EUROPEAN PATENT SPECIFICATION

Date of publication and mention of the grant of the patent: 23.06.2010 Bulletin 2010/25

Application number: 04700897.4

Date of filing: 08.01.2004

Designated Contracting States:
DE ES FR GB IT

Priority: 10.01.2003 US 340691
24.09.2003 US 669214


Proprietor: Royal Appliance Mfg. Co. Glenwillow, OH 44139 (US)

Inventors:
- KISELA, David
  Cuyahoga Falls, OH 44223 (US)
- FARONE, Richard, C.
  Willoughby, OH 44094 (US)
- WALDRON, Sreven, D.
  Courtland, OH 44410 (US)
- WRIGHT, Michael, F.
  Stow, OH 44224 (US)
- SAUNDERS, Craig, M.
  Rocky River, OH 44116 (US)
- KALMAN, Jeffrey, M.
  Cleveland Heights, OH 44118 (US)
- TUFTS, Lindsey, Jr.
  Eastlake, OH 44095 (US)

Representative: Müller-Boré & Partner Patentanwälte
Grafinger Strasse 2
81671 München (DE)

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Description

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

[0001] The present invention relates to floor care devices. More particularly, the present invention relates to a combined floor mop and vacuum suction device.

DISCUSSION OF THE ART

[0002] A wide variety of products exist which are capable of cleaning hard surfaces, such as ceramic tile floors, hardwood floors, and the like. Many of these products comprise a directing handle and a sponge for absorbing a fluid cleaning composition. The sponge is rinsed periodically to remove dirt, soil, and other residues. These products are not designed to handle larger particulate material such as crumbs and the like. Such materials are removed either by use of a broom or by use of a vacuum cleaner.

[0003] Non-woven sheets have been used for dry dust-type cleaning, as disclosed, for example, in U.S. Patent Nos. 3,629,047 and 5,144,729. The sheets are designed to attract particulate dirt electrostatically and minimize the amount of residue left on the surface being wiped.

[0004] Recently, cleaning tools have been developed with disposable cleaning pads for removal of dirt from damp surfaces. For example, U.S. Pat. No. 5,094,559 describes a mop that includes a disposable cleaning pad comprising a scrubber layer for removing dirt from a soiled surface, a blotter layer for absorbing fluid after the cleaning process, and a liquid impervious layer positioned between the scrubber and blotter layers. During the cleaning action with the scrubber layer, the impervious sheet prevents fluid from moving to the absorbent blotter layer. After the cleaning action is completed, the pad is removed from the mop handle and reattached such that the blotter layer contacts the floor. This operation is time consuming for the user and involves the handling of a soiled, wet pad.

U.S. Pat. No. 5,419,015 describes a mop having removable, washable work pads. Each pad has an upper layer, which is capable of attaching to hooks on a mop head, a central layer of synthetic plastic microporous foam, and a lower layer for contacting a surface during the cleaning operation.

However, such tools are designed for light floor cleaning and are unsuited to handle large particles of dirt, such as pebbles, crumbs, and the like. There remains a need for a single device that is capable of removing quantities of dry dirt and larger particles, crumbs and the like from a floor surface and also of performing wet cleaning of the surface.

WO 98/23200 discloses a cleaning implement having a liquid delivery system, including a handle with first and second ends, a cleaning head member attached to the handle at the first end, and a sprayer nozzle preferably attached to the cleaning head member, independent of the handle, for providing increased directional control of the sprayer nozzle.

Further, DE 201 03 268 U1 describes a steam cleaner. The steam cleaner comprises an electrically heatable steam generator, a cleaning head connected to said steam generator via a pipe and a handle for conducting the steam cleaner. The steam generator is formed as a liquid reservoir, has an elongate shape and on its upper end the handle is located. On the lower end of the steam generator the cleaning head is located. The opening for the withdrawal of the steam and the hot water is located at the bottom of the steam generator. Additionally, it is possible to provide the steam cleaner with a suction device.

The present invention provides a new and improved floor cleaning device and method of use, which overcome the above-referenced problems and others and meet the above-stated needs.

SUMMARY OF THE INVENTION

[0005] In accordance with one aspect of the present invention, a cleaning device is provided. The device includes a handle assembly. A cleaning head is pivotally mounted to the handle assembly and configured for receiving a replaceable cleaning pad for collecting dirt from a floor surface to be cleaned. A spray nozzle is carried by one of the cleaning head and the handle assembly for delivering a cleaning fluid to a floor surface to be cleaned. A liquid delivery system is provided, communicating with the spray nozzle and being carried by at least one of the handle assembly and the cleaning head. A suction nozzle is carried by the cleaning head and the handle assembly. A dirt collection assembly, communicating with the suction nozzle, is provided for collecting dirt. The dirt collection assembly is carried by one of the handle assembly and the cleaning head. A source of suction is carried by the handle assembly and the cleaning head. The source of suction communicates with the dirt collection assembly and the suction nozzle. A switch for selectively actuating the source of suction is provided. The source of suction operates only when the switch is in a first position. The switch comprises a second position, and wherein when the switch is in the second position, the flow of working air is stopped and the liquid delivery system is actuated.

In accordance with another aspect of the present invention, a method of cleaning a surface with a device comprising a handle assembly and a cleaning head pivotally attached to the handle assembly, and a cleaning liquid delivery system mounted to at least one of the handle assembly and the cleaning head and communicating with a spray nozzle carried by one of the handle assembly and the cleaning head is provided. The method includes spraying a cleaning solution on the surface. The cleaning head is directed over the surface with the handle assembly such that dirty cleaning solution from the surface is...
transferred to a cleaning pad selectively mounted on the cleaning head. Dirt and dirty cleaning solution are selectively suctioned from the surface through a suction nozzle carried by one of the cleaning head and the handle assembly. The suctioning and applying steps are controlled by a switch. The suctioning step includes the subsidiary step of moving the switch to a first position, which causes suction to be applied to the suction nozzle and prevents the liquid delivery system from applying cleaning solution to the surface. The applying step includes the subsidiary step of moving the switch to a second position in which the suction is not applied to the suction nozzle and the liquid delivery system is caused to apply cleaning solution to the surface.

In accordance with another aspect, a cleaning device is provided. The device includes a housing. A suction fan and motor assembly is mounted to the housing. A cleaning head is pivotally mounted to the housing. The cleaning head selectively holds a cleaning pad for collecting dust and debris from a surface to be cleaned. A suction nozzle is carried by the cleaning head or the housing. A dirt collecting receptacle is mounted to the housing and in fluid communication with the suction nozzle and the suction fan and motor assembly. At least one spray nozzle is disposed on at least one of the suction nozzle, housing, and the cleaning head.

In accordance with another aspect, a cleaning device is provided. The device has two modes of operation. A first mode of operation comprises suctioning debris from a surface to be cleaned. A second mode of operation comprises application of a cleaning solution to the surface. The device comprises a housing and a cleaning head pivotally mounted to the housing. A cleaning pad is selectively mounted to the cleaning head for collecting dust and debris from a surface. A spray nozzle is carried by one of the cleaning head and the housing. A suction nozzle is carried by one of the cleaning head and the housing. A dirt collecting receptacle is mounted to the housing and in fluid communication with the suction nozzle and the suction fan and motor assembly. At least one spray nozzle is disposed on at least one of the suction nozzle, housing, and the cleaning head.

The advantages of the present invention will be readily apparent to those skilled in the art, upon a reading of the following disclosure and a review of the accompanying drawings.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0006] FIGURE 1 is a front perspective view of a first embodiment of a floor cleaning device not forming part of the present invention;

[0007] FIGURE 2 is an exploded perspective view of the floor cleaning device of FIGURE 1;

[0008] FIGURE 3 is an enlarged perspective view of the lower end of the cleaning device of FIGURE 1, showing a suction nozzle in a raised position, with a spray nozzle shown displaced from the suction nozzle, for clarity;

[0009] FIGURE 4 is an enlarged side view in cross section of a lower end of the cleaning device of FIGURE 1;

[0010] FIGURE 5 is an enlarged exploded perspective view of a lower portion of the floor cleaning device of FIGURE 1;

[0011] FIGURE 6 is a bottom plan view of an alternative embodiment of a floor cleaning pad attached to a lower surface of a cleaning head of a floor cleaning device, with one corner of the pad peeled back to reveal its multilayer construction; not forming part of the invention

[0012] FIGURE 7 is an enlarged exploded perspective view of part of a handle assembly of the floor cleaning device of FIGURE 1;

[0013] FIGURE 8 is an exploded perspective view of a fluid delivery system for the cleaning device of FIGURE 1;

[0014] FIGURE 9 is exploded perspective view of a cleaning fluid reservoir of the floor cleaning device of FIGURE 1;

[0015] FIGURE 10 is an enlarged side sectional view of an upper portion of a handle assembly of the floor cleaning device of FIGURE 1;

[0016] FIGURE 11 is an exploded perspective view of the upper portion of a handle assembly of FIGURE 10;

