

Jan. 4, 1966

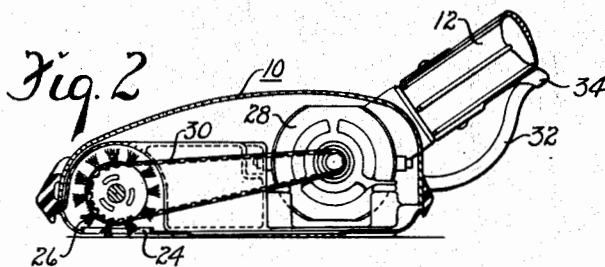
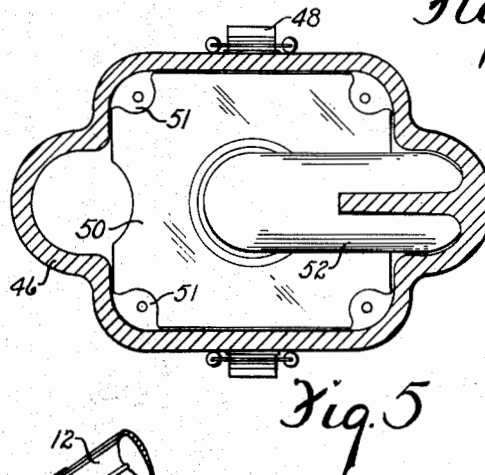
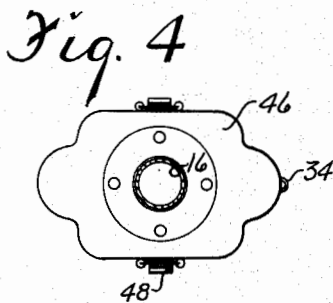
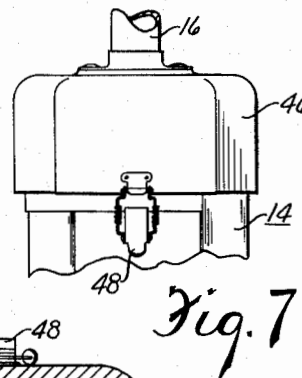
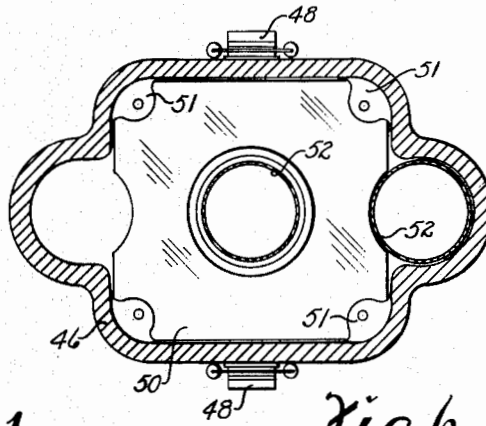
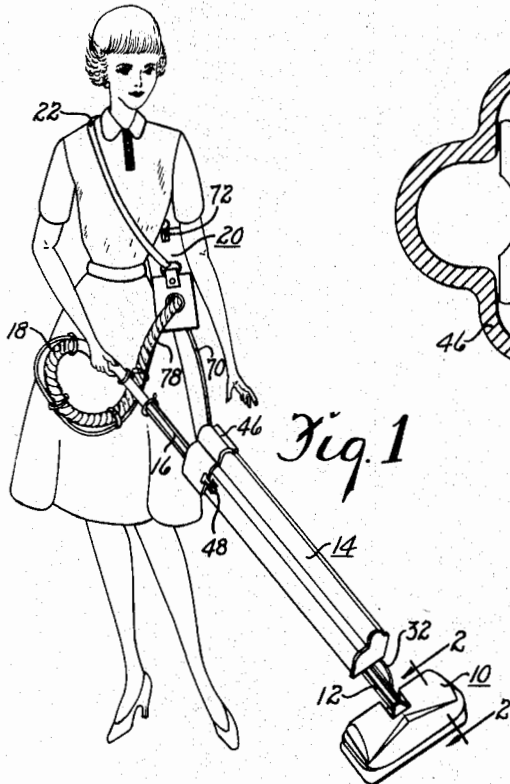
R. L. BROWN ETAL

