

[54] **ONE PIECE SWITCH HOLDER AND FOOT OPERATED HINGE ACTUATOR FOR VACUUM CLEANER SWITCH**

[75] Inventor: **Erwin E. Nordeen**, St. Paul., Minn.

[73] Assignee: **Whirlpool Corporation**, Benton Harbor, Mich.

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Primary Examiner—James R. Scott

Attorney, Agent, or Firm—Hofgren, Wegner, Allen, Stellman & McCord

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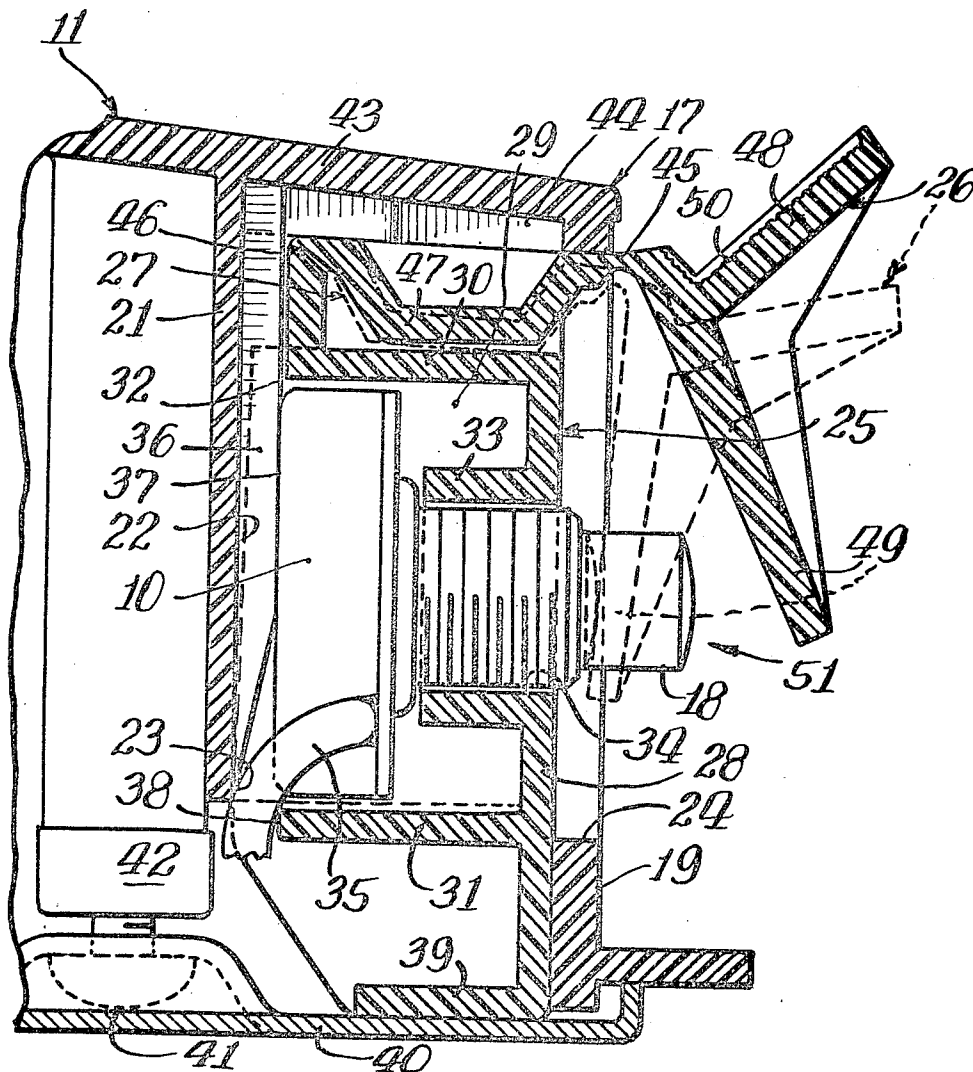
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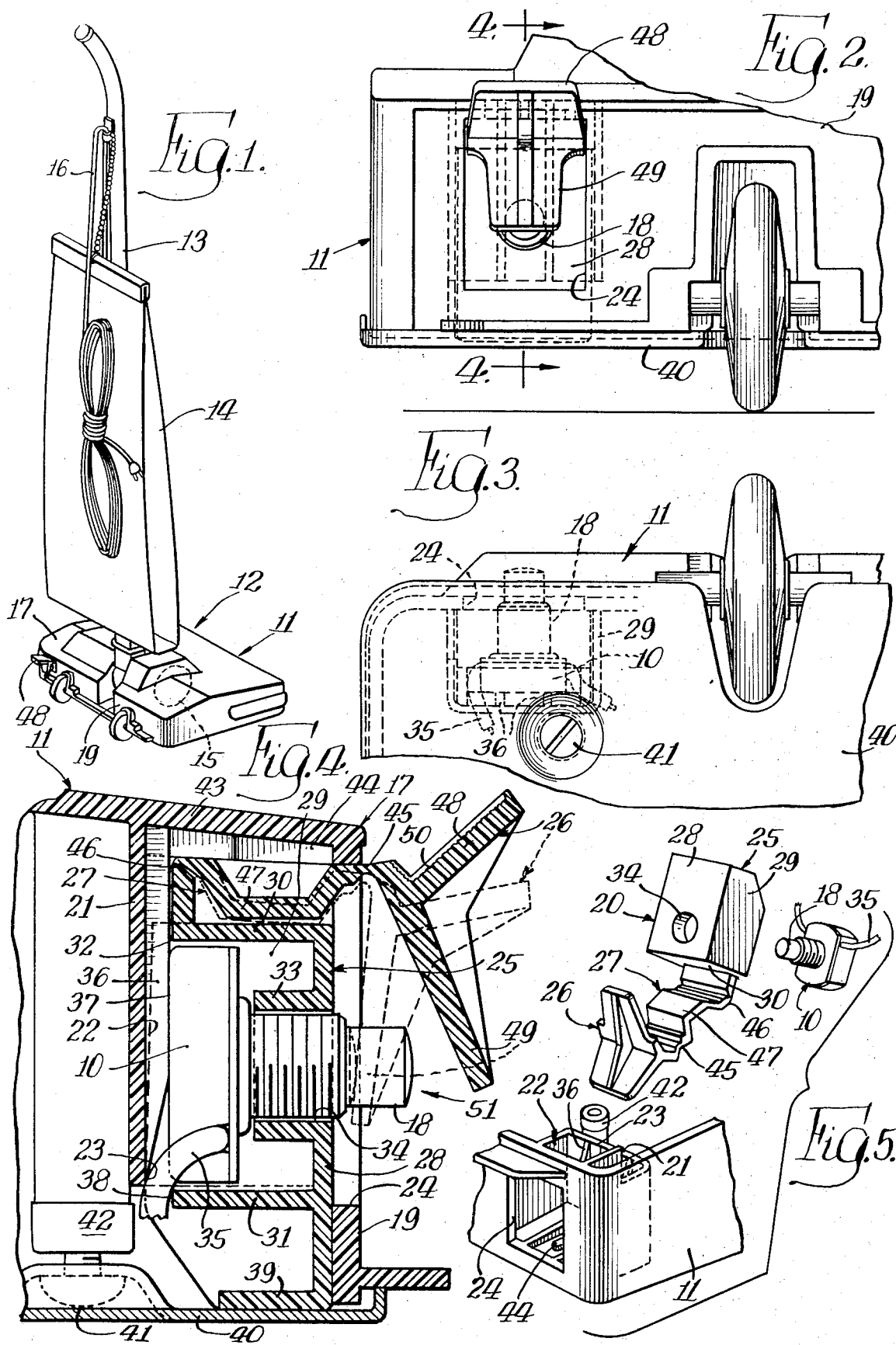
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[57] ABSTRACT

