

United States Patent

Sharpe

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[54] **APPARATUS FOR SANITIZING A DOMESTIC CLOTHES WASHER**
 [72] Inventor: Verlos G. Sharpe, Northfield, Ohio
 [73] Assignee: General Motors Corporation, Detroit, Mich.
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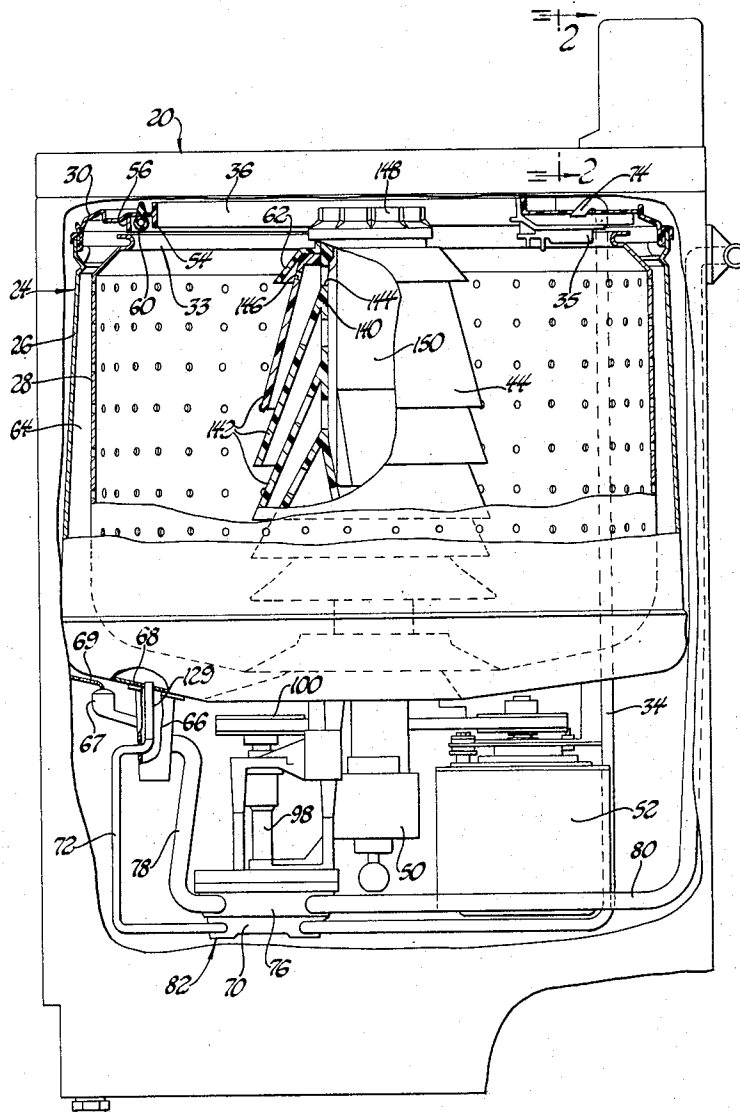
Primary Examiner—William I. Price
 Attorney—Williams S. Pettigrew et al.

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 [51] Int. Cl.D06f 39/02, D06f 39/08
 [58] Field of Search68/12 R, 12 F, 17 R, 17 A, 68/207, 23.5, 23.6, 208

[57] **ABSTRACT**
 A method and apparatus for sanitizing domestic clothes washer wherein a predetermined concentration of liquid sanitizing solution is first distributed throughout the washer and the washer's water recirculation system, then removed from the washer but retained in the water recirculation system.

[56] **References Cited**
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3 Claims, 5 Drawing Figures



