



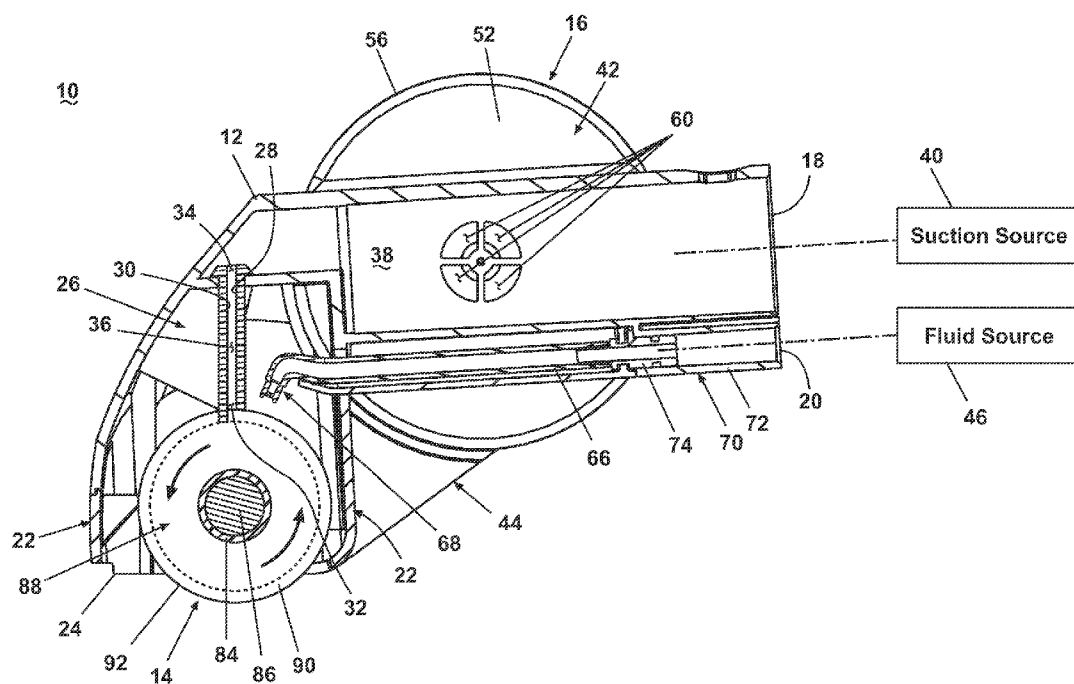
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(19) **United States**(12) **Patent Application Publication**
Johnson(10) **Pub. No.: US 2010/0236010 A1**(43) **Pub. Date: Sep. 23, 2010**(54) **WET EXTRACTION ACCESSORY CLEANING TOOL****Publication Classification**(75) Inventor: **Steven Johnson**, Hudsonville, MI
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(52) **U.S. Cl. 15/320**Correspondence Address:
MCGARRY BAIR PC
32 Market Ave. SW, SUITE 500
GRAND RAPIDS, MI 49503 (US)(73) Assignee: **BISSELL HOMECARE, INC.**,
Grand Rapids, MI (US)(21) Appl. No.: **12/726,381**(22) Filed: **Mar. 18, 2010****Related U.S. Application Data**(60) Provisional application No. 61/161,929, filed on Mar.
20, 2009.(57) **ABSTRACT**

An accessory tool for use with a suction source has a housing with a suction outlet and a fluid inlet. The suction outlet is adapted to be connected to the suction source. A roller assembly has a roller element rotatably mounted in the housing and adapted to contact a surface being cleaned. A turbine assembly has a turbine housing and a turbine fan rotatably mounted within the turbine housing. The turbine housing includes one or more inlet apertures in fluid communication with the atmosphere, as well as a turbine outlet in fluid communication with the suction outlet. A drive mechanism is operably coupled to both the turbine fan and to the roller element to drive rotation of the roller element when the suction source is connected to the suction outlet.