3,226,758

VACUUM CLEANERS

Filed May 24, 1963

3 Sheets-Sheet 1



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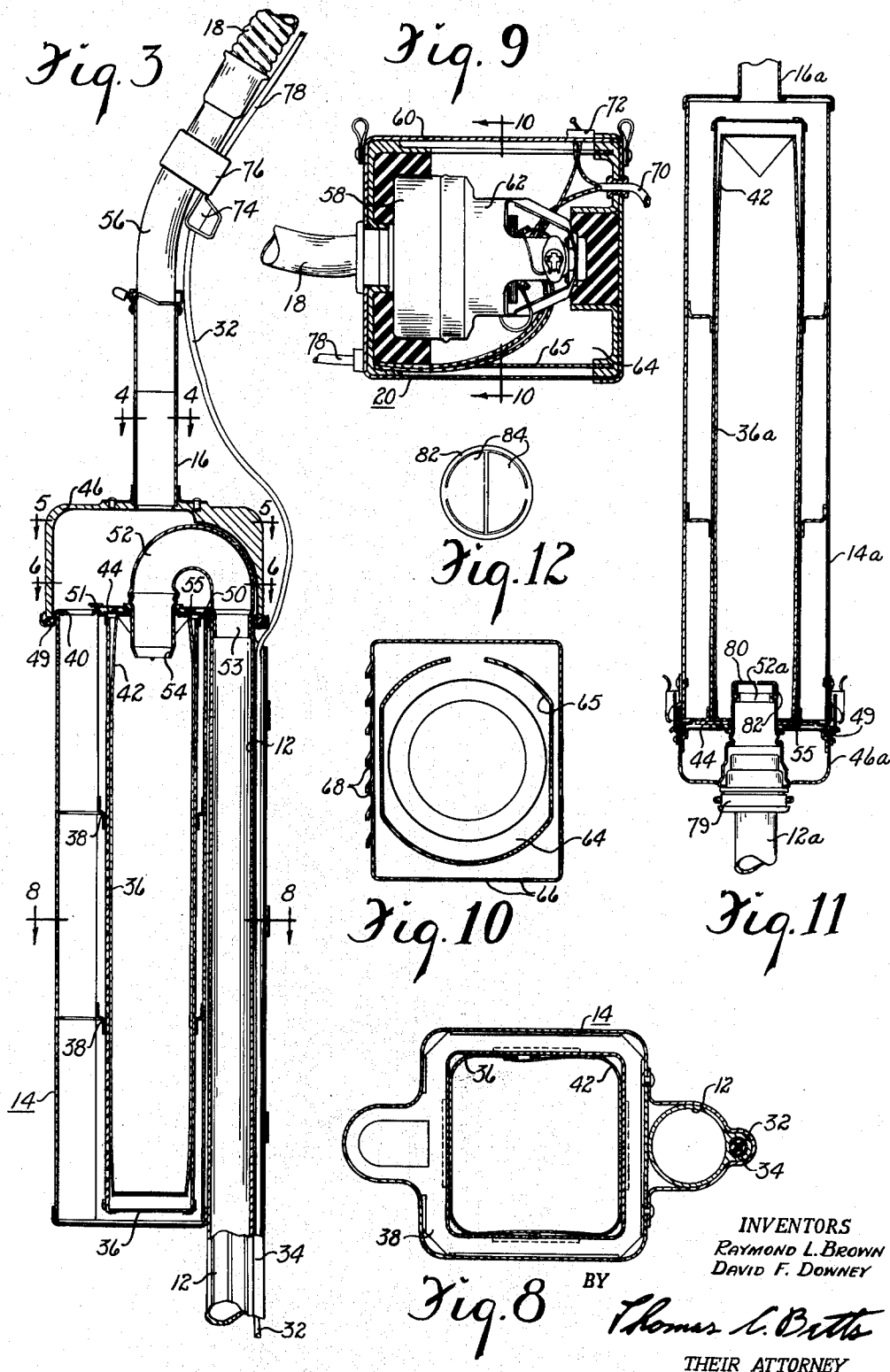
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3 Sheets-Sheet 2



