United States Patent [19]

Sundheim

[11] **3,821,830**

[45] **July 2, 1974**

[54] **CLEANER FOR CARPETS AND THE LIKE**

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[22] Filed: **Aug. 3, 1972**

[21] Appl. No.: **277,741**

[52] **U.S. Cl.**..... **15/321,** 15/353, 55/DIG. 3, 55/429, 55/467

[51] **Int. Cl.**..... **A47l 7/00**

[58] **Field of Search**..... 15/320, 321, 353; 55/DIG. 3, 429, 467

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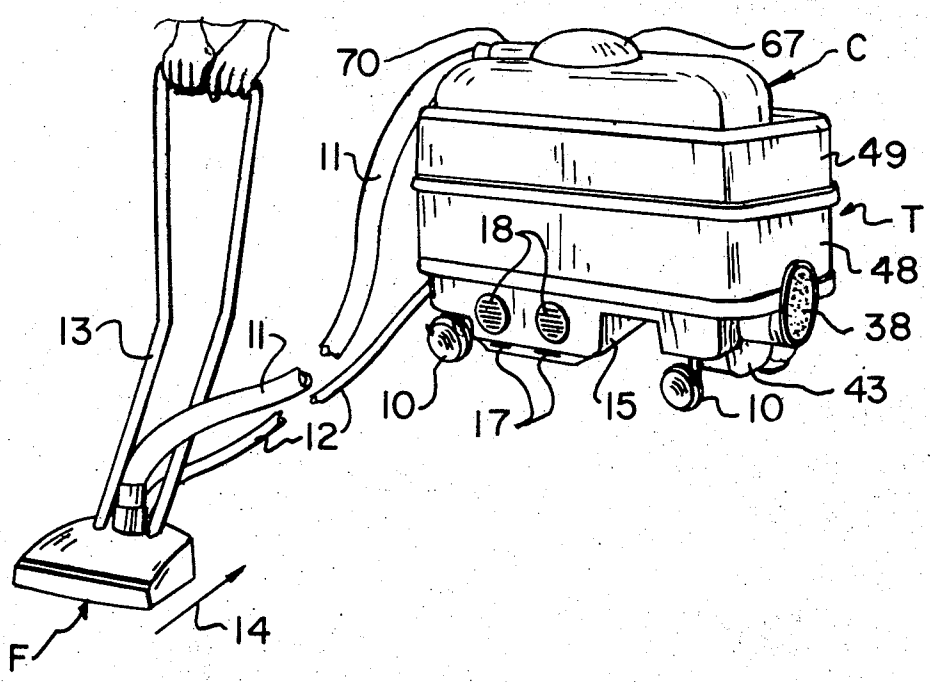
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[57] **ABSTRACT**

A tank type cleaning machine used with a floor tool and having a transparent cover connected to the suction hose from the floor tool and a space beneath the cover for a pail or bucket for collecting dirty cleaning solution removed from the carpet. The cover has a depending flange which extends into the upper end of the pail which, with the upper end of the pail, causes a separation of dirty water droplets from the air, which then passes around the bucket. A suction blower is connected to the bucket receiving space, adjacent the bottom thereof, and discharges through a lower housing which contains the water pump for supplying the floor tool. A tank for cleaning solution surrounds an upright wall, which in turn surrounds the space for receiving the pail, while an annular air filter may be placed around the depending flange and engage the top of the bucket, for operation of the suction blower only and use of the floor tool as a vacuum cleaner. The machine will hold a variety of liquids in the cleaning solution tank and will separate any liquids, which do not dissolve the plastic parts, in the vacuum separator, and will also separate many solids from the air used as the vehicle.

