June 27, 1967 L. ANASTASIA 3,327,727

LIQUID DISPENSING SYSTEM FOR WASHING MACHINES

Filed June 1, 1964 2 Sheets-Sheet 1

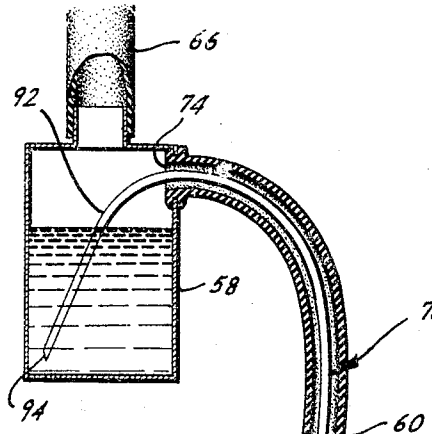
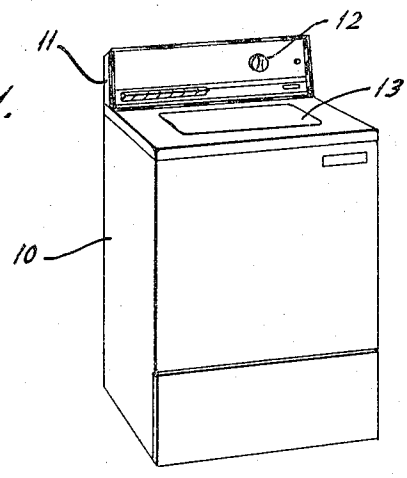
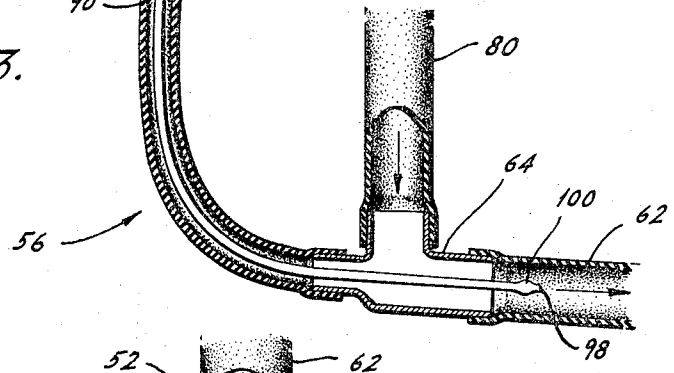


FIG. 3.

FIG. 1.





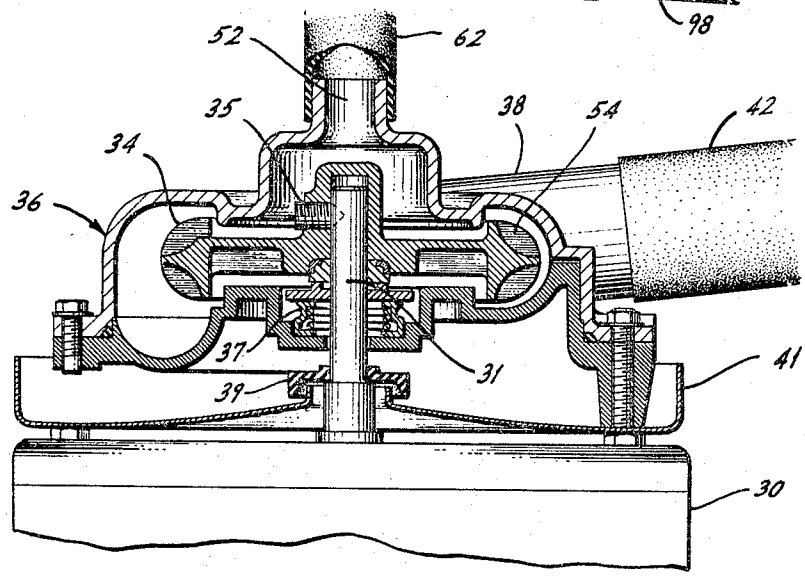


FIG. 4.

