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[54] **MULTIPLE AUTOMATIC WASHER SYSTEM**

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[52] **U.S. Cl.** ..... **68/12 R**, 68/18 F, 68/27, 210/167, 210/195, 210/210

[51] **Int. Cl.** **D06f 31/00**, D06f 39/10

[58] **Field of Search** ..... 68/12 R, 18 R, 18 F, 27; 210/167, 195, 210

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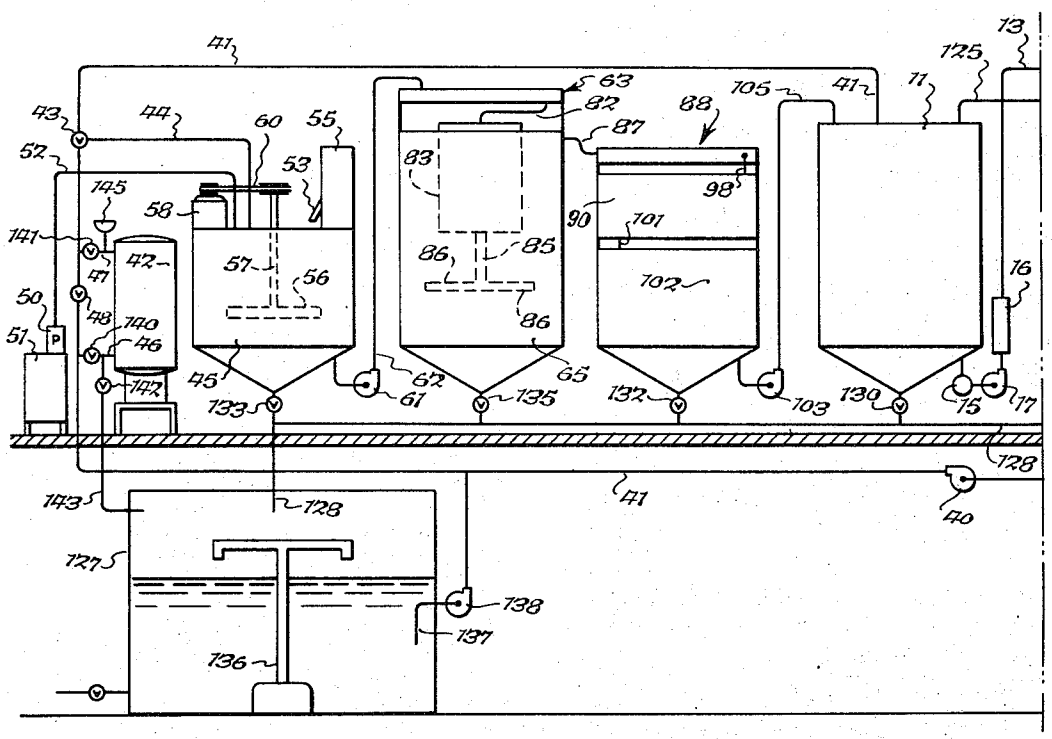
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Primary Examiner—Harvey C. Hornsby
Assistant Examiner—Philip R. Coe
Attorney, Agent, or Firm—Connolly and Hutz

[57] **ABSTRACT**

A dual water supply and reclaiming system adapted to serve a series of automatic laundering machines. The wash water and rinse water from the several machines are circulated through separate systems for independently treating and reclaiming the same for reuse by the several laundering machines. Both systems include filtering arrangements and the wash water system additionally includes means for chemically treating the used wash water to sterilize and neutralize the same. Makeup water for the wash water system is supplied from the rinse water system, which is replenished with fresh water from a public water supply system.

