

[54] **CLEANING APPARATUS**

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[51] **Int. Cl.**..... **A47I 7/00, A47I 9/06**

[58] **Field of Search** **15/320, 321, 322, 353, 15/396**

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[57]

ABSTRACT

A typical embodiment of the invention provides a convenient means for mopping floors, and the like. A centrifugal pump, discharging into an household drain, is mounted on the drain, a dolly, or on a hand-held "wand." The pump has a vented discharge container that enables the mop to draw air along with liquid and solid matter from a floor. Thus, the discharge vent permits the air that is entrapped in the pumped liquid to escape, while the liquids pour into the drain. A filter to strain out particulate matter can be interposed between the mop head and the pump. Other features, as for example, a rinse water dispenser and a screen that supports the porous mop head also characterize the invention.

2 Claims, 9 Drawing Figures

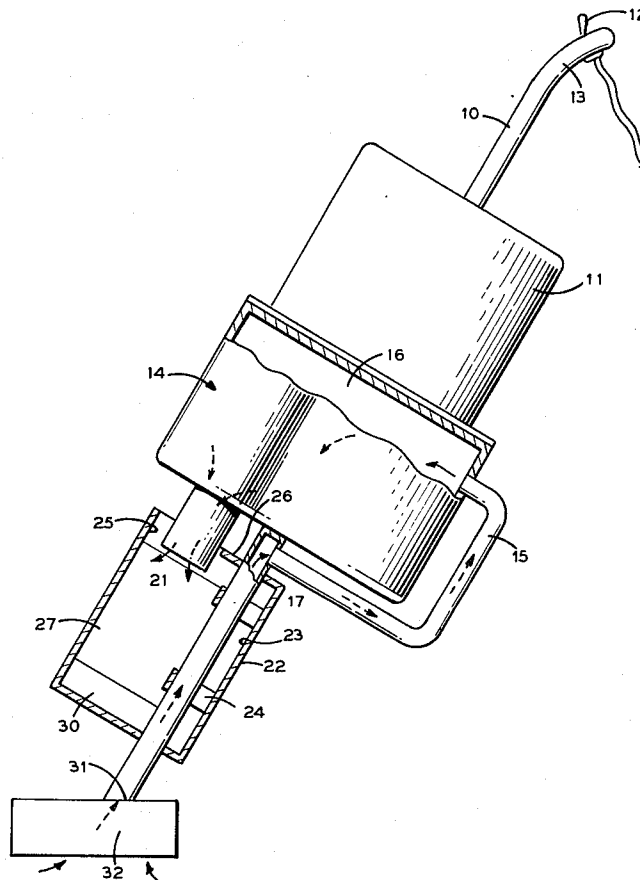
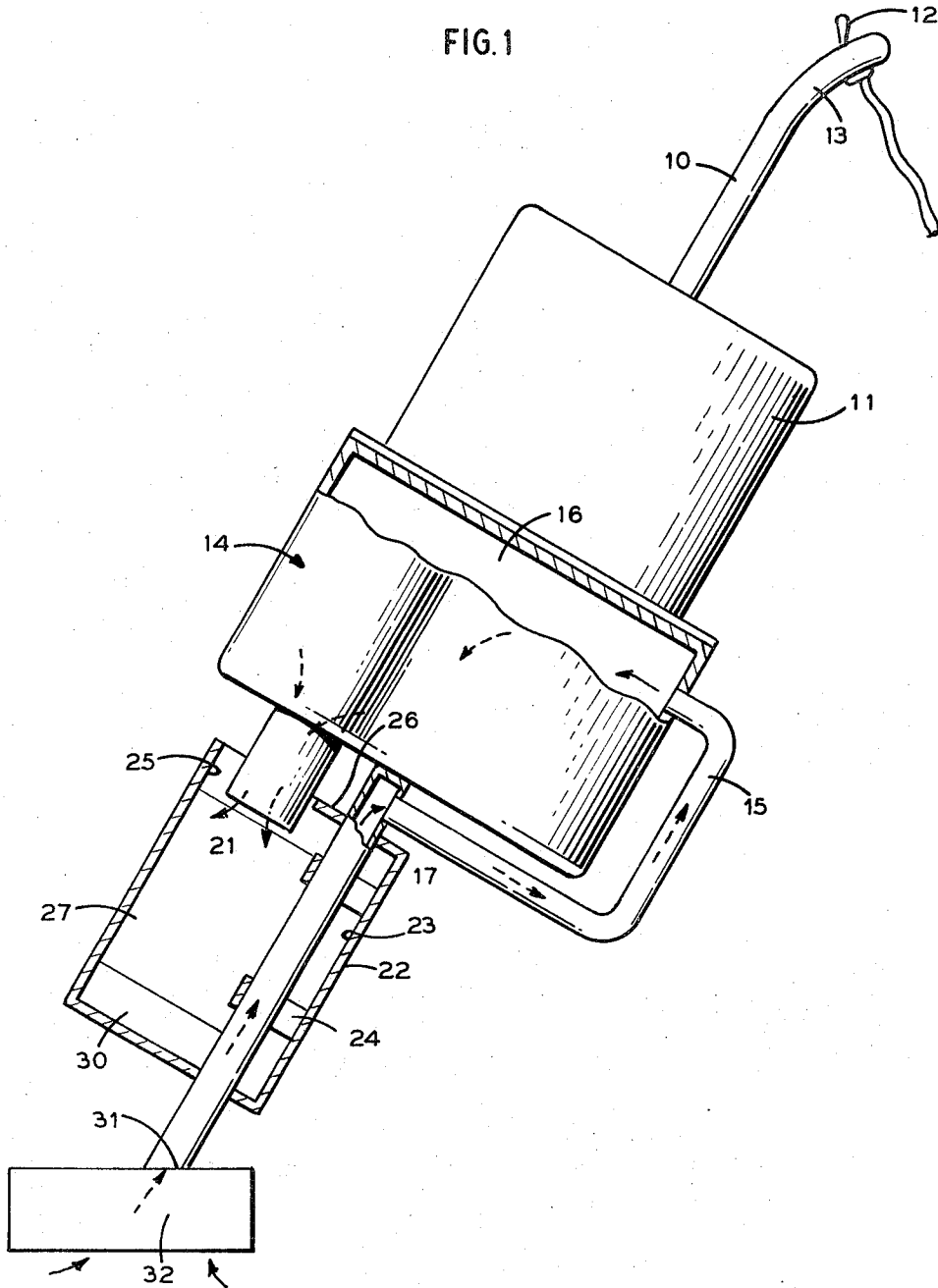


