

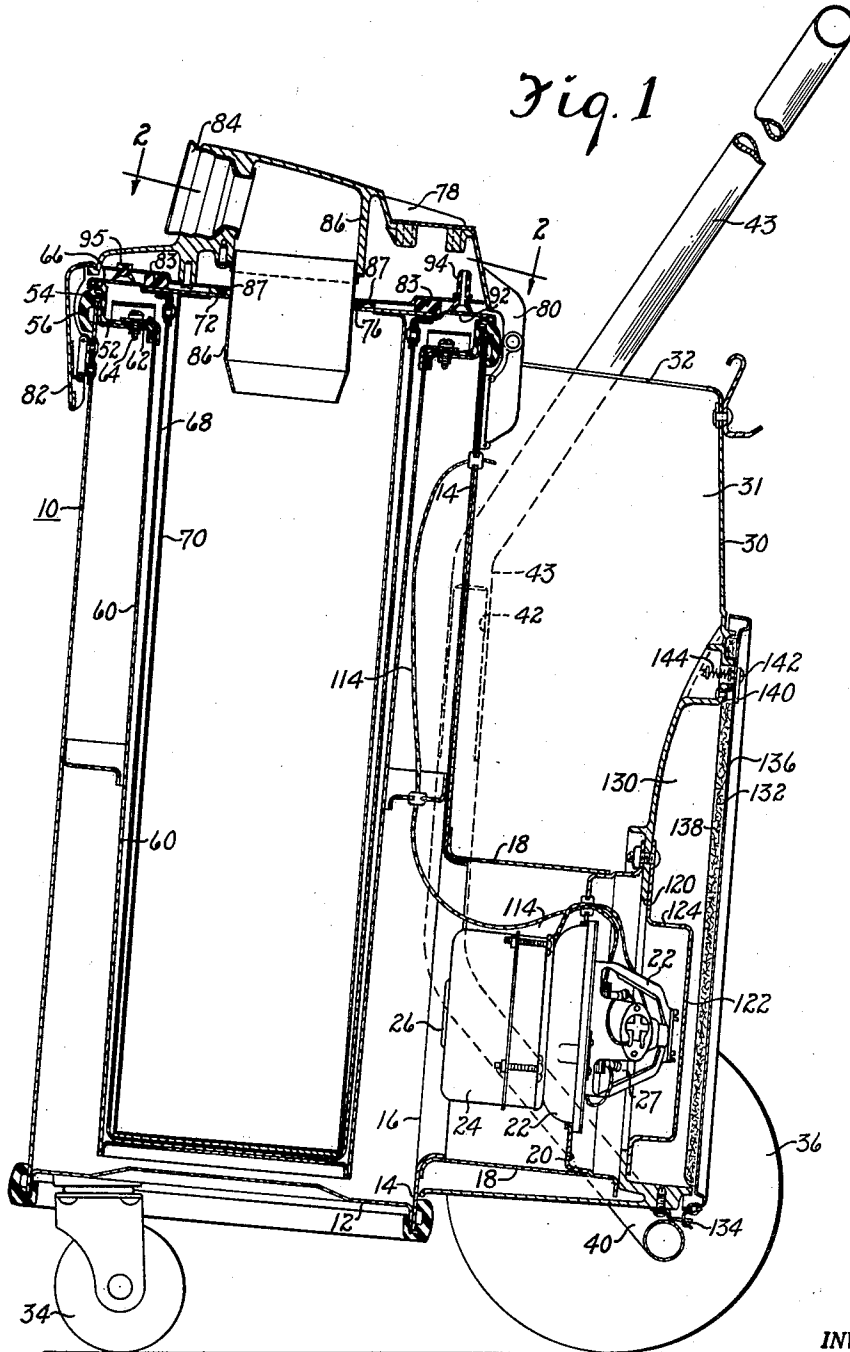
March 9, 1965

J. J. KOWALEWSKI
COMMERCIAL VACUUM CLEANERS

3,172,743

Filed Nov. 30, 1961

3 Sheets-Sheet 1



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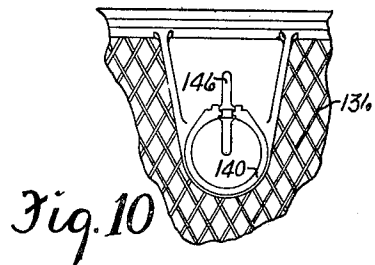