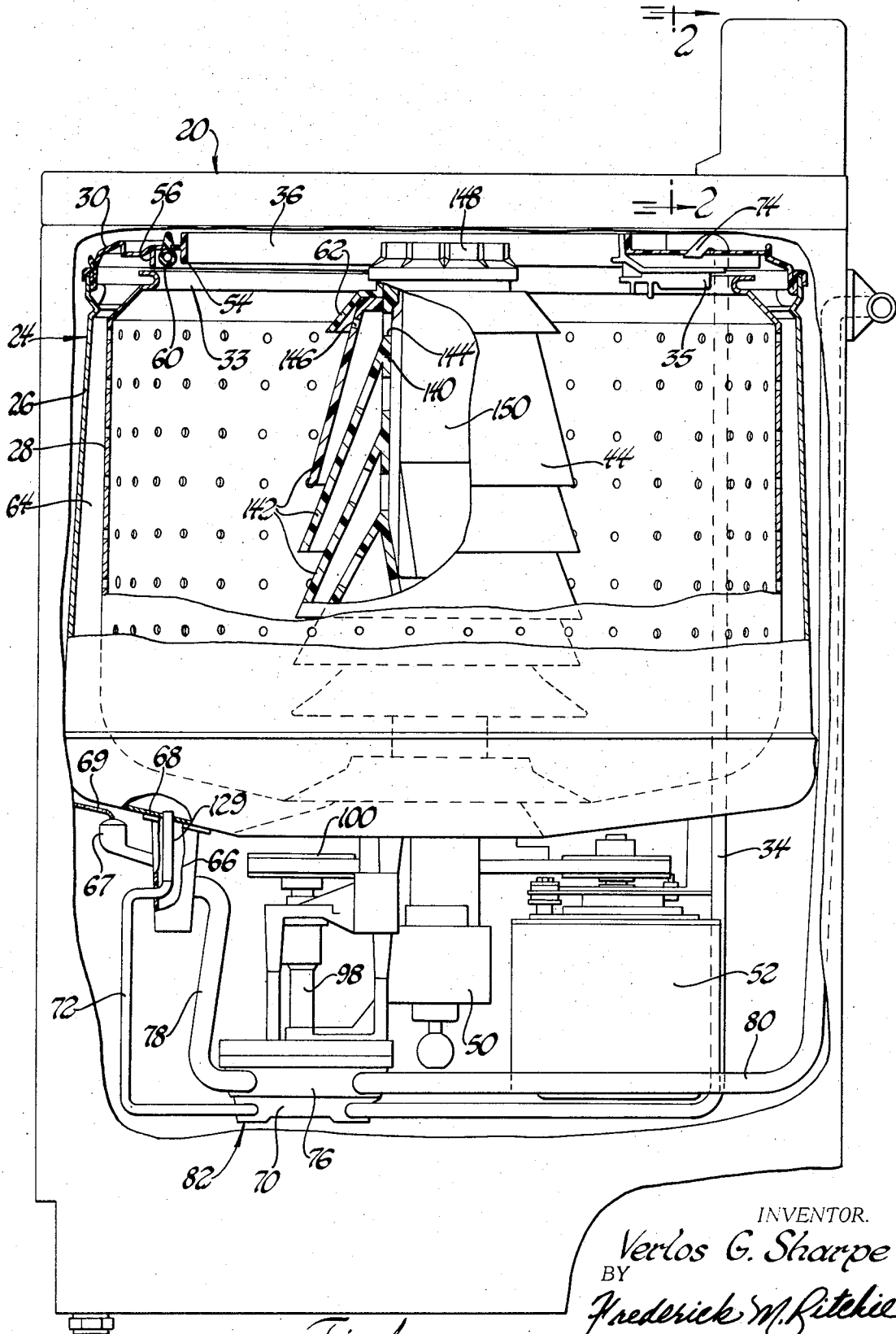


Fig. 1

INVENTOR.
Verlos G. Sharpe
BY
Frederick M. Ritchie
ATTORNEY

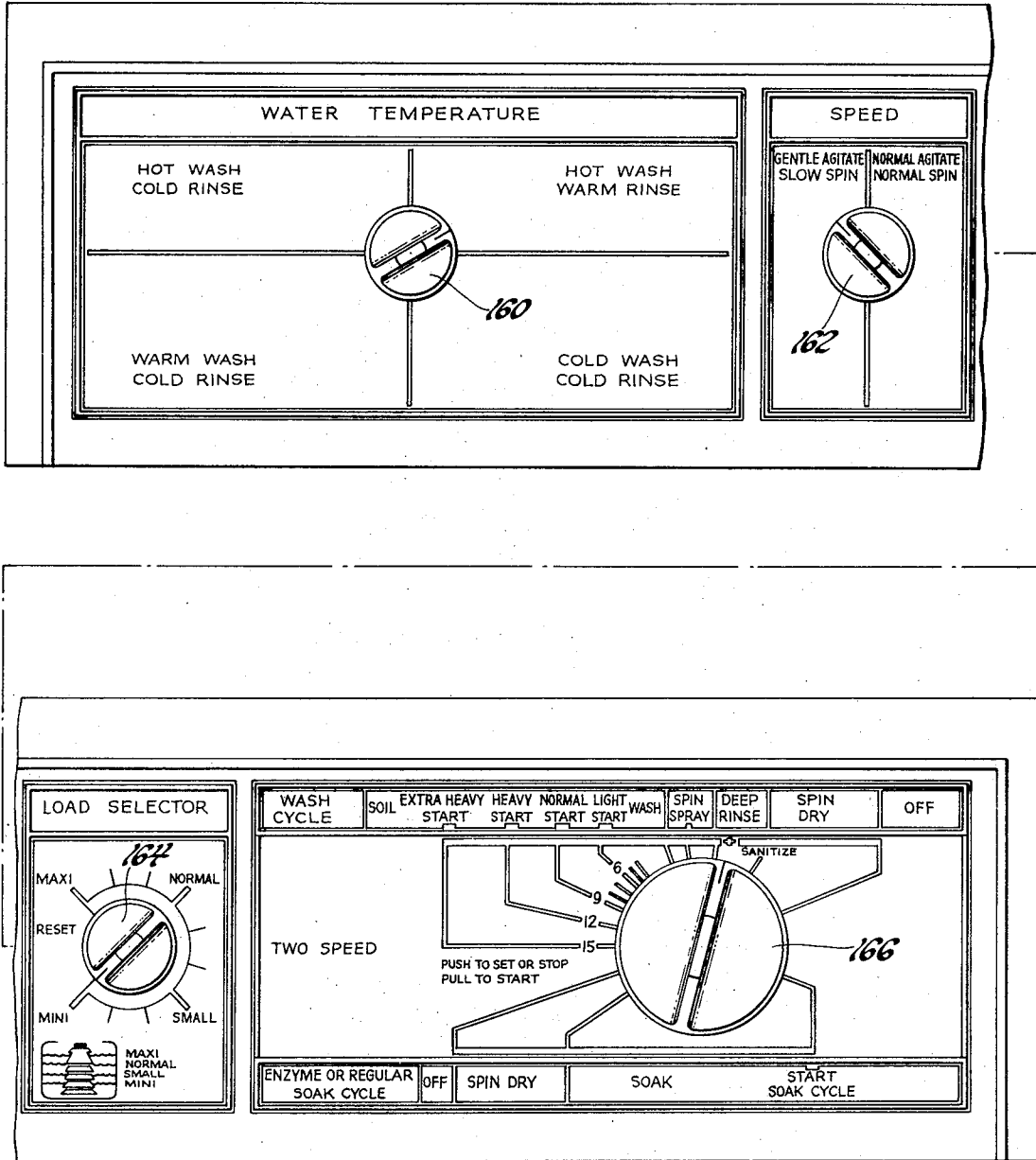
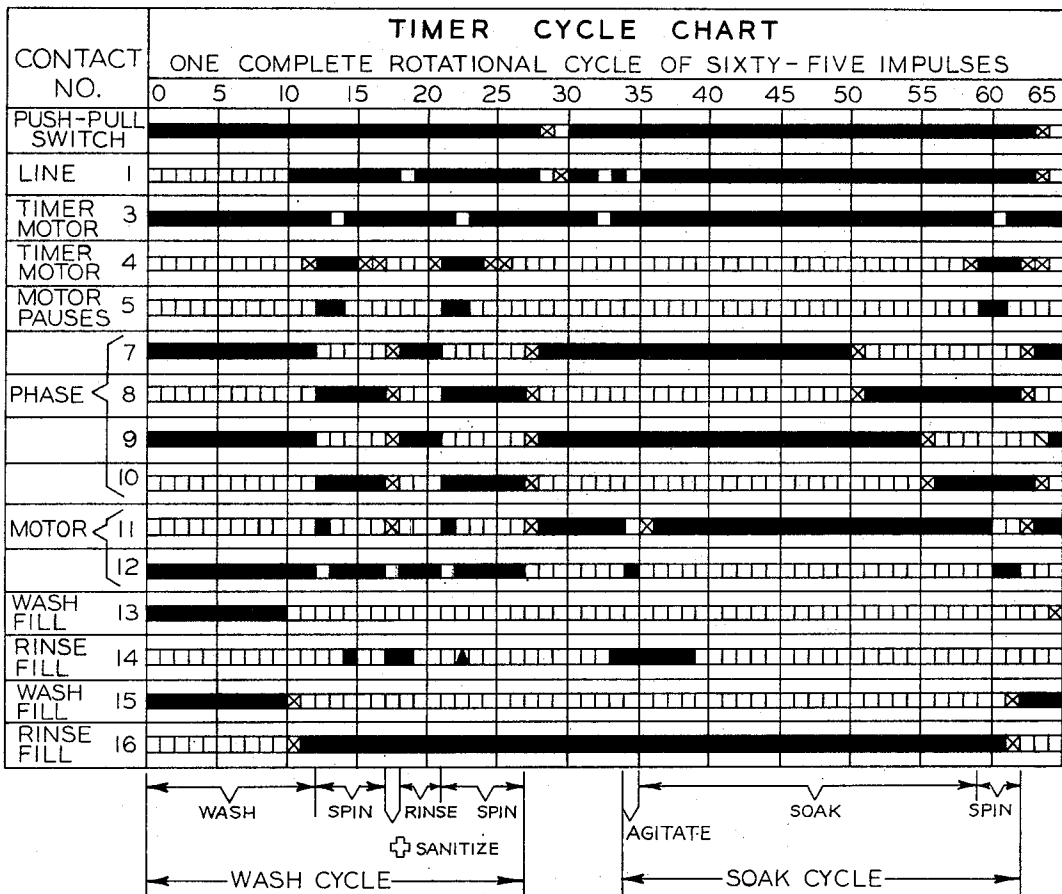


Fig. 2

INVENTOR.
Verlos G. Sharpe
 BY
Frederick M. Ritchie
 ATTORNEY



FILLED IN AREAS INDICATE CONTACTS CLOSED
 ⊗ = CONTACTS MAY BE OPEN OR CLOSED
 ⊕ = CONTACT CLOSED FROM 6 TO 20 SECONDS
 ONE IMPULSE = 72 SECONDS