FIG. 1



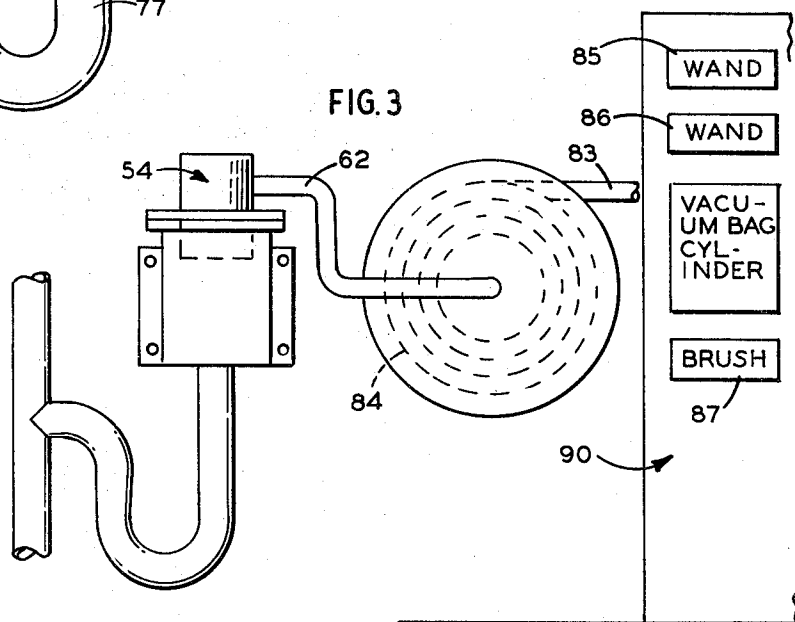
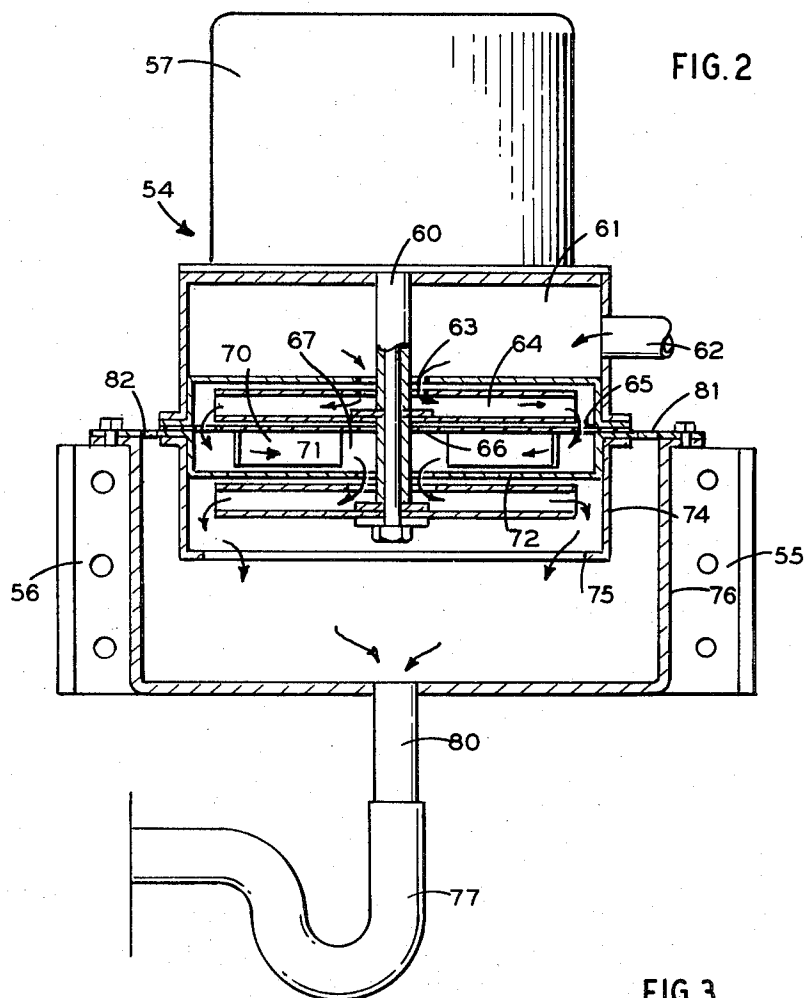


