HEATED LIQUID VACUUM GENERATOR FOR USE WITH A TWO CHAMBER CLEANING NOZZLE

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ABSTRACT

A compact liquid-vacuum generator for use with a two chamber cleaning nozzle in rug and upholstery cleaning features a cleaning solution supply tank within a larger vacuum tank on a portable housing. The vacuum tank is evacuated through a standpipe connected to a vacuum blower in the housing, and extending above the top of the solution tank. A vacuum inlet for connection to the cleaning nozzle enters the vacuum tank just below the top of the solution tank and extends downwardly therefrom. The vacuum tank is covered with a transparent dome containing a solution inlet pipe opening into the vacuum tank above the solution tank and connected to a remote reservoir of solution. By this arrangement, each time the cleaning nozzle engages the work surface, a vacuum is created in the tank sufficient to draw solution from the reservoir to replenish the solution tank. Spent cleaning solution is returned to the vacuum tank via the vacuum inlet. The presence of the solution tank within the vacuum tank not only provides compactness and enhances portability, but also provides a mechanism whereby excess spent solution will flow into the solution tank before it flows into the standpipe to the blower.

5 Claims, 2 Drawing Figures
HEATED LIQUID VACUUM GENERATOR FOR USE WITH A TWO CHAMBER CLEANING NOZZLE

BACKGROUND OF THE INVENTION

This invention relates to a liquid-vacuum generator for use with a two chamber cleaning nozzle in the cleaning of rugs, carpets and upholstery, and more particularly relates to an improvement in the design of the generator resulting in compactness, and enhanced portability, efficiency, convenience and safety.

The heated liquid-vacuum generator for use with a two chamber cleaning nozzle in rug, carpet and upholstery cleaning has come into fairly widespread commercial use within the past several years, due to its ability to more thoroughly clean piled fabrics than the more conventional vacuum cleaners and rug shampooers. Typical of such generators is the one described in the F. E. Hays U.S. Pat. No. 3,262,146. This generator employs two tanks positioned on a portable housing, a first liquid tank for supplying cleaning solution to the nozzle, and a second vacuum tank for collecting spent solution and dirt. The housing contains liquid and vacuum pumps, a liquid heater, a vacuum exhaust silencer and power supplies. The vacuum tank is evacuated through a standpipe connected to the vacuum pump. In operation, replenishing the solution tank must either be carried out on site, in which case the operator must be careful to avoid spills, or the unit must be returned to a remote location for refilling. In addition, inattention to the level of spent solution being collected in the vacuum tank may result in the solution running down the standpipe and into the vacuum pump, necessitating shutdown for cleaning and possible repairs, and causing expensive downtime. Finally, the weight and bulkiness of the cleaner seriously impairs its portability.

SUMMARY OF THE INVENTION

A compact liquid-vacuum generator for use with a two chamber cleaning nozzle in rug and upholstery cleaning features an open cleaning solution supply tank within a larger vacuum tank supported on a portable housing. The vacuum tank is evacuated through a standpipe extending from the bottom of the vacuum tank to above the top of the solution tank, and connected at the lower end to a vacuum blower in the housing. A vacuum inlet for receiving dirt and spent cleaning solution from the vacuum chamber of the cleaning nozzle enters the vacuum tank just below the top of the solution tank, and extends downwardly therefrom. The vacuum tank is sealed with a cover which may contain a viewing port or, in one embodiment, itself is transparent so that solution levels in the tanks may be monitored during operation. The cover contains a solution inlet pipe opening into the vacuum tank above the solution tank and adapted for connection to a remote reservoir of cleaning solution. By this arrangement, each time the cleaning nozzle engages the work surface, a vacuum is created in the vacuum tank sufficient to draw solution from the reservoir to replenish the solution tank. The presence of the solution tank within the vacuum tank not only provides compactness and enhances portability, but also provides a mechanism whereby excess spent solution will flow into the solution tank before it flows into the standpipe to the blower.

In a preferred embodiment, a float valve is provided to prevent solution from flowing into the standpipe in the unlikely event that the solution tank becomes filled before the machine is shut down.

In another embodiment, a liquid heater is provided for heating the cleaning solution before it is applied to the work surface.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view, partly cut away, of one embodiment of the improved liquid-vacuum generator of the invention.