Fig. 3

INVENTOR.
Verlos G. Sharpe
 BY
Frederick M. Ritchie
 ATTORNEY

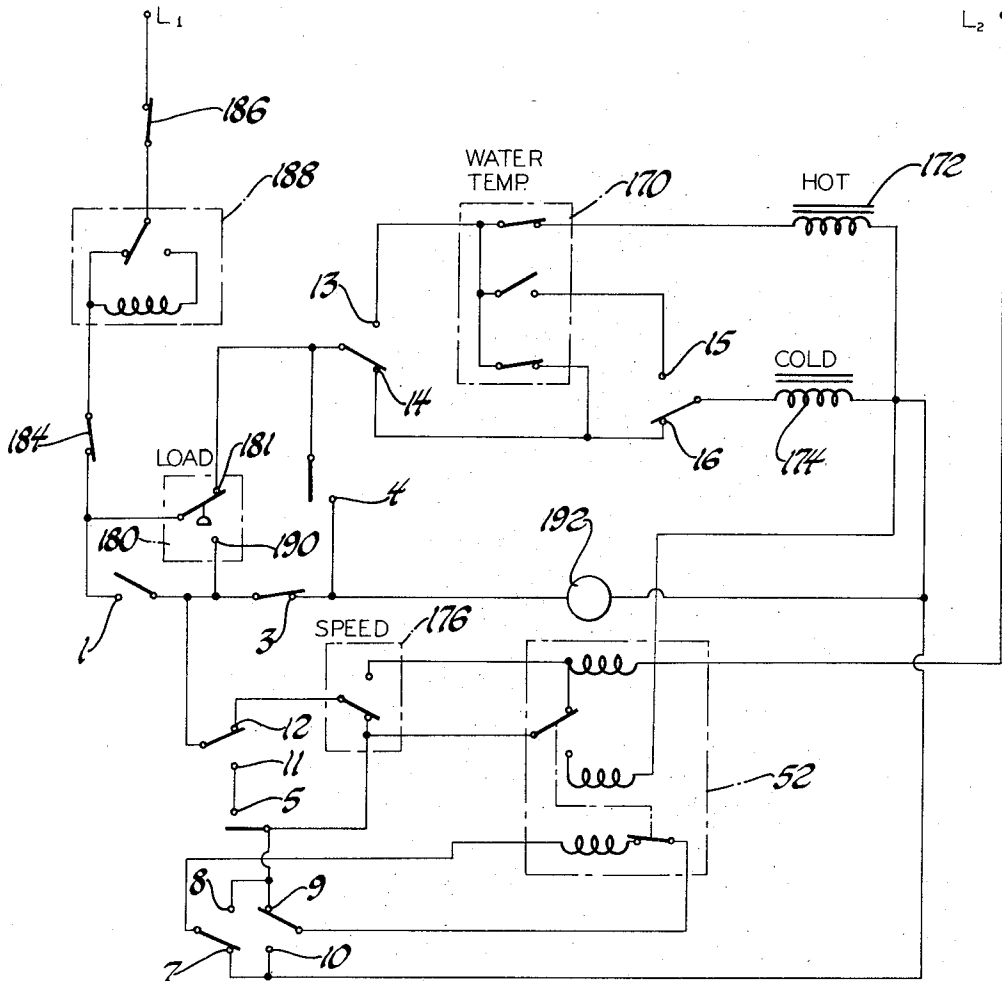


Fig. 4

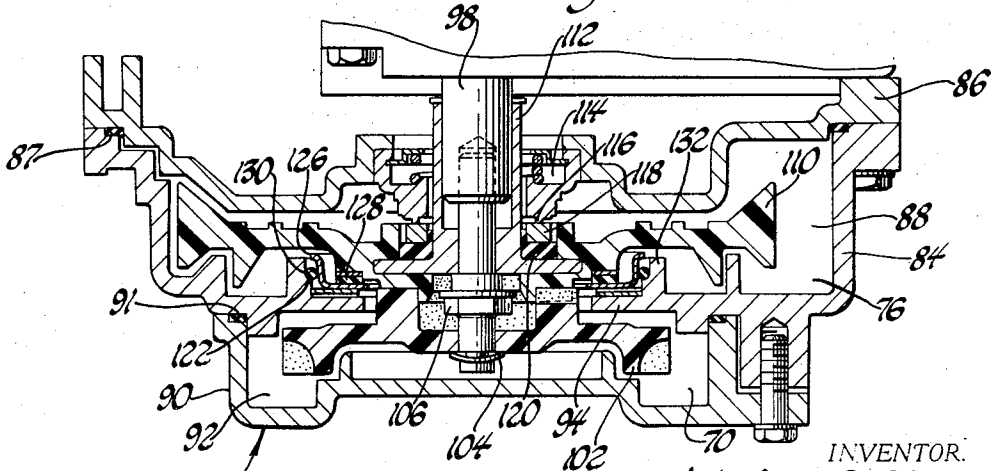


Fig. 5

INVENTOR.
Verlos G. Sharpe
BY
Frederick M. Ritchie
ATTORNEY

APPARATUS FOR SANITIZING A DOMESTIC CLOTHES WASHER

The United States Department of Agriculture has suggested that domestic clothes washers may be sanitized occasionally to help prevent the spread of illness among family members. It is also a good practice for periodic general housekeeping or for freshening and deodorizing the washer. There are some bacteria that are not killed at temperatures below 140° F. and many loads of clothes are washed in water much cooler than that. As a precaution against spreading bacteria from one wash load to another, the washer can be sanitized with liquid chlorine bleach. Additional information about sanitizing can be found in the U.S. Department of Agriculture's Home and Garden bulletin No. 97, "Sanitization and Home Laundry." This invention is directed to an improved method and apparatus for sanitizing a recirculating-type domestic clothes washer.

Accordingly, it is an object of this invention to provide a method of sanitizing a domestic clothes washer which retains sanitizing solution in the water recirculation system but not in the clothes washer after sanitizing.

It is also an object of this invention to provide a domestic clothes washer having dual water systems for recirculation and drain with a timer controlled sanitizing cycle and means to seal one water system from the other in order to retain sanitizing solution in one of said systems after the sanitizing cycle.

Another object of this invention is the provision of a timed wash cycle for a domestic clothes washer which includes a sanitizing cycle as a concluding portion of the timed wash cycle.

It is also an object of this invention to provide a sanitizing cycle for a domestic clothes washer which incorporates the terminal rinse fill, agitate and spin portion of a wash cycle and utilizes a partial fill with a liquid chlorine bleach as the sanitizing solution.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of the present invention is clearly shown.

IN THE DRAWINGS

FIG. 1 is a fragmentary side elevational view of a domestic clothes washer suitable for use with this invention and with parts broken away to show elements thereof to be sanitized;

FIG. 2 is a front elevational view of a control panel adapted for use with the method and apparatus of this invention;

FIG. 3 is a timer cycle chart illustrating preferred cycles to wash and soak clothes and to sanitize the clothes washer thereafter;

FIG. 4 is a schematic wiring diagram operable in accordance with the timer cycle chart of FIG. 3; and

FIG. 5 is a fragmentary sectional view of a dual pump arrangement suitable for use with the dual water systems of this invention.