10 Claims, 6 Drawing Figures



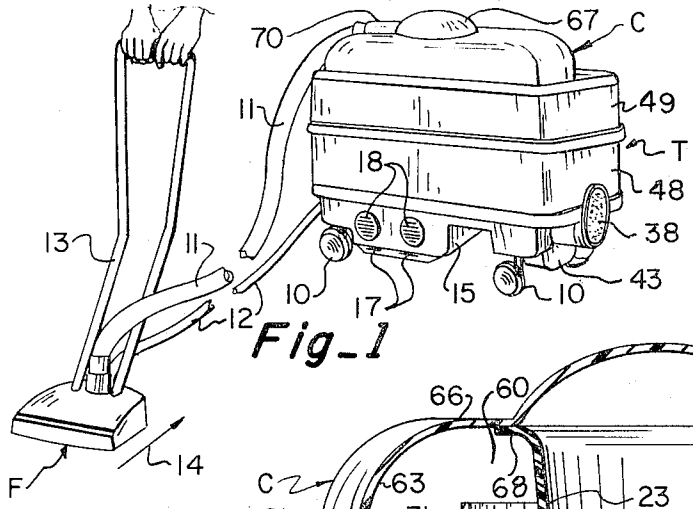


Fig_1

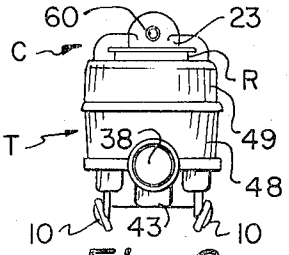


Fig_2

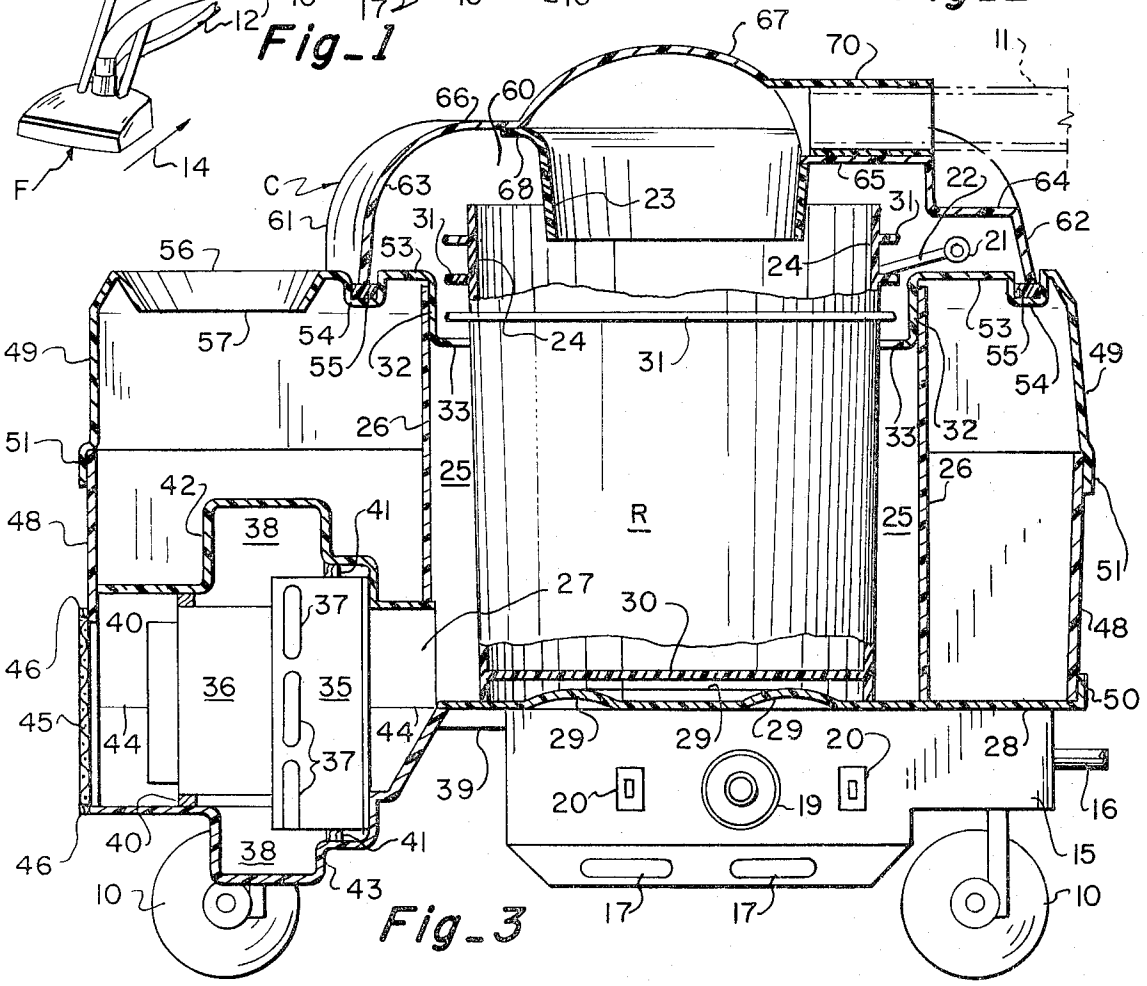


Fig_3

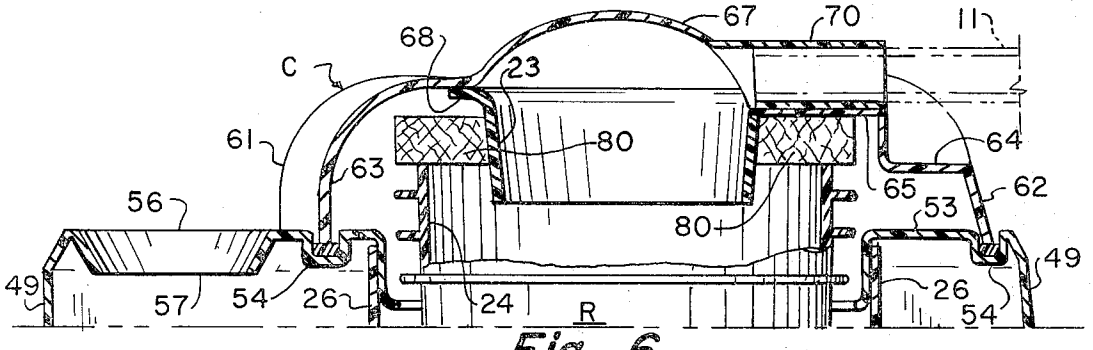


Fig_6

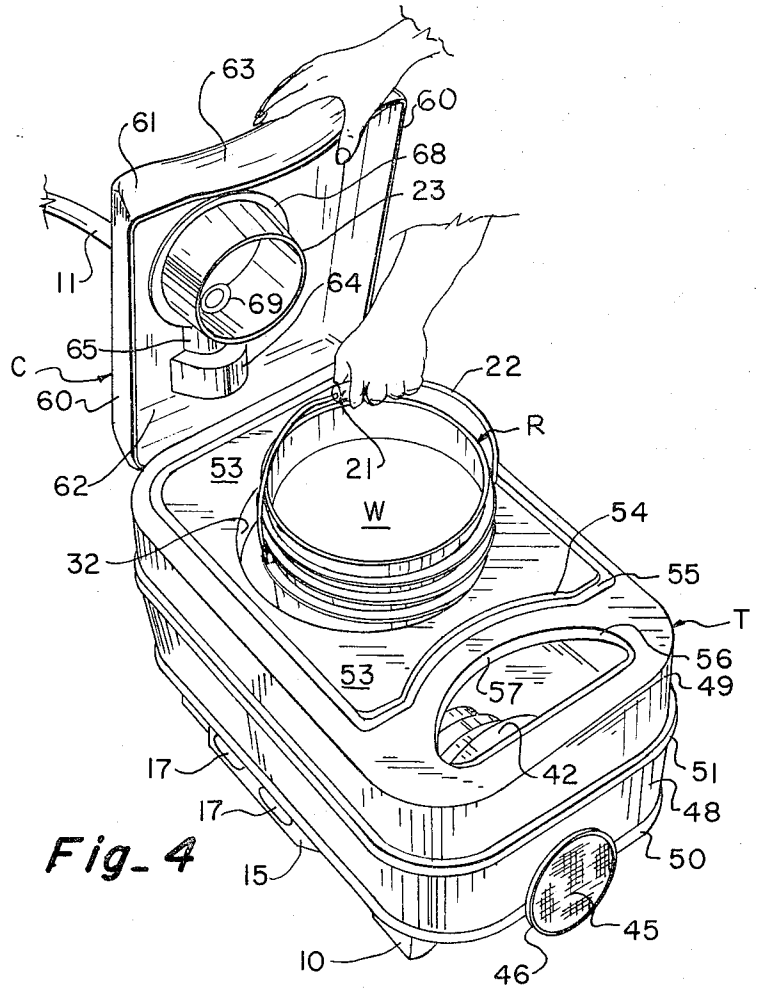

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Fig_4

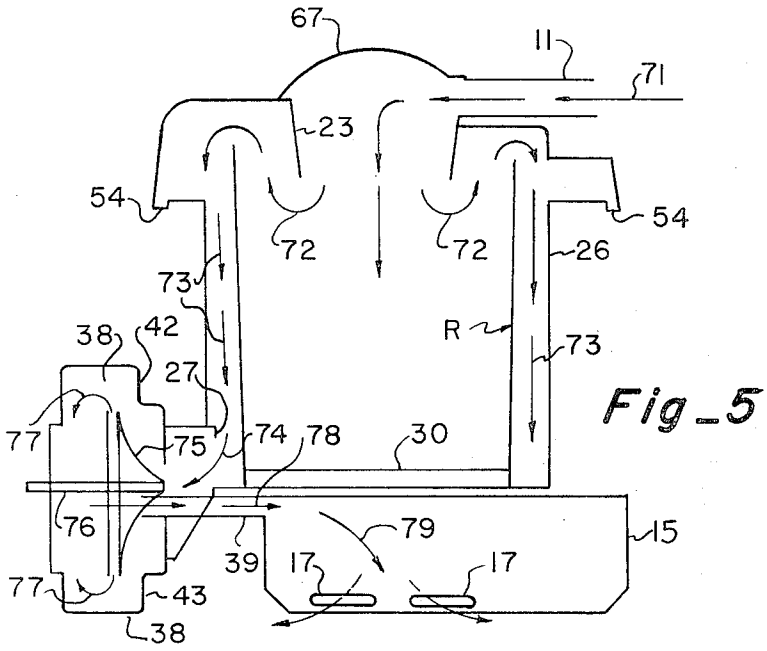

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Fig_5

CLEANER FOR CARPETS AND THE LIKE

This invention relates to cleaners for carpets and the like, and particularly such cleaners which may be used either as extraction cleaners utilizing a cleaning solution or merely as vacuum cleaners.

In the conventional cleaning solution carpet cleaners heretofore known, neither use of heated water to produce a cleaning solution nor the use of a blower to produce suction have involved any particular problems, although the design of this type of apparatus has incurred numerous changes through the repositioning of the various parts to achieve a more compact arrangement. However, the removal of the dirty water or cleaning solution from the suction air, and also the removal of the collected dirty water or cleaning solution from the machine, have involved problems which not only contribute to the size and weight of the machine, but also the draining of the tank in which the collected dirty water or cleaning solution is stored. In one type of machine, the dirty water removed from the suction air, as by a cyclone type of separator, is merely deposited in the clean water and soon makes the cleaning solution unusueable. Also, the volume of the then dirty cleaning solution, which must be removed from the device, requires considerable time to empty through drain valves, which are normally located close to the floor of the room in which the device is utilized. In other machines, a separate collection area and a cyclone type separator are provided, but the size and weight of the machine are unduly increased, again accompanied by the problem of emptying the space in which the removed dirty water or used cleaning solution is collected.

The machines for cleaning carpets and the like of the above types are normally provided with a floor tool, which is essentially a manually held device provided with rollers for movement along successive paths on a carpet or the like, and to which hoses lead for supplying cleaning solution from the principal part of the machine, normally referred to as the "tank" or "tank cabinet" of the machine, with the floor tool being provided with a transversely arranged nozzle or nozzles through which the cleaning solution is directed onto an area of the carpet corresponding in width to that of the floor tool. A transverse suction nozzle adjoins the cleaning solution nozzle or nozzles, in order to pick up by suction the cleaning solution in which the dirt or the like in the carpet has been dissolved, for transport back to the tank cabinet of the machine, through another hose, usually of a substantially larger diameter than the water supply hose.

When an exceptionally dirty carpet is encountered, it is often desirable to clean dirt or debris from the carpet by suction, prior to cleaning with a cleaning solution formed from heated water. However, a normal cyclone type separator which separates dirty water droplets from the air pulled by a blower will not ordinarily be effective to separate particles of dust from the air, which separation normally requires a filter. However, previous types of commercial machines have not included provision for placement of an air filter in the suction blower line.

Among the objects of this invention are to provide a novel carpet cleaning machine in which the separation of droplets of dirty water from the blower suction path is readily accomplished, with a concurrent provision

for removing the collected dirty water in a much more facile manner; to provide such a machine in which the dirty water separated from the air suction path is collected in a pail or receptacle which may be readily removed from the machine for emptying; to provide such a machine in which the pail or receptacle in which such dirty water is collected itself forms a part of the dirty water separation means; to provide such a machine in which the air suction may be operated alone, for utilizing the floor tool essentially as a vacuum cleaner, and in which an air filter may be readily placed and the collected dust particles not retained in the air filter will fall into the same pail in which separated dirty water is ordinarily collected; to provide such a machine which is relatively simple in construction and easy to operate; and to provide such a machine which is easy to manufacture and efficient in operation.

Further objects and the advantages of this invention will become apparent from the following description and the accompanying drawings, in which:

FIG. **1** is a perspective view of a tank cabinet incorporating the principles of this invention and a floor tool associated in use therewith;

FIG. **2** is an end elevation, on a reduced scale, of the tank cabinet of FIG. **1**;

FIG. **3** is a central, vertical, longitudinal section, on an enlarged scale, of the tank cabinet of FIG. **1**;

FIG. **4** is a perspective view, on a slightly enlarged scale, of the tank cabinet of FIG. **1**, but showing a cover thereof lifted and a pail or receptacle containing dirty water being removed from the cabinet, for disposal;

FIG. **5** is a diagram comprising essentially a line illustration of the principal parts of the tank cabinet shown in FIG. **3**, but with arrows showing the air flow therethrough, as well as the collection of droplets of dirty water in the pail or receptacle of FIG. **4**; and

FIG. **6** is a fragmentary, vertical, longitudinal section corresponding to the upper portion of FIG. **3**, but illustrating the manner in which an air filter may be installed, when the tank cabinet and tool are to be utilized essentially as a vacuum cleaner.

The principles of this invention may be applied to a tank cabinet T of FIGS. **1** and **2**, having a series of casters **10** by which the tank cabinet may be rolled about the floor, and a cover C from which an air suction hose **11** leads to a floor tool F. A hot water hose **12**, normally smaller in diameter than the suction hose **11**, also leads from the tank cabinet T to the floor tool F. The floor tool F may be conventional in nature, having a transverse nozzle or series of nozzles (not shown) on the underside, for directing the aqueous cleaning solution, supplied by the hose **12**, against the carpet or the like on which the floor tool is placed. The floor tool is provided with a handle **13** and a transverse suction nozzle (not shown) on the underside disposed adjacent the cleaning solution nozzle or nozzles to suck droplets of water containing dissolved dirt and the like from the carpet and through the suction hose **11**, as when the floor tool F is moved along the carpet in the direction of the arrow **14**. The floor tool F may be provided with rollers (not shown) on the underside, to permit the floor tool to be moved along the carpet, with the cleaning solution nozzles spaced therefrom but with the suction nozzle essentially in contact with the carpet. The floor tool may also be provided with an adjustment device for varying the relative height of the suction noz-

zle. Other suitable types of floor tools or hand tools may be used.

As shown in FIG. 3, the tank cabinet T may be provided with a housing 15 on the underside, in which is installed a water pump (not shown). Housing 15 has a plug connection 16 on one end for connecting the cleaning solution hose 12 thereto, a pair of vents 17 on each side adjacent the bottom of the housing, as well as a pair of screen covered side vents 18, as in FIG. 1. The purpose of the vents 17 and 18 is to permit the discharge of air from the suction blower, referred to later, into the housing 15 for discharge as close to the floor as possible. Also, an electrical plug 19 is mounted on one side of the housing 15, for supplying electricity to the pump and blower motors, while switches 20 are used to turn the respective motors on and off.

In accordance with the present invention, the cover C is removable, as by being tipped up to the position of FIG. 4, so that a receptacle R, such as a pail or bucket, may be removed, after a sufficient amount of dirty water W has collected therein. The cover C is preferably formed of a transparent material, such as transparent plastic, so that the amount of water carrying dirt and the like which is separated out from the stream of air passing through the suction hose 11 into the tank cabinet, can be observed. As in FIG. 4, the cover C may readily be tipped upwardly with one hand, after the suction blower motor has been turned off, the cover being relatively light because only the suction hose 11 is connected thereto, and the receptacle R lifted out of the tank cabinet by the other hand of the operator, as by grasping a handle 21 of the receptacle, which is mounted on a bail 22.

In further accordance with this invention, the cover C is provided with a generally circular, depending flange 23, to the inside of which the air carrying dirty water is supplied by the suction hose 11 and which, with the cover in closed position, as in FIG. 3, extends downwardly inside the receptacle R. The distance which the depending flange 23 extends below the top of the side wall 24 of receptacle R is preferably sufficient to cause a sharp turn in air passing downwardly through the flange and thereby cause droplets of water carrying dirt and the like to separate from the air through the action of gravity and centrifugal force, as the air turns around the bottom edge of flange 23, and to collect within receptacle R. In addition, the cross sectional area of the inside of the receptacle R, as well as the inside of flange 23, is greater than the cross sectional area of the suction hose 11, so that the velocity of the air is decreased as it enters the flange and receptacle, thereby contributing to the separation of water droplets carrying dirt and other material dissolved from the carpet or the like. The receptacle R is placed within a receiving space 25 formed by an upright, annular wall 26 which has a diameter sufficiently greater than the outside diameter of the receptacle R that air will flow freely around the receptacle to a blower suction opening 27 at an appropriate position at the bottom of wall 26 adjacent a base plate 28. The lower edge of wall 26 is secured, as by a suitable cement, welding or the like, to base plate 28, or may be integral therewith, while the base plate is provided with a raised ring 29 placed centrally of the space 25, for reinforcement purposes, to support the weight of receptacle R when nearly filled with dirty water, as well as to assist in centering the receptacle, whose bottom 30 is spaced above the lower edge of its side wall 24. Receptacle R may also be provided with a series of ribs 31 on the outside, near the top, while the upper end of wall 26 may be secured, as by cement, to the outside of an annular, depending rim 32 formed in the top wall of the tank T and extending downwardly into the space formed by annular wall 26. Rim 32 may be formed by molding the top to provide a cylindrical extension, then severing the base of the extension at the edge of a cylindrical aperture 33. Although not necessary for operation, the outside ribs 31 of the receptacle R assist in restricting the flow of air down the outside of the receptacle, at the top, thereby contributing to the reduction of the velocity of the air in the receptacle R and the separation of droplets of dirty water. Of course, the restriction of flow outside the receptacle should not be sufficient that the suction blower has difficulty in pulling sufficient air through the air hose 11.

Air flowing around the receptacle R to the suction opening 27 will be drawn into a suction blower 35 driven by a motor 36 and having a series of air discharge slots 37. Air from the blower is discharged into an annular space 38, from the periphery of which and on each side a pair of tubes 39 lead to the inside of housing 15. The annular space 38 is formed between seal rings 40 and 41 by a generally cylindrical portion of a housing which encloses the motor and blower and extends from the upright wall 26 at suction opening 27 to the near end of the tank cabinet. This housing, sealed to wall 26 and base plate 28, is conveniently formed from plastic or other suitable material by an upper half 42 and a lower half 43, the two halves being sealed together along a horizontal line 44, as by an overlapping joint. The exposed end of motor 36 is ventilated through a screen 45 mounted in a rim 46, as of metal.

A space for receiving cleaning liquid, such as heated tap water containing a suitable cleaning chemical, surrounds annular wall 26 and is formed by a side wall 48 which has a contour corresponding to the exterior shape of the tank and a similarly shaped, depending wall 49 of the tank top, with side wall 48 fitting within an upstanding peripheral flange 50 of base plate 28 and also within an offset 51 of the depending wall, so that a liquid tight seal may be more readily formed by a suitable cement, such as of the epoxy type. The adjacent end of upper housing half 42 is also secured to wall 48, again by a suitable adhesive. The tank top and its depending wall 49, wall 48, base plate 28, blower housing halves 42 and 43 and annular wall 26 may all be formed of plastic or other suitable material through molding, but conveniently of an opaque and therefore less expensive plastic than the cover C, and may also be reinforced by fiber glass or other suitable material. Receptacle R is also conveniently opaque.

The tank top provides a ledge 53 which surrounds the space for receptacle R, and from the inside of which rim 32 depends. As in FIGS. 3 and 4, ledge 53 forms a space beneath cover C, at either end, to accommodate handle 21 and bail 22 of the receptacle R. Ledge 53 is surrounded by a groove 54 which receives a seal strip 55 for the lower edge of cover C, seal strip 55 being formed of sponge rubber, sponge plastic or the like, into which cover C may press, to provide an air seal which prevents air being drawn by the suction produced by blower 35. Fresh cleaning liquid may be placed in the space therefor through an opening 56

having an inwardly slanted flange **57**, to assist in pouring the cleaning liquid therein, and suitably having the contour shown in FIG. **4**. For this purpose, the seal ring **55** and the groove **54** preferably have the contour shown in FIG. **4**, thus being offset inwardly adjacent the filling opening **56**.

As indicated previously, the cover C is formed of a suitable transparent plastic, such as acrylic, being molded to shape against a mold by air pressure or in any other suitable manner, to form side walls **60** and end walls **61** and **62**, having a contour at the bottom corresponding to the groove **54** and seal strip **55**, thereby providing a concavity **63** at end **61**, as in FIGS. **3** and **4**. The opposite end **62** is formed with a semicylindrical depression **64** and a smaller, partially cylindrical groove **65**, to accommodate suction hose **11**. A top **66** of the cover may be formed with a partially spherical dome **67** at the center, while the depending flange **23** may be formed separately and attached to the underside of the top, as by a suitable cement, through a top peripheral flange **68** thereof. A hole of a suitable shape is formed in one edge of dome **67** and depending flange **23**, to receive a clear plastic tube **70**, which rests in partially cylindrical groove **65** and is cemented or welded to the associated parts. Any other suitable manner of construction may be utilized. As in FIGS. **1** and **3**, the end of suction hose **11** is inserted in tube **70**. It will be noted that, since cover C is transparent, both receptacle R and depending flange **23** are visible through the cover, while tube **70**, at the opposite end of the cover, is also visible.

The path of the suction air is indicated in the diagram of FIG. **6**, in which the arrows **71** indicate air carrying dirt-laden water droplets and passing from the hose **11** into the cover C, thence downwardly through the passage provided by depending flange **23** and into the receptacle R. Arrows **72** indicate air turning around the underside of the depending flange **23**, then moving upwardly and over the upper edge of the receptacle R, while arrows **73** indicate the air, by this time having lost the dirt-laden water droplets previously contained therein, passing downwardly along the side of receptacle R, between the receptacle and the wall **26**. Arrow **74** indicates the air entering the suction inlet **27** and passing to the intake end of an impeller **75** of the blower, mounted on a shaft **76**, while arrows **77** indicate the air being discharged from the impeller into the space **38**. Arrows **78** indicate the air passing through tubes **39** and into the housing **15**, while arrows **79** indicate the discharged air passing through the housing and the louvers **17**. As will be evident, air velocity loss through expansion in the receptacle R causes dirt-laden water droplets to drop out of the air stream, while any air which moves directly from inside flange **23** to the space outside receptacle R, will make a reverse turn, indicated by arrows **72**, so that centrifugal force will tend to throw dirty water droplets out of such air. As will be evident, an advantage of the transparent cover C is that the amount of dirty water collecting in receptacle R is visible from the exterior of the tank cabinet T, so that the receptacle R can be emptied before the level of dirty water **20** therein approaches too closely to the lower edge of flange **23**.

In further accordance with this invention, as illustrated in FIG. **6**, the depending flange **23** of cover C preferably tapers inwardly and downwardly, so that an annular air filter **80** may be placed thereon and then wedged upwardly on the flange by the upper edge of wall **24** of receptacle R. The air filter **80** is initially placed on depending flange **23**, so that when the cover C is placed in position, the upper edge of wall **24** of the receptacle R will wedge the filter upwardly until the top of the filter abuts the underside of groove **65**. Being wedged on depending flange **23**, filter **80** will stay in position while air is sucked through it by the blower, so that dirt particles and the like carried by the air will separate out and fall into the receptacle R or be retained on the underside of or in filter **80**, within the confines of the top of the receptacle. Thus, for use of the tank cabinet T and floor tool F as essentially a vacuum cleaner, the water supply pump is not turned on, while the motor **36** for the suction blower **35** is turned on. As will be evident, the machine will then act in a manner similar to an industrial type vacuum cleaner, in order to suck the more readily available dirt particles or debris from the carpet, rug or the like. After the material available for merely suction cleaning has been removed, the cover C is removed, the receptacle R removed and emptied, while the filter **80** is also removed from the cover and stored or cleaned for the next use. Normally, the machine will be used for vacuum cleaning only prior to use with a cleaning solution, so that cleaning solution is not usually present in the space therefor. Thus, after vacuum cleaning, the cleaning solution space may be filled with hot tap water, a cleaning chemical added, the hot water pump turned on, and the liquid cleaning operation may proceed as before.

While a preferred embodiment of this invention has been illustrated and described, it will be understood that other embodiments may exist, all without departing from the spirit and scope of this invention.

What is claimed is:

1. In a cleaning machine of the tank type associated with a tool adapted to direct a liquid cleaning solution against a carpet or the like and, by suction, remove droplets of liquid containing dirt and the like dissolved by such liquid cleaning solution, wherein said tank type device is adapted to supply cleaning solution to said tool and is provided with means for producing suction and a suction hose connected with said tool, the improvement including:

removable receptacle means mounted within said machine;

a space for receiving said receptacle means, said suction means being connected to said space;

a cover for said space having an inlet, said suction hose being connected to said cover inlet; and

passage means depending from said cover and communicating with said inlet, said passage means extending into said receptacle in spaced relation to the side walls thereof, said passage means having a substantially greater transverse size than said suction hose.

2. In a cleaning machine, as defined in claim **1**, wherein:

said space for said receptacle has a wall disposed in spaced relation to said receptacle and a bottom on which said receptacle rests; and

said suction means is connected to said space adjacent said bottom.

3. In a cleaning machine, as defined in claim **1**, wherein:

the axis of said suction hose at said cover connection is generally transverse to the axis of said passage means.

4. In a cleaning machine, as defined in claim **1**, wherein:

said receptacle is formed of comparatively rigid, self-supporting material.

5. In a cleaning machine, as defined in claim **4**, wherein:

said receptacle space is generally circular;

said receptacle is generally circular; and

said passage means is generally circular.

6. In a cleaning machine of the tank type associated with a tool adapted to direct a liquid cleaning solution against a carpet or the like and, by suction, remove droplets of liquid containing dirt and the like dissolved by such liquid cleaning solution, wherein said tank type device is adapted to supply cleaning solution to said tool and is provided with means for producing suction and a suction hose connected with said tool, the improvement including:

a removable receptacle mounted within the machine;

means for separating, from the suction air, droplets of liquid carrying removed dirt and the like, said separating means including a portion of said receptacle;

a removable cover having an inlet connected to said suction hose;

a space for said receptacle having a wall disposed in spaced relation to said receptacle and a bottom on which said receptacle rests;

said suction means being connected to said space adjacent said bottom;

said wall for said receptacle space being generally cylindrical and said machine providing a space for cleaning solution which surrounds said wall;

a housing for a blower and blower motor being disposed adjacent one end of said machine and extending to said suction inlet;

a portion of the top of said blower housing forming a portion of the bottom of the cleaning solution space, said blower housing also forming a cylindrical space surrounding the discharge portion of said blower; and

a tube carrying air discharged from said blower into said cylindrical space connecting with said space at a peripheral position and extending longitudinally of said machine.

7. In a cleaning machine, as defined in claim **1**, wherein:

the top of said machine is provided with a groove corresponding to the contour of the bottom edge of said cover; and

a seal ring for engaging the bottom edge of said cover is disposed in said groove.

8. In a cleaning machine, as defined in claim **7**, wherein:

said receptacle is formed of relatively rigid, selfsupporting material; and

the top of said machine forms a ledge around said receptacle receiving space, said ledge providing a greater area beneath said dome at one end to provide space for receiving a handle and a portion of a bail of said receptacle.

9. In a cleaning machine, as defined in claim **1**, wherein:

said cover is elongated longitudinally and is provided with a central dome above said depending flange and a concave groove disposed longitudinally of and extending to said dome;

a transparent tube rests in said groove for receiving an end of said suction hose, said tube connecting with the interior of said dome and the interior of said depending flange; and

said cover has a generally semicylindrical depression larger than said groove and disposed between said groove and the adjacent end of said cover, to provide clearance for said suction hose.

10. In a cleaning machine of the tank type associated with a tool adapted to direct a liquid cleaning solution against a carpet or the like and, by suction, remove droplets of liquid containing dirt and the like dissolved by such liquid cleaning solution, wherein said tank type device is adapted to supply cleaning solution to said tool and is provided with means for producing suction and a suction hose connected with said tool, the improvement including:

a removable receptacle mounted within said machine;

a removable cover having an inlet connected to said suction hose;

a depending flange extending downwardly from said cover and into said receptacle in spaced relation to the side walls of said receptacle, said flange tapering inwardly and downwardly and the space within said flange communicating with said inlet; and

an annular air filter engaged with the outside of said flange and with the top of said receptacle, when said cover is in closed position.

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