FIG. 2 is a perspective view showing an upper portion of the standpipe of the generator of FIG. 1, with a float valve assembly attached to the standpipe opening.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIG. 1, there is shown one embodiment of the invention comprising a vacuum tank 10 supported by a portable housing 11, and containing a smaller solution tank 12 open at the top. Vacuum tank 10 is sealed with cover 13, which may be of a transparent material, as shown here, or may contain a transparent viewing port, so that the level of solution in the tanks may be monitored during operation. In operation, cleaning solution from tank 12 is fed to pump 14 in the housing through tube 15 and thence pumped through tube 16 in the housing to the solution chamber of the cleaning nozzle, not shown. A detailed disclosure of the structure and operation of the cleaning nozzle may be found in U.S. Pat. No. 3,262,146, issued to F. E. Hays on July 26, 1966, and thus is not a necessary part of this description. Spent cleaning solution and dirt are returned from the vacuum chamber of the cleaning nozzle through vacuum line 17 and discharged into vacuum tank 10 via vacuum inlet 18. Inlet 18 enters tank 10 just below the open top of solution tank 12, and turns downwardly at approximately a right angle from the entrance direction, thus insuring against contamination of the fresh cleaning solution by splashing. Tank 10 is evacuated through standpipe 19, which extends upward from the bottom of the tank to a level above the open top of solution tank 12. The lower end of standpipe 19 is connected to vacuum blower 20 in the housing via vacuum line 21. Blower 20 exhausts through silencer 22 to the outside of the housing via exhaust pipe 23. As mentioned above, the upper end of standpipe 19 extends above the top of the solution tank 12. Thus, if the level of spent cleaning solution is permitted to rise too high in the vacuum tank by an inattentive operator, it will flow into the solution tank before it flows into the standpipe to the vacuum blower. The appearance of contaminated cleaning solution at the nozzle would then serve to warn the operator to shut down the apparatus before the solution level reaches the top of the standpipe, and thence flows down the standpipe to the vacuum blower.

Dome 13 is fitted with a solution inlet 24, which enters into the vacuum tank 10 above the opening in the solution tank 12 and extends downward to open into the solution tank 12. Inlet 24 is connected via tube 25 to a remote solution reservoir, not shown. By this arrangement, when the cleaning nozzle engages the work surface, a vacuum is built up in tank 10 which is sufficient to draw fresh solution into tank 12 from the remote reservoir. This arrangement has the advantage of providing fresh solution to the work area directly thus
eliminating the need for carrying buckets to the work site, with the possibility of spills, or alternatively for removing the generator from the worksite for replenishment. Tube 25 may, of course, be disconnected and inlet 24 capped at any time, should the need for added portability arise.

A further advantage of drawing the cleaning solution into the solution tank by vacuum is the beneficial mixing effect caused by forcing fresh solution through the inlet into the tank. By way of example, it has been found that use of a three-eighth inch diameter solution inlet pipe in connunction with a 1 horsepower vacuum blower results in sufficient vacuum at the nozzle, to achieve excellent mixing. In addition, since this is essentially a closed system any loss of vacuum at the cleaning head due to use of the solution inlet is too little to measure with the standard vacuum gage usually used on this type of equipment.

Referring now to FIG. 2, there is shown an arrangement for preventing backflow of spent cleaning solution into the standpipe 19. This arrangement consists of U-shaped connector 31 attached to the upper open end of the standpipe, and having a screened enclosure 32 attached to its open end, the enclosure containing float 33. Thus, should the operator fail to shut down the machine even after the solution tank becomes filled with spent solution, the float will rise with the solution level to seal the opening and prevent solution from reaching the blower.

The housing may also contain a solution heater connected to the pump outlet, to obtain heated cleaning solution. Such heated solution may be preferred for cleaning heavily soiled items, although warm solutions obtained with household tap water have been found satisfactory for most cleaning jobs.

The invention has been described in terms of a preferred embodiment. However, it is to be understood that variations which rely upon the teachings herein, and which are within the skill of the art to effect, form a part of this invention.

What is claimed is:

1. A two-tank liquid-vacuum generator for use with a two chamber cleaning nozzle comprising:
   a housing, vacuum means, mounted within the housing, and
   having an intake and an outlet, a liquid pump, mounted within the housing, and having an intake and an outlet
   a vacuum tank mounted on the housing, a vacuum tank mounted on the housing,
   a standpipe extending upwardly from the bottom of the vacuum tank,
   a vacuum line communicating the intake side of the vacuum means with the lower end of the standpipe,
   a vacuum inlet extending inwardly through the side of the vacuum tank below the top of the standpipe and downwardly inside the tank,
   a solution tank mounted on the housing,
   a solution supply line extending from the bottom of the solution tank to the intake side of the liquid pump, and
   a liquid tube having one end thereof communicating with the pump and the other end thereof forming for releasable connection to the cleaning nozzle, characterized in that:
   The solution tank is located inside the vacuum tank and has an open top above the level at which the vacuum inlet pipe enters the vacuum tank, but below the top of the standpipe, and further characterized in that a solution inlet pipe extends inwardly through an upper portion of the vacuum tank and opens into the top of the solution tank, the inlet pipe being adapted for releasable connection to a liquid tube leading to a remote solution reservoir.

2. The generator of claim 1 in which at least a portion of the top of the vacuum tank is of a transparent material, so as to form a viewing port for the monitoring of solution levels within the tanks.

3. The generator of claim 2 in which the top of the vacuum tank is of a transparent material, and the solution inlet pipe enters the transparent top of the solution tank and extends in a downwardly direction to a point below the top of the solution tank.

4. The generator of claim 1 in which means are provided for closing the standpipe when the solution level approaches the top of the standpipe.

5. The generator of claim 4 in which the closing means comprises a float valve.

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