ABSTRACT

The invention provides a floor care appliance in which an auxiliary flow of air is introduced to floor care appliance mainstream air after the same has passed through the dirt bag, motor, and suction fan system. An advantageous arrangement is arrived at that provides a much lower air discharge temperature and an advantageous cooling of the cleaner body in the area of this air discharge.

10 Claims, 9 Drawing Figures
CLEANER WITH AUXILIARY AIR FLOW

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates, generally, to floor care appliances and, more specifically, relates to floor care appliances having an auxiliary air flow introduced to the floor care appliance for cooling purposes.

2. Description of the Prior Art

The use of auxiliary air flow for cooling purposes in electrically actuated floor care appliances is generally old and well known. Such auxiliary air flow has been utilized to cool the electric motor driving the fan generating suction, to separate a moist suction discharge on floor care machines from the motor compartment and to provide suction relief upstream from the electric motor to eliminate the possibility of motor burn-out by clogging of the dirt-laden suction stream. However, none of the aforesaid uses of auxiliary air have been found as effective for cooling the discharge air stream and its adjacent cleaner structure as an auxiliary air flow which is introduced directly into the pressure air flow immediately before the exhaust of the same from the floor care appliance.

Accordingly, it would be advantageous to provide a floor care appliance with an auxiliary cooling flow of air which was introduced into the exhaust air stream immediately prior to exhaust, thereby cooling only this stream and the floor care appliance structure located adjacent to it.

It would be advantageous to provide such an auxiliary stream with only a minimum of additional structural intricacy being added to the floor care appliance.

It would also be advantageous to provide such an auxiliary air flow of sufficient quantity without the imposition of a significant, additional fan horsepower requirement or the added heat of compression dictated by other auxiliary air systems so that the effective cooling of such an arrangement would permit the use of plastic for the housing of the cleaner and related parts and yet permit application of a high performance motor as a driving means for the fan system.

It would still be a further advantage of the auxiliary air introduction system that a reduction in suction air flow and a consequent increase in pressure air discharge temperature would be mitigated against by an increase in auxiliary air flow due to the drop of back pressure caused by the reduced pressure air flow. Thus, increased cooling air would be available when most needed.

SUMMARY OF THE INVENTION

In accordance with the principles of the invention, a floor care appliance, such as a canister cleaner, is provided in which cleaner air flow is caused to move through a filter bag contained in the cleaner, through a motor situated downstream of the filter bag and through a fan system for providing a pressure differential to urge dirt-laden air into the filter bag.

Disposed behind this fan system may conveniently be arranged an additional fan means that may be an actual fan structure or a "viscous" fan which motivates a secondary flow of auxiliary ambient air into the cleaner. Such air may be, advantageously, drawn through the rear of the canister cleaner by means of a louvered assembly so as to maintain this air flow discrete from the suction air flow being provided at the canister cleaner nozzle. The auxiliary air is discharged peripherally outwardly by this fan means so that it merges directly with the discharge or pressure air from the suction inducing fan system after it passes through that fan system, the motor, and filter bag. Exit louveres on the top side of the cleaner are utilized to lead the mixed suction air and auxiliary air to atmosphere discharge.

DESCRIPTION OF THE DRAWINGS

Reference may now be had to the appended drawings for a better understanding of the invention, both as to its organization and function, with the illustration being only exemplary, and in which:

FIG. 1 is a perspective view of a canister cleaner incorporating the invention;

FIG. 2 is a sectional elevational view of the invention with certain features shown schematically;

FIG. 3 is a plan view of the cleaner, partly broken away, with certain features shown schematically;

FIG. 4 is an enlarged, sectional, elevational view, generally of the fan section of the cleaner, with certain features shown schematically;

FIG. 5 is a cross-sectional elevational view taken on line 5—5 of FIG. 4, with certain parts removed and certain features shown schematically;

FIG. 6 is a cross-sectional elevational view taken on line 6—6 of FIG. 4, with certain features of the invention shown schematically;

FIG. 7 is a cross-sectional elevational view taken on line 7—7 of FIG. 4, with certain features of the invention shown schematically;