A structure for mounting an electrical switch in another element such as the housing portion of a vacuum cleaner eliminating the requirement of separate fastening elements. The switch mounting structure is received in a cavity portion of the vacuum cleaner nozzle and may be retained therein by a portion of the bottom plate of the nozzle. The switch mounting structure includes a portion for engaging the actuating portion of the switch, and in the illustrated embodiment, the engagement portion comprises a foot pedal.

13 Claims, 5 Drawing Figures





ONE PIECE SWITCH HOLDER AND FOOT OPERATED HINGE ACTUATOR FOR VACUUM CLEANER SWITCH

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to electrical switch mounting means and in particular, to means for mounting electrical switches in appliances such as vacuum cleaners.

2. Description of the Prior Art

In one form of conventional vacuum cleaner, an electrical motor is provided for driving a suitable air moving fan or blower to develop suitable suction for effecting the desired vacuum cleaner operation. An electrical switch is provided for controlling the operation of the electric motor and in one conventional form of upright vacuum cleaner, the switch is installed on the upper end of the handle. In certain vacuum cleaners, the control switch is mounted in the base portion thereof. A foot operated pedal is provided for operation of the switch by the user's foot providing an improved, simplified control of the vacuum cleaner operation. In the conventional pedal-operated switch structures, a relatively costly mounting means and means for operating the switch are required.

In U.S. Pat. No. 3,597,564 of Keith Lewis, an electrical switch is disclosed wherein the operating member and the body of the switch are molded integrally with one another. Lewis does not show any form of structure for mounting the switch so constructed in another structure, but is concerned solely with the construction of the switch itself.

SUMMARY OF THE INVENTION

The present invention comprehends an improved structure for mounting an electrical switch having a projecting actuator portion, including means defining a cavity having an insertion opening and an exposure opening, and a one-piece combination switch holder and switch operator element removably retained in the cavity, having a first portion defining switch-holding means for carrying the electrical switch in the cavity with the actuator portion exposed through the exposure opening of the cavity, a second portion defining an engagement means for engaging the actuating portion of the switch, and a third portion defining hinge means hingedly connecting the engagement means to the switch holding means, the hinge means including a portion within the cavity and being arranged to dispose the engagement means adjacent the actuation portion of the switch whereby preselected movement of the engagement means causes operation of the actuating means to operate the switch.

The combination switch holder and switch operator element may be formed of a molded synthetic resin. The connecting hinge portion may define a double hinge, and where the element is formed of synthetic resin, may comprise a pair of integral hinges. The switch mounting structure is adapted for use in mounting the switch in a housing portion of a vacuum cleaner. The engagement means of the switch may comprise a foot pedal projecting outwardly from the vacuum cleaner base portion for facilitated engagement by the user's foot for controlling the operation of the switch. In one form of the invention, the vacuum cleaner comprises an upright vacuum cleaner wherein the base portion comprises a nozzle with the switch being retained

in the cavity of the housing nozzle by a bottom plate of the nozzle underlying the cavity.

The engagement means of the switch holder and operator element may be biased by the connecting hinge portion to be normally spaced outwardly from the switch actuating portion.

The switch mounting structure is adapted to be mounted in the housing cavity without the use of separate fasteners, thus simplifying the installation and minimizing the cost of the appliance.

Thus, the switch mounting structure of the present invention is extremely simple and economical of construction while yet providing the highly desirable features discussed above.

BRIEF DESCRIPTION OF THE DRAWING

Other features and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing wherein:

FIG. 1 is a perspective view of a vacuum cleaner having a switch mounting means embodying the invention;

FIG. 2 is a fragmentary enlarged rear view thereof;

FIG. 3 is a fragmentary bottom plan view thereof;

FIG. 4 is a fragmentary further enlarged vertical section taken substantially along the line 4—4 of FIG. 2; and

FIG. 5 is a fragmentary exploded view illustrating the installation of the switch and switch mounting means in the vacuum cleaner nozzle cavity, with the nozzle being shown in an inverted position with the bottom plate removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the exemplary embodiment of the invention as disclosed in the drawing, an electrical switch generally designated 10 is shown to be mounted in a housing 11 of an electrical appliance, which in the illustrated embodiment comprises a vacuum cleaner 12.

More specifically, in the illustrated embodiment, vacuum cleaner 12 comprises an upright vacuum cleaner wherein the housing 11 comprises the nozzle, or base, portion of the vacuum cleaner with a handle 13 movably connected to the nozzle and carrying a conventional dirt collecting bag 14. The vacuum cleaner may include a conventional motor operated fan 15 disposed within the nozzle 11 and arranged to be energized through a suitable electrical cord 16, under the control of switch 10.

