

April 15, 1952

W. L. PENGELLY

2,592,596

JET ACTION WASHING MACHINE

Filed Aug. 24, 1945

6 Sheets-Sheet 1

Fig. 1

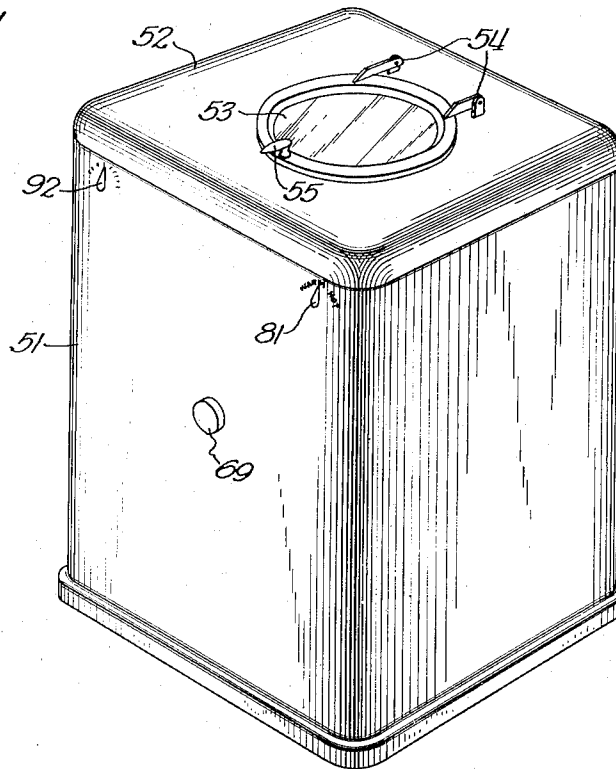
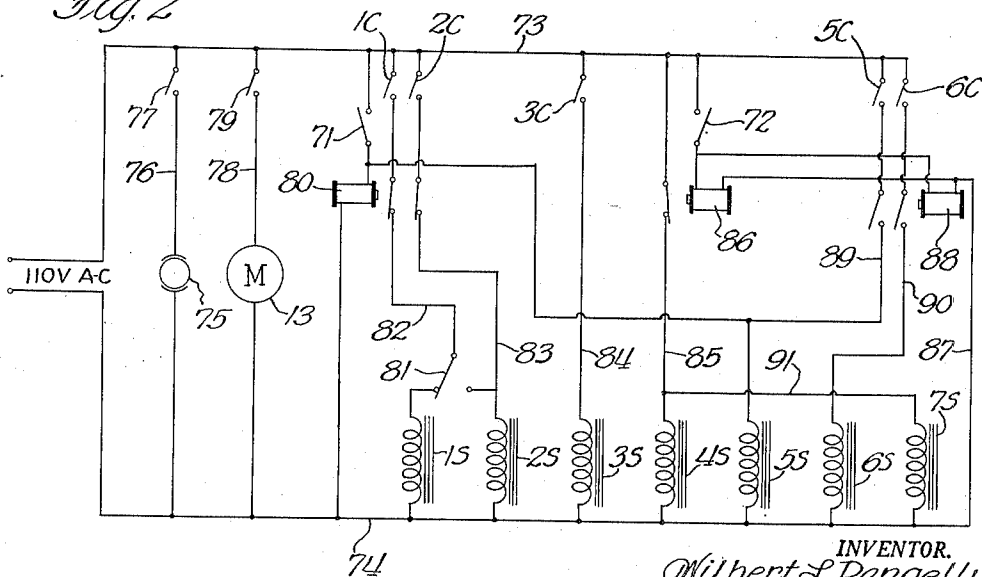


Fig. 2



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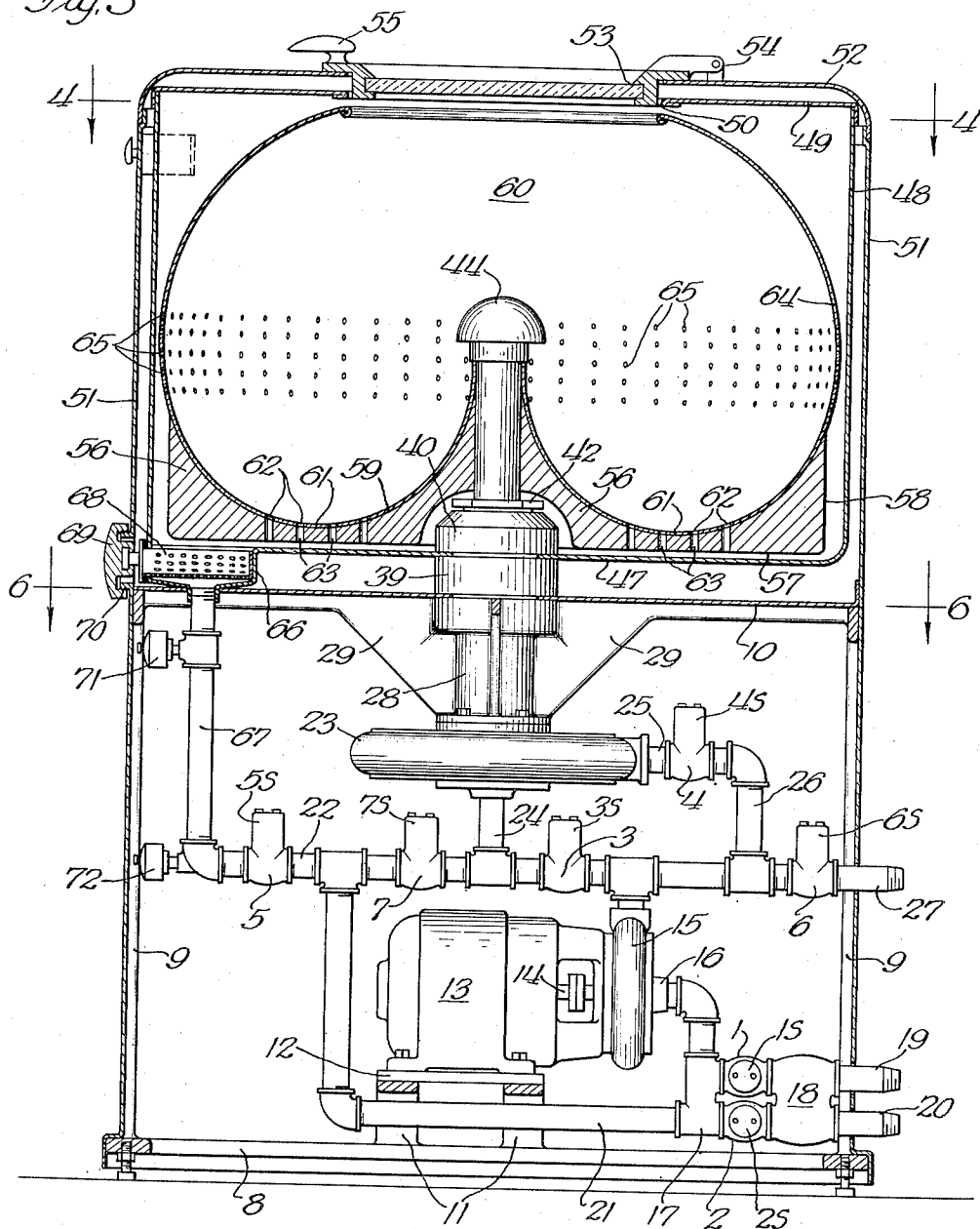
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Fig. 3



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Fig. 4

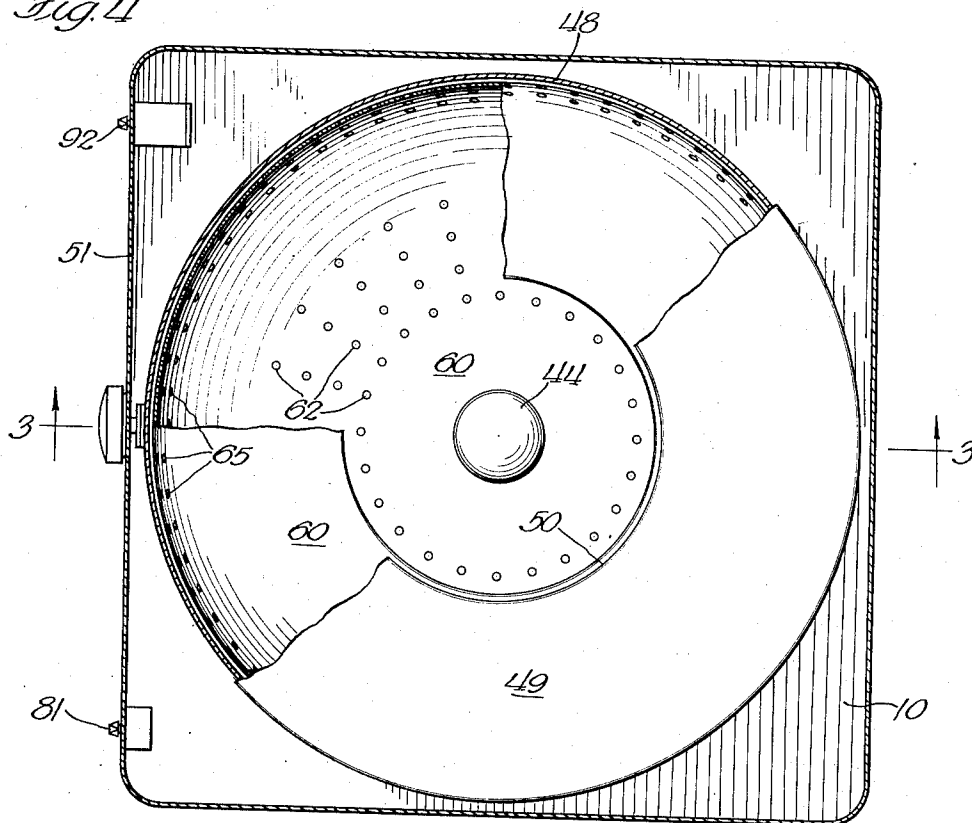
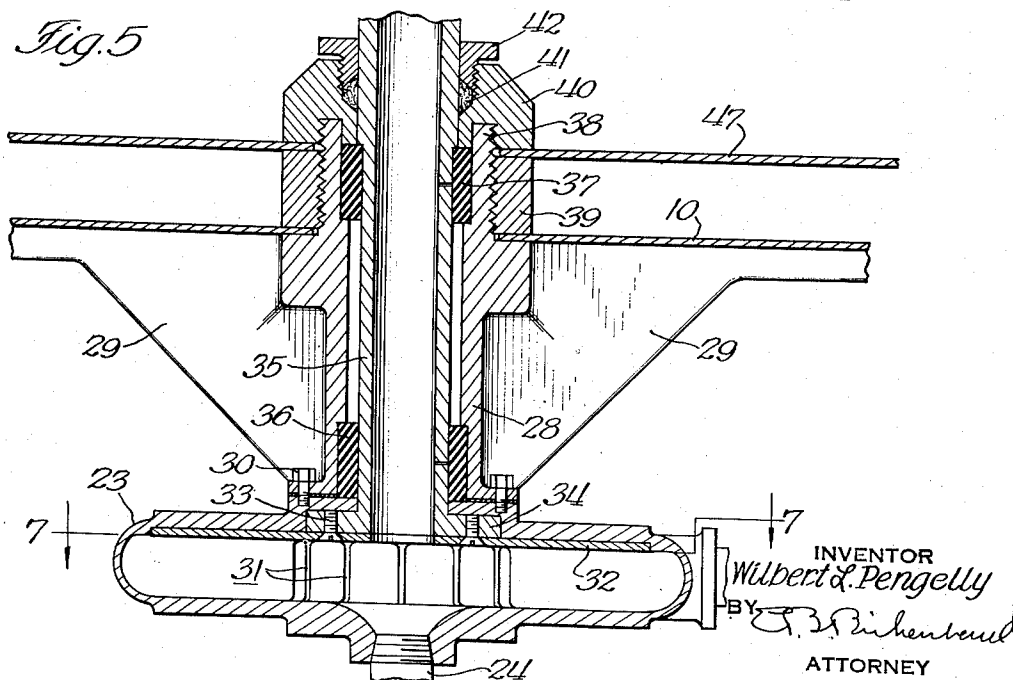


Fig. 5



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Fig. 6

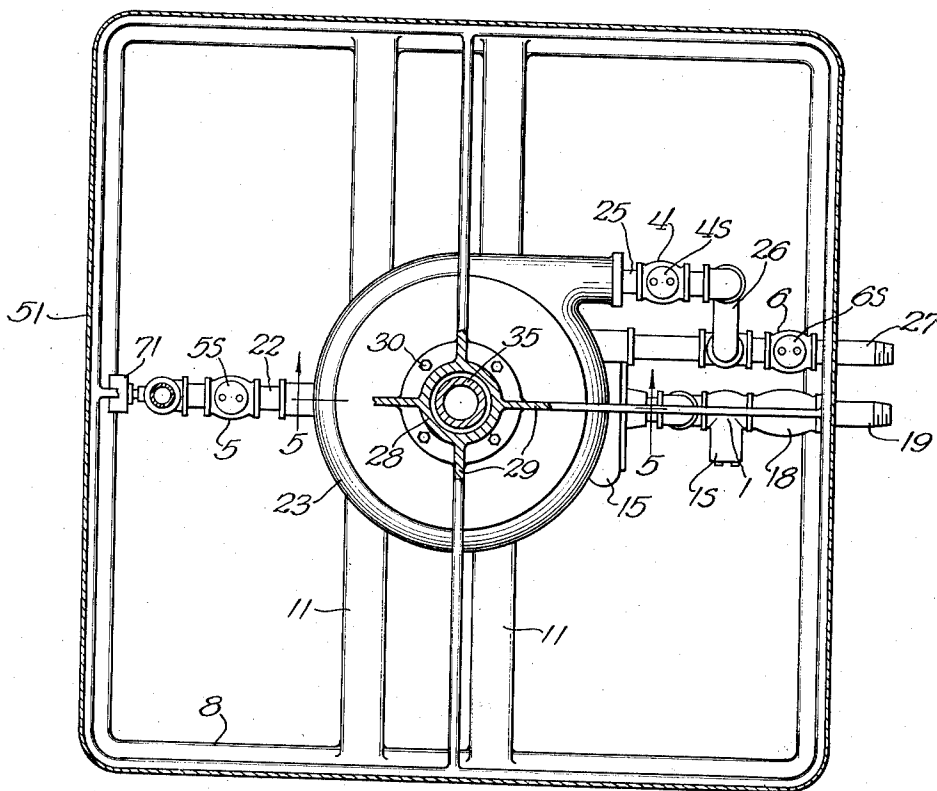


Fig. 7

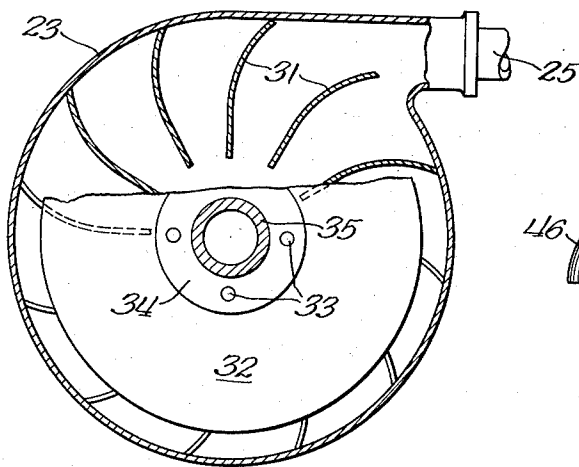
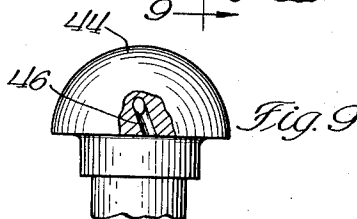
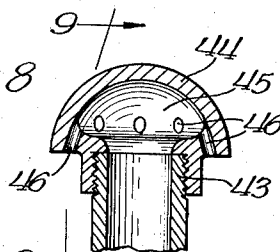


Fig. 8



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Fig. 10

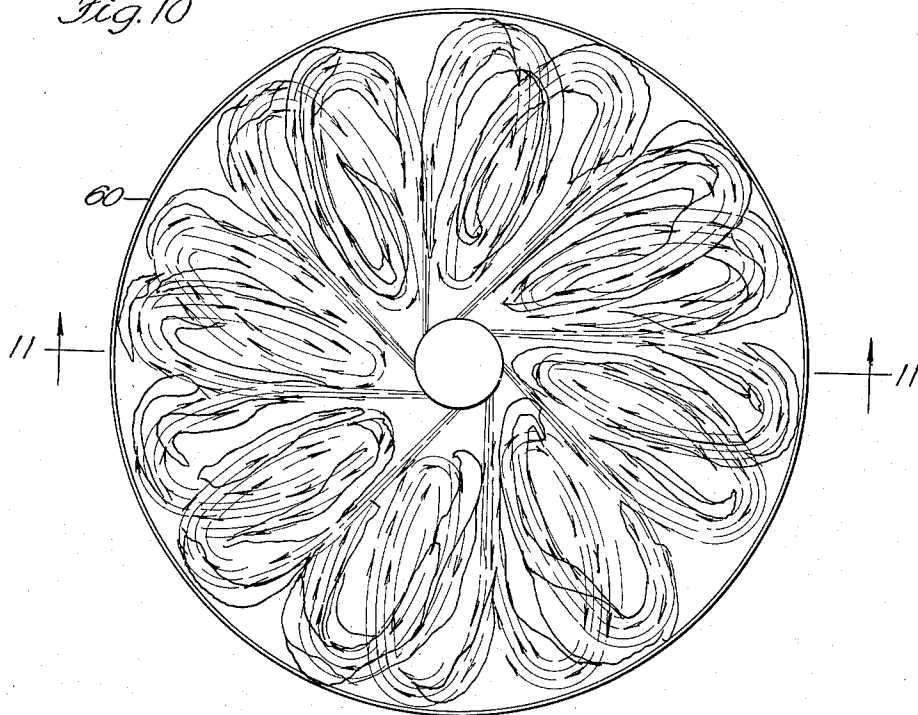
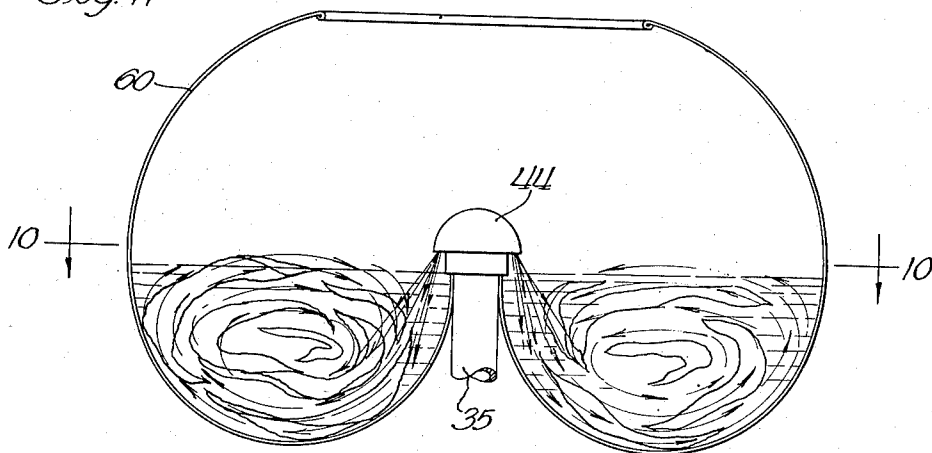


Fig. 11



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Fig. 12

VALVE POSITIONS - FOUR MAJOR CYCLES				
OPERATION		VALVES		
		OPEN	CLOSED	
*	FILL	1+2 OR 2+3	4-5-6-7	
	SOAK, WASH OR RINSE	3-5	1-2-4-6-7	
	DRAIN	5-6	1-2-3-4-7	
	DRY	4-7	1-2-3-5-6	
	OFF		1-2-3-4-5-6-7	
TIMER CAM SHAFT CONTACT INDEX				
OPERATION		CONTACTS		
		OPEN	CLOSED	
PRE-SOAK	FILL	1C-5C-6C	79-77-2C-3C	
	SOAK	1C-5C-6C	77-79-2C-3C	
	DRAIN	1C-2C-3C	77-79-5C-6C	
	SPIN	1C-2C-3C	77-79-5C-6C	
	SLOW	79-1C-2C-3C	77-5C-6C	
	OFF	77-79-1C-2C-3C-5C-6C		
WASH	FILL	2C-5C-6C	77-79-1C-3C	
	WASH	2C-5C-6C	77-79-1C-3C	
	DRAIN	1C-2C-3C	77-79-5C-6C	
	DRY	1C-2C-3C	77-79-5C-6C	
1 ST RINSE	FILL	1C-5C-6C	77-79-2C-3C	
	RINSE	1C-5C-6C	77-79-2C-3C	
	DRAIN	1C-2C-3C	77-79-5C-6C	
	DRY	1C-2C-3C	77-79-5C-6C	
FINAL RINSE	FILL	1C-5C-6C	77-79-2C-3C	
	RINSE	1C-5C-6C	77-79-2C-3C	
	DRAIN	1C-2C-3C	77-79-5C-6C	
	DRY	1C-2C-3C	77-79-5C-6C	
	SLOW	79-1C-2C-3C	77-5C-6C	
	OFF	77-79-1C-2C-3C-5C-6C		

NOTE * ON DRY CYCLE VALVES 4-7 OPEN AND CLOSE ALTERNATELY AND INTERMITTENTLY WITH 5-6 TO BLEED OFF SYSTEM OF EXCESS WATER DURING SPIN.

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UNITED STATES PATENT OFFICE

2,592,596

JET ACTION WASHING MACHINE

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Application August 24, 1945, Serial No. 612,482

19 Claims. (Cl. 68—23)

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This invention relates generally to washing machines and particularly to that type of washing machine in which the cycle of soaking, washing, rinsing and drying is carried on in automatic succession, whereby clothes, fabrics, textiles and the like may be completely and automatically laundered without the use of a large number of operating parts.

The second object is to provide a machine of the class described which will reduce the cost of controlling and assembling as well as eliminating any service problems, thereby insuring a greater durability, longer life and quieter operation, and employing only two major moving parts in the entire washing mechanism, these consisting of a motor and pump in assembly on a single shaft and a turbine and its component operating parts on another single shaft.

The third object is to provide a machine of the class described which provides four ways in which water pressure from the pump assembly is employed, namely, first, to fill the washer tub; second, to provide a washing action, third, to drain the tub, and fourth, to damp dry the clothes.

The fourth object of this invention is to provide a machine in which the washing action does not involve friction and wear commonly caused by clothes rubbing against each other or against the sides of a tub as in a cylinder type of machine or against an agitator in an agitator type of machine, and further, that it is more quiet in operation than is the vacuum cup of the plunger type of machine.

The fifth object is to construct a machine in which the objectionable action commonly due to inertia is avoided by making changes in speed gradual instead of abrupt.

The sixth object is to provide a machine in which the clothes are automatically distributed within the washing basket by the water action during the wash cycle, thereby eliminating the vibration that is commonly found in the basket type of machines where the clothes are bunched or balled up.

The seventh object of this invention is to provide a gyroscopic fly wheel or balancer on the bottom of the spinner basket, thereby adding to the stability of the spin operation and tending to minimize vibration.

The eighth object is to utilize the dead water as a brake when the motor has been shut off and the circulating pump stopped, thereby enabling the spinning basket to come down to a relatively quick stop.

The ninth object is to construct a machine of

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the class described in which the loading is done from the top side, thereby eliminating unnecessary stopping.

The tenth object is the employment of pressure valves instead of using float chamber mechanisms which tend to become inoperative due to soap curds and scum forming thereon.

I accomplish these and other objects in a manner set forth in the following specification as illustrated in the accompanying drawings, in which:

Fig. 1 is a perspective view of the completed machine.

Fig. 2 is an electrical schematic layout of the operating elements, showing the parts in an "off" position.

Fig. 3 is a vertical section taken along the line 3—3 in Fig. 4.

Fig. 4 is a plan of the machine with a portion broken away along the line 4—4 in Fig. 3.

Fig. 5 is a fragmentary section taken along the line 5—5 in Fig. 6.

Fig. 6 is a horizontal section taken along the line 6—6 in Fig. 3.

Fig. 7 is a section taken along the line 7—7 in Fig. 5.

Fig. 8 is a vertical section through the spraying head.

Fig. 9 is a side elevation of the spraying head with a portion cut away along the line 9—9 in Fig. 8.

Fig. 10 is a horizontal section taken along the line 10—10 in Fig. 11.

Fig. 11 is a vertical section taken along the line 11—11 in Fig. 10.

Fig. 12 is a chart showing the timer contact and valve positions throughout the cycles.

Similar numerals refer to similar parts throughout the several views.

Referring in detail to the drawing, the device which I am about to describe is based upon a series of valves including a hot fill valve 1, a lukewarm fill valve 2, a wash valve 3, a spin valve 4, a tub drain valve 5, a drain valve 6 and a turbine return valve 7, the separate function and relationship of which will be described in detail.

On the base 8 is mounted an upright frame 9 across the top of which is placed a floor plate 10. On the base 8 are the motor supporting bars 11, across which is secured a plate 12 upon which is mounted an electric motor 13, on whose shaft 14 is mounted a high pressure pump 15, whose intake 16 is connected to a 4-way fitting 17. One inlet of the fitting 17 is controlled by the hot

fill valve 1 and whose second inlet opening is controlled by the lukewarm fill valve 2. The valve 1 is actuated by a solenoid 1-S and the valve 2 is actuated by a solenoid 2-S. The valves 1 and 2 control the outlets of a thermostatically controlled mixer valve 18, such as are now in common use. Hot water is admitted to the valve 18 through the pipe 19 from a source of supply (not shown). Cold water is admitted to the valve 18 through the pipe 20 from a water supply line.

The fourth outlet from the fitting 17 is connected by a pipe 21 to a horizontal pipe 22, in which are mounted in series the valves 5, 7, 3 and 6, the connection between the pipes 21 and 22 being made between the valves 5 and 7.

The valve 3 is actuated by a solenoid 3-S, while the valve 5 is actuated by a solenoid 5-S and the valve 6 is actuated by a solenoid 6-S, and the valve 7 is actuated by a solenoid 7-S. The discharge from the pump 15 is connected to the pipe 22 between the valves 3 and 6.

Mounted approximately in the vertical center line of the machine is a water turbine 23, whose central outlet 24 is connected to the pipe 22 between the valves 3 and 7.

The tangential inlet 25 is connected to the spin valve 4, which is actuated by the solenoid 4-S. The valve 4 is connected by the pipe 26 to the pipe 22 between the valves 3 and 6. The drain valve 6 is provided with a waste pipe 27, which may be connected to a suitable container or drain.

The turbine 23 is supported by a housing 28, whose ribs 29 are integral with the frame 9. The housing 28 is secured to the turbine 23 by means of the screws 30.

The impeller 31 of the turbine 23 is provided with a flange 32, which is secured by means of the screws 33 to the flange 34 of the tubular shaft 35 which journals in the water lubricated rubber bearings 36 and 37. The upper end 38 of the housing 28 is externally threaded and the floor plate 10 is clamped thereon by means of a nut 39. A stuffing box 40 is threaded upon the uppermost ends of the threaded portion 38, and contains the packing 41 and gland nut 42 which surrounds the tubular shaft 35.

At the upper end 43 of the shaft 35 are formed external threads upon which are mounted the nozzle head 44 which is in the form of a hemisphere and from whose hollow interior 45 extends the downwardly and spirally directed outlet 46, by means of which water may be directed outwardly and spirally.

Between the nut 39 and stuffing box 40 is clamped the bottom 47 of the inner tub 48, which is provided with a removable cover 49 having the enlarged central opening 50. An outer housing or shell 51 extends from the bottom of the base 10 to the upper portion of the inner tub 48. A cover 52 for the casing 51 is provided with a transparent clothes door 53, which is mounted on the hinge 54 and retained by the latch handle 55.

Secured on the shaft 35 is a spinner base 56, which is perfectly balanced and acts as a gyroscopic stabilizer. The bottom 57 of the base 56 is substantially parallel with the bottom 47 of the inner tub 48, while the outer face 58 is cylindrical. The top surface 59 of the base 56 is curved as shown to receive the spinning basket 60, whose bottom portion 61 is in the form of an annular channel concentric with the vertical axis of the shaft 35. The bottom 61 has a plurality of openings 62 through which water can escape through the ports 63 in the base 56 into the

inner tub 48. The outermost portion 64 of the basket 60 is provided with perforations 65, through which water escapes in the drying operation.

In the bottom 47 is formed a well 66, which is connected by a pipe 67 to the pipe 22 on the outer side of the valve 5. A drain drawer 68 is disposed within the well 66 and can be withdrawn laterally by means of the knob 69, which is threaded onto the flange 70. In the pipe 67 is disposed a high pressure fill switch 71 and a low pressure drain switch 72. The positions indicated for these switches are merely relative and in actual practice their position may need to be varied, depending upon various conditions such as water pressures and other factors.

In Fig. 2 is indicated the sides 73 and 74 of a power line, across which are shunted the various elements about to be described.

The first of these elements is a timer motor 75, whose leads 76 contain the timer motor control switch 77.

The motor 13 has its leads 78, which include the motor control switch 79. Between the leads 73 and 74 is placed the coil of a relay 80, which is controlled by the high pressure switch 71. The hot water solenoid 1-S and the warm water solenoid 2-S are selectively controlled by the manually operated switch 81, whose lead 82 extends to the contact switch 1-C, whereas the solenoid 2-S has its lead 83 connected to the contact switch 2-C. Both of the leads 82 and 83 are also controlled by the relay 80, which opens the circuit when the coil of relay 80 is energized by the closing of the switch 71.

The wash valve 3 is actuated by the solenoid 3-S which is connected by the lead 84 to the contact switch 3-C. The spin valve 4 is actuated by the solenoid 4-S, whose lead 85 is connected to the low pressure switch 72. The lead 85 is also controlled by a relay 86 having a coil supplied with energy from the lead 87. The coil of relay 88 is also supplied with energy from the lead 87 and controls the lead 89 which joins the tub drain valve solenoid 5-S to the contact switch 5-C.

The relay 88 also controls the lead 90, which connects the drain valve solenoid 6-S to the contact switch 6-C. The turbine return valve solenoid 7-S is connected by a lead 91 to the lead 85.

Attention is drawn to the fact that the contact switches 77, 79, 1-C, 2-C, 3-C, 5-C and 6-C are cam actuated and are all mounted on a common shaft, which is positioned by the manually operated indicator 92, and gear driven by timer motor 75 (gearing and cam not shown).

The operation of the device is as follows: The clothes are placed in the spinner basket 60 that is reached through the loading door or port 53, situated on the top of the machine.

The temperature switch 81 is set to hot or warm, such as the washing requires. This selects the thermostat inlet valves 1 or 2 to be opened, thus determining the temperature of the water admitted.

The timer control 92 is then turned on to the desired length of time the machine is to remain in the wash cycle. The following action takes place: The timer motor 75 and the main pump motor 13 are started. The inlet valves selected by the temperature control switch 81, either hot or warm, opens. (Only one inlet valve at a time operates 1 or 2.)

The tub drain valve 5 is closed and wash pressure valve 3 is open. Valves 4, 6 and 7 are closed,

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thus blocking any water flow beyond these points. The water is forced up through the hollow turbine outlet and up the hollow turbine and spinner shaft 35, where it is forced out the nozzle head jets 44 under pressure.

The filling action continues until the water level in the tub reaches almost to the level of the spray jets in the nozzle head 44. The high pressure switch 71 is adjusted to then close, causing inlet valves 1 or 2 to close. The soap is then added through the door or port until the desired suds is obtained. The water then follows the course outlined in the diagram, or the water being returned through the tub outlet system is returned to the pump circuit where it is put under pressure and forced back into the tub again by way of the spinner shaft 35 and nozzle head 44, where it is expelled under pressure again to cause water turbulence and washing action. This continuous course of flow continues using the tub as a reservoir for as long a period as the desired washing interval had been pre-set on the initial setting of the timer control 92.

When the proper wash time has elapsed, the timer 92 then causes the drain valve 6 to open, and wash valve 3 to close, thus diverting the water out the drain pipe 27. This continues until the water level has reached below the drain screen 66. The low pressure switch 72, which is adjusted to that level, then opens, thus causing the tub drain valve 5 and the machine drain 6 to close. At the same time, turbine inlet 4 and turbine outlet 7 opens, thus creating a water pressure intake and return through the turbine 23, which causes the turbine 23 to revolve which in turn causes the basket 60 to spin, thus expelling the water remaining in the clothes by centrifugal force.

NOTE.—The low pressure valve 72 is adjusted to release when the level is just below the drain trap 68, but does not drain the circuit dry. Enough water is maintained in the system to provide a hydraulic transmission of power between the pump 15 and the turbine 23.

At intervals during the spinning cycle the water being expelled from the clothes will rise beyond the point set on the low pressure switch 72. When this occurs, the pressure is raised sufficiently to close the low pressure switch 72, which in turn opens valves 5 and 6 closing 4 and 7 long enough to bleed off the circuit and allow the draining of water from the machine through 6 until the water level is brought back down to below the drain trap 68, and then the low pressure switch 72 opens again causing the machine to resume the spin operation.

The spin operation continues for a period of time determined by the timer control 92, which is adjusted to allow sufficient time for drying. When this process is ended, the machine returns to the fill cycle again, and repeats the foregoing operation. This time, however, it is without the addition of soap. This constitutes a fresh water rinse.

NOTE.—Regardless of where the temperature control 81 is set during the wash cycle, the timer control 92 automatically selects warm only for the two following rinse operations by closing cam contact switch 2-C instead of 1-C as in fill cycle.

When the complete cycle of the first rinse is completed, the entire operation is then repeated. This constitutes the second rinse. This proceeds the same as the foregoing cycle until a minute before the machine is due to turn off. The motor is then turned off by the timer control which provides a gradual braking for the spinner basket 60 caused by the resistance offered by the dead water in the system to the turbine blades. This

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is then followed by a complete turn off of the timer or end of wash.

On the timer dial a soaking cycle is arranged just in front of the wash cycle. This soaking cycle operates the same as a wash cycle, soap being added same as in the wash. However, the thermostat inlet valves are set for warm only by the timer control cam. And the machine stops running at the end of the soak and drain cycle omitting the dry operation, allowing the clothes to remain in the tub with a content of soapy water in them until the dial is set ahead to the regular wash cycle. This provides a warm soapy water soak before washing.

Among the numerous advantages arising from the construction above outlined are included the ability to fill the machine faster in areas where the regular house pressure is low, also it enables the machine to fill itself where there is no water pressure, even permitting the machine to draw its water from tanks or containers below the level of the washer.

In the washing action, the pump provides water pressure in the system. This water is forced up in the hollow shaft 35 and through the washing head jets, thus creating a downward drive of aerated columns of water which follow the curvature or cylindrical pattern of the lower section of the spinner basket 60. The direction of the jets being staggered or offset slightly to one side causes not only a vertical rotation of the water flow, but also causes the water to follow a spiraling course around the spinner shaft. This causes the clothes to rotate and spiral around the spinner shaft, changing positions with the flow and coming directly under the force of water from the jets at various intervals, causing the wash water to be forced through the mesh in the fabric, thus flushing out the soil, dirt particles and stains. Aeration and air bubbles also assist in this action.

Another feature of this washing action is the absence of friction and wear caused by the clothes rubbing against each other or against the sides of a tub, such as may be found in the cylinder type of washing machines. It also eliminates wear caused by clothes rubbing against an agitator in that type of machine and is much quieter and smoother than the vacuum cup or plunger type of machine.

This construction also provides water pressure to drain the machine during the drain cycle, thus eliminating the additional use of a drain pump for that purpose, such as is found in conventional designs.

This construction also permits the use of water pressure to drive the spinner turbine with only a small amount of water remaining in the system for that purpose. The water pressure against the blades of the water motor cause it to spin, which in turn spins the basket to which it is attached by means of the hollow spinner shaft 35, thus expelling water from the clothes by centrifugal force.

One outstanding advantage of this construction is the gradual increase in the speed of the spinner basket as the water is expelled from the clothes, thus reducing their weight.

This gradual cushioned take-up utilizing water power as a propellant eliminates the necessity of clutches, belts and gear mechanism. The maximum speed of the basket is self-equalizing or self-adjusting and is reached as the clothes lose their water content.

Another feature of the spinning operation is

the self-distribution of clothes caused by the water action during the wash cycle having a tendency to force the clothes to the outer edges of the basket and the spiralling effect causing the clothes to be equally distributed around the spinner shaft, thus eliminating the vibration that is found in instances where the clothes are bunched or balled up. Another advantage of the construction outlined herein is the use of a heavy fly wheel 56 on the bottom of the basket, which conforms to the shape of the spinner basket. This adds to the stability of the spin operation and has a gyroscopic effect, which tends to minimize vibration.

Another feature is the braking effect in the last drying operation when the motor has shut off, stopping the pump, at which time the dead water in the system offers a resistance to the spinning basket, thus slowing it to a quick but easy stop. In the two spins that precede the final spin, the braking of the still spinning basket is accomplished by the new water entering the tub, slowing down the spinner by its presence.

Attention is also drawn to the use of pressure valves to regulate the water level, thereby eliminating the use of float valve mechanisms which are less satisfactory because of soap curds and scum forming in the float chamber which causes the float to stick.

Reference is made to my continuation-in-part application, Serial No. 668,193, filed May 8, 1946, for Washing Machine.

I claim:

1. In a washing machine, a tub, a vertical tubular member in said tub, a high pressure source of water connected with said tubular member, a circular basket having a raised central portion with inside, bottom and outside walls forming a smooth, annular channel in said basket concentric with said tubular member, and an agitator for agitating material supported in water in the basket without rubbing comprising a plurality of nozzles mounted on said tubular member and disposed in a circle above the raised central portion of said basket and all directed downwardly substantially tangentially to said circle for discharging high pressure jets of water downwardly along the inner walls of the basket to rotate the contents of the basket in regular vertical circulatory motion and to advance said contents around the basket from one jet to the next.

2. In a washing machine, a tub, a vertical tubular member in said tub, a circular basket mounted on said member and having upstanding inner walls around said member, means for connecting said tubular member with a high pressure source of water supply, and a plurality of nozzles on said tubular member all directed downwardly and approximately tangentially to said tubular member for discharging high pressure streams of water along the inner walls of the basket to provide the necessary washing agitation for material in the basket.

3. A washing machine comprising a tub, a hollow vertical shaft extending through the bottom of said tub, a spinner basket mounted on said shaft for rotation in said tub, a nozzle head on the upper end of said shaft arranged to direct water jets into said basket, a turbine runner having a central open eye on the lower end of said shaft, a high pressure source of water, and pipe connections equipped with valves for selectively directing a pressure stream of water from said source into the blades of said turbine runner for discharge downwardly through the

eye of said runner to spin said basket or upwardly through the eye of said turbine runner and said shaft for discharge through said nozzle head.

4. In a washing machine, a tub, a hollow vertical shaft extending through the bottom of said tub, a centrifuging spinner basket mounted on said shaft for rotation in the tub, a washing agitator comprising a nozzle head on the upper end of said shaft having nozzles directed into said basket, a turbine rotor mounted on the lower end of said shaft outside of said tub, said rotor having an eye communicating upwardly into said hollow shaft, a pipe extending downwardly from the eye of the turbine to serve as a discharge pipe for the turbine in a centrifuging operation and as a supply pipe for said nozzle head in a washing operation, and a pump having outlet connections with said turbine and said pipe including valves whereby said pump may serve to supply either said nozzle head or said turbine.

5. In a washing machine, a tub, a hollow vertical shaft in said tub, a washing and centrifuging basket mounted on said shaft for rotation in the bottom of the tub for centrifuging in the space occupied by the wash water in a washing operation, a nozzle head on the upper end of said shaft arranged to direct water jets into said basket, a turbine having driving connection with said shaft for rotating said basket, a pump, and pipe connections equipped with valves for selectively directing the output of said pump upwardly through said hollow shaft for discharge through said nozzle head for a washing operation or into said turbine to rotate the turbine and spin said basket for a centrifuging operation.

6. A washing machine comprising a tub, a hollow vertical shaft extending through the bottom of said tub, a spinner basket mounted on said shaft for rotation in said tub, a nozzle head on the upper end of said shaft arranged to direct water jets into said basket, a hydraulic turbine connected with said shaft for rotating said shaft, a pump, and pipe connections equipped with valves for selectively directing the output of said pump upwardly through said hollow shaft for discharge through said nozzle head for a washing operation or into said turbine to rotate the turbine and spin said basket for a drying operation.

7. A washing machine comprising a tub, a spinner basket mounted on a hollow vertical shaft extending through the bottom of said tub, a nozzle head in said basket on the upper end of said shaft, a hydraulic turbine operatively connected with said shaft for rotating said shaft, a pump, a fresh water supply pipe, piping connections including said pump between said supply pipe and said hollow shaft for filling said tub with fresh water through said nozzle head, piping connections from said tub through said pump and hollow shaft for pumping water from said tub through said hollow shaft and nozzle head, and piping connections from said tub through said pump and turbine for driving said turbine from said pump with water drained from said tub.

8. In a washing machine, a tub, a spinner basket mounted for rotation in said tub, nozzles arranged to direct high pressure jets of water into said basket to agitate material in said basket for a washing operation, a turbine for spinning said basket, a fresh water inlet, a pump, pipe connections through said pump from said fresh water inlet for pumping fresh water into said basket through said nozzles, a tub drain, pipe connections from said tub drain through said pump

and nozzles for recirculating tub water, and pipe connections from said tub drain through said pump and turbine arranged for driving said turbine to spin said basket with water pumped out of said tub after said tub is empty.

9. A washing machine comprising a tub, a perforated spinner basket mounted for centrifuging operation at the bottom of said tub in the space normally occupied by wash water in the tub, said basket having the same position for washing and centrifuging, a washing agitator comprising nozzles directed into said basket, a pump, means including pipe connections for connecting the pump inlet with the bottom of the tub and the pump outlet with said nozzles for washing and rinsing, a turbine having driving connection with said basket and having a discharge outlet outside of the tub, and valve means for changing the pump outlet connection from said nozzles to the turbine inlet to drive the turbine with tub water under pressure for centrifuging.

10. A washing machine comprising a tub, a hollow vertical shaft extending through the bottom of said tub, a centrifuging basket mounted on said shaft for rotation in the tub, a nozzle head on the upper end of said shaft arranged to direct a plurality of water jets into said basket to provide the necessary washing agitation for material in the basket, a perforate peripheral wall in said basket to pass water from the basket to the tub, said basket having a position for both washing and centrifuging in the space occupied by the water in the tub in a washing operation, a pump, means including pipe connections for connecting the pump inlet with the bottom of the tub and the pump outlet with said hollow shaft to supply said nozzle head with tub water under pressure for washing and rinsing operations, a turbine having driving connection with said shaft outside of said tub, and valve means for changing the pump outlet connection from said hollow shaft to the turbine inlet to drive said turbine with tub water under pressure for a centrifuging operation when the tub is drained.

11. A washing machine comprising a tub, a spinner basket mounted for rotation in said tub, a hydraulic turbine having driving connection with said basket, a tub drain, a pump, pipe connections from said tub drain to the inlet of said pump for draining said tub, pipe connections from the outlet of said pump for disposing of said tub water, pipe connections including a portion of said last mentioned connections connecting the outlet of said pump with said turbine for operating the turbine with tub water, and means connected with certain of said pipe connections for retaining a portion of the water drained from the tub to supply said pump and turbine after the tub is drained.

12. In a washing machine, a tub, a washing and centrifuging basket mounted for rotation in the bottom of the tub for centrifuging in the space occupied by the wash water in a washing operation, a turbine having driving connection with said basket, a tub drain, a pump, a pipe connection between said tub drain and the inlet of said pump, a pipe connection from the outlet of said pump for delivering water from the pump to said basket for a washing operation, a pipe connection from the outlet of said pump to said turbine for driving the turbine with tub water from the pump, and means connected with certain of said pipe connections for withholding a portion of the tub water when the tub is drained

to supply said pump and turbine for spinning said basket after the tub is drained.

13. A washing machine comprising a tub, a hollow vertical shaft in said tub, a washing and centrifuging basket mounted on said shaft for rotation in the bottom of the tub for centrifuging in the space occupied by the wash water in a washing operation, a nozzle head on the upper end of said shaft arranged to direct water jets into said basket, a turbine having driving connection with said shaft for rotating said basket, a fresh water inlet, a tub drain, a pump, pipe connections from the inlet of said pump to said fresh water inlet and said tub drain, pipe connections from the outlet of said pump for disposing of the tub water, pipe connections from the outlet of said pump to said turbine and nozzle head including a portion of said last mentioned pipe connections, valves in said pipe connections for supplying water to said pump from said fresh water inlet or said tub drain and for directing the outflow from said pump to said nozzle head or said turbine selectively, and means connected with certain of said pipe connections for withholding a portion of the water drained from the tub to operate said turbine after the tub is drained.

14. A washing machine comprising a tub, a spinner basket mounted for rotation in said tub, a hydraulic turbine for rotating said basket, a tub drain, a pump, pipe connections including said pump and tub drain for draining said tub, means including a switch responsive to the water level in said tub and a drain valve actuated thereby for discharging all but the last portion of said drain water from the machine, and pipe connections through said pump and turbine for directing said last portion of said drain water in a closed circuit through said pump and turbine to spin said basket after the tub is empty.

15. A washing machine comprising a tub, a spinner basket mounted for rotation in said tub, a hydraulic turbine for rotating said basket, a fresh water inlet, a tub drain, a pump, pipe connections including said pump and fresh water inlet for pumping fresh water into said basket, pipe connections including said pump and tub drain for pumping water from said tub into said basket, pipe connections including said pump and tub drain for draining said tub, pipe connections for establishing a closed hydraulic circuit through said pump and turbine to drive said turbine for spinning said basket, and means including a pressure-responsive switch and drain valve actuated thereby for discharging all but the last portion of the drain water through a part of said hydraulic circuit and then withholding said last portion in said hydraulic circuit.

16. A washing machine comprising a tub, a spinner basket mounted for rotation in said tub, a hydraulic turbine for rotating said basket, a plurality of nozzles for directing jets of water into said basket, a fresh water inlet, a tub drain, a pump, pipe connections from said inlet for directing fresh water through said pump and said nozzles to fill said basket and tub, pipe connections from said tub drain to recirculate water from said tub through said pump and nozzles to perform a washing operation, pipe connections from said tub drain through said pump to pump the water out of said tub, a closed hydraulic circuit through said pump and turbine to spin said basket, a drain valve connected with said circuit, and means responsive to the falling water level in said tub when the tub is drained to close said

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drain valve and confine the last portion of said drained tub water in said closed hydraulic circuit.

17. A washing machine comprising a tub, a spinner basket mounted for rotation in the bottom of said tub, a hydraulic turbine for rotating said basket, a plurality of nozzles for directing jets of water into said basket, a fresh water inlet, a tub drain, a pump, a drain valve, pipe connections from said inlet through said pump for pumping fresh water through said nozzles into said basket, pipe connections including said pump and tub drain for pumping water from said tub through said nozzles to perform a washing operation, pipe connections including said pump, tub drain and drain valve for draining said tub, liquid level responsive means operatively connected with said drain valve for closing said valve to retain the last portion of said drain water in certain of said pipe connections, pipe connections including parts of said previously mentioned pipe connections for directing said last portion of said drain water in a closed circuit through said pump and turbine for spinning said basket.

18. A washing machine comprising a tub, a tub drain pipe connected with said tub, a spinner basket mounted for rotation in said tub, a hydraulic turbine having driving connection with said basket for rotating the basket, nozzles arranged to direct jets of water into said basket, a fresh water inlet, a pump, a drain valve, pipe connections from the inlet of said pump to said fresh water inlet and said tub drain pipe, pipe connections from the outlet of said pump to said nozzles, the inlet of said turbine, and said drain valve, portions of said pipe connections being arranged to form a closed hydraulic circuit through said pump and turbine and connected with said drain valve, and means responsive to the liquid level in said tub and tub drain pipe operatively connected with said drain valve for closing said valve to retain the last portion of the tub water in said closed hydraulic circuit through said pump and turbine when the tub is drained.

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19. A washing machine comprising a tub, a spinner basket mounted for rotation in said tub, a hydraulic turbine having driving connection with said basket for rotating the basket, nozzles arranged to direct jets of water into said basket, a fresh water inlet, a tub drain pipe, a pump, a drain valve, pipe connections between said pump inlet, said fresh water inlet and said tub drain pipe, pipe connections between said pump outlet, said nozzles, the inlet of said turbine and said drain valve, portions of said pipe connections being arranged to form a closed hydraulic circuit through said pump and turbine for driving said turbine from said pump, and a pressure responsive switch in said tub drain pipe operatively connected with said drain valve to close said drain valve as soon as the tub is drained, to confine the last portion of the water drained from the tub in said closed hydraulic circuit for spinning said basket.

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