Abstract

A self-propelled walk behind floor cleaning apparatus includes a frame. A plurality of floor engaging wheels support the frame above a floor and a brush assembly fixed to the frame agitates a fluid on the floor. A floating tank is supported by the frame.
WALK BEHIND FLOOR CLEANING APPARATUS WITH FLOATING TANK

CROSS REFERENCES TO RELATED APPLICATIONS


STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH

[0002] Not Applicable.

BACKGROUND OF THE INVENTION

[0003] The field of invention is floor cleaning equipment, and more particularly, floor cleaning equipment such as scrubbers, for use in industrial and commercial environments.

[0004] Industrial and commercial floors, such as concrete, terrazzo, wood, and the like, are cleaned on a regular basis by floor cleaning equipment, such as scrubbers, for aesthetic and sanitary purposes. Typical scrubbers, such as Factory Cat® and TOMCAT® scrubbers available from R.P.S. Corporation, Racine, Wis. are walk-behind or drivable, self-propelled, wet process machines.

[0005] Known scrubbers apply a liquid cleaning solution from an on-board cleaning solution tank to floor through nozzles fixed to a forward portion of the scrubber. Rotating brushes forming part of the scrubber rearward of the nozzles agitate the solution to loosen dirt and grime adhering to the floor. The dirt and grime become suspended in the solution which is collected by a vacuum squeegee fixed to a rearward portion of the scrubber and deposited into an onboard recovery tank.

[0006] The solution and recovery tanks are fixed to a frame which also carries other scrubber components, such as batteries, motors, and electronic circuitry. Maintenance of these other components often requires completely removing the tanks to gain access to the other scrubber components. Because the tanks are fixed to the frame, removal is often difficult and time consuming. Therefore, a need exists for a scrubber having an easily removable tank.

[0007] The tanks are also often formed from molded plastic which is attached to the frame by hardware, such as mechanical fasteners, which rigidly fixes the tanks to the frame. During operation and transportation of the scrubber, the frame and/or one or more of the tanks may strike a fixed object causing relative movement between the frame and tanks. For example, the frame may twist or the tank may shift on the frame. This relative movement between the frame and rigidly fixed tank can damage the tank, especially the area proximal the fasteners rigidly fixing the tanks to the frame. Therefore, a need exists for a scrubber having a tank that is not readily damaged upon impact with a fixed object.

BRIEF SUMMARY OF THE INVENTION

[0008] The present invention provides a walk behind floor cleaning apparatus with a tank that is easily removed and not readily damaged upon impact with a fixed object. The apparatus includes a frame. A plurality of floor engaging wheels support the frame above a floor and a brush assembly fixed to the frame agitates a fluid on the floor. A floating tank is supported by the frame.

[0009] A general objective of the present invention is to provide a cleaning apparatus having a tank that is easily removable and not readily damaged. This objective is accomplished by floating the tank on the frame.

[0010] The foregoing and other objectives and advantages of the invention will appear from the following description. In the description, reference is made to the accompanying drawings which form a part hereof, and in which there is shown by way of illustration a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a right side perspective view of a cleaning apparatus incorporating the present invention;

[0012] FIG. 2 is a bottom view of the apparatus of FIG. 1;

[0013] FIG. 3 is a right, front perspective view of FIG. 1 with the jaws open;

[0014] FIG. 4 is a right side view of the apparatus of FIG. 1 with the tank in an open position;

[0015] FIG. 5 is a right, front perspective view of FIG. 1;

[0016] FIG. 6 is a detailed view of FIG. 5 along line 6-6;

[0017] FIG. 7 is a rear, bottom perspective view of FIG. 1;

[0018] FIG. 8 is a detailed view of FIG. 7 along line 8-8;

[0019] FIG. 9 is a detailed view of FIG. 7 along line 9-9.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0020] As shown in FIGS. 1-4, a walk-behind wet process floor cleaning apparatus 10 includes a floating tank 12 that is easily removed and is not readily damaged upon impact with a fixed object. A floating tank is defined as a tank that is capable of moving vertically relative to a supporting frame. The walk-behind apparatus 10 includes a squeegee frame 20 having a front end 22 and a rear end 24 joined by sides 26. The frame 20 is supported by floor engaging front wheels 30 and rear casters 32. The tank 12 and plurality of batteries 18 are supported above the frame 20 by the frame 20. A squeegee assembly 14 and a brush assembly 27 are fixed to the frame 20 and suspended beneath the frame 20 for engagement with the floor being cleaned.

[0021] The batteries 18 provide electrical power to an electric drive motor 29 coupled to the rear wheel 30. The batteries 18 also provide electrical power to other electrical components described below. The drive motor 29 rotatably drives the front wheels 30 to propel the apparatus 10 along the floor. Although an electric motor powered by the batteries for rotatably driving the front wheels 30 is preferred, the front wheels 30 can be rotatably driven by other means, such as an internal combustion engine powered by gasoline, natural gas, and the like, without departing from the scope of the invention.