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VACUUM CLEANERS

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Fig. 15

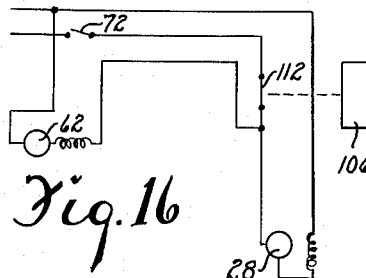
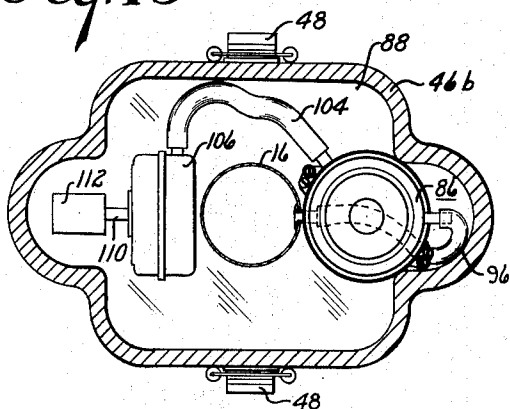


Fig. 16

Fig. 14

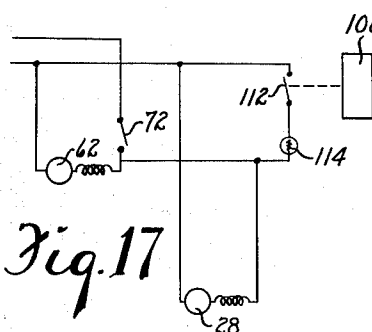
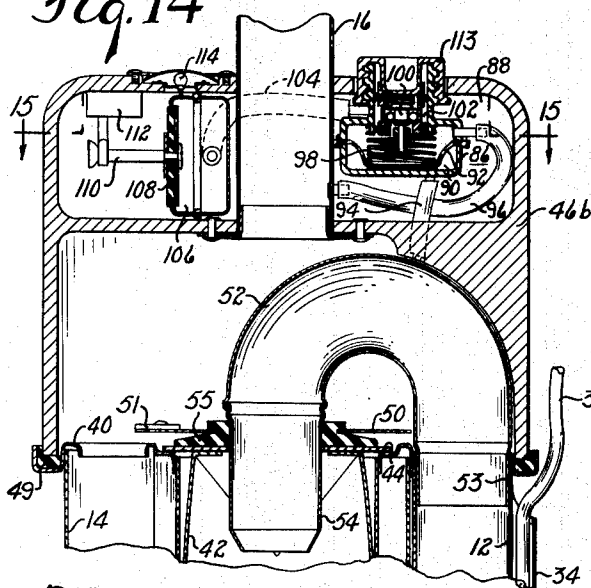


Fig. 17

Fig. 13

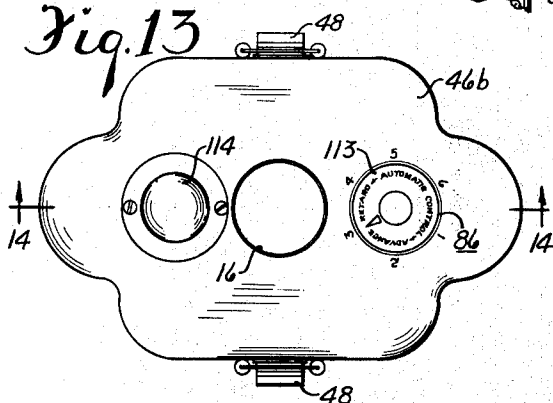


Fig. 18

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VACUUM CLEANERS

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1 Claim. (Cl. 15—327)

Our invention relates to vacuum cleaners and more particularly to a lightweight vacuum cleaner which may be very easily manipulated.

In accordance with our invention the vacuum cleaner includes a suction nozzle, preferably provided with a motor driven brush or other agitator member. A suction conduit is pivotally connected to the nozzle and carries an elongated dust bag compartment through which the air passes and in which the dust and dirt is entrapped. The dust bag compartment is connected by means of a short length of flexible hose with a motor-fan unit which is contained within a housing supported on the body of the operator, preferably by means of a shoulder strap.

A cleaner of this construction may be very easily manipulated, as the relatively light nozzle is the only part on the floor and there is no tank or other part trailing along behind the operator.

