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G. HESKESTAD

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JET AGITATION IN A WASHING MACHINE

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FIG. 1

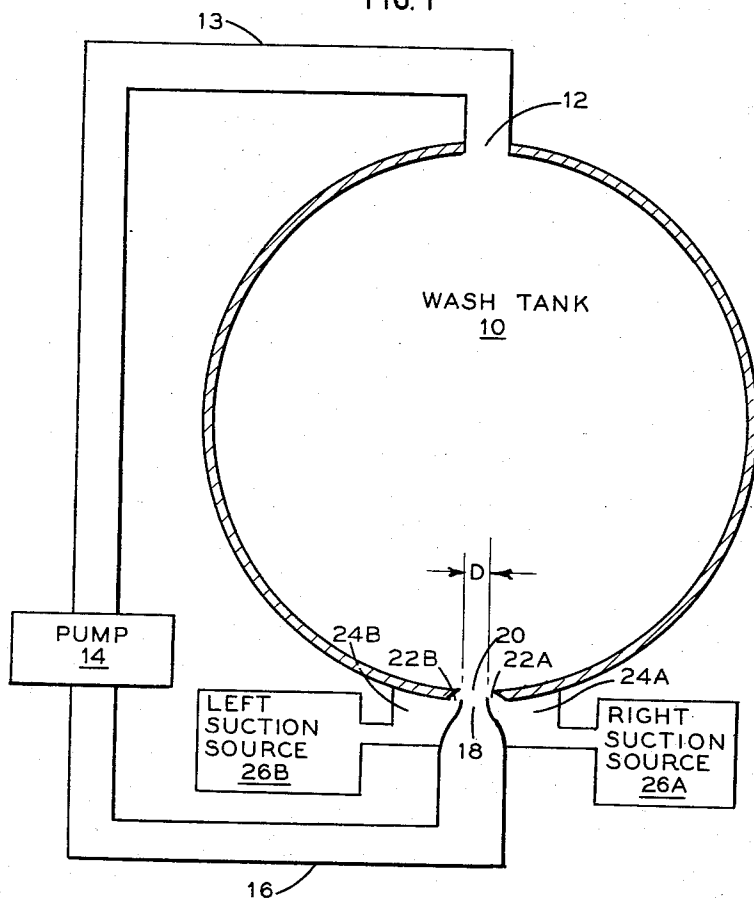


FIG. 2

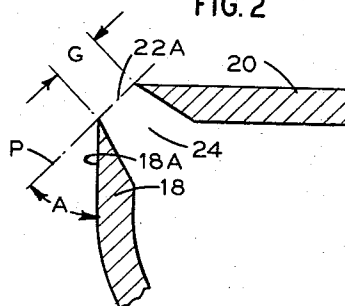
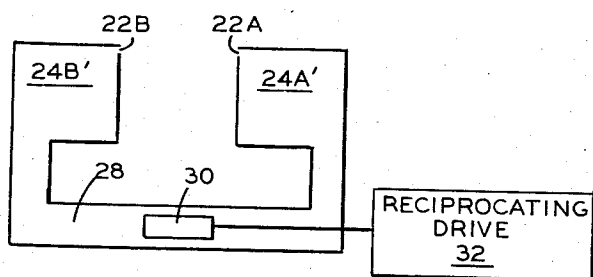


FIG. 3



INVENTOR
Gunnar Heskestad
BY *Eli Weiss*
ATTORNEY

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JET AGITATION IN A WASHING MACHINE
Gunnar Heskestad, Piscataway, N.J., assignor to American
Standard Inc., New York, N.Y., a corporation of
Delaware

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ABSTRACT OF THE DISCLOSURE

This invention provides a washing machine that omits the conventional mechanically-driven, rotationally-oscillating vane configuration. Instead of the oscillating vane construction, the invention contemplates a wash solution mechanism which feeds a jet of the wash solution into the wash tank. Suction is applied at a varying rate at the region of entry of the solution into the wash tank in order to change the direction of the jet of solution. The jet of solution can be caused to sweep across the internal region of the wash tank and thereby induce a desired turbulent convection of the solution.

This invention pertains to improvements in washing machines and more particularly to improvements in the jet agitation of the wash solution in the wash tank of a washing machine.

The wash solution agitators in common home washing machines usually comprises a rotationally oscillating vane configuration. The washing of clothes in the wash tank is caused by agitator produced turbulent convection of the water solution past and through the material being washed.

Although this type of wash solution motion adequately cleans the material in the wash tank, the rotationally oscillating vane configuration is a combination of movable parts which are mechanically driven. Accordingly, because of the constant movement of these parts during the wash cycle, the parts are subject to wear.

It is accordingly, a general object of the invention to provide improvements for creating the agitator action in washing machines.

It is another object of the invention to provide for the agitation of wash solution in a washing machine by utilizing apparatus which is more simple and more immune to wear than presently available rotational type agitators.

It is a further object of the invention to provide an improved apparatus for producing turbulent convection of the wash solution in the wash tank of a washing machine.

Briefly, the invention contemplates agitating the wash solution in the wash tank of a washing machine by feeding at least one jet of wash solution into the wash tank and controllably applying suction at a varying rate to at least one portion of the jet of solution at its region of entry into the wash tank. Thus, the direction of entry of the jet of solution can be varied. In fact, the jet of solution will scan or sweep across the region inside of the wash tank and induce the desired turbulent convection of the wash solution in the wash tank.