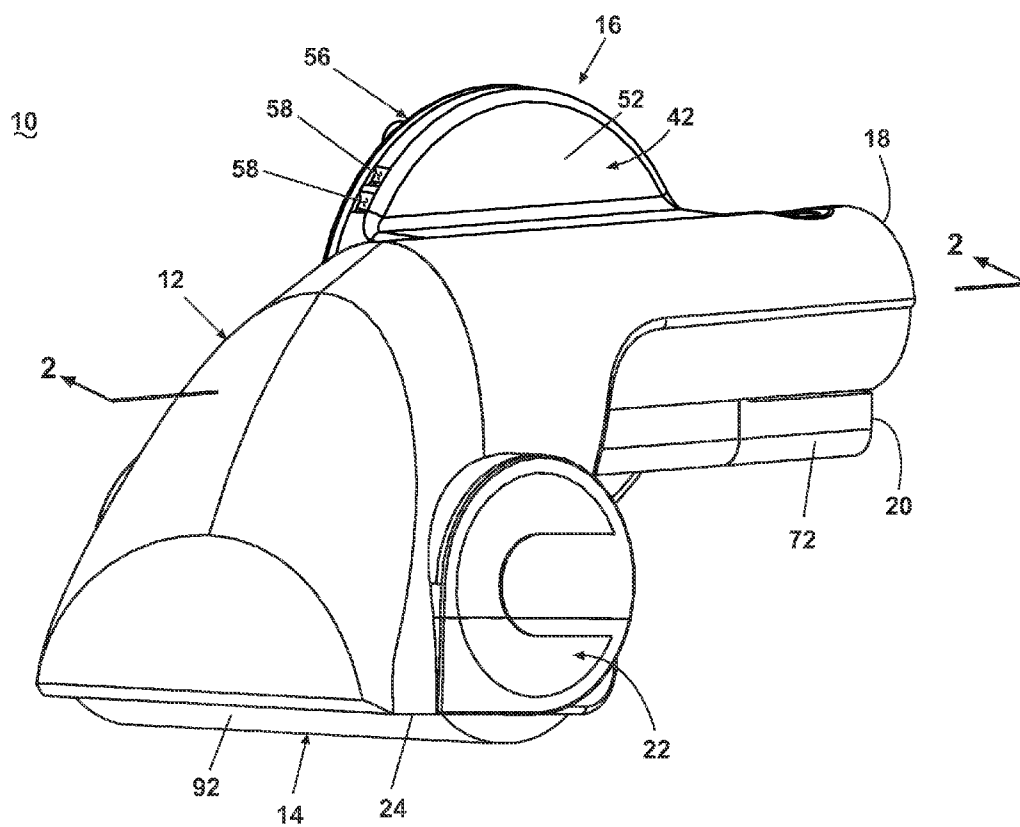


Fig. 1

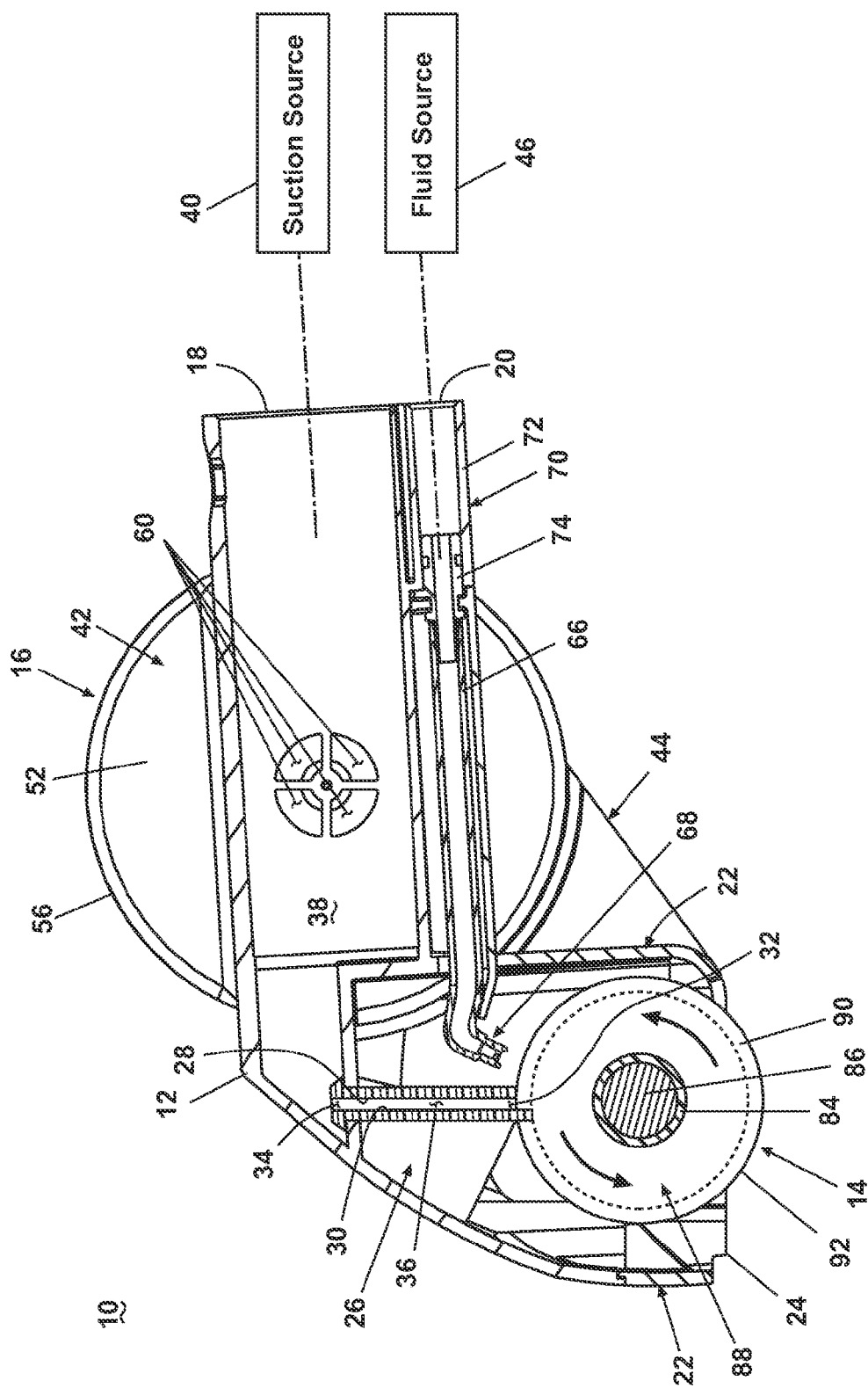


Fig. 2

WET EXTRACTION ACCESSORY CLEANING TOOL

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Patent Application Ser. No. 61/161,929, filed Mar. 20, 2009, which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The invention relates to a hand-held wet extraction accessory tool for an extractor. In one of its aspects, the invention relates to a hand-held turbine driven extractor tool for applying cleaning solution to a surface to be cleaned and wiping dirt and debris from the surface.