INVENTOR.
LOUIS ANASTASIA
BY Stanley H. Lyhen
ATTORNEY

June 27, 1967 L. ANASTASIA 3,327,727

LIQUID DISPENSING SYSTEM FOR WASHING MACHINES

Filed June 1, 1964 2 Sheets-Sheet 2

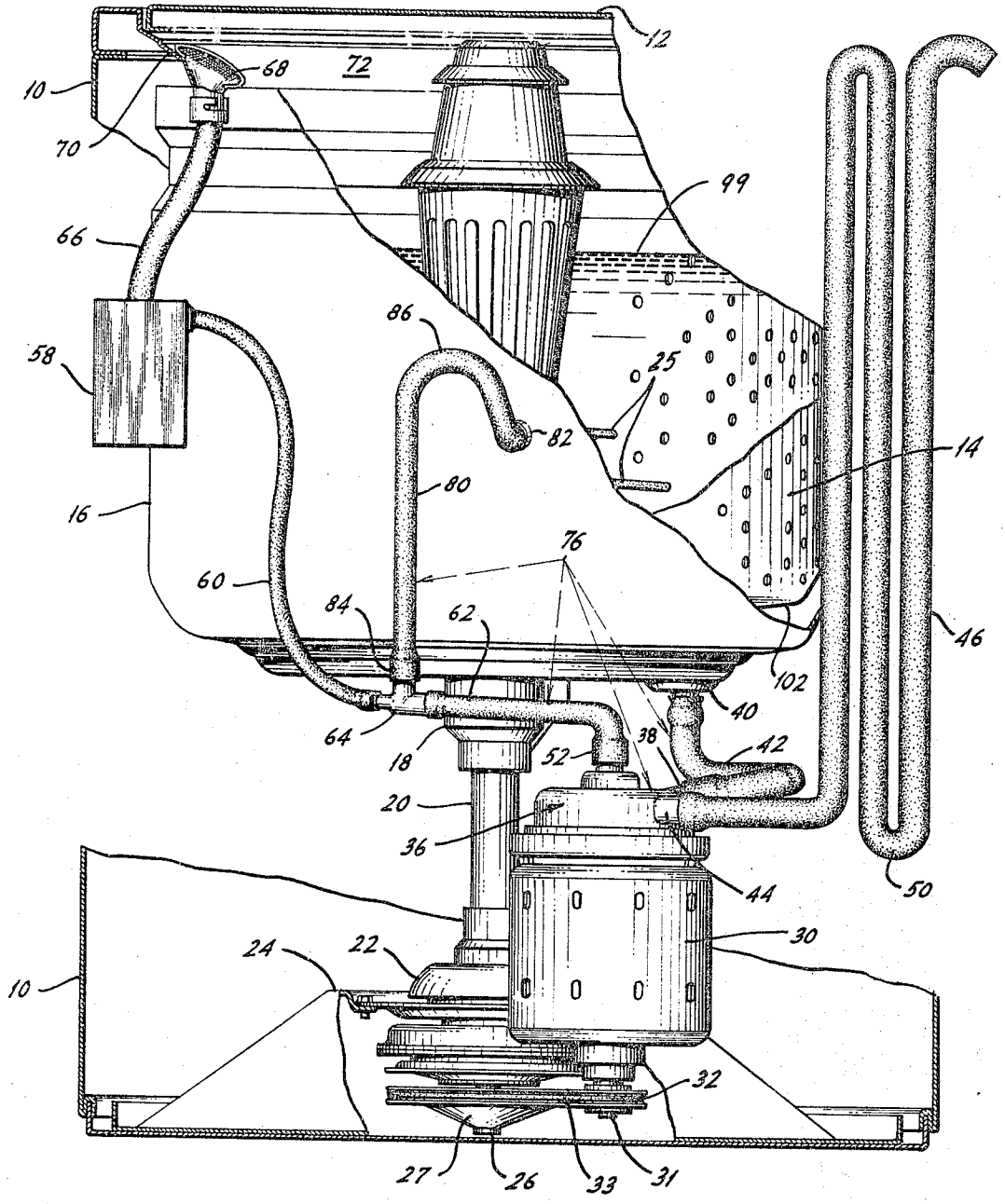


FIG. 2.

INVENTOR.
LOUIS ANASTASIA
BY Stanley H. Reyhan
ATTORNEY

United States Patent Office 3,327,727
Patented June 27, 1967

3,327,727
LIQUID DISPENSING SYSTEM FOR WASHING MACHINES

Louis Anastasia, Highland, N.J., assignor to Philco-Ford Corporation, a corporation of Delaware

Filed June 1, 1964, Ser. No. 371,346
6 Claims. (Cl. 137—147)

This invention relates to laundry apparatus and more particularly to novel and improved liquid dispensing means for use with washing machines.