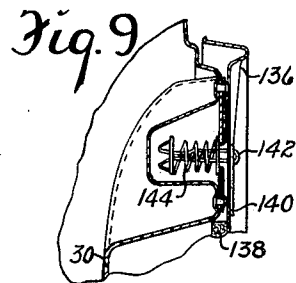
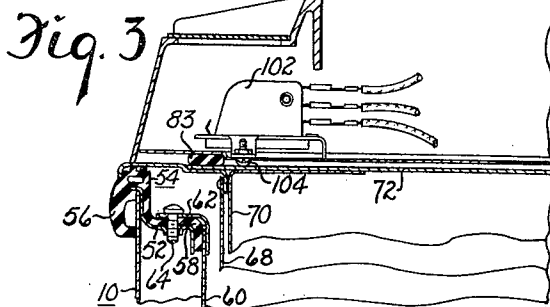
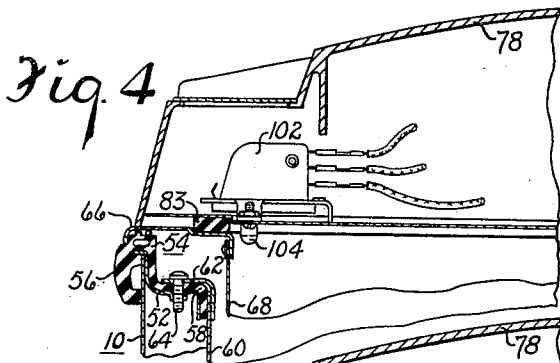
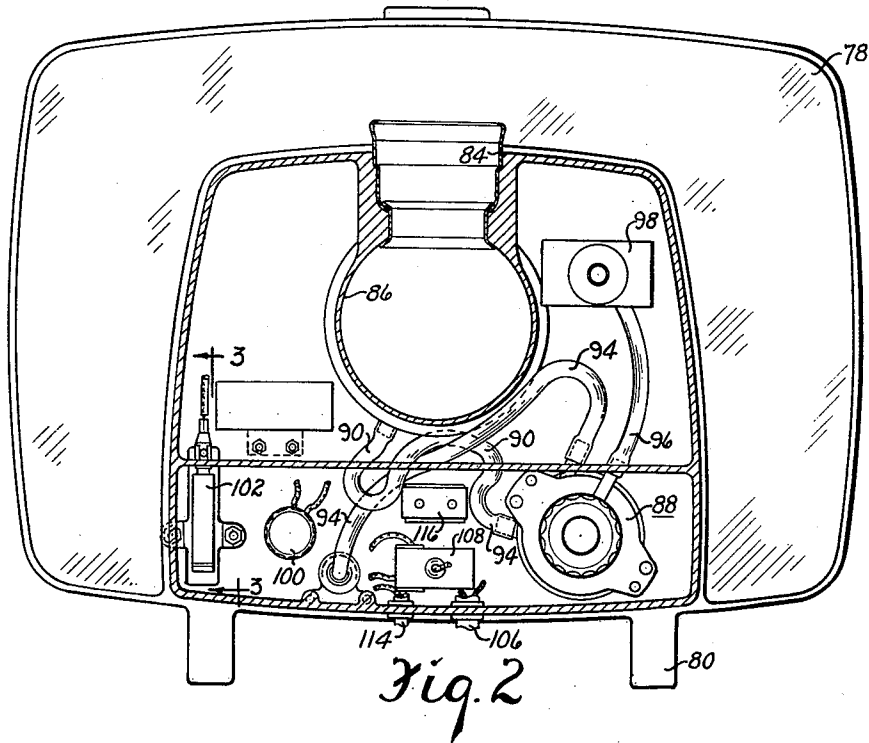
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Filed Nov. 30, 1961