Refer now to FIG. 1 wherein a top-opening clothes washer 20 is illustrated. The clothes washer includes a nested tub assembly 24. The assembly includes an open-top, imperforate wall water container 26 and a perforate wall spin basket 28. Perforations are coexten-

sive with the cylindrical side wall of the spin basket. An annular plastic subtop 30 is sealingly clamped to the open top of the water container 26. The subtop circumscribes the open top of the water container and extends over a rim 33 forming the top opening of the spin basket 28 to define an access collar 36 between the top opening in the clothes washer cabinet and the top opening 33 of the spin basket.

In some washers of this type, it is desirable to continuously recirculate washing fluid through a filter during the agitate portions of a wash cycle. For this purpose the clothes washer 20 may be provided with a recirculation supply conduit 34 which receives water pumped from the water container 26 and returns it through a removable lint filter drawer shown generally at 35.

The water container 26 and, thus, the tub assembly 24 is mounted on a suspension system more fully taught in U.S. Pat. No. 3,493,118 granted Feb. 3, 1970. The tub assembly includes an agitator 44 which with the spin basket 28 is connected in movement effecting relationship to a drive mechanism or movement effecting means shown generally at 50. The drive mechanism may be of a roller-drive type taught more fully in U.S. Pat. No. 3,087,321 granted Apr. 30, 1963. In general, mechanism 50 may be operated through a reversible motor 52 in one manner to vertically reciprocate or oscillate the agitator 44 for washing clothes in the tub assembly. When mechanism 50 is operated in another manner, the spin basket 28 is rotated with respect to the water container 26 for centrifuging washing fluid from the clothes in the spin basket.

A peripheral fill system is carried and supported on the annular plastic subtop 30. The under side of the subtop includes a pair of integral ribs 54, 56 which define a channel to receive a flexible fill tube 60 arranged around the top opening 33 of the spin basket and adapted to direct a series of fan-shaped sprays downwardly into the spin basket.

Most of the spray enters the spin basket where it serves to wet down dry clothes placed in the clothes washer at the beginning of a clothes washing cycle. This is insured by the depending rib 56 which diverts the outboard portion of the spray downward. Rib 56 approaches rim 33 and also serves thereby as a guard to prevent clothes from being spun into the space 64 between the tubs. Later in the wash cycle after the clothes have become plastered on the side of the spin basket during centrifuging, the spray serves to release the clothes from the side wall by breaking down the adhesion between the clothes and the spin basket. During the latter part of a "SANITIZE" cycle, the spray serves to flush the residue of sanitizing solution from the agitator 44 and the spin basket 28, i.e., those parts of the washer which would expose fabric to insufficiently diluted bleach if a wash cycle immediately followed a sanitize cycle.

