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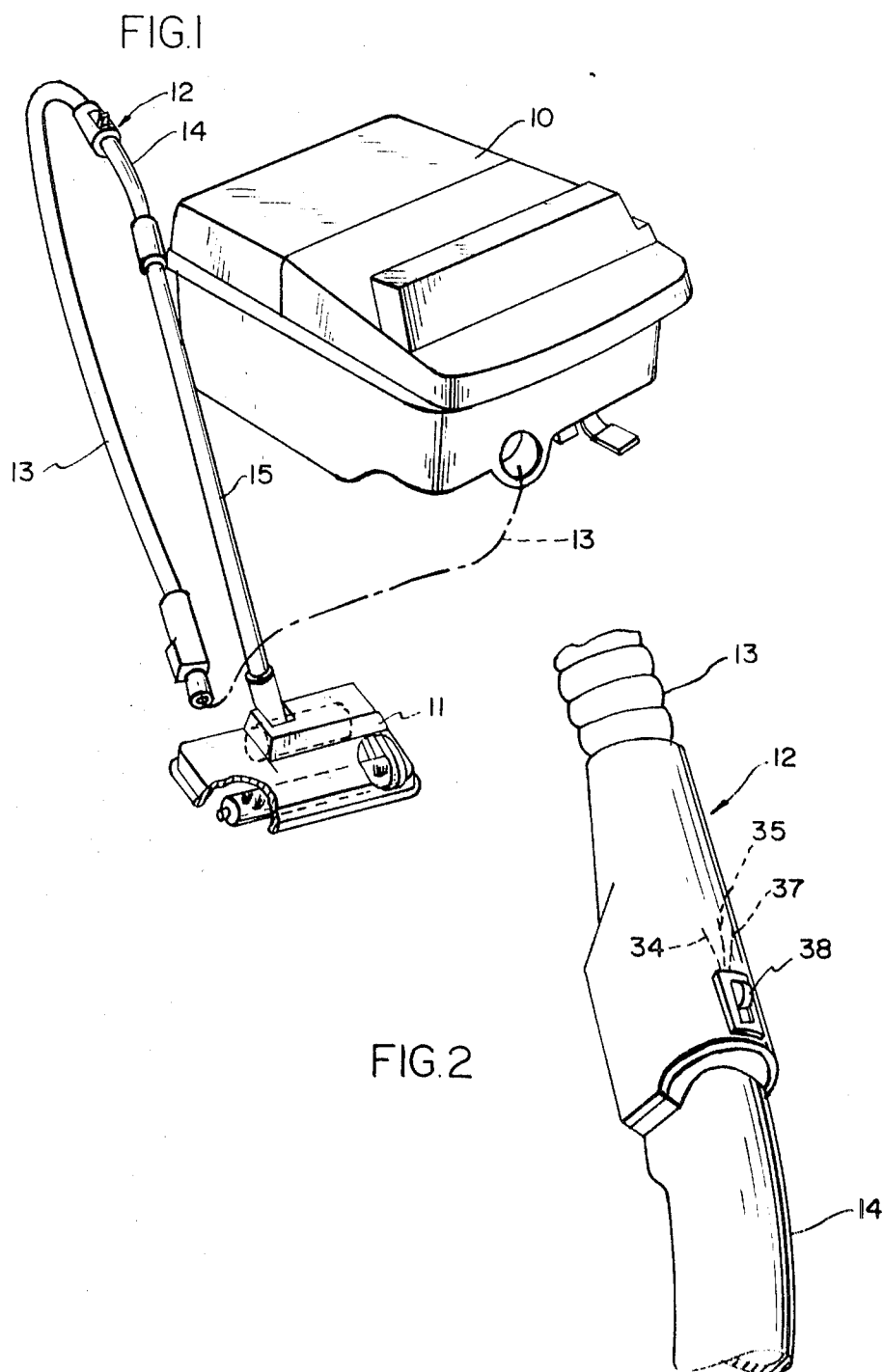
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3,588,943