While of broader applicability, the invention will be described in connection with the dispensing of bleaching solution in vertical-type machines. It should be understood, however, that the invention is usable in the dispensing of liquids generally such, for example, as detergent solutions, fabric and water softeners, as well as liquid bleaching agents. Also, principles of the invention are usable in horizontal, inclined, and vertical axis washing machines.

An important requirement in the use of bleaching agents is that their introduction into the wash water be delayed until the fluorescing agents or optical dyes contained in many modern detergents have had time to act. It has been determined that certain types of bleach neutralize the action of the fluorescing agents rendering them useless. It further has been determined, in instances where the clothes to be washed are undergoing washing action during introduction of the wash water, as is normally the case with horizontal axis machines, that the beneficial action of the fluorescers is complete on filling of the wash tub thus permitting introduction of the bleach immediately upon completion of the fill phase of the wash cycle. In vertical axis machines, in which washing is normally delayed until filling of the tub is complete, introduction of the bleach is desirably delayed two to four minutes after initiation of the agitation phase to permit maximum benefit to be derived from the detergent.

In achievement of the desired delay, it is prior art practice to employ some form of mechanical timing mechanism, or orifice metering device, or simply to rely on the operator manually adding the treatment solution at the desired time. The first of the mentioned systems, while reliable, is expensive. The second is both complex in form and prone to malfunctioning, and the third results in inefficient use of the operator's time.

Accordingly, it is a general object of this invention to provide a simplified and reliable system for achieving automatic dispensing of liquid treating agents which overcomes the limitations and deficiencies of the prior art.

It is a further object of the invention to provide a liquid-dispensing system for use with washing machines which is automatically operable to dispense a liquid treating agent into the washing fluid after a predetermined time delay and without the use of mechanical timing means.

A still further object of the invention is the provision of an automatic dispensing system insuring optimum dilution of the liquid treating agent prior to its introduction into the washing fluid, and insuring uniform distribution of the treating agent throughout the washing fluid after introduction.

Another and more particularized object of the invention is the provision of an automatic liquid-dispensing system which is self-cleaning.

The above mentioned and other objects within contemplation will be more readily understood by reference to the accompanying detailed description and drawings, in which:

FIGURE 1 is a perspective view of a vertical axis machine embodying the present invention;

FIGURE 2 is a partially sectionalized elevational view

of the machine shown in FIGURE 1 showing details of the fluid dispensing system comprising a preferred structural form of the instant invention;

FIGURE 3 is an enlarged view showing structural details of the venturi operated siphon constituting a special feature of the instant invention; and

FIGURE 4 is a sectional view of a portion of the apparatus illustrated in FIGURE 2 showing structural details of the pump and associated drive mechanism.

In accomplishment of the foregoing and other objectives, there is provided a novel system for achieving delayed siphonic transfer of treatment solution from a reservoir to the tub area which comprises, conduit means forming a path for the circulation of washing fluid arranged in fluid-flow communication with the siphonic element of the system and having operably associated therewith means inducing siphonic transfer of solution from said reservoir into the washing fluid on flow of fluid through said conduit means.

The invention is illustrated as embodied in a washing machine of the type automatically operable through a sequence of fill, wash, rinse and extraction phases in performance of a washing cycle. Referring to FIGURES 1 and 2 of the drawing there is shown a vertical washing machine of the automatic type housed within an outer casing or cabinet **10** to which there is mounted a control panel **11** housing timer mechanism, not shown, operable by dial **12**. A door **13** is hingedly mounted over the access opening of the machine in accordance with usual practice, to permit loading and unloading of an upwardly presented, rotatable basket **14**. The basket is nested within an imperforate non-rotatable tub **16**. Basket **14** is mounted upon hub means (not shown) suitably journalled within bearing means **18** provided in the bottom of stationary tub **16**. Bearing means **18** and tub **16** are in turn supported upon a non-rotatable central tubular column **20** which has at its lower end a downwardly flaring skirt portion **22** disposed in resilient supporting engagement with the bottom or base portion **24** of cabinet **10**.