Clean wash water is supplied to the tub assembly 24 by means of the peripheral fill tube 60 which is connected to a domestic water supply. For additional details regarding the peripheral fill system for clothes washer 20, reference may be had to the copending commonly assigned application Ser. No. 55,813, filed July 17, 1970.

Water supplied to the tub assembly is recirculated during a clothes washing operation. The recirculation system includes the sump 66 joined to and in communication with the bottom 68 of the water container 26. A recirculation pump 70 is supplied from the sump by means of a conduit 72 and returns water to the wash tub assembly 24 by means of the conduit 34. Conduit 34 terminates at 74 on the subtop 30 which leads to the removable lint filter drawer 35 through which the recirculating water flows on its way to the tub assembly.

Water is drained from the tub assembly through the sump 66. For this purpose, a drain pump 76 is connected to the sump by means of a conduit 78 and to a remote drain by means of a conduit 80. The upper drain pump 76 and the lower recirculation pump 70 are joined into a stacked pump assembly 82 shown more particularly in FIG. 5.

The dual pump assembly 82 is comprised of the recirculating pump 70 and the drain pump 76 stacked on top thereof. An upper pump housing 84 is closed at the top by a pump cover 86 and upper pump housing gasket 87 to form the pumping cavity 88 for the drain pump. It is closed at the bottom thereof by a lower pump housing 90 and lower pump housing gasket 91 to form a recirculation pump cavity 92. A partition 94 integral with the upper pump housing generally separates the cavity of the two pumps. A shaft 98 is directly driven from the reversible motor 52 by means of a belt and pulley arrangement 100 (FIG. 1). A lower pump impeller 102 is fastened by a retaining ring 104 to a pump impeller stud 106. The stud is threadedly engaged on the lower end of the drive shaft 98. Above the lower impeller 102 is the upper pump impeller 110. The upper pump impeller is formed on a hub portion 112 the upper portion of which overfits the drive shaft 98. Between the pump cover 86 and the impeller hub 112 is a pump seal 114. The seal fits snugly into a socket of the pump cover and includes on its lower end an annular sealing rib 116 adapted to bear sealingly against an annular seal seat 118 which, in turn, is positioned in sealing engagement with the pumping cavity on a seal gasket 120.

In accordance with one aspect of this invention, it is important that the recirculation pump cavity 92 be sealed against fluid interchange with the drain pump cavity 88. For this purpose a sealing arrangement 122 is provided between the central partition 94 and the rotating impellers. The sealing arrangement is comprised of a cup-like seal retainer 126 cradling in the center thereof an impeller seal 128 and outboard thereof, an O-ring seal 130 between the retainer and a raised annular rib 132 on the partition 94. Relative rotation occurs between the seal 128 and the retainer 126 without permitting the interchange of fluids from one pump cavity to the other. In this regard separation of the fluids in the drain and recirculation systems is enhanced in the sump also. The recirculation conduit 72 communicates directly with a standpipe 129 inside the sump 66 which extends upwardly to a point slightly above the open top of the sump and the bottom 68 of the water container. The entrance of stagnant drain pump water into the recirculating system is thus minimized.

The construction of the agitator 44 is adapted for use with the "SANITIZE" cycle of this invention. For this

purpose, the agitator includes a hollow, central column 140 and agitating cones 142. Openings 144 in the housing and 146 in the cones provide communication between the central cavity of the agitator and the spin basket 28. The agitator includes a removable cap 148 which, when inverted, provides a measuring chamber having a capacity of one and one-half cups. A removable bleach cup 150 inserts within the column 140 and is retained therein by the agitator cap 148. This forms a bleach dispensing arrangement of the type taught in U.S. Pat. No. 3,306,084 granted Feb. 28, 1967.

The "WASH" cycle and the "SOAK" cycle will not be described in detail but may be understood with reference to the wiring diagram (FIG. 4) and the timer cycle chart (FIG. 3). The "SANITIZE" cycle embraces the terminal portion of the "WASH" cycle.

The "SANITIZE" cycle will now be described with reference to FIGS. 2, 3 and 4. The user may sanitize the washer 20 as follows. Using the inverted cap 148 as a measure, 1 1/2 cups of liquid chlorine bleach or disinfectant is added to the bleach dispensing cup 150 and the cap returned to its normal position on top of the agitator. The dials 160, 162, 164 and 166 are set as shown in FIG. 2. FIG. 4 represents control circuitry at the start of a "SANITIZE" cycle with the dials in the shown positions.

More particularly, dial 160 programs a water temperature switch 170 to the positions shown in FIG. 4 to control a hot water valve solenoid 172 and a cold water valve solenoid 174 to provide a warm water fill.