VACUUM CLEANER SUCTION AND BRUSH CONTROL

Filed Nov. 12, 1968

2 Sheets-Sheet 1



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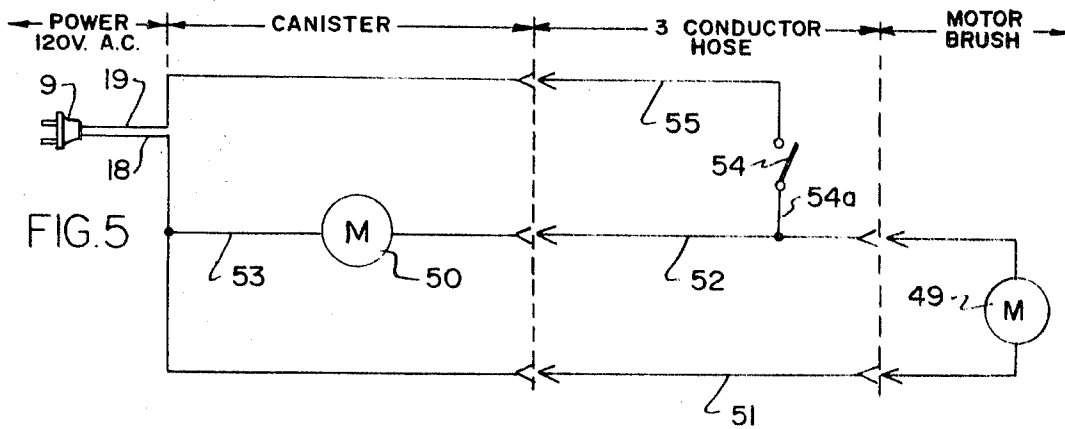
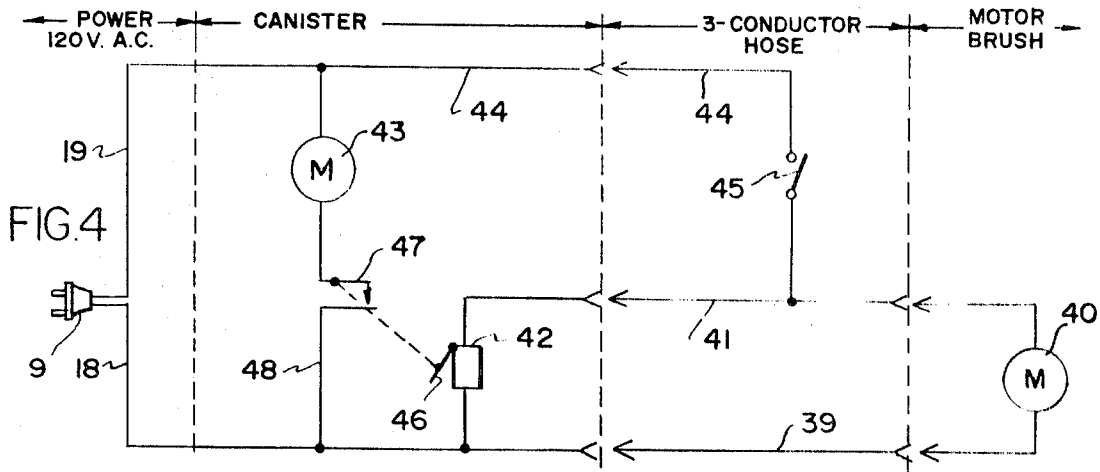
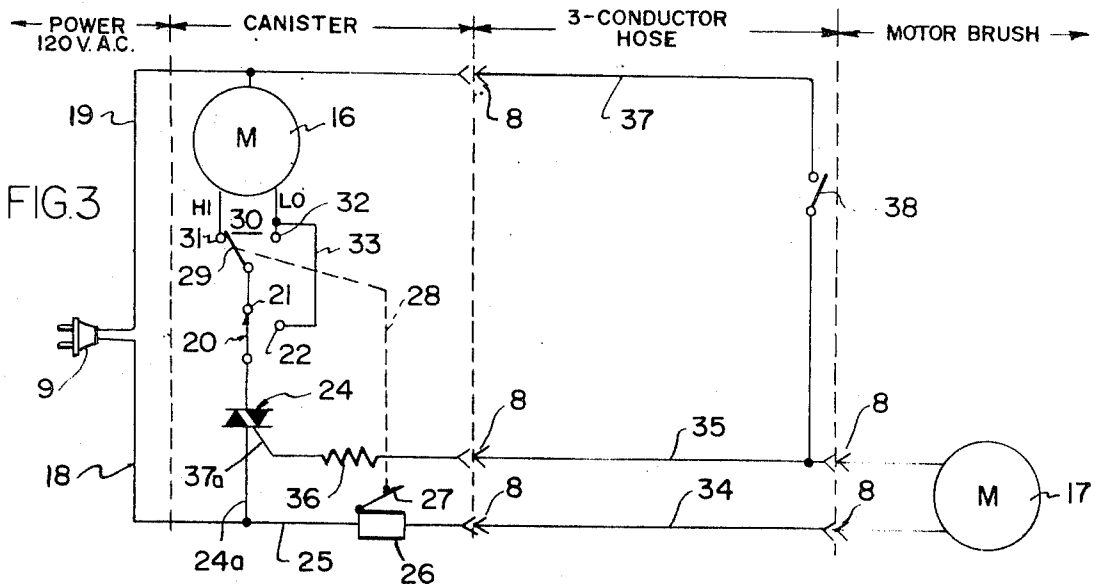
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VACUUM CLEANER SUCTION AND BRUSH CONTROL

