MANEUVERABLE DOMESTIC CLEANING APPLIANCE

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ABSTRACT
An upright floor vacuum cleaner comprising (a) a base having a vacuum nozzle disposed for cleaning the floor; (b) an upright handle having one end thereof connected to the base for pivotal movement thereon about a generally horizontal axis; (c) a suction source operative, upon energization, to create a vacuum in said nozzle; and, (d) a plurality of freely rotatable wheels mounted on said base each fully casted about a vertical axis and operative to permit free omnidirectional movement in translation and rotation of the base on the floor.
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BACKGROUND

[0001] The present disclosure relates to domestic cleaning appliances, such as upright vacuum cleaners or sweepers which are easy to maneuver. One known type of upright vacuum cleaner is the “stick” or “broom” type which usually includes a self-contained power source or battery pack. Such vacuum cleaners may have a removable cup or container located in the upright handle for collecting dirt vacuumed from a floor instead of a replaceable filter bag. Another such known appliance is a sweeper which may also be provided with a suction motor. However, in a sweeper, the dirt container is mounted to the base, and not to the handle. Similarly, the power source, if there is one, is mounted to the base. Still other appliances of this sort are hard floor cleaners and carpet extractors. Stick or broom type vacuum cleaners, as well as sweepers, have the advantage or attraction of being lighter in weight and easier for the user to maneuver over a floor surface to be cleaned.

[0002] Stick or broom type upright vacuum cleaners have the handle connected to the base, or floor engaging portion of the vacuum cleaner, in a manner pivoting the handle on the base about an axis horizontal or parallel of the floor to be cleaned. Sweepers are similarly arranged. Thus, the upright handle has a single degree of motion i.e. pivoting in a single plane with respect to the base of the cleaning appliance.

[0003] Hereofore, such cleaning appliances with a single degree of freedom upright handle have employed a pair of rollers rotating about an axis parallel to the pivot axis of the handle. Some also included and may have an auxiliary wheel which is castered for facilitating rotation of the vacuum cleaner base about a vertical axis. The aforesaid wheel and caster arrangements of stick or broom type upright vacuum cleaners as well as sweepers have thus permitted translation movement of the cleaning appliance only in a direction perpendicular to the axis of rotation of the main wheels. Thus, sideways translation or lateral movement of the cleaning appliance has been precluded. This restriction on lateral movement or limitation of movement to a single back and forth direction has been found to be a disadvantage in floor cleaning. Additional maneuverability for such cleaning appliances over the surface to be cleaned has been desired.

BRIEF DESCRIPTION

[0004] A cleaning appliance comprising (a) a base having a vacuum nozzle disposed for cleaning the floor; (b) an upright handle having one end thereof connected to the base for pivotal movement thereon about a generally horizontal axis; (c) a suction source operative, upon energization, to create a vacuum in said nozzle; and, (d) a plurality of freely rotatable wheel assemblies or roller assemblies mounted on said base, each being fully rotatable about a vertical axis and operative to permit free omni directional movement in translation and rotation of the base on the floor.

[0005] A cleaning appliance comprising (a) a base portion including a nozzle; (b) an upright handle portion pivotally mounted to said base portion; (c) a vacuum generator disposed in one of said handle portion and the base and communicating with the nozzle; and, (d) a plurality of wheels or rollers mounted to the base portion for free rolling arrangement wherein an axis of each wheel or roller is mounted for full rotation about a generally vertical axis, or alternatively, socket mounted spherical rollers.

[0006] A cleaning appliance comprising (a) base portion including a suction nozzle for movement over a floor surface to be cleaned; (b) an upright handle pivotally mounted to the base and including a suction generator operatively connected to the suction nozzle; (c) a user removable dirt cup assembly including a filter disposed thereon associated with one of the upright handle and the base portion; and, (d) a wiper for agitating the filter during removal for effecting shaking of dirt from the filter into the dirt cup.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is an isometric external view of the upright vacuum cleaner of the present disclosure;

[0008] FIG. 2 is an enlarged front elevation view of the base portion of the vacuum of FIG. 1;

[0009] FIG. 3 is an enlarged exploded perspective view of the base portion of the vacuum cleaner of FIG. 1;

