April 1, 1941. O. J. CHAYIE 2,236,748

WASHING MACHINE

Filed May 28, 1938 5 Sheets-Sheet 1

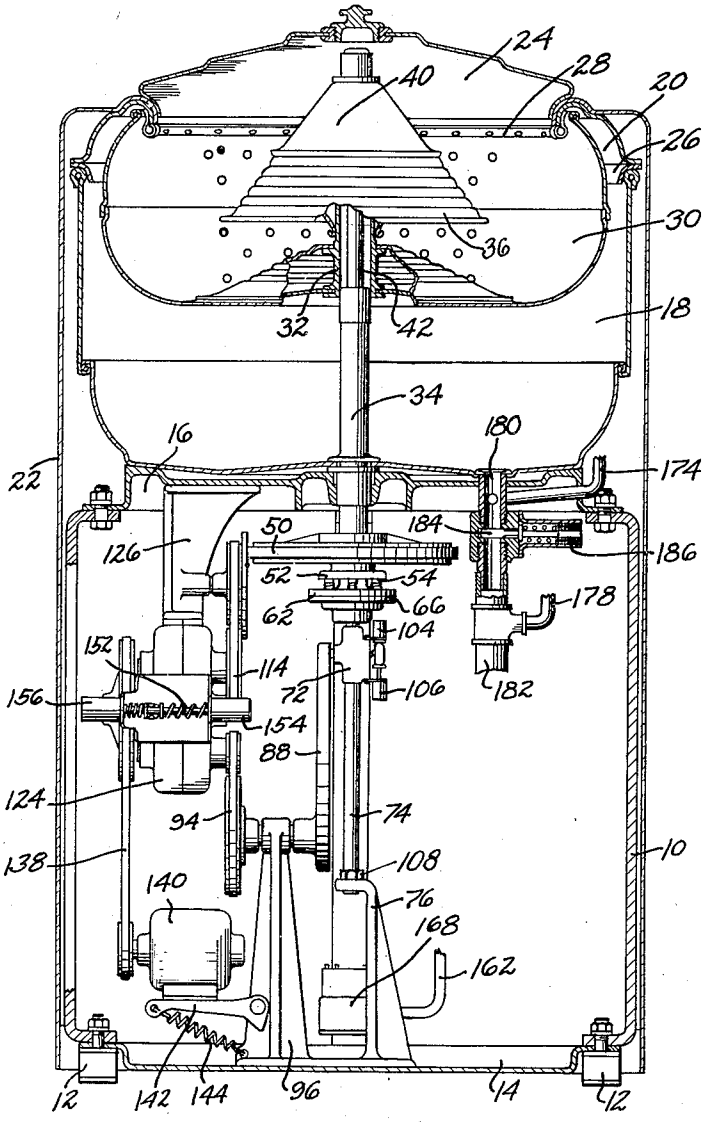

Fig. 1

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WASHING MACHINE

Filed May 28, 1938 5 Sheets-Sheet 2

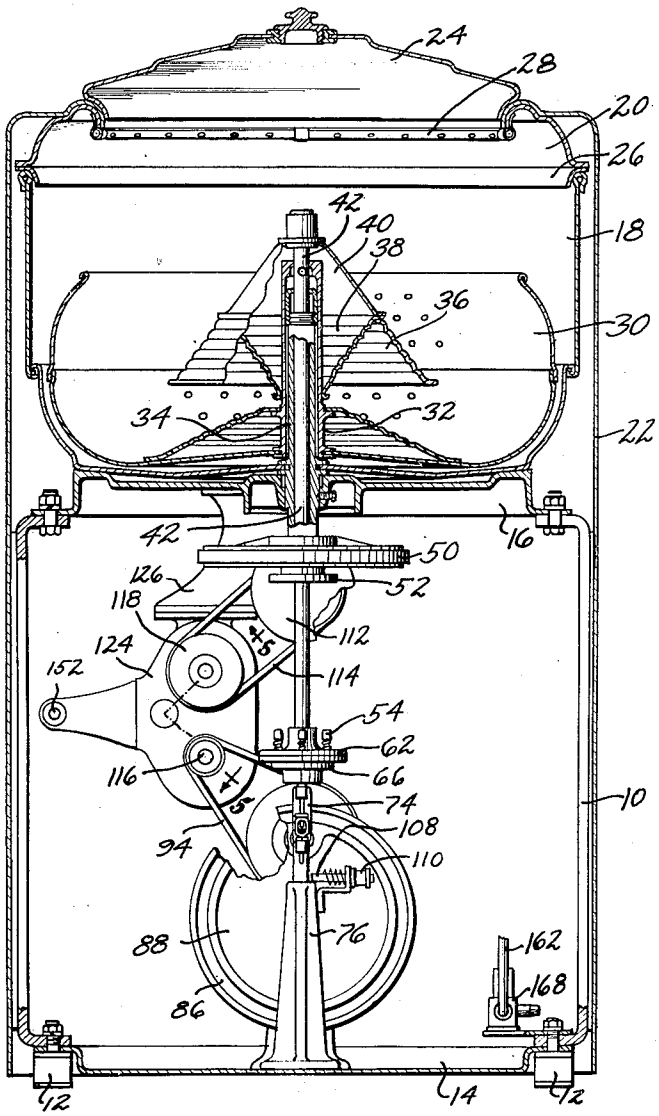

Fig. 2

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WASHING MACHINE

Filed May 28, 1938 5 Sheets-Sheet 3

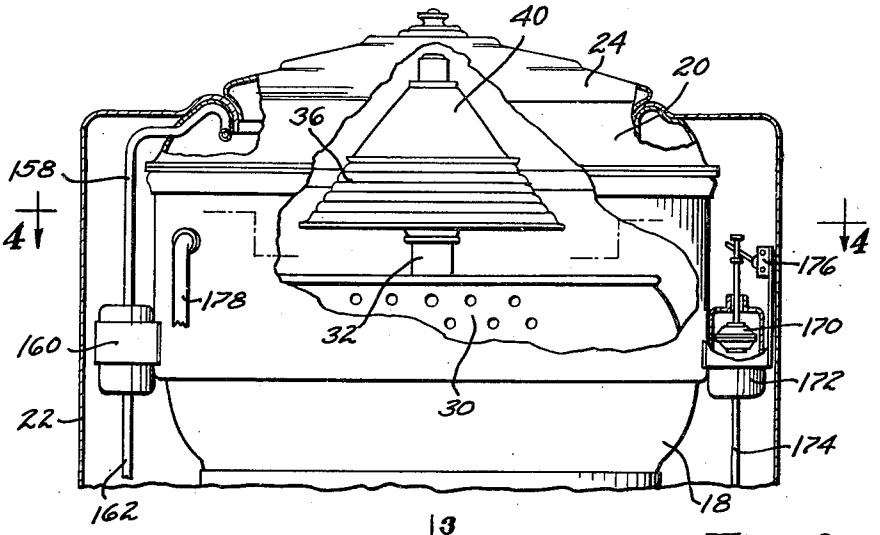

Fig. 3

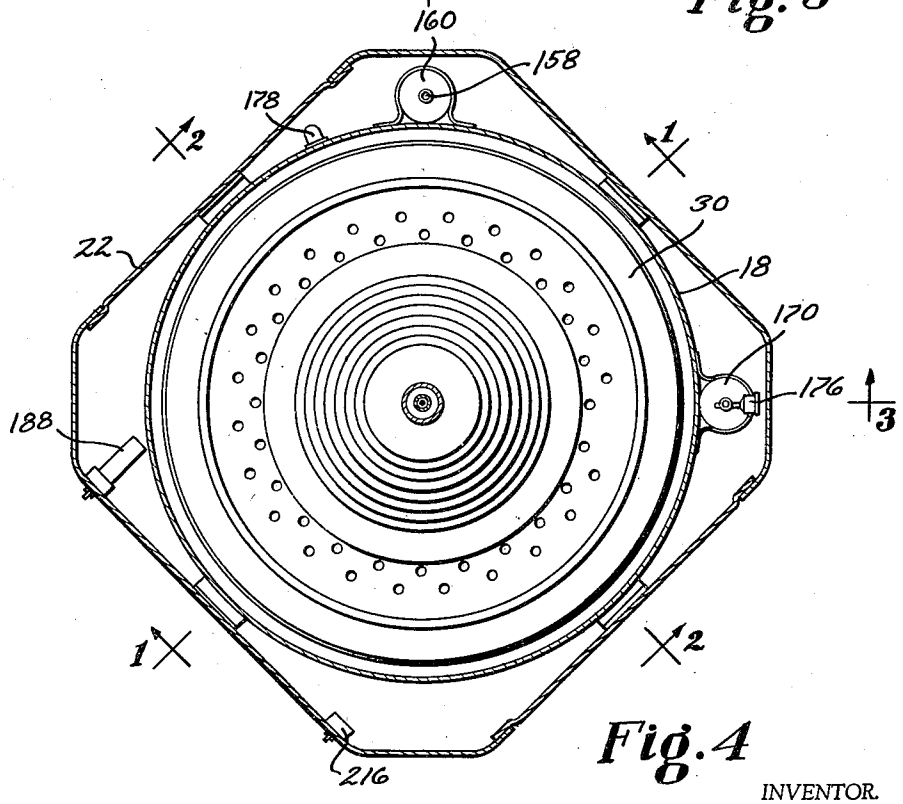

Fig. 4

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WASHING MACHINE