In the illustrated embodiment, switch 10 is mounted in a rear portion 17 of the nozzle with an actuator portion 18 of the switch projecting outwardly from the rear wall 19 of nozzle portion 17. As shown in FIGS. 4 and 5, switch 10 is received in a one-piece combination switch holder and switch operator element generally designated 20 and the assembly of the switch in element 20 is received in a wall portion 21 of the nozzle 11 defining a cavity 22. As shown in FIG. 5, wall portion 21 defines an insertion opening 23 and an exposure opening 24. When the switch 10 is installed in element 20 and the assembled structure 51 installed in the cavity 22, switch actuator 18 projects outwardly through exposure opening 24, as shown in FIG. 4.

More specifically, element 20 includes a first portion defining a switch holding means 25, a second portion defining switch engagement means 26, and a third portion defining hinge means 27 hingedly connecting the

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engagement means 26 to the switch holding means 25, as best illustrated in FIG. 5. In the installed arrangement of the assembly 51, as shown in FIG. 4, switch holder portion 25 and hinge means 27 are disposed within the cavity 22 with the switch engagement portion 26 disposed outwardly of the cavity in overlying relationship to switch actuator 18 for engagement therewith as a result of suitable operation of the engagement means by the user to effect desired operation of switch 10.

More specifically, switch holder portion 25 comprises a generally parallelepiped receptacle having a front wall 28, side walls 29, top wall 30 and bottom wall 31 cooperatively defining an open rear portion 32 for movement of the switch forwardly through open portion 32 with the actuator portion 18 extending coaxially through an inturned annular flange 33 and front opening 34 of front wall 28. Suitable electric leads 35 connected to switch 10 may be brought out rearwardly through the open rear portion of the switch holder for connection to the electrical system of the vacuum cleaner.

As shown in FIG. 4, the side walls 29 of the switch holder extend rearwardly into abutment with the wall 21 defining the cavity 22. Wall 21 may be provided with a pair of ribs 36 extending vertically to engage the rear surface 37 of the switch and retain it snugly against the annular flange 33. Bottom wall 31 is shorter than side walls 29 to define a space 38 through which the leads 35 are brought from switch 10. A lower extension portion 39 of the switch holder 25 projects downwardly from bottom wall 31 forwardly of housing wall 19 into engagement with the bottom plate 40 of the vacuum cleaner which is normally secured across the lower end of the nozzle 11 by conventional suitable means such as screws 41 threadedly engaging suitable support posts 42 of the nozzle. The top wall 43 of the nozzle portion 17 is provided with a plurality of downwardly projecting ribs 44 which are engaged by the hinge portion 27 of element 20 and as a result of the resiliency of the hinge portion, resiliently snugly retain the element 20 in cavity 22 against the secured bottom plate 40.

Hinge portion 27 defines a pair of integral hinges 45 and 46 and an interconnecting portion 47 between the hinges. As shown in FIG. 4, first hinge 46 is folded to extend midportion 47 outwardly through cavity 22 from the inner end of the top wall 30 of the switch holder portion 25. Second hinge portion 45 extends outwardly through the exposure opening 24 to dispose the engagement portion 26 of element 20 outwardly of switch actuator 18. As best seen in FIG. 4, engagement portion 26 includes a pedal portion 48 and a force transfer portion 49. Hinge portion 45 may be arranged to space the force transfer portion 49 normally outwardly of switch actuator 18 whereby depression of pedal 48 swings the force transfer portion 49 into engagement with the switch actuator 18 permitting inward movement of the actuator to operate switch 10 to control the vacuum cleaner operation. Thus, the switch actuator is normally free to prevent hindrance of the resetting of the switch upon completion of an actuation operation.

The upper surface 50 of the pedal 48 may be serrated for improved positive engagement by the user's foot in controlling the operation of the vacuum cleaner.

The one-piece combination switch holder and switch operator 20 may be economically formed as a molded

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element of synthetic resin with the hinge portion 27 extending generally away from the holder portion 25 in the original, formed arrangement thereof. To install the assembled switch 10 and element 20 in the cavity 22, the engagement portion is firstly brought through the bottom insertion opening 23 of the cavity and swung rearwardly through the exposure opening 24 while the hinge portion and switch holder portion 25 are moved downwardly into the cavity, with the cavity opening upwardly as shown in FIG. 5. The hinge portion 27 is automatically disposed to be brought into engagement with the ribs 44 and thereby dispose the engagement portion 26 in the desired overlying relationship to switch actuator 18, as shown in FIG. 4, with the assembly being retained in cavity 22 by the nozzle bottom plate 40 as discussed above.

