the casing and actuable through the casing for stopping oscillation of the shaft with the coil energized. This will now be described.

Returning to FIGS. 2 and 3, shaft end 11' is provided with a cylindrical braking surface 51. A pair of brake shoes 52, 53 are mounted for engagement with the brake surface 51 by pressure applied to buttons 15, 15'. As here shown, the brake shoes are integral with fitting 35, and portions 52' and 53' are of relatively small cross-section so as to provide sufficient flexibility to permit the shoes to be pressed against surface 51. A molded plastic fitting may be employed for the purpose. When buttons 15, 15' are pressed inwards by the user, the projections 54, 54' thereof act through the corresponding areas of sleeve 31 to press the brake shoes against brake surface 51 to stop oscillation of the shaft.

This structure is simple and effective, and can be designed to occupy only a small space, hence enabling it to be fitted into a handle of conveniently small size.

Referring to FIG. 4, the brake surface 51 is shown as a thin shell of rubber or other material suitable for providing sufficient friction with the brake shoes 52, 53 to secure satisfactory braking without requiring excessive pressure. Shell 51 is secured around an annular section 55 of shaft end 11', and hence is fixed with respect to shaft 11. The annular space between shaft 11 and section 55 is to accommodate the rotor biasing spring 29 (FIG. 2), the spring being omitted in FIG. 4 to avoid confusion.

Referring now to FIGS. 5 and 6, a structure similar to that of FIGS. 2 and 3 is shown, except that the resilient sleeve 31' does not extend under the button areas. This avoids the danger of wearing the sleeve by repeated actuation of the buttons.

Here the rear end of the sleeve is held tightly against the casing by a ring section 58 which is joined with fitting 35 by intermediate legs 59, 59'. A thin washer 61 of a locking type is placed over shaft end 11' to hold the front end of sleeve 31' firmly abutted against section 18 of the shaft end.

Various changes in the specific arrangement of the brake shoes, and the manner of flexibly mounting them within the casing may be made for convenience in manufacture.

I claim:

1. An electrically-operated hand appliance for personal care which comprises

(*a*) a casing forming a handle,

(*b*) a shaft extending through one end of the casing for carrying an appliance head,

(*c*) electrical means mounted within the casing for oscillating the shaft,

(*d*) said electrical means including an actuating coil for connection to an external alternating-current power supply to produce oscillation of the shaft,

(*e*) an insulated multiple-conductor electric cord extending through said casing and having the conductors thereof fixedly connected inside the casing to said coil,

(*f*) said coil and the insulated end of the cord adjacent thereto being encapsulated in a waterproof insulating material,

(*g*) and brake means mounted within said casing and actuable through said casing for stopping oscillation of the shaft with said coil energized from the power supply through said cord.

2. An electrically-operated hand appliance for corporal care which comprises

(*a*) a casing of insulating material forming a handle,

(*b*) a shaft extending through one end of the casing for carrying an appliance head,

(*c*) electrical means mounted within the casing for oscillating the shaft,

(*d*) said electrical means including an actuating coil for connection to an external alternating-current power supply to produce oscillations of the shaft,

(*e*) means for rendering substantially watertight the portion of the casing containing the electrical means,

(*f*) a multiple-conductor electric cord extending through the wall of said portion of the casing in substantially watertight relationship and having the conductors thereof fixedly connected to the ends of said coil,

(*g*) said cord being insulated with a waterproof material and the coil and the insulation of the cord adjacent thereto being embedded in a waterproof insulating plastic,

(*h*) a brake surface on said shaft,

(*i*) and at least one brake shoe mounted within the casing for engagement with the brake surface,

(*j*) said brake shoe being arranged for actuation by manual pressure on the casing to stop oscillation of the shaft with said coil energized from the power supply through said cord.

3. Apparatus in accordance with claim 2 including a pair of brake shoes mounted within the casing for engagement with the brake surface on opposite sides of the shaft, and resilient areas on opposite sides of the casing adjacent the brake shoes for allowing actuation of the brake shoes by manual pressure thereon.

4. An electrically-operated toothbrush which comprises

(*a*) a casing of insulating material forming a handle,

(*b*) a shaft extending through one end of the casing for carrying a toothbrush head,

(*c*) an electric motor mounted within the casing for rotationally oscillating the shaft,

(*d*) said motor having an electromagnetic stator structure including an actuating coil and being adapted to produce rotational oscillation of the shaft when alternating-current is supplied to the coil,

(*e*) means for rendering the portion of the casing containing the motor substantially watertight,

(*f*) a multiple-conductor electric cord extending through the wall of said portion of the casing in substantially watertight-relationship and having the conductors thereof fixedly connected to the ends of said coil for supplying alternating-current to the coil from a power supply,

(*g*) said cord being insulated with a waterproof material and the coil and the insulation of the cord adjacent thereto being encapsulated in a waterproof insulating material,

(*h*) a brake surface on said shaft,

(*i*) a pair of brake shoes mounted on spring arms attached to said casing,

(*j*) said brake surface and brake shoes being within said watertight portion of the casing and the brake shoes being positioned for engagement with the brake surface on opposite sides of the shaft,

(*k*) and resilient areas on opposite sides of the casing adjacent the brake shoes for allowing actuation of the brake shoes by manual pressure thereon.

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