FIG. 4

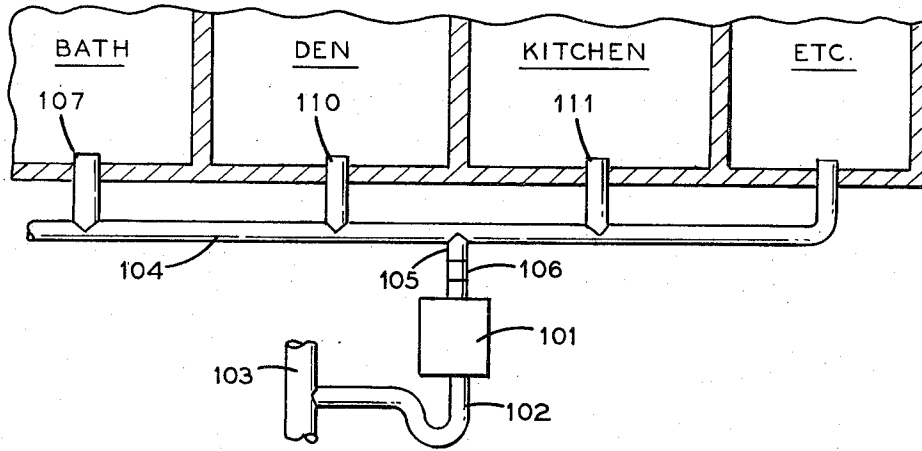


FIG. 5

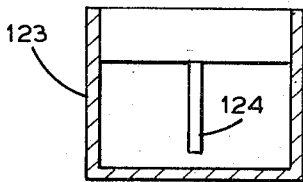


FIG. 6

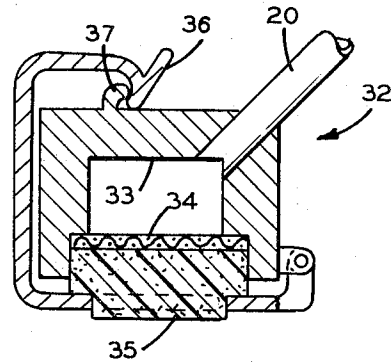


FIG. 7

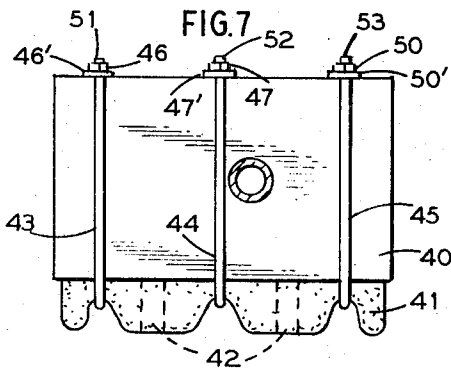


FIG. 8

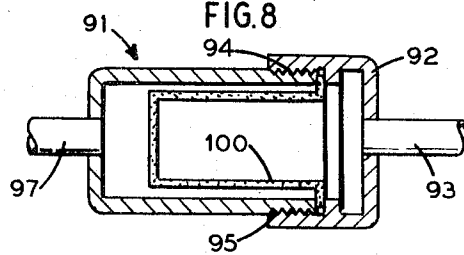
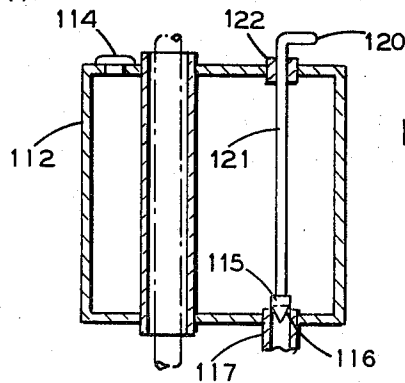


FIG. 9



CLEANING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to cleaning equipment and, more particularly to techniques for rinsing and mopping floors, and the like.

2. Prior Art

Floor mopping is a burdensome household task. Usually, a soapy rinse is applied to the floor to remove the dirt. The rinse water application is followed by a clean mopping action, in which the mop frequently must be wrung out. Heavy pails and wringers are necessarily carried to and from the place of use. The pails, moreover, must be filled with hot water and emptied of dirty water — all of these are fatiguing, awkward and distasteful operations.

Notwithstanding these laborious mopping tasks, the problem of removing solid matter from floors has not been successfully solved. Usually, a dust pan and a "fox-tail" brush are needed to sweep up the solid and particulate matter that falls to the floors of most households. This brush and pan practice is unsatisfactory because coffee grounds, sugar, salt, flour and breakfast cereals, for example, can not be completely swept up. Some residue always seems to remain on the floor.

Further in this regard, not only does the brush and pan approach require a great deal of stooping, bending and kneeling, but it also seems that the mouth of the pan is always too wide for the trash receptacle, a situation that often leads to further spillage.