[0017] FIGURE 12 is an enlarged exploded rear perspective view of a dirt cup assembly of the floor cleaning device of FIGURE 1;

[0018] FIGURE 13 is a reduced front exploded perspective view of the dirt cup assembly of FIGURE 12;

[0019] FIGURE 14 is an enlarged exploded perspective view of a filter and frame of the dirt cup assembly of FIGURE 13;

[0020] FIGURE 15 is an enlarged exploded perspective view of a suction fan and motor assembly of the floor cleaning device of FIGURE 1;

[0021] FIGURE 16 is a schematic view of an alternative embodiment of a fluid delivery system for the cleaning device of FIGURE 1 or FIGURE 17;

[0022] FIGURE 17 is a perspective view of a cleaning head and lower portion of a housing of a cleaning device according to the present invention;

[0023] FIGURE 18 is an enlarged perspective view of the suction nozzle of the cleaning device of FIGURE 17;

[0024] FIGURE 19 is an enlarged perspective view of the handle of the cleaning device of FIGURE 17;

[0025] FIGURE 20 is a perspective view of a cleaning device not forming part of the present invention;

[0026] FIGURE 20A is an enlarged side sectional view of the clip of FIGURE 20 with the suction nozzle attached;

[0027] FIGURE 21 is a perspective view of a battery pack of FIGURE 22;

[0028] FIGURE 22 is a perspective view of a different embodiment of a floor cleaning head of a floor cleaning device, with one corner of the pad peeled back to reveal its multilayer construction; not forming part of the invention

[0029] FIGURE 22A is an enlarged front elevational view of the battery pack of FIGURE 22;

[0030] FIGURE 23 is a perspective view of a different
embodiment of a cleaning device according to the present invention; and

[0031] FIGURE 24 is a side elevational view of the cleaning device of FIGURE 23, showing a cleaning head and pad attached.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0032] Referring now to the FIGURES, wherein the showings are for purposes of illustrating several preferred embodiments of the invention only and not for purposes of limiting the same, FIGURE 1 illustrates a floor cleaning device 10 suited to the cleaning of vinyl, ceramic, and finished wood floors, and other hard surfaces. The floor cleaning device 10 incorporates both mopping and suction functions, allowing an operator to change rapidly from dirt suctioning to mopping.

[0033] The cleaning device 10 includes a cleaning head 12 for contacting a floor surface 13 to be cleaned, and an elongate handle assembly 14, which is pivotally attached to the cleaning head by a universal joint 16, best shown in FIGURE 2. During floor cleaning, the handle assembly 14 is positioned at an acute angle to the direction of travel of the cleaning head 12, for directing the cleaning head across the floor surface.

[0034] A suction nozzle 18 extends forward of a leading edge 20 of the cleaning head 12 for suctioning dirt from the floor surface. In one embodiment, the suction nozzle is movable between a floor suctioning position, illustrated in FIGURE 2, and a raised position, illustrated in FIGURE 3. One or more spray nozzles 22 are mounted to the cleaning device for delivery of a spray of cleaning fluid onto the floor surface adjacent the cleaning head. In the illustrated embodiment, the spray nozzle 22 is attached to an upper end of the suction nozzle 18. In the case of a movable suction nozzle, the spray nozzle is thus movable with the suction nozzle. In an alternative embodiment, the spray nozzle is attached to an upper surface of the cleaning head 12, to the universal joint 16, or elsewhere on the cleaning device for delivering a spray of a cleaning fluid to the floor surface. In yet another embodiment, the spray nozzle clips onto the cleaning head, allowing it to be removed from the device when not in use. The spray nozzle 22 can produce a fine spray which contacts the floor forward of the cleaning head 12. The spray created by the nozzle(s) 22 may be a fluidic oscillating spray, a fan angled spray, or a uniform distribution spray, as desired. In one embodiment, an oscillating spray is employed which delivers cleaning fluid across a fan-shaped area over about 52° forward of the cleaning head. One suitable spray nozzle for generating such an oscillating fan pattern is a fluidic oscillator obtainable from Bowles Fluidics Corp., 6625-T Dobbin Rd, Columbia, MD 21045. The cleaning head 12 picks up at least a portion of the sprayed cleaning fluid, together with dirt loosened from the floor surface. As shown in FIGURE 5, the spray nozzle 22 can be carried by a spray tip cover 24, which is removably attached to the upper end of the suction nozzle 18, although other attachment means are also contemplated.

[0035] The cleaning fluid can be a liquid, such as water or a suitable conventional cleaning solution. Suitable cleaning liquids include those marketed by Procter and Gamble and by Clorox for use with their Swiffer™ Wet Jet and ReadyMop™ floor cleaning devices. For example, the cleaning fluid can include a detergent in water for improving the removal of dirt from the floor. The cleaning liquid may include other additives, such as antimicrobial agents, bleaches, and the like. For cleaning wood floors, the cleaning fluid can be formulated to minimize damage to the floor and may include a wax or other wood floor coating ingredients.

[0036] With reference to FIGURE 1, the handle assembly 14 includes an upper handle portion 26 and a housing 28, which is mounted to a lower end of the upper handle portion and to the universal joint 16. As shown in FIGURES 4 and 7, the housing 28 accommodates a source of suction 30, such as a fan and motor assembly, a dirt collection assembly 32, a power source 34, such as one or more replaceable/rechargeable batteries, a cleaning fluid supply reservoir 36, and a cleaning fluid delivery pump 38, each of which will be described in greater detail below.

[0037] With reference once more to FIGURE 2, the universal joint 16 permits rotation of the cleaning head 12 relative to the handle assembly 14 about two rotational axes, as indicated by arrows R1 and R2. The rotational axes are angularly spaced, preferably by about 90°. As shown in FIGURE 5, the universal joint 16 includes a first rotational joint or clevis 39 comprising first and second spaced and generally parallel arms 40, 42, which extend downward from opposite sides of a central portion 44. The arms 40, 42 receive disk-shaped pivot pins 50 which are also received in respective aligned apertures 51, 53 positioned in spaced flanges 52, 54 extending upward from the cleaning head 12. In other words, the clevis 39 is rotatably mounted on the cleaning head 12. The handle assembly 14 is thus able to pivot forward or rearward, relative to the cleaning head 12, as shown by arrow R1 in FIGURE 2.

[0038] The universal joint 16 includes a second clevis or rotational joint 55, oriented perpendicular to the first clevis 39. The second clevis 55 includes first and second spaced and generally parallel arms 56, 58, similar to arms 40, 42, which extend upward from an opposite face of the central portion 44 to the arms 40, 42. The arms 56, 58 are pivotally connected to flanges 60 (see FIGURE 2) at a lower end 64 of the housing 28 by pivot pins 66. This allows the handle assembly 14 to pivot relative to the universal joint 16 as shown by arrow R2 (FIGURE 2). The second rotational joint 55 thus has a rotational axis generally perpendicular to the axis of the first rotational joint 39. It will be appreciated that other conventional methods of attachment of the handle assembly 14 to the cleaning head 12 are also contemplated. The central por-
tion 44 includes a large aperture 68 for accommodating a hose, as will be discussed below.

[0039] For floor mopping operations, the cleaning device 10 can be maneuvered, for example, forwards and backwards or side to side by moving the handle assembly 14 as required. As a result, the movement of the handle will be translated, via the universal joint 16, to the cleaning head 12.

[0040] With reference once more to FIGURE 5, the cleaning device 10 accepts a cleaning pad 70, which is removably attached to the cleaning head 12 such that it covers a generally flat lower surface 72 of the cleaning head. The lower surface 72 can be defined by a rectangular plastic or foam plate 73. The cleaning pad 70 may be formed from multiple layers or be a single sheet of material. In one embodiment, the pad 70 has a multilayer construction including an upper layer 70A, formed from a water impermeable material, such as plastic and an intermediate layer 70B is formed from a highly absorbent material, such as a synthetic plastic microporous foam. A lower layer 70C includes extension portions 74, which extend beyond the perimeter of the upper layers such that the layer 70C can be wrapped around the cleaning head 12 and releasably attached to an upper surface 75 of the cleaning head, as described below.

[0041] The lower layer 70C can be formed from a fabric which is sufficiently durable such that the layer will retain its integrity during the cleaning process. It is permeable to water and other liquids, which pass through the lower layer into the absorbent layer 70B, where they are trapped. The pad is preferably disposable, although reusable pads, which can be cleaned by washing, are also contemplated. It is also contemplated that different types of pad may be used depending on the type of cleaning to be performed. For example, if the user plans to do only dry cleaning at a particular time, a pad 70 comprising an electrostatic layer suited to picking up dry dirt may be employed. Such pads are particularly suitable for removal and entrapment of dust, lint, hair, grass, and the like. Pads particularly suited to polishing and/or buffing wood floors may be selected for wood floor cleaning operations.