An agitator **25**, preferably of the "wobble" type, is disposed within basket **14** and is driven by shaft **26** having a lower end portion extending below base member **24** and to which shaft portion a pulley **27** is affixed. Means for driving pulley **27** conveniently comprises selectively reversible motor means **30** mounted upon a bracket (not shown) affixed to skirt **22** of column **20**. The lower end of motor shaft **31** includes a pulley **32** drivingly connected with pulley **27** by a belt **33**. As mentioned, motor means **30** is of the reversible type, and when rotated in one direction conditions brake means (not shown), associated with the drive coupling, to prevent basket **14** from rotating, but causing agitator shaft **26** to impart undulating movements to agitator **25**. When motor means **30** is rotated in the opposite direction, the brake means is actuated to release basket **14** and permit rotation of agitator **25** and basket **14** as an integral unit to centrifuge water from clothes within basket **14**, all in accordance with conventional practice.

With more particular reference to FIGURES 2 and 4, a wash-fluid drain pump **36** is mounted atop motor means **30** for drive by motor shaft **31**. The impeller **34** of drain pump **36** is keyed for rotation with shaft **31** by a set screw **35**, and conventional shaft seal means **37** is provided to prevent outflow of fluid from pump **36** along the drive shaft **31**. In the event leakage should occur, a slinger disc **39**, carried by shaft **31** is so shaped and positioned that it will centrifuge water from the shaft to prevent flow onto motor **30**. As an additional precautionary measure a pan **41** is mounted on top of motor **30** to catch any overflow or leakage. Port **38** of the pump is disposed in fluid flow communication with a drain sump portion **40** of tub **16** by means of a flexible

hose connection 42. Pump 36 is of the rotary impeller type and is constructed to withdraw fluid from tub 16 through hose 42 for discharge through outlet port 44 and drain hose 46 when motor 30 is driven in a direction to perform the centrifuging phase of the wash cycle. During agitation phases of the wash cycle pump 36 is driven in a direction opposite to that in which it was driven during extraction phases, causing washing fluid to circulate through hose 42 into tub 16. During wash-agitation there is a tendency for the pump to pull air through drain hose 46 to expel it into tub 16 by way of hose connection 42, causing objectionable frothing of the washing solution. This may be prevented by incorporating a check valve in the discharge line or by providing a trap 50 in the manner diagrammatically illustrated in FIGURE 2.

In accordance with the invention, pump means 36 is provided with a third port 52 in the region of the eye of the pump. This construction insures that port 52 is at a reduced pressure in relation to ports 38 and 44 permitting it to serve as an inlet connection to the pump regardless of the direction of rotation of the pump impeller blade 34.

Communicating with pump 36 is a conduit system 76 for circulating washing fluid externally of the tub 16. The system 76 comprises hoses 80 and 62 interconnected by T-fitting 64, pump 36 and hose 42 and is disposed in novel cooperation with siphoning means 78 operably associated with a reservoir 58 mounted upon an inside wall portion of cabinet structure 10 by means not shown.

The reservoir 58 is designed for receipt of treatment solution ultimately to be dispensed to the washing fluid within tub 16 and is constructed to have a volumetric capacity sufficient to accommodate the required quantity of treatment solution such that it will not overflow into opening 74 of hose 60. In the embodiment illustrated hose 60 is interposed in a connection between the upper part of reservoir 58 and the conduit system 76. The reservoir in its initially loaded condition, prior to filling of tub 16 is graphically illustrated in FIGURE 3 showing the relative position of parts and the solution level. This construction prevents premature introduction of treatment solution into the washing fluid, which does not occur until provided for by the novel fluid injection apparatus comprising the instant invention.

Communicating with the reservoir and permitting convenient loading thereof by the operator is a fill hose 66 terminating at its upper end in a circumferentially grooved loading funnel 68 snap-fitted into an aperture provided in a throat portion 70 of the apron defining the door access opening 72.

Referring to FIGURE 2 and in particular to the fluid circulating system 76, one end 82 of hose 80 is fastened to and communicates with tub 16 at a location below the low-water level of washing fluid within the tub. The other end 84 of hose 80 is positioned at an elevation below connection 82 and is in fluid flow communication with reduced-pressure regions of the pump by way of T-fitting 64 and hose section 62.

To prevent flow of washing fluid through hose 80 during filling of the tub and thereby to prevent premature operation of siphon means 78, the operation of which is hereinafter described, the hose is formed with an intermediate portion 86 at an elevation above the hose end connections 82 and 84. This hose configuration permits the formation of an air lock within the hose during filling of the tub, preventing hydrostatically induced flow therethrough. The same result can be achieved by employing a check valve or other suitable flow-controlling device internally of the hose.