22 Claims, 4 Drawing Figures



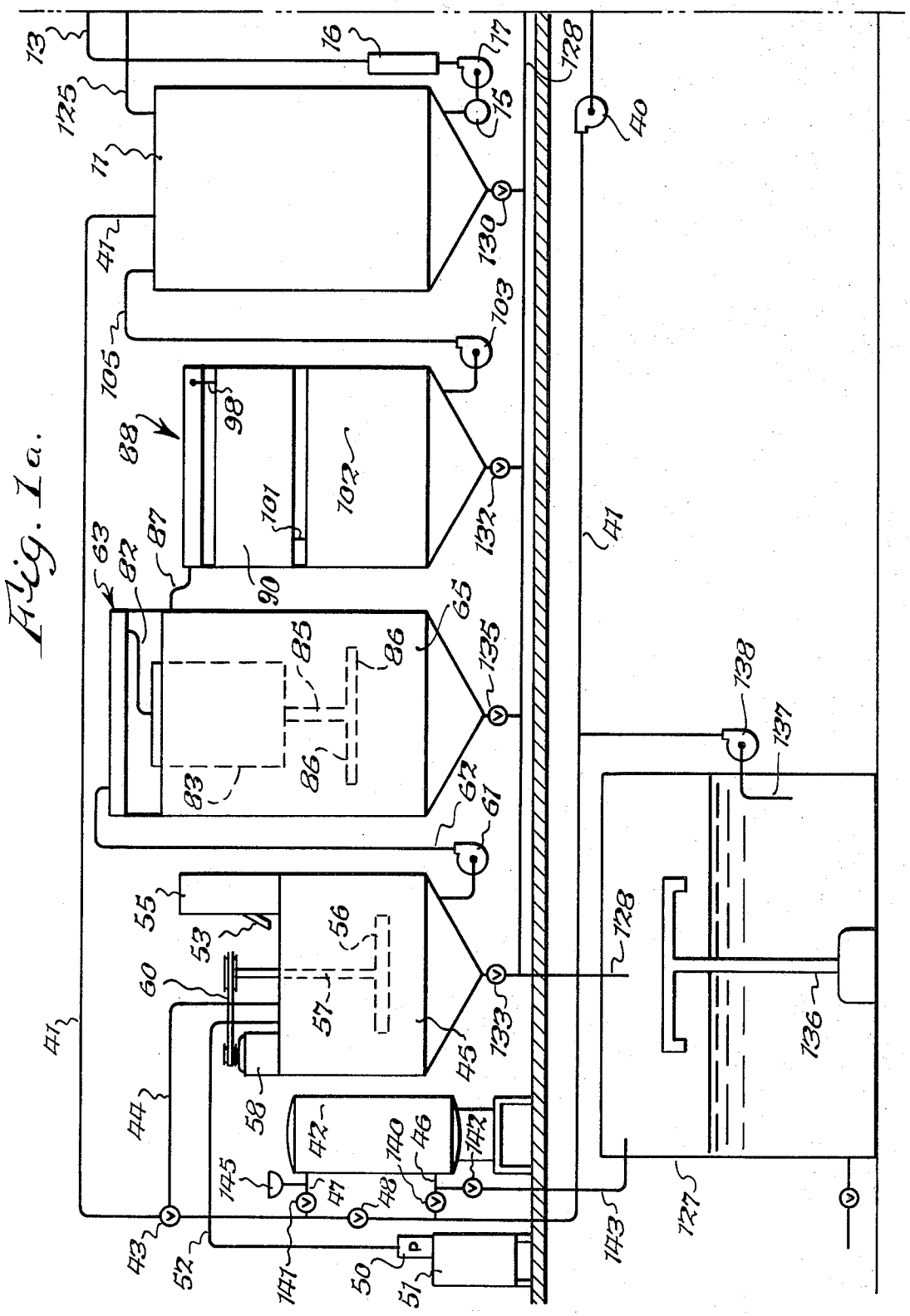

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Fig. 1a.

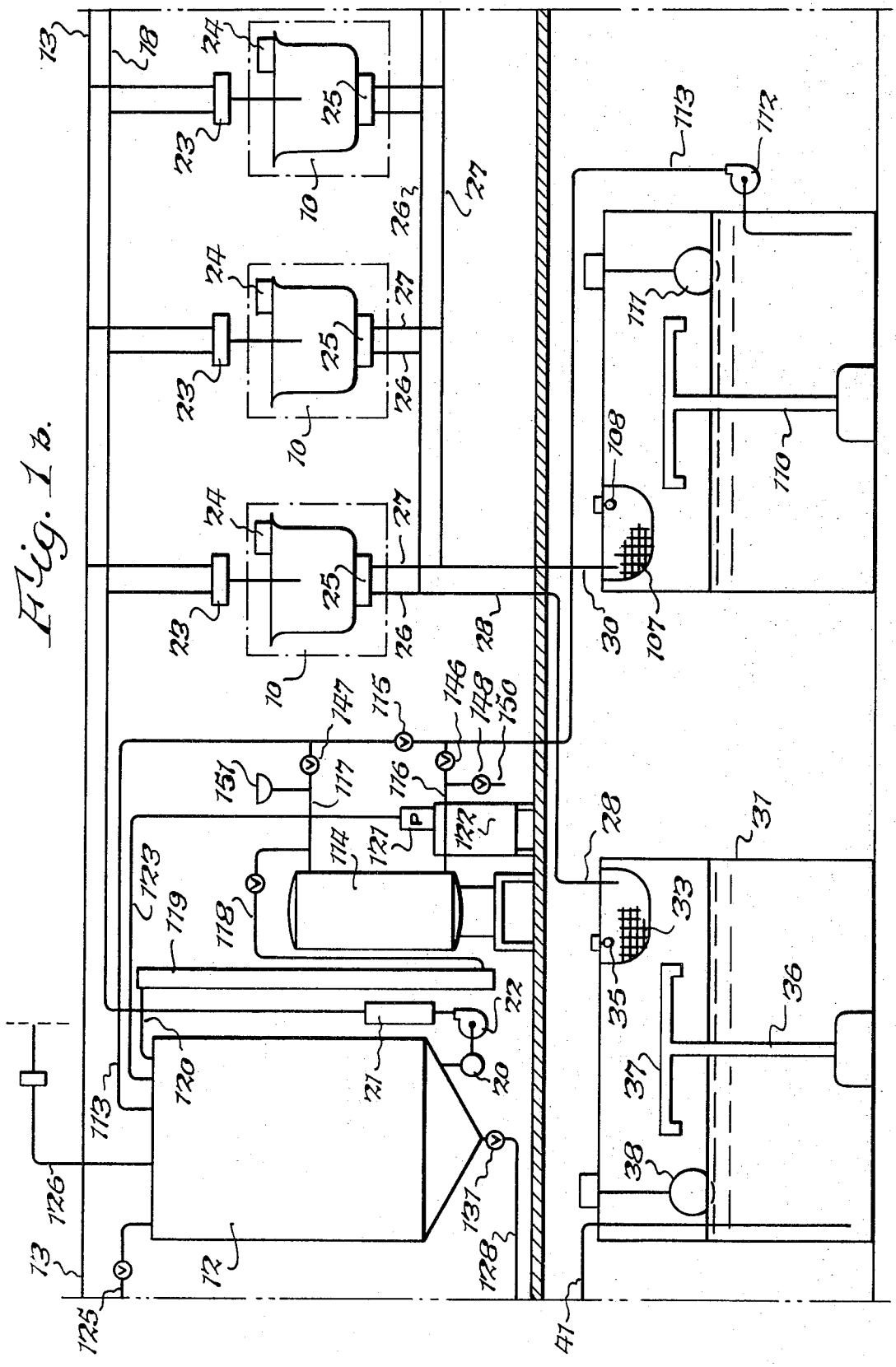


Fig. 1a.

