

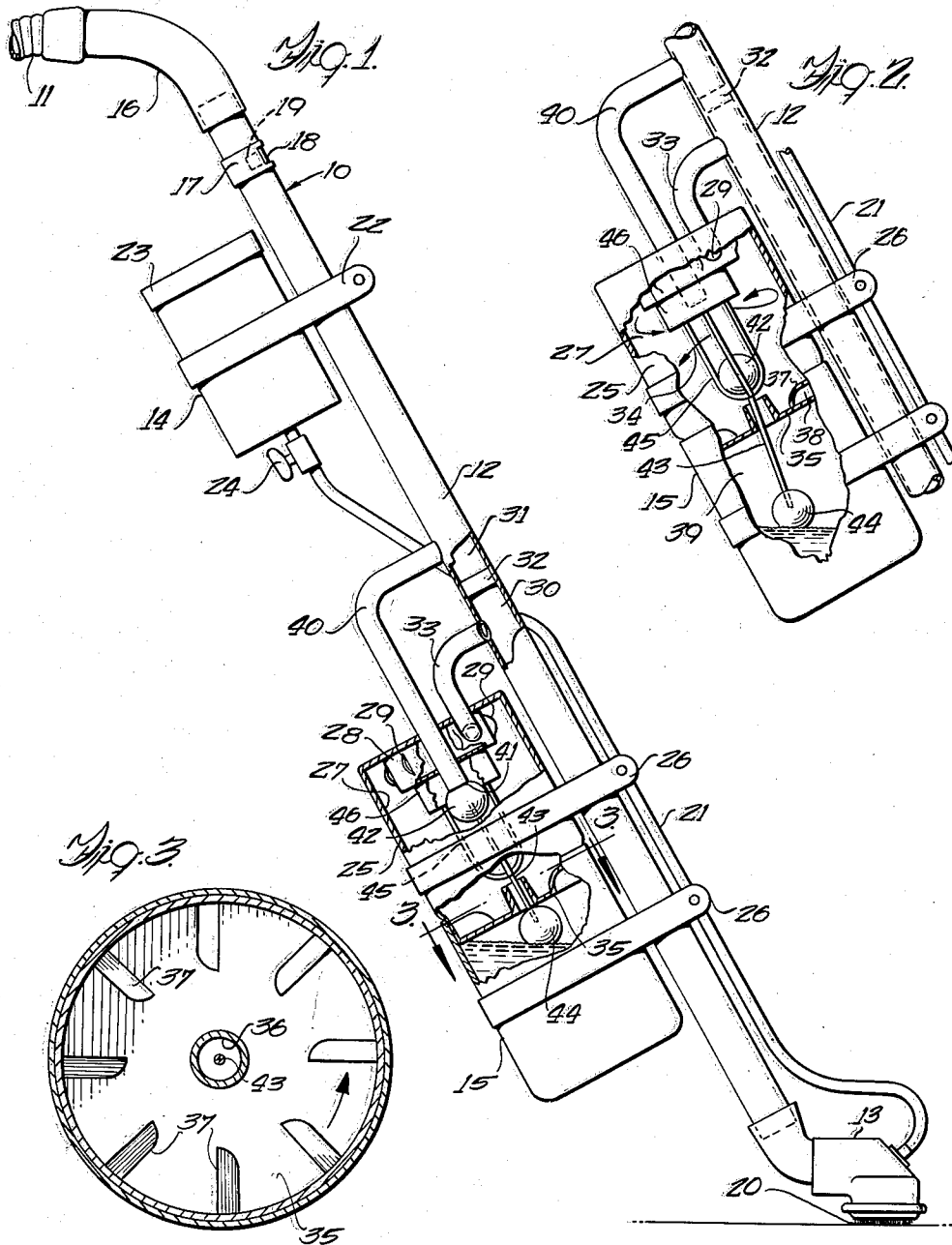
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FLOOR CLEANING DEVICE

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FLOOR CLEANING DEVICE

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6 Claims. (Cl. 15—353)

This invention relates to a floor cleaning device, and more specifically, to a device particularly suited for use in connection with a conventional vacuum cleaner for washing floors and floor coverings.

An important object of the present invention is to provide a simple and inexpensive vacuum cleaner attachment for the washing and scrubbing of carpets, rugs and other floor coverings, the suction of the vacuum cleaner being utilized to remove the water, dirt and cleaning agent from the floor. In this connection, it is a principal object to provide such an attachment with highly effective means for removing water from the air stream to protect the vacuum cleaner proper against corrosion, wear, or other damage, such as shorting of the unit's electrical components, arising because of water invasion. Specifically, it is an object to provide a water extractor of simple, inexpensive and highly efficient design.

A further object is to provide an extractor in which all of the elements responsible for extracting water and dirt from a stream of air are non-moving, at least with reference to each other. Still another object is to provide an extractor for withdrawing liquid and particulate matter from a stream of air, the extractor being useable in conjunction with vacuum cleaner units of any size and capacity without loss of efficiency. An additional object is to provide a water and dirt extractor for a floor cleaning device which will automatically interrupt the flow of air when the extractor is filled with water.

Other objects will appear from the specification and drawings in which:

FIGURE 1 is a side elevational view of a floor cleaning device embodying the present invention, portions of the extractor unit therefor being shown in longitudinal section;

FIGURE 2 is a broken elevational and sectional view showing the extractor unit only partially filled with water;

FIGURE 3 is an enlarged transverse sectional view of the extractor unit taken along line 3—3 of FIGURE 1.

In embodiment of the invention illustrated in the drawings, the numeral 10 generally designates a floor cleaning device adapted to be attached to the flexible hose 11 of a conventional vacuum cleaner. Essentially, the device comprises a substantially straight tube 12, a scrubbing head 13, a container 14 for holding a supply of water and cleaning agent, and an extractor 15.

As shown in FIGURE 1, the straight tube 12 is provided at its upper end with a curved section of tubing 16 which provides an operating handle for the device. Adjacent its upper end, tube 12 is also provided with a conventional valve 17 for regulating the amount of air flowing through the main tube. As is well known in the art, valve 17 comprises a rotatable sleeve having an opening 18 which can be moved into and out of register with an aperture 19 in tube 12.

Scrubbing head 13 communicates with tube 12 at the lower end thereof and is provided with a brush 20 for the scrubbing of floors and floor coverings. A feed pipe 21 is connected at one end to the scrubbing head and at its opposite end to container or reservoir 14. The container is secured by bracket 22 to the upper end portion of the tube 12 and is equipped with a removable cover 23. An adjustable valve 24 is interposed along line 21 to control the flow of liquid from the reservoir to the scrubbing head.

Extractor 15 includes a casing 25 secured by straps

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26 to the lower portion of tube 12. Within the casing is a cylindrical extraction chamber 27 for the centrifugal traction of water, dirt, and washing agent from air streaming therethrough. At the upper end of chamber 27 is a deflector 28 of generally cylindrical shape. The hollow deflector is provided along its cylindrical surface with a plurality of circumferentially-spaced jets or nozzles 29 for directing air (and the material entrained thereby) tangentially into the upper end of the chamber.

As shown most clearly in FIGURE 1, the interior of tube 12 is divided into inlet and outlet passages 30 and 31 by means of a partition 32 located intermediate the ends of the tube. A conduit 33 communicates with the upper end of the inlet passage 30 and leads directly to the upper end of the extractor where it communicates with hollow deflector 28. Thus, fluid passing upwardly through the inlet passage flows directly into the deflector through conduit 33 and, because of the direction of jets 29, is thrown outwardly against the cylindrical sides of the casing in a counter-clockwise spiral path (when viewed from above). The direction of movement of the air is indicated by the arrows 34 of FIGURE 2.

Intermediate the upper and lower ends of the casing is a partition 35 having a central opening 36 and a plurality of circumferentially-spaced upwardly-projecting scoops 37 overlying openings 38. It will be observed that the scoops face in directions opposite to the jets 29 so that the spiralling stream of air with its entrained liquid and particulate matter will pass through openings 38 into the lower chamber 39.

Extending between the outlet passage 31 of tube 12 and the upper extraction chamber 27 is a clean air discharge conduit 40. The lower end portion of this conduit passes downwardly through the central portion of the deflector 28 and terminates in an annular valve seat 41 disposed beneath the deflector. A valve member in the form of ball 42 cooperates with this valve seat to control the flow of air through the discharge conduit. The valve member is connected by a depending rod 43 to a float 44 within the lower chamber 39. When the lower chamber is empty or when the fluid level therein is low, valve member 42 is unseated, as illustrated in FIGURE 2. However, when the lower chamber is nearly filled with liquid the raised float 44 urges valve member 42 upwardly into the seated position shown in FIGURE 1.

Movement of the valve member between raised and lowered positions is guided by a valve cage 45. Preferably, an annular shield 46 extends about the lower end of the discharge conduit 40 to eliminate or reduce the possibility that air discharged from the jets of the deflector may pass directly into the open mouth of the discharge conduit.

In the operation of the illustrated embodiment, container 14 is filled or partially filled with a suitable cleaning solution, ordinarily an aqueous solution of a conventional washing agent. With hose 11 connected to an operating vacuum cleaner and with valve 24 in an open position, a user, gripping the device by handle 16, simply urges the scrubbing head 13 back and forth over the surface to be cleaned. The suction of the vacuum then lifts the water and dirt from the floor or rug surface so that the surface does not become soaked with liquid and the dirt particles and stains do not migrate downwardly. In some instances, where it is desirable to first saturate the floor covering with the cleansing liquid, operation of the vacuum cleaner may commence after the scrubbing step has been completed.

As the air and water pass through the hollow deflector unit 28 they are forced into a spiral path by the circumferential series of jets 29 and the cylindrical inner surface

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of casing 25. The air spins downwardly towards the lower end of the extraction chamber 27 and, because of their greater density, water droplets and particles of dirt, soil, etc. tend to be thrown outwardly under the influence of centrifugal force and impinge on the cylindrical side walls of the extraction chamber. Consequently, the air tends to be relieved of most of the larger droplets of water as the stream follows a helical path downwardly through the extraction chamber. Upon reaching the lower portion of that chamber, the liquid and air enter lower chamber 39 through the openings adjacent scoops or fins 37. The scoops tend to act as secondary baffles for collecting smaller droplets of water and, in connection with the remainder of the centrally apertured partition, cause an abrupt change in the direction of flow of the air. The air, relieved of the water and particulate matter carried thereby, passes upwardly from the lower chamber through the central opening of partition 35 and then leaves the extractor through discharge conduit 40.

From the above, it is believed apparent that the cylindrical wall of the extraction chamber 27 serves as a primary baffle in collecting water droplets impinging on it by reason of the spiral flow downwardly through that chamber. Water is centrifugally extracted without significantly restraining the flow of air through the extraction chamber. Furthermore, the velocity of the spinning action, and hence the effects of centrifugal force on the water droplets and particulate matter, are in direct relation to the power of the vacuum unit used in conjunction with the cleaning device.

While in the foregoing I have described an embodiment of the invention in considerable detail for purposes of illustration it will be understood by those skilled in the art that many of these details may be varied without departing from the spirit and scope of the invention.

I claim:

1. In a surface washing device, an extractor for removing liquid and particulate matter from a stream of air, said extractor comprising a casing having curved side walls defining an extraction chamber, said casing having an inlet opening at one end thereof, a deflector at said one end of said chamber communicating directly with said inlet opening for directing an incoming stream of air in a spiral path axially through said chamber, whereby, liquid and particulate matter carried by said air are thrown outwardly against said walls under the influence of centrifugal force, a discharge passage having a discharge opening centrally located within said chamber for the removal of relatively clean and dry air from the central portion of said chamber, a ball valve member cooperable with said discharge opening for opening and closing the same, a cage mounted within said chamber and supporting said ball valve member for movement between open and closed positions, said extraction chamber being provided at its opposite end with a wall having a plurality of scoops facing in directions opposite to the direction of spiral movement of said air, and a second chamber communicating with said extraction chamber through openings within said scoops, whereby, liquid and particulate matter carried by air spiraling through said extraction chamber and against said end wall is collected in said second chamber, said scoop-providing wall having a central opening therethrough, a rod of substantially smaller diameter than said opening extending downwardly therethrough into said second chamber, said rod being secured at its upper end to said valve member and at its lower end to a float member.

2. The structure of claim 1 in which said opening in said scoop-providing end wall faces said discharge passage, whereby, air passing through said second chamber may flow through said last-mentioned opening and into said discharge passage.

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3. A floor washing device comprising a stiff and substantially straight tube having a scrubbing head affixed to the lower end thereof, said tube adapted to be connected adjacent its upper end to the hose of a vacuum cleaner for the removal of wash water and dirt from a cleaned floor, a transverse partition separating the interior of said tube to provide a lower inlet passage and an upper outlet passage, and an extractor for extracting wash water and dirt from air passing through said tube, said extractor comprising a casing having upper and lower chambers therein, said upper chamber communicating with said inlet passage and being provided with deflector means for imparting spiral movement to air streaming into said upper chamber from said inlet passage, said upper chamber also having a centrally-disposed discharge port communicating with the upper outlet passage of said tube, said upper and lower chambers being separated by an intermediate apertured wall having a central opening coaxial with said discharge port, whereby, dirt and wash water carried by air deflected by said deflector means are thrown outwardly against the walls of said upper chamber and drains downwardly into said lower chamber through said apertured intermediate wall, a valve member in said upper chamber for opening and closing said port, a rod connected to said valve member and extending downwardly through said central opening, said rod having a diameter substantially smaller than said central opening, and a float secured to the lower end of said rod.

4. The structure of claim 3 in which said intermediate apertured wall is provided with scoops for directing dirt and wash water into said lower chamber through said apertures.

5. In a surface washing device, an extractor for removing liquid and particulate matter from a stream of air, said extractor comprising a casing having curved side walls defining an extraction chamber, said casing having an inlet opening at one end thereof, a deflector at said one end of said chamber communicating directly with said inlet opening for directing an incoming stream of air in a spiral path axially through said chamber, a discharge passage having a discharge port centrally located within said chamber for the removal of relatively clean and dry air, a wall at the opposite end of said chamber having a central opening coaxial with said discharge port, a second chamber communicating with said extraction chamber through said apertured wall, a valve member in said extraction chamber for opening and closing said port, a rod connected to said valve member and extending downwardly through said central opening, said rod having a diameter substantially smaller than said central opening, and a float secured to the lower end of said rod.

6. The structure of claim 5 in which said apertured wall at said opposite end of said extraction chamber is provided with a plurality of scoops facing in directions opposed to the direction of spiral movement of said air, whereby, liquid and particulate matter carried by air spiraling through said extraction chamber and against said scoops is collected in said second chamber.

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