VACUUM CLEANER WITH HEAT SINK IN AIR PATH

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ABSTRACT

A floor care appliance includes a nozzle assembly having a suction inlet, a canister assembly, a dirt collection vessel carried on the canister assembly, a suction generator carried on the canister assembly and a wand assembly connecting the nozzle assembly with the canister assembly. The wand assembly includes an inlet connected to the nozzle assembly, an outlet connected to the canister assembly and a conduit defining an air path between the inlet and the outlet. A heat sink carried on the wand assembly is provided in communication with the air path in the conduit. An electronic control is connected to the heat sink.
VACUUM CLEANER WITH HEAT SINK IN AIR PATH

[0001] This application claims the benefit of U.S. Provisional Application Ser. No. 60/977,218 filed on 3 Oct. 2007.

TECHNICAL FIELD

[0002] The present invention relates generally to the floor care equipment field and, more particularly to a floor care appliance incorporating a novel heat sink arrangement for dissipating heat produced by an electronic control.

BACKGROUND OF THE INVENTION

[0003] Upright and canister vacuum cleaners have long been known in the art to be useful for cleaning dirt and debris from bare floors, rugs, carpets and other above floor surfaces. Vacuum cleaners typically use a suction generator to draw dirt and debris into a dirt collection vessel such as a filter bag or dirt cup. The dirt collection vessel traps the dirt and relatively clean air is then returned to the environment. For most convenient operation, users typically wish to have the vacuum cleaner operating controls on the handle portion of the wand of a canister vacuum cleaner or the control handle of an upright vacuum cleaner. The present invention relates to a unique arrangement for dissipating heat typically produced by electronic controls such as those incorporating a circuit board and triac.

SUMMARY OF THE INVENTION

[0004] In accordance with the purposes of the present invention as described herein, an improved floor care appliance is provided. The floor care appliance comprises a nozzle assembly including a suction inlet, a canister assembly, a dirt collection vessel carried on the canister assembly, a suction generator carried on the canister assembly and a wand assembly connecting the nozzle assembly with the canister assembly. The wand assembly includes an inlet connected to the nozzle assembly, an outlet connected to the canister assembly and a conduit defining an air path between the inlet and the outlet. A heat sink is carried on the wand assembly in communication with the air path in the conduit. An electronic control is connected to the heat sink.

[0005] More specifically describing the invention, the wand assembly includes a handle section. The wand assembly may also include an optional telescoping section. Further, the wand assembly includes a hose section.

[0006] The conduit includes a wall having an opening. The heat sink is received in the opening. In one possible embodiment the heat sink is flush with an interior surface of the conduit. In another embodiment, the heat sink projects from the interior surface of the conduit into the air path. The heat sink may be mounted to the wand assembly by a fastener, by friction fit, by an adhesive or any other appropriate means.

[0007] Typically the heat sink includes an arcuate wall. In one possible embodiment the heat sink includes an arcuate wall having a first radius of curvature substantially equal to a second radius of curvature characteristic of the wall of the conduit.

[0008] Still further describing features of the invention, the nozzle assembly includes a rotary agitator. The electronic control includes a circuit board, a triac or even a circuit board and a triac.

[0009] In accordance with an additional aspect of the present invention a method is provided for cooling an electronic control on a vacuum cleaner including a wand assembly having a conduit defining an air path. The method comprises the steps of connecting the electronic control to a heat sink and securing the heat sink to the conduit so that the heat sink is in communication with the air path.

[0010] In the following description there is shown and described one possible embodiment of this invention, simply by way of illustration of one of the modes best suited to carry out the invention. As it will be realized, the invention is capable of other different embodiments and its several details are capable of modification in various, obvious aspects all without departing from the invention. Accordingly, the drawings and descriptions will be regarded as illustrative in nature and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The accompanying drawings incorporated herein and forming a part of the specification, illustrate several aspects of the present invention and together with the description serve to explain certain principles of the invention. In the drawings:

[0012] FIG. 1 is a partially cut away perspective view of the floor care appliance, in this instance a canister vacuum cleaner, constructed in accordance with the teachings of the present invention;

[0013] FIG. 2 is a top plan view, with cover removed, illustrating the internal structure of the canister assembly shown in FIG. 1;

[0014] FIG. 3 is a detailed perspective view of the handle section of the wand assembly and, more particularly, the conduit which defines a portion of the air path;

[0015] FIG. 4 is a detailed perspective view of the heat sink used in the present invention;

[0016] FIG. 5 is a detailed cross sectional view illustrating the heat sink of FIG. 4 mounted on the conduit of FIG. 3; and

[0017] FIG. 6 is a detailed perspective view of the structure illustrated in FIG. 5.