FIG. 8 is a cross-sectional elevational view taken on line 8—8 of FIG. 4, with certain features thereof shown schematically;

FIG. 9 is a partial cross-sectional elevational view taken on line 9—9 of FIG. 3, with certain features of the invention shown schematically.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIGS. 1, 2 and 3, there is shown a canister cleaner 10 having a split casing 12 forming an enclosure for the internal operating components of the cleaner 10. Rear wheels 14, 14 and front wheel 16 permit the cleaner 10 to be easily moved about the floor. Suction tube 18 (only partially shown) may conveniently terminate in a nozzle (not shown) for the pick up of grime or dirt encrusted in or present on the rugs or floors being cleaned. Handle 20 is provided at the front end of the cleaner 10 so that it may be easily carried by the user of the cleaner 10.

Exhaust louveres 22 are disposed in a top portion 23 of the split casing 12 to provide an exit arrangement for pressure air moved into the cleaner by the motivating means disposed therein. Auxiliary air intake louveres 24 are positioned in a rear face 25 of the cleaner 10 so as to provide a convenient entrance for the auxiliary air utilized in cooling in the instant invention.

The cleaner 10 includes a conventional dust bag 26 disposed upstream of an electric motor 28 so that the suction air moves through the dust bag into the motor as urged by a fan section 30 provided downstream from the dust bag 26 and motor 28.

The structure so far described is substantially conventional and the flow of suction air through the motor 28 is also substantially conventional. More specifically, suction air moves through the filter bag 26 and then
passes into the motor 28 by either moving into the motor 28 through an end bell 32 or by entering through a series of slots 34 extending longitudinally (axially) of the motor 28 or through apertures 36 disposed near the rear portion of the motor 28.

The inventive aspects of the cleaner 10 can now be more readily appreciated by referring to FIGS. 4 through 8. It can be seen therein that suction air flows outwardly of motor 28 substantially axially by being discharged through a casing end face 37 so as to be presented to an eye 39 of a centrifugal fan 38 of fan section 30. This fan discharges the partially pressurized air radially peripherally into a diffuser 40 so that the air can again be directed inwardly (radially) to be discharged axially into an eye 41 of a second centrifugal fan 42.

The fan 42, as well as the fan 38, are substantially conventional so that no further description of them will be offered, it being sufficient to note that the discharge from the second centrifugal fan 42 moves outwardly past a fan baffle 44 having struck-out peripheral directing vanes 46, each of which provides an aperture and a louver to maintain the pressure flow of the discharge air parallel to the axis of the cleaner 10 and spaced outwardly therefrom. The baffle 44 as well as the directing vanes 46 serve as a diffuser arrangement to convert a portion of the velocity of the pressure air to pressure and thereby reduces noise produced by this air stream. The baffle 44 may also include a series of integral dimples 47 which provide rigidity to its disk shape.

Air moves from the directing vanes 46 towards the rear of the cleaner and exhales through a passageway 48 provided by the radially inner termination of a fan housing 50 that covers and serves as a guard for the fans 38 and 40 as well as providing a closed chamber for directing the flow of air within it.

Auxiliary air enters through the auxiliary air intake louvers 24 (FIG. 2) and moves through a compartment 52 provided for a cord reel 54 or the like which may be utilized to store a power cord (not shown) for the cleaner 10. A baffle or partition 56 closes off the cord reel compartment 52 from the forward portion of the cleaner 10 so as to isolate the cord and power reel from the fan system 30, motor 28 and other parts of the cleaner 10.

The baffle or partition 56 (FIG. 4) includes a series of slots 58 formed centrally thereof in a hat-shaped portion 60 of the baffle 56. More specifically, an annular, axially extending projection is formed integrally with the partition 56, with the same providing an attachment means for an auxiliary air boot 62 which leads the flow of auxiliary air into an auxiliary fan 64.

