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G. E. LOFGREN

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VACUUM CLEANER

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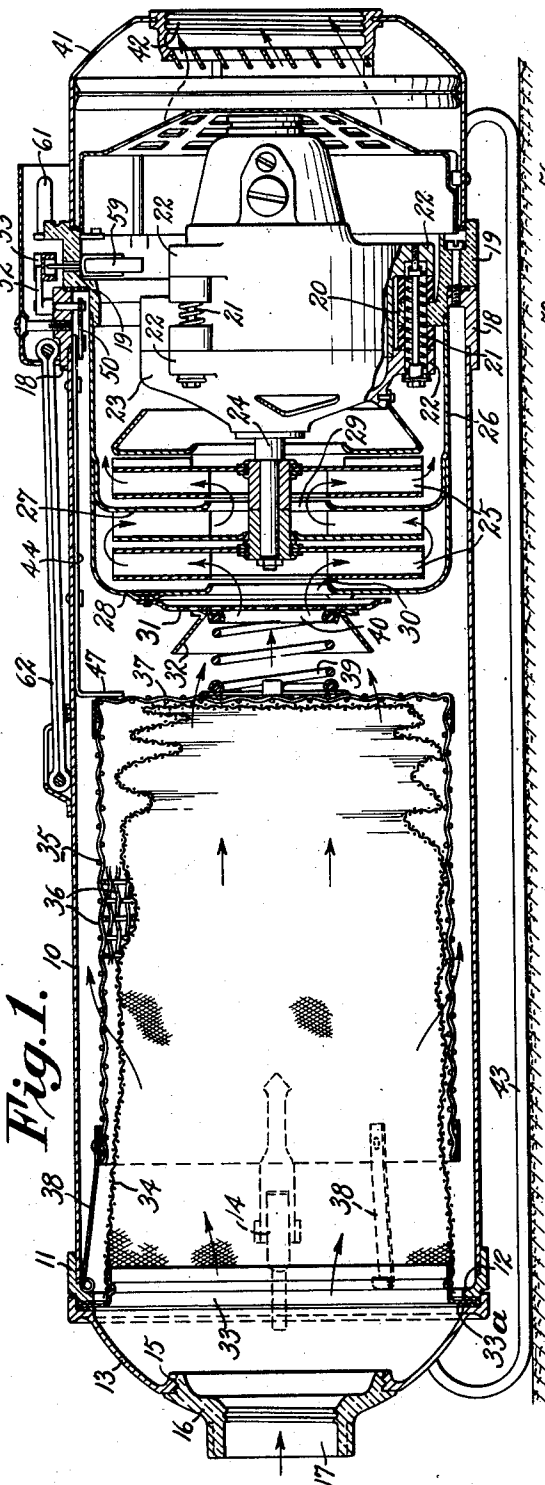


Fig. 2.

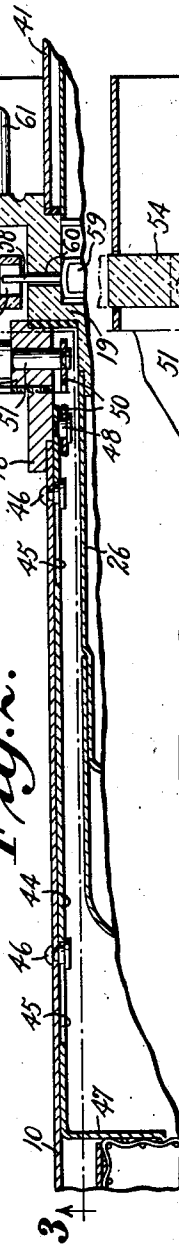
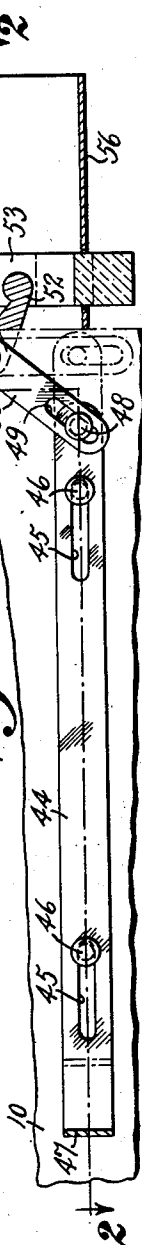


Fig. 3.