Filed May 28, 1938 5 Sheets-Sheet 4

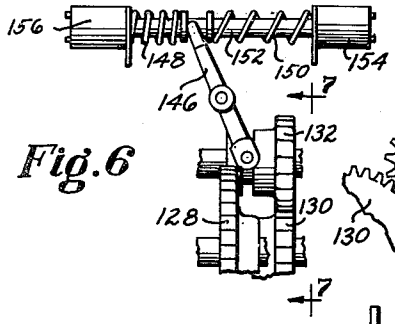

Fig. 6

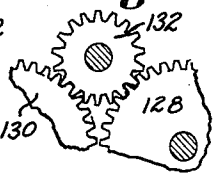

Fig. 7

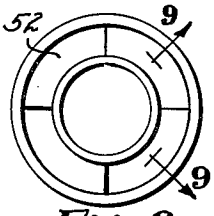

Fig. 8

Fig. 9

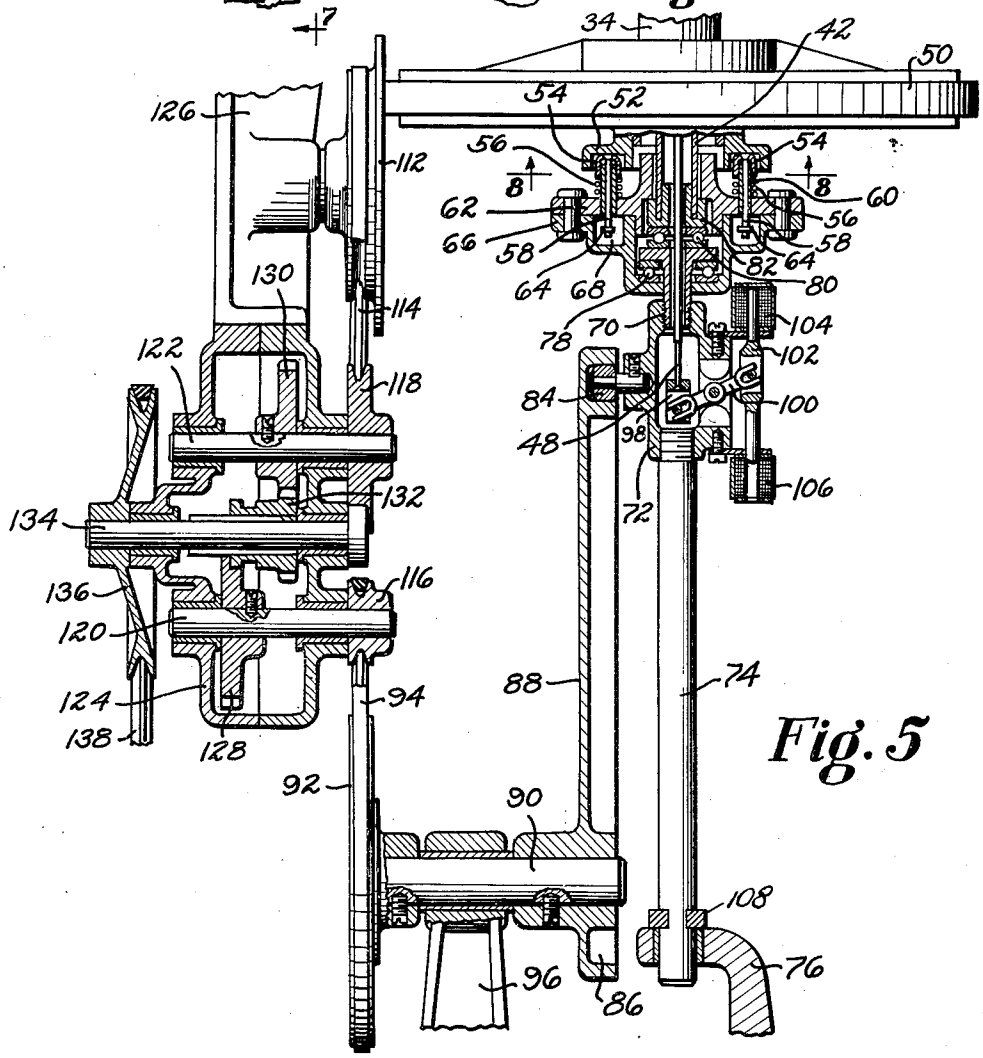

Fig. 5

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WASHING MACHINE

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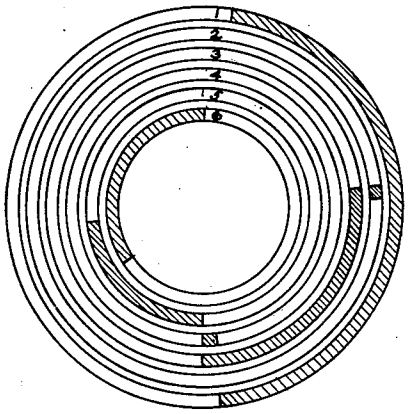


Fig. 13

Fig. 10

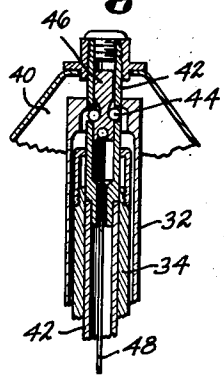


Fig. 11

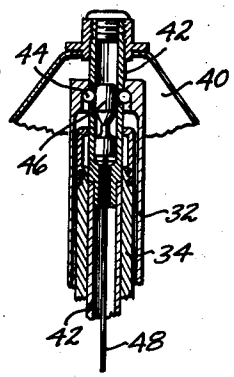
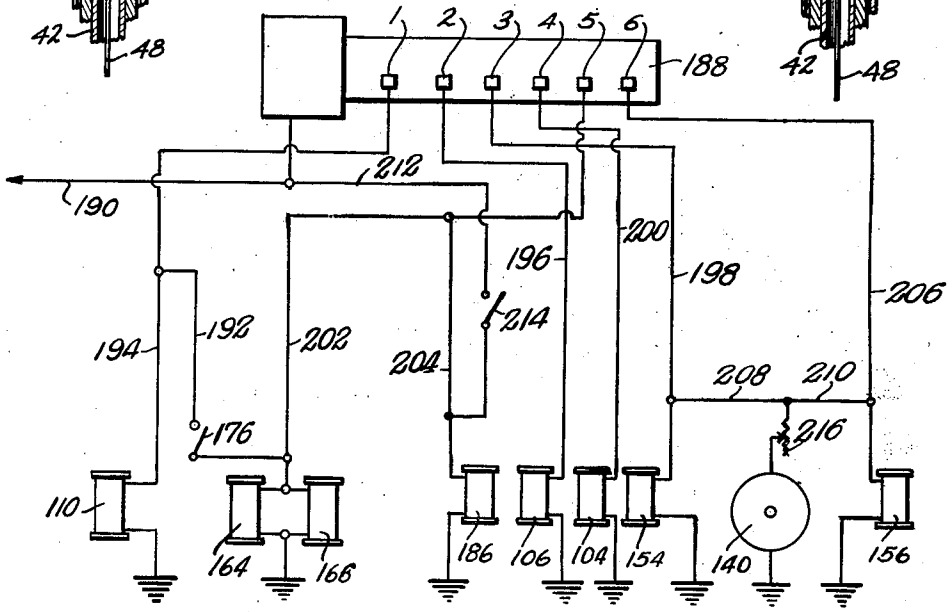


Fig. 12



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UNITED STATES PATENT OFFICE

2,236,748

WASHING MACHINE

Oliver J. Chayie, South Bend, Ind., assignor, by mesne assignments, to American Machine and Metals, Inc., East Moline, Ill., a corporation of Delaware

Application May 28, 1938, Serial No. 210,566

7 Claims. (Cl. 68—12)

This invention relates to washing machines, and is illustrated as embodied in a machine for automatically washing and rinsing and drying the work all in the same container.

An object of the invention is to provide simple and reliable automatic control means for a machine of the type having a basket which is lowered to immerse the work in the wash water while it is washed, and which is then lifted out of the water and rotated to dry the work centrifugally. Another object of the invention is to provide improved water-inlet means for spraying the water from an annular spray just inside the mouth of the basket when in its upper position, to insure a flushing action during rinsing. A further object is to arrange the inlet and drain valves for automatic operation.