[0042] With continued reference to FIGURE 5, the upper surface 75 the cleaning head 12 may be defined by a support plate 76, formed from metal or plastic, which is attached at a lower surface thereof to the plate 73. Gripping members or clips 78 are provided on the upper surface 75, or elsewhere on the cleaning head, for releasable gripping the pad 70. Specifically, the gripping members can each include a slit or slits 79 in a deformable material which allow the extension portions 74 of the pad to be pushed into a hole created by temporary deformation of the area around the slit when the gripping member is pressed. The gripping members may be removably attached to the support plate 76 (for example, using corresponding threaded regions, as shown) to allow the gripping members 78 to be replaced by gripping members of the same or of a different type.

[0043] FIGURE 6 shows an alternative embodiment of a cleaning head 12' and pad 70', where similar elements are identified with a primed (') suffix and new elements are identified by new numerals. The pad 70' has a multilayer construction including an upper layer 70'A, which is capable of attaching to a strip of conventional hook material 73'A secured to a plate 73'. Also provided are an intermediate layer 70'B of an absorbent material, and a lower layer 70'C for contacting a surface meant to be cleaned during the cleaning operation. The pad upper layer 70'A, which includes a loop material, and the hook material 73'A cooperate to form a hook and loop fastening system of the well known Velcro™ type. The hook material 73'A can be adhesively attached or molded onto the surface 72', although other attachment methods are contemplated. Thus, the bottom surface 72' of the cleaning head 12 engages at least a portion of the cleaning pad 70' during use.

[0044] With reference once more to FIGURE 2, the housing 28 includes a front socket 80, which receives the dirt cup assembly 32. The lower end 64 of the housing 28 is pivotally connected with the universal joint, below the socket, as described above. The housing 28 also defines a rear socket 81, best shown in FIGURE 7, with an upper opening 82 for receiving the cleaning fluid reservoir 36, which may be in the form of a replaceable bottle. The upper handle portion 26 (FIG. 2) includes an elongate handle member in the form of a cylindrical sleeve 84, the lower end of which is received through an opening 86 in the housing. The end of the sleeve 84 is bolted or otherwise fixedly attached to the housing 28. The housing 28 can be formed from two, three, or more housing portions 87, 88 and 89, which are screwed, adhesively attached, snap fitted or otherwise connected together to form the housing.

[0045] With continued reference to FIGURE 7, a liquid delivery system 90, which includes the pump 38, delivers the cleaning liquid from the reservoir 36 to the spray nozzle 22. As the reservoir 36 is inserted into the housing, the reservoir is automatically connected with the liquid delivery system 90. In one embodiment, the reservoir 36 includes a first closure or cap 92 (FIG. 9), which is brought into engagement with an opening assembly 94 of the pump, best shown in FIGURE 8. The opening assembly 94 may include a spring biased valve opening member 95, which opens a valve 96 mounted within the cap 92 of the reservoir. The valve 96 may also be biased by a spring 97 into a closed position, unless acted on by the opening assembly 94 allowing fluid to flow from a lower opening or outlet 98 in a reservoir bottle 99 to the pump 38.

[0046] With reference now to FIGURE 9, a vent valve 100 allows air to enter the bottle to replace the volume of fluid dispensed. That is, as cleaning fluid is pumped from the reservoir 36, ambient air is admitted through the vent valve 100 to replace the fluid so that the reservoir does not collapse or generate a vacuum within the container 36. The reservoir vent valve 100 may be associ-
ated with a second cap or closure 102, which closes an upper opening or inlet 104 in the bottle 99. The second opening 104 is positioned above the fluid level, e.g., at an opposite end of the bottle from the lower opening 98. The bottle 99 may be about a 25 cm tall by about 6 cm diameter bottle blow molded from a high density polyethylene or other suitable plastic.

[0047] Alternatively, the vent valve may be located below the fluid level. In one embodiment, the vent valve is associated with the cap 92 and is positioned adjacent to the valve 96.

[0048] With reference once more to FIGURE 8, the pump 38 can be an impeller pump, a gear pump, peristaltic pump, or any other known liquid pump. In the illustrated embodiment, the pump is a vaned impeller pump. The pump includes an impeller 110, with a plurality of radially spaced vanes 112, five in the illustrated embodiment. The vanes direct the fluid radially outward, towards the walls of a pump housing 114. A fluid supply pathway 116 connects the pump housing with the spray nozzle 22. A drive motor 118 for the pump 38 is powered by the power source 34 (FIG. 7), such as batteries. For example, a low-voltage DC motor 118 is readily powered by the batteries 34. The cleaning device 10 may be configured to employ a wall mounted charger (not shown) for recharging the batteries without the need for removing them from the housing. Alternatively, a socket (not shown) in the housing can be adapted to receive a drop in battery pack. One such battery pack is sold by Black and Decker, Inc. of Towson, Maryland, under the mark Versapack™. Although batteries 34 represent one means for powering and operating the pump 38, other alternatives may be used. For example, an electric power cord (not shown) can be selectively connected to a source of AC power for supplying electrical power to the pump 38, fan motor 30, and any other electrically operated components of the device, or, the pump may be manually operated.

[0049] The fluid flows through an opening in the pump housing 114 and travels via the fluid supply path 116 to the spray nozzle 22. The fluid supply path includes a first fluid supply conduit 120, such as a flexible tube, which connects the pump housing with the inlet of a solution filter 122. The solution filter filters dirt and other small particles from the cleaning liquid which may clog the spray nozzle. If the cleaning fluid is free of particles, the filter may not be needed.

[0050] The outlet of the solution filter 122 is connected by a second conduit 124 to the inlet of check valve 126. The check valve 126 may be a solenoid valve, spring loaded ball valve, or other type of check valve commonly known in the art. The check valve 126 limits a dribbling of fluid from the spray nozzle 22 particularly when the suction nozzle 18 is in operation. The check valve 126 may also generate a cracking pressure so that fluid entering into the spray nozzle(s) 22 has sufficient energy to drive the fluid through the spray nozzle(s) 22 and break the fluid up into fine droplets.

[0051] In an alternative embodiment embodiment, the check valve 126 also serves as a shut off valve which remains closed until it is desired to dispense fluid from the spray nozzle. Or, a separate shut off valve may be provided elsewhere in the fluid pathway 116. In such an embodiment, the pump can be left running continuously throughout a floor cleaning operation, running continuously in both mopping and suction modes. For this embodiment, the valve 126 would be used to close off the flow during the suction mode. Alternatively or additionally, the pump 38 can be switched off during the suction mode.

[0052] Another suitable pump for use as the solution pump is a gear pump as is described in U.S. Patent No. 6,328,543. Because of the continuous static head from the reservoir 36, when a gear pump is used, a check valve analogous to the check valve 126 can have a cracking pressure greater than the static head, so that no leakage occurs through an inactive pump. The cracking pressure could be higher than the static head to the extent that fluid passing through the check valve 126 when the pump operates has sufficient pressure to cause the spray nozzle 22 to produce a fine spray.

[0053] Vaned impeller pumps have advantages in that the dimensions are less critical and tolerances for the vanes are larger than is the case with gears in a gear pump. If a gear pump is used, the reservoir 36 can be located directly above the gear pump so that a static head is always present to prime the pump, and no suction is required. This helps to minimize precision and power, and therefore size and cost of the pump. With a vaned impeller pump, the reservoir need not be located above the pump. Although it may be convenient to do so.

[0054] A third conduit 128 is connected with an outlet of the check valve 126 and passes out of the housing 28. The conduit 128 connects at its distal end with the nozzle 22.

[0055] As can be seen in FIGURES 2 and 7, the conduit 128 may be routed through an opening 130 in the lower end of the housing 28 so that the supply conduit does not need to pass through the u-joint and potentially become entangled with the suction hose. A slot 132 (FIG. 5), formed in an external surface of the central portion 44 of the u-joint, receives the conduit 128 therethrough. Alternatively, the hose 128 may be clipped to an exterior surface of the u-joint by a suitable clip. In yet another embodiment, the conduit passes through aperture 68 in the u-joint.

[0056] The fluid delivery system 90 thus described includes conduits 120, 124, 128, pump 38, check valve 126, filter 122, and optionally, a separate shut off valve. It will be readily appreciated, however, that alternative fluid delivery systems, such as those employing gravity feed, pressure on the bottle by squeezing with the user’s hand, or other means of supplying the fluid to the nozzle 22, are also contemplated.

[0057] With reference to FIGURE 10, the upper handle portion 26 includes a hand grip 140, which may be as-
seemled from left and right hand grip portions 142, 144, as illustrated in FIGURE 11. The left and right hand grip portions are screwed, bolted or otherwise attached to each other to enclose an upper end of the sleeve 84. A manually operable actuation system 150, can be associated with the hand grip to operate the fan and motor assembly 30 and the pump 38 and/or valve 126. The actuation system 150 includes a thumb or finger-operated thumb switch 152 and optionally also a trigger 154, which can both be mounted to the hand grip 140. In the illustrated embodiment, the hand grip is formed from left and right hand grip portions 142, 144.