[0010] FIG. 4 is an isometric view of the mounting of a castared wheel of the vacuum cleaner of FIG. 1;

[0011] FIG. 5 is an exploded perspective view of the wheel mounting of FIG. 4 on a reduced scale;

[0012] FIG. 6 is an enlarged bottom view of the base portion of the vacuum cleaner of FIG. 1;

[0013] FIG. 7 is an enlarged side elevation view of a removable dust or dirt collector cup of the vacuum of FIG. 1;

[0014] FIG. 8 is a perspective view of the dirt cup of FIG. 7 showing a filter subassembly and with a conduit removed;

[0015] FIG. 9 is an enlarged perspective view from below of the filter subassembly of FIG. 8;

[0016] FIG. 10 is a perspective view from above of the filter subassembly of FIG. 9;

[0017] FIG. 11 is an enlarged perspective view of the filter compartment and the dirt cup compartment in the handle of the vacuum of FIG. 1;

[0018] FIG. 12 is an enlarged perspective view of a portion of the vacuum of FIG. 1 showing the installation of filter wipers in the handle;

[0019] FIG. 13 is an exploded perspective view of the handle assembly of the vacuum of FIG. 1; and,

[0020] FIG. 14 is an exploded view of a battery charger and holder for the vacuum cleaner of FIG. 1.

DETAILED DESCRIPTION

[0021] In the detailed description the domestic cleaning appliance will be discussed in the form of an upright vacuum cleaner. However, it should be appreciated that the appliance could also be a sweeper or a similar device. In addition, the disclosure is applicable to hard floor cleaners which employ a nozzle, as well as to carpet extractors and the like.

[0022] Referring to FIG. 1, an upright vacuum cleaner of the present disclosure is illustrated in an exemplary embodiment indicated generally at 10. More particularly, a “stick vac” is shown. However, it should be appreciated that the present disclosure is also applicable to other types of upright vacuum cleaners, as well as various other domestic floor care appliances. The vacuum cleaner includes a base or floor engaging portion indicated generally at 12 and a handle assembly generally indicated at 14. The handle assembly has an upper handle portion 16 and an enlarged lower section 18, which is pivotally connected to the base indicated generally at 12, as will hereinafter be described. The enlarged portion 18
of the handle has disposed therein a source of power such as a battery pack and a vacuum generator which may be of the form of a direct current motor driving a rotating fan, as will hereinafter be described in greater detail. Alternatively, the source of power and vacuum generator may be disposed in base 12.

[0023] Referring to FIG. 2, the floor engaging portion or base 12 has a platform or deck 20 with a cover or hood 22 disposed upon the pivotal connection of the handle lower portion 18. Shown in FIG. 2 is an optional floor engaging brush or wiper 24.

[0024] Referring to FIG. 3, the base 12 has the deck or platform 20 provided with three hollow castor receiving towers 28, 30, 32 thereon. Centrally disposed is a cradle 34 having spaced aligned bearing surfaces 36, 38 upon which are journaled oppositely disposed trunnions, such as trunnion 40 disposed on a handle barrel 42. The trunnion 40 is journaled in the bearing 38. An oppositely disposed trunnion (not shown) is similarly journaled in bearing 36.

[0025] Deck 20 has a floor nozzle aperture 44 formed therein, between the sides of the cradle 34. Also provided in the deck 20 is a slot 45 (shown in FIGS. 1 and 6) which communicates with the floor nozzle 44. This slot enables a pickup of larger items by the vacuum cleaner. A subassembly of nozzle forming pieces, indicated generally at 46, is secured to the cradle 34 to provide a suction nozzle on the deck 20. Handle barrel 42 has a passage 48 formed therein generally at right angles to the axis of the trunnion 40, which passage communicates at its lower end (not shown) with the nozzle passage formed by the subassembly 46. Connected to the passage 48 and secured thereto by suitable clamp members 52, 54 is a handle attachment tube or adapter 50. The pivoted handle barrel 42 and handle adapter 50 are covered by hood 22, which is secured on the deck 20 by a clamping band 52. It should be appreciated that the band 52 may also serve as a bumper for the platform 12.