[0004] 2. Description of the Related Arts

[0005] Extractors are known for deep cleaning carpets and other fabric surfaces, such as upholstery. Most carpet extractors comprise a fluid delivery system, a fluid recovery system, and optionally an agitation system. The fluid delivery system typically includes one or more fluid supply tanks for storing a supply of cleaning fluid, a fluid distributor for applying the cleaning fluid directly to the surface to be cleaned or to an intermediate cleaning member that subsequently contacts the surface to be cleaned, and a fluid supply conduit for delivering the cleaning fluid from the fluid supply tank to the fluid distributor. The fluid recovery system typically comprises a recovery tank, a nozzle adjacent the surface to be cleaned (or in contact with an intermediate cleaning member in direct contact with the surface to be cleaned) and in fluid communication with the recovery tank through a working air conduit, and a vacuum source in fluid communication with the working air conduit to draw the cleaning fluid from the surface to be cleaned through the nozzle and the working air conduit to the recovery tank. The agitation system can include an agitator element for scrubbing the surface to be cleaned, an optional drive means, and selective control means. The agitation system can include a fixed or driven agitator element that can comprise a brush, pad, sponge, cloth, and the like. The agitation system can also include driving and control means including motors, turbines, belts, gears, switches, sensors, and the like. An example of an upright extractor is disclosed in commonly assigned U.S. Pat. No. 6,131,237 to Kasper et al.

[0006] Various attachments have been developed for use with carpet extractors in order to adapt the carpet extractors to various cleaning scenarios, such as cleaning smaller spaces. These attachments typically connected to a suction hose of the carpet extractor. Many of these attachments include a miniature brush or other scrubbing element adapted to loosen dirt and moisture from a surface to be cleaned.

[0007] U.S. Pat. No. 6,662,402 to Giddings et al. discloses a soil transfer extraction cleaning method employing a roller assembly including a soil transfer cleaning medium to mechanically remove soil from the surface to be cleaned. The method includes the steps of successively and repeatedly wetting a portion of the cleaning medium with a cleaning liquid, extracting any soil and at least some of the cleaning liquid from the previously wetted portion of the cleaning medium, and wiping the surface to be cleaned with the cleaning medium so as to transfer soil from the surface to be cleaned to the cleaning medium.

[0008] U.S. Pat. No. 6,735,812 to Hekman et al. discloses an apparatus having a cleaning implement in selective wiping contact with the surface to be cleaned; a cleaning solution dispenser that selectively wets a portion of the cleaning implement, a portion of the surface to be cleaned, or both; a first selectively controllable vacuum extractor tool to remove some of the dispensed cleaning solution and soil from the cleaning implement; and a second selectively controllable vacuum extractor tool which removes soil and some of the cleaning solution directly from the surface to be cleaned.

[0009] U.S. Pat. No. 6,711,777 to Frederick et al. discloses a turbine powered vacuum cleaner tool wherein a nozzle body encloses an agitator located adjacent an elongated suction inlet opening. A turbine rotor is rotatably connected to the nozzle body and operatively connected to the agitator so that airflow generated by a remote suction source flows through the nozzle body and rotates the agitator.

[0010] U.S. Pat. No. 6,658,693 to Reed discloses a hand-held extraction cleaner including a rotary agitation brush for agitating the surface to be cleaned. The brush is driven by an air-powered turbine assembly that is fluidly connected between ambient air and the suction source.

[0011] Traditionally, carpet extractors deliver cleaning fluid directly to a surface to be cleaned or onto an agitation system which subsequently delivers the cleaning solution to the surface to be cleaned. In both cases, the surface to be cleaned is saturated with cleaning fluid and the cleaning solution, together with any entrained debris, is removed from the surface to be cleaned through a suction nozzle and collected via the fluid recovery system. This extraction process commonly leaves behind some residual moisture in the surface to be cleaned. The present invention employs an alternative fluid distribution and extraction system that reduces the amount of fluid applied to the surface to be cleaned, thus minimizing the residual moisture.