INVENTOR
Gustaf Einar Lofgren
BY
W. J. Skellum
his ATTORNEY

UNITED STATES PATENT OFFICE

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VACUUM CLEANER

Gustaf Einar Lofgren, Rye, N. Y., assignor to
Electrolux Corporation, Dover, Del., a corpora-
tion of Delaware

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14 Claims. (Cl. 183—37)

My invention relates to vacuum cleaners and particularly to electrically operated vacuum cleaners of the enclosed bag type.

In any vacuum cleaner in which the dust is separated from the air stream by passing the air through a dust bag or other fibrous dust separating member, the dust accumulates within the bag or against the member and offers an increasing resistance to the passage of air therethrough. In my copending application Serial No. 636,500, filed October 6, 1932, there is disclosed a vacuum cleaner including means for utilizing this increase in resistance to flow for operating a signal which informs the operator when sufficient dust has accumulated in the bag to require its emptying.

One of the objects of the present invention is the provision of improved means for making use of the increase in resistance to flow through the bag or other dust separating member.

Another object of my present invention is to provide means operable upon a predetermined increase of resistance to flow through the dust bag to open an electric switch in the motor circuit. This causes the motor to stop and it is necessary for the operator to clean the bag before the vacuum cleaner may be used further.

Further objects and advantages of my invention will be apparent from the following description considered in connection with the accompanying drawing of which:

Fig. 1 is a side view, chiefly in cross-section, of a vacuum cleaner including a preferred embodiment of my invention;

Fig. 2 is a cross-sectional view of an enlarged scale of a portion of the device shown in Fig. 1, and is taken on the line 2—2 of Fig. 3; and

Fig. 3 is a cross-sectional view taken on the line 3—3 of Fig. 2.

Referring more particularly to Fig. 1, reference character 10 designates a barrel member comprising the main part of a casing. Secured to one end of barrel 10 is a ring 11 provided with an inwardly extending annular flange 12. An end member 13 is adapted to be secured to ring 11 by means of spring clips 14, or by any other suitable fastening means. Member 13 is provided with a threaded central aperture 15 into which may be screwed a coupling member 16. Coupling 16 is likewise provided with a centrally threaded aperture 17 which is adapted to receive one end of a flexible hose, the other end of which is connected to any suitable type of suction mouth piece.

Secured to the other end of barrel 10 is a ring

18. Secured to ring 18 is a ring 19 of insulating material, such as bakelite. Ring 19 is provided with a plurality of lugs 20 having apertures therethrough for receiving springs 21. The ends of springs 21 are received in apertured lugs 22 formed on the housing of an electrical motor 23. Springs 21 thus serve to resiliently support the motor on the ring 19.

The motor 23 is provided with an armature shaft 24 on which is mounted a centrifugal fan comprising one or more rotors 25. Rotors 25 are enclosed within a fan housing 26 which is supported from ring 18 or otherwise. Housing 26 comprises a cylindrical portion and two transverse portions 27 and 28. Portion 27 is between the two rotors, while portion 28 is ahead of the first rotor. Portions 27 and 28 are provided with central apertures 29 and 30, respectively. Secured to transverse portion 28 so as to cover aperture 30 therethrough is a perforated plate 31. Mounted on plate 31 is a funnel-shaped member 32.

A ring 33 is provided with an outwardly extending annular flange 33a which is adapted to be clamped between flange 12 on ring 11 and end member 13. Secured to ring 33 is the open end of a more or less cylindrical dust bag 34. Bag 34 is made of suitable material, preferably cloth, which permits the passage therethrough of air but which is impervious to dust. Surrounding the greater portion of bag 34 within barrel 10 is a cage 35 having an open work cylindrical portion 36 and an open work end wall 37. A plurality of leaf springs 38, preferably three, are secured at one end to the open end of cage 35, while their other ends are adapted to contact the interior of barrel 10. Suitably secured to end wall 37 is a coil spring 39, the other end of which is provided with a ring 40 of insulating material, such as rubber. This end of spring 39 is adapted to be received within funnel-shaped member 32 and to be centered with respect to the barrel 10 thereby.

