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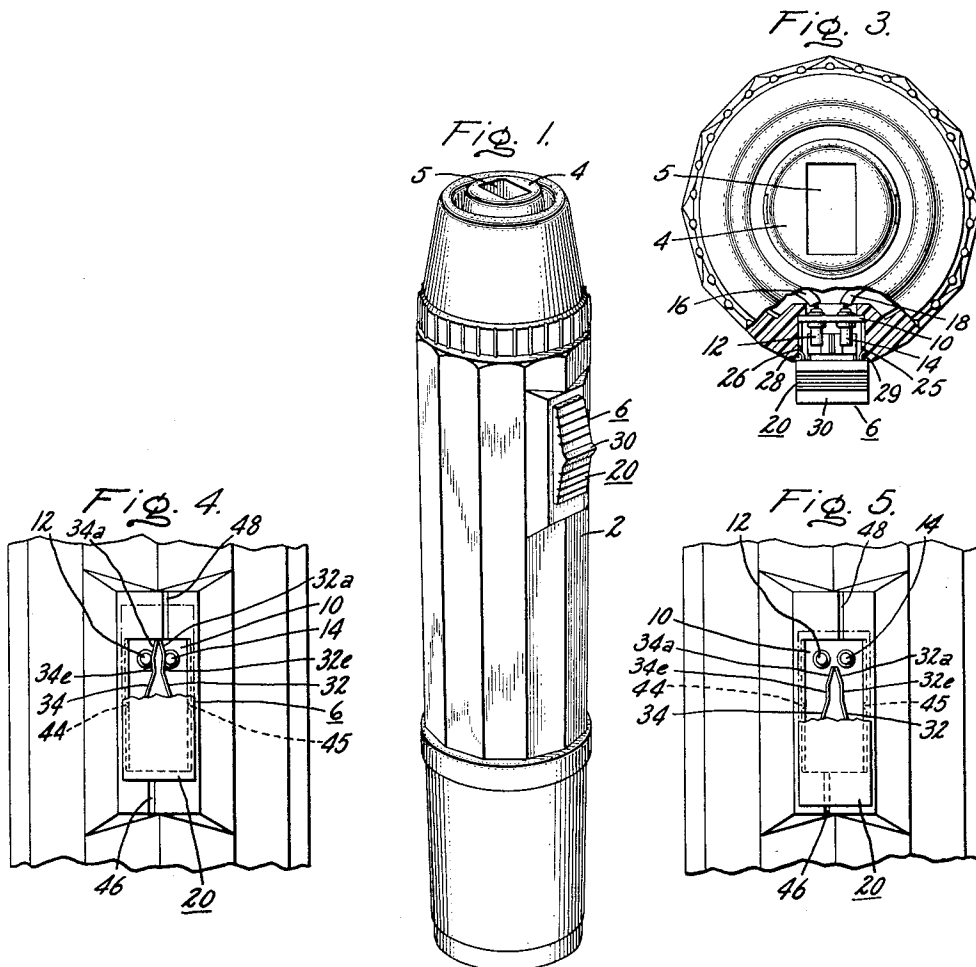
H. SPRINGER ETAL