These almost "classical" floor cleaning techniques may have been acceptable when most exposed floor surfaces were of wood. This cleaning method, however, continues to persist in spite of the fact that it is entirely inappropriate to the plastic floor coverings that are found in most modern homes. Thus, the older floors tended to absorb a good part of the soapy rinse water that was spilled on them before the mopping or scrubbing phase of the cleaning process commenced, thereby significantly reducing the volume of water that had to be mopped up after the scrubbing was complete. Plastic tile or other types of the more popular floor coverings that are now in use do not absorb water. Accordingly, the water tends to stand in small puddles and is, in general, more difficult to remove. This rinse water also tends to flow into the seams between adjacent tiles or linoleum sections and will remain in these seams despite repeated mop strokes. The water so entrapped usually leaves unsightly black water lines in the seams and, after some time, will cause the tiles or linoleum to buckle and pucker at these seams.

There is a need, moreover, to provide a single instrument or device that will handle most of the common surface cleaning jobs that are encountered instead of the proliferation of mops, brushes, sponges, pails and other paraphernalia that are required to do a thorough job. Further in this regard, devices have been proposed that discharge cleansing water on floors, and the like. These devices that have been suggested also have some sort of suction apparatus to draw the soapy water from the floor. There are, however, several major flaws. There is, for example, no provision for scrubbing or scouring the soapy water against the dirty surface. The liquid is merely poured on the surface and then sucked up, thereby leaving behind a residuum of dirt that is completely unacceptable. The suction also tends to be

weak because it has been applied indirectly. In this regard, a vacuum is applied to a container, causing fluid to flow from the floor and into the container rather than to cause the rinse water to flow directly through the vacuum pump.

There are a number of apparent reasons for these inadequacies of the prior art. Perhaps, the most pressing reason is the failure of these suggested designs to be able to cope with the conflicting requirements of interposing some sort of scrubbing apparatus between the wet floors and the vacuum pump without sucking the scrubber up into a vacuum line or plugging the scrubber with particulate matter.

Thus there is a need for an inexpensive mop that not only overcomes the requirement for water-filled pails, rinsing water and wringing, but also provides an efficient means for cleaning the floor of solid matter.

SUMMARY

These and other disadvantages of the prior art are, to a large extent, overcome through the practice of the invention. Illustratively, a motor driven centrifugal pump applies a partial vacuum to a flexible tube that terminates in a relatively stiff "wand" or mop.

Preferably, the working head of the mop has a rather wide cavity. The bottom of the cavity is covered by a perforated plate or screen that provides some structural support for a porous rubber or sponge mop-head. Thus, as suction is applied to the mop, the pliable head is not drawn up into the wand, but is held essentially in its proper position between the screen and the floor. This mop preferably is made from sponge material and has holes drilled through it which are about one half of an inch in diameter in order to establish direct fluid communication between the matter on the floor and the pump. This improvement enables a device that characterize the invention to draw solid and granular material as well as water from the floor without plugging or otherwise impeding flow through the scrubbing head.

The centrifugal pump can be permanently connected to the household drain system and, through conduits that terminate in outlets in each room, service the entire building. Alternatively, the pump can be coupled to the trap under a kitchen sink while the associated tube is stored on an adjacent spring-loaded reel. Further pump combinations can be provided according to the needs of the user. For instance, the pump can be mounted on a wheeled dolly with a removable discharge bucket to catch the water that is sucked from the floor. If desired, the discharge bucket also can be mounted directly on the wand.

In accordance with a feature of the invention, the pump discharge is in free communication with the atmosphere. Thus, as suds and air-water mixtures flow from the pump outlet, the water drains to the bottom of the discharge container, while the air (and perhaps, other gases) flows back to the atmosphere through vents or openings in the top of the container. In this way, a pressure lock or foam build-up in the discharge container is prevented. Unless checked, foam or pressure build-up would tend to reduce the pump's suction head and decrease or eliminate the vacuum needed to clean the floor.

To further inhibit foaming, ribs can be formed in the discharge container. These ribs may be extended from the top of the container downwardly toward the bot-

tom. The ribs, however, should not divide the container into individual compartments, but should, instead, stop short of the container's bottom surface in order to provide free fluid communication or a free flow area in the bottom of the container. The ribs thus serve as baffles in order to prevent the liquid that is discharged from the pump swirling and thereby generating more undesirable foam.