Auxiliary air boot 62 includes a collar portion 66 of annular configuration which fits tightly against hat portion 60 of baffle 56 so that the auxiliary air flow is directed towards the auxiliary fan 64. Attached integrally to the collar portion 62 is a lead-in portion 68 that is formed by extending the collar portion 66 radially inwardly to terminate proximate the slots 58. Integral to the lead-in portion 68 is a second collar portion 69 that extends axially so that it forms a fairly tight seal with an outer, annular rim 70, formed on the fan baffle 44.

Both the annular rim 70 of the fan baffle 44 and the second collar portion 69 of the auxiliary air boot 62 are disposed centrally of the cleaner so that the auxiliary air fan 64 is mounted centrally relative to the eye of the second fan 42. A common shaft 72 may conveniently mount, in tandem, the fan 38, fan 42 and also the auxiliary fan 64 so that power is easily supplied to these fans through the shaft 72 from the motor 28.

The auxiliary fan 64 may be in the configuration of a paddle wheel with radially extending paddles 73 and also may be relatively thin in width since a large volume or air is not needed and since a portion of the auxiliary air flow will be provided merely by the fact that a confronting face 75 of fan 42 provides a viscous fan for the induction of auxiliary air flow. Thus, the additional auxiliary air flow required for cooling is conveniently supplied, primarily, by the simplified construction of auxiliary air fan 64. The flow of this auxiliary air is discharged between an inner face 77 of fan baffle 44 and the confronting face 75 of the second fan 42.

This discharged auxiliary air mixes with discharged pressure flow of air in the general volume of cleaner 10 afforded between the baffle 44 and the termination of the outer radial peripheral of the fan 42. It then moves through and further mixes, generally, in the area of the directing vanes 46. Additionally, mixing of this air may then occur downstream of this location in the area between the fan baffle 44 and an outer, annular portion 77 of the fan housing 50. The mixed air is discharged outwardly of the fan housing 50 by means of the aforementioned passageway 48 and then led therefrom through a chamber 74 formed by the baffle or partition 56, the fan housing 50 and the inner periphery of the cleaner casing 12.

This air then moves towards discharge through a pair of channel means 76 (FIGS. 2 and 9) each formed by an axially extending partition 78 and the inner surface of cleaner casing 12. This partition has an axial extent, generally, between the fan housing 50 and the front termination of the aforementioned exhaust louvers 22 so that air discharged from the cleaner 10 is exited over a wide area. A series of panels 80, 82 and 84 divide the width of each of the passage means 76 so that discharge air from the cleaner is also subject to dispersal between the individual channels formed by these panels.

The manner of operation of the cleaner 10 should now be readily apparent. Suction air passes through the suction tube 18, dust bag 26, motor 28, fan 38 and fan 42 to be discharged axially outwardly as a pressure flow from the fan baffle 44, with the directing vanes 46 providing the proper directive force to the air. This pressurized air then passes through the passageway 48, having already partially merged and mixed with the flow of auxiliary air being moved into the cleaner by auxiliary air fan 64.

Auxiliary air enters the cleaner 10 through the auxiliary air intake louvers 24, through the cord reel compartment 52 and from it through slots 58 formed in the baffle or partition 56. The auxiliary air is led from these slots through the auxiliary air boot 62 and from thence to the center or eye of the auxiliary air fan 64. The auxiliary air is imparted with centrifugal force by the auxiliary air fan to discharge this air flow radially outwardly of the auxiliary air fan 64 so that it moves between the fan baffle 44 and the outer face 75 of the second centrifugal fan 42. This air then mixes with the suction air as it exits through the fan baffle 44, with direction being given to the combined flow by the directing vanes 46.

The mixed air undergoes additional mixing in the passageway 48 and is discharged from the fan housing
50 through passageway 48 and led into the pair of channel means 76 and from thence to room atmosphere through the discharge louvers 22. Thus, the auxiliary air cools only the exhaust suction air and the cleaner portions downstream of the auxiliary air fan 64 so that air discharge temperature and the temperature of portions of cleaner housing 12 adjacent thereto are effectively reduced to eliminate operator injury or discomfort caused by impingement of any hot air flows and cleaner hot spots.

