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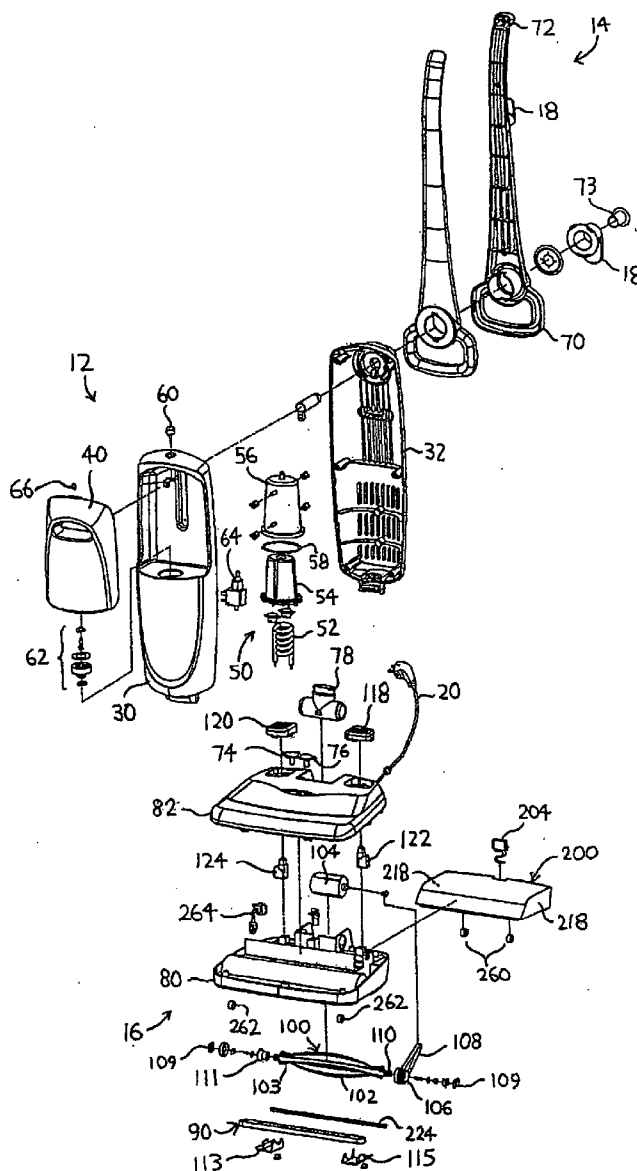
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(57) **ABSTRACT**

A floor cleaning apparatus includes a discharger for discharging cleansing solution and/or steam to a floor surface, a receptacle, and a sweeping member operatively associated with the discharger and the receptacle for sweeping used liquid on the floor surface into the receptacle.

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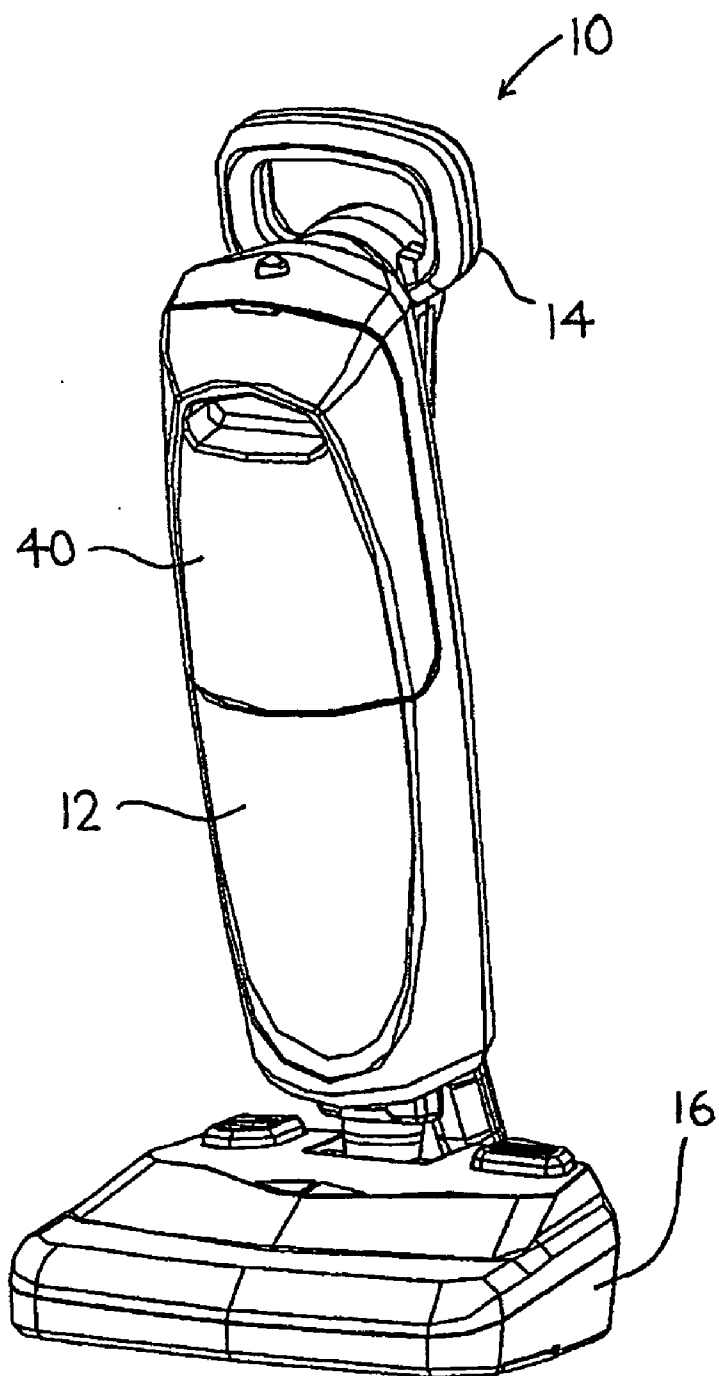