[0018] Reference is now made in detail to the present invention, an example of which is illustrated in the accompanying drawings.

DETAILED DESCRIPTION OF THE INVENTION

[0019] Reference is now made to FIG. 1 illustrating a floor care appliance 10 of the present invention. In the illustrated embodiment, the floor care appliance 10 takes the form of a canister vacuum cleaner. The canister vacuum cleaner 10 incorporates a unique structural arrangement that allows a heat sink 12 to efficiently dissipate heat generated by an electronic controller 14 (see also FIGS. 2-5) in a manner to be described in greater detail below.

[0020] The canister vacuum cleaner 10 includes a canister housing 16 that includes a receiver 18 for receiving a dirt collection vessel 20 used to collect dirt and debris in a manner known in the art. As illustrated in FIG. 2, the dirt collection vessel 20 is a filter bag. Alternatively, the dirt collection vessel 20 could take the form of a dirt cup (not shown). Such a dirt cup may include a cylindrical sidewall, a tangentially directed inlet and an axially directed outlet. Further a main, or primary filter may be provided in the dirt cup over the outlet. The filter may be cylindrically shaped and concentrically received within the sidewall of the dirt cup so as to provide an annular
space therebetween. The tangentially directed inlet promotes cyclonic airflow within this annular space to enhance the cleaning efficiency of the canister vacuum cleaner 10 equipped in this manner.

[0021] Referring back to drawing FIG. 2, the canister housing 16 also includes a compartment 22 that receives a suction generator 24. The canister vacuum cleaner 10 further includes a nozzle assembly 26. In the illustrated embodiment the nozzle assembly 26 includes a suction inlet 28, a rotary agitator 30 extending across the suction inlet 28, and an agitator drive motor 32. In the illustrated embodiment a belt (not shown) connects the agitator drive motor 32 to the rotary agitator 30. It should be appreciated that alternative drive systems such as an all gear drive could also be utilized.

[0022] A wand assembly, generally designated by reference numeral 36 connects the nozzle assembly 26 with the canister assembly 16. More specifically, the wand assembly 36 includes an inlet end 38 connected to the nozzle assembly 26, an outlet end 40 connected to the canister assembly 16 and a conduit 42 defining an air path between the inlet and the outlet. More specifically, the wand assembly 36 includes a handle section 44, a wand section 46, which may include a telescoping feature in a manner known in the art, and a flexible hose section 48. The conduit 42 extends through the handle, wand and hose sections 44, 46, 48.

[0023] As best illustrated in FIG. 3, handle section 44 includes a conduit wall 50 defining an internal air path 52. An opening 54 is provided in the conduit wall. The opening 54 provides communication with the air path 52. As illustrated in FIG. 4, the heat sink 12 includes an arcuate base 56 and an upstanding electronic component support 58. In the illustrated embodiment, the heat sink 12 also includes a pair of opposed mounting lugs 60. Each mounting lug 60 includes an aperture 62.

[0024] As best illustrated in FIGS. 5 and 6, the heat sink 12 is mounted to the conduit wall 50. More specifically, the base 56 of the heat sink is positioned in the opening 54 in the conduit wall 50. In the illustrated embodiment, the arcuate base 56 has a first radius of curvature that matches the radius of curvature of the conduit wall 50 and the base fits flush with the interior surface of the conduit 42. Fasteners such as screws 64 are used to secure the heat sink 12 in the opening 54. More specifically, the screws 64 extend through the apertures 62 in the lugs 60 and threadedly engage in the bosses 66 formed on the conduit 42 at opposite sides of the opening 54.

[0025] As further illustrated in FIGS. 5 and 6, the electronic control 14 is secured to the heat sink 12. In the illustrated embodiment the electronic control 14 comprises a printed circuit board 68 and an associated triac 70. An electrical connector 72 connects the electronic control 14 to the main wiring harness (not shown) and the other appropriate electrical components of the vacuum cleaner 10 including, for example, the suction generator 24.