Fig. 4.

X = ON O = OFF	TIME (MIN.)	WASH WATER FILL	AGITATE	PAUSE	SPIN EXTRACT	PAUSE	RINSE WATER FILL	AGITATE	PAUSE	SPIN EXTRACT
		2	12	.5	3	.5	2	5	.5	3.5
MAIN POWER CURRENT		X	X	X	O	X	X	X	X	X
MOTOR (AGITATE)		X	X	O	O	O	X	X	X	O
MOTOR (SPIN)		O	O	O	X	O	O	O	O	O
TIMER MOTOR		X	X	X	X	X	X	X	X	X
WASH WATER FILL SOL. VALVE		X	X	O	O	O	O	O	O	O
RINSE WATER FILL SOL. VALVE		O	O	O	O	O	X	X	O	O
WASH WATER DRAIN SOL. VALVE		O	O	O	X	O	O	O	O	O
RINSE WATER DRAIN SOL. VALVE		O	O	O	O	O	O	O	O	O

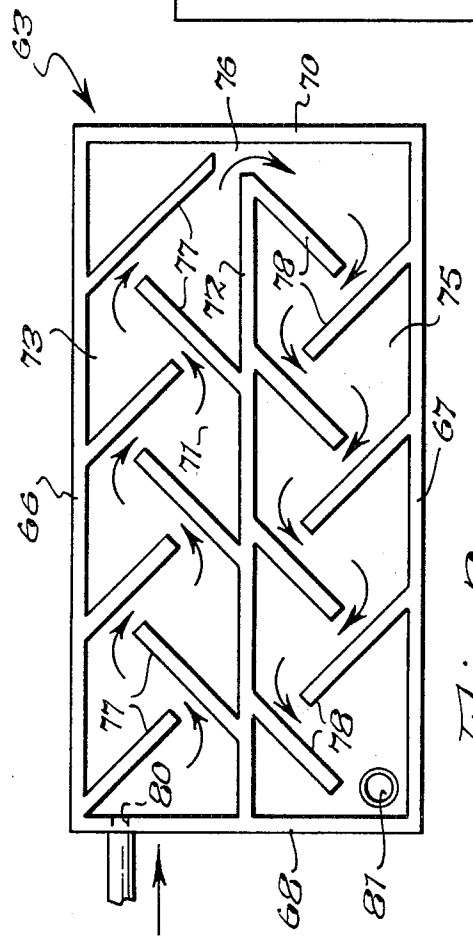


Fig. 2.

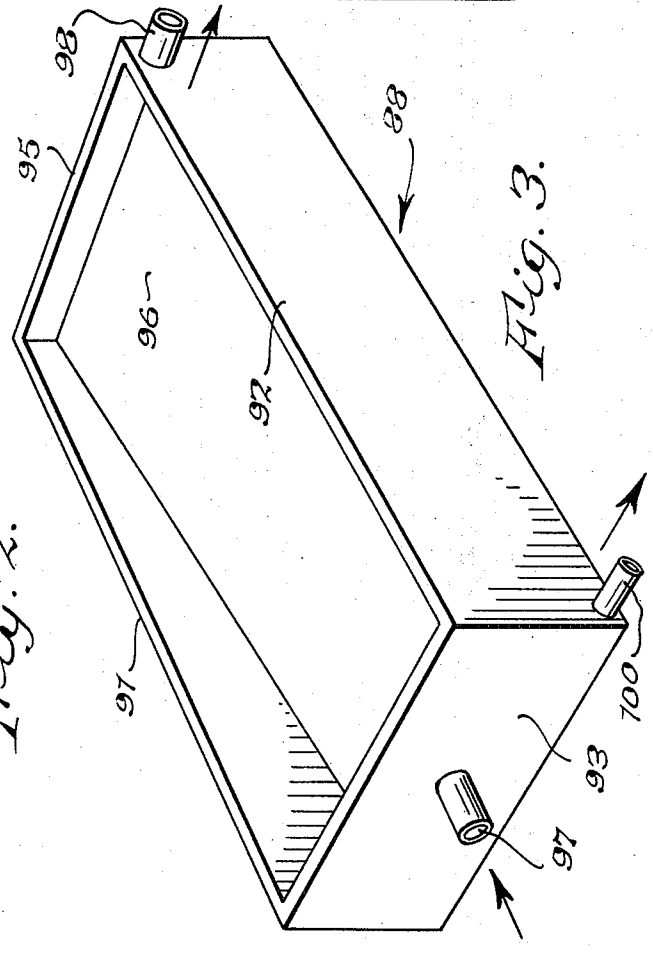


Fig. 3.

MULTIPLE AUTOMATIC WASHER SYSTEM

BACKGROUND OF THE INVENTION

This invention relates to automatic laundering machines such as are used in self-service laundry establishments and, more particularly, to a dual water supply and reclaiming system adapted to serve a battery of independently operable laundering machines of this general type.

In the operation of self-service laundries in which a number of automatic washing machines are made available for use and operation by patrons, usually by coin operation, problems have frequently been encountered in connection with water supply and disposal. For example, in some communities, local ordinances prohibit the dumping of large quantities of waste water, such as are normal and customary in this type of business. In others, no adequate municipal or public water drainage or disposal facilities may be available. Where suitable drainage facilities are available, the dumping of large quantities of laundry waste waters therein, which ultimately find their way to streams and other natural bodies of water, present pollution problems because of the presence of detergents and other laundry additives which often contains phosphates, enzymes and other harmful constituents. Also, the actual cost of water may be a substantial cost factor when the water utilized in the washing machines for the wash and rinse cycles is used only once and then passed on to sewage or other disposal.