A fresh water container also can be fitted to the wand to pour some water onto the floor, or the like, in order to provide a vehicle for washing dirt away. This water, having been used to remove dirt on the floor, can, of course, be sucked up by the pump. Thus, many otherwise burdensome household tasks are eliminated through an application of this one device.

A filter also can be interposed in the tubing between the mop-head and the pump. Preferably, a coupling in the tubing clamps a perforated metal strainer or a porous cloth bag in the liquid flow path. The strainer can be removed and cleaned of solid matter from time to time, e.g., if the suction head is subject to an appreciable decrease.

Naturally, this apparatus can be used for a number of purposes. It can be used, for example, in the form of small handheld device for cleaning tables, counters, automobile windshields and the like.

For a more complete understanding of the present invention, together with other and further objects thereof, reference is had to the following description taken in conjunction with the accompanying drawings, the scope of the invention being pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 shows a side view in broken section of an illustrative embodiment of the invention;

FIG. 2 is a side view of a pump that embodies features of the invention;

FIG. 3 is a schematic view of a permanent installation for the pump that is shown in FIG. 2;

FIG. 4 is a schematic diagram of an installation that services an entire building;

FIG. 5 is a side view in full section of a typical liquid discharge container for use in connection with the invention;

FIG. 6 is a side view in full section of a typical mop-head for use in accordance with the invention;

FIG. 7 is a rear elevation of another mop-head for use in connection with the invention;

FIG. 8 is a side view in full section of a filter; and

FIG. 9 is a side view in full section of a rinse water dispenser for attachment to the wand.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1, an upper wand section 10 is connected to the outer casing of an electric motor 11. The motor 11 is controlled through a manually operated switch 12 that is attached to a terminal curved portion 13 of the wand 10.

The motor 11 drives a two stage centrifugal pump 14, described hereinafter in more complete detail. The pump 14 takes suction through a curved hose 15 that establishes fluid communication between a pump inlet chamber 16 and a discharge port 17 formed in the uppermost end of a lower wand section 20.

The pump 14 also has a discharge outlet 21 that directs pumped liquids into a detachable container 22. Thus, as shown in FIG. 1, the container 22 has a longitudinal groove 23 that supports a pair of spring clips 24 which engage the outer surface of the tubular lower wand section 20 and retain the container 22 in proper position relative to the discharge port 21.

The detachable container 22 embodies an additional feature of the invention. Thus, the pump discharge port 17 protrudes into the container 22 through an aperture 25 that is formed in container top 26. The aperture 25 is substantially larger than the outer circumference of the discharge outlet 21. The irregular annulus of air that this structure provides between the outlet 21 and the container top 26 enables air and any other gases that might be entrained in the liquid from the pump 14 to escape into the atmosphere. In this manner, increased back pressure on the pump 14 is largely eliminated because the air can escape without generating a foam in the discharged liquid or causing a pressure lock.

The container 22 is further characterized by a rib 27 that essentially divides the discharge outlet 21 into two halves. The rib 27, moreover, does not extend to the bottom of the container 22, but stops short of the container bottom to provide a free flow area 30. This unique construction keeps the discharged liquid in the container 22 from swirling around and, in that manner, from spilling out of the container or generating additional foam. It may be desirable to add to the container 22 a further rib of essentially the same size and shape as the rib 27. This second rib preferably intersects the rib 27 perpendicularly and divides the mid-portion of the container 22 into four generally equal quarters. The lower wand section 20 has a lowermost end 31 that is in swivelling engagement with a working head 32.

Turning now to FIG. 6, one embodiment of the invention that characterizes the working head 32, comprises a wide cavity 33 which is in liquid communication with the inside of the lower wand section 20 through the lowermost wand end 31. The bottom aperture of the working head 32 is covered with a perforated plate or a rather wide-mesh screen 34 that provides structural support for a very porous mop head 35. Preferably, the mop head 35 has vertical holes that are about one half of an inch in diameter formed in sponge rubber, a replaceable cellulose material, or the like. As a suction is applied to the mop head 35, the screen 34 tends to steady the mop head 35 in proper position, rather than allowing the mop head to be sucked up into the cavity 33 and prevent effective mopping activity. The mop head 35 is releasably clamped in position under the screen 34 through one or more lock pins 36. The pins 36 are pivoted on one side of the working head 32, extend across the bottom and press against the mop-head 34 and extend up and over a detent 37 that retains the pin in place.

If desired, a comb-like structure can be fixed to the working head 32. The comb may extend down along one or more of the exposed sides of the mop 35 to retain the mop in place in the working heads 32 while stroking the mop back and fourth over a surface. Alternatively, the mop 35 can be received within a recess formed in the working head 32 leaving only a limited portion of the mop to protrude from the working head and, in this way, stabilize the portion of the mop 35 while it is in use.

Among the many alternative working heads that can embody these features of the invention, attention also is invited to FIG. 7. The internal structural details of working head 40 are essentially the same as those which are shown in FIG. 6 in connection with the working head 32. In FIG. 7, however, a porous mop head or sponge 41 having generally vertically passageways 42 formed therein is pressed against the screen (not shown) by means of three flexible straps 43, 44 and 45. The ends of each of the straps terminate in grommets 46 and 46', 47 and 47', 50 and 50', respectively. Each of these pairs of grommets are received on individual pegs 51, 52 and 53 which serve to draw the straps around the working head 40 and the sponge 41 and press the sponge against the screen (not shown) with sufficient force to hold the sponge in position during normal use.

If desired, brushes also can be provided on the lower edge of the working heads that are shown in FIG. 6 and 7 to aid in the cleansing process. As an additional feature, a scrub brush can be provided on the top surface of the working head 32. When a scrubbing action is desired, in contrast to a mopping effect, the working head 32 is flipped over to engage the surface and provide the necessary scrubbing brush.

For a more complete understanding of the invention, FIG. 2 shows a pump 54 that is permanently attached to a wall, kitchen cabinet, or the like, through a pair of brackets 55 and 56. The pump 54 is driven by an electric motor 57. In this particular case, a one quarter horsepower electric motor has been found quite suitable. A commutator shaft 60 protrudes downwardly from the motor 57 through a pump inlet chamber 61 that is in fluid communication with the porous mop-head (not shown in FIG. 2) by way of an intake tube 62. An annular opening 63 that is concentric with the shaft 60 establishes fluid communication between the chamber 61 and a first stage of impeller vanes 64 that are fixed to and rotate with the shaft 60. Centrifugal force slings the liquid toward the tips of the vanes 64. The centrifugal liquid then pours through apertures 65 that are formed in the periphery of a base plate 66 apertures another chamber 67 that is equipped with radially disposed flow guides 70. The guides 70 prevent the liquid in the chamber 67 from swirling around and foaming. The guides 70, moreover, tend to redirect the liquid flow toward another annular opening 71 in a plate 72 that is disposed below the flow guides 70.

The liquid pours through the annular opening 71 into a second stage impeller 73 that repeats the centrifugation process by slinging the liquid against a vertical wall 74 of the impeller housing. Holes 75 formed in the bottom of the impeller housing permit the liquid from the second stage of the pump to pour into a container 76 that is coupled to a trap 77 through a discharge port 80 in the base of the container 76. Preferably, all of the horizontal surfaces in the pump 54 are slightly pitched or slope to promote liquid flow in the proper direction.

In accordance with a feature of the invention, and as described in connection with FIG. 1, gas discharge passageways 81 and 82 are formed in the top surface of the container 76 to enable air, and other gases if necessary, to escape to the atmosphere and thus reduce the likelihood of a back pressure from developing due to foaming in the liquid, pressure lock, or the like.

The complete installation for the pump 54 is shown in FIG. 3. As illustrated, the intake tube 62 is coupled

to a flexible hose 83 that is coiled on a spring-loaded reel 84.

When not in use, upper wand section 85 and lower wand section 86 as well as working head 87 and other accessories are held by spring clips, or the like, on the back of a kitchen cabinet door 90. In this instance, the wand sections 85 and 86 and the working head 87 are joined together through an engagement of telescoping joints. The upper wand section is then joined to the bitter end of the hose 83 in a similar manner. The pump 54 is energized and the apparatus is ready to mop up the adjacent floor.