Secured to ring 19 in any suitable manner, as by spring clips similar to those shown at 14, is an end member 41. This member is provided with a threaded central aperture 42 which is adapted to receive coupling 16 when the device is used as a blower. The vacuum cleaner is supported on a surface by means of a pair of parallel runners 43 secured at one end to ring 11 and at the other end to ring 18.

As is more clearly shown in Figs. 2 and 3, a member 44 is slidably mounted within the upper part of barrel 10. Member 44 is provided with

one or more longitudinally extending slots 45 which engage rivets or the like 46. The forward end of member 44 is bent at right angles, as is shown at 47, so as to extend substantially radially of the barrel 10. This radially extending arm is adapted to be contacted by the rear wall 37 of cage 35. The other end of member 44 is provided with a pin 48 which is engaged within a slot 49 formed in one end of an arm 50. The other end of arm 50 is secured to a pin 51 which is journaled in ring 18 and extends through the ring. Secured to the outer end of pin 51 is an arm 52 which extends within a recess 53 formed in a switch operating or handle member 54. Member 54 is slidably mounted in a hood 56 and is provided with a lower recess 57 engaging a switch arm 58. Member 54 is longer than hood 36 is wide, so that one end or the other of the member extends outside the hood. One end of member 54 may be colored black while the other end may be red. Arm 58 is a part of a snap action electric switch 59 which is connected in the circuit of electric motor 23. As is characteristic with switches of this nature, arm 58 is retained in either one of two extreme positions. When it is moved from one extreme position towards the other, it offers resistance to such movement for about one-half of the distance between the two positions and then snaps suddenly to the other position. Thus, inasmuch as member 54 engages arm 58, it has similar movement. When the red end of member 54 is protruding from hood 56, the switch is closed. To open the switch, the red end is pushed in, thus moving arm 57 which, after having been moved about half way, snaps the remainder of the distance and causes the black end of member 54 to protrude. Obviously other designations than the red and black ends of member 54 may be used to indicate whether the switch is open or closed. Switch 59 is secured within ring 19 and arm 58 extends through a slot 60 in the ring. Electric contacts 61 are also supported on ring 19 and are adapted to receive a plug connected to an electric cable for supplying current to the electric motor. A carrying handle 62 is suitably secured to the upper side of barrel 10.

The operation of the above described device is as follows:

Assume that switch 59 is in its closed position. Under these conditions, member 54 is in the full line position shown in Fig. 3. Also, assume that the dust bag is clean, wherefore arm 52 is also in full line position. The operation of motor 23 causes fan 25 to draw air in through the opening 17 in coupling 16. If this opening is connected to a suitable suction mouth piece, as by a flexible hose, and this mouth piece is passed over a dusty surface, dust laden air will be drawn into the dust bag 34. This air passes through the dust bag while the dust is separated from the air stream and accumulates within the bag. The air is drawn into the fan through the perforations in plate 31 and through the opening 30 in transverse portion 28. The air is discharged from the fan around and through the motor, thereby cooling the motor and is discharged from the unit through opening 42.

The passage of air through the dust bag tends to inflate this member to its greatest length and thus the closed end of the dust bag presses against the end wall 37 of cage 35, and thus tends to move the cage to the right, as viewed in the figures, against the action of spring 39. When the dust bag is clean a comparatively small re-

sistance is offered to the passage therethrough of air and hence the tendency for the bag to move the cage against the action of spring 39 is comparatively small. The strength of spring 39 is so selected that under these conditions little or no movement of cage 35 takes place. As dust accumulates in bag 34 and the resistance to the passage of air through the bag increases, the cage is moved to the right, thus compressing spring 39. This movement is communicated through arm 47 to member 44 and slides the latter member to the right. This movement of member 44 causes arm 50, pin 51 and arm 52 to pivot in a counter-clockwise direction (as viewed in Fig. 3) and the end of arm 52 strikes member 54 and moves it upwardly, as viewed in Fig. 3. This movement of member 54 causes switch arm 58 to be moved. At first this movement is resisted and has no effect on the circuit through the switch, inasmuch as it is a snap action switch. However, after arm 52 has moved a certain distance and thus switch arm 58 has been moved a corresponding distance, about half its total travel, the mechanism of switch 59 suddenly causes arm 58 to be snapped suddenly in the same direction and to move member 54 to the position shown in dotted lines in Fig. 3. The switch is now opened and the motor stops which indicates to the operator that the dust bag should be emptied.