3,156,804

SLIDABLE SWITCH MECHANISM FOR AN ELECTRIC TOOTHBRUSH

Filed May 31, 1962

2 Sheets-Sheet 1



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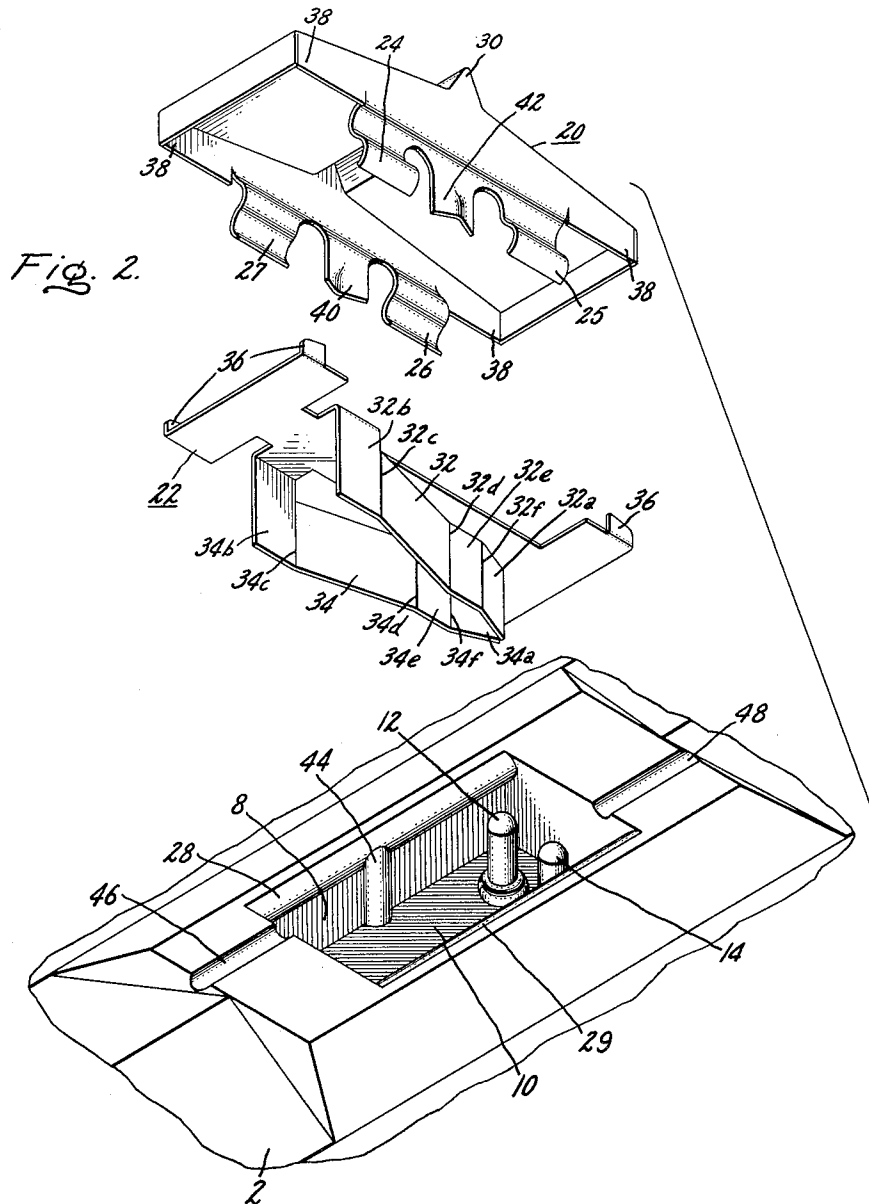
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3,156,804 SLIDABLE SWITCH MECHANISM FOR AN ELECTRIC TOOTHBRUSH

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7 Claims. (Cl. 200—157)

This invention relates to an electric motor driven tooth-
brush, and more particularly, to a switch mechanism for
controlling the toothbrush and to the combination of the
toothbrush casing and the switch mechanism.

In a copending application of Edgar A. Phaneuf and
Hans Springer, Serial No. 198,883 filed May 31, 1962,
now Patent No. 3,142,852, and assigned to the same
assignee as the present invention there is disclosed an elec-
tric toothbrush including a power handle containing a
motor and a battery controlled by a switch mounted on
the handle. Since the toothbrush power handle will be
exposed to water, dentifrice, and other foreign materials,
a switch which will perform effectively under these condi-
tions is especially desirable.

Accordingly, it is a primary object of this invention to
provide a unique electric switch which will reliably con-
trol a low voltage, low current electric circuit with a
minimum of voltage loss under adverse operating condi-
tions such as may exist in the operation of an electric
toothbrush.

