

[54] CONTROL SWITCH ARRANGEMENT FOR AN UPRIGHT VACUUM CLEANER

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[22] Filed: Dec. 30, 1971

[21] Appl. No.: 214,301

[52] U.S. Cl. .... 200/157, 15/324, 15/339

[51] Int. Cl. .... H01h 9/06, H01h 21/10

[58] Field of Search ..... 200/157, 61.85; 15/331, 333, 334, 324, 319, 339

[56] References Cited

UNITED STATES PATENTS

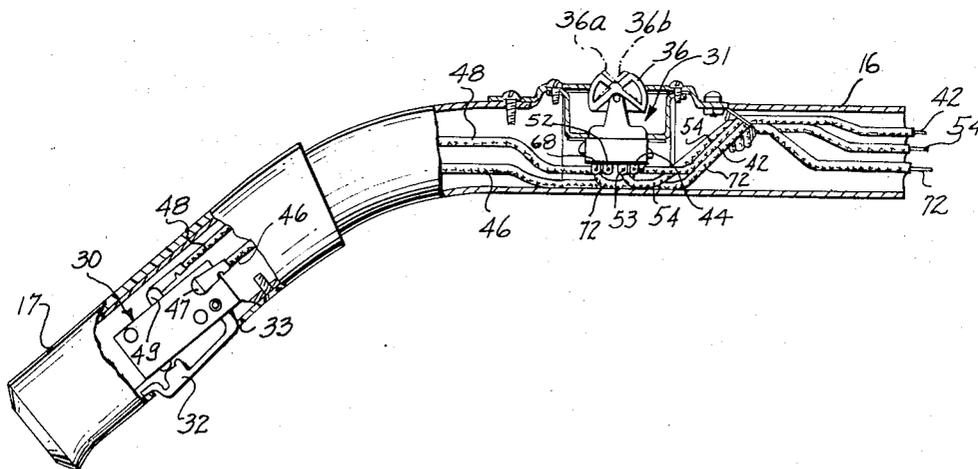
2,639,456 5/1953 Smith ..... 200/157 X

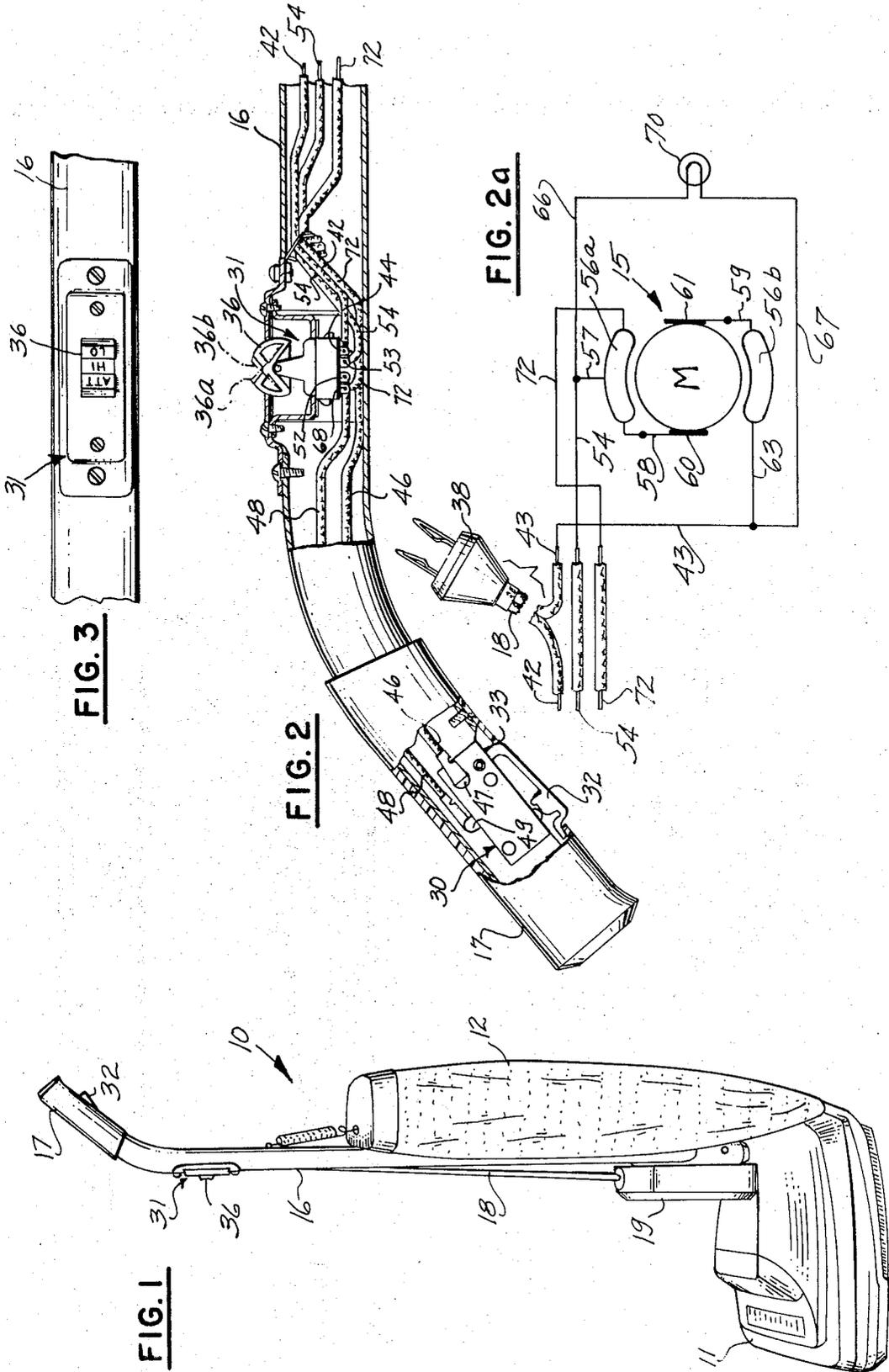
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[57] ABSTRACT

A control switch arrangement for controlling the operation of an upright vacuum cleaner during on-the-floor and off-the-floor cleaning. An elongated handle is pivotally connected to the body of the cleaner, and a power switch is mounted in the grip of the handle for controlling the operation of the fan drive motor. The power switch has an actuating lever which projects through an opening in the grip and which serves to close the power switch when a user grasps the grip. A combination motor speed control and bypass switch is also mounted on the handle in circuit with the fan drive motor. The speed control switch permits the fan to run at two different speeds when the cleaner is set up for on-the-floor cleaning, and at a speed suited for off-the-floor cleaning when the cleaner is set up for this mode of operation. When the speed control switch is in its off-the-floor cleaning position, the power switch is bypassed.

3 Claims, 4 Drawing Figures





## CONTROL SWITCH ARRANGEMENT FOR AN UPRIGHT VACUUM CLEANER

This invention relates to vacuum cleaners, and more particularly relates to a control switch arrangement for controlling the operation of the fan drive motor of an upright vacuum cleaner during on-the-floor and off-the-floor cleaning.

Various types of switch arrangements have been heretofore advanced for controlling the operation and speed of the fan drive motor of an upright vacuum cleaner to suit different operating conditions. Some of these arrangements have utilized a power switch in the grip of the handle of the cleaner for controlling the operation of the fan drive motor of the cleaner, and a separate speed control switch for controlling the speed of the motor. An example of such a switch arrangement is disclosed in the Naul U.S. Pat. No. 1,766,929. The motor speed control switch of the Naul arrangement, however, does not bypass the power switch so that the cleaner will cease to operate any time a user releases the grip of the operating handle. The Allen U.S. Pat. No. 1,932,126 discloses a similar arrangement.