The speed selector dial 162 controls a speed selector switch 176 to position the switch to condition the motor 52 for slow speed. This produces 240 strokes per minute at the agitator 44 during rinse and about 425 r.p.m. spin of the spin basket 28 during spin.

The load selector dial 164 conditions a water level switch 180 to provide a "MINI" fill of water. The switch 180 may be of a pressure sensitive type which is programmed by the turn of the dial 164 to provide a variety of water levels in tub 26 from 10 1/2 gallons at "MINI" fill to 21 gallons at "MAXI" fill. The pressure fill control system consists of the pressure switch 180, drain sump 66 with built-on air pressure chamber 67. A plastic tube 69 connects the pressure chamber to the pressure switch. The operation of the fill control system is accomplished by both electrical and mechanical action. With the timer set in Fill period, pressure switch contact 181 is closed and remains so as the water comes into the tub and fills the drain sump 66. As the water level rises the air in the air chamber 67 becomes compressed, and the compressed air acts against the diaphragm in the pressure switch. As the pressure increases it overcomes the spring tension being applied against the diaphragm. The spring tension varies with the setting of the water level desired. For a "MAXI" load the tension is greater against the diaphragm than when a "MINI" load selection is made. With this control any water level may be selected according to the size of the load.

When the compressed air overcomes the spring tension the switch activates. This causes the switch to transfer from contact 181 to contact 190. This breaks the flow of current to the water valve and makes the circuit to the timer motor and drive motor for agitate operation.

For the purpose of the "SANITIZE" cycle the "MINI" fill is selected. This selection in conjunction with the 1 1/2 cups of liquid chlorine bleach provides the preferred concentration of sanitizing solution. In washers having the nominal 18 pound clothes load capacity of clothes washer 20 but without variable fill, a similar concentration may be provided with 3 cups of liquid chlorine bleach in a full water fill of 19 1/2 gallons.

The clothes washer timer is set to provide the timer switch positions in FIG. 4 for timer switch contacts 1, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 16 when dial 166 (FIG. 2) is set to the "SANITIZE" setting +. This setting coincides with either the 18th or 19th impulse on the timer cycle chart (FIG. 3). The rotation of dial 166 advances the timer through the first eighteen impulses on the timer cycle chart. After this dial setting rotation, the dial 166 is pushed inwardly to close a push-pull switch 184. Lid switch 186 is closed whenever the top clothes access lid (not shown) is closed.

A "MINI" fill of warm water is provided as follows. The hot water valve solenoid 172 is energized from L-1 through lid switch 186, a tub unbalance relay switch 188, push-pull switch 184, load selector switch 180 (on its tub-empty contact 181), timer switch contact 14, water temperature switch 170 to the hot water valve solenoid 172. The cold water valve solenoid 174 is energized in the same fashion to timer switch contact 14 from which it is energized by means of timer switch contact 16. Ten and one-half gallons of warm water are thus provided to the outer water container 26. Fill is completed in response to fill depth pressure when the load selector switch 180 moves to contact 190 and timer motor 192 is energized through timer switch contact 3. The timer cycle is now advanced out of the 18th timer impulse (where the dial setting was in 18) into the 19th timer impulse of (where the dial setting was in 19) the timer motor starts when the water fill is completed. Timer switch contact 1 is closed in the 20th impulse along with additional timer switch contacts 7, 9 and 12 to energize the main motor 52 in a direction to provide agitation of the agitator 44 at the slow speed setting predetermined by the speed selector dial 162 and switch 176. This dispenses the bleach gradually from cup 150 and agitator 44 to form a sanitizing solution with the warm water in the tub 26. Agitation is provided through the 21st timer impulse to distribute sanitizing solution throughout the clothes washing area. Thereafter, a time pause occurs to reverse the motor and reenergize it to rotate spin basket 28 and pump the sanitizing solution from the wash area within the spin basket.

During the 23rd timer impulse, timer switch contact 14 is closed to initiate a brief (6 to 20 seconds) spray of fresh clean water (about 1 gallon) from the peripheral spray tube 60. The plurality of fan-shaped sprays flush the outer surface of the agitator 44 and the inner surface of the spin basket 28 to remove all traces of the liquid bleach sanitizing solution. It is important that some means be provided to flush the sanitizing solution from the clothes engaging components where a load of colored clothes is to be put through a "WASH" cycle immediately after a "SANITIZE" cycle.