FIG. 1

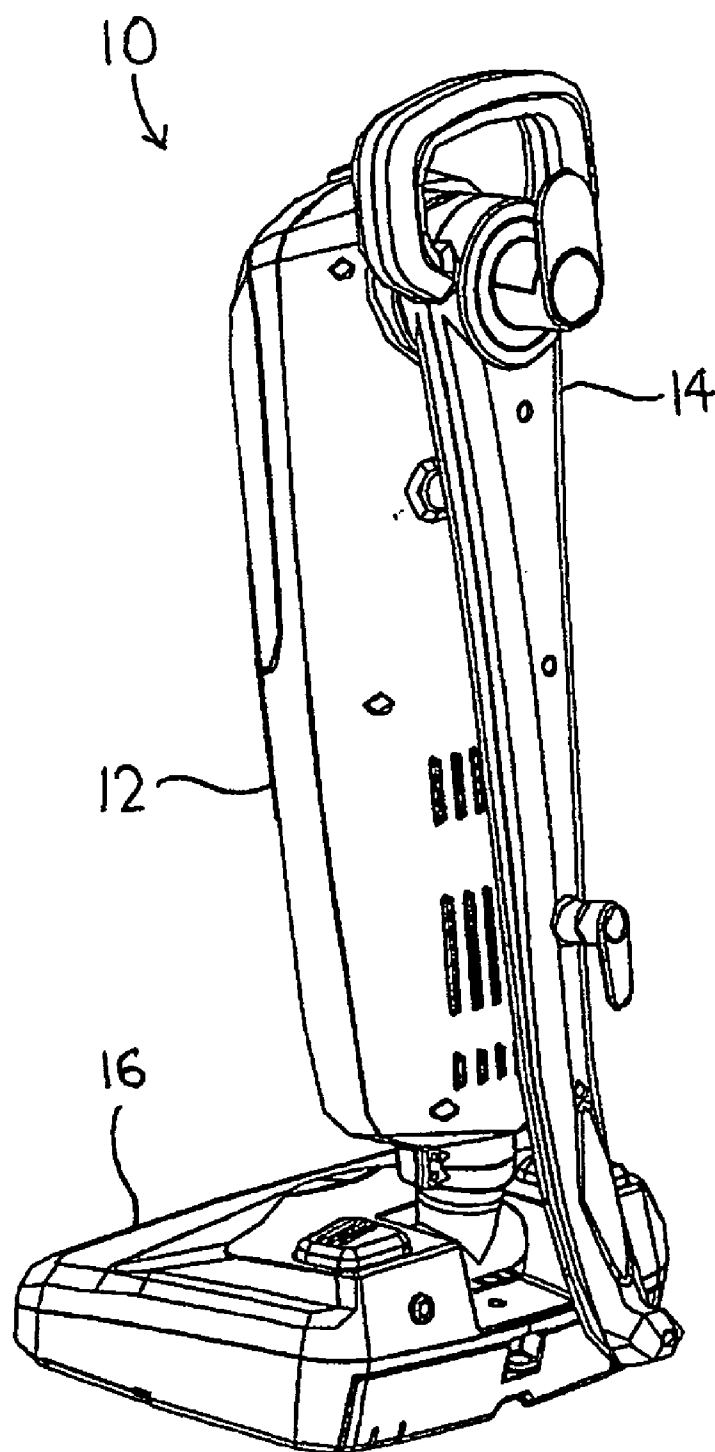


FIG. 2

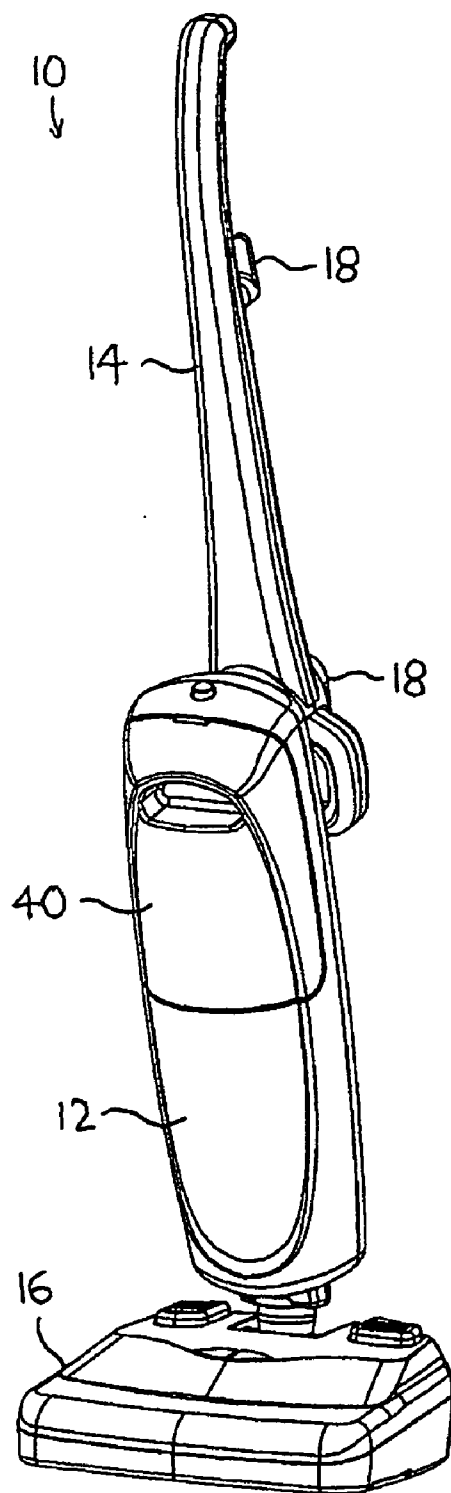


FIG. 3

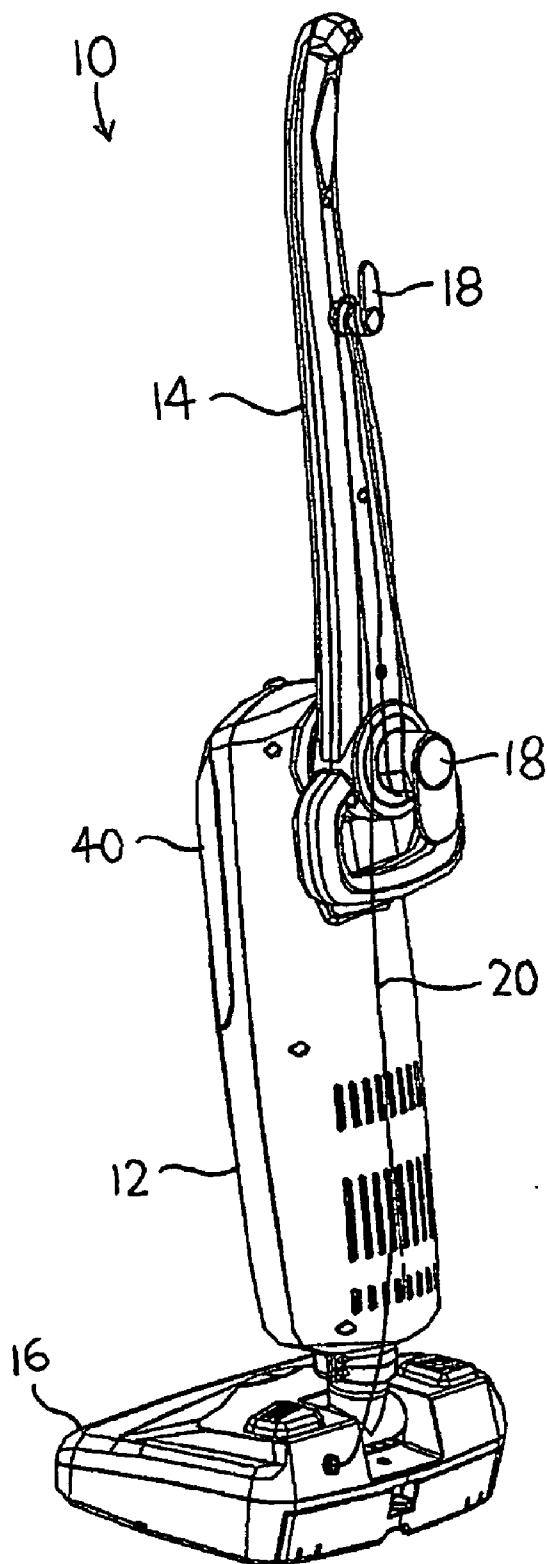


FIG. 4

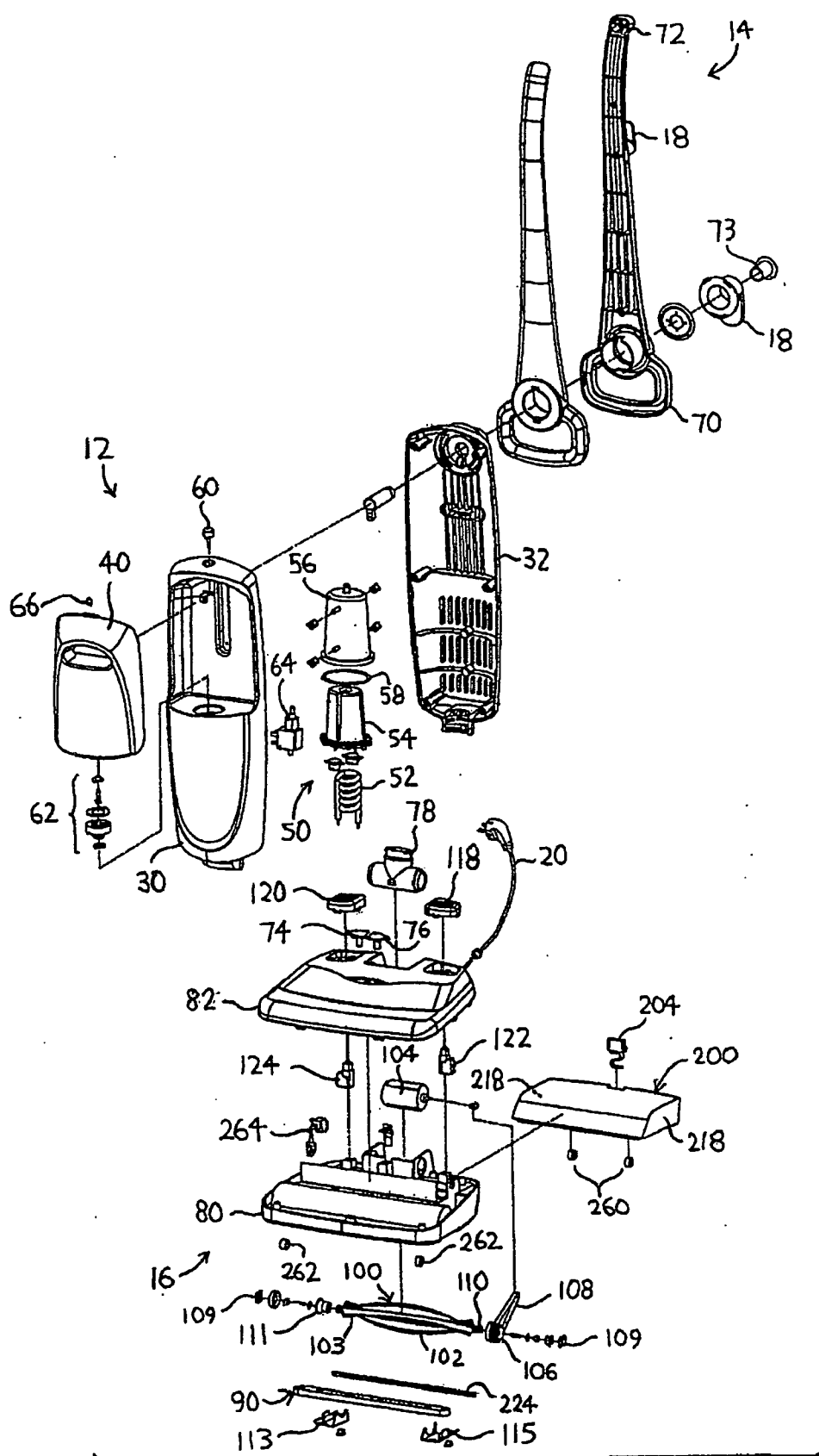


FIG. 5

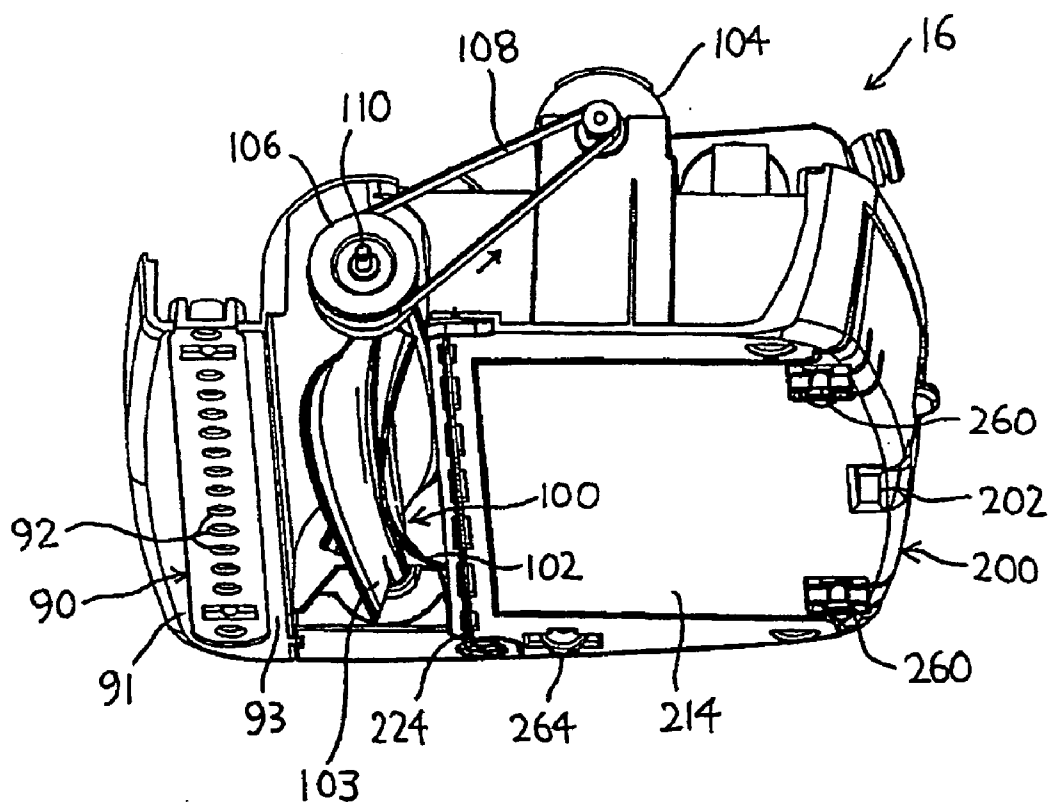


FIG. 6

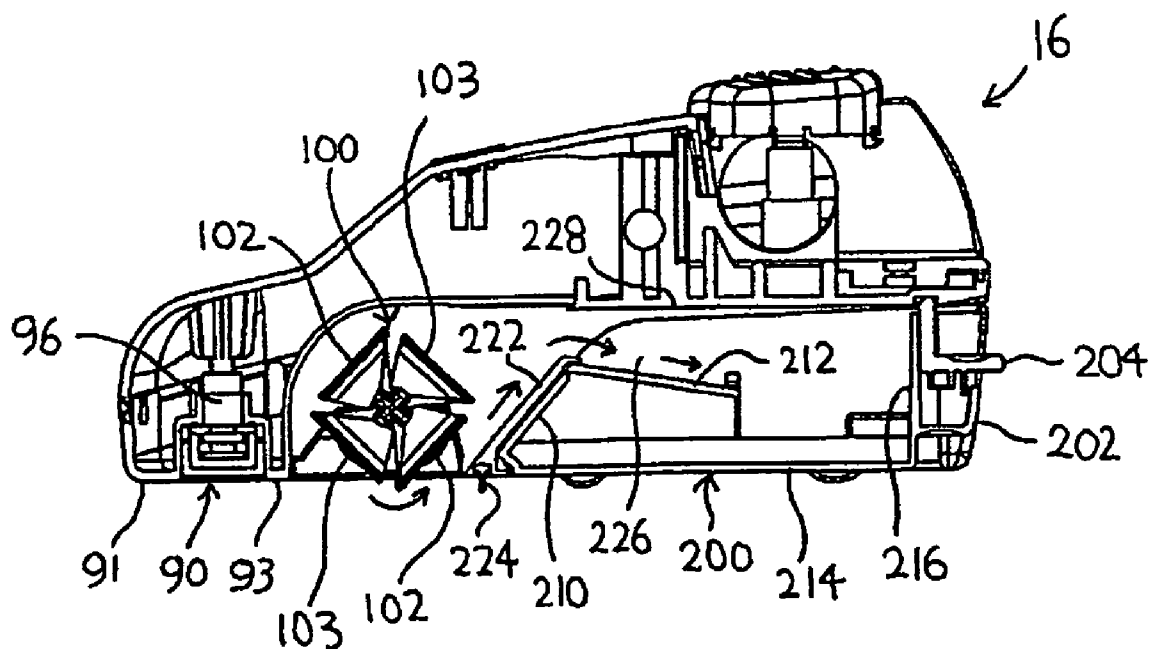


FIG. 7

FLOOR CLEANING APPARATUS AND METHOD

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application Ser. No. 60/642,553 filed Jan. 11, 2005, which is hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to a floor cleaning apparatus and, in particular, a combined discharger and electric sweeping member.

BACKGROUND OF THE INVENTION

[0003] Conventional dischargers have been used to effectively clean and degrease floors. In addition to removing dust, dirt, grease, stain from the floors, steam also has a desirable sanitizing and anti-bacterial effect. These conventional dischargers have cloths mounted thereon for wet cleaning and scrubbing. These conventional dischargers are equipped with reservoirs and heaters for generating steam to be discharged through steam outlets in the form of jets of steam directed towards the floors to be cleaned.

[0004] On contacting the floor, some of the steam is condensed, and the condensate, mixing with the dust, dirt, grease, etc., usually cannot be completely soaked up by the mop. The condensate mixed with dust, dirt, grease, etc. is still spread in part over the floor to be cleaned. Extra step or steps have to be taken to completely remove the condensate and dirt spread in part over the floor after wet cleaning by the discharger is completed.