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7 Claims

ABSTRACT OF THE DISCLOSURE

A vacuum cleaner having a motor fan suction unit and a floor contacting motor brush unit with a switch preferably adjacent to the handle used for propelling the motor brush unit over the floor being cleaned with this switch controlling current flow to both of the motors.

One of the features of this invention is to provide an improved vacuum cleaner structure including a motor fan suction unit for drawing a dirt laden air stream from a floor contacting motor brush unit together with a switch for controlling the motors for the two units.

Other features and advantages of the invention will be apparent from the following description of several embodiments thereof taken in conjunction with the accompanying drawings. Of the drawings:

FIG. 1 is a simplified perspective view of a motor fan suction unit and a motor brush unit interconnected by a hose structure for conducting a dirt laden air stream from the brush unit, with the motor brush unit housing broken away for clarity of illustration.

FIG. 2 is a fragmentary enlarged perspective view of a portion of the handle of the cleaner that carries the control switch.

FIG. 3 is a wiring diagram illustrating a first embodiment of the invention.

FIG. 4 is a wiring diagram illustrating a second embodiment of the invention.

FIG. 5 is a wiring diagram illustrating a third embodiment of the invention.

The vacuum cleaner illustrated in the accompanying drawings comprises a motor fan suction unit or canister 10 and a floor contacting motor brush unit 11 adapted to be propelled over a floor during a cleaning operation. The two units 10 and 11 are releasably connected by a suction hose unit assembly 1 comprising a conventional three-conductor flexible hose 13, which is preferably corrugated, and a curved wand handle portion 14. Handle portion 14 is adapted for connection to a straight metal tube or wand 15 attached to motor brush unit 11 and thus handle portion 14 provides a hand engaging portion for propelling brush unit 11 over a floor. Hose 13 includes three electrical wire conductors 34, 35 and 37, spaced and insulated from each other and helically wound within the hose 13. The canister 10 and the brush unit 11 each contains an electric motor.

In the embodiment illustrated by the wiring diagram of FIG. 3 three separable manually releasable sections are indicated: A canister section at the left of the diagram; a hose section at the center; and a motor brush section at the right. Conventional mating terminals used to con-

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nect the electrical conductors of the three manually separable sections are indicated on the diagram at 8. The motor fan suction unit 10 includes a first electric motor 16 while the brush unit 11 is powered by a second electric motor 17. There are also provided suitable wires 18 and 19 for connecting the motor fan suction unit 10 to a conventional plug 9 adapted for connection to an electrical power supply, such as a conventional wall socket (not shown) connecting to a 115 volt alternating current power source. A manual switch structure 20 is provided for speed controlling the motor 16. This switch 20 as shown in FIG. 3 is in the high speed position with respect to the winding of the motor 16. As such it engages a contact 21. There is also provided a second contact 22.

The switch 20 is connected to one side of a gatable conduction device 24 which in the embodiment shown is a bidirectional current conducting gatable semiconductor device commonly known as a triac. The other side of the triac 24 is connected to an end terminal 24a which is connected to an electric conductor or wire 25 which extends between wire 18 adapted for connection to the current source via plug 9 and a current relay coil 26 having an associated movable armature 27. Triacs, which are well known in the electronics art, normally exhibit a low impedance therebetween in response to the application of a signal, having an amplitude greater than a predetermined magnitude, to their third or gate terminal.