SUMMARY OF THE INVENTION

The present invention, as hereinafter described, provides a solution to the above problems by providing separate wash water and rinse water systems particularly adapted to serve a number of independently operable automatic washing machines. The various wash and rinse waters from such machines are received in separate systems for independently treating and reclaiming the same and returning the reclaimed wash and rinse waters to the several washing machines for recycling as the individual operations of the machines require the same. In filtering and cleaning the wash and rinse waters and returning the same for reuse, the problem of sewage or drainage disposal, together with the problem of pollution, is eliminated.

In addition to disposing of the drainage and pollution problems, the present system offers substantial economies in the matter of heating the wash water and in the amounts of detergent employed in the washing operations. The temperature of the wash water after filtering and treating will ordinarily contain residual heat and be much higher than the normal public water supply temperature and thus require much less heat to bring the same to the desired wash water temperature.

Furthermore, the filtration and chemical treatment of the used wash water does not substantially reduce the detergent content of the wash water so that in the normal course of events in those commercial operations wherein the addition of detergents to the wash water is controlled by an attendant, it is only necessary to add detergent in proportion to the amounts of water left in the washed fabrics after the washing operation and the spin drying operation which follows the same prior to rinsing.

Generally, the only quantity of water lost in the present system is the wash water remaining in the damp-dry fabrics after washing. The water content of the clothes before and after the rinsing operation remains approximately constant. In the present system of this invention, water from the rinse system is employed to replenish lost wash water and then the rinse water system is replenished from the public water supply or other source. Thus, the heat and detergent which pass to the rinse water from the wash water during the rinse cycle tend to be returned to the wash cycle, at least, to the extent of water replenishment which the wash cycle requires. Also, the addition of fresh water to the rinse water tends to dilute the residual detergents therein and maintains the rinse water as clean as possible for efficient laundering purposes.

Generally speaking, the present invention provides two separate systems for automatically directing wash water and rinse water from the washing machines back to the respective wash water and rinse water supply systems. The wash water recycling system includes a filtering operation to remove particulates from the used wash water and a chemical treating operation to remove insolubles from such wash water and to disinfect the same. The rinse water recycling system includes a filtering operation to remove particulates and an activated charcoal filtering process to remove detergents and insolubles such as oils, dyes and the like. All of the make up water required by the system is received in the rinse water system.

DESCRIPTION OF THE DRAWINGS

FIGS. **1***a* and **1***b* constitute a composite schematic or diagrammatic view showing a plurality of washer units and a dual wash water and rinse water supply and reclaiming system therefor arranged in accordance with one form of the present invention;

FIG. **2** is a top plan view, on an enlarged scale, of a mixing apparatus incorporated in the system of this invention;

FIG. **3** is a perspective view, on an enlarged scale, of a separator used in the system of this invention; and

FIG. **4** is a chart showing the conditions of the several electrical contacts of the special automatic washer timer of each washer unit during the successive phases of a complete wash cycle of an individual machine.

DETAILED DESCRIPTION OF AN ILLUSTRATIVE EMBODIMENT

Referring now in detail to the drawings, there is shown in FIG. **1***b* a series of automatic washing machines **10** of the type generally employed in coin-operated laundry establishments and individually operated by patrons of the establishment. However, these washing machines **10** may be of the type used in commercial laundries operated by employees of the facility whereby the amount and type of detergents and other laundering additives used are controlled. In either event, while three such washing machines **10** are shown in the illustrative embodiment depicted in FIGS. **1***a* and **1***b*, it should be understood that a battery of any given number of washers may be employed, the operation of each individual washer being selective and entirely independent of the operation of other washers of the series, each being equipped with the special timer which governs the successive phases of a complete wash and rinse cycle of operation.

A pair of similar storage tanks **11** and **12** are provided for receiving and dispensing reclaimed wash water and rinse water, respectively. A common wash water supply conduit **13** connects tank **11** to the several washing machines **10** and a pump **15** contained therein delivers the wash water under pressure to machines **10.** The wash water from tank **11** passes through a very fine mesh filter **16,** on the order of 2–3 microns, for example, for filtering out any minute particles remaining in the wash water after the filtering and chemical treating operation, as will hereinafter be more fully described. A normally idle booster pump **17** also is incorporated in supply conduit **13** and is energized by a pressure switch (not shown) to assist pump **15** in delivering the large quantity of wash water required when a large number of washing machines **10** are simultaneously in use.

In a similar arrangement, a common rinse water supply conduit **18** connects tank **12** to the several washing machines **10** and a pump **20** contained therein constantly delivers the rinse water under pressure toward machines **10.** This rinse water is conveyed through a fine mesh filter **21** to remove any particulates remaining in the rinse water after the filtering operation, hereinafter more fully described. A normally idle booster pump **22** also is incorporated in conduit **18** to deliver an adequate volume of rinse water to the washing machines **10** during peak loading thereof as when a large number of such machines **10** are being operated simultaneously.