[0005] Therefore, there is a need to clean a floor with a discharger and remove the condensate and dirt completely in one single step.

BRIEF SUMMARY OF THE INVENTION

[0006] The present invention is directed to a floor cleaning apparatus. In one embodiment, the floor cleaning apparatus includes a discharger for discharging cleansing solution and/or steam to a floor surface, a receptacle, and a sweeping member operatively associated with the discharger and the receptacle for sweeping used liquid on the floor surface into the receptacle. In one embodiment, the sweeping member may be a rotary sweeping member. In one embodiment, the sweeping member may be positioned posterior to the discharger and anterior to the receptacle. In one embodiment, the sweeping member may include at least one row of bristles. In one embodiment, the sweeping member may include at least one sweeping strip. In another embodiment, the sweeping member may include two rows of bristles and two sweeping strips.

[0007] The floor cleaning apparatus may further include a slant wall disposed between the sweeping member and the receptacle, so that the used liquid on the floor surface can be swept into the receptacle via a top surface the slant wall. In one embodiment, the bottom surface of the slant wall and the floor surface define an acute angle when the floor cleaning apparatus is in use. Optionally, the acute angle is in the range of about 20 degrees to about 70 degrees and preferably about 45 degrees. In one embodiment, the receptacle includes a slanted panel configured to abut against a bottom surface of

the slant wall when the floor cleaning apparatus is in use. The receptacle may include a top panel slanted downwardly towards a central portion of the receptacle.

[0008] The present invention is also directed to a method of cleaning a floor surface. In one embodiment, a discharger initially discharges cleansing solution and/or steam to the floor surface. A sweeping member then sweeps used liquid on the floor surface into a receptacle. The discharger, the receptacle and the sweeping member are operatively associated with each other. The used liquid on the floor surface may be swept into the receptacle via a slanted wall between the sweeping member and the receptacle. The used liquid on the floor surface may be swept into the receptacle by using a rotary sweeping member.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] **FIG. 1** is a front and side view of a floor cleaning apparatus in accordance with one embodiment of the present invention.

[0010] **FIG. 2** is a back and side view of the floor cleaning apparatus of **FIG. 1**;

[0011] **FIG. 3** is a front and side view of the floor cleaning apparatus of **FIG. 1** with the handle extended.