SUMMARY OF THE INVENTION

[0012] According to the invention a hand-held accessory tool for use with a suction source and a fluid source comprises a main housing comprising a suction outlet and a fluid inlet, wherein the suction outlet is adapted to be operably coupled to the suction source, and the fluid inlet is adapted to be fluidly coupled to a fluid source; a roller element rotatably mounted in the housing and adapted to contact a surface being cleaned, the roller element comprising a soft, compressible, and absorbable cleaning medium; a turbine assembly associated with the main housing and comprising a turbine housing and a turbine fan rotatably mounted within the turbine housing, the turbine housing including one or more inlet apertures in fluid communication with the atmosphere and a turbine outlet in fluid communication with the suction outlet; and a drive mechanism operably coupled to both the turbine fan and to the roller element and adapted rotate the roller element. The suction source, when connected, rotates the turbine fan, and the rotation of the turbine fan operates the drive mechanism to rotate the roller element.

[0013] In one embodiment, a fluid distributor is fluidly connected to the fluid inlet and is configured to distribute fluid to the roller element. In one embodiment, the fluid distributor can include a spray tip. In another embodiment, the fluid distributor can be a perforated bar that is positioned above the roller element and is connected to the fluid inlet through a solution tube.

[0014] In another embodiment, a suction nozzle is mounted within the housing for contact with the roller element and is fluidly connected to the suction outlet the nozzle outlet, wherein operation of the suction source also draws air through the nozzle inlet. The nozzle inlet is adapted to interface with the roller element to remove a portion of fluid and debris from the roller element upon operation of the suction source.

[0015] In another embodiment, the drive mechanism is adapted to rotate the roller element in a direction so that the suction nozzle is circumferentially spaced from the fluid distributor in the direction of rotation of the roller element so as to remove the portion of fluid and debris from the roller element after the roller element has been wetted by the fluid distributor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] In the drawings:

[0017] FIG. 1 is a front perspective view of a wet extraction accessory tool according to the invention.

[0018] FIG. 2 is a cross-sectional view of the wet extraction accessory tool taken along line 2-2 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0019] Referring to FIGS. 1 and 2, a hand-held wet extraction accessory tool 10 according to the invention for use with a remote suction source, such as a conventional carpet extractor or vacuum cleaner, and a remote fluid reservoir, such as one contained in the conventional carpet extractor or vacuum cleaner is illustrated. An example of an upright extractor suitable for use with the invention is disclosed in U.S. Pat. No. 6,131,237 to Kasper et al., which is incorporated herein by reference in its entirety. An additional example of a suitable upright extractor for use with the inventive wet extraction accessory tool 10 is disclosed in U.S. Patent Application Publication US20090229069 to Lenkiewicz et al., published Sep. 17, 2009, which is also incorporated herein by reference in its entirety.

[0020] The wet extractor accessory tool 10 according to the invention also includes a number of elements similar to those described with respect to the foot assembly disclosed in the Lenkiewicz et al. U.S. Patent Application Publication US20090229069. These elements will not be described in details herein except as necessary for a complete understanding of the instant invention.

[0021] The accessory tool 10 comprises a main housing 12, a roller assembly 14 operatively coupled to an air powered turbine assembly 16, and a suction outlet 18 and fluid inlet 20 formed within the main housing 12. The suction outlet 18 is adapted for removable connection to a remote suction source 40 by attaching a conventional vacuum hose (not shown) thereto in a known manner. The fluid inlet 20 is adapted for removable connection to a remote fluid source 46, preferably pressurized, such as one contained in a carpet extractor or vacuum cleaner or a separate fluid reservoir, by attaching a conventional fluid supply hose (not shown) to the fluid inlet 20 in a known manner.

[0022] The roller assembly 14 can be rotatably mounted at a forward portion of the main housing 12 within a roller housing 22 connected to the main housing 12 by a snap fit. Alternatively, the roller housing 22 can be formed integrally with the main housing 12. The roller assembly 14 is mounted

within the roller housing 22 such that it protrudes through a bottom opening 24 of the roller housing 22 for contacting a surface to be cleaned.