It is a further object of the invention to provide a switch
which is dependable, easy to operate, and capable of being
manufactured and embodied in an electric toothbrush at
low cost.

In accordance with one aspect of this invention, the
switch includes a pair of fixed, spaced terminals which
are connected or disconnected by a slidably mounted
manual control button. More specifically, the control
button carries a pair of flexible contact arms each having
a free end and an end fixed to the control button. The
ends of the contact arms connected to the control button
are spaced from each other while the free ends are in
contact with each other so that the arms present a V-
shape. When the button is manually moved in one direc-
tion, the arms are wedged between the terminals to there-
by close the switch. When the button is slid in the op-
posite direction the arms are moved out of engagement
with the terminals to thereby open the switch. The
wedging action insures positive electrical contact with the
terminals due to the pressure employed and wiping action
obtained between the contact arms and the terminals.

Further features, objects, and advantages will become
apparent with reference to the following drawings in
which:

FIG. 1 is a perspective view of a toothbrush motorized
handle incorporating the switch of this invention;

FIG. 2 is an enlarged, exploded, perspective view of the
switch of this invention;

FIG. 3 is a top view of the handle of FIG. 1 partially
sectionalized to show the switch mechanism;

FIG. 4 is an enlarged view of a portion of the power
handle of FIG. 1 with a portion of the manual control
button cut away to show the switch in its closed position;
and

FIG. 5 is a view similar to FIG. 4 but with the switch
shown in its open position.

The construction and operation of the automatic tooth-
brush power handle shown in FIG. 1 is completely shown
and described in the above-mentioned, co-pending applica-
tion, and reference may be made to that application to
obtain a detailed understanding of the handle. However,
for purposes of understanding the switch of this invention,

such detail is not essential. Briefly stated, the handle in-
cludes a tubular casing 2 having a motor (not shown)
centrally positioned within the casing and driven by a
battery (not shown) located in the lower half of the
casing as viewed in FIG. 1. The motor output is trans-
mitted, through suitable translating mechanism, to the
toothbrush holder member 4 positioned in the upper end
of the handle. The holder member 4 has a socket 5
adapted to receive the shank end of a toothbrush, and
the holder and the toothbrush are reciprocated by the
motor during operation. The operation of the motor-
battery electrical circuit is controlled by a manually oper-
ated switch mechanism 6 positioned in the exterior wall
of the tubular casing 2.

Referring now to the enlarged, exploded view of FIG.
2, it may be seen from the portion of casing 2 shown
therein that the casing is provided with a recess or cavity
8 having a rectangular cross section. The bottom wall
10 of the recess may be formed integral with casing 2;
or for convenience of manufacture and assembly, the wall
may be formed as a separate plate as shown in FIG. 3.
A pair of spaced parallel terminal pins 12 and 14 are
firmly fixed to the plate 10. These pins pass through the
plate and extend perpendicularly from the plate in a
direction which could be roughly characterized as extend-
ing radially with respect to the longitudinal axis of the
casing 2. The inner ends of terminal pins 12 and 14 are
respectively connected to conducting wires 16 and 18, as
shown in FIG. 3. These wires are in turn connected to
the motor-battery circuit contained within the toothbrush
handle. The terminal pins are, of course, made of suit-
able conducting material so that by electrically connect-
ing the two pins, the toothbrush motor-battery circuit is
completed.

It is contemplated that the battery used in the tooth-
brush power handle of FIG. 1 will have a potential of
approximately 1.5 volts and that the small D.C. motor
driven by the battery will draw approximately 2 amps.
In order to keep the size of the battery to a minimum so
that the toothbrush power handle will be lightweight and
easily manipulated, it is extremely important to keep the
voltage loss in the switch 6 to a minimum. Accordingly,
it is essential that the contact member or members used
to connect the two terminal pins make good positive con-
tact with the terminals. Due to the frequency with which
the switch will be actuated, it is also important that the
contacting mechanism be durable and reliable. Since it
is quite possible that water, dentifrice or other foreign
material may enter the switch cavity or recess during
operation, it is necessary that the contacting mechanism
be kept clean to have good contact. All of the foregoing
objectives are obtained by the unique movable contact
unit including control member or button 20 and its insert
or contact member 22, shown in FIG. 2.