3 Sheets-Sheet 2



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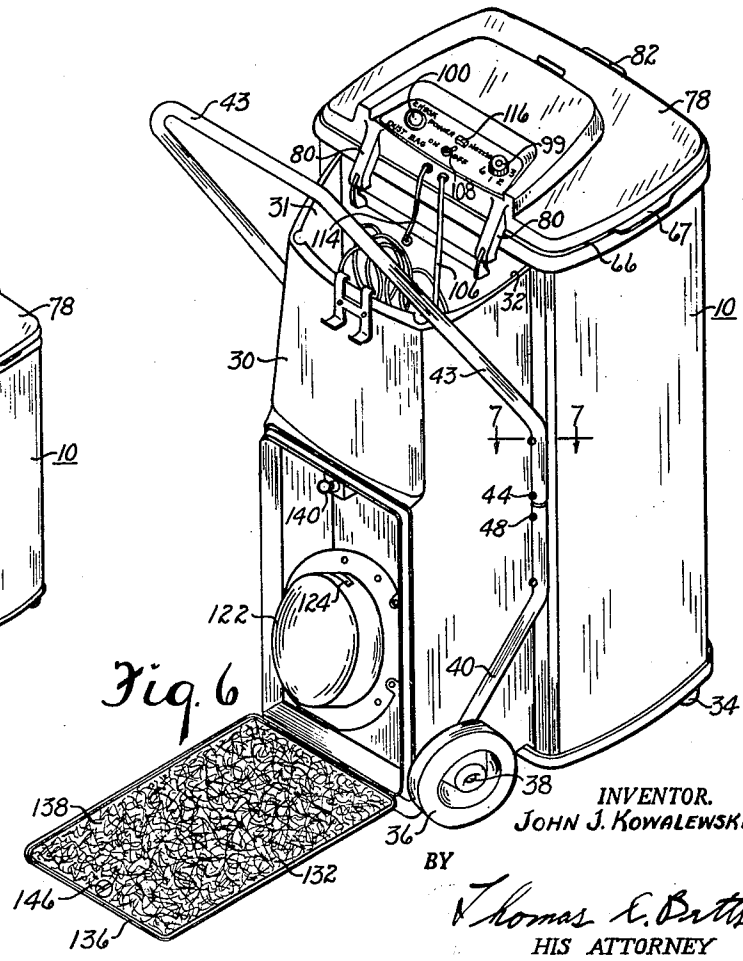
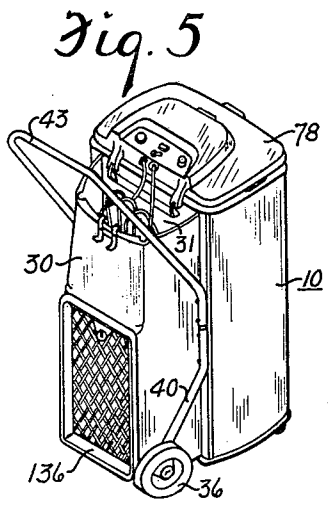
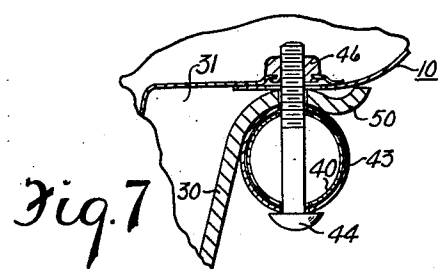
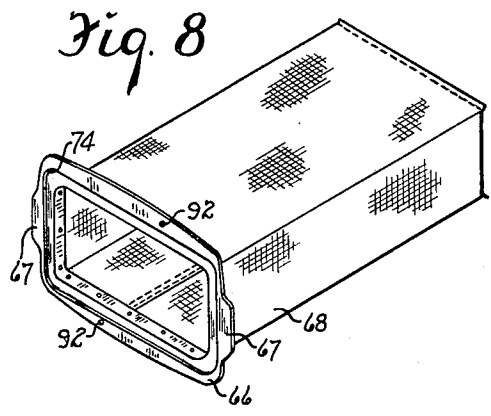
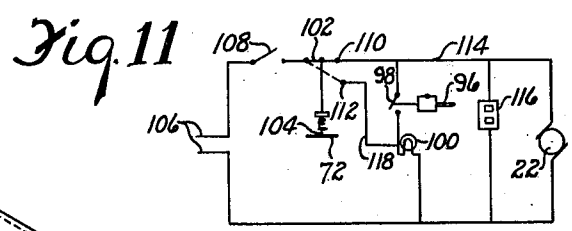
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3,172,743