The dual water supply and reclamation system of the present invention is adaptable to various building arrangements. For example, the wash water and rinse water tanks **11** and **12** may be located in rooms separate from the washing machines **10** and may be located above the latter so that the water supply thereto may be conveyed entirely by gravity, if desired. However, the system of the present invention is adapted for use under conditions where it is desirable or necessary for tanks **11** and **12** to be at substantially the same level as the series of washing machines **10** with the various sump tanks, hereinafter described, disposed in a suitable basement area below the level of the tanks **11** and **12** and the washing machines **10.**

Each washing machine **10** includes an electrical solenoid operated two-way valve **23** which is controlled by the individual timer **24** of the washing machine **10** to admit wash water or rinse water or shut off the supply of either to the washer unit. Each washer **10** has a common drain provided with an electrical solenoid operated two-way valve **25** which is activated by the individual timer **24** associated therewith to close the drain or open the latter for draining the wash water or rinse water through conduits **26** or **27,** respectively, leading to a common wash water drain conduit **28** and a common rinse water drain conduit **30,** respectively. The timer **24** incorporated in each machine **10** is operative to coordinate the actuation of valves **23** and **25** in a timed relationship with the washing and rinsing operations so that the drain is closed when either wash or rinse water is supplied through valve **23** and opened to discharge either the wash water or rinse water after the washing and rinsing operations are completed.

The contaminated wash water and rinse water are drained from each washing machine **10** by gravity via conduits **28** and **30,** respectively, to a wash water sump tank **31** and a rinse water sump tank **32,** both located below the level of the tanks **11** and **12** and the several washers **10.** The used wash water is discharged from the outlet of drain conduit **28** and through a lint removing filter **33** into sump tank **31.** A probe **35** is suspended in sump tank **31** above filter **33** to generate a signal when the lint accumulates to a certain level, indicating to the attendant that the filter must be cleaned. A pump **36,** provided with outlet return manifold **37,** is mounted in sump tank **31** for continuously stirring the accumulated wash water therein to aerate such accumulated wash water for destroying at least some of the bacteria therein and minimizing the odors resulting therefrom.

A float control switch **38** is suspended in wash water sump tank **31** and when the wash water reaches a predetermined level, switch **38** actuates the operation of a pump **40** to convey the wash water from sump tank **31** through a supply conduit **41,** a filter **42,** a manually operated control valve **43,** and a branch conduit **44** into a chemical mixing tank **45.** As shown in FIG. **1***a*, inlet and outlet pipes **46** and **47** are tapped into conduit **41** for directing the wash water under pressure through filter **42,** which preferably comprises three different grades of sand grit and filter media. However, an on-off control valve **48** is provided in conduit **41** between filter inlet **46** and outlet **47** to bypass filter **42,** if desired or necessary. Also, the manual valve **43** provided in conduit **41** at the juncture of branch conduit **44** can be actuated to completely bypass the chemical treatment operation, hereinafter described, and deliver the wash water directly to storage tank **11** under peak load conditions when all or substantially all the washing machines **10** are in operation. Also, control valve **43** may be utilized to divert only a portion of the wash water into branch conduit **44** for chemical treatment, dependent on the extent of wash water contamination and the degree of cleanliness desired for subsequent reuse.

The float control switch **38** also is effective to initiate the operation of a pump **50** for feeding a chlorine solution at a controlled rate from a supply reservoir **51** to the mixing tank **45** via conduit **52.** Simultaneously, switch **38** effects operation of a feeder **53** for delivering the proper amounts of a suitable flocculant or chemical, such as lime, for example, from a storage bin **55** into the mixing tank **45.** The lime and the chlorine or chemical solution is continually blended with the wash water by a mixer **56** mounted on the lower end of a vertically extending, rotatable shaft **57** driven by a motor **58** through a suitable pulley and belt drive assembly **60.** The lime serves as a flocculant or precipitant in collecting the unwanted insolubles in the form of aggregates or precipitants to form a liquid suspension. While not limited thereto, the specific chlorine solution employed in the illustrative embodiment is tri chloro cyanurate.

The float control switch **38** also activates a pump **61** contained in the mixing tank outlet conduit **62** for delivering the admixture or liquid suspension from tank **45** into a mixer **63** for slowly and completely mixing the lime and chlorine solution with the wash water prior to the introduction thereof into a settling tank **65.**

As shown in FIG. **2,** a simplified type of mixer **63** comprises a generally rectangularly shaped, box like container having a pair of side walls **66** and **67,** a pair of end walls **68** and **70,** and a bottom wall **71.** An intermediate partition wall **72** extends parallel to the side walls **66** and **67** and divides the housing into two cham-

bers 73 and 75, which are in communication with each other through a passage 76. A series of axially spaced baffle plates 77 in chamber 73 extend inwardly from walls 66 and 72 and are oriented at angles extending rearwardly or away from end wall 68. Likewise, a series of axially spaced baffle plates 78 in chamber 75 extend inwardly from walls 72 and 67 and are oriented at angles extending forwardly toward end wall 68. An inlet 80, in communication with conduit 62, is provided in end wall 68 for admitting the wash water admixture into chamber 73 and an outlet 81 is provided in the bottom wall 71 of chamber 75 for discharging the wash water through a conduit 82 into settling tank 65. The ends of baffle plates 77, 78 are spaced from their respective adjacent baffle plates to form passages therebetween causing the wash water admixture to flow in a slow, tortuous path in the direction of the arrow through chamber 73, passage 76 and compartment 75, assuring a thorough and complete blending of the chlorine solution and lime or chemicals with the wash water.

Conduit 82 empties into an inner receptacle 83 mounted in settling tank 65 for separating out the larger masses of aggregates suspended in the wash water. The chlorinated and lime-treated wash water flows downwardly through a manifold 85 and then outwardly through outlets 86 into the settling tank 65. The heavier aggregates remaining in the wash water tend to flow to the bottom of tank 65 and settle there as sludge. The treated wash water, together with a certain amount of fine, suspended particles therein, rises upwardly in tank 65 and flows outwardly therefrom through conduit 87 and into a separator tank 88 mounted on top of a tank 90 housing a mediae filter bed.