It should now be easily seen that the advantages set out for the invention in the beginning portion of this specification have been provided for by the structure related. It should also be clear that many modifications could be made to the cleaner structure described which would readily occur to one skilled in the art and which would fall within the spirit of the description offered. For example, the auxiliary air louvers 24 could be located differently or dispensed with entirely if the fitting for the cleaner housing parts was sufficiently loose so that the leakage of outside air would be of a sufficient quantity, as driven by the auxiliary air fan 64, to provide the desired reduction in temperature of the discharge air and surrounding cleaner structure. If a smaller temperature drop was required for the discharge air and its surrounding cleaner structure, the auxiliary air fan 64 could be dispensed with entirely and the flow of cooling air through the auxiliary air louvers 24 could be induced by the viscous fan means formed by the confronting face 75 of fan 42 so that this face would then serve as the auxiliary air fan means. Equally obvious other modifications would readily occur to one skilled in the art.

What is claimed is:

1. A floor care appliance for providing a suction flow of air for cleaning purposes having a casing and including:
   a. a motor and motor-driven suction fan means for providing said suction flow, said suction flow moving directly through a suction inlet for said casing and then through a filter means for said floor care appliance to then pass through said motor for cooling the same so that the temperature of the suction flow of air is thereby increased, said suction flow of air then passing through said motor-driven suction fan means to become a pressure flow of air,
   b. an auxiliary means for providing an auxiliary flow of air to said floor care appliance,
   c. said auxiliary fan means discharging said auxiliary flow of air to said pressure flow of air downstream of said motor, immediately adjacent the downstream discharge of said motor-driven suction fan means, for cooling said pressure flow, without impinging said auxiliary flow of air on said suction flow of air in the volume encompassed by said motor and between it and the discharge of said motor-driven suction fan means.

2. In a floor care appliance having an outer casing utilized for cleaning purposes;
   a. a motor and motor-driven fan suction means for providing a suction flow of air through said motor and a pressure flow of air discharged from said motor-driven fan suction means;
   b. said suction air moving through a suction inlet for said casing and then through a filter means for said floor care appliance to then pass through said motor for cooling thereof;
   c. a secondary flow of air directly induced by said motor-driven fan suction means and discharged directly into said pressure flow of air immediately downstream of said motor-driven fan suction means and within a fan housing means which encapsulates said motor-driven fan suction means, and is spaced radially inwardly of said outer casing, and
   d. said secondary flow of air being discharged into said pressure flow of air downstream of said motor means whereby said secondary flow of air does not pass through said motor means.

3. The floor care appliance of claim 1 wherein;
   a. said auxiliary fan means and said motor-driven pressure fan means are driven from a common shaft extending from said motor.

4. The floor care appliance of claim 1 wherein;
   a. the combined discharge flow of said suction flow and said auxiliary flow of air exits from said floor care appliance through spaced louvers formed in the top of the housing of said floor care appliance.

5. The floor care appliance of claim 1 wherein;
   a. an apertured fan baffle means is disposed downstream of said auxiliary fan means and said motor-driven suction fan means, and
   b. said auxiliary air flow is discharged into said pressure flow to provide a combined flow prior to movement of said flow through said apertured fan baffle means.

6. The floor care appliance of claim 5 wherein;
   a. said apertured fan baffle means includes directing vanes that direct said combined flow axially of said floor care appliance, and
   b. a chamber means disposed downstream of said apertured fan baffle means for providing for further mixing of said combined flow.

7. The floor care appliance of claim 6 wherein;
   a. a housing is provided for covering and forming said chamber means around said auxiliary fan means and said motor-driven suction fan means, and
   b. mixing of said auxiliary flow of air and pressure flow of air occurs within said housing.

8. The floor care appliance of claim 7 wherein;
   a. said apertured fan baffle means is disposed within said housing.

9. The floor care appliance of claim 8 wherein;
   a. a passageway means is provided from said fan housing, and
   b. said combined flow moves through said passageway means to be discharged from said floor care appliance.

10. The floor care appliance of claim 9 wherein;
    a. said floor care appliance includes a boot means for guiding said auxiliary air flow to said auxiliary fan means,
    b. said boot extending through said housing and opening to said auxiliary fan means.

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