COMMERCIAL VACUUM CLEANERS

Filed Nov. 30, 1961

3 Sheets-Sheet 3



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3,172,743

COMMERCIAL VACUUM CLEANERS

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Filed Nov. 30, 1961, Ser. No. 155,934

4 Claims. (Cl. 55-214)

My invention relates to vacuum cleaners and more particularly to a vacuum cleaner designed for use in commercial establishments.

Among the objects of my invention is to provide a vacuum cleaner having a large dirt capacity, but which at the same time is easy to maneuver, even up and down stairs.

A further object is to provide a large disposable paper dust bag, together with means for removing a filled bag from the cleaner without danger of rupturing it due to the weight of the large quantity of dirt accumulated therein.

Another object of my invention is to minimize turbulence within the large dust bag so as to reduce the rate of clogging of the porous material of the bag.

Another object of my invention is to provide a signal system for warning the operator both against operation of the cleaner without a dust bag therein and against operating the cleaner after the bag has become filled with dirt.

A still further object of my invention is to provide a replaceable filter having an extra large area.

Further objects and advantages of my invention will be apparent from the following description considered in connection with the accompanying drawings which form part of the specification and of which;

FIG. 1 is a cross-sectional view showing a preferred embodiment of my invention;

FIG. 2 is a cross-sectional view of a portion of the vacuum cleaner shown in FIG. 1 and is taken on the line 2-2 of FIG. 1;

FIG. 3 is a cross-sectional view of a portion of the vacuum cleaner shown in the preceding figures and is taken on the line 3-3 of FIG. 2;

FIG. 4 is a view similar to FIG. 3, but with the dust bag omitted;

FIG. 5 is a perspective view of the vacuum cleaner shown in the preceding figures;

FIG. 6 is a view similar to FIG. 5, but on an enlarged scale and showing the filter grille opened;

FIG. 7 is a cross-sectional view on an enlarged scale taken on the line 7-7 of FIG. 6;

FIG. 8 is a perspective view of a bag supporting member;

FIG. 9 is a cross-sectional view on an enlarged scale of a filter latch;

FIG. 10 is an elevational view of the latch shown in FIG. 9; and

FIG. 11 is a wiring diagram of certain electrical connections embodied in my invention.

Referring more particularly to FIG. 1, reference character 10 designates generally an elongated housing which is open at the top and closed at the bottom by a wall 12. The rear wall 14 of the housing is formed with an opening 16 and an enclosure 18 is secured to the rear wall with its interior communicating with the interior of hous-

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ing 10 through opening 16. Enclosure 18 is provided with a bulkhead 20 in which is mounted a motor-fan unit comprising an electric motor 22 driving a centrifugal fan 24, the latter being provided with an inlet opening 26, and the air being discharged through openings 27 in the motor frame.

Mounted outside the rear wall 14 is a hollow body 30, the lower part of which surrounds the enclosure 18 and the upper part of which forms a storage bin 31 which is open at the top, as indicated at 32. The upper part of enclosure 18 forms the bottom of bin 31.