As shown in FIG. 3, separator 88 comprises a generally rectangularly shaped container having opposed sidewalls 91 and 92, opposed end walls 93 and 95, and a bottom wall 96 inclined upwardly from the inlet 97 toward the outlet 98. Inlet 97 is in communication with conduit 87 for receiving the wash water discharged from settling tank 65. As the wash water flows from the deep end of separator 88 adjacent inlet 97 to the shallow end thereof adjacent outlet 98, the generally moderate sized particulates remaining in the wash water will settle out and be collected along the inclined bottom wall 96 while the relatively clean wash water will flow outwardly through the outlet 98 adjacent the top of separator 88. A sludge outlet 100 is provided in sidewall 92 adjacent the deep end of separator 88 to periodically drain off the sludge accumulated therein.

The wash water discharged through outlet 98 then passes downwardly through the filter bed in tank 90 to remove any fine particles remaining in the treated wash water and is then admitted as clean and sterilized wash water into an intermediate collecting tank 102 via conduit 101. When the reconditioned wash water in tank 102 reaches a predetermined level, a pump 103 in outlet conduit 105 becomes energized to deliver such reclaimed wash water to storage tank 11. Thus, the dirty wash water drained from washing machines 10 into sump tank 31 is routed through a water filtering and cleaning operation, as described above, and returned to storage tank 11 as reconditioned or reclaimed clean water for recycling through washing machines 10. Generally speaking, it is necessary to chemically treat only a portion of the wash water returned to tank 11 for efficient laundering purposes, the proportion of wash water so treated depending on the degree of contamination thereof and the desired cleanliness required for effective cleansing action. When peak loads are encountered during the simultaneous operation of a large number of washing machines 10, the wash water can bypass the chemical treatment system temporarily by means of control valve 43 and be subsequently completely treated during slow periods of washer usage.

The rinse water, which is less contaminated than the wash water, is routed through a simpler reconditioning or treating system. Similar to the wash water system, the used rinse water drained by gravity through conduit 30 passes through a lint removing filter 107 into sump tank 32. A probe 108 is suspended in sump tank 32 above filter 107 to generate a signal when the lint accumulates to a predetermined level, indicating that the filter must be cleaned. A pump 110 is mounted in sump tank 32 for continually stirring the accumulated rinse water in a manner aerating the accumulated rinse water therein.

A float control valve 111 is suspended in rinse water sump tank 32 and is operative, when the rinse water reaches a predetermined level in tank 32, to initiate the operation of a suction pump 112 to convey the rinse water under pressure from sump tank 32 through a conduit 113 and a triple mediae filter 114, and then into storage tank 12. The filter 114 preferably includes a layer of sand grit, a layer of electromedia, and a layer of carbon. As shown in FIG. 1, a normally closed, manually operated control valve 115 is provided in conduit 113 between the filter inlet 116 and outlet 117 and may be opened to bypass filter 114, if desired, or if filter 114 should become clogged or inoperative.

A portion of the filtered rinse water is bled from filter outlet 117 through a branch conduit 118 into the lower end of a detergent absorbing cannister 119, the proportion of rinse water directed through cannister 119 being determined by the amount of detergent contained therein and the amount tolerable in the rinse water supply for effective rinsing. The cannister 119 is filled with activated charcoal granules for completely removing any detergents, cleaning additives, oils, dyes and the like contained in the rinse water flowing upwardly therethrough. The purified rinse water is discharged from the upper end of cannister 119 through an outlet 120 into the rinse water storage tank 12.

The float control valve 111 also is effective to initiate the operation of a pump 121 for feeding a chlorine solution, such as a tri cloro cyanurate solution, for example, at a controlled rate from a supply tank 122 to rinse water storage tank 12 via conduit 123. The amount of the chlorine solution added should be sufficient to maintain the appropriate pH value, which preferably ranges from about 6.5 to 7.5, and to maintain a residual chlorine content of from about 0.8 to 1.0 p.p.m. for disinfecting purposes.

In the separate water reclamation systems described above, it will be observed that none of the water is discharged into any exterior sewage drainage and that the only water lost is that which remains in the clothes after the wash water extraction. The make-up water for the wash water system is supplied to wash water tank 11 from the rinse water tank 12 by suitable piping means 125. The amount by which the rinse water is thus depleted is made up from the public water supply system or the like through pipe 126. Thus, fresh water is introduced to the rinse water storage tank 12 and is effective

to dilute any detergents remaining in the rinse water therein.

A sludge sump tank **127**, located in a suitable basement area, is provided for receiving sludge from the various tanks and for receiving the water used in back washing filters **42** and **114**. As shown in FIG. **1**, the lower ends of mixing tank **45**, settling tank **65**, intermediate tank **102**, wash water tank **11** and rinse water tank **12** are connected to a common drain conduit **128** for draining off any sludge collected along the bottoms thereof, the conduit **128** leading to sludge tank **127**. Tanks **11**, **12** and **102** are only occasionally drained by opening normally closed manually operated valves **130**, **131** and **132**, respectively, until the water flows clear. On the other hand, chemical mixing tank **45** and settling tank **65** should be drained daily by opening normally closed manually operated valves **133** and **135** until clean water flows outwardly therefrom.

A chemical solution, such as calcium hyperchlorite, may be periodically introduced into sludge tank **127** for facilitating the settling of solids therein and to preclude the growth of bacteria in the solids. At the end of each business day, the sludge in tank **127** can be thoroughly stirred by agitator pump **136** for approximately 5 minutes and allowed to settle overnight. The clean water can be decanted the following morning through conduit **137** by pump **138** and delivered to wash water supply conduit **41** for reuse. The collected sludge in tank **127** can be periodically removed and constitutes the only wastes that must be disposed of exteriorly of the system of the present invention.