[0012] **FIG. 4** is a back and side view of the floor cleaning apparatus of **FIG. 1** with the handle extended and an electric cord hung on the handle.

[0013] **FIG. 5** is an exploded view of a floor cleaning apparatus in accordance with another embodiment of the present invention.

[0014] **FIG. 6** is side and bottom view of a cleaning head of the floor cleaning apparatus of **FIG. 5**.

[0015] **FIG. 7** is cross sectional view of the cleaning head of the floor cleaning apparatus of **FIG. 5**.

DETAILED DESCRIPTION OF THE INVENTION

[0016] In the following detailed description of the preferred embodiments, reference is made to the accompanying drawings, which form a part thereof, and within which are shown by way of illustration specific embodiments by which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the invention.

[0017] **FIGS. 1 to 4** are various perspective views of a floor cleaning apparatus in accordance with an embodiment of the present invention.

[0018] The floor cleaning apparatus, designated generally by reference numeral **10**, includes a body or housing **12**, a handle **14** coupled to the housing **12**, and a cleaning head **16** coupled to the housing **12**.

[0019] In the illustrated embodiment, the handle **14** may be rotatably connected to the housing **12** and movable between a retracted position, as shown in **FIGS. 1 and 2**, and an extended position, as shown in **FIGS. 3 and 4**. The handle **14** may have cord hangers **18** for hanging an electric cord **20** thereon.