Thus, the switch holding means of the present invention is extremely simple and economical of construction and permits facilitated low cost installation in the vacuum cleaner housing nozzle without the need for separate fastening means. Removal of the assembly as for servicing or replacement of the switch may be readily effected by simple removal of the vacuum cleaner bottom plate 40 and reverse, withdrawal movement of the assembly from the cavity 22.

The switch is spaced from the bottom plate 40 and retained within the molded plastic nozzle portion 21 so as to be effectively insulated from metal parts of the vacuum cleaner by the synthetic resin material of the element 20 including the spacing means defined by extension 39 positioning the switch holder portion 25 substantially above the plate 40 as seen in FIG. 4.

The foregoing disclosure of specific embodiments is illustrative of the broad inventive concepts comprehended by the invention.

Having described the invention, the embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In an electrical device having an electrical switch provided with a projecting actuator portion, the improvement comprising: wall means on said device defining a cavity having an insertion opening and exposure opening; and a one-piece combination switch holder and switch operator element inserted through said insertion opening to be removably received in said cavity, said element having a first portion defining switch holding means carrying the electrical switch in said cavity with the actuator portion exposed through said exposure opening of the cavity, a second portion defining an engagement means for selectively engaging said exposed actuating portion of the switch, and a third portion defining hinge means hingedly connecting said engagement means to said switch holding means, said hinge means including a portion within said cavity and being arranged to dispose said engagement means adjacent said actuating portion of the switch whereby preselected movement of said engaging means causes operation of said actuating means to operate the switch.

2. The switch mounting structure of claim 1 wherein said hinge means comprise a double hinge having a first hinge element connected to said switch holding means, a second hinge element connected to said engagement means, and a connecting portion extending between said hinge elements.

3. The switch mounting structure of claim 1 wherein said combination switch holder and switch operator el-

ement comprises a unitary molded synthetic resin element.

4. The switch mounting structure of claim 1 wherein said switch holding means disposes said switch in said cavity with the actuator portion of the switch extending outwardly through said exposure opening.

5. The switch mounting structure of claim 1 wherein said engagement means is biased to a position spaced from said actuator portion of the switch.

6. The switch mounting structure of claim 1 wherein said engagement means comprises a first portion to be moved by the user, and a second, switch-engaging portion engaging said switch actuator portion for operating the switch as the result of a preselected movement of said first portion by the user.

7. The switch mounting structure of claim 1 wherein said switch holding means comprises a generally parallelepiped receptacle having an open portion for passing of the switch therethrough, and an opening opposite said open portion for extension of said switch actuator portion therethrough with the switch received in the receptacle.

8. The switch mounting structure of claim 1 wherein said engagement means comprises a foot pedal adjacent said hinge means and a force transfer means movable with said foot pedal to engage and operate said switch actuator portion as a result of depression of said foot pedal.

9. In a vacuum cleaner having a housing portion, and an electrical switch provided with a projecting actuator portion, the improvement comprising: means on said vacuum cleaner housing portion defining a cavity having an insertion opening and an exposure opening; and a one-piece combination switch holder and switch op-

erator element removably received in said cavity, having a first portion defining switch holding means carrying the electrical switch in said cavity with the actuator portion exposed through said exposure opening of the cavity, a second portion defining an engagement means for selectively engaging said exposed actuating portion of the switch, and a third portion defining hinge means hingedly connecting said engagement means to said switch holding means, said hinge means including a portion within said cavity and being arranged to dispose said engagement means outwardly of said vacuum cleaner housing portion adjacent said actuating portion of the switch whereby preselected movement of said engaging means causes operation of said actuating means to operate the switch.

10. The switch mounting structure of claim 9 wherein said vacuum cleaner comprises an upright vacuum cleaner and said housing portion comprises a base portion of the vacuum cleaner.

11. The switch mounting structure of claim 9 wherein said housing portion comprises a base portion of the vacuum cleaner and said engagement means defines a foot pedal exposed outwardly of said base portion to be operated by the user's foot.

12. The switch mounting structure of claim 9 wherein said vacuum cleaner housing portion comprises a suction nozzle.

13. The switch mounting structure of claim 9 wherein said vacuum cleaner housing portion comprises a suction nozzle having a bottom plate, a portion of the bottom plate underlying said cavity and retaining said combination switch holder and switch operator element therein.

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