July 20, 1954 M. H. RIPPLE 2,684,413

ELECTRIC SWITCH

Filed Nov. 24, 1951

FIG. 1

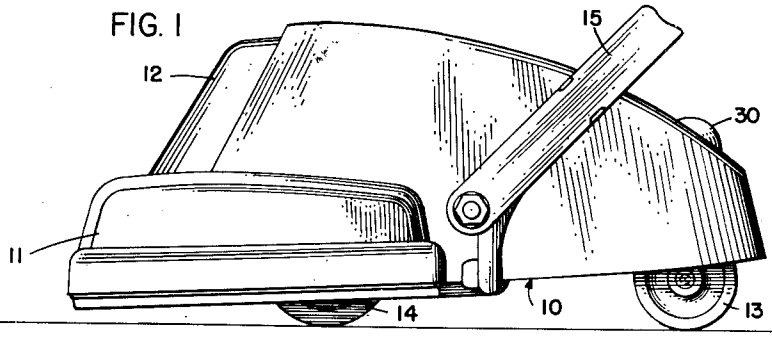
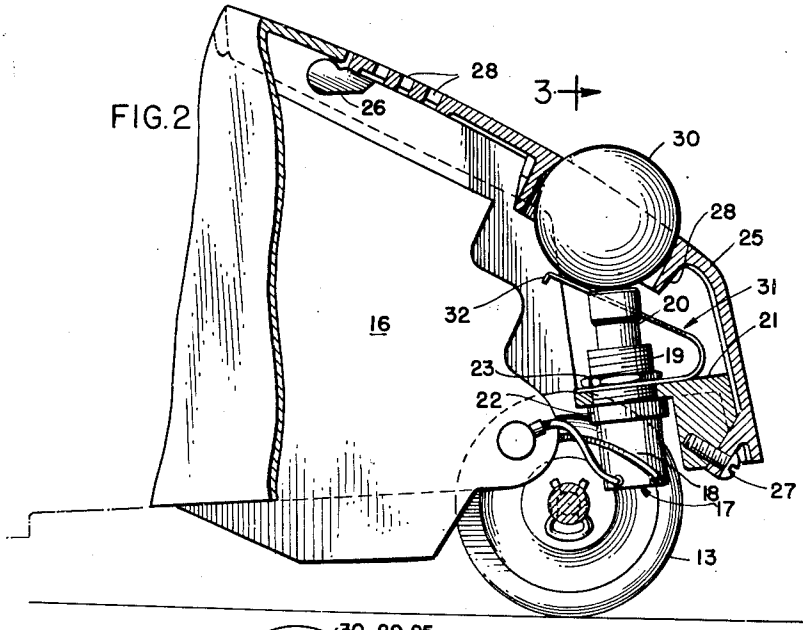


FIG. 2



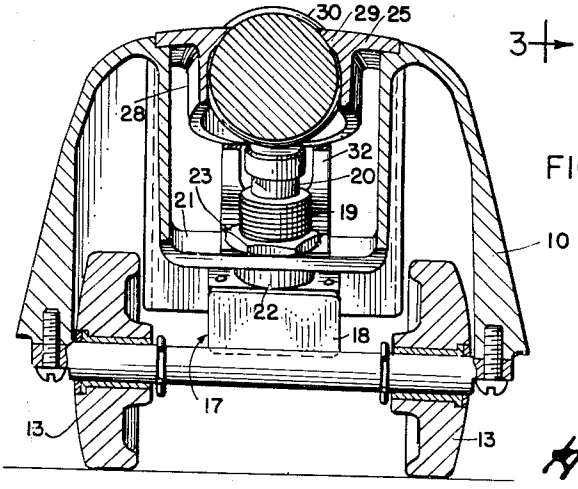


FIG. 3

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ELECTRIC SWITCH

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1 Claim. (Cl. 200—52)

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This invention relates to electric switches for electrical appliances and more particularly to a unique actuator for a push-push type switch.

This invention involves a very simple and rugged construction which will withstand great abuse without injury to the switch proper as well as one which operates with unusual ease and effectiveness irrespective of the angle from which the actuating force is applied. Accordingly, the invention is especially advantageous in applications wherein a switch is to be operated by an operator's foot as for example a great variety of portable power tools. As herein disclosed by way of example, my novel control switch is mounted on the body of a floor type suction cleaner.

Essentially, the invention comprises interposing a ball actuator between the control member of an electric switch and a confining guide for the ball which has a restricted opening holding the ball captive but exposing a portion of it for contact by the operator. By virtue of the spherical construction of the switch actuator, it will be obvious that an actuating force applied to the exposed portion thereof from any direction is transmitted to the switch control member in a most efficacious manner and with a minimum of effort. This is due to the fact that the operating effort required is substantially the same irrespective of whether it is applied directly or at an acute angle because the spherical design of the actuator enables it to roll along the enclosing guideway in contrast to the high resistance sliding action characteristic of the common reciprocating actuators heretofore used.

Figure 1 is a side view of a suction cleaner showing the invention incorporated in the rear end of the main body;

Figure 2 is a vertical sectional view through the cleaner along the center line of the switch; and

Figure 3 is a view along line 3—3 on Figure 2.