Another switch arrangement heretofore advanced utilized a power switch mounted on the base of the cleaner and actuated in accordance with the position of the handle thereof. A second switch was mounted on the handle of the cleaner, and would bypass the power switch when shifted to an appropriate position for maintaining continuous operation of the fan drive motor. Such arrangement is disclosed in the Sellers U.S. Pat. No. 2,534,479. The Sellers switch arrangement, however, is dependent upon the position of the handle of the cleaner for its operation, which is sometimes disadvantageous.

A more recently advanced switch arrangement for an upright cleaner, utilizes a power switch mounted on the housing of the cleaner and actuated in accordance with the position of the handle of the cleaner. A motor speed control switch, actuated by a wheel positioning lever mounted on the base of the cleaner, bypasses the power switch when the wheel positioning level is shifted to a position to set up the cleaner for off-the-floor cleaning. Such arrangement is disclosed in the Hayba U.S. Pat. No. 3,217,351. The Hayba arrangement, however, does not provide for more than one speed of operation of the fan drive motor when the cleaner is set up for on-the-floor cleaning, and the position of the handle of the cleaner is a control element in this arrangement. Either one or both of the latter aspects of operation of the Hayba switch arrangement is sometimes disadvantageous.

Accordingly, it is a general object of the invention to provide a novel control switch arrangement for controlling the operation of an upright vacuum cleaner, which overcomes the aforementioned disadvantages of the prior art.

Another object is to provide a novel control switch arrangement for an upright vacuum cleaner having a power switch for controlling the operation of the fan drive motor of the cleaner and a separate speed control switch for controlling the speed of the fan drive motor during on-the-floor and off-the-floor cleaning, wherein the speed control switch provides at least two different speeds of operation of the fan drive motor for on-the-floor cleaning.

A further object is to provide a novel control switch arrangement for an upright vacuum cleaner of the foregoing character, wherein the power switch is bypassed by the speed control switch when the cleaner is set to operate in an off-the-floor cleaning mode.

Other objects and advantages of the invention will become apparent from the following detailed description and accompanying drawing, in which:

FIG. 1 is a perspective view of an upright cleaner incorporating a control switch arrangement embodying the features of the invention;

FIG. 2 is an enlarged view of the upper end portion of the handle of the cleaner illustrated in FIG. 1, with portions of the handle broken away to show some of the electrical connections and wiring therein;

FIG. 2a is a semi-diagrammatic view of a portion of the electrical circuit utilized in the cleaner illustrated in FIG. 1; and

FIG. 3 is an elevational view of the combination motor speed control and bypass switch of the invention.

In FIG. 1, an upright vacuum cleaner embodying the features of the present invention is illustrated and indicated generally at 10. The cleaner 10 is conventional to the extent that it includes a housing 11 having wheels (not shown) on the underside thereof to facilitate movement of the housing over a horizontal surface to be cleaned, such as a rug or carpet. The inlet (also not shown) of a suction nozzle is also located on the underside of the housing, and receives dirt and other material dislodged from the surface being cleaned. Such dirt is drawn through the nozzle and discharged into a replaceable filter enclosed in a porous bag 12 at the rear end of the housing 11.

A fan (not shown) having its inlet connected to the suction nozzle, is mounted in the housing 11 and driven by an electric motor. Such motor is illustrated diagrammatically in FIG. 2a and indicated at 15. When driven by the motor 15, the fan generates suction at the inlet of the suction nozzle and also serves to rotate a brushroll (not shown) mounted in the suction nozzle inlet.

An elongated handle 16 is pivotally connected at its lower end to the rear of the housing 11, and a grip 17 is provided at the upper end of the handle to facilitate manipulation of the cleaner over a horizontal surface to be cleaned. Electrical power is supplied to the electric motor 15 through an electrical cord 18. When not in use, the electrical cord 18 may be stored on a drum (not shown) that is rotatably carried in a housing 19 mounted on the lower front portion of the handle 16.

According to the present invention, the cleaner 10 includes a novel control switch arrangement for controlling the operation of the motor 15, and consequently the fan of the cleaner, during on-the-floor and off-the-floor cleaning. Such control switch arrangement includes a power or on-off switch 30 (FIGS. 1 and 2) mounted in the grip 17 of the handle 16, and a combination motor speed control and bypass switch 31 mounted on the handle 11 somewhat below the switch 30.