The trigger 154 can be pivotally mounted to the handle grip and includes an extension portion 156 which extends into the hand grip. The end of the extension portion is received within a slot 158 in an upper end of an actuation rod or linking rod 160. The linking rod 160 is carried within the hollow sleeve 84. When the trigger is depressed, the linking rod is pushed in a generally downward direction, illustrated by arrow A, away from the hand grip 140. The actuation rod 160 carries an actuating member 162, such as a protrusion or ring, which actuates a first microswitch 164 (FIG. 11). The actuation of the first microswitch 164 energizes the fluid supply pump 38 (and/or actuates the shut off valve 126 to move to the open position), whereby the supply of liquid from the reservoir 36 to the spray nozzle 22 is initiated. In this mode, the pump 38 withdraws cleaning solution from the reservoir 36 and directs it to the spray nozzle 22, via the fluid supply pathway 116. A user maneuvers the cleaning head 12 over the floor, using the handle assembly 14. The sprayed cleaning fluid and dirt from the floor are collected on the replaceable pad 70 as the cleaning head passes across the floor.

When pressure on the trigger is released, a torsion spring 165 biases the trigger to the off position, and the fluid delivery is interrupted.

The switch 152 is operable to convert the device 10 from the mopping mode to the vacuum suction mode. Specifically, when the thumb switch 152 is depressed, the actuation rod or linking rod 160 is pushed in a generally upward direction, illustrated by arrow B towards the hand grip 140. The actuating member 162 actuates a second microswitch 166 (FIG. 11) only when the thumb switch 152 is depressed. In particular, the thumb switch 152 can engage a trigger arm 168 which is pivotally mounted to the hand grip. Pressure on the thumb switch rotates the trigger arm, causing the trigger extension 156 to pull the actuation rod 160 in the direction of arrow B.

The second microswitch 166 can be mounted, either in the sleeve 84 or in the housing 28, in spaced relation to the first microswitch 164. Actuation of the switch 166 causes the fan motor assembly 30 to operate, creating a suction force on the suction nozzle 18. Additionally, it will be appreciated that when the actuation rod 160 is retracted, by pulling upward, the protrusion 162 is released from engagement with the first microswitch 164, switching off the pump 38 (and/or closing the shut off valve 134) and thereby closing off and/or switching off fluid flow to the spray nozzle 22.

The floor cleaning device 10 is thus operable in a suction mode. The user maneuvers the cleaning head 12 over the floor surface using the handle assembly 14. With reference now to FIGURE 4, the suction fan motor assembly 30 creates a flow of working air at a suction inlet 170 of the suction nozzle 18. Dirt and dust from the floor enter the suction nozzle inlet 170 and are carried along a working air flowpath 172, defined in part by the suction nozzle 18, and into the dirt collection assembly 32, along with the working air. If both suction and mopping operations are to be carried out, the suction operation can be performed first and then the device 10 can be converted to the spray/mopping mode by changing the switch position.

With reference again to Figure 11, the trigger arm 168 includes a flat spring 173, which biases the thumb switch 152 to the off position when the pressure on the switch is removed. Optionally, a thumb lock button 174 is actuated (e.g., slid forwardly) to lock the switch 152 in a selected position, such as the depressed position. This allows the user to lock the switch in the suction mode. The switch 152 can be released by sliding the lock button rearwardly.

It will be appreciated that the positions of the two microswitches 164, 166 shown in FIGURE 11 may be reversed, such that the fan motor assembly 30 is operated by pulling on the trigger 154 and the liquid spray is operated by pushing on the switch 152. Additionally, while the switch 152 and trigger 154 are most conveniently positioned on or adjacent the hand grip 140, it is also contemplated that one or other of the switch 152 and trigger 154 may be positioned elsewhere on the device 10. For example, a foot operated rocker switch may be provided on the cleaning head, or the switch may be located on the housing.

Other embodiments are also contemplated, such as a single switch which operates to either actuate fluid delivery or to actuate suction. For example, a slide switch may have first and second positions, S1, S2, for actuating the microswitches 164 and 166, respectively, and optionally an intermediate, OFF position S3, in which neither of the microswitches is actuated. An actuation system of this type is illustrated in FIGURE 19 and is described in further detail below.

As noted above, the suction nozzle 18 of FIGURE 1 is moveable between a first position, in which the inlet is adjacent the floor surface, and a second position, in which the nozzle inlet is spaced from the floor surface. More particularly, and with reference again to FIGURE 5, the suction nozzle 18 is pivotally mounted on the support plate 76 by a pair of spaced apart arms 180, 182, which extend from a rearward end 184 of the suction nozzle. The arms 180, 182 each have a hole 186, 188, respectively, through which pivot pins 190 extend to rotatably secure the suction nozzle to the corresponding flanges 52, 54 extending from the upper surface 75 of
the support plate 76.

[0067] Each of the suction nozzle arms 180, 182 can have forward and rearward concave surfaces or indents 192, 194 which engage or ride upon a respective detent 196 in the form of a flat spring. Ends of the flat spring 196 snap fit into corresponding slots 198 defined in the support plate upper surface 75, adjacent the respective support plate flange 52, 54. The suction nozzle 18 is manually pivoted or rotated from an operating (suction) position, in which the nozzle is adjacent to the floor surface, to a non-operating (retracted/raised) position. In the suction position, illustrated in FIGURE 2, the forward surface 192 engages the flat spring 196. In the retracted position, the rearward surface 194 engages the flat spring. The suction nozzle 18 is able to move from one position to the other, under slight manual pressure, since the surfaces 192, 194 ride along the detent 196 until the suction nozzle is locked into one of the two positions.

[0068] In the suction position, the suction nozzle 18 is aligned adjacent to and generally parallel with the floor surface to be cleaned, with the suction inlet 170 pointing towards the floor. Air entrained dirt is drawn from the suction nozzle 18 to the dirt collection assembly 32, via a flexible hose 200, which passes through the opening 68 (FIG. 2). The flexible hose 200 is connected to the lower end of the housing 28 by a collar 202. In the retracted position, the inlet is spaced away from the floor, allowing easy removal of the cleaning pad 70.

[0069] Alternatively, the suction nozzle 18 could be spring biased to the retracted (raised) position. In such an embodiment, a latch (not shown) or other suitable restraining member would retard upward movement of the nozzle 18 when the nozzle is in the suction position. The latch would be movable between an engaged position, in which the latch engages the suction nozzle 18 and a disengaged position, in which the suction nozzle is free to move upwardly, under the bias of the torsion spring. The latch can be normally restrained in the engaged position by a foot operated release member (not shown), which can include a foot operated switch, positioned on the cleaning head 12 or in other convenient location. To reengage the suction nozzle 18 with the latch, the user pushes the suction nozzle downward with either the foot or hand and reengages the latch.

[0070] In another alternate embodiment, a lower end of the actuation rod 160 is operatively connected with the suction nozzle 18, such that the suction nozzle 18 is moved from the floor suctioning position (FIGURE 2) to the retracted position (FIGURE 3) when the switch 152 is depressed.

[0071] With reference now to FIGURE 13, the dirt collection assembly 32 includes a dirt collection receptacle 208, such as a removable, generally transparent dirt cup, fabricated from a thermoplastic material, or other suitable material. The dirt cup defines a dirt collection chamber 210. As best shown in FIGURE 4, when the dirt cup 208 is positioned within the socket 80 in the housing 28, the suction nozzle 18 is fluidly connected with an inlet 212 of the dirt cup 208 by the flexible suction hose 200. The air from the suction hose 200 passes through the collar 202 mounted in the aperture 68 in the universal joint 16 and enters the housing 28 through a suitably positioned lower opening 214 located between the two flanges 60, 62 (FIG. 2).

[0072] A flap valve or dust cover 215 (FIGURE 4) positioned at the dirt cup inlet 212 is normally in a closed position. When the fan motor operates, the suction force opens the flap valve 215, allowing dirt and air to be drawn into the dirt cup 208. The flap valve 215 may be formed from rubber or other suitable flexible material. When the fan motor is switched off, the flap valve falls back to its closed position, sealing off the suction nozzle 18 from the dirt cup 208 and preventing collected dirt from falling out of the device through the suction nozzle.

[0073] As shown in FIGURE 13, an open end 216 of the dirt cup 208 selectively accommodates a removable filter assembly 218, which directs the airflow and filters dirt and debris from the working air before it leaves the dirt cup. As best shown in FIGURE 14, the filter assembly 218 can include a filter member 220 to retain smaller particles within the dirt cup 208. The filter member 220 includes a filter support or cage 222, and a flexible filter 224 supported thereon. The filter member is removable from a baffle 226, mounted in the dirt cup 208, for cleaning. The dirt cup 208 is removed from the socket 80 in the housing and emptied of collected dirt at intervals. This entails removing the filter assembly 218 from the dirt cup and tipping out collected dirt. The filter assembly 218 may also be cleaned at this time, or less frequently, for example, by rinsing the filter member 220 in water or a detergent solution.