[0020] FIG. 5 is an exploded view of the floor cleaning apparatus 10 in accordance with an embodiment of the present invention.

[0021] The housing 12 may include a front cover 30 and a rear cover 32. The front and rear covers 30, 32 define a space or compartment within the housing 12.

[0022] A reservoir 40 for receiving cleansing solution is removeably mounted on the housing 12, preferably at an upper front portion thereof. The reservoir 40 can be of any appropriate shape and dimension. The reservoir 40 is preferably transparent or semi-transparent so that the liquid level within the reservoir 40 is visible by a user. A reservoir release button 60 is provided to actuate an engaging mechanism employed to removably engage the reservoir 40 with the housing 12. The engaging mechanism may take the form of a conventional retaining clip, a catch, or a clamp, etc.

[0023] As used in the present invention, the “cleansing solution” refers to water, liquid chemical/non-chemicals, liquid cleaning agent, water mixed with solid or liquid chemical/non-chemical cleaning agents or combination thereof.

[0024] The front cover 30, the rear cover 32, and the reservoir 40 may be made of plastic or any suitable material by conventional method such as injection molding.

[0025] Preferably, a heating assembly, generally denoted by reference numeral 50, may be mounted within the housing 12 for producing hot cleansing solution and/or steam. The heating assembly 50 may take any conventional form and may be installed within the housing 12 in any conventional way. In the present embodiment, the heating assembly 50 may include a coiled heating element 52, a heater 54 to be heated up by the heating element 52, and a heater shell 56. The heater 54 and the heater shell 56 together define a space or compartment for containing cleansing solution to be heated. A sealing ring 58 may be used to establish a sealing engagement between the heater 54 and the heating shell 56.

[0026] When the floor cleaning apparatus 10 is turned on, the cleansing solution from the reservoir 40 enters the heater shell 56 through a valve assembly 62. The cleansing solution in the heater shell 56 is to be heated up by the heater 54 to produce hot cleansing solution and/or steam.

[0027] Although the illustrated embodiment shows that hot cleansing solution and/or steam is produced by the floor cleaning apparatus 10, it is to be understood that cleansing solution need not to be heated.

[0028] In the illustrated embodiment, the handle 14 is generally elongated and is designed in such a way that the floor cleaning apparatus 10 can easily be controlled and manipulated by the user. The handle 14 can be rotatably connected to the housing 12 at a rear upper portion thereof. The handle 14 may have an enlarged round-shaped handgrip portion 70 and an outturned end 72. The user may grip the handgrip portion 70 and move the floor cleaning apparatus 10 back and forth. The user may rotate the handle 14 into an extended position, as illustrated in FIGS. 3 and 4, and grip the outturned end 72 for cleaning hard-to-reach floor surfaces. A handle button 73 may be used to release and hold the handle 14 in the retracted or extended position.

[0029] In the illustrated embodiment, the cleaning head 16 may be hingedly connected to the housing 12 at a bottom end thereof by a hinge mechanism 78. The hinge mechanism 78 may be a universal hinge or any other suitable hinge mechanism.

[0030] In the illustrated embodiment, the cleaning head 16 may include a base 80 and a top cover 82. The base 80 and the top cover 82 may be made of plastic or any suitable material by conventional method such as injection molding. The base 80 and the top cover 82 define a space or compartment for receiving the cleaning tool assembly of the floor cleaning apparatus 10, details of which will be described below.

[0031] As shown in FIGS. 5, 6 and 7, a discharger 90 is provided on the cleaning head 16. As used in the present invention, the “discharger” refers to a part of the floor cleaning apparatus which can discharge cleansing solution and/or steam onto the floor surface. The discharger 90 may include a plurality of outlets 92, a leading edge 91 and a trailing edge 93, as depicted in FIG. 6. Hot cleansing solution or steam produced in the heater shell 56 may travel to the discharger 90 via a conventional duct 96 and may discharge through the plurality of outlets 92 in the form of jets directed towards the floor to be cleaned. A pump 64 may be used to control the amount of cleansing solution entering the heater shell 56 and the amount of hot cleansing solution and/or steam produced.

[0032] In the illustrated embodiment, a sweeping member, generally represented by reference numeral 100, is provided within the cleaning head 16 posterior to the trailing edge 93 of the discharger 90. In the illustrated embodiment, the sweeping member 100 is rotary. The rotary sweeping member 100 may be driven by an electric motor 104. The electric motor 104 may drive a pulley 106 via a traction belt 108. The pulley 106 in turn may drive the rotary sweeping member 100. It is appreciated that the rotary sweeping member 100 can be driveably coupled to the electric motor 104 using other suitable coupling mechanisms such as gear mechanism, chain assembly, etc.

[0033] The pulley 106 may be covered by a pulley cover 115. The rotary sweeping member 100 may be rotatably mounted on opposite sidewalls of the cleaning head 16 via conventional bearing assemblies 109. The rotary sweeping member 100 may be held in position at one end thereof by a rotary sweeping member holder 111 which may be covered by a rotary sweeping member holder cover 113.

[0034] The electric motor 104 can be powered by AC power supplied to the floor cleaning apparatus 10 through the power cord 20. The electric motor 104 may be powered by a plurality of single-use or rechargeable batteries, if necessary.

[0035] According to a preferred embodiment, the rotary sweeping member 100 may include two rows of bristles 102 and two sweeping strips 103. The two rows of bristles 102 and the two sweeping strips 103 may be made of resilient deformable material. Preferably, the two sweeping strips 103 are made of rubber. The two rows of bristles 102 may be arranged in alternate with the two sweeping strips 103.