Further objects and advantages of our invention will be apparent from the following description considered in connection with the accompanying drawings which form part of this application and of which:

FIG. 1 is a perspective view of a vacuum cleaner in accordance with our invention;

FIG. 2 is a cross-sectional view of the nozzle on an enlarged scale taken on the line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken through the dust bag compartment of the vacuum cleaner shown in FIG. 1;

FIG. 4 is a cross-sectional view taken on the line 4—4 of FIG. 3;

FIG. 5 is a cross-sectional view taken on the line 5—5 of FIG. 3;

FIG. 6 is a cross-sectional view taken on the line 6—6 of FIG. 3;

FIG. 7 is a side view of the upper end of the dust bag compartment;

FIG. 8 is a cross-sectional view taken on the line 8—8 of FIG. 3;

FIG. 9 is a cross-sectional view of the motor-fan unit of the vacuum cleaner shown in FIG. 1;

FIG. 10 is a cross-sectional view taken on the line 10—10 of FIG. 9;

FIG. 11 is a cross-sectional view through a modified form of a dust bag compartment;

FIG. 12 is an end view of a valve shown in FIG. 11;

FIG. 13 is a top view of a modification including automatic controls;

FIG. 14 is a cross-sectional view taken on the line 14—14 of FIG. 13;

FIG. 15 is a cross-sectional view taken on the line 15—15 of FIG. 14; and

FIGS. 16, 17 and 18 show three different wiring diagrams, each of which may be used in the modification shown in FIGS. 13 through 15.

Referring to the drawings and more particularly to FIGS. 1 through 10, reference character 10 designates generally a suction nozzle to which is pivotally connected a suction conduit 12. Mounted on the latter is an elongated dust bag compartment 14. A second suction conduit 16 is connected to the upper end of compartment 14 and to a flexible hose 18 which leads to a motor-fan unit designated generally by reference character 20. As is illustrated, the latter is supported by means of a strap 22 around the shoulder of the operator.

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As is shown in FIG. 2, nozzle 10 is formed with a suction inlet opening 24 within which is rotatably mounted a brush 26 driven by an electric motor 28 through a belt 30. Power for operating the motor 28 is supplied through a cord 32 which extends from the nozzle through a channel 34 formed on the exterior of the suction conduit 12.

As is shown more particularly in FIGS. 3 and 8 dust bag compartment 14 is secured to the exterior of conduit 12 and comprises an elongated housing which is closed at its lower end and open at its upper end. A perforated inner body 36 is disposed within compartment 14 and is supported by a pair of perforated bulkheads 38 and an end wall 40. The perforated inner body is adapted to receive an elongated dust bag 42 formed of dust filtering material which at its upper end is provided with a disc 44 of stiff material, such as cardboard, formed with a centrally located inlet opening.

A hollow cover 46 is removably secured to the upper end of compartment 14 by means of a pair of spring clips 48, shown more particularly in FIGS. 1 and 7 and rests in airtight relation on a gasket 49 extending around the upper end of compartment 14. A plate 50 extends partially across the open end of the cover and is secured to ears 51 extending inwardly from the walls of the cover. Supported within the cover 46 by means of the plate 50 is a conduit 52 in the form of a return bend. One end 53 of this conduit is adapted to be received within the upper end of conduit 12, while the other end 54 extends into the dust bag 42 through the above mentioned inlet opening in the disc 44. End 54 carries a gasket 55 which bears against disc 44 to provide an airtight connection between conduit 52 and the dust bag. The second suction conduit 16 is connected to the upper end of cover 46 and communicates with the space within the cover which is outside the conduit 52, and this space also is in communication with the space within compartment 14 outside of the dust bag 42.

The hose 18 has a rigid end 56 which is removably connected to upper conduit 16 and, as is shown particularly in FIG. 9, leads to the inlet of a centrifugal fan 58 disposed within a housing 60 of the motor-fan unit 20. This hose may be of light construction as it does not drag on the floor and is not in danger of being stepped on. Fan 58 is driven by an electric motor 62, the air exhausted from the fan passing through the electric motor in order to cool the latter and into a space 64 within a baffle 65 in the housing 60. From here the air passes into the space between the baffle and housing 60 and is exhausted through openings 66 in the bottom of the housing and through louvered openings 68 in the side thereof which is away from the operator.