[0026] It will be understood that the adapter 50 is hollow and has a passage 58 therethrough which communicates with the suction passage 48 in the barrel 42. Thus, an air path is defined from the floor nozzle aperture 44 upwardly through the adapter 50. It will be understood that, with the lower end of upright handle 10 connected to adapter 50, the handle 10 is pivoted on base 12 only about the axis of the trunnions journaled in bearing surfaces 36, 38 and this pivots only in a single plane about base 12.

[0027] Received in each of the castor towers 28, 30, 32 of the deck from underneath, is a respective caster from castor subassemblies 60, 62, 64 as will hereinafter be described.

[0028] Referring to FIGS. 4, 5 and 6, the castor subassembly 62 is received in a well 31 formed in the underside of castor tower 30. Caster subassembly 60 is received in a well 29 formed in the underside of caster tower 28; and, caster subassembly 64 is received in a well 33 formed in the underside of caster tower 32 as shown in FIG. 6. It should be appreciated that the castor subassemblies are countersunk in the base 12. While three such subassemblies are illustrated in this exemplary embodiment, other embodiments are also contemplated. A recessed area 66 can be defined in the bottom face of the base 12.

[0029] Referring to FIG. 5, the construction of the castor subassemblies 60, 62, 64 is indicated. It should be appreciated that the three subassemblies have the same construction. Typically, a plate 68 has a central hub 70 into which is received, such as by press-fitting, a needle bearing 72. Journaled into the bearing 72 is the upper end 74 of a contra curve axle member indicated generally at 76. Plate 68 is secured to the undersurface of the castor towers 28, 30, 32 by suitable fasteners such as screws 79 (not shown in FIG. 5, but see FIG. 6) received through the three apertures 78, 80, 82 provided in the plate 68. The lower portion or wheel axle portion 84 of axle 76 has disposed thereon a roller race bearing 86 which is received in wheel hub 88. Secured over wheel hub 88 is a floor wheel or cap member 90. While needle bearings and roller bearings have been described, it should be appreciated that sintered bearings can be used instead.

[0030] With reference again to the axle member 76, which can be a wireform or the like, it includes three straight sections connected by two bent portions. The first straight section is defined by the upper section 74. Connecting to it a first end of a second straight section 75 is a first bent portion 77. A second bent portion 79 connects a second end of the second straight section 75 to the third straight section, defined by the lower portion 84. A first mounting end 81 is located on the axle member 76. Also, a roll pin 83, or the like, is employed to hold the needle bearing 72 in the correct location on the axle member 76. To this end, an aperture 85 extends through the axle member 76 for accommodating the roll pin. Located on an opposite end of the axle member 76 is a second mounting end 87.

[0031] It should be appreciated that in this design, the axle member 76 includes reduced diameter sections 89a and 89b respectively on the upper end 74 and the lower end 84 for accommodating the bearings 72 and 86. Alternatively, the wheel bearings, such as 86 may be eliminated and the wheels journaled directly on the axle surface 89b. With this double curved design, the axle member 76 allows a low profile mounting of the wheel assembly 88, 90. Thus, despite the presence of two bearings 72 and 86, which enable unrestricted rotation or swiveling of both the axle member 76 and the wheel assembly 88, 90, the wheels do not space the base 12 so far from the floor surface being cleaned as to hinder the operation of the suction nozzle 44. Of course, the countersunk nature of the plate 68 in the deck 20 aids in this regard.

[0032] Although the presently disclosed embodiment utilizes fully castered axle mounted wheels, alternatively, socket mounted omni directional spherical rollers may be employed.

[0033] Referring to FIGS. 1, and 7-10, mounted to the enlarged diameter portion 18 of the upright handle 10 is a dirt cup assembly indicated generally at 92. Attached thereto is an air flow tube 94 which communicates at its upper end with the interior of the dirt cup, through aperture 96. A lower end of tube 94 is configured to be received over the upper end 58 of the adaptor 50 (see FIG. 3) for communicating suction air flow from the floor nozzle to the dirt cup.

[0034] Mounted to the upper end of the dirt cup 92 is a filter assembly, indicated generally at 98. This is mounted on an adaptor 100 which has a baffle or deflector 102 for deflecting dirt and foreign particles away from the filter to minimize direct impact thereon. The filter assembly 98, which can include a pleated filter material, is removable from the adaptor 100 for cleaning by snap tabs 106 provided on the adaptor.