[0036] In the illustrated embodiment, the two rows of bristles 102 and the two rubber sweeping strips 103 are fixedly attached to a rod 110 of the rotary sweeping member

110. The two rows of bristles **102** and the two rubber sweeping strips **103** may be arranged parallel to the rod **110**, or in a plurality of helixes about the rod **110**.

[**0037**] The two rows of bristles **102** of the rotary sweeping member **100** are adapted to sweep dust, dirt, and other waste substances from the floor to be cleaned. The rubber sweeping strips **103** of the rotary sweeping member **100** are for sweeping debris and used liquid remaining on the floor into a receptacle **200** which is provided within the cleaning head **16** behind the rotary sweeping member **100**. As used in the present invention, the “used liquid” refers to liquid that is originated from cleansing solution and/or steam and is discharged by the discharger of the floor cleaning apparatus onto the floor surface. The “receptacle” refers to a container disposed in the floor cleaning apparatus, which is used to collect the used liquid from the floor surface.

[**0038**] The rotary sweeping member **100** can be turned on and off by pushing a switch button **120**. This switch button **120** may be located on the floor cleaning apparatus **10** at a position easily accessible by the user. The switch button **120** can be located on the handle **14**, or the housing **12**, or preferably on the cleaning head **16**.

[**0039**] The position of the rotary sweeping member **100** relative to the floor to be cleaned may be adjustable, if desired, by adjusting the position of the rotary sweeping member **100**, or by replacing the rotary sweeping member **100** with one having a bristle length commensurate with the floor to be cleaned.

[**0040**] The floor cleaning apparatus **10** may come with a set of rotary sweeping members of different bristle length or strip height, and different materials for different floor surfaces to be cleaned, e.g. wooden floor, tiled floor, carpet, etc.

[**0041**] In the illustrated embodiment, a rubber scraper **224** may be provided at the bottom of a slanted wall or ramp **222**. The rubber scraper **224** can be used to scrape the floor to be cleaned during the cleaning process. The rubber scraper **224** can also be used to sweep the debris and used liquid, which are driven under the slanted wall **222**, towards the rotary sweeping member **100** during forward movement of the floor cleaning apparatus **10**.

[**0042**] Although it has been shown in the illustrated embodiment that there is only one rotary sweeping member **100** having two rows of bristles **102** and two rubber sweeping strips **103**, it is understood that the floor cleaning apparatus **10** of the present invention may contain one rotary sweeping member **100** having only one row of bristles **102** and/or only one rubber sweeping strip **103**. It is also understood that the floor cleaning apparatus **10** of the present invention may contain one rotary sweeping member **100** having more than two rows of bristles **102** and/or more than two rubber sweeping strips **103**. The floor cleaning apparatus **10** of the present invention may even contain more than one rotary sweeping member **100** in side-by-side or parallel relationship.

[**0043**] In the illustrated embodiment, the slanted wall or ramp **222** is disposed transversely with respect to the cleaning head **16**. Dust, dirt, debris, used liquid, and other waste substances are driven by the rotary sweeping member **100** towards the front surface of the slanted wall **222**.

[**0044**] The slanted wall **222** is slanted in such a manner that the front surface thereof is disposed at an acute angle with respect to the floor to be cleaned. The slanted wall **222**

and the floor may be disposed at an acute angle which is in the range of about 20 degrees to about 70 degrees. Preferably, the acute angle is about 45 degrees.

[**0045**] A gap or clearance may be provided between the slanted wall **222** and the floor such that the floor will not be scratched by the lower edge of the slanted wall **222** when the floor cleaning apparatus **10** is moved back and forth during the cleaning process.

[**0046**] Dust, dirt, debris, used liquid, and other waste substances swept from the floor can be driven by the rotary sweeping member **100** toward the front surface of the slanted wall **222** in the directions as shown by arrows in **FIG. 7**.

[**0047**] The receptacle **200** is located within the cleaning head **16** and is configured to be removable therefrom. Preferably, the receptacle **200** can be removable from the rear end of the cleaning head **16**. The receptacle **200** may be of any shape and preferably in the shape of a tray to be fitted within a rear portion of the cleaning head **16**. The receptacle **200** can be made of plastic, metal, or any other suitable materials.

[**0048**] The receptacle **200** may be slidably fitted into the rear end of the cleaning head **16**. A conventional retaining mechanism, such as a lock **204**, may be employed to securely retain the receptacle **200** within the cleaning head **16**.

[**0049**] As best illustrated in **FIG. 7**, the receptacle **200** of the illustrated embodiment may include a front panel **210**, a top panel **212**, a bottom panel **214**, a back panel **216**, and two opposite side panels **218** (**FIG. 5**). The bottom panel **214** is a flat panel defining the bottom wall of the cleaning head **16** when the receptacle **200** is inserted into the cleaning head **16**. The front panel **210** is slanted such that the front panel **210** and the bottom panel **214** are disposed at an acute angle.

[**0050**] In the illustrated embodiment, the front panel **210** and the bottom panel **214** may be disposed at an acute angle which is in the range of about 20 degrees to about 70 degrees. Preferably, the acute angle is about 45 degrees.

[**0051**] The slanted front panel **210** may be adapted to abut against the slanted wall **222** when the receptacle **200** is fully inserted into the cleaning head **16**. The top panel **212** may be connected to the top edge of the front panel **210**. Although it has been disclosed that the receptacle **200** is used in cooperation with the slanted wall **222**, it is appreciated that the slanted front panel **210** of the receptacle **200** may define the slanted wall itself.

[**0052**] The debris, used liquid, and other waste substances may be driven through a passage **226** defined by the top panel **212** of the receptacle **200** and an interior partition wall **228** of the cleaning head **16**. The debris, used liquid, and other waste substances are collected in the receptacle **200**.