The armature 27 is operatively attached as indicated by the dotted line 28 to the movable arm 29 of a high-low speed switch 30. When the relay is deenergized, as shown, the arm 29 is in engagement with the high speed contact 31. When, however, the relay coil 26 is energized to move the armature 27 down, the connection of the armature to the switch arm 29 as indicated at 28 moves this arm to the right as shown in FIG. 3 to engage low speed contact 32. This low speed contact 32 is connected to the other low speed contact 22 by a conductor 33.

The other side of the relay 26 is connected to the second or brush motor 17 by conductor 34. The other side of the motor 17 is connected by conductor 35 to a resistor or impedance 36 whose other side is connected to the third or gate terminal 37a of the triac 24. The brush motor 17 is also connected to the wire 19 connecting to the power source via plug 9 by conductor 37 which contains a control switch 38.

The circuit of FIG. 3 includes the three conductors carried by the hose unit assembly 12. Thus a portion of the wiring for the motors in the separate suction unit 10 and brush unit 11 are conveniently contained within the hose unit that connects the two.

The operation of the embodiment of FIG. 3 is as follows. If suction only is desired without using the motor brush in the unit 11, then the circuit for the suction unit in the canister 10 is established by the manual speed control switch 20 which may be mounted at any convenient location such as on the canister. With the switch 20 in a position engaging contact 21 the canister motor 16 is energized through the high speed winding to operate at high suction such as 100 inches of water. If it is desired to operate at low suction such as 60 inches of water for example, for cleaning draperies, curtains and the like, the switch arm is moved to the right to engage contact 22 to

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establish a circuit to energize the motor 16 through the low speed winding.

If the operator desires to use both the canister suction and the motor brush in the unit 11 the switch 38 which is on the handle is closed which immediately supplies power to the motor 17 of the brush unit. At the same time this energizes the relay coil 26 and pulls the armature 27 downwardly to move the switch arm 29 to the right and engage the low speed contact 32. This means that whenever the motor brush is used the canister motor 16 is automatically energized at low speed which permits the use of smaller conductors in the circuit including the conductors 34, 35 and 37 in the hose with full compliance with safety standards. The closing of switch 38 establishes the gate signal for the triac 24 which will thus be in a conducting state. The circuit for motor 16 is thereby via plug 9, wire 19, motor 16, terminal 32, switch arm 29, terminal 21, switch 20, triac 24, end terminal 24a, conductor 25, wire 18 to plug 9. The triac gate signal is via plug 9, wire 19, conductor 37, switch 38, conductor 35, resistor 36, gate terminal 37a to triac 24, and triac 24, end terminal 24a, wire 18 to plug 9. The signal for motor 17 is as follows: via plug 9, wire 19, conductor 37, switch 38, motor 17, conductor 34, relay coil 26, conductor 25, wire 18, plug 9.

The embodiment of FIG. 4 is somewhat simplified as the triac 24 is not used and the switching circuit is simpler. In this embodiment the wire 18 for connection to the power source is connected by a conductor 39 to one side of the brush motor 40 while the other side of this motor is connected by a conductor 41 to one side of the relay 42 coil whose other side is connected to the conductor 39. Suction motor 43 has one side connected to a conductor 44, one end of which is connected to a wire 19 adapted for connection to the other side of the current source with the other end being arranged for connection to the conductor 41 via a hand-held control switch 45 that is similar to the switch 38 of the FIG. 3 embodiment.

In this embodiment there is provided a first circuit which includes the conductor 41, a second circuit which includes the conductor 44 and a third circuit which includes the conductor 39. Portions of these circuits include the three conductors in the hose as indicated by the diagram of FIG. 4. Because these hose portions of the circuits are used to carry current to the brush motor 40 only as controlled by the switch 45 the current capacity of the three conductors in the hose is quite small. Thus in one embodiment the brush motor 40 required only two amperes for sufficient power. The wire conductors 18 and 19 supplying power to the suction motor 43 may therefore be much heavier as they are outside the hose.