[0035] Referring to FIGS. 11 and 12, the enlarged portion 18 of the upright handle is shown with the dirt cup assembly removed to illustrate the cover 106 for the filter assembly and a pair of stationary wipers 108, 110. These, upon removal of the dirt cup and filter assembly, wipe across the surface of the filter material 104 to provide an agitation. This action shakes the dirt or other material retained on the windward or under-
side of the filter and enables it to fall into the dirt cup. Extending into the filter cover 106 are the vanes 112 of a suction fan for directing flow upward, as will hereinafter be described. [0036] A release button 114 for permitting the filter cup assembly to be removed, is shown in FIG. 11. Upon pushing the release button 114, a spring 116 causes a partial ejection of the dirt cup assembly 92 to facilitate user removal thereof. In the illustrated exemplary embodiment, release button 114 operates a latch mechanism indicated generally at 118 in FIG. 13 for releasing the upper end of the dirt cup assembly 92. [0037] Referring to FIG. 13, the enlarged diameter portion 18 of the upright handle has a half shell portion 120 onto which is mounted a battery pack assembly 122. The half shell portion 120 also houses a vacuum or suction generator assembly indicated generally at 124 which includes a motor 126 and a motor driven fan 128. These are mounted over the filter cover to create air flow from the floor upwardly through the floor nozzle, tube 94, dirt cup 92 and filter assembly 98. The air is discharged through a cover or grill 130 disposed over an aperture 132 provided in the handle portion 18. The motor has terminals 127 thereon which engage corresponding terminals (not shown) on the battery pack 122. [0038] A motor switch, actuator rod and switch button assembly 134 are disposed in the upper handle for permitting the user to energize the motor from the battery pack by moving the remote switch button in the upper end of the handle, as denoted by reference numeral 136. [0039] Although the presently described embodiment has the dirt cup assembly, filter, vacuum generator disposed in the upright handle, these may, alternately, be disposed in base 12. [0040] Referring to FIG. 14, a charger assembly is indicated generally at 138. It includes a tray 140 having three apertures 142, 144, 146 therein, disposed in spaced arrangement thereabout and located to each provide clearance for receiving one of the casters 60, 62, 64 therein. The tray has provided thereon a tower 148, which has unshown electrical contacts provided thereon for engaging corresponding electrical contacts 150 provided on the undersurface of platform 26 (see FIG. 6). These are connected to the battery pack 122. The tray includes a receptacle 152 which is adapted to have an end of a charger cord which is connected to a remote charger 156 engaged therewith for recharging the battery. A support frame 158 has the tray 140 mounted thereon for supporting the tray when the vacuum cleaner is resting on the tray for charging. [0041] The present disclosure thus describes an exemplary embodiment of an upright vacuum cleaner having freely rotating, fully swiveled wheels for a wheeled base or platform. This allows for omni directional translation and rotation of the base section of the upright vacuum cleaner over a floor to be cleaned. In the embodiment disclosed, all of the wheel assemblies 60, 62, 64 are mounted inside the cover or hood 22. This construction allows for a smaller footprint for the base 12 in comparison to conventional nozzle base designs. [0042] Even though the handle assembly 14 only pivots on a single axis, extending through trunnion 40, the base 12 can be oriented in any desired direction by twisting the handle assembly around its longitudinal axis 170 (FIG. 1). In other words, while the handle only moves from a vertical orientation shown in FIG. 1 to an acute angle in relation to the floor surface which is being cleaned (such that handle adapter 50 enters a recessed area 172 defined in the hood 22, see FIG. 3) the base 12 can be freely rotated, due to the presence of the several casted wheel assemblies. [0043] The vacuum cleaner includes a dirt cup removable from the upright handle. Upon removal of the dirt cup, the wipers agitate the filter mounted to the dirt cup, to cause the dirt collection on the filter to fall into the cup. This reduces the messiness of emptying the dirt cup and cleaning the filter. [0044] The present disclosure describes an upright vacuum cleaner of the type having an on-board source of power for the vacuum generator or motor and with an upright handle pivotally connected to the floor engaging base for movement about an axis generally horizontal or parallel to the floor. The upright vacuum of the present disclosure has the base or floor engaging portion provided with three freely rolling wheels each fully casted and swivelable about a vertical axis to permit omni directional movement of the vacuum cleaner in translation and rotation. The upright vacuum of the present disclosure thus provides a highly maneuverable vacuum for cleaning a floor surface. The vacuum cleaner has a nozzle in the base which is connected to the vacuum generator for drawing dirt and foreign matter from the floor into a removable cup which may be conveniently emptied by the user. The cup has an air flow filter thereover which is agitated by wipers, upon removal of the cup, to shake dirt collected on the filter into the cup. [0045] The disclosure has been described with reference to an exemplary embodiment. Obviously, modifications and alterations will occur to others upon reading and understanding the preceding detailed description. It is intended that the exemplary embodiment be construed as including all such modifications and alterations in so far as they come within the scope of the appended claims or the equivalents thereof. 1. A cleaning appliance comprising: (a) a base having a vacuum nozzle disposed for cleaning the floor; (b) an upright handle having one end thereof connected to the base for pivotal movement thereon about a generally horizontal axis; (c) a suction source operative, upon energization, to create a vacuum in said nozzle and; (d) a plurality of freely rotatable wheel assemblies or roller assemblies mounted on said base, each being fully rotatable about a vertical axis and operative to permit free omni directional movement in translation and rotation of the base on the floor. 2. The appliance defined in claim 1, wherein said wheel assemblies each include wheels that are each mounted on an axle having a skewed orientation with respect to the floor. 3. The appliance defined in claim 2, wherein said axle comprises three straight sections connected by two bent sections. 4. The appliance defined in claim 2, wherein said axle is formed integrally from a one-piece member. 5. The appliance defined in claim 2, wherein each wheel is mounted on its respective axle by a first bearing and the axle is mounted to said base by a second bearing. 6. The appliance defined in claim 5, wherein said first bearing comprises a ball race bearing. 7. The appliance defined in claim 5, wherein said second bearing comprises a needle race bearing. 8. The appliance defined in claim 1, wherein said base includes a platform with said wheel assembly mounted thereto and said nozzle mounted thereon and a hood covering said platform and nozzle.
9. The appliance of claim 8, wherein said wheel assemblies are countersunk in said platform.