In order to trap dry powders and other particulate matter that is drawn from the surface being cleaned, FIG. 8 shows a typical filter 91 that preferably is interposed between the upper wand and the communicating pump inlet. As shown, the filter 91 comprises a female coupling 92 that has a nipple 93 for insertion into the flexible tube that connects the wands to the pump. The female component 92 of the filter has an internal thread 94 that receives a mating external thread 95 on a male component 96. The male component also has a nipple 97 which establishes communication with the pump intake tube. A strainer 100 is clamped between the, female and male filter components 92 and 96 to prevent solid matter from being drawn into the pump. The strainer 100 can be a perforated metal cup, a porous cloth bag, or other suitable material for arresting the flow of solid matter. The strainer 100 can be removed for cleaning or replacement by unscrewing the threaded connection and extracting the perforated metal plate or cloth bag. After cleaning, the plate, or a new bag, for example, is reinserted in the filter after which the male and female components 92 and 96 are once more joined.

As hereinbefore mentioned, the system under consideration can be provided for an entire building. Thus, as shown in FIG. 4, a centrally disposed pump 101 is connected through a trap 102 to a soil pipe 103. The pump 101 conveniently can be located in the basement of an ordinary dwelling. A manifold 104 is connected to pump 101 through an inlet 105 that also includes a filter 106.

Individual tubes 107, 110, and 111 lead from the manifold 104 to individual rooms in the building. The end of each of these tubes is provided with an easily removable air-tight cap that will preserve the vacuum in the system.

FIG. 9 shows a rinse water dispenser for attachment to the wands. Thus, a generally cylindrical rinse water dispenser 112 has a centrally disposed passageway 113 that is snugly received on, for example, a lower wand section. The surface of the dispenser 112 is provided with a plug 114, which, when removed, enables fresh or soapy rinse water to be poured into the dispenser. A drain plug 115 is seated in fluid tight relationship in a discharge hole 116 that is formed in the bottom surface of the dispenser 112. Preferably, a flexible hose 117, seated on a nipple (not shown) in the bottom surface of the dispenser 112 enables rinse water flowing from the dispenser to be applied in the desired direction. The drain plug 115 is unseated from the hole 116 by applying manual force in an upward direction on a grip that is formed on a rigid operating rod 121 which passes through a sleeve 122 in the top surface of the dispenser. The rod 121 is directly connected to the top of the drain plug 115. To reinsert the drain plug 115 and stop

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the flow of water through the hose 117, the grip 120 is forced in a downward direction to push the plug 115 back into hose 117.

As previously mentioned, liquids discharged from the pump are received in a container. In a further alternative embodiment of the invention, the pump can be moved about on a dolly. In this instance, FIG. 5 shows a typical discharge container 123 with vertical ribs 124 which can be transported with the pump on the dolly to catch and hold the fluid that is discharged from the pump.

I claim:

1. Apparatus for pumping matter from a surface comprising a motor, a centrifugal pump having a discharge outlet and driven by said motor for drawing air and liquid entrained matter from the surface, a working head having a cavity formed therein in communication with said pump, said cavity establishing further communication with the surface, mop head support means interposed between said working head cavity and the surface, said support means having a screen to permit

the flow of air and liquid entrained matter to said cavity, a mop head in engagement with said support means for mopping the surface, said mop means having passageways to enable the matter on the surface to pass into said cavity and to said communicating pump, an upper wand section connected to said motor, a lower wand section connecting said pump and said motor to said working head, a container detachably mounted on said lower wand section and in fluid communication with said pump to receive the discharge therefrom, said detachable container having at least one aperture formed therein to establish gaseous communication with the atmosphere and at least one rib formed in said container between said aperture and a free flow area in said container, said rib dividing the flow out of said pump discharge outlet into two portions.

2. Apparatus according to claim 1 further comprising a filter for solid matter interposed between said pump and said working head.

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