The embodiment of FIG. 4 provides for energizing both motor 40 and 43 simultaneously with closing of switch 45 on the handle portion of the hose unit. When the switch 45 is closed brush motor 40 is immediately energized to operate the brush. At the same time the relay 42 coil is energized to move the armature 46 thereof to the right as shown in FIG. 4 which immediately closes the control switch 47 which is in the circuit connecting the motor 43 to the one side of the current source via wire 18 and plug 9. This switch 47 as shown is connected to a conductor 48 which connects the motor 43 to the conductor 39. When the switch 45 is open to the position shown in FIG. 4 the relay coil 42 is deenergized and the armature 46 returned to the position shown which opens the switch 47.

The circuit of the third embodiment shown in FIG. 5 provides a very simple control for the brush motor 49 as well as the canister suction motor 50. In this embodiment the wire 18 for connection to one side of the source of electric current is connected by a conductor 51 to one side of the motor 49. The other side of this brush motor 49 is connected by a conductor 52 to one side of the suction motor 50. The other side of this suction motor

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is connected to the conductor 51 by means of a conductor 53.

Control switch 54 of this embodiment which is also mounted on the handle portion of the hose unit is connected by a conductor 54a to the conductor 52 and to the other side of the current source via conductor 55 and wire 19.

In this embodiment closing of the control switch 54 energizes both motors 49 and 50 to create a suction through the hose unit and operate the motor brush. As in the other embodiments portions of the conductors 51, 52 and 55 are located in the three conductor hose as illustrated.

The operation of the embodiment of FIG. 5 is as follows. If simultaneous operation of the canister and motor brush units is desired, closing of the control switch 54 energizes both motors 49 and 50. Then at the end of the cleaning operation the switch 54 may be opened to the position illustrated to deenergize both motors simultaneously. On the other hand, if only the canister unit is operated, the motor brush unit may be detached and the motor 50 controlled by operating switch 54.

Having described my invention as related to the embodiments shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description, unless otherwise specified, but rather be construed broadly within its spirit and scope as set out in the accompanying claims.

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

1. A vacuum cleaner, comprising: a motor fan suction unit having a first electric motor; a floor contacting motor brush unit having a second electric motor therein; a suction hose unit connecting said suction unit and motor brush unit having a hand engaging portion elevated when in use in easy access position for propelling said motor brush unit over a floor; circuit means for connecting both said motors to a source of alternating current including a plurality of current carrying conductors in said hose; a single first switch on said hose unit adjacent said hand engaging portion for controlling current flow to both said motors; a conductor in said motor brush unit including a connecting second switch means for connecting said first motor across said source; and means for opening and closing said second switch means simultaneously with the opening and closing of said first switch means.

2. The cleaner of claim 1 wherein there is provided an electric relay means in said circuit means having an armature connected to said second switch means for said opening and closing of the second switch means.

3. The cleaner of claim 2 wherein said circuit means comprises a first of said conductors interconnecting one side of each motor, a second of said conductors for connecting said first conductor to said source, and a third of said conductors for connecting the other side of each motor to said source, said first switch is located in one of said second and third conductors, and said electric relay means is connected to said first and third conductors.

4. A vacuum cleaner, comprising: a motor fan suction unit having a first electric motor; a floor contacting motor brush unit having a second electric motor therein; a suction hose unit connecting said suction unit and motor brush unit having a hand engaging portion for propelling said motor brush unit over a floor; circuit means for connecting both said motors to a source of alternating current including a plurality of current carrying conductors in said hose; a first switch on said hose unit adjacent said hand engaging portion for controlling current flow to both said motors; a conductor in said motor brush unit including a variable speed control switch means for connecting said first motor across said source; and means for switching said variable speed switch from a higher to a lower speed upon closing said first switch means.

5. The cleaner of claim 4 wherein said variable speed control means comprises an electric relay means having a

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movable armature connected to said variable switch means.

6. The cleaner of claim 5 wherein there is provided in said motor brush unit conductor a gatable conduction device having one side connected to said first motor through said variable speed control means and the other side connected to one side of said source, said other side of said gatable conduction device also being connected through an impedance to said second motor.

7. The cleaner of claim 6 wherein said gatable conduction device is bidirectional.

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