The power switch 30 has at least one pair of internal contacts, which are opened and closed by an operating lever 32 that is pivotally connected to one end of the switch housing. The lever 32 projects through an opening 33 in the underside of the grip 17 so that the contacts of the switch 30 are closed when the lever 32 is

moved inwardly by a user's fingers when the grip 17 is grasped.

The combination motor speed control and bypass switch 31, in the present instance, is of the three position, rocker type, and includes a manually shiftable rocker 36. The switch 31 is connected to the electrical circuit of the cleaner so as to provide two different speeds of operation of the motor 15 when the cleaner 10 is set up for on-the-floor cleaning, and one speed of operation of the motor 15 when the cleaner is operating in an off-the-floor cleaning mode. The manner in which the switches 30 and 31 control the operation of the cleaner 10 in each of the aforementioned modes will be described in connection with the following description of the electrical circuit of the cleaner.

Referring now to FIG. 2a in conjunction with FIG. 2, the electrical circuit of the cleaner includes a conventional, double-prong plug 38 of the type that is adapted to be plugged into a standard 125 V.A.C. outlet. The prongs of the plug 38 are respectively connected to a pair of conductors or wires 42 and 43 in the cord 18. As shown in FIGS. 2 and 2a, the conductor 42 is connected to a terminal 44 on the switch 31, and another conductor 46 connects the terminal 44 to one, indicated at 47, of the two terminals of the power switch 30. One end of another conductor 48 is connected to the other, indicated at 49, of the terminals of the switch 30, and the opposite end of the conductor 48 is connected to another terminal 52 of the switch 31.

When the rocker 36 of the switch 31 is in its full line position illustrated in FIG. 2, at least one pair of contacts therein are closed and establish a connection between the terminal 52 and another terminal 53 of the switch 31. Thus, the switch 31 permits current to flow from the terminal 52 through the switch to the terminal 53 and thence through a conductor 54 that is connected at one end to the terminal 53. The opposite end of the conductor 54 is connected to a wire 57 which, in turn, is connected to a portion of the windings of the field coils, indicated at 56a and 56b, of the motor 15. The field coils 56a and 56b are interconnected through the armature of the motor by wires 58 and 59, and a respective pair of brushes 60 and 61. A wire 63 connects one end of the windings of the field coil 56b with the supply conductor 43.

A headlamp 70 is physically positioned at the top portion of the housing 11 and is electrically disposed in a parallel branch circuit with the motor 15. Such branch circuit is provided by a pair of wires 66 and 67 which are respectively connected at one end to the lamp 70 and at their opposite ends to the wires 57 and 63.

With the foregoing connection and with the rocker 36 of the switch 31 in its full line or "HI" position illustrated in FIG. 3, the motor 15 of the cleaner will operate at high speed and the lamp 70 in the base thereof will be illuminated.

When the rocker 36 of the switch 31 is depressed to its "LO" position illustrated in broken lines and indicated at 36a in FIG. 2, a pair of contacts in the switch are closed which establish a connection between the terminal 52 and another terminal 68 thereof. Consequently, current from the supply conductor 42 may flow to the terminal 44, and thence through the conductor 46 to the switch 30. After passing through the switch 30, the current flows through the conductor 48 to the terminal 52 of the switch 31. The current then

flows through the internal contacts in the switch 31 to the terminal 68 thereof and thence into a conductor 72, which is connected at one end to the terminal 68. The conductor 72 extends through the handle 16 and is connected to the end of the windings of the field coil 56a so that the field coils 56a and 56b generate their maximum flux density. The motor 15 will thus operate at reduced speed and the lamp 70 is illuminated.

If a user of the cleaner 10 should release her grasp on the grip 17 at any time while the cleaner is in operation and the rocker 36 of the switch 31 is in either its "HI" position or its "LO" position, indicated at 36 and 36a in FIG. 2, respectively, no current will flow through either of the conductors 54 or 72. Consequently, the motor 15 will stop and the light 70 will go out. The cleaner 10 may, of course, be again rendered operative by a user, merely by grasping the grip 17 so as to close the switch 30.