The control button 20 has a substantially rectangular
shape and is adapted to be received within recess 8. More
specifically, the button is slidably received and retained
within the recess by means of a plurality of downwardly
depending flexible flanges or lugs 24, 25, 26, and 27
formed integral with the control button 20. These lugs
are curved to cooperate with a pair of parallel ridges 28
and 29 disposed on opposing sides of recess 8 and formed
integral with the casing 2 which may be suitably formed
of plastic. The lugs 24-27 are curved to permit the but-
ton to be inserted within the recess and to retain the but-
ton within the recess when so placed as can be seen from
FIGS. 2 and 3. To facilitate movement of the control
button 20, it is provided with a central raised portion or
peak 30 and a plurality of grooves or serrations flanking
the peak on each side of the exterior surface of the
button as seen in FIG. 1. The button may be made of

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any suitable material including metal, such as brass, in that the low voltage, low current circuit which the switch controls presents no shock hazards.

One of the features of the switch of the invention is its ease of manufacture. The contact member or insert 22 may be accurately punched from a plate and bent into the shape shown in FIG. 2. The insert may be made of any suitable conducting material; however, it has been found that phosphorus bronze coated with silver on the side which comes in contact with terminals 12 and 14 is particularly suitable to obtain a low voltage loss connection. The contact plate or insert is formed with a pair of contact arms 32 and 34. In accordance with the invention, each of these arms has a free end 32a and 34a, respectively, and a fixed end 32b and 34b, respectively, with the fixed ends being formed integral with the remainder of the insert or contact plate. The contact arms 32 and 34 have been bent at right angles with respect to the remainder of the insert 22 so that the flat side surfaces of the arms are positioned in opposing relation to each other.

The arms have been bent towards each other along the lines 32c and 34c so that the free ends 32a and 34a are urged into engagement with each other. With the arms bent in this fashion, they form substantially a V-shape with the free ends of the arms forming the closed end of the V and the fixed ends of the arms forming the open ends of the V. Each corner of the insert is formed with a tab 36 which fits within the interior of the control button 22 when the insert is assembled to the button. The tabs 36 extend upwardly to abut the inner surface of the upper wall of control button 20 to limit the movement of the insert into the control button. The insert 22 may be retained within the button 20 to be carried thereby by deforming corner portions of flange 38 in the area adjacent tabs 36.

Once the insert 22 is secured to control button 20, the assembly is snapped into place within the recess 8 with the free ends of the contact arms being aligned between the terminal pins 12 and 14. Thus, it will be appreciated that by sliding the control button in one direction the contact arms are wedged between the terminal pins to close the circuit, as shown in FIG. 4. Moving the control button in the opposite direction disengages the contact arms from the terminal pins to open the circuit, as shown in FIG. 5. With this arrangement, it can be seen that the terminal pins engage the relatively flat, side surface on the respective contact arms to obtain good electrical contact. It should be noted that the metal contact arms contact only the metal terminal pins. This facilitates a low voltage loss connection. Further, the wedging action provides a firm and positive contact, and provides a contact wiping action whenever the arms are moved into or out of engagement with the pins. That is, the terminal pins and contact arms wipe each other while moved from the point of initial engagement to the final position shown in FIG. 4 and during the reverse disengaging movement. This prevents the accumulation of foreign material on the contacts or the terminal pins.