As seen in FIGURE 3 siphoning means 78 includes a siphoning tube 90 conveniently disposed within hose 60. Portions of the shorter leg 92 of the tube are positioned within reservoir 58 and the upper opening 94 of the tube is located adjacent the bottom of the reservoir in the

manner shown. To reduce the possibility of blockage of opening 94 the end is chamfered. In the embodiment illustrated the longer leg portion of the siphon is housed for convenience within hose 60, its lower opening 98 being disposed within hose section 62 of the conduit system 76.

When motor 30 is energized, in performance of the wash agitation phase, impeller 34 (FIGURE 4), directly coupled to the motor drive shaft 31, is driven in a direction causing circulation of washing fluid through hose 42 into tub 16. When pump 36 operates a reduced pressure is created in the region of eye port 52 which is transmitted to the hose network 76 and is sufficient to overcome the air lock formed in the raised portion 86 of hose 80. As viewed in FIGURE 2, this action produces counter-clockwise flow of washing fluid from and to tub 16 through the conduit system 76. As the washing fluid passes over lower end portions of the siphoning tube 90, FIGURE 3, the flow path undergoes restriction producing a zone of reduced pressure in the region of the lower opening of the siphon. To accentuate this action the siphoning tube may be provided with lobes 100 adjacent its lower opening.

In this connection it should be noted that restriction in the flow path may be achieved in numerous ways, such for example, as by reducing the diameter of hose 62 in the region of the lower opening of the siphon or by inserting within the hose an independent, flow-restricting member. As a result of the induced venturi action, siphoning is initiated causing flow or bleach, or other treatment solution contained in reservoir 58, through siphoning tube 90 into the stream of washing fluid circulating through the conduit system 76. The treatment solution is thus transported by the circulating stream, through pump 36, into the washing fluid within tub 16. Mixing of the bleach in the washing fluid is aided by the fact that the admixture of bleach and washing fluid coming from the pump on entering tub 16 impinges on the imperforate bottom 102 of basket 15, dispersing the incoming stream.

As a result of the coordinate action between the fluid circulating system and siphoning means 78, introduction of bleach into the washing fluid is delayed until completion of the fill phase. Following initiation of wash agitation there is automatic, diffusion-injection of bleach into the recirculating stream for transport thereby into the washing fluid within tub 16.

To provide for self-cleaning of the reservoir and further to aid in diluting the bleach prior to its introduction into the washing fluid within tub 16, the reservoir preferably is positioned at an elevation below the low-water operating level 99 within the tub. This constructional arrangement results in replacement of bleach solution withdrawn from reservoir 58 by siphoning action, by washing fluid flowing into reservoir 58 through hose 60 as a result of the hydrostatic head within the system. To insure this mode of operation the restriction in the flow path within the conduit system 76 should be positioned downstream of the T-connection in the manner shown in FIGURE 3. If this is not done the reduced pressure region formed in the area of the lobes may prevent circulation of fluid through hose 60. An alternative arrangement which avoids the above problem is simply to divorce hose 60 from tube 90, and connect the hose directly to tub 16 at an elevation below the low-water level 99. If this arrangement is employed, tube 90 can be inserted directly into the conduit system 76 through an hermetically sealed entrance port, the construction of which has not been shown since it is believed obvious.

It will be noted that there are several aspects of the invention. For example, the system can be built to function without the self-cleaning feature by deleting hose connection 60 and simply disposing the lower end of the siphoning tube 90 within the recirculating system

in the manner discussed immediately above. The preferred form of the invention, however, is that shown in the drawing, in which the siphoning tube is disposed within hose **60** in such manner that the dual features of automatic injection of treatment solution through venturi induced siphonic action, and self-cleaning of the reservoir may be accomplished with a minimum of strucural complexity.