Other objects and the features and advantages of the invention will be apparent from the following detailed description when read together with the accompanying drawings which show, by way of example and not limitation, preferred apparatus for practicing the invention.

In the drawings:

FIG. 1 is a schematic diagram of the wash solution system of a washing machine which shows in cross section the solution jet producing means and the suction means for controlling the direction of entry of the jet of solution into the wash tank;

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FIG. 2 is an enlarged cross-sectional view of the region of the wash tank where the jet of solution is produced; and

FIG. 3 is a schematic diagram of a suction system for controlling the direction of flow of the jet of solution.

Referring now to FIG. 1, those parts of a washing machine concerned with the invention are shown. In particular, there is a cylindrical wash tank 10 having a wash solution outlet 12 which is connected by a return line 13 to the input of a pump 14. The output of pump 14 is connected via a feed line 16 to an orifice 18 which is opposite a slot-like opening 20. Opening 20 is in the circumferential wall of wash tank 10.

Pump 14 drives a sheet-like jet of solution from orifice 18 into wash tank 10. The solution is recirculated via a path which includes outlet 12 and return line 13 to the input of pump 14.

Of course, a complete washing machine solution circulation system would include valving means to control the initial introduction of water into the system and the final removal of wash solution from the system. Since the invention is not concerned with these aspects of the washing machine, they are not shown.

In order to produce the scanning sweep of the jet of solution, the orifice 18 fits in the inlet 20 such that there are a pair of slit-like gaps 22 between the orifice 18 and the opposed peripheral edges of the inlet 20. Each of the gaps communicates with a chamber 24. Chamber 24A is connected to right suction source 26A and chamber 24B is connected to left suction source 26B.

It has been found that by applying suction to a portion of the peripheral edge of an orifice which is expelling a jet of fluid, the direction of the jet of fluid will be deflected toward the direction of the region of the application of the peripheral edge suction. Thus, for example, when right suction source 26A is operative suction is applied to the right hand gap 22A (as viewed in FIG. 1) and the sheet-like jet is deflected to the right of the line connecting inlet 20 and outlet 12. Similarly, operation of left suction source 26B causes a leftward deflection of the jet of solution. The degree of deflection is to a certain extent controlled by the suction rate.

When the dimensions of the gap 22A are chosen according to the following criteria, optimum deflection of the jet is obtained. The gap width G (FIG. 2) should be between a half and ten percent of the width or diameter D (FIG. 1) of the orifice 18. In addition, the angle of inclination A of the gap 22A with respect to the inner wall 18A of orifice 18 (FIG. 2) should be in the range of thirty to ninety degrees. Generally, the larger the inclination angle of the gap and the greater the width of the gap, the greater the deflection of the jet of solution. However, greater suction rates are required. The same criteria holds for gap 22B.

If suction sources 26A and 26B are alternately energized then the sheet-like jet will oscillatingly scan or sweep the interior of wash tank 10. Furthermore, by varying the rates of suction of the sources and their cycle of alternation, the turbulent convection of the wash solution can be controlled.

In FIG. 3, there is shown schematically means for alternately applying suction to the gaps 22A and 22B. A conduit 28 connects the chambers 24A' and 24B'. Within the conduit 28 is a piston 30 which is reciprocatingly driven by drive 32. When the piston 30 moves to the right (as shown in FIG. 3) suction occurs in chamber 24B' and pressure occurs in chamber 24A'. The suction at the left gap 22B will deflect the jet of water to the left. This deflection is slightly reinforced by the pressure at the right gap 22A. A complementary effect occurs when the piston 30 moves to the left.

There has thus been shown improvements in agitating

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the wash solution in the wash tank of a washing machine. In particular, by controllably applying suction to the peripheral edge of a jet of solution as it is expelled from an orifice to deflect the jet of solution, scanning of the wash tank is obtained to produce the desired agitation with a minimum of apparatus. Furthermore, the required apparatus is subject to a minimum of wear.

There will now be obvious to those skilled in the art many modifications and variations satisfying any, or all of the objects of the invention but which do not depart from the spirit thereof, as defined in the appended claims.

What is claimed is:

1. In a washing machine which includes a cylindrical wash tank having a wash solution outlet, a return line connection to said wash solution outlet, a feed line and a pump connecting said return line to said feed line, the improvement comprising apparatus for delivering a movable jet of wash solution to said wash tank comprising a slot-like inlet in said wash tank, an orifice disposed in said inlet and spaced from each side of its long dimension edges to provide a pair of gaps, said orifice being connected to said feed line, a first chamber opening on one of said gaps, a second chamber opening on the other of said gaps, and means for applying suction to said chambers.

2. The washing machine of claim 1 wherein said gaps are slit-like and disposed adjacent opposed regions of said orifice.

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3. The washing machine of claim 2 wherein said suction applying means includes means for applying differential suction to said chambers.

4. The washing machine of claim 2 wherein said suction applying means includes means for applying suction alternately to said chambers.

5. The washing machine of claim 2 wherein the width of each of said gaps is from one-half to ten percent of the width of said orifice.

6. The washing machine of claim 2 wherein the gap inclination angle of each of said gaps is between thirty and ninety degrees.

7. The washing machine of claim 2 wherein the width of each of said gaps is from one-half to ten percent of the width of said orifice and the gap inclination angle of each of said gaps is between thirty and ninety degrees.

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IRVING BUNEVICH, *Primary Examiner.*