[**0053**] In the illustrated embodiment, a handgrip **202** may be provided on the receptacle **200** at a rear end thereof. The handgrip **202** is adapted to facilitate the insertion and removal of the receptacle **200** into and from the cleaning head **16**. The handgrip **202** may be in form of a conventional U-shaped handle, or a recess or groove, or a projection provided separately or integrally thereon.

[**0054**] In the illustrated embodiment, two rear wheels **260** may be provided at the bottom of the receptacle **200**. Two front wheels **262** may also be provided at the bottom front portion of the cleaning head **16**. A microswitch wheel

assembly **264** may be provided on the cleaning head **16** at one side thereof for monitoring the movement of the cleaning head **16** relative to the floor to be cleaned.

[0055] Although it has been described that the rotary sweeping member **100** is positioned behind the discharger **90**, and that the receptacle **200** is positioned behind the rotary sweeping member **100**, it is contemplated that the discharger **90**, the rotary sweeping member **100** and the receptacle **200** may be arranged in other suitable order.

[0056] The operation of the floor cleaning apparatus **10** of the present invention is described hereinbelow.

[0057] Firstly, the reservoir **40** is to be filled up with cleansing solution. The liquid level of the reservoir **40** can be monitored by a sensor. The reservoir **40** can be filled up with cleansing solution through an inlet valve **66**. Optionally, the reservoir **40** can be removed from the housing **12** by pressing the reservoir release button **60** provided at the top of the housing **12**. The filled-up reservoir **40** can then be mounted back onto the housing **12** of the floor cleaning apparatus **10**. When the reservoir **40** is properly mounted on the housing **12**, the valve assembly **62** is activated, thereby allowing cleansing solution in the reservoir **40** to enter and fill up the heater shell **56**.

[0058] To commence cleaning, the floor cleaning apparatus **10** is connected to a power source. The user then turns on the cleaning apparatus **10**. The discharger **90** is then activated, and the heating element **52** is turned on. The heating element **52** generates heat to heat up the cleansing solution within the heater shell **56**, thereby producing cleansing solution and/or steam. The cleansing solution and/or steam so produced is discharged through the outlets **92** disposed along the front bottom portion of the cleaning head **16**. In the meantime, the rotary sweeping member **100** is also activated. Alternatively, the discharger **90** and the rotary sweeping member **100** can be activated at different times as required by the user.

[0059] During the cleaning process, debris and used liquid spread in part over the floor are swept by the rotary sweeping member **100** towards the slanted walls **222**. The use of the discharger **90**, the rotary sweeping member **100**, and the scraper **224** at the same time can clean up the floor completely without leaving behind any trace of debris and used liquid.

[0060] The discharger **90** is used for cleaning and scrubbing to remove dirt, dust, stain, liquid, etc. from the floor. The rotary sweeping member **100** is used to sweep dust, dirt, debris, liquid, etc. on the floor. The discharger **90** and the rotary sweeping member **100** together perform floor cleaning, scrubbing, and sweeping at the same time to completely clean the floor in one single step. Of course, the user has the options to operate the discharger **90** or the rotary sweeping member **100** alone, if desired.

[0061] While the present invention has been shown and described with particular references to a number of preferred embodiments thereof, it should be noted that various other changes or modifications may be made without departing from the scope of the present invention.

I claim:

1. A floor cleaning apparatus comprising:

a discharger for discharging cleansing solution and/or steam to a floor surface;

a receptacle; and

a sweeping member operatively associated with the discharger and the receptacle for sweeping used liquid on the floor surface into the receptacle.

2. The floor cleaning apparatus of claim 1, wherein the sweeping member includes a rotary sweeping member.

3. The floor cleaning apparatus of claim 1, wherein the sweeping member is positioned posterior to the discharger and anterior to the receptacle.

4. The floor cleaning apparatus of claim 1, wherein the sweeping member comprises at least one row of bristles.

5. The floor cleaning apparatus of claim 1, wherein the sweeping member comprises at least one sweeping strip.

6. The floor cleaning apparatus of claim 1, wherein the sweeping member comprises two rows of bristles and two sweeping strips.

7. The floor cleaning apparatus of claim 1 further comprising a slant wall disposed between the sweeping member and the receptacle, so that the used liquid on the floor surface can be swept into the receptacle via a top surface the slant wall.

8. The floor cleaning apparatus of claim 7, wherein a bottom surface of the slant wall and the floor surface define an acute angle when the floor cleaning apparatus is in use.

9. The floor cleaning apparatus of claim 8, wherein the acute angle is about 45 degrees.

10. The floor cleaning apparatus of claim 8, wherein the acute angle is in the range of about 20 degrees to about 70 degrees.

11. The floor cleaning apparatus of claim 7, wherein the receptacle includes a slanted panel configured to abut against a bottom surface of the slant wall when the floor cleaning apparatus is in use.

12. The floor cleaning apparatus of claim 11 wherein the receptacle includes a top panel slanted downwardly towards a central portion of the receptacle.

13. A method of cleaning a floor surface, the method comprising:

discharging cleansing solution and/or steam to the floor surface by a discharger; and

sweeping used liquid on the floor surface into a receptacle by using a sweeping member, wherein the discharger, the receptacle and the sweeping member are operatively associated with each other in a floor cleaning apparatus.

14. The method of claim 13, wherein sweeping used liquid comprises sweeping the used liquid on the floor surface into the receptacle via a slanted wall between the sweeping member and the receptacle.

15. The method of claim 13, wherein sweeping used liquid comprises sweeping the used liquid on the floor surface into the receptacle by using a rotary sweeping member.