To obtain reliable switching operation, it is essential that the movable switch contact unit remain in the position placed and require positive action to move to its other position. For this purpose, the switch of the invention includes detent means formed integral with the movable unit. More specifically, the control button 20 is provided with a pair of depending lugs or detent arms 40 and 42, which cooperate with a pair of ridges in the side walls of the recess. These ridges, one of which is shown at 44 in FIG. 2, extend upwardly from the bottom plate 10 and intersect ridges 28 and 29, respectively. The detent arms 40 and 42 are centrally located on the control button 20 and the detent ridges 44 are centrally located within the recess 8. When the control button 20 is slidably moved within the limited confines of the recess 8, the detent arms must slide over the respective ridges. Thus, when the

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control button is placed in either the "off" or "on" positions the button tends to remain in the position placed in that the detent means resists movement and a positive force is required. The resistance between lugs 24-27 and the ridges 28 and 29 of the recess 8 also provide some resistance to slippage or inadvertent movement.

Additional detent means to complement the detent action provided by the control button and the recess, are provided by uniquely forming the contact arms 32 and 34. More specifically, contact arm 32 is bent along the line 32d inwardly towards contact arm 34 and similarly arm 34 is bent inwardly along the line 34d towards arm 32. This forms a pair of relatively flat surfaces 32e and 34e in the arms which are out of alignment with the planar surfaces formed by the adjoining portions of the respective arms. That is, when unrestrained, the contact surfaces 32e and 34e are roughly parallel to each other in this area rather than being angled towards each other as in the other sections of the arms. When the control button is moved to the "on" position as shown in FIG. 4, the contact arms are wedged between the terminal pins sufficiently far that the sides of the pins engage the surfaces 32e and 34e of the contact arms. In this position, the portions of the contact arms in the area of the bend lines 32b and 34b are moved more closely to one another than the portions of the arms in the area of the bend lines 32f and 34f. In effect, indentations or recesses are formed for receiving the contact pins; hence the pins remain engaged with the contact arms. A positive movement of the control button 20 is required to open the switch, and slippage is thereby prevented. Thus, it can be seen that detent means are provided by both the control button 20 and by the contact member 22.

As previously mentioned, the toothbrush handle is exposed to water and dentifrice during operation of the toothbrush, and it is necessary to prevent material from entering through the switch into the interior of the handle. Accordingly, the joints formed by the plate 10 and the surrounding casing material and the joints formed by the terminal pins 12 and 14 extending through the plate 10 may be sealed with suitable material. In view of the seals in these areas, it is not necessary to seal the control button 20 with respect to recess 8. Instead, a pair of grooves 46 and 48 are formed in the surface of the casing adjacent recess 8 to permit water to drain from the recess and the cavity within button 20. Also a certain amount of air circulation can take place through these grooves.

While a specific embodiment of the invention has been shown and described in the foregoing paragraphs, it should be understood that the invention is not limited to the particular construction described. Accordingly, it is intended in the appended claims to cover all modifications within the spirit and scope of the invention.

What we claim is:

1. A switch for an electric toothbrush comprising a pair of upwardly extending generally cylindrical fixed spaced terminals, a manual control button slidably mounted on said tooth brush, a pair of flexible contact arms, said arms being formed of sheet metal, each of said arms having a free end, an intermediate portion and an end secured to said control button to provide secured ends and free ends, said secured ends being spaced from each other, said free ends being in contact with each other so that together the arms form a generally V shaped arrangement, the intermediate portions of said arms being bent to be generally parallel to each other to provide generally parallel arms, said contact arms being spaced from said terminals in one position of said control button and in contact with said terminals in another position of said control button so that by sliding the control button in one direction the contact arms are wedged between the generally cylindrical terminals with the generally parallel intermediate portions remaining in contact with the terminals and the free ends being wiped against the terminals to obtain good electrical contact, means pro-

vided on said contact arms for holding the contact arms in contact with the terminals in the switch closed position, said flexible contact arms being moved out of engagement with said terminals by manually sliding the button in the opposite direction.