[0023] A suction nozzle 26 is mounted within a forward portion of the main housing 12 and is adapted to contact the roller assembly 14. The suction nozzle 26 can be mounted in the main housing 12 in any suitable manner, such as by conventional fasteners in the form of screws, snaps, press fit or the like. The suction nozzle 26 comprises a leading nozzle wall 28 and a trailing nozzle wall 30. The suction nozzle walls 28, 30 form a conduit 36 therebetween and extending from a nozzle inlet 32 positioned near the roller assembly 14 to a nozzle outlet 34 at an opposite end of the conduit 36. The leading and trailing nozzle walls 28, 30, respectively, are defined with respect to the direction of rotation of the roller assembly 14 during operation of the accessory tool 10, which is counter-clockwise as viewed in FIG. 2 as indicated by the arrows. The trailing nozzle wall 30 extends downwardly beyond the leading nozzle wall 28 and facilitates the extraction process as will be more fully described in the operation description below. The nozzle outlet 34 is in fluid communication with a turbine conduit 38, which is coupled thereto in a manner preventing air and fluid leakage. In operation, a first working air path (not shown) extends from the bottom opening 24, through the nozzle inlet 32, through the conduit 36, through the nozzle outlet 34, through the turbine conduit 38, and to the conventional vacuum hose through the suction outlet 18 at the end of the turbine conduit 38.

[0024] A turbine housing 42 and a gear housing 44 are integrally formed with the main housing 12 at one side thereof adjacent to the turbine conduit 38 and close portions of a drive mechanism. The turbine housing 42 encloses a turbine fan (not shown), which is adapted to drive the roller assembly as is disclosed in the published U.S. Patent Application Publication No. US2006/0248680 A1, which is incorporated by reference herein in its entirety. The gear housing 44 encloses a gear train (not shown) that operatively connects a turbine fan shaft (not shown) to a drive belt (not shown) in a similar manner to the connection that disclosed in U.S. Patent Application Publication No. US2006/0248680 A1. However, the gear train of the drive mechanism of the instant invention can further comprise a gear reduction assembly (not shown) operatively connected to the turbine fan shaft and to the drive belt in order to drive the roller assembly 14 more slowly than in the drive mechanism disclosed in U.S. Patent Application Publication No. US2006/0248680 A1.

[0025] The turbine housing 42 can comprise substantially circular and parallel sidewalls 52 connected by an outer curved annular wall 56 having a plurality of inlet apertures 58 formed therein. The turbine housing 42 further comprises a turbine outlet 60 formed within the sidewall 52 adjacent the main housing 12 in order to fluidly coupled the interior of the turbine housing 42 with the remote suction source via the turbine conduit 38. A detailed description of a suitable turbine-driven roller drive configuration is disclosed in U.S. Pat. No. 6,658,693 which is incorporated by reference herein in its entirety.

[0026] In operation, a second working air path (not shown) flows from the atmosphere through the inlet apertures 58, through the turbine housing 42, and through the turbine outlet 60 into the turbine conduit 38, where it then joins the first working air path in the turbine conduit 38 and is carried through the suction outlet 18 and through the conventional suction hose connected to a remote suction source. The sec-

ond working air path also functions to rotate the turbine fan as it flows within the turbine housing 42 so as to rotate the turbine shaft, which serves as the driving force of the drive mechanism.

[0027] The accessory tool 10 also comprises a fluid distributor comprising a solution tube 66, a spray tip 68, and a coupling 70, all of which operate to selectively distribute cleaning fluid onto the roller assembly 14. The solution tube 66 extends between the spray tip 68 and the coupling 70 and comprises a conventional fluid conduit adapted pass fluid under pressure from the coupling 70 to the spray tip 68. The coupling 70 comprises a connector 72 formed integrally with the main housing 12 and forming the fluid inlet 20. The connector 72 is adapted for removably receiving a conventional fluid supply hose, and a coupler 74 positioned between the connector 72 and the solution tube 66 provides an airtight fluid connection therebetween to fluidly couple the fluid supply hose to the solution tube 66.

[0028] The spray tip 68 is preferably positioned within the roller housing 22 and is positioned in a manner to uniformly distribute cleaning fluid directly onto the roller assembly 14 along a length of the roller assembly 14. As illustrated in FIG. 2, wetting of the roller assembly 14 can be achieved by spraying, dripping, or otherwise supplying cleaning fluid directly onto the roller assembly 14 via the spray tip 68. In an alternative embodiment of the accessory tool, and, as disclosed in the Lenkiewicz et al. US20090229069, the spray tip 68 can be positioned to spray cleaning fluid onto a deflector wall (not shown), which, in turn, is adapted to expand or restrict the spray width accordingly. In addition, the fluid distributor can include a fluid distribution bar that distributes fluid along the length of the roller element 80 by gravity flow.

[0029] In operation, the solution tube 66 receives fluid under pressure from when the connector 70 is connected to the conventional fluid supply hose, which is in turn connected to a source of pressurized fluid, such as a conventional fluid reservoir carried by a carpet extractor or vacuum cleaner. The fluid accessory tool 10 can further comprise a dispensing actuator (not shown) of the conventional variety for controlling the dispensing of cleaning fluid through the spray tip 68. The dispensing actuator can be provided on the accessory tool 10. In an alternative embodiment, the dispensing actuator can be included near or on the remote suction source and/or remote source of fluid as disclosed in U.S. Pat. No. 6,131,237 to Kasper et al. The roller assembly 14 comprises a roller element 80 rotatably mounted within the roller housing 22. The roller assembly 14 can comprise elements adapted to reversibly mount the roller assembly 14 within the roller housing 22 as disclosed in the Lenkiewicz et al. US20090229069 publication, such as but not limited to bearings, end caps, brush gears, and the like.

[0030] The roller element 80 is substantially similar to the roller element disclosed in the Lenkiewicz et al. US20090229069 publication. The roller element 80 comprises a cylindrical roller frame 84 adapted to receive a roller axle 86. The roller frame 84 can be surrounded by a soft, compressible and absorbable cleaning medium 88 comprising a suitable material or combination of materials, a non-limiting example of which is a Denier Nylon. The roller element 80 can be sized slightly differently from the roller element disclosed in the Lenkiewicz et al. US20090229069 publication. Specifically, the nominal pile outer diameter is 1.08 inches [27.4 mm] with a nominal nap depth of 0.25 inches [6.35 mm]. A working region 90 is defined as a portion

of the cleaning medium 88 extending a distance part-way inwardly from an outer peripheral surface 92 of the cleaning medium 88 towards the roller frame 84 such that the working region 90 is spaced from the roller frame 84. The working region 90 is particularly pliable and is the primary interface between the surface to be cleaned and the fluid extraction system.

[0031] When the accessory tool 10 is in the use position, the roller assembly 14 is compressed between the surface to be cleaned and the suction nozzle 26. As previously described, the trailing nozzle wall 30 of the suction nozzle 26 is longer than the leading nozzle wall 28 and extends below the leading nozzle wall 28. In operation, the leading nozzle wall 28 interfaces the cleaning medium 30 at or near the outer peripheral surface 92. The trailing nozzle wall 30 penetrates the pliable working region 90 of the cleaning medium 88.

[0032] In operation and after the user has connected both the suction outlet 18 to the remote suction source and the fluid inlet 20 to the remote fluid reservoir, such as by a conventional suction hose and a conventional fluid supply hose, respectively, the user can use a conventional actuator (not shown) on the remote suction source, on the accessory tool 10, or on the suction hose in a well-known manner to initiate the application of suction force via the conventional suction hose. The second working air path drawn through the inlet apertures 58 of the turbine housing 42 rotates the turbine fan, which in turn rotates the turbine shaft and drives the drive mechanism to rotate the roller assembly 14.