Viewed from an operational standpoint, use of the disclosed bleach dispensing system consists simply of lifting the door panel **13** and adding the desired amount of treatment solution, such as raw bleach, to reservoir **58**. As previously noted, the reservoir is designed to have a fluid capacity sufficient to prevent overflow of solution into hose **60**. With the treatment solution added, the wash cycle is initiated by advancing the timer control knob **12** to effect energization of conventional timing means not shown. In order to provide for self-cleaning of the reservoir it is positioned at an elevation below the low-water level within the tub. As the tub fills, washing fluid rises within the network of hoses eventually overflowing into reservoir **58** from hose **60**. This dilutes the treatment solution and while some degree of diffusion occurs between the solution and washing fluid within the reservoir there is no measurable transfer of solution by this mechanism into the tub area. Water simultaneously rising in hose **80** and tub **16** traps air within pocket **86** preventing flow of fluid from the tub area through hose **80** and consequent premature activation of the siphon. Immediately the tub is filled, the motor, through pressure-responsive means not shown, is caused to be energized initiating the agitation phase of the wash cycle. There is thus established, through operation of the motor-coupled pump **36**, circulation of water into and out of tub **16** through the fluid recirculating system **76**.

When fluid moving through the hose network comprising the conduit system **76** passes over lobes **100** formed on an end portion of siphoning tube **90**, the stream of fluid undergoes restriction. As the velocity of flow increases in the region of restriction, the pressure decreases initiating siphonic action. Once siphonic action begins it continues until substantially all solution within the reservoir **58** is withdrawn. Since the reservoir-communicating port **74** of hose **60** is below the operating fluid level **99** within tub **16** any solution siphonically withdrawn from the reservoir is replaced by fluid forced through hose **60** by the hydrostatic pressure within the system. This induced countercirculation results both in continual dilution of the treatment solution throughout the period of its siphonic withdrawal, and self-cleaning of the reservoir chamber.

The rate of siphonic flow can be modulated conveniently by varying either the siphoning tubes inside diameter or the relative lengths of the legs of the siphon. A siphoning tube having a ⅛" I.D. was found to provide an 8–10 minute injection period using a long-to-short leg ratio of about 4:1.

Siphoning action and consequent dilution of the treatment solution continues throughout the wash agitation phase as a result of the continual refilling of the reservoir by washing fluid. During this period fluid is constantly recirculated through the conduit system **76** by pump **36**, insuring optimum dispersion of treatment solution siphonically withdrawn from the reservoir.

Following completion of the agitation phase of the cycle, there is an increment of dwell during which period the motor is allowed to coast to a stop preliminary to reversal of its direction of rotation in performance of the extraction phase. During this period of dwell, siphoning action continues with the result that reservoir **58** is flushed by inflowing fluid by the mechanism previously described. During the succeeding spin operation, siphoning action continues to empty the reservoir of all solution. As a result of this sequence substantially the entire liquid content of the system is discharged to drain during the extraction phase of the cycle. This series of operations is conventionally followed by one or more rinse-extraction sequences completing the wash cycle.

Once siphoning action is initiated it will continue regardless of the operation or nonoperation of the pump, emptying the bleach reservoir and readying the system for the next cycle of operation. In the apparatus disclosed substantially all of the treatment solution is discharged from the system during the spin phase of the cycle, leaving little if any solution remaining to infiltrate the washing fluid during subsequent rinse-extraction phases. Any solution which does remain at the end of the cycle as a result of the pump's inability to effect complete discharge of the wash is in a highly diluted state and incapable of damaging even the most delicate of fabrics.

By the described arrangement of features there is provided a time-delayed fluid injection system automatically operable to dispense treatment solution into the washing fluid in accordance with a predetermined operational schedule, without utilization of valves or timing mechanism. This system is both simple and inexpensive in construction and can readily be modified, in the manner described, whereby to render it self-cleaning.

While specific embodiments illustrative of the present invention have been depicted and described, modifications may be made therein without departing from the spirit and scope of the present invention. It will be understood, therefore, that such changes and modifications are contemplated as come within the scope of the appended claims.

I claim:

1. In a washing machine of the type having a receptacle for receipt of washing liquid, a wash-aid liquid-dispensing system comprising:

(a) first conduit means and an associated pump providing a path for circulation of washing liquid into and out of said receptacle at a level below the normal level of liquid therein,

(b) reservoir means for storing wash-aid liquid to be dispensed to said receptacle,

(c) siphoning means including a siphoning tube the upper end of which is disposed in operable relation with said reservoir means and the lower end of which is positioned within said conduit means,

(d) means constructed and arranged to produce a restriction in the flow-path provided by said conduit means in the region of the lower end of said siphoning tube whereby siphonic transfer of wash-aid liquid from said reservoir means is induced by flow of liquid through said restriction, and

(e) second conduit means constructed and arranged to place said reservoir means and said first conduit means in direct liquid flow communication, whereby liquid siphonically withdrawn from said reservoir means will be replaced automatically by liquid flowing through said second conduit means as a result of hydrostatic pressure when said receptacle is filled.

2. In a washing machine of the type automatically operable through a sequence of filling, washing and extraction operations in performance of a washing cycle, the combination comprising:

(a) a receptacle for receipt of washing liquid,

(b) a reservoir for storage of treatment solution,

(c) a liquid-circulating system comprising pump means and associated conduit means placing inlet and outlet ports of said pump means in liquid flow communication with regions of said receptacle below the normal liquid level therein,

(d) a siphoning tube the upper opening of which is disposed within said reservoir and the lower opening of which is disposed within said system,

(e) drive means associated with said pump means operable during a washing operation to produce cir-

culation of washing liquid through said system and past the lower opening of said siphoning tube to create a zone of reduced pressure in the region of said lower opening whereby to initiate siphonic transfer of solution from said reservoir to said receptacle by way of said system, and

(f) hose means constructed and arranged to place said reservoir in direct liquid-flow communication with said conduit means to accommodate flow of liquid to said reservoir from said receptacle on filling of the latter.

3. In a washing machine, of the type automatically operable through a sequence of filling, washing and extraction operations, the combination comprising:

(a) a wash tub for receipt of washing liquid,

(b) a reservoir for storage of treatment solution positioned at an elevation below that of the lowest expected operating liquid level within said tub,

(c) a liquid circulating system comprising a pump and including conduit means placing inlet and outlet ports of said pump in liquid-flow communication with regions of said tub below the expected operating liquid level therein,

(d) a siphoning tube the upper opening of which is disposed adjacent the bottom of said reservoir and the lower opening of which is within said liquid-circulating system,

(e) means operably associated with said circulating system forming a restriction in the flow path defined by said system in the region of the lower opening of said siphoning tube,

(f) drive means associated with said pump operable to produce circulation of washing liquid through said system and past the lower opening of said siphoning tube to create a zone of reduced pressure in the region of said lower opening, and

(g) conduit means constructed and arranged to place said reservoir in direct liquid-flow communication with said liquid circulating system.

4. In a washing machine of the type having a receptacle for receipt of washing liquid, a wash-aid liquid dispensing system comprising: first conduit means having opposite end portions connected with said receptacle, in regions thereof below the normal level of liquid in the receptacle; a pump providing for circulation of washing liquid through said first conduit means; reservoir means for

storing wash-aid liquid to be dispensed to said receptacle, said reservoir means being disposed at a level below the normal level of washing liquid in said receptacle; siphoning means including a siphoning tube the upper end of which is disposed in operable relation with said reservoir means and the lower end of which is positioned within said path; means constructed and arranged to produce a restriction in the flow path provided by said first conduit means in the region of the lower end of said siphoning tube whereby siphonic transfer of liquid from said reservoir means to said first conduit means is induced by flow of fluid past said restriction; and second conduit means the upper end of which communicates with said reservoir means at a level above the level of the upper end of said siphoning tube and the lower end of which communicates directly with said first conduit means in the region of the lower end of said siphoning tube, whereby washing liquid will be caused hydrostatically to flow from said receptacle, through a portion of said first conduit means, thence through said second conduit means into said reservoir means.

5. A washing machine according to claim 4, and characterized in that said siphoning tube is of lesser cross-sectional area than the said second conduit means and extends through the latter, the upper end of said tube extending into the recited operable relation with the reservoir means through the recited connection of said second conduit means with said reservoir means.

6. A washing machine according to claim 5, and further characterized in that the disposition of the lower end of said siphoning tube is such as to reduce the effective cross-sectional area of said first conduit means, whereby to form the recited restriction for inducing siphonic flow.

References Cited

UNITED STATES PATENTS

1,769,428	7/1930	Gatchet	23—272.7
2,993,214	7/1961	Franco	4—228
2,993,357	7/1961	Smith et al.	68—207
3,001,210	9/1961	Diehl	4—225
3,088,304	5/1963	Bochan	68—12

M. CARY NELSON, *Primary Examiner.*

HENRY T. KLINKSIEK, *Examiner.*