2. In an electrically operated toothbrush, an elongated power operated toothbrush handle having a recess in its exterior surface, a pair of fixed spaced terminal pins positioned within said recess, a sheet metal control button having depending lugs integrally formed therewith for holding said button on said power handle, a generally flat sheet metal insert secured to the interior of said button, said insert being stamped and bent to provide two contact arms having flat side surfaces, said contact arms being bent at right angles with respect to the remainder of the insert so that the rear portions of the arms are held substantially fixed with respect to the insert, the flat side surfaces of the arms being positioned in opposing relation to each other, said arms having forwardly extending free ends, said free ends being in contact with each other so that together the arms form a generally V-shape, said contact arms being situated with respect to said terminals such that the free end portions of said arms are wedged between the terminals by sliding the button in one direction and such that the arms are moved out of engagement with said terminals by sliding the button in the opposite direction.

3. In an electrically operated toothbrush, a power operated toothbrush handle, wall means providing an inwardly extending recess in said handle, a pair of spaced terminals extending upwardly from the bottom of said recess and downwardly through the bottom of said recess into the interior of the handle, sealing means provided in the bottom of said recess for preventing the passage of water through the bottom of the recess to the interior of said handle, a manual control button slidably received within said recess, flexible contact means carried by said control button, said contact means having portions adapted to be moved into contact with the terminals by sliding the button in one direction and adapted to be disengaged from said terminals by sliding the button in the opposite direction.

4. In an electrically operated toothbrush, a power operated toothbrush handle having a recess in its exterior surface, a pair of fixed spaced terminal pins positioned within said recess and extending into the interior of said handle, a manual control button slidably received within said recess, a pair of flexible contact arms carried by said control button, each of said arms having opposing portions adapted to be wedged between the terminals by sliding the button in one direction and adapted to be disengaged from said terminals by sliding the button in the opposite direction, a pair of opposed parallel ribs generally centrally positioned on the opposite side walls of said recess and extending generally parallel to said terminal pins, a plurality of depending lugs integrally formed with said button extending into said recess to engage said ribs for maintaining the control button in the position placed.

5. In an electrically operated toothbrush an elongated power operated toothbrush handle having a recess in its exterior surface, a pair of fixed spaced terminal pins positioned within said recess and extending into the interior

of said handle, a pair of spaced parallel ribs formed within said recess, a manual control button slidably received within said recess, said control button having resilient lugs along opposing edges which extend into said recess to engage said ribs to hold the button on said power operated toothbrush handle, a pair of contact arms carried by said control button, each of said arms having opposing portions adapted to be wedged between the terminals by sliding the button in one direction and adapted to be disengaged from said terminals by sliding the button in the opposite direction.

6. In an electrically operated toothbrush, a tubular shaped power operated toothbrush handle having a longitudinal axis, wall means providing an inwardly extending recess in said handle, a pair of spaced parallel guides arranged generally parallel to the longitudinal axis of said generally tubular handle provided within said recess, a manual control button slidably received within said recess, said control button having resilient lugs along opposing edges which extend into said recess to engage said guides to keep the button within the recess, a pair of fixed spaced terminals, flexible contact means connected for movement with said button, said flexible contact means being adapted to be moved by said button into and out of engagement with said terminals, said spaced parallel guide means being situated with respect to said button such that the button is guided for longitudinal reciprocating motion generally parallel to the longitudinal axis of said generally tubular power operated toothbrush handle, said button being slid forwardly for moving the contacts into engagement with said terminals and slid rearwardly for moving the contact out of engagement with said terminals.

7. In an electrically operated toothbrush, a tubular shaped power operated toothbrush handle having a recess formed in its exterior surface, a pair of fixed spaced terminal pins positioned within said recess and extending into the interior of said handle, a pair of spaced parallel ribs formed within said recess, a manual control button slidably received within said recess, said control button having resilient lugs along opposing edges which extend into said recess to engage said ribs to keep the button within the recess, a pair of flexible contact arms carried by said control button, each of said arms having opposing portions adapted to be wedged between the terminals by sliding the button in one direction and adapted to be disengaged from said terminals by sliding the button in the opposite direction, said button and said recess having cooperating detent means for maintaining said control button in the position placed.

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