When the motor stops, and consequently the flow of air through the dust bag also stops, spring 39 forces cage 35 to the left, but inasmuch as arm 47 is not secured to the cage it is not moved. If the operator now presses the black end of member 54 inwardly, this movement pivots arm 52, pin 51 and arm 50 clockwise, as shown in Fig. 3, and thus moves member 44 and arm 47 to the left, as shown in the figures, and member 47 again contacts cage 35. This movement of member 54 also closes the switch, but if the dust bag has not been cleaned, the cage is again moved to the right and the switch is again opened. If, on the other hand, the dust bag has been cleaned, the cage will not be moved against the action of spring 39 and the switch will remain closed.

It will be noted that the recess 53 in member 54 is of sufficient extent so that the member 54 may be moved to the dotted line position while the arm 52 remains in the full line position. Hence, the operator may manually open the switch by pushing in the red end of member 54, while the dust bag is clean and hence arm 52 is in the full line position.

Springs 38 on the forward end of cage 35 are for the purpose of supporting this end of the cage within barrel 10 and spacing it from the barrel while allowing it to have sliding movement. Spring 39 supported within funnel-shaped member 32 serves to support the rear end of cage 35 and to space it from the barrel 10. This arrangement insures a free sliding of the cage, even though the barrel 10 is accidentally dented. The only part of the cage assembly which contacts the barrel is the springs 38, and if one of these springs should, in the movement of the cage, encounter a dent in the barrel 10, it would be deformed sufficiently to pass over the dent.

While I have described one more or less specific embodiment of my invention, it will be understood that this is for purposes of illustration only and that the scope of my invention is to be limited only by the appended claims viewed in the light of the prior art.

What I claim is:

1. The combination with vacuum cleaner apparatus including a fibrous dust separating member, means to produce flow of air through said dust separating member, an electric motor for operating said means and an electric switch for controlling the current supply to said motor, of means responsive to pressure drop through said dust separating chamber for actuating said switch.
2. The combination with vacuum cleaner apparatus including a fibrous dust separating member, means to produce flow of air through said dust separating member, an electric motor for operating said means and an electric switch for controlling the current supply to said motor, of resilient means movable in response to pressure drop through said dust separating member for actuating said switch.
3. In a vacuum cleaner including a casing, a distendable fibrous dust separating member in said casing, means for producing suction on said dust separating member, an electric motor for operating said means and an electric switch for controlling the current supply to said motor, a spring arranged to resist distention of the dust separating member, and means for opening said switch in response to distortion of said spring.
4. In a vacuum cleaner including a casing, a distendable fibrous dust separating member in said casing, means for producing suction on said dust separating member, an electric motor for operating said means and an electric switch for controlling the current supply to said motor, apparatus for opening said switch comprising a yieldable member arranged to press against said dust separating member and to be moved as the dust separating member is distended due to the passage of air through the casing, and means operatively connecting said member with said switch.
5. A vacuum cleaner comprising an air-tight casing, a distendable fibrous dust separating member in said casing, means for causing flow of air through said casing, an electric motor for operating said means, an electric switch for controlling the current supply to said motor, said switch having a movable operating member, a yieldable member arranged to press against said dust separating member and to be moved as the dust separating member is being distended due to the passage of air through the casing, a member slidably supported by said casing and arranged to be moved by said yieldable member, and means engaging said slidably supported member and engageable with the switch operating member for moving the latter to open the switch when said yieldable member has been moved a desired distance.
6. In a vacuum cleaner, an air-tight casing having an inlet opening and an outlet opening, means for producing flow of air through said casing, an electric motor for operating said means, an electric switch for controlling the current supply to said motor, a dust bag of pervious flexible material within said casing having one end open and the other end closed, means for securing the open end of said bag to said casing adjacent to said inlet, a yieldable member within said casing, the length of said bag being greater than the distance between the place where the bag is secured to the casing and said member, and means for opening said switch in response to movement of said yieldable member.
7. In a vacuum cleaner, an air-tight casing having an inlet opening and an outlet opening, a fan in said casing, a housing around said fan, an electric motor for driving said fan, an electric switch for controlling the current supply to said motor, a dust bag of pervious flexible material within said casing between said fan and said inlet, one end of said bag being open and the other end being closed, means for securing the open end of said bag to said casing adjacent to said inlet, and a resilient member secured to the front of said fan housing, the closed end of said dust bag being adapted to press against said resilient member when the bag is being inflated due to air flow therethrough, and means for opening said switch in response to movement of said member.
8. In a vacuum cleaner having an air-tight casing having an inlet opening and an outlet opening, a dust bag in said casing, means for causing flow of air through said casing, an electric motor for operating said means and an electric switch for controlling the current supply to said motor, apparatus for opening said switch when said dust bag should be cleaned comprising a cage having openwork wall structure disposed around and in contact with said bag, a yieldable member arranged to press said cage against said bag and to be compressed as the bag is inflated due to the passage of air through the casing, and means for opening said switch actuated by the movement of said cage.
9. In a vacuum cleaner, an air-tight casing having an inlet opening and an outlet opening, means for causing flow of air therethrough, a cage having openwork wall structure movably mounted in said casing in the path of air flow therethrough, a spring having one end secured to one end of said cage, means for supporting the other end of said spring centrally within said casing, resilient means for supporting the other end of said cage within and spaced from said casing, and a dust bag of pervious flexible material disposed in said cage.
10. In a vacuum cleaner, an air-tight casing having an inlet opening and an outlet opening, means for causing flow of air therethrough, a cage having openwork wall structure movably mounted in said casing in the path of air flow therethrough, a spring having one end secured to one end of said cage, means for supporting the other end of said spring centrally within said casing, a plurality of springs secured to said cage around its periphery adjacent to its other end for supporting said other end within and spaced from said casing, and a dust bag of pervious flexible material disposed in said cage.
11. In a vacuum cleaner, an air-tight casing having an inlet opening and an outlet opening, means for causing flow of air therethrough, a cage having openwork wall structure movably mounted in said casing in the path of air flow therethrough, a funnel-shaped member, means for supporting said member within said casing, a spring having one end secured to one end of said cage, the other end of said spring being adapted to extend into and to be supported by said funnel-shaped member, resilient means for supporting the other end of said cage within and spaced from said casing, and a dust bag of pervious flexible material disposed in said cage.
12. In a vacuum cleaner, an air-tight casing having an inlet opening and an outlet opening, means for causing flow of air therethrough, a cage having openwork wall structure movably mounted in said casing in the path of air flow

therethrough, a funnel-shaped member, means for supporting said member within said casing, a spring having one end secured to one end of said cage, the other end of said spring being adapted to extend into and to be supported by said funnel-shaped member, a plurality of leaf springs secured to said cage around its periphery adjacent to its other end for supporting said other end within and spaced from said casing, and a dust bag of pervious flexible material disposed in said cage.

13. In a vacuum cleaner, an air-tight casing having an inlet opening and an outlet opening, a fan in said casing for causing flow of air therethrough, a housing around said fan, means for operating said fan, a cage having openwork wall structure movably mounted in said casing in the path of air flow therethrough, a funnel-shaped member supported by said fan housing, a spring having one end secured to one end of said cage, the other end of said spring being adapted to extend into and to be supported by said funnel-

shaped member, resilient means for supporting the other end of said cage within and spaced from said casing, and a dust bag of pervious flexible material disposed in said cage.

14. In a vacuum cleaner, an air-tight casing having an inlet opening and an outlet opening, means for causing flow of air therethrough, an electric motor for operating said means, an electric switch for controlling the current supply to said motor, a cage having openwork wall structure movably mounted in said casing in the path of air flow therethrough, a spring having one end secured to one end of said cage, means for supporting the other end of said spring centrally within said casing, resilient means for supporting the other end of said cage within and spaced from said casing, a dust bag of pervious flexible material disposed in said cage, and means for opening said switch in response to movement of said cage against the action of said spring.

GUSTAF EINAR LOFGREN.