[0022] The tank 12 is preferably partitioned into two separate volumes 28, 34. The first volume 28 holds unused cleaning solution proximal a front of the tank 12. A fill opening 36 at the front of the tank 12 provides access to the first volume interior for filling the first volume 28 with the cleaning Solution. A lid 38 covers the fill opening 36 to prevent spillage as the apparatus 10 travels across the floor.

[0023] The second volume 34 holds recovered cleaning solution proximal a rear of the tank 12 and has an open top for easy access to a strainer 40 and vacuum screen 42 disposed in the second volume 34. A cover 44 seals the second volume open top when a vacuum is formed in the second volume 34 to draw water into the second volume 34 through the vacuum screen 42 from the squeegee assembly 14.
The tank 12 can be formed from any material known in the art, such as plastic, metal, fiberglass, and the like without departing from the scope of the invention. Although a single tank 12 partitioned into the two volumes 28, 34 is preferred, the volumes can be separate tanks, such as a solution tank and recovery tank, that are coupled together, remain independent of each other, or a joined together, without departing from the scope of the invention.

As shown in Figs. 4-9, the tank 12 is supported by the frame 20 and floats above the frame 20 for easy removal and to minimize damage caused by impacting a fixed object. The front end of the tank 12 is supported by upwardly facing grommets 46 fixed to an upper edge 48 of a vertical wall 50 forming part of the frame 20. The rear end of the tank 12 is supported by pegs 52 extending laterally outwardly from the frame 20 proximal the frame rear end 24. The pegs 52 are received in downwardly opening peg receptacles 54 formed in the tank 12. Preferably, the peg receptacles 54 are molded into the tank 12 to avoid comprising the integrity of the molded tank 12.

Neither the grommets 46 nor the pegs 52 received in the peg receptacles 54 restrict vertical movement of the tank 12, thus allowing the tank 12 to move vertically, i.e., float, relative to the frame 20. Advantageously, the floating tank 12 allows the tank 12 to be lifted off the frame 20 without tools. Moreover, the floating tank 12 allows the frame 20 to move relative to the tank 12 in the event the frame 20 or tank 12 strikes a fixed object, thus avoiding damage caused by the frame 20 gouging into the tank 12. Of course, the peg receptacles 54 can be upwardly open receptacles formed in the frame 20 which receives pegs extending laterally from the tank 12 without departing from the scope of the invention.

The pegs 52 pivotally mount the tank 12 relative to the frame 20 to provide access to components of the apparatus 10 beneath the tank 12. A detachable retractor 56 having one end 58 fixed relative to the frame 20 and an opposing end 60 fixed relative to the tank 12 prevents the tank 12 from pivoting beyond a desired arc length, but past a tipping point in which the weight of the tank 12 maintains the tank 12 in a pivotally open position, as shown in Figs. 4 and 5. Although a retractor 56 in the form of a detachable strap is shown, any device for restraining pivotal movement of the tank can be used, such as physical stops, without departing from the scope of the invention.

Resilient latches 62, such as formed from rubber, having one end 64 fixed to the frame 20 and a second end 66 engaging the tank 12 biases the tank 12 toward a closed position, shown in Fig. 1, over the frame 20. Advantageously, the resilient latches 62 allow the tank 12 to float on the frame 20 while sufficiently restricting movement of the tank to prevent inadvertent separation of the tank 12 and frame 20. Referring to Figs. 1-4, a control panel 68 mounted on the rear end of the tank 12 houses circuitry for controlling the drive motor 29 and the other electrical components described below. Control circuitry for controlling motors, pumps, and other electrical components is known in the art, such as control circuitry available on TECMATIC® cleaning equipment available from R.P.S. Corporation in Racine, Wis. A handlebar 72 mounted to the tank 12 rearward of the control panel 68 is provided for grasping by a user walking behind and operating the apparatus 10.

The apparatus 10 dispenses a liquid cleaning solution from the first volume 28 onto the floor being cleaned, agitates the cleaning solution, and then using suction draws the cleaning solution through the squeegee assembly 14 into the second volume 34. A fluid dispenser, such as spray nozzles, a perforated manifold, and the like, supported forward of the brush assembly 27 above the floor being cleared is in fluid communication with the first volume 28. The fluid dispenser dispenses the cleaning solution onto the floor as the apparatus 10 is travels across the floor. The cleaning solution can be gravity fed or pumped out of the first volume 28 through the fluid dispenser without departing from the scope of the invention.

The cleaning solution deposited onto the floor is agitated by a pair of rotating disk brushes 74, 76 forming part of the brush assembly 27 disposed rearwardly of the fluid dispenser. The brushes 74, 76 are rotatably driven by electrical motors, 78, 80. Rotation of the brushes 74, 76 agitate the cleaning solution on the floor to dislodge dirt and grime adhering thereto. Advantageously, the dirt and grime are then suspended in the cleaning solution which can be drawn into the second volume 34, as described below. Although rotating disk brushes 74, 76 are shown, other agitating means may be preferred for specific applications, such as one or more cylindrical brushes, a single cylindrical brush, and the like, and can be used without departing from the scope of the invention.