Important features of novelty relate to the automatic cycle of operation, to automatic means for operating a clutch for connecting the basket to the agitator, to be raised and lowered and rotated thereby, and to other novel combinations and desirable arrangements, all of which will be apparent from the following description of the illustrative embodiment shown in the accompanying drawings, in which:

Figure 1 is a vertical section through the machine, on the line 1—1 of Figure 4;

Figure 2 is a vertical section through the machine at right angles to Figure 1, on the line 2—2 of Figure 4;

Figure 3 is a vertical section through the upper part of the machine, on the line 3—3 of Figure 4;

Figure 4 is a horizontal section through the machine, on the line 4—4 of Figure 3;

Figure 5 is an enlarged section through part of the drive mechanism, at the left on the line 5—5 of Figure 2 and at the right through the axis of the machine;

Figure 6 is an enlarged elevation of the shifting means for the driving gears;

Figure 7 is a partial elevation on the line 7—7 of Figure 6;

Figure 8 is a bottom plan view, on the line 8—8 of Figure 5, showing a clutch member;

Figure 9 is a partial section on the line 9—9 of Figure 8;

Figures 10 and 11 are partial central vertical sections, on an enlarged scale, of the means for clutching the basket and agitator together, with the parts in different positions;

Figure 12 is a wiring diagram; and

Figure 13 is a diagram of the cycle of the machine.

The machine illustrated comprises a base 10, mounted on sponge rubber blocks 12 having metal plates vulcanized to their upper surfaces and carrying fastenings to secure them to the base, and having vulcanized to their lower surfaces other plates frictionally engaging the floor. The base 10 is provided with a transverse bottom member 14 which supports some of the parts described below.

The base 10 supports a horizontal cast member 16, upon which rests a suitable generally-cylindrical tub 18, shown as formed by permanently securing together a cup-shaped bottom stamping and a cylindrical central member, and detachably securing thereto an annular overhanging top member 20. A cabinet 22 is suspended from the member 20, and forms a housing for the machine. A removable cover 24 is provided for the machine. The annular member 20 has welded to its lower edge a ring 26 fitting within the top of the tub 18. An annular inlet pipe 28 is secured to and within the upper edge of member 20, and is perforated at intervals to discharge a large number of jets downwardly and radially inwardly into the tub.

Within the tub 18 is mounted a perforated basket or clothes container 30, shown made of two main stampings and a reinforcing stamping permanently secured together, and which is arranged for rotation about a vertical axis and for reciprocation upwardly and downwardly in the direction of that axis. The bottom of the basket 30 is secured to the lower end of a hollow shaft 32 which is sleeved about a vertical stationary hollow support or standpipe 34 passing through and permanently centrally secured to the bottom of the tub 18, and fitting within a sleeve formed centrally in the casting 16.

Within the basket 30 is arranged an agitator for washing the clothes, the one shown being a vertically reciprocating vacuum cup or dasher made by permanently securing together three stamped cones 36, 38, and 40 arranged upon a vertical axis. As best shown in Figures 10 and 11, the cone 40 is secured to the upper end of a hollow rotatable and reciprocable shaft 42 which passes down through the stationary standpipe 34. The cone 38 slides upon the hollow shaft 32.

The hollow shafts 42 and 32 are provided at their upper ends (see Figures 10 and 11) with a clutch by which they can be connected and disconnected. The clutch illustrated comprises a series of balls 44 arranged in openings in the wall of shaft 42, and which can be forced out to seat in grooves in the upper end of shaft 32.

The movement of the balls is controlled by a

cam plunger 46 formed with a groove so that in one position (Figure 10) the balls can move inwardly to disconnect the shafts. By moving the cam plunger 46 downwardly to the position of Figure 11, the balls 44 are forced outwardly to clutch the shafts together. It will be noted that the shaft 32 in this position rests on the tops of the balls 44, so that the shaft 42 can now lift the shaft 32 as well as rotate it. The cam plunger 46 is manipulated by a rod 48 passing downwardly through the hollow shaft 42.

A friction drive wheel 50 is journaled on the lower end of the stationary standpipe 34 and carries on its lower face a clutch member 52 formed, as shown in Figures 8 and 9, for one-way driving engagement with plungers 54 urged upwardly by springs 56 and having stems 58 passing through sleeves 60 seated in arms of a carrier plate 62 and provided at their lower ends with nuts or other stops 64 to limit their upward movement.