Power for operating the electric motor is supplied through the usual cord 70 which may be plugged into a convenient receptacle. Operation of the motor 62 is controlled by means of a switch 72 conveniently located on the motor-fan unit 20. The upper end of cord 32 is provided with a plug 74 which may be received within a receptacle 76 secured to the end 56 of the hose 18. From the receptacle 76 a cord 78 runs along the hose 18 and is connected to the electric circuit within the motor-fan unit so as to be controlled by the switch 72.

In operation, if the switch 72 is closed both the motors 28 and 62 are caused to operate. The former drives the brush 26 so as to agitate the surface being cleaned, while the motor 62 drives the fan 58 to create a current of air which enters the nozzle through the suction inlet 24, passes through the suction conduit 12 and the conduit 52 to within the dust bag 42. This air picks up dirt from the surface being cleaned and the dirt is deposited within the dust bag 42, the air passing through the walls of the bag and through the perforated inner body 36 and thence into the

cover 46, from where it is exhausted through the hose 18 to the fan 58 and finally out through the openings 66 and 68.

As the nozzle 10 is moved back and forth over the surface to be cleaned the operator is not hampered by any apparatus trailing behind her which has to be manipulated around furniture or other objects in the room which simplifies and speeds up the cleaning process. At the same time, inasmuch as the dirt is separated from the air before the air reaches the fan, the latter may be of the high speed, lightweight type capable of producing a relatively high suction which, together with the agitation produced by the rotary brush 26, results in very thorough cleaning of both rugs and hard surfaces.

A somewhat simplified construction of a dust bag compartment is illustrated in FIG. 11. As here shown, the suction conduit 12a from the nozzle communicates with the lower end of the dust bag compartment 14a, the latter having an open bottom which is closed by means of a removable cover 46a. The dust bag compartment includes a perforated inner body 36a which is adapted to receive the same dust bag 42 as is shown in the first embodiment. However, when in use, the inlet end of the dust bag is at the bottom. The cover 46a is provided with a conduit 52a which is adapted to enter the inlet opening in the disc 44 of the dust bag. The upper end of conduit 12a is provided with a separable coupling 79 for connecting it to conduit 52a. In order to prevent spilling of the dirt from the dust bag when there is no airflow taking place, the inner end of the conduit 52a is provided with a check valve 80 which includes an annular portion 82 surrounding conduit 52a. Hinged to the annular portion 82 is a pair of flap valves 84 which normally extend across the open end of conduit 52a, but which may be pivoted upwardly and to one side by the airflow during operation of the cleaner.

A suction conduit 16a is connected to the upper end of compartment 14a and communicates with the space therein outside the dust bag.

This modification operates the same as that previously described, except when it is desired to remove the dust bag it is necessary to disconnect the conduit 12 from the cover 46a by means of coupling 79, to disconnect the hose end 56 from the conduit 16a and to then turn the dust bag compartment 14a end-for-end so as to bring the cover 46a to the top. The cover may then be removed and the filled dust bag 42 lifted out and replaced by a new one.

The embodiment illustrated in FIGS. 13 through 18 includes automatic controls for either interrupting the electric circuit to the motors 28 and 62 when the dust bag should be replaced, or signaling the operator by means of a light that the bag should be removed. The automatic control mechanism is included in the cover 46b of the dust bag compartment 14 of the first embodiment. As is shown particularly in FIGS. 14 and 15, a control unit designated generally by reference character 86 is disposed within a compartment 88 formed in the cover 46b and includes a diaphragm chamber 90 divided by a flexible diaphragm 92. The space below the diaphragm is connected by means of a tube 94 with the interior of conduit 52 which conveys dirt-laden air into the dust bag. The space above the diaphragm 92 is connected by means of a tube 96 with the interior of conduit 16 which conveys clean air from the dust bag. A spring 98 urges the diaphragm 92 downwardly, while a valve 100 is arranged to be unseated by upward movement of the diaphragm. Opening of the valve 100 established communication between the space within the diaphragm chamber above the diaphragm and a space 102. A tube 104 connects the space 102 with the chamber 106 of a diaphragm 108 which is connected by means of a stem 110 to operate an electric switch 112. As is shown in the wiring diagram in FIG. 16, the switch 112 is connected in series with the

manually operable switch 72 so as to control both the motors 28 and 62. Valve 100 is part of a valve assembly including a knob 113 which is accessible for manipulation outside cover 46b and, when turned, changes the location of the valve assembly with respect to the diaphragm 92, thus varying the displacement of the latter required to open the valve.

The automatic control operates as follows:

As dirt is picked up and deposited within the bag 42 it tends to clog the pores of the bag and hence increases the resistance to flow of air therethrough. Inasmuch as the lower side of the diaphragm 92 is connected through the tube 94 to the inlet side of the dust bag, while the upper side of the diaphragm is connected through the tube 96 to the outlet side of the bag, this diaphragm is subjected to the pressure drop through the bag. As this drop increases due to the further accumulation of dirt, the diaphragm is moved upwardly against the force of spring 98 and finally lifts the valve 100 from its seat, thus permitting the high vacuum which exists within conduit 16 and within the space above the diaphragm to be communicated through the tube 104 to diaphragm chamber 106. The reduction of pressure within this diaphragm chamber causes the diaphragm 108, the opposite side of which is subjected to atmospheric pressure, to move to the right, thus opening switch 112. This shuts off both motors and thus indicates to the operator that the dust bag should be replaced by a clean one. The pressure drop required to operate the control may be adjusted by turning the knob 113, there being positions 1 through 6 calibrated on the cover around the knob.

In accordance with the wiring diagram shown in FIG. 17, operation of the switch 112 does not stop the motors, but serves to energize a signal light 114 which is conveniently located at the end of cover 46b, which indicates to the operator that the bag should be replaced.

According to the wiring diagram of FIG. 18, the diaphragm 108 operates a double throw switch 112a which is located in both the circuit of the parallel-connected motors and the branch circuit of the signal lamp 114. With the switch 112a in the position shown in FIG. 18, current is supplied to both the motors 28 and 62, while the lamp circuit is deenergized. When the switch is moved to the right by the diaphragm 108 it opens the circuit to the two motors while closing that to the lamp 114. The advantage of this arrangement over that shown in FIG. 16 is that the operator is certain that the motors have stopped because the bag should be replaced and not because of a failure of the power supply, as would result for instance if the plug at the end of cord 70 pulled out of the wall receptacle. Should the latter occur with the wiring shown in FIG. 18, the motor would stop and the light 114 would not light. However, if the motors are stopped because the dust bags should be replaced, the light 114 will be lit.

While we have shown and described several embodiments of our invention it is to be understood that this has been done for purposes of illustration only and the scope of our invention is not to be limited thereby, but is to be determined from the appended claim.

What we claim is:

A vacuum cleaner comprising:

- a suction nozzle adapted to be moved over a surface to be cleaned;
- a brush mounted within said suction nozzle for rotation against said surface to be cleaned;
- an electric motor mounted within said suction nozzle for rotating said brush;
- a rigid suction conduit member pivotally secured at its lower end to said suction nozzle and communicating therewith;
- a hollow body secured to said suction conduit member and having an open upper end;
- a removable dust-filtering air-porous dust bag located

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within said hollow body and having an inlet opening at its upper end;

a removable cover member for closing the open upper end of said hollow body and having a first tube which, when said cover member closes the open upper end of said hollow body, has one end thereof communicating with the interior of said air-porous dust bag through said upper inlet opening thereof and an opposite end thereof communicating with the upper end of said suction conduit member;

a second tube carried by said cover member and having one end thereof communicating with a space within said hollow body exteriorly of said dust bag; the opposite end of said second tube protruding from said cover member;

a fan for producing airflow;

an electric motor for operating said fan;

a housing for mounting said fan and motor and having openings therein for passage of said air flow;

a flexible hose coupled between said opposite end of said second tube and one of said openings in said housing;

means for supporting said housing from the person of an operator;

a differential pressure diaphragm located in said cover member;

means in said cover member for subjecting one side of said diaphragm to the pressure existing in said first tube and the other side of said diaphragm to the pressure existing in said second tube;

electrical circuit means in said cover member connectable to an electric voltage;

said circuit means providing a circuit connecting said fan and brush motors in parallel and a branch circuit having a signal device therein;

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said circuit means including a double-throw switch interposed between said motor circuit and said signal branch circuit whereby said fan and brush motor circuit is normally maintained closed and said signal device circuit is normally maintained open;

said double-throw switch being responsive to movement of said diaphragm caused by an increase in pressure difference acting thereon, due to excessive dust in said dust bag, for opening the circuit of said fan and brush motors and closing said signal branch circuit for actuation of the signal device therein.

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