Referring now to FIG. 5, the operation of the pump assembly 82 will be described in the context of a "SANITIZE" cycle. While the agitator is distributing

sanitizing solution to sanitize the clothes washing area, the recirculation pump 70 operates to withdraw sanitizing solution from water container 26 through sump standpipe 129 and conduit 72. This sanitizing solution is then returned to the tub assembly by means of conduit 34 and the entire recirculation system is thus sanitized. When motor 52 and thus pumps 70, 76 are reversed to purge the tub assembly of the sanitizing solution, a small amount of the sanitizing solution remaining in pump 70 and its associated conduits 34, 72 and 129 is returned to the bottom 68 of the water container where it enters sump 66 and is pumped from the clothes washer to drain by drain pump 76 along with the diluted sanitizing solution and its associated conduits 78, 80. The drain pump 76 operates to remove sanitizing solution to drain so long as the "SANITIZE" cycle is in spin. Note that the clean flushing water which is sprayed during the 23rd timer impulse is removed to drain during the spin portion of the "SANITIZE" cycle.

Some sanitizing solution is not purged from the recirculation system of the clothes washer during spin and remains in the recirculation pump 70 and its associated conduits 72 and 34 to continue the sanitation thereof after the "SANITIZE" cycle. In this regard, it is important that the residue of water in the drain pump system not interchange with the sanitizing solution in the recirculation pump 70 either prior to the termination of the "SANITIZE" cycle or at the start of the next succeeding "WASH" or "SOAK" cycle. The sealing arrangement 122 together with standpipe 129 provide for segregating the two pump cavities and the systems for recirculation and drain. Thus when the clothes washer is not in use, the stagnant liquid in the recirculation pump 70 is sanitizing solution which continues to disinfect by fighting the growth of bacteria. The strength of the sanitizing solution, of course, decreases with time (little effect after 48 hours) but it remains strong enough to resist the growth of bacteria for an extended period (up to 24 hours) after the "SANITIZE" cycle. This is important for the reason that at the start of a subsequent "WASH" cycle, the recirculation pump 70 first starts by pumping the residual liquids in the recirculation system back into the wash tub assembly and onto the clothes load. On the other hand, the first operation of the drain pump 76 is to pump away from the tub assembly to drain.

It should now be seen that an improved method and apparatus have been provided for sanitizing a domestic clothes washer whereby sanitizing solution is added at a predetermined point in a timer programmed washing cycle which avoids rinsing the sanitizing solution from the clothes washer. Moreover, the improved sanitizing method and apparatus provide for retaining a residue of sanitizing solution in the recirculation water system by sealing it from the drain water system.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

I claim:

1. A clothes washing machine comprising, a rotatably mounted perforated clothes receptacle, means for effecting movement of clothes and liquid in said clothes receptacle; an imperforate liquid receptacle substantially surrounding said clothes receptacle so

as to retain liquid within said clothes receptacle, said liquid receptacle having a drain and recirculation sump formed in the bottom thereof; a reversible rotary pump structure including first and second pumps secured along a common partition to operate together, each of said pumps having first and second openings, each of said pumps adapted to draw in liquid through its first opening and discharge it through its second opening when rotated in one direction, each of said pumps adapted to draw in liquid through its second opening and discharge it through its first opening when rotated in the opposite direction, a common reversible drive motor for said pumps, said clothes receptacle and said movement-effecting means, operation of said motor in a first direction rotating said pumps in said one direction and operating said movement-effecting means, operation of said motor in a second opposite direction rotating said pumps in said opposite direction and rotating said clothes receptacle at a centrifuging speed, first conduit means connected at one end to said first opening of said first pump and adapted to discharge from its other end into a drain, second conduit means connected at one end to said second opening of said first pump and at its other end to said sump, third conduit means connecting said sump with said first opening of said second pump and including means separating the connection thereof with said sump from the connection of said second conduit means with said sump, fourth conduit means having one end connected to said second opening of said second pump and having its other end positioned to discharge into the top of said clothes receptacle; sealing means in said common partition to prevent the interchange of liquids between said pumps, means for supplying said liquid receptacle

with predetermined full or small loads of warm water, means for dispensing a predetermined quantity of disinfectant into the predetermined load of water supplied to form a sanitizing solution, and timer means for controlling said reversible drive motor and said filling means in a sanitize cycle including sequential periods of rinse water fill, rinse agitate, rinse spin, rinse water flush and spin dry, said timer means controlling said water supply means and adapted therewith to supply a small load of warm water during said rinse water fill period and thereafter controlling said water supply means to supply a flushing load of water during said rinse water flush period, said timer means controlling said drive motor for operation in one direction while said sanitizing solution is being formed by said dispensing means to recirculate said sanitizing solution onto said clothes receptacle and said movement-effecting means during said rinse agitate period, and said timer means controlling said drive motor for operation in the opposite direction during said periods of rinse spin, rinse water flush and spin dry to drain said sanitizing solution and said flushing load of water, said sealing means enabling said second pump to retain a portion of said sanitizing solution in said second pump after the completion of said sanitize cycle.

2. The clothes washing machine of claim 1 wherein said movement-effecting means includes an agitator in said clothes receptacle and said agitator encloses said dispensing means.

3. The clothes washing machine of claim 1 wherein said full load is 21 gallons, said small load is 10½ gallons, said disinfectant is liquid chlorine bleach and said predetermined quantity thereof is 1½ cups, and said flushing load is 1 gallon.

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