Referring to Figure 1 it will be noted that the invention is applied to a floor type suction cleaner having a main body casting 10 enclosing a motor fan unit axis extending lengthwise of the body. The suction nozzle is located at the forward end of the body and an upwardly extending suction passageway communicates with the fan eye directly behind the removable front cover 12. The cleaner body is supported on a pair of rear wheels 13 and a pair of front wheels 14. The usual propelling handle is provided having a bail 15 at its lower end which straddles the cleaner body and is pivotally supported on the main body.

The novel switch constituting an important

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feature of the invention will be best understood by reference to Figures 2 and 3. The rear end of motor fan unit 16 will be observed to terminate somewhat forwardly of the rearmost end of the main body leaving room for the mounting of a motor control switch generally indicated at 17. The switch comprises a rectangular main body 18 which encloses a push-push type snap action switch of any well known construction. A threaded tube 19 projects upwardly from the top of this casing and reciprocally supports a plunger 20 which acts to open or close the switch each time the plunger is depressed through a predetermined short distance. The entire switch is supported on a shelf 21 extending across the rear of the main body and preferably cast integral with the body. Tube 19 passes through an opening in this shelf and a pair of lock nuts 22, 23 disposed on either side of shelf 21 serve to clamp the switch firmly in position thereon.

As clearly appears from Figures 2 and 3 a portion of the rear and top portion of casting 10 is cut away to provide access to the rear end of motor fan unit 16 and the motor control switch assembly 17. The cut away portion of the body is normally closed by a cover member 25 the upper surface of which lies flush with the outer contour of the main casting. The upper forward portion of the cover is provided with a pair of ears 26 which engage beneath the forward edge of the opening to hold the cover in place. A single screw 27 extends through an opening in the lowermost edge of cover 25 and extends into a tapped opening on the underside of shelf 21, as clearly shown in Figure 2. The upper side of the cover may be provided with a series of openings 28 through which cooling air for the motor fan unit circulates.

Cover 25 is provided with a downwardly and forwardly inclined tubular guideway 28. The inner wall of this guideway is cylindrical at its lower end and is provided with a spherical shoulder 29 at its upper end. Thus, tubular member 28 provides a guideway for a spherical switch actuator ball 30. This actuator rests on or is spaced slightly above the top of switch plunger 20 and approximately one-third of its upper surface extends through the opening in the guideway. The actuator is normally held seated on shoulder 29 in this manner by a U-shaped leaf spring 31 one leg of which is secured to shelf 21 by lock nut 23 while its upper leg 32 is slotted and straddles plunger 20 and rests against the lower side of actuator 30 as clearly shown in Figure 2. Hence, it will be obvious that the spring

maintains actuator 30 firmly seated in the socket end of the guideway at all times except when the switch is being operated. In keeping the ball seated in the socket dirt and foreign matter is prevented from entering and fouling the guideway. Another important function of the spring is to take up manufacturing tolerances.

Operation

Let it be assumed that the cleaner is fully assembled ready for operation. To energize the motor by closing the electrical circuit through push-push switch 17, the operator places her foot upon the exposed portion of actuator ball 30 and depresses it. It will of course be understood that switch 17 is connected in circuit with motor 16 through the usual service cord. As actuator 30 is depressed it is forced against one of the walls of the guideway whereupon it rolls along this guideway as it depresses plunger 20. When the plunger has been depressed approximately three-sixteenths of an inch, the snap action mechanism within the switch casing will operate to close the circuit. As the operator removes her foot, the spring acting on plunger 20 as well as end 32 of spring 31 will move upwardly and restore actuator 30 to its normal position in which it is firmly seated against spherical shoulder 29 of the guideway.

It will be obvious from the foregoing that it is immaterial from what direction or angle the operator applies the force to actuator 30. This is because at all angles of force application, the actuator is constrained to roll along the side wall of the guideway as it is depressed and to transmit an axially downward force to plunger 20. It will also be self-evident that the only friction or resistance to the movement of the actuator in the guideway is the insignificant resistance to the rolling action of a ball along a hard surface.

While I have shown but a single modification of my invention it is to be understood that this modification is to be taken as illustrative only and

not in a limiting sense. I do not wish to be limited to the particular structure shown and described but to include all equivalent variations thereof except as limited by the scope of the claim.

I claim:

The combination with a floor type suction cleaner having a main casing, said casing having an upwardly opening cavity therein, a push-push type switch for said cleaner rigidly supported in a wall of said cavity, said switch having a reciprocable plunger projecting upwardly toward the top of said cavity; of actuating means for said switch comprising, a detachable closure plate for said cavity, a large diameter open ended tubular guideway extending downwardly from the lower side of said plate toward said plunger and having its lower end closely spaced from the upper end of said plunger, the upper end of said guideway being restricted sufficiently to hold a ball actuator captive therewithin, a ball actuator in said tubular guideway having a diameter slightly less than the bore of said guideway, spring means independent of said plunger normally holding said actuator seated in the restricted end of said guideway so that a major portion thereof lies exposed above said closure plate and so that the lower side thereof lies closely adjacent the upper end of said reciprocable plunger whereby the depression of said actuator by a force applied from any angle causes said ball to roll along said guideway on a line opposite from said applied force to depress said plunger and actuate said switch.

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