Means also are provided for back washing filters **42** and **114** and such back washing is accomplished, referring to the wash water system by way of example, by closing normally open valves **140** and **141** in conduits **46** and **47** and opening normally closed valve **142** in bypass conduit **143**. A hose or the like delivering either fresh water from an external source or wash water from storage tank **11** under pressure is applied to a back wash adaptor **145** and conveyed through filter **42** in a reverse direction and discharged through bypass conduit **143** into sludge tank **127**. Likewise, filter **114** may be backwashed by closing normally open valves **146** and **147** in conduits **116** and **117** and opening normally closed valve **148** in bypass conduit **150** leading to the sludge tank **127**. A hose or the like delivering fresh water from an external source or rinse water from storage tank **12** under pressure is applied to a back wash adaptor **151** and conveyed through filter **114** in a reverse direction and discharged through bypass conduit **150** into the sludge tank **127**.

The washing machines **10** of the illustrative embodiment may be any of the various types customarily employed in coin-operated laundry establishments. As is well known in the art, each such washing machine is provided with a coin control mechanism for initiating a cycle of operation and each machine **10** includes a timer or clock type mechanism **24** with multiple cams for establishing and controlling the execution of the several steps in a cycle of operation by opening and closing appropriate electrical contacts operatively connected to the solenoid operated valves **23** and **25**. Various adjustments may be made by servicemen to regulate the durations of the several steps of a cycle of operation and the inclusion or exlusion of various steps or periods of operation.

FIG. **4** is a timing chart which illustrates one specific time sequence of operations for one washing machine, the specific sequence of operations being illustrated by way of example only, it being understood that various departures therefrom may be made without departing from the principles of this invention. A diagram similar to FIG. **4** is all that is required for the setting up of a commercial coin controlled automatic washer by an ordinarily competent serviceman.

The conventional automatic washer timing mechanism, identified at **24** in FIG. **1***b*, incudes a timer motor and cams which are moved thereby to close and open switches at proper intervals for performing the various functions of the machine. In FIG. **4**, the letter X indicates that a particular pair of timer contacts is closed during the indicated period and the letter O indicates that such contacts are open during the period so marked. It is believed that no further amplification or detailed explanation of FIG. **4** is necessary for the purposes of the present application. It will be understood that the wash water and rinse water fill and drain solenoid valves referred to in FIG. **4** comprise the normally closed valves **23** and **25** of FIG. **1** which are openable to either of the supply conduits **13** or **18** or to either of the outlet conduits **26** or **27** by energization of the respective solenoid windings conventionally incorporated in each valve.

The present invention thus provides a dual water supply and reclaiming system comprised of separate wash water and rinse water systems adapted to serve a plurality of independently operable laundering machines. Thus, two systems are provided for separately receiving the various wash and rinse waters, respectively, from the washing machines, treating and reclaiming the same, and then returning the respective waters to the several machines as the individual operations of the machines require the same. While the means for initiating operation of the two systems are dependent upon the level of waste wash and rinse waters in sump tanks **31** and **32**, it should be understood that such means may be associated with and responsive to float control valves or the like mounted in storage tanks **11** and **12** for sensing the levels of the wash water and rinse water therein as the same is depleted on demand from the several washing machines. Also, the intermediate tank **102** can be eliminated, if desired, with separator **88** and filter tank **90** mounted directly above wash water storage tank **11**. Also, it should be understood that automatic washing machines of various types may be present slightly variant washing and rinsing cycles and procedures and may also present various types of automatic valving arrangements for controlling the several water supply requirements. The general system present herein will be adaptable to such varying wash cycles and procedures by those skilled in the automatic washing machine art.

A preferred form of this invention having been herein described and illustrated in the drawings, it is to be understood that modifications thereof may be made without departing from the broad spirit and scope of the invention.

We claim:

1. In combination, a plurality of automatic washing machines, each of said machines having independent time control means for executing wash and rinse cycles each including introduction of water to the machine and discharge of water therefrom; a wash water storage

tank and a rinse water storage tank each serving the several machines in common; a wash water sump and a rinse water sump; an outlet in each machine having drain conduits leading to said sumps, respectively; means in said outlet connected for operation by said time control means for directing wash water and rinse water through said conduits to the respective sumps; conduit means including pump means for delivering water from said sumps to said storage tanks, respectively; rinse water treating means in said conduit means including means for filtering and removing detergent from said rinse water prior to returning said rinse water to said rinse water storage tank; and wash water treating means in communication with said wash water conduit means including means for chemically treating, precipitating solids and sludge and removing the precipitated solids and sludge from and filtering said wash water prior to returning the same to said wash water storage tank whereby said rinse and wash water are maintained separate from each other and suitable for total recirculation for separate use in wash and rinse cycles.

2. The combination of claim **1** wherein said wash water treating means includes a series of tanks through which at least a portion of said wash water is successively circulated enroute to said wash water storage tank; and conduit means between each adjacent pair of said series of tanks.

3. The combination of claim **2** wherein said series of tanks includes a first tank; means for admitting a disinfecting chemical solution into said first tank for admixture with and treatment of said wash water portion; and means in said first tank for mixing said chemical solution with said wash water portion.

4. The combination of claim **3** including means for admitting a precipitant into said first tank for admixture with said wash water portion to form a liquid suspension.

5. The combination of claim **4** including a second tank for receiving said chemically treated liquid suspension and means in said second tank for settling out the heavier masses of solids from said liquid suspension.

6. The combination of claim **5** including a third tank and means therein for separating moderate-sized masses of solids from said liquid suspension.

7. The combination of claim **6** including a fourth tank having a filter bed therein for removing the remaining particles from the liquid suspension.