The housing 10, enclosure 18 and hollow body 30 are supported in the position shown in FIGS. 1, 5 and 6 by means of a pair of casters 34 secured to the bottom wall 12 near the forward corners thereof and a pair of larger wheels 36 mounted on stub shafts 38 which are secured to a U-shaped tubular member 40, the legs of the U extending upwardly and being secured to the housing 10 as is shown in FIGS. 6 and 7. The upper ends of tubular member 40 are reduced in diameter as shown at 42 so that the legs of a U-shaped tubular handle 43 may be telescoped thereover and secured by bolts 44 which pass through both the tubular member 40 and the tubular handle 43, as is shown particularly in FIG. 7, and extend through openings in the housing 10 to have threaded engagement with clinch nuts 46 secured within the housing. These bolts as well as similar bolts 48 which pass through only the tubular member 40 serve to secure the hollow body 30 in place by clamping a flange 50 thereof against the housing 10. For convenience in packing in a shipping carton or the like, the handle 43 may be removed by removing the bolts 44, the lower bolts 48 being sufficient to retain the tubular member 40 and the body 30 in place while the machine is packed.

As shown more particularly in FIGS. 3 and 4, the upper open end of housing 10 is provided with an annular ring 52 secured to the housing by spot welding or the like. An annular gasket 54 extends around the open end of housing 10 and has a portion 56 outside thereof which serves as a bumper and a portion 58 which conforms to the upper surface of ring 52. An inner body 60 of perforated sheet metal or of other open work formation is supported from the ring 52 by means of an outwardly extending flange 62 which overlies the portion 58 of the gasket 54 and is secured in place by means of bolts 64.

Adapted to be removably supported on the upper edge of gasket 54 is an annular ring 66 having extending handle portions 67 to which ring is secured an open mesh bag or sack 68 of substantially the same length as the chamber within the inner perforated body 60. The metal ring 66 and sack 68 are shown in FIG. 8 removed from the housing and they constitute means for supporting a paper dust bag having a bag portion 70 of porous paper secured as by gluing to a cardboard disc 72. As is shown in FIG. 1, the disc is adapted to seat in a recess 74 formed in ring 66. The disc is formed with a centrally located inlet opening 76. If the ring 66 is not in place the disc 72 will not be properly supported, which should indicate to the operator that he has forgotten to place the ring in the cleaner. However, should he not notice that the disc is improperly supported, he will not be able to start the motor, as will be explained hereinafter.

A cover 78 is pivotally secured to housing 10 by means of suitable hinges 80 and may be held in closed position by a spring latch 82. A gasket 83 is carried by the cover and serves to hold the disc 72 properly seated in the recess 74 and to hold the ring 66 in air-tight contact with gasket 54. Cover 78 is provided with a coupling member 84 to which may be removably connected one end of a usual flexible suction hose which leads to a suction nozzle. Coupling 84 communicates substantially at right angles with inlet conduit 86, cross-sectional area of the conduit being substantially greater than that of the coupling. The lower end of conduit 86 is of sufficient length so as to extend through the inlet opening 76 in the dust bag disc 72 when the cover is closed, as is shown in FIG. 1. A gasket 87 surrounds conduit 86 so as to bear against disc 72 around the opening 76 for preventing leakage between the conduit and the disc.

Mounted within a hollow portion of cover 78 is a differential pressure actuated valve designated generally by reference character 88. This valve is of the type shown in Patent No. 2,714,425, issued August 2, 1955, to Allen P. Cawl, and includes a diaphragm which is subjected on one side to the pressure existing within inlet conduit 86, which is communicated thereto through a tube 90, and on the other side to the inlet pressure of the fan 24 which is communicated thereto through the housing 10, an opening 92 formed in ring 66 and a tube 94 carried by the cover and having an end arranged to seal around the opening 92 when the cover is closed. As will be seen in FIG. 8, rim 66 is rectangular and consequently may be placed in housing 10 in two different positions. Hence, it is provided with two openings 92 located diametrically with respect to each other so that one of them will be in line with the tube 94 regardless of the position of the rim. A plug 95 is carried by the cover 78 diametrically opposite the tube 94 so as to close the opening 92 which is not in communication with the tube.