The squeegee assembly 14 is removably attached to the frame rear end 24 and dries the surface of a hard floor being cleaned by the apparatus 10. The squeegee assembly 14 includes a forward arcuate squeegee strip 84 nested in a rearward arcuate squeegee strip 86. The nested squeegee strips 84, 86 extend across the width of the apparatus, and define a crescent shaped vacuum zone 88. The vacuum zone 88 is connected to the vacuum source, such as via hoses, which suctions the cleaning solution out of the vacuum zone 88 into the second volume 34. Preferably, the strips 84, 86 are formed from a flexible, elastomeric material, such as rubber, plastic, and the like, which can sealingly engage the floor.

The vacuum source can be any known assembly, such as a vacuum pump in fluid communication with the second volume 34. The vacuum pumps draw air out of the second volume 34 through the vacuum screen 42 to create a partial vacuum. The partial vacuum draws the cleaning solution into the second volume 34, such as via hoses, through the squeegee assembly 14.

Referring to Figs. 1-9, in operation, as the operator guides the apparatus 10 across the floor, the fluid dispenser dispenses cleaning solution from the first volume 28 onto the floor. The disc brushes 74, 76 counter rotate to agitate the cleaning solution on the floor. As the apparatus 10 moves across the floor, the agitated cleaning solution is collected by the squeegee assembly 14 and drawn off of the floor by the vacuum source and deposited into the second volume 34 for later disposal.

For maintenance, the first and second volumes 28, 34 in the tank 12 are drained of liquid and, if desired, the squeegee assembly 14 is removed. The resilient latches 62 are disengaged from the tank 12 and the jaws 82 are opened. The tank 12 is then pivoted about the pegs 52 to the open position exposing the batteries and other scraper components. For maintenance requiring removal of the tank 12, the tank is lifted upwardly off of the frame after draining the volumes 28, 34.
While there have been shown and described what is at present considered the preferred embodiments of the invention, it will be obvious to those skilled in the art that various changes and modifications can be made therein without departing from the scope of the invention defined by the appended claims. For example, the floor cleaning apparatus can be propelled across a floor by the brushes instead of a driven wheel without departing from the scope of the invention.

1. A self-propelled walk behind floor cleaning apparatus comprising:
   a frame;
   a plurality of floor engaging wheels supporting said frame above a floor;
   a brush assembly fixed to said frame and agitating a fluid on the floor; and
   a floating tank supported by said frame.

2. The floor cleaning apparatus as in claim 1, in which one of said tank and said frame includes a peg receptacle receiving a peg extending from the other of said tank and said frame, said peg receptacle having a length and being open along at least a portion of said length allowing said tank to float relative to said frame.

3. The floor cleaning apparatus as in claim 2, in which said tank includes a peg receptacle formed therein, and said peg receptacle opens downwardly.

4. The floor cleaning apparatus as in claim 1, in which said tank is pivotally supported on said frame.

5. The floor cleaning apparatus as in claim 4, in which a detachable restrainer restricts pivotal movement of said tank.

6. The floor cleaning apparatus as in claim 1, including a resilient latch urging said tank toward said frame.

7. The floor cleaning apparatus as in claim 1, in which said tank is partitioned into at least two volumes, one of said volumes holding unused cleaning solution and the other of said volumes holding recovered cleaning solution.

8. The floor cleaning apparatus as in claim 1, including a squeegee assembly fixed to a rear end of said frame, said squeegee assembly recovering solution from said tank.

9. The floor cleaning apparatus as in claim 1, in which said brush assembly includes at least one motor driven brush.

10. The floor cleaning apparatus as in claim 1, including handlebar fixed relative to said tank for grasping by a user walking behind and operating said apparatus.

11. A self-propelled walk behind floor cleaning apparatus comprising:
   a frame having a rear end and a front end;
   a plurality of floor engaging wheels supporting said frame above a floor;
   a floating tank supported by said frame;
   a fluid dispenser in fluid communication with said tank and dispensing a fluid from said tank onto a floor;
   a brush assembly fixed to said frame rearwardly of said fluid dispenser and agitating the fluid on the floor; and
   a squeegee assembly fixed to a said frame rearwardly of said brush assembly and recovering the fluid from the floor.

12. The floor cleaning apparatus as in claim 11 in which one of said tank and said frame includes a peg receptacle receiving a peg extending from the other of said tank and said frame, said peg receptacle having a length and being open along at least a portion of said length allowing said tank to float relative to said frame.

13. The floor cleaning apparatus as in claim 12, in which said tank includes a peg receptacle formed therein, and said peg receptacle opens downwardly.

14. The floor cleaning apparatus as in claim 11, in which said tank is pivotally supported on said frame.

15. The floor cleaning apparatus as in claim 14, in which a detachable restrainer restricts pivotal movement of said tank.

16. The floor cleaning apparatus as in claim 11, including a resilient latch urging said tank toward said frame.

17. The floor cleaning apparatus as in claim 11, in which said tank is partitioned into at least two volumes of said volumes holding unused cleaning solution and the other of said volumes holding recovered cleaning solution.

18. The floor cleaning apparatus as in claim 11, including handlebar fixed relative to said tank for grasping by a user walking behind and operating said apparatus.

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