When it is desired to convert the cleaner 10 for off-the-floor cleaning, an adapter (not shown) is engaged with the housing 11. Such adapter renders the inlet on the underside of the housing 11 ineffective and permits an associated suction hose and a selected one of a set of cleaning tools (not shown) to receive all of the vacuum generated by the fan.

Either prior to or after the adapter has been engaged with the housing 11, the rocker 36 of the switch 31 is moved to its "ATT" position illustrated in broken lines and indicated at 36b in FIG. 2. When the rocker 36 is so positioned, the contacts in the switch 31 establish a connection between the terminals 44 and 53 thereof. Thus, the power switch 30 is bypassed and current enters the motor 15 through the tap 57 of the field coil 56a. Consequently, the motor 15 operates at high speed. Since the power switch 30 is bypassed at this time, the cleaner 10 will operate even though the contacts of the power switch are open. In addition, the headlamp 70 will be illuminated since the motor circuit is energized.

From the foregoing, it will be apparent that the control switch arrangement and electrical circuit utilized in the vacuum cleaner 10 permits a user to select either one of two different speeds of operation of the suction generating fan of the cleaner for on-the-floor cleaning. In addition, continued operation of the cleaner in this mode is maintained only so long as a user maintains her grasp on the grip 17. If the grip 17 should be released for any reason, the power switch 30 opens and the flow of current to the fan motor 15 and headlamp 70 is interrupted. The heretofore described control switch arrangement and electrical circuit also permits the motor 15 of the cleaner 10 to operate at high speed when the cleaner is set to operate in an off-the-floor cleaning mode. When the cleaner is operating in the latter mode, the power switch 30 in the handle grip 17 is bypassed by the speed control switch 31. Consequently, the user does not have to maintain her grasp on the grip 17. It will further be apparent from the foregoing description that the operation of the motor 15 is completely independent of the angular position of the handle 16 with respect to the housing 11.

While only one embodiment of the invention has been herein illustrated and described, it will be understood that modifications and variations thereof may be effected without departing from the scope of the invention as set forth in the appended claims.

We claim:

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1. A control switch arrangement for controlling the operation of an electric motor which drives the suction generating fan of an upright vacuum cleaner when said cleaner is functioning in either an on-the-floor or off-the-floor cleaning mode, said cleaner including a housing having a suction inlet communicating with said fan and an electrical circuit for supplying current to said motor, said housing also having a handle pivotally connected thereto and a grip at the upper end of said handle to facilitate movement of said housing over a surface to be cleaned, said control switch arrangement comprising a manually actuated power switch adapted to be connected to said electrical circuit and adapted to be mounted in the grip of said handle so as to be closed by a user's hand when said handle grip is grasped, and a manually actuated combination motor speed control and bypass switch adapted to be connected to said electrical circuit for coaction with said power switch, said combination switch having a first position adapted to cause said motor to operate at a speed suited for on-the-floor cleaning when said power switch is closed, said combination switch also having a second position adapted to cause said motor to operate at a speed suited for off-the-floor cleaning, and said

combination switch being operable to bypass said power switch when in said second position, whereby the flow of current to said motor is interrupted whenever the grip on said handle is released by a user and said combination switch is in said first position but is maintained regardless of the position of said power switch when said combination switch is in said second position.

2. The control switch arrangement of claim 1, further characterized in that said combination switch has a third position for operating said motor at another speed suited for on-the-floor cleaning when said power switch is closed.

3. The control switch arrangement of claim 2, further characterized in that said housing includes an electric light for illuminating an area to be cleaned, and said combination switch is adapted to cause said lamp to be illuminated only when said power switch is closed and said combination switch is in either said first or said third position, said combination switch also being adapted to cause said lamp to be illuminated regardless of the position of said power switch when said combination switch is in said second position.

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