[0026] During operation of the canister vacuum cleaner 10, dirt and debris is beaten from the nap of an underlying carpet by the rotary agitator 30. That dirt and debris is then drawn into the suction inlet 28 of the canister vacuum cleaner 10 by operation of the suction generator 24, which creates an air stream that entrains the dirt and debris. That air stream follows the air path 52 defined by the conduit 42 through the wand assembly 36. Eventually the air stream is delivered to the dirt collection vessel 20 where dirt and debris are captured and removed from the air stream. A clean air stream is then directed over the motor that drives the suction generator 24 in order to provide cooling. The air stream is then directed through a final filter 75 before being discharged back into the environment.

[0027] During operation of the vacuum cleaner 10, waste heat is generated by the electronic control 14 including, particularly, the triac 70. As illustrated, the triac 70 is mounted on the component support 58 of the heat sink 12 by a screw 74. Heat sink 12 is made from a material having a high thermal conductivity. Accordingly, the heat sink 12 functions to draw heat away from the triac 70. Since the base 56 of the heat sink 12 is received in the opening 54, the base of the heat sink is provided in fluid communication with the air path 52. Accordingly, the moving air stream functions to cool the heat sink 12 thereby removing the heat from the entire electronic control 14 and, accordingly, the handle section 44. This serves to increase operating comfort by eliminating any potential hot spots from the handle section 44.

[0028] The foregoing description of the preferred embodiment of the present invention have been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. Obvious modifications or variations are possible in light of the above teachings. For example, the heat sink 12 may include a portion 76 (see phantom line shown in FIG. 5) that projects from the interior surface of the conduit 42 into the air path 52 in order to provide still better cooling efficiency.

[0029] The embodiment was chosen and described to provide the best illustration of the principles of the invention and its practical application to thereby enable one of ordinary skill in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. All such modifications and variations are within the scope of the invention as determined by the appended claims when interpreted in accordance with the breadth to which they are fairly, legally and equitably entitled. The drawings and preferred embodiments do not and are not intended to limit the ordinary meaning of the claims in their fair and broad interpretation in any way.

What is claimed:

1. A floor care appliance, comprising:
   a nozzle assembly including a suction inlet;
   a canister assembly;
   a dirt collection vessel carried on said canister assembly;
   a suction generator carried on said canister assembly;
   a wand assembly connecting said nozzle assembly with said canister assembly;
   said wand assembly including an inlet end connected to said nozzle assembly, an outlet end connected to said canister assembly and a conduit defining an air path between said inlet end and said outlet end;

2. The floor care appliance of claim 1, wherein said wand assembly includes a handle section.

3. The floor care appliance of claim 2, wherein said wand assembly includes a telescoping wand section.

4. The floor care appliance of claim 3, wherein said wand assembly includes a hose section.

5. The floor care appliance of claim 2, wherein said wand assembly includes a hose section.
6. The floor care appliance of claim 1, wherein said conduit includes a wall having an opening and said heat sink is received in said opening.

7. The floor care appliance of claim 6, wherein said heat sink is flush with an interior surface of said conduit.

8. The floor care appliance of claim 6, wherein said heat sink projects from an interior surface of said conduit into said air path.

9. The floor care appliance of claim 1, wherein said heat sink is mounted to said wand assembly by a fastener.

10. The floor care appliance of claim 1, wherein, said heat sink is friction fit to said wand assembly.

11. The floor care appliance of claim 1, wherein said heat sink is adhered to said wand assembly.

12. The floor care appliance of claim 1, wherein said heat sink includes an arcuate base.

13. The floor care appliance of claim 6, wherein said heat sink includes an arcuate wall having a first radius of curvature substantially equal to a second radius of curvature characteristic of said wall of said conduit.

14. The floor care appliance of claim 1, wherein said nozzle assembly includes a rotary agitator.

15. The floor care appliance of claim 1, wherein said electronic control includes a circuit board.

16. The floor care appliance of claim 1, wherein said electronic control includes a triac.

17. The floor care appliance of claim 1, wherein said electronic control includes a circuit board and a triac.

18. A method of cooling an electronic control on a vacuum cleaner including a wand assembly having a conduit defining an air path, said method comprising: connecting said electronic control to a heat sink; and securing said heat sink to said conduit of said wand so that said heat sink is in communication with said air path.

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