[0033] The user can also actuate the dispensing actuator to start the flow of fluid from the remote fluid reservoir through the conventional fluid supply hose to the coupling 70. Fluid passes through the coupling 70, into the solution tube 66, and through the spray tip 68 for distribution to the cleaning medium 88. As shown, the spray tip 68 will convert the fluid into a fan-shaped pattern for even distribution onto the cleaning 88. The fluid is subsequently absorbed by the working region 90. The cleaning medium 88 is rotated in a forward or counter-clockwise direction via the drive mechanism as previously described by the movement of the turbine fan. Sufficient fluid is delivered to the working region 90 to saturate the cleaning medium 88. The saturated working region 90 passes under the suction nozzle inlet 32 where the trailing wall 30 acts like a squeegee to remove excess fluid from the working region 90. The slightly damp portion of the working region 90 continues to rotate and contacts the surface to be cleaned where residual fluid is transferred to the surface to be cleaned and loose debris is transferred from the surface to be cleaned to the working region 90.

[0034] The debris embedded working region 90 continues to rotate and passes beneath the spray tip 68 where additional cleaning fluid is applied. The debris and fluid embedded working region 90 then passes beneath the suction nozzle inlet 32 where both loose debris and excess fluid are removed. This cycle is repeated at a rate sufficient to wipe the surface to be cleaned.

[0035] While the invention has been specifically described in connection with certain specific embodiments thereof, it is to be understood that this is by way of illustration and not of limitation, and the scope of the appended claims should be construed as broadly as the prior art will permit. Reasonable variation and modification are possible within the foregoing written specification and drawings without departing from the spirit of the invention, which is defined in the appended claims.

What is claimed is:

1. A hand-held accessory tool for use with a suction source and a fluid source comprising:

a main housing comprising a suction outlet and a fluid inlet, wherein the suction outlet is adapted to be operably coupled to the suction source, and the fluid inlet is adapted to be fluidly coupled to a fluid source;

a roller element rotatably mounted in the main housing and adapted to contact a surface being cleaned, the roller element comprising a soft, compressible, and absorbable cleaning medium;

a turbine assembly associated with the main housing and comprising a turbine housing and a turbine fan rotatably mounted within the turbine housing, the turbine housing including at least one inlet aperture in fluid communication with the atmosphere, and further including a turbine outlet in fluid communication with the suction outlet; and

a drive mechanism operably coupled to both the turbine fan and to the roller element and adapted rotate the roller element;

wherein the turbine fan is adapted to rotate when suction is applied to the suction outlet, and the rotation of the turbine fan drives rotation of the roller element through the drive mechanism.

2. The hand-held accessory tool of claim 1 and further comprising a fluid distributor that is connected to the fluid

inlet and is adapted to apply fluid to the roller element when the fluid distributor is connected to a fluid source

3. The hand-held accessory tool of claim 2 wherein the fluid distributor comprises a spray tip.

4. The hand-held accessory tool of claim 2 and further comprising a suction nozzle mounted within the housing and defining a nozzle inlet and a nozzle outlet, the nozzle inlet is positioned adjacent the roller element and the nozzle outlet is fluidly connected to the suction outlet, wherein suction nozzle is adapted to remove fluid and debris from the roller element when the suction outlet is fluidly connected to a suction source.

5. The hand-held accessory tool of claim 4 wherein the drive mechanism is adapted to rotate the roller element in a direction so that the nozzle inlet is circumferentially spaced in the direction of rotation of the roller element downstream from the fluid distributor so as to remove the portion of fluid and debris from the roller element after the roller element has been wetted.

6. The hand-held accessory tool of claim 1 and further comprising a suction nozzle mounted within the housing and defining a nozzle inlet and a nozzle outlet, the nozzle inlet is positioned adjacent the roller element and the nozzle outlet is fluidly connected to the suction outlet, wherein suction nozzle is adapted to remove fluid and debris from the roller element when the suction outlet is fluidly connected to a suction source.

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