10. The appliance defined in claim 5, wherein said handle includes a removable dirt cup operative to receive dirt from said nozzle.

11. The appliance defined in claim 1, further comprising electrical contacts provided on said base for engaging an associated charger for re-energizing rechargeable batteries mounted to said handle.

12. The appliance defined in claim 1, wherein each of said wheel assemblies includes a wheel that is castered on a plate attached to said base.

13. The appliance defined in claim 12, wherein said wheel assemblies are all enclosed by a cover of said base.

14. A cleaning appliance comprising:
(a) a base portion including a nozzle;
(b) an upright handle portion pivotally mounted to said base portion;
(c) a vacuum generator disposed in one of said handle portion and said base portion and communicating with the nozzle; and,
(d) a plurality of wheels or rollers mounted to the base portion for free rolling arrangement wherein an axis of each wheel or roller is mounted for full rotation about a generally vertical axis.

15. The appliance defined in claim 14, wherein each wheel includes a first bearing.

16. The appliance defined in claim 14, further comprising a second bearing for mounting each wheel for swivelng about the vertical axis.

17. The appliance defined in claim 14, further comprising a one piece axle with contra curvature for mounting each wheel to said base portion.

18. The appliance defined in claim 14, wherein each wheel is mounted to a plate in a freely swiveling manner and wherein each plate is attached to the base in a countersunk manner.

19. A cleaning appliance comprising:
(a) base portion including a suction nozzle for movement over a floor surface to be cleaned;
(b) an upright handle pivotally mounted to the base and including a suction generator operatively connected to the suction nozzle;
(c) a user removable dirt cup assembly including a filter disposed thereon associated with one of the upright handle and the base portion; and,
(d) a wiper for agitating the filter during removal for effecting a shaking of dirt from the filter into the dirt cup.

20. The appliance defined in claim 19, wherein the filter is disposed over an open end of the cup.

21. The appliance defined in claim 19, wherein the filter has a pleated configuration.

22. The appliance defined in claim 21, wherein a plurality of spaced wipers are provided.

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