[0074] The filter assembly also includes a baffle 226, which is positioned within the dirt cup such that a flange 228 at an open end thereof seals around the opening in the dirt cup. The flange may be fitted with an overmolded seal 229 formed from rubber or other compressible material, to aid in creation of a seal between the flange and the dirt cup. The baffle 226 defines an upper opening 230 shaped to receive the filter member therethrough, whereby the filter member is seated in the baffle. A flange 232 at an upper end of the filter cage 222 forms a seal between the filter member and the baffle 226.

[0075] As best shown in FIGURE 12, the baffle 226 includes an annular, generally vertical wall 234 which is closed at a lower end by a base 235. The. annular wall defines a side opening 236 which serves as an air inlet through which air enters a chamber 237 defined in the baffle. Air enters the dirt cup 208 via the movable flap valve 215 at the end of the tube 200 and follows the flow path 172 illustrated in FIGURE 4.

[0076] The air is directed along a convoluted pathway by a curved deflector wall 238, which extends below the baffle opening at least 60° in the region of the baffle opening to partially surround the flap valve 215. The deflector wall has an opening 240, radially spaced about 180° from the baffle opening, to provide room for the flap valve to open.
The air flows between the deflector wall 238 and the inside of the dirt cup to the baffle opening 236. A shelf 242, which extends laterally adjacent the lower end of the opening and a pair of vanes 244, extending from the inside of the dirt cup 208 assist in directing the air around the baffle vertical wall 234 and into the baffle opening 236. The convoluted air path causes much of the dirt and substantially all of the moisture in the air stream to drop out of the air stream into the dirt cup 208. This allows use of a fan and motor which are not specifically designed for use with air laden with water droplets. A further portion of the dirt, mostly dry dirt of a lighter weight, enters the opening and a pair of vanes 244, extending from the inside of the dirt cup 208 assist in directing the air around the baffle opening 236 in the air stream are trapped on the filter 224.

[0077] The baffle well 246 thus provides an additional dirt collecting region, which increases the dirt collection capacity of the dirt collection assembly. Once the level of dirt in the dirt cup 208 reaches about the level of the flap valve 215, it is desirable to empty the dirt cup and baffle chamber of collected dirt.

[0078] As shown in FIGURE 2, during operation of the suction system, the dirt cup 208 is secured in place in the socket 80 by a latch mechanism 250 or other suitable conventional fastening mechanism. With reference now to FIGURE 7, to remove the dirt cup 208, depression of a release button 251 of the latch mechanism 250 can release a spring biased tab 252 from a slot 254 (FIG. 12) formed in the outlet end of the dirt cup 208. It should be apparent from FIGURES 12 and 13 that the baffle 226 and dirt cup 208 can be keyed, as at 256, 257 so that the baffle only fits in the dirt cup in one orientation. Similarly, the filter member 220 can be keyed, as at 258, 259, for one way receipt into the baffle 226 so that the portion of the filter 224 exposed through the opening 236 is free of seams to maximize airflow (FIG. 13).

[0079] With reference now to FIGURE 15, the fan and motor assembly 30 includes a motor 260 capable of operating on a dc voltage of about 7.2-9.6 volts DC, provided by the power source 34 (FIGURE 7) and a fan assembly 262. The fan assembly includes a diffuser cover 264, fan cover 266, fan bottom 268, and radial diffuser 270 which are stacked together to form the fan assembly. The fan cover 266 and fan bottom 268 serve as an impeller 272, which is rotated by the motor 260 to create a suction force on the dirt cup 208, drawing air and dirt from the floor suction nozzle 18 into the dirt cup.

[0080] The air is drawn through the diffuser cover 264 via a central opening 276 therein and directed radially outwardly by vanes 278 on the fan cover 266. The radial diffuser 270 has a plurality of vanes 282 which are angled to direct the air flow outward. The air is directed through a plurality of arcuately spaced apertures or slots 284 in an upper end of the diffuser cover 264. This system provides an efficient means of directing the air stream away from the fan in a direction generally perpendicular to the axis of rotation of the fan. The fan is thus capable of operating on a relatively low-powered motor. It also reduces the possibility of moisture in the air coming into contact with the motor and causing damage.

[0081] With reference again to FIGURE 4, when the fan motor assembly 30 is operational, the working air follows a short and efficient flow path. Dirt-laden air is drawn in through the suction inlet 170 of the suction nozzle and is carried upward along the short flexible hose 200 and exits out the dirt cup inlet 212, which is elevated, relative to the base of the dirt cup 208. Heavier dirt particles fall to the base of the dirt cup 208 under gravity. Any fluid in the airstream is separated out by the tortuous flow path around baffle 226, along with additional dirt or dust. Lighter particles may be drawn upward in through the baffle opening 236, where they are trapped on the filter 220 or in the baffle well 246 beneath the filter. Working air is drawn through the filter 220 by fan assembly 262, flows away from the motor 260, and is directed out of the housing by the fan and motor assembly 30 through suitably positioned louvers 286 (FIG. 7).

[0082] In place of the dirt cup 208 and filter assembly 218, another suitable conventional dirt collection assembly may be employed, such as a replaceable filter bag made from paper, cloth, or other porous material, a cyclonic flow dust separation system, or the like.

[0083] With reference to FIGURE 2, a brush 290 or other suitable cleaning tool can be removably mounted to the handle assembly to aid in dislodging dirt which is too firmly adhered to the surface to be readily removed by the cleaning pad or suction nozzle alone. A lower hand grip 292 may be mounted to the handle sleeve 84 for ease of lifting the cleaning device.

[0084] With reference now to FIGURE 16, an alternative embodiment of a liquid delivery system 90' for the cleaning device 10 is shown, where similar elements are identified with a primed suffix (') and new components are shown by new numerals. The liquid delivery system 90' includes a pump 38', which delivers the cleaning liquid from a bottle 36' to one or more spray nozzles 22' (two in the illustrated embodiment). As the bottle 36' is inserted into the housing, the bottle is automatically connected with the liquid delivery system 90'. A closure or cap 92' of the bottle 36' is brought into engagement with a bottle piercing assembly 94', which is movably mounted in a socket analogous to socket 81 of FIGURE 7. The bottle piercing assembly 94' includes piercing needles 295, 296, which puncture a portion of the cap, such as an elastomeric gasket 297. One of the needles 295 is connected with a vent valve 298, which allows air to enter the bottle 36' as the cleaning liquid is dispensed. That is, as cleaning fluid is pumped from the bottle 36', ambient air is admitted through the vent valve 298 to replace the fluid so that the container 36' does not collapse or generate a vacuum within the container 36'. The other needle 296 is fluidly connected with the pump 38'. In this embodiment, the bottle 36' can be similar to bottle 36, but does not need a vent mechanism due to the vent valve.
298, although it is also contemplated that a vent mechanism similar to vent mechanism 100 could be used in place of the vent valve 298 and needle 295. Such a liquid delivery system is described in more detail in U.S. Patent No. 6,321,941.

[0085] The pump 38 can be a gear pump, peristaltic pump, or any other known liquid pump. One suitable gear pump 38 is described in U.S. Patent No. 6,328,543. A check valve 126 is positioned in a fluid supply conduit 124, such as a flexible tube, downstream of the pump 38. A drive motor 118 for the pump 38 is powered by a power source. For example, a low-voltage DC motor 118 is readily powered by the batteries 34, as illustrated in FIGURE 7, or by an electric power cord (not shown), or the like.

[0086] The check valve 126 may be a spring loaded ball valve or other type of check valve commonly known in the art. The check valve 126 limits dribbling of fluid from the spray nozzles 22, particularly when the suction nozzle 18 is in operation. The check valve 126 generates a cracking pressure so that fluid entering into the spray nozzles 22 has sufficient energy to drive the fluid through the spray nozzles 22 and break the fluid up into fine droplets in preferably a fan-shaped pattern.

[0087] Although gear pumps are able to lift fluid from a container below them, gear pump precision and power determines the suction head available. In order to minimize precision and power, and therefore size and cost, the reservoir 36 can be located directly above the gear pump 38 so that a static head is always present to prime the pump, and no suction is required. Because of the continuous static head from the reservoir 36, the check valve 126 preferably has a cracking pressure greater than the static head, so that no leakage occurs through an inactive pump. The cracking pressure is preferably higher than the static head to the extent that fluid passing through the check valve 126 when the pump operates has sufficient pressure to cause the spray nozzles 22 to produce a fine spray.

[0088] Optionally, a filter assembly, 122 filters dirt and other small particles from the cleaning liquid, such as small amounts of cap gasket material dislodged during puncturing the cap. Optionally, a shut off valve 299 is selectively closable to prevent the flow of liquid to the spray nozzles 22. The valve 299 can include a movable valve stem which is biased to an open position (fluid flow) by a spring. When pressure is applied to the valve stem, the fluid flow is shut off. Optionally, the pump 38 runs continuously in both mopping and suction modes and the valve 299 is used to close off the flow. Alternatively or additionally, the pump 38 can be switched off during the suction mode using the microswitch 164, as described above.

[0089] As shown in FIGURE 16, where two spray nozzles are employed, a fluid line 128 in the form of a T-connector, downstream of the pump 38, splits the fluid flow into two flowpaths, one for each of the nozzles 22.