A lower cover plate 66 bolted to the carrier plate is formed with an annular recess 68 for the lower ends of stems 58, and has rotatably journaled in a central opening a flat-headed sleeve 70 through which the rod 48 passes, and which is threaded into the top of, or otherwise secured to, a carrier casting 72 having depending therefrom a guide plunger 74 passing through a guide opening in a bracket 76 mounted on the base plate 14.

The head of the sleeve 70 rests on a ball thrust bearing 78, and supports another ball thrust bearing 80 engaged by a fitting 82 to which the lower end of the hollow shaft 42 is secured. This fitting 82 has tongue-and-groove interlocking clutching engagement with plate 62, and serves to key that plate to the shaft.

It will be noted that lowering the carrier 72 disengages the plungers 54 from the clutch member 52, while raising it again causes re-engagement, springs 56 yielding if it is necessary for the plungers 54 to slip over the tops of the teeth of clutch 52 before driving engagement takes place. The carrier 72 is reciprocated vertically during washing by a cam-roller 84 riding in a face cam track 86 in one side of a disk 88 eccentrically mounted on a shaft 90 driven through a pulley 92 by a belt 94. The shaft 90 is supported by a bracket 96.

The rod 48 is provided at its lower end with a fitting 98 arranged in a recess in carrier 72, and having a pin received in a fork in one end of a lever 100 pivoted on the carrier 72 and forked at its other end to embrace a pin carried by a core plunger 102 having its ends reciprocating in solenoid coils 104 and 106. All of these parts move up and down with the carrier 72, but only the plates 62 and 66 and the fitting 82 and the hollow shaft 42 rotate when the clutch 52 drives the plungers 54.

When so driven, the carrier 72 is held in upper position by a spring latch plunger 108 mounted on the bracket 76 and forked to fit over a reduced portion of the plunger 74 and operated by a solenoid 110, and the friction disk 50 is driven by a vertical disk 112 rigid with a pulley driven by a belt 114.

The belts 94 and 114 are driven respectively by small and large pulleys 116 and 118 on shafts 120 and 122 mounted in a transmission housing 124 secured to and depending from a bracket 126 bolted to the bottom of the casting 16. This bracket 126 also supports a shaft carrying the drive disk 112 and its pulley.

The shafts 120 and 122 have secured thereon gears 128 and 130, either of which may mesh with a shiftable gear 132 slidably keyed on an intermediate shaft 134 provided with a pulley 136 driven by a belt 138 from a motor 140. The motor 140 (see Figure 1) is mounted on a support 142 pivoted on the bracket 96, and is urged by the weight of the motor and by a spring 144 in a direction to tighten the belt 138.

The gear 132 is shifted yieldingly in one direction or the other, to drive either the disk 50 or the eccentric 88, by a shift lever 146 having a yoke end with the usual pins projecting into a groove in the shift collar of gear 132, and having its forked outer end confined between springs 148 and 150 sleeved on a plunger 152 mounted to serve as the core of two opposed solenoid coils 154 and 156.

Wash water is supplied to the inlet ring 28 through a conduit 158 from a mixing chamber 160 connected by a conduit 162 with hot and cold solenoid-operated inlet valves 164 and 166 (Figure 12) in a valve unit 168 connected in any desired manner to sources of hot and cold water. The normal water level is controlled by a float 170 in a float chamber 172 communicating with the tub through the drain above the drain valve by a conduit 174. The float 170 operates a float switch 176, to cut off the water supply when the water reaches the desired level. There may also be, as a safety measure, an overflow pipe 178 communicating with the drain pipe directly.

The bottom of the tub is provided with a drain fitting 180 communicating with the drain pipe 182 under the control of a drain slide valve 184 operated by a solenoid 186.

The cycle of the machine is controlled by a multiple motor-driven cyclic switch 188, which may be of the construction described in application No. 129,429, filed March 6, 1937, by Rex Earl Bassett, Jr., and John W. Chamberlin, now Patent No. 2,165,884, July 11, 1939, or of the construction described in application No. 240,163, filed November 12, 1938, by Rex Earl Bassett, Jr. This switch controls the various circuits of the machine, shown in Figure 12, the various units being shown grounded and supplied with current from a line 190.

This switch has a shaft driven through one revolution during each cycle of the machine, and provided with cams opening and closing a series of contacts 1, 2, 3, 4, 5, and 6. The timing of the opening and closing of these contacts is shown in the diagram of Figure 13.

Contact 1 controