

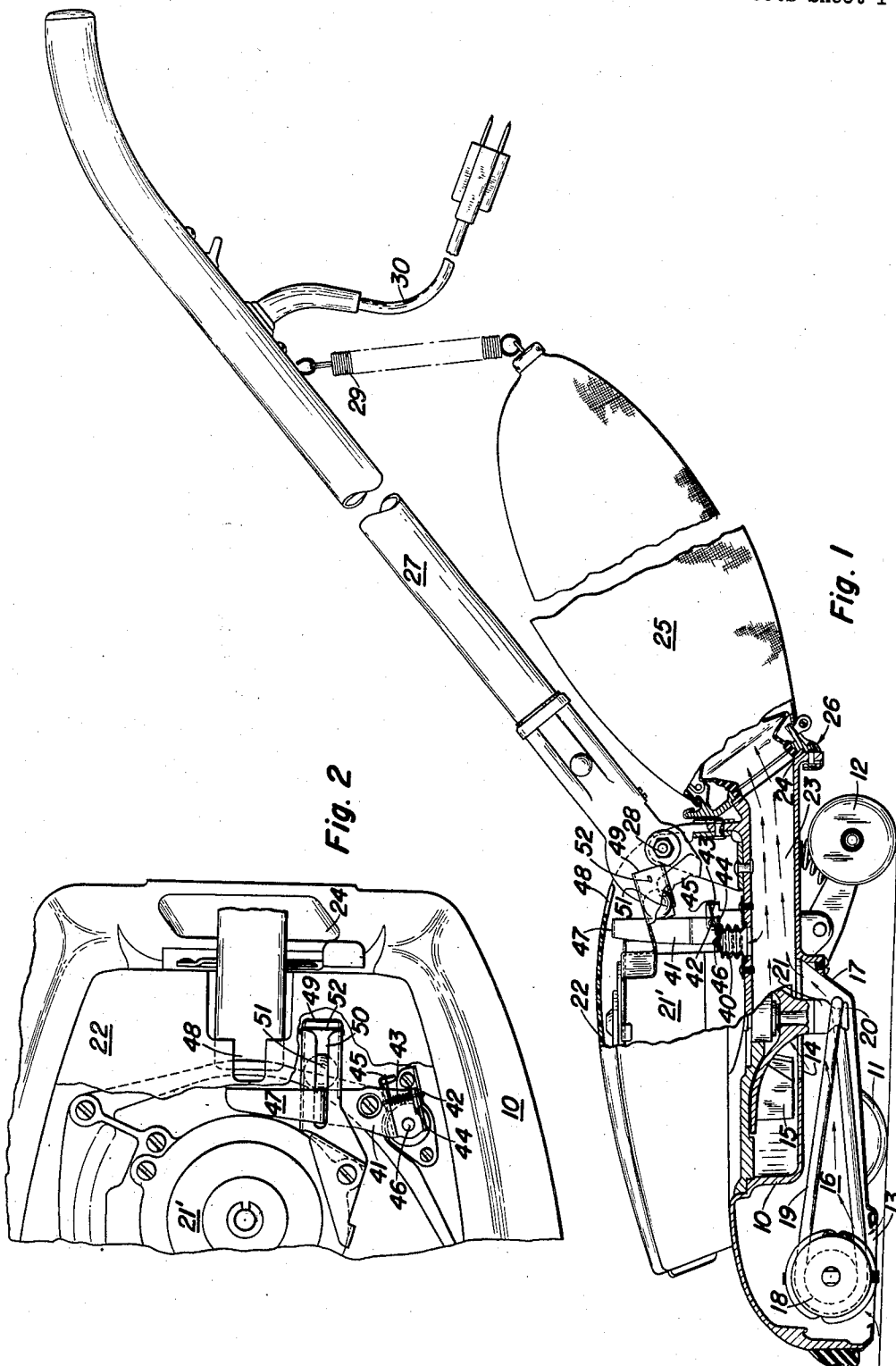
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L. E. SEGESMAN
SUCTION CLEANERS

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

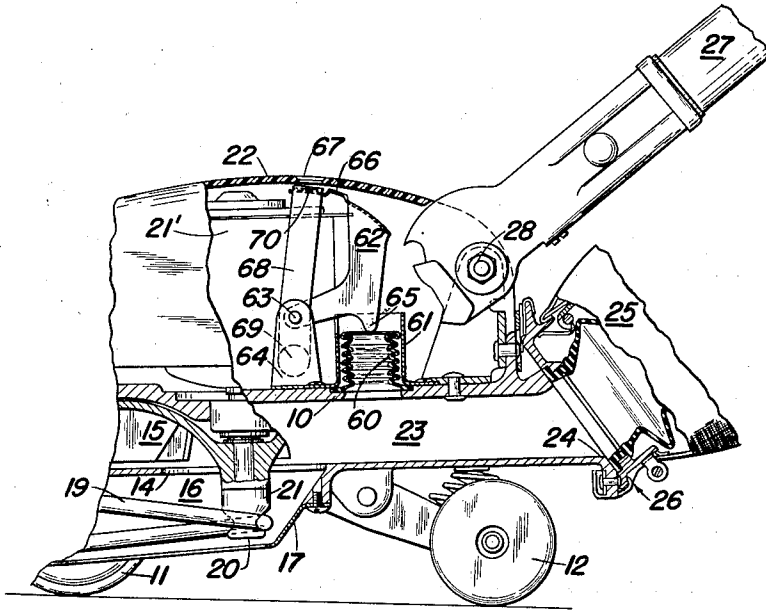


Fig. 3

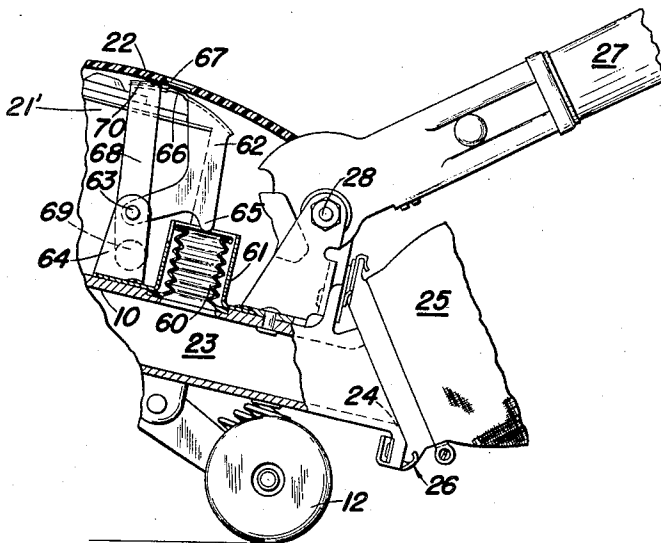


Fig. 4

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2,846,709

SUCTION CLEANERS

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5 Claims. (Cl. 15—339)

The present invention relates to suction cleaners and more particularly to back pressure indicators therefor.

The present invention relates specifically to a suction cleaner of the upright type which is propelled about over the floor during the cleaning operation. Such cleaners have a suction nozzle for contact with a carpet or other surface being cleaned and a filter bag by which the dust and dirt picked up by the nozzle is separated from the air stream.

As the dirt accumulates in the filter bag the resistance to air flow through the filter wall increases and eventually the cleaner will become inefficient in operation because of the reduced air flow through the cleaner.

The dirt clogging action in the cleaner bag may be compared to an imaginary valve placed across the exhaust outlet which may be gradually closed. When the imaginary valve is fully open the fan will be capable of moving a large quantity of air through the cleaner, and if the suction nozzle is sealed or substantially sealed the high suction or vacuum may be produced at the nozzle. If the imaginary valve is completely closed, no air will flow through the cleaner and the suction produced at the nozzle will be practically nil. At intermediate positions of the imaginary valve the resistance to air flow through the cleaner will vary with the valve setting and the suction produced at the nozzle will vary accordingly.

Thus, when the resistance to air flow through the filter bag by the accumulation of dirt therein becomes too great it is necessary that the filter be cleaned or replaced in order for the cleaner to operate efficiently.

As the resistance to air flow through the filter bag increases the back pressure in the exhaust passage will also increase. Thus, the back pressure in the exhaust passage may be used as a measure of the filtering capacity of the filter bag to indicate the need for its cleaning or replacement.

However, if the nozzle of the cleaner is sealed or substantially sealed, there will also be a small air flow through the cleaner with the result that the air pressure in the exhaust passage under such conditions might be as low as atmospheric pressure or slightly above. It is obvious that under such conditions the pressure in the exhaust passage would not be a true indication of the resistance of flow through the filter bag. It is also obvious that, as the cleaner is moved about over the floor during cleaning operations, the degree of sealing at the nozzle will vary widely and accordingly the pressure in the exhaust passage will also vary and not give a true indication of the dirt accumulation in the filter bag.

According to the present invention a back pressure indicator is provided in which it is necessary that the nozzle be raised from the floor to provide for the free flow of air through the cleaner before a correct indication of the dirt accumulation in the filter bag can be obtained.

The back pressure indicator of the present invention is in the form of a bellows located so as to communi-

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cate with the exhaust passage in front of the exhaust nozzle to which the filter bag is attached so as to be responsive to the pressure in the bag and thus measure resistance to the flow of air through the filter bag. The bellows actuates a signal device which is visible only when the suction nozzle of the cleaner is raised from the floor a sufficient distance to permit the free passage of air therethrough whereby the bellows will measure the true back pressure in the exhaust passage caused by the resistance to air flow through the filter bag and thus measure the accumulation of dust and dirt on the filter bag walls.

According to a preferred form of the invention the signal is locked out of operation until the nozzle is raised from the floor sufficiently to provide for the free flow of air through the nozzle, at which time the signal will become visible provided the resistance to air flow through the filter bag is great enough to cause the signal to operate. Thus, to get a correct indication of dirt accumulation in the filter bag it is necessary that the cleaner be in operation and that the nozzle be raised from the floor.

According to a preferred form of the invention it is merely necessary that the cleaner be tilted backwardly on its rear wheels while the cleaner is in operation. That action will release the signal device and a correct indication of dirt accumulation in the filter bag will be indicated. When the filter bag is comparatively clean the signal will not be visible but if the filter bag is dirty and needs cleaning or replacement the signal will then become visible.

Other objects and advantages of the present invention will become apparent as the description proceeds when taken in connection with the accompanying drawings in which

Fig. 1 is a vertical plan view of one embodiment of the suction cleaner of the present invention, partly in section to show the details of construction;

Fig. 2 is a top view of the cleaner of Fig. 1 with the motor hood removed to show the details of construction;

Fig. 3 is a partial view of a cleaner similar to that of Fig. 1 and showing a different form of signal device; and

Fig. 4 is a segmental view of the cleaner of Fig. 3 partly in section showing the signal in operative position.

Referring to the drawings, the reference numeral 10 represents the main frame or body of the suction cleaner of the present invention. The body 10 is mounted for ambulatory movement on front wheels 11 and rear wheels 12. The frame 10 is provided with a downwardly facing suction nozzle 13 communicating with the eye 14 of a fan 15 by means of a suction passageway 16 closed by a cover plate 17.

An agitator 18, of any suitable construction, is rotatably mounted in the nozzle 13 and is driven by a belt 19 encircling a pulley 20 on the end of a shaft 21 extending downwardly from the fan 15. The fan 15 is driven by a motor 21' housed within an appearance hood 22 suitably secured to the frame 10. The frame 10 is provided with an exhaust passage 23 and an exhaust nozzle 24 to which is attached a filter bag 25 by any suitable clamping means generally indicated by the reference numeral 26.

The cleaner is manipulated by means of a handle 27 pivoted to the rear of the frame 10 as at 28, the upper end of the bag 25 being attached to the handle 27 by means of a spring 29.

The motor 21' may be connected to a suitable electrical outlet by means of an electric conductor 30 attached to the upper end of the handle and having leads

extending downwardly through the handle to the motor terminals.

During normal operation the motor 21' is energized and the cleaner propelled about over the surface to be cleaned by means of the handle 27. The suction created by the fan 15 draws the surface covering upwardly against the nozzle 13 whereby dust and dirt is removed therefrom by the combined action of the rotating agitator 13 and the air being drawn through the surface covering by the suction produced by the fan 15. The dust laden air will pass through the suction passage 16, through the fan eye 14 and be discharged through the exhaust passage 23 into the filter bag 25 where the dust will be separated from the air which passes through the walls of the filter bag, the dust being deposited on the interior walls of the filter bag.

As the dust and dirt collects on the interior walls of the filter bag the resistance to the passage of air there-through increases with the result that back pressure within the exhaust passageway will gradually increase and eventually the efficiency of the cleaner will decrease to a point where it will be necessary to clean or replace the filter bag.

It is also obvious that the back pressure in the exhaust passage 23 will also be affected by the amount of air being handled by the fan 15 and that the latter is variable depending upon the type of surface covering being cleaned as well as upon the tightness of the seal between the surface covering and the nozzle 13 which will vary as the cleaner is moved about.

The increase of back pressure in the exhaust passage 23, as dirt accumulates in the filter bag, may be utilized to actuate a signal device to indicate that the filter bag needs cleaning or replacement. However, the above noted variations in the amount of air being handled by the fan 15 causes the back pressure in the exhaust passage 23 to give an incorrect indication unless the signal reading be taken when the air flow through the cleaner is the same for each time such a reading is taken.

According to the present invention, the signal reading cannot be taken unless the nozzle 13 is raised from the floor covering a sufficient distance to break the seal between the nozzle 13 and the floor covering so as to provide for an increased flow of air through the nozzle and cleaner when the signal reading is taken. In that way the back pressure in the exhaust nozzle 23 will be unaffected by variations in air flow caused by different floor coverings and by variations in the tightness of the seal between the nozzle 13 and the floor covering being cleaned.

According to the modification of Figs. 1 and 2, the above is accomplished by means of a flexible bellows 40 in open communication with the exhaust passage 23 so that the bellows 40 will expand and contract with variations in the back pressure within the exhaust passage 23.

A signal lever 41 is pivoted at 42 to the frame 10 and is spring biased counterclockwise by a light spring 43 having one end in engagement with an arm 44 of lever 41 and its other end in engagement with the bracket 45 upon which the lever 41 is pivoted. The arm 44 is provided with an opening through which a button 46 on the upper end of the bellows 40 extends so that the arm 44 and correspondingly the lever 41 will follow the movements of the bellows 40.

The bellows 40 and lever 41 are positioned to one side of the pivot point 28 for the handle 27 and the lever 41 has a laterally extending arm 47 extending to the center of the cleaner. The arm 47 may be provided with a red indicia visible through an opening 48 in the hood 22 under certain conditions as will presently appear, the hood 22 adjacent opening 48 normally screening the indicia from view.

Located to the rear of the lever 41 is an open-ended tube 49 having a slot 50 (Fig. 2) into which the lever

41 is moved by an upward movement of the bellows 40 as will presently appear.

Positioned within the tube 49 is a ball 51 which normally engages the arm 41 to hold the latter in its non-signalling position. The rear end of the tube 49 is closed by a pin 52 to prevent the escape of the ball 51 when the cleaner is tilted rearwardly, as will be presently described.

The tube 49 is inclined at an angle of about 15° to the horizontal so that normally the ball 51 is in engagement with the lever 41 to hold the latter in the position shown in Fig. 1 so that the indicia on the arm 47 will not be visible through the opening 48.

Often, during normal operation, the handle 27 may be pushed downwardly to lift the nozzle 13 over an obstruction which will permit the free flow of air through the cleaner, the handle joint being so constructed as to lift the nozzle by downward movement thereof. Also, the user may be instructed to periodically move the handle downwardly to lift the nozzle from the floor so as to get a correct indication of the dirt accumulation in the filter bag.

In either case, the ball 51 will roll rearwardly away from the lever 41 to permit its movement in accordance with the pressure conditions in the bellows 40. If the dirt accumulation within the filter bag is such that it needs cleaning or replacement, the back pressure in the exhaust passage 23 will be high so as to cause the bellows 40 to expand and pivot the lever 41 clockwise to move the indicia on the arm 47 beneath the opening 48 to indicate to the user that the filter bag needs cleaning or replacement.

The cleaner of the modification of Figs. 3 and 4 is the same as that of Figs. 1 and 2 except for the "time to empty" indicator. Where the parts are the same, the same reference numerals have been applied.

A bellows 60 is in open communication with the exhaust passage 23 so as to expand and contract with variations in pressure therein. The bellows 60 is enclosed within a housing 61 as shown in Fig. 3.

A signal arm 62 is pivoted at 63 to a bracket 64 attached to the frame 10. The arm 62 is provided with a projection 65 in engagement with the upper end of the bellows 60 so that the arm 62 will be pivoted counterclockwise upon expansion of the bellows 60. The arm 62 is provided with an indicia-carrying portion 66 adapted to be moved beneath an observation opening 67 in the hood 22 when the back pressure within the exhaust passage 23 rises to a sufficient extent.

The opening 67 is normally closed by a shield 68, also pivoted at 63 on the bracket 64. The shield 68 is provided with a counterweight 69 so that its upper end 70 closes the opening 67 when the cleaner is in its normal horizontal position, as shown in Fig. 3.

Pressure conditions within the exhaust passage 23 may be such as to cause the bellows 60 to expand and pivot the arm 62 counterclockwise to move the indicia portion 66 beneath the opening 67. However, with the cleaner in its normal horizontal position, the indicia 66 will not be visible because the upper end 70 of the shield arm 68 will be positioned below the opening 67.

As in the modification of Figs. 1 and 2, the nozzle may be periodically raised by the lowering of the handle 27. That will break the seal between the nozzle and the floor covering to permit a free flow of air through the cleaner except for the resistance of flow through the filter bag. If the dirt accumulation in the filter bag is sufficient to indicate the need for cleaning or replacement of the filter bag, the bellows 60 will expand because of the high back pressure in the exhaust passage 23. The expansion of the bellows 60 will pivot the arm 62 counterclockwise to bring the indicia 66 beneath the opening 67 as shown in Fig. 4.

As the cleaner is tilted backwardly, the counterweight 69 will move the shield arm 68 to the position shown

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in Fig. 4 so as to move the upper end 70 thereof from beneath the opening 67 whereby the indicia 66 will be visible to the operator provided the filter bag needs to be cleaned or replaced.

Thus, it is necessary for two conditions to exist before the signal is visible. The dirt accumulation in the filter bag must be such that the back pressure in the exhaust passage 23 will expand the bellows to rotate arm 62 to a position in which the indicia 66 is positioned beneath the opening 67 with the flow of air through the cleaner being unobstructed except for the resistance to flow through the filter bag. The cleaner must be tilted rearwardly to remove the upper end 70 of shield 68 from beneath the opening 67 to expose the indicia 66 to view provided the pressure conditions are such that the indicia 66 has been moved beneath the opening 67 by the action of the bellows as above described.

While only two embodiments of the invention have been shown and described, it is to be understood that those embodiments are to be taken as illustrative only and not in a limiting sense. I do not wish to be limited to the specific structures shown and described but wish to include all equivalent variations thereof except as limited by the scope of the claims.

I claim:

1. In a suction cleaner including a body having a downwardly facing nozzle for contact with a surface to be cleaned; said body being mounted in a substantially horizontal position for ambulatory movement over said surface; a suction fan for drawing air through said nozzle; an exhaust passage communicating with the pressure side of said fan and a filter for separating dust and dirt from the air flowing through the cleaner attached to said exhaust passage; the arrangement being such that the accumulation of dirt on the walls of said filter will cause a rise in back pressure in said exhaust passage; a pressure responsive device in communication with said exhaust passage and responsive to the pressure therein; a signal device connected to said pressure responsive device so as to be actuated thereby upon a rise in pressure in said exhaust passage to a predetermined value and blocking means for rendering said signal device invisible during normal operation of the cleaner and requiring that said predetermined pressure be applied to said pressure responsive device and that said body be tilted from its

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normal horizontal position in a direction to raise said nozzle from said surface before becoming operative to render said signal device visible.

2. In a suction cleaner according to claim 1 in which said pressure responsive device is a bellows in open communication with said exhaust passage, said signal device comprises an arm pivoted to said body positioned to be actuated by said bellows upon a rise in pressure therein to said predetermined value and said blocking means includes screen means on said body for normally screening said arm from view.

3. In a suction cleaner according to claim 2 in which said blocking means also includes means for locking said arm from movement and being responsive to said tilting of said body from its normal horizontal position to release said arm for movement from beneath said screen means.

4. In a suction cleaner according to claim 1 in which said blocking means includes movably mounted screen means and means responsive to said tilting of said body for moving said screen means to uncover said signal device for visual observation.

5. In a suction cleaner including a body having a downwardly facing nozzle for contact with a surface being cleaned, a suction fan for drawing air through said nozzle, an exhaust passage and a filter bag attached to said exhaust passage for separating dust and dirt from the air flowing through the cleaner; a pressure responsive device in said exhaust passage responsive to the pressure therein; a signal device connected to said pressure responsive device so as to be actuated thereby upon a rise in pressure in said exhaust passage to a predetermined value, and means normally preventing actuation of said signal device and responsive to a tilting movement of said body in a direction to raise said nozzle from the surface being cleaned to release said signal device for actuation by said pressure responsive device.

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