As is shown and explained in detail in the above-mentioned Patent No. 2,714,425, displacement of the diaphragm by an increase in the difference in pressures acting on opposite sides thereof serves to open a valve which establishes communication between the tube 94 and a tube 96, the latter leading to a pressure actuated switch 98 mounted in the cover. A manually operable knob 99 is provided which is adjustable to vary the value of the pressure difference required to open the valve. As is shown more particularly in the wiring diagram of FIG. 11, the switch 98 is located in the circuit of a warning light 100 which is mounted in line with an opening in the top of the cover so as to be visible.

Also mounted in the cover is a two-position switch 102 which has an actuating plunger 104 extending therebelow. As is shown in FIG. 3, when a dust bag is in the machine and disc 72 thereof properly supported by the ring 66, the plunger 104 contacts the cardboard disc 72 of the bag and is forced upwardly, while if the ring 66 is omitted so that disc 72 is not supported, or no bag is in the cleaner, the plunger 104 is spring biased downwardly to the position shown in FIG. 4. The switch 102 is connected in the electric circuit of the cleaner as shown in FIG. 11. Here reference character 106 indicates a pair of conductors supplying electric current to the vacuum cleaner which are conveniently enclosed in a single flexible cord of sufficient length to be plugged into any suitable outlet. One of the conductors 106 is connected directly to the motor 22, while the other conductor leads to a manually operable switch 108 mounted in the cover. Switch 108 is connected electrically to the movable blade of switch 102 which may be moved by the plunger 104 between the contacts 110 and 112. Contact 110 is connected by conductor 114 with motor 22. The pressure actuated switch 98 and the warning light 100 are connected in series across the conductor 114 and the conductor 106 which is connected directly to the motor. A receptacle 116 for connecting a power operated tool may also be connected

in parallel with the motor so as to be energized and de-energized therewith. A conductor 118 is connected between the lower contact 112 of switch 102 and the conductor leading from the pressure switch 98 to the warning light 100.

It will thus be seen that if the manual switch 108 is closed when a dust bag is in proper position within the vacuum cleaner, the disc 72 of which lifts plunger 104 so as to close the circuit through the switch 102 to contact 110, current will be supplied to the motor 22. On the other hand, if no dust bag is in the cleaner or if the bag disc 72 is improperly supported due to the absence of ring 66, switch 102 will be closed through the contact 112 thereof so that the motor circuit will be open but current will be supplied to the warning light 100. Under these conditions the motor will not operate but the warning light will be lit, thus indicating to the operator that while electric power is present in the cleaner, the motor is not running because of the absence or improper support of the dust bag. On the other hand, during operation of the vacuum cleaner, when sufficient dirt accumulates within the bag 70 so as to increase the pressure drop of the air passing therethrough above a value determined by the setting of knob 99, the differential pressure diaphragm in member 88 will open the valve therein so as to communicate suction through the tube 96 to the pressure actuated switch 98, thus closing the latter. This does not stop the operation of the vacuum cleaner, but it does light the lamp 100, thus indicating to the operator that the bag should be replaced.

In order to replace the bag the latch 82 is released and the cover 78 pivoted to its open position. If the motor has not already been stopped by opening the switch 108, opening of the cover will automatically stop the motor, as switch 102 will be actuated when the plunger 104 is moved out of contact with the disc 72 of the dust bag. The handles 67 of metal rim 66 are then grasped and the ring lifted out of the housing 10, thus bringing with it the paper dust bag. Due to the large size of this bag the weight of the dirt which it is capable of holding might be sufficient to tear the bag from the cardboard disc if it were attempted to lift the bag by grasping this disc. However, the weight of the dirt is taken by the open mesh sack 68 which may be made of suitable cloth having sufficient strength for this purpose, but porous enough so as not to become clogged by retaining any fine dust which may pass through the paper bag. The holder comprising the rim 66 and sack 68 may be used to transport the paper bag to the trash receptacle or other place where it is desired to dispose of the paper bag and the latter may be removed from the cloth bag holder by merely turning them upside down and permitting the paper bag to slide out.

The lower part of the hollow body 30 is formed with an opening 120 in line with the motor 22, which opening is covered by a cup-shaped member 122 which is formed with an opening 124 in the upper part thereof. This opening communicates with a space 130 formed by a recess in the rear wall of body 30 and bounded by a filter 132 which is removably and pivotally secured to the bottom of hollow body 30 by means of a separable hinge 134. The filter comprises a large rectangular grille 136 which removably supports a similarly shaped sheet or pad of suitable filter material 138. As will be seen particularly in FIG. 1, the space 130 and filter 132 extend well above the bottom of the storage bin 131 so as to provide ample filtering surface.

The filter may be secured in the closed position shown in FIGS. 1 and 5 by means of a ring 140 which is pivotally secured to a spring mounted member 142 which is urged inwardly by means of a spring 144. The filter grille 136 is formed with a slot 146 of sufficient size to receive the ring 140 when the latter is properly aligned therewith. However, when the ring is turned at right angles to the

slot it obviously cannot pass therethrough and serves to hold the filter in closed position, and the ring may be pivoted flat against the filter grille, as is shown in FIGS. 1, 9 and 10, so as to be out of the way.

In operation, the fan 24 serves to create a partial vacuum within the housing 10 which is communicated through the porous paper of the dust bag 70 to the inlet 86 and the hose which is connected to the coupling 84. If the suction nozzle at the other end of the hose is passed over a dusty surface the inrushing air will pick up the dust and dirt and convey it into the dust bag. However, due to the sudden increase in cross-sectional area between the coupling 84 and the inlet conduit 86, the velocity of the air and entering dirt is materially reduced at this point, thus permitting the dust and dirt to be introduced rather quietly into the dust bag rather than being blow violently thereinto. This tends to cause the dirt to be deposited in the bottom of the bag and to fill the latter from the bottom up, rather than being deposited in a vertical layer around the sides of the bag all the way between the top and the bottom. The fact that the upper part of the bag remains relatively free of such layer materially reduces the resistance to the flow of air through the dust bag as the bag is being filled and consequently the pressure drop does not increase to an objectionable value until the bag is substantially filled. When this does occur the signal light 100 is energized as previously described.

Air discharged from the motor passes through the opening 124 into the chamber 130 from where it may pass through the filter material 138 to the atmosphere. This filter removes any fine dust which may have passed through the paper bag, as well as carbon dust generated by the wearing of the carbon brushes of the electric motor 22. The large area of this filter results in a minimum resistance to airflow while assuring a maximum life of the filter.

Due to the broad base support provided by the wheels and casters located at the four corners of the cleaner and the low center of gravity resulting from locating the motor at the bottom, the cleaner may be pulled around by the hose connected to the coupling 84 without danger of tipping. Also, the large wheels 36 make it possible to move the cleaner up or down stairs by grasping the handle 43 and pulling the cleaner up step by step or letting it down in the same manner.

While I have shown and described one more or less specific embodiment of my invention, it is to be understood that this has been done for the purpose of illustration only and the scope of my invention is not to be limited thereby, but is to be determined from the appended claims.

What I claim is:

1. In a vacuum cleaner, an elongated housing open at one end, means for supporting said housing in a substantially vertical position with the open end thereof at the top, a dust bag removably received in said housing and extending substantially the entire vertical extent thereof, a movable cover for closing said open end, said housing being formed with an opening in the lower portion of one side thereof but above the lower end of said dust bag, means forming an enclosure extending laterally from the lower portion only of said one side of said housing around said opening, a motor-fan unit mounted in said enclosure, wall means forming a storage bin disposed on the exterior of said one side of said housing and above said enclosure, means forming a filter housing extending vertically along the outer side of said enclosure and along at least a portion of said storage bin, said enclosure communicating with said filter housing, and a removable filter member forming an exterior wall of said filter housing.

2. In a vacuum cleaner, an elongated housing open at one end, means for supporting said housing in a substantially vertical position with said open end at the top, a dust bag supporting member within said housing, said member including a stiff rim supported by the upper end of said housing and an open mesh sack secured to said

rim and extending substantially the entire vertical length of said housing, a dust separating member comprising a bag of porous paper joined at its upper end to a cardboard disc, said paper bag being removably received within said bag supporting member with said disc supported on said stiff rim and removable therewith from said housing whereby the joint between said paper bag and disc is relieved of strain, a movable cover for closing said open end, means forming an enclosure communicating with and extending laterally from one side of said housing adjacent to the lower end thereof, a motor-fan unit mounted in said enclosure, an electric circuit for said motor, a switch carried by said cover and connected in said circuit, and an operating member for said switch biased to a position opening said circuit, said operating member being so located as to be displaced to a circuit closing position by contact with said disc when said cover is closed with a dust separating member positioned in said housing with said cardboard disc supported by the stiff rim of said bag supporting member, said operating member being spaced from said ring so as to remain in open circuit position when said cover is closed with no dust separating member so positioned in said housing.

3. In a vacuum cleaner, an elongated housing open at one end, means for supporting said housing in a substantially vertical position with said open end at the top, a dust bag supporting member within said housing, said member including a stiff rim supported by the upper end of said housing and an open mesh sack secured to said rim and extending substantially the entire vertical length of said housing, a dust separating member comprising a bag of porous paper joined at its upper end to a cardboard disc, said paper bag being removably received within said bag supporting member and removable therewith from said housing whereby the joint between said paper bag and disc is relieved of strain, a movable cover for closing said open end, means forming an enclosure communicating with and extending laterally from one side of said housing adjacent to the lower end thereof, a motor-fan unit mounted in said enclosure, a first electric circuit for said motor, signal means, a second electric circuit for said signal means, a two position switch carried by said cover and connected in both said circuits, and an operating member for said switch biased to a position opening said first circuit and closing said second circuit, said operating member being so located as to be displaced to a position closing said first circuit and opening said second circuit by contact with said disc when said cover is closed with a dust separating member in said housing, said operating member being spaced from said rim so as to remain in the first-mentioned position when said cover is closed with no dust separating member in said housing.

4. In a vacuum cleaner, an elongated housing open at one end, means for supporting said housing in a substantially vertical position with said open end at the top, a dust bag supporting member within said housing, said member including a stiff rim supported by the upper end of said housing and an open mesh sack secured to said rim and extending substantially the entire vertical length of said housing, a dust separating member comprising a bag of porous paper joined at its upper end to a cardboard disc, said paper bag being removably received within said bag supporting member and removable therewith from said housing whereby the joint between said paper bag and disc is relieved of strain, a movable cover for closing said open end, means forming an enclosure communicating with and extending laterally from one side of said housing adjacent to the lower end thereof, a motor-fan unit mounted in said enclosure, a first electric circuit for said motor, signal means, a second electric circuit for said signal means, a two position switch carried by said cover and connected in both said circuits, an operating member for said switch biased to a position opening said first circuit and closing said second circuit, said operating member being so located as to be displaced to a position clos-

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ing said first circuit and opening said second circuit by contact with said disc when said cover is closed with a dust separating member in said housing, said operating member being spaced from said rim so as to remain in the first-mentioned position when said cover is closed with no dust separating member in said housing, and a pressure responsive switch connected in said second circuit and responsive to an increase in the pressure drop of air passing through said dust separating member for closing said second circuit.

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