[0090] With reference now to FIGURE 17, another embodiment of a cleaning device 300 is shown. The device 300 is similar to the device 10, except as otherwise noted. The device 300 includes a cleaning head 312, which is connected to a housing 313 of a handle assembly 314 by a universal joint 316. Only a lower portion of the handle assembly is illustrated in FIGURE 17. A suction nozzle 318 is carried by the cleaning head for suctioning dirt off the floor surface. In this embodiment, the suction nozzle 318 is optionally connected with a rigid tubular member 320, which, in turn, is connected with the end of a hose 322 similar to hose 200. The hose 322 carries entrained dirt in a flow of air to a dirt cup of a dirt collection assembly 324, having a dirt cup similar to dirt cup 208. The rigid member 320 is pivotally connected to the nozzle at a pivot axis 326. It will be appreciated that hose 322 may alternatively be connected to the suction nozzle by a flexible connection in the same manner as illustrated in the embodiment of FIGURE 1.

[0091] One or more spray nozzles 330, 332 (two in the illustrated embodiment) are attached to the cleaning head 312 for delivering a spray of a cleaning fluid to the floor surface. Specifically, the spray nozzles are mounted to an upper surface 334 of the cleaning head, one on either side of the suction nozzle 318, and thus do not move as the suction nozzle moves. It will be appreciated, however, that the spray nozzle or nozzles may be alternatively or additionally carried elsewhere on the device, such as on the suction nozzle, universal joint, or the like. The spray nozzles 330, 332 are connected with the fluid delivery system by a fluid conduit (not shown), passing through the cleaning head 312. The fluid delivery system may be analogous to delivery system 90 or 90', illustrated in FIGURES 8 and 16, respectively.

[0092] In this embodiment, the suction nozzle 318 lacks the restraining means, illustrated in the embodiment of FIGURE 5 which comprises arms 180, 182 and cooperating flat springs 196. Rather, as best shown in FIGURE 18, a restraining means includes a torsion spring 336, which is mounted between the suction nozzle 318 and the cleaning head 312. The spring 336 biases the suction nozzle 318 to the retracted position. This ensures that cleaning fluid from the spray nozzles 330, 332 is not sucked directly into the suction nozzle 318 just after it is sprayed out through the spray nozzles in the wet floor cleaning mode. As illustrated in FIGURE 17, when in use, the suction nozzle 318 can be held against upward movement by a latch 338 or other suitable restraining member. In one embodiment, the latch 338 is generally triangular in cross section. The latch 338 can be pivotable, as between an engagement position, in which a distal end of the latch engages the suction nozzle 318 and a disengaged position, in which the suction nozzle is free to move upwardly, under the bias of the torsion spring. The latch 338 can be normally restrained in the engaged position by a foot operated switch 340, conveniently positioned on the cleaning head 312. It will be appreciated that the nozzle may alternatively be restrained by cooperating arms and detents similar to arms 180, 182 and detents.
of the embodiment of FIGURE 5.

[0093] In this embodiment, a cleaning pad 370 analogous to pad 70' is attached to a lower surface 372 of the cleaning head 312 using a strip of conventional hook and loop material as in the embodiment of FIG. 6. Alternatively, a pad analogous to pad 70 with gripping members, similar to gripping members 78, 79, as illustrated in FIG. 5 can be employed.

[0094] A manually operable actuation system 380, best shown in FIGURE 19, operates both a fan and motor assembly and liquid supply pump similar to assembly 30 and pump 38, respectively, of the earlier embodiment. The actuation system 380 includes a thumb or finger-operated switch 382, which can be mounted to a hand grip 384 of the handle assembly 314. The switch 382 is operable to convert the device 300 from the spray/mopping mode to the vacuum suction mode. Specifically, when the switch 382 is moved to a first position S1 (pushing the switch forward in the illustrated embodiment), a plunger or actuation rod 386, which is carried within a hollow rod 388, is pushed in a generally downward direction, illustrated by arrow A, away from the hand grip 384. The plunger 386 carries an actuating member 390, such as a protrusion, which actuates a first microswitch 392 only when the switch 382 is in the first position. The actuation of the first microswitch 392 energizes the fluid supply pump and or opens a shut off valve to allow cleaning solution to flow from the pump, in the case that the pump operates continuously thereby permitting the supply of liquid from a cleaning solution reservoir (similar to bottle 36) to the spray nozzles 330, 332.

[0095] When the switch 382 is moved to a second position S2 (in the illustrated embodiment by pulling it rearward), the plunger 386 is pulled upwardly in the direction of Arrow B until the actuating member 390 actuates a second microswitch 394. Only while the switch 382 is in the second position S2 is the second microswitch actuated, which causes the fan motor assembly (analogous to assembly 30) to operate, creating a suction force on the suction nozzle 318. Additionally, when the plunger 386 is retracted, by pulling upward, the protrusion 390 is released from engagement with the first microswitch 392, closing the shut off valve and/or switching off the pump, and thereby closing off and/or switching off fluid flow to the spray nozzles 330, 332.

[0096] The use of a single switch 382 in this manner prevents accidental operation of the spray nozzles 330, 332 while suction is applied to the suction nozzle 318.

[0097] The switch 382 may also have a central neutral position S3, in which neither the suction fan nor the liquid delivery system is operating. This position may be used, for example, during a floor mopping operation where the use of additional liquid is not desired, such as when cleaning a wood floor or an already wet floor, or when a cleaning pad 370, 70, 70' is used which is already impregnated with a cleaning or polishing fluid. The forward and rear switch positions may include means for retaining the switch in the set position until actively disengaged, such as a rocker switch or a switch which engages detents. Alternatively, the switch 382 may be a slide switch which is spring-biased to the neutral position S3 when the finger pressure is withdraw. Other embodiments are also contemplated, such as a switch which is spring biased to one of the first and second positions S1, S2.

[0098] It will be appreciated that in place of actuation system 380, a switch and trigger similar to switch 152 and trigger 154 shown in FIGURE 10 may be employed.

[0099] With reference now to FIGURE 20, an alternative embodiment of a cleaning device 400 is shown. The device 400 includes a cleaning head 412, which is pivotally attached to a handle assembly 414 by a universal joint 416 analogous to universal joint 16. In this embodiment, however, the spray cleaning and suctioning functions are provided by a removable cleaning attachment 420, which is carried in part by the handle 414 and in part by the cleaning head 412.

[0100] The cleaning attachment 420 includes a housing 422, which accommodates a fluid supply pump, fan motor assembly, optionally, a power source, such as batteries (although in the illustrated embodiment the device is provided with a power cord 424 for attaching the device to a source of electrical power), and other internal components similar to those shown in FIGURES 4 and 8, although in slightly different positions. A cleaning fluid tank 430 is removably mounted to a lower end of the housing 422 and is fluidly connected with a single spray nozzle 432 by a fluid supply conduit 434 in the form of a flexible hose. A dirt collection assembly 436, analogous to dirt collection assembly 32, is received in a socket 437 of the housing 422 and is connected with a floor suction nozzle 438 by a flexible conduit 440. The housing 422 includes conventional clips (not shown) or other known connecting members, which allow it to be conveniently fitted to a rod 442 of the handle assembly 414 and removed therefrom when the spraying/suctioning functions of the attachment 420 are not being used. Alternatively, a lower portion (not shown) of the rod 442 can be removed from the handle assembly 414, and the housing 422 can be selectively connected between an upper portion of the rod 442 and the universal joint 416. In one embodiment the cleaning head has a plurality of clips 450 (four in the illustrated embodiment). The clips are configured for selectively receiving and gripping edges of a cleaning pad or sheet analogous to pad 70. Alternatively, a pad similar to pad 70' is employed.

[0101] The suction nozzle 438 can be readily attached to the cleaning head 412 with screws, bolts, clips, or other suitable known attachment members (not shown). In one embodiment, the suction nozzle 438 can include a pair of arms 451 having resilient flexible umbrella-shaped protrusions 452 (FIGURE 20A), which cooperate with a corresponding pair of the gripping members 450 to selectively hold the suction nozzle to the cleaning head until it is desired to remove the cleaning assembly 420 from the device. In this embodiment, the suction nozzle does not pivot, but remains angled toward the floor surface,
even during spraying. However, spraying and vacuuming can be performed separately, as discussed above.

[0102] The cleaning assembly 420 also includes a spray trigger 460, which clips on to or is otherwise selectively attached to a hand grip 462 of the handle assembly (FIG. 20). The trigger is connected by a cord or rod 463 to a valve (not shown) for releasing fluid from the tank. Alternatively or additionally, the spray trigger 460 actuates the pump. The fan motor assembly is actuated by a switch 464, which may be located on the housing 422.

[0103] The cleaning assembly 420 allows a conventional stick cleaning device, such as the Swiffer™ device sold by Proctor & Gamble, to be converted to a suction/spray mop whenever these functions are desired. For example, when only dry dirt is to be removed with the pad 70, 70' the attachment 420 can be removed from the device and stored until needed. When it is desired to use the suction and/or wet mopping functions, of the attachment 420, the housing 422 is connected to the handle 414, the suction nozzle 438 is connected to the cleaning head 412, and the spray trigger 460 clipped on to the hand grip 462, which takes only a short time. The device 400 is then ready for spraying and or suction operations in a manner similar to that described for the device 10.

For the latter functions, the conventional electrostatic cleaning cloth of the Swiffer™ device would be replaced with a cleaning and mopping cloth, of the type identified by numeral 70, 70' in FIGURES 5 and 6.

[0104] With reference now to FIGURE 21, a cleaning device 480 analogous to any one of devices 10, 300, 400 may be configured to employ a wall mounted charger 482 for recharging rechargeable batteries (not shown) within the housing 482. Alternatively, as shown in FIGURE 22, a device 490, analogous to any one of devices 10, 300, 400, 480 may be configured with a socket 492 adapted to receive a drop in battery pack 494 shown enlarged in FIGURE 22A. One such battery pack is sold by Black and Decker, Inc. of Towson, Maryland, under the mark Versapack™. As with device 400, 480 cleaning device 490 includes a removable cleaning attachment 496, although it is also contemplated that the device may be configured with an integral housing, as shown in FIGURES 1-19.

[0105] With reference now to FIGURE 23, a hand held wet/dry cleaning device suited to cleaning above floor surfaces, such as table tops, ledges and the like, as well as floor surfaces is shown. One such cleaning device is generally described in U.S. Patent No. 6,347,428. According to the present invention, a cleaning device 500 includes a housing 502, which supports a cleaning liquid container 504 for supplying a cleaning solution to a spray nozzle 506. A suction nozzle 508 is mounted below the spray nozzle for suctioning sprayed cleaning solution and dirt from a surface to be cleaned. The suction nozzle fluidly communicates with a dirty liquid container 510, removably mounted to a lower surface 512 of the housing 502. An arcuate gripping handle 516 is connected to the housing at both its ends.

[0106] As shown in FIGURE 24, the cleaning device 500 may be fitted with a cleaning head 520 for mopping the surface. Specifically, a stem 522 is selectively connected with a lower surface of the housing by a suitable known fitment. The stem 522 can have a universal joint 524 (analogous to universal joint 16), or another suitable joint, at its lower end through which the stem is pivotally connected to the cleaning head 520. The cleaning head 520 carries a removable cleaning pad 526, analogous to pad 70, 70' for mopping and dusting the surface.

[0107] The device includes an on/off switch 530. The switch is connected to a power source via an electrical cord 531. When powered, a fan and motor assembly in the housing 502 draws a suction force on the suction nozzle 508. A switch 532 connects the power source with a cleaning fluid supply pump (not shown), which delivers cleaning fluid from the tank 504 to the spray nozzle 506. The switch 532 is a three position switch, and has a first (forward) position for operation of the spray, a second (rearward) position for powering the suction and a neutral (intermediate) position in which neither the spray nor the suction is operational.

Claims

1. A cleaning device (10, 300, 400, 480, 490) comprising:
   a handle assembly (14, 314, 414);
   a cleaning head (12, 12', 312, 412) pivotally mounted to said handle assembly and configured for receiving a replaceable cleaning pad (70, 70', 370) for collecting dirt from a floor surface (13) to be cleaned;
   a spray nozzle (22, 22', 330, 332, 432) carried by one of said cleaning head and said handle assembly for delivering a cleaning solution to a floor surface to be cleaned;
   a liquid delivery system (90, 90') for the cleaning solution, said liquid delivery system communicating with said spray nozzle and being carried by at least one of said handle assembly and said cleaning head;
   a suction nozzle (18, 318, 438) carried by one of said cleaning head and said handle assembly;
   a dirt collection assembly (32, 324, 436) communicating with said suction nozzle, said dirt collection assembly being carried by one of said handle assembly and said cleaning head;
   a source of suction (30), carried by one of said handle assembly and said cleaning head, said source of suction communicating with said dirt collection assembly and said suction nozzle; and characterised by
   a switch (382, 532) for selectively actuating said source of suction (30), said source of suction
operating only when the switch (382, 532) is in a first position, said switch comprising a second position, and wherein when said switch is in said second position, the flow of working air is stopped and the liquid delivery system is actuated.

2. The cleaning device (10, 300, 400, 480) of claim 1, wherein said dirt collection assembly includes a dirt cup (208) which is removably mounted on said handle assembly.

3. The cleaning device (10, 300) of claim 1 or 2, wherein said suction nozzle (18, 318) is pivotable relative to said cleaning head (12, 12’, 312).

4. The cleaning device (10, 300) of any one of preceding claims 1-3, wherein the suction nozzle (18, 318) is movable, relative to said cleaning head, between a floor suctioning position, in which the suction nozzle is positioned adjacent the floor surface to be cleaned and a retracted position, in which the suction nozzle is spaced from the floor surface.

5. The cleaning device (10) of any one of claims 3 and 4 wherein the spray nozzle (22) is mounted to said cleaning head, said spray nozzle moving as the suction nozzle (18) is moved.

6. The cleaning device (300) of any one of preceding claims 1-4, wherein the spray nozzle (330, 332) is attached to an upper surface (314) of said cleaning head (312).

7. The cleaning device (10, 300, 400, 480, 490) of any one of preceding claims 1-6, wherein:

   said cleaning head (12, 12’, 312) includes a support plate (76), said support plate being pivotally connected with said handle assembly and carrying said spray nozzle (22, 22’, 318, 438) and said suction nozzle (18, 318, 438) on an upper surface (75, 334) thereof.

8. The cleaning device (10, 400, 480, 490) of any one of preceding claims 1-7, further comprising:

   a multiple axis joint (16, 316, 416) which interconnects said cleaning head and said handle assembly.

9. The cleaning device (10, 300, 400, 480, 490) of any one of preceding claims 1-8, wherein the spray nozzle (22, 330, 332) is carried by said cleaning head for producing a spray of cleaning fluid which contacts the floor surface at a location forward of the cleaning head.

10. The cleaning device (10, 300, 400, 480, 490) of any one of preceding claims 2-9, wherein said dirt collection assembly (32, 324, 436) comprises a dirt cup (208) and a filter member (220) is located in said dirt cup (208).

11. A method of cleaning a surface (13) with a device (10, 300, 400, 480, 490) comprising a handle assembly (14, 314, 414), a cleaning head (12, 12’, 312, 412) pivotally attached to said handle assembly, and a cleaning liquid delivery system (90) mounted to at least one of said handle assembly and said cleaning head and communicating with a spray nozzle (18, 318, 418) carried by one of said handle assembly and said cleaning head, the method comprising:

   spraying a cleaning solution on the surface;
   directing the cleaning head over the surface with the handle assembly such that dirty cleaning solution from the surface is transferred to a cleaning pad (70, 370) selectively mounted on the cleaning head;
   selectively suctioning dirt from the surface through a suction nozzle (18, 318, 438) carried by one of said cleaning head and said handle assembly, and
   controlling the suctioning and applying steps by a switch (382, 532), the suctioning step including the subsidiary step of moving the switch (382, 532) to a first position, which causes suction to be applied to the suction nozzle and prevents the liquid delivery system from applying cleaning solution to the surface, and the applying step including the subsidiary step of moving the switch to a second position in which the suction is not applied to the suction nozzle and causes the liquid delivery system to apply cleaning solution to the surface.

Patentansprüche

1. Reinigungsvorrichtung (10, 300, 400, 480, 490), die umfasst:

   eine Griffanordnung (14, 314, 414);
   einen Reinigungskopf (12, 12’, 312, 412), der schwenkbar an der Griffanordnung montiert ist und aufgebaut ist, um ein austauschbares Reinigungskissen (70, 70’, 370) zum Sammeln bzw. Auffangen von Schmutz von einer Bodenfläche (13), die gereinigt werden soll, aufzunehmen;
   eine Sprühdüse (22, 22’, 330, 332, 432), die von dem Reinigungskopf oder der Griffanordnung gehalten wird, um eine Reinigungslösung an eine Bodenfläche, die gereinigt werden soll, zu liefern;
ein Flüssigkeitszuführungssystem (90, 90') für die Reinigungslösung, wobei das Flüssigkeitszuführungssystem mit der Sprühdüse in Verbindung steht und von der Griffanordnung und/oder dem Reinigungskopf gehalten wird;

eine Saugdüse (18, 318, 438), die von dem Reinigungskopf und/oder der Griffanordnung gehalten wird;

eine Schmutzaufnahmeanordnung (32, 324, 436), die mit der Saugdüse in Verbindung steht, wobei die Schmutzaufnahmeanordnung von der Griffanordnung oder dem Reinigungskopf gehalten wird;

eine Saugquelle (30), die von der Griffanordnung oder dem Reinigungskopf gehalten wird, wobei die Saugquelle mit der Schmutzauffanganordnung und der Saugdüse in Verbindung steht; und gekennzeichnet durch einen Schalter (382, 532) zum selektiven Betätigen der Saugquelle (30), wobei die Saugquelle (30) nur arbeitet, wenn der Schalter (382, 532) in einer ersten Stellung ist, wobei der Schalter eine zweite Stellung umfasst, und wobei die Betriebsluftströmung beendet wird und das Flüssigkeitszuführungssystem betätigt wird, wenn der Schalter in der zweiten Stellung ist.

2. Reinigungsvorrichtung (10, 300, 400, 480) nach Anspruch 1, wobei die Schmutzauffanganordnung einen Schmutzbecher (208) umfasst, der abnehmbar auf der Griffanordnung montiert ist.

3. Reinigungsvorrichtung (10, 300) nach Anspruch 1 oder 2, wobei die Saugdüse (18, 318) relativ zu dem Reinigungskopf (12, 12', 312) schwenkbar ist.

4. Reinigungsvorrichtung (10, 300) nach einem der vorhergehenden Ansprüche 1 - 3, wobei die Saugdüse (18, 318) relativ zu dem Reinigungskopf zwischen einer Bodensaugstellung, in der die Saugdüse an die zu reinigende Bodenfläche angrenzend positioniert ist, und einer eingezogenen Stellung, in der die Saugdüse von der Bodenfläche beobachtet ist, beweglich ist.

5. Reinigungsvorrichtung (10) nach einem der Ansprüche 1 oder 2, wobei die Sprühdüse (22) an den Reinigungskopf montiert ist, wobei die Sprühdüse sich bewegt, während die Saugdüse (18) bewegt wird.

6. Reinigungsvorrichtung (300) nach einem der vorhergehenden Ansprüche 3 und 4, wobei die Sprühdüse (22) an dem Reinigungskopf montiert ist, wobei die Saugdüse sich bewegt, während die Saugdüse (30) angebracht ist.

7. Reinigungsvorrichtung (10, 300, 400, 480, 490) nach einem der vorhergehenden Ansprüche 1 - 6, wobei:

der Reinigungskopf (12, 12', 312) eine Trägerplatte (76) umfasst, wobei die Trägerplatte schwenkbar mit der Griffanordnung verbunden ist und die Sprühdüse (22, 22', 318, 438) und die Saugdüse (18, 318, 438) auf seiner oberen Fläche (75, 334) hält.

8. Reinigungsvorrichtung (10, 400, 480, 490) nach einem der vorhergehenden Ansprüche 1 - 7, die ferner umfasst:

eine mehrachsige Verbindung (16, 316, 416), die den Reinigungskopf und die Griffanordnung miteinander verbindet.

9. Reinigungsvorrichtung (10, 300, 400, 480, 490) nach einem der vorhergehenden Ansprüche 1 - 8, wobei die Sprühdüse (22, 330, 332) von dem Reinigungskopf gehalten wird, um einen Sprühregen aus einem Reinigungsfluid zu erzeugen, der die Bodenfläche an einer Stelle vor dem Reinigungskopf berührt.

10. Reinigungsvorrichtung (10, 300, 400, 480, 490) nach einem der vorhergehenden Ansprüche 2 - 9, wobei die Schmutzauffanganordnung (32, 324, 436) einen Schmutzbecher (208) umfasst und ein Filterelement (220) in dem Schmutzbecher (208) angeordnet ist.

11. Verfahren zum Reinigen einer Fläche (13) mit einer Vorrichtung (10, 300, 400, 480, 490), die eine Griffanordnung (14, 314, 414), einen schwenkbar an der Griffanordnung angebrachten Reinigungskopf (12, 12', 312, 412) und ein Reinigungsflüssigkeitszuführungssystem (90) umfasst, das an der Griffanordnung und/oder dem Reinigungskopf montiert ist und mit einer Sprühdüse (18, 318, 418) in Verbindung steht, die von der Griffanordnung oder dem Reinigungskopf gehalten wird, wobei das Verfahren umfasst:

Sprühen einer Reinigungslösung auf die Fläche; Ausrichten des Reinigungskopfs über der Fläche; Reinigungsstiften (70, 370), die selektiv auf dem Reinigungskopf montiert sind, übertragen wird, selektives Ansaugen von Trümmern von der Oberfläche durch eine Saugdüse (18, 318, 438), die von dem Reinigungskopf oder der Griffanordnung gehalten wird, und Steuern der Saug- und Auftragschritte durch einen Schalter (382, 532), wobei der Saugschritt einen untergeordneten Schritt des Verstellens des Schalters (382, 532) in eine erste Stellung umfasst, die bewirkt, dass ein Sog an die Saugdüse angelegt wird, und verhindert, dass das Flüssigkeitszuführungssystem Reinigungslösung auf die Oberfläche aufbringt, und der Auf-
Revendications

1. Dispositif de nettoyage (10, 300, 400, 480, 490) comprenant :

un ensemble de manche (14, 314, 414) ;
une tête de nettoyage (12, 12', 312, 412) montée de manière pivotante sur ledit ensemble de manche et configurée pour recevoir un tampon de nettoyage remplaçable (70, 70', 370) pour ramasser de la poussière d’une surface de plancher (13) à nettoyer ;
une buse de pulvérisation (22, 22', 330, 332, 432) portée par l’un de ladite tête de nettoyage et dudit ensemble de manche pour distribuer une solution de nettoyage à une surface de plancher à nettoyer ;
un système de distribution de liquide (90, 90') pour la solution de nettoyage, ledit système de distribution de liquide étant en communication avec ladite buse de pulvérisation et étant porté par au moins l’un dudit ensemble de manche et de ladite tête de nettoyage ;
une buse d’aspiration (18, 318, 438) portée par l’un de ladite tête de nettoyage et dudit ensemble de manche ;
un ensemble de ramassage de poussière (32, 324, 436) en communication avec ladite buse d’aspiration, ledit ensemble de ramassage de poussière étant porté par l’un dudit ensemble de manche et de ladite tête de nettoyage ;
une buse d’aspiration (18, 318, 438) portée par l’un de ladite tête de nettoyage et dudit ensemble de manche ;
un ensemble de ramassage de poussière (32, 324, 436) en communication avec ladite buse d’aspiration, ledit ensemble de ramassage de poussière étant porté par l’un dudit ensemble de manche et de ladite tête de nettoyage ;
une source d’aspiration (30), portée par l’un dudit ensemble de manche et de ladite tête de nettoyage, ladite source d’aspiration étant en communication avec ledit ensemble de ramassage de poussière et ladite buse d’aspiration ;
une source d’aspiration (30) pour activer de manière sélective ladite source d’aspiration (30) ;
une source d’aspiration (30) ne fonctionnant que quand le commutateur (382, 532) est dans une première position, ledit commutateur comprenant une seconde position, et dans lequel quand ledit commutateur est dans ladite seconde position, le flux d’air de travail est arrêté et le système de distribution de liquide est activé.

2. Dispositif de nettoyage (10, 300, 400, 480) selon la revendication 1, dans lequel ledit ensemble de ramassage de poussière comprend une coupe à pous-
10. Dispositif de nettoyage (10, 300, 400, 480, 490) selon l’une quelconque des revendications précédentes 2 à 9, dans lequel ledit ensemble de ramassage de poussière (32, 324, 436) comprend une coupe à poussière (208) et un élément de filtre (220) est situé dans ladite coupe à poussière (208).

11. Procédé pour nettoyer une surface (13) avec un dispositif (10, 300, 400, 480, 490) comprenant un ensemble de manche (14, 314, 414), une tête de nettoyage (12, 12’, 312, 412) attachée de manière pivotante audit ensemble de manche, et un système de distribution de liquide de nettoyage (90) monté sur au moins l’un dudit ensemble de manche et de ladite tête de nettoyage et étant en communication avec une buse de pulvérisation (18, 318, 418) portée par l’un dudit ensemble de manche et de ladite tête de nettoyage, le procédé comprenant les étapes consistant à :

pulvériser une solution de nettoyage sur la surface ;

diriger la tête de nettoyage sur la surface avec l’ensemble de manche de sorte que de la solution de nettoyage sale de la surface est transférée sur un tampon de nettoyage (70, 370) monté de manière sélective sur la tête de nettoyage ;
aspirer de manière sélective de la poussière de la surface à travers une buse d’aspiration (18, 318, 438) portée par l’un de ladite tête de nettoyage et dudit ensemble de manche, et commander les étapes d’aspiration et d’application par un commutateur (382, 532), l’étape d’aspiration comprenant l’étape subsidiaire consistant à déplacer le commutateur (382, 532) dans une première position, ce qui a pour conséquence que l’aspiration est appliquée à la buse d’aspiration et empêche le système de distribution de liquide d’appliquer la solution de nettoyage sur la surface, et l’étape d’application comprenant l’étape subsidiaire consistant à déplacer le commutateur dans une seconde position dans laquelle l’aspiration n’est pas appliquée à la buse d’aspiration et a pour conséquence que le système de distribution de liquide applique la solution de nettoyage sur la surface.
FIG. 3
FIG. 5
FIG. 8
FIG. 11
REFERENCES CITED IN THE DESCRIPTION

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