8. The combination of claim **5** including a mixing apparatus included between said first and second tanks for completely intermixing said chemical solution and said precipitant with said wash water portion prior to the entry thereof into said second tank.

9. The combination of claim **2** including a sludge tank; conduit means including valve means connecting the bottom ends of said series of tanks to said sludge tank for periodically discharging any sludge accumulated in said series of tanks to said sludge tank.

10. The combination of claim **9,** wherein an agitator pump is installed in said sludge tank whereby the sludge can be periodically stirred and allowed to settle into a layer of substantially clean water above settled sludge whereby said layer of substantially clean water can be decanted from above said settled sludge.

11. The combination of claim **1,** wherein said rinse water treating means includes means in selective communication with said rinse water conduit means for conveying at least a portion of said rinse water to said detergent removing means.

12. The combination of claim **11** wherein said detergent removing means comprises a cannister filled with activated charcoal granules and said portion of rinse water flowing upwardly therethrough.

13. The combination of claim **1** including means for admitting a disinfecting chemical solution into said rinse water storage tank.

14. The combination of claim **1** including means for delivering makeup water from said rinse water storage tank to said wash water storage tank; and means for adding fresh water to said rinse water storage tank.

15. In combination, a plurality of automatic washing machines, each of said machines having independent time control means for executing successive wash and rinse cycles each including introduction of water to the machine and exhaust of water therefrom; a wash water storage tank and a rinse water storage tank each serving the several machines in common; a wash water sump and a rinse water sump; an outlet in each machine having drain conduits leading to said sumps, respectively; means in said outlet connected for operation by said time control means for directing wash water and rinse water through said conduits to the respective sumps; conduit means including pump means for delivering water from said sumps to said storage tanks, respectively; means in said conduit means, respectively, for filtering said wash water and said rinse water prior to returning the same to said respective storage tanks, means in selective communication with said wash water conduit means for chemically treating said wash water prior to returning the same to said wash water storage tank; said chemical treating means including a series of tanks through which at least a portion of said wash water is successively circulated enroute to said wash water storage tank; conduit means between each adjacent pair of said series to tanks; said series of tanks including a first tank; means for admitting a disinfecting chemical solution into said first tank for admixture with an treatment of said wash water portion; means in said first tank for mixing said chemical solution with said wash water portion; means for admitting a precipitant into said first tank for admixture with said wash water portion to form a liquid suspension; a second tank for receiving said chemically treated liquid suspension; means in said second tank for settling out the heavier masses of solids from said liquid suspension; a mixing apparatus interposed between said first and second tanks for completely intermixing said chemical solution and said precipitant with said wash water portion prior to the entry thereof into said second tank; said mixing apparatus comprising a container having a partition therein defining a pair of chambers; passage means between said chambers; an inlet in one of said chambers and an outlet in the other of said chambers and a series of baffle plates mounted in each member for directing said liquid suspension in a tortuous path through said chambers for slowly and completely intermixing said chemical solution and said precipitant therewith.

16. In combination, a plurality of automatic washing machines, each of said machines having independent time control means for executing successive wash and rinse cycles each including introduction of water to the machine and exhaust of water thereform; a wash water

storage tank and a rinse water storage tank each serving the several machines in common; a wash water sump and a rinse water sump; an outlet in each machine having drain conduits leading to said sumps, respectively; means in said outlet connected for operation by said time control means for directing wash water and rinse water through said conduits to the respective sumps; conduit means including pump means for delivering water from said sumps to said storage tanks, respectively; means in said conduit means, respectively, for filtering said wash water and said rinse water prior to returning the same to said respective storage tanks; means in selective communication with said wash water conduit means for chemically treating said wash water prior to returning the same to said wash water storage tank; said chemical treating means including a series of tanks through which at least a portion of said wash water is successively circulated enroute to said wash water storage tank; conduit means between each adjacent pair of said series of tanks; said series of tanks including a first tank; means for admitting a disinfecting chemical solution into said first tank for admixture with and treatment of said wash water portion; means in said first tank for mixing said chemical solution with said wash water portion; means for admitting a precipitant into said first tank for admixture with said wash water portion to form a liquid suspension; a second tank for receiving said chemically treated liquid suspension; means in said second tank for settling out the heavier masses of solids from said liquid suspension; a third tank and means therein for separating moderate-sized masses of solids from said liquid suspension; said separating means comprising a receptacle having an inlet at one end and an outlet at the other end thereof; and an inclined bottom wall rising upwardly from said inlet end to said outlet end for collecting solids thereon from said liquid suspension.

17. The combination of claim **1**, wherein a recirculating pump is installed in said wash water storage sump, which continuously agitates and aerates the wash water to help destroy bacteria and minimize odors.

18. The combination of claim **1**, wherein a recirculating pump is installed in said rinse water storage tank which continuously agitates and aerates the rinse water to help destroy bacteria and minimize odors.

19. The combination of claim **1** wherein bypass means is connected around said wash water treating means whereby the used wash water may be directed around said treating means during peak periods and treated during periods of lesser usage of said automatic washing machine.

20. The combination of claim **1** wherein said wash water treating means includes sludge collecting, settling and decanting means for reclaiming reusable wash water from said sludge and directing it to said wash water storage tank whereby said wash water is conserved.

21. The combination of claim **1** whereby said rinse water treating means includes chlorinating means for adding chlorine and maintaining the pH of said rinse water at about from 6.5 to 7.5 and for leaving a residual chlorine content for disinfecting and sterilizing the rinse water.

22. The combination of claim **21** wherein said chlorinating means is constructed and arranged to leave a residual chlorine content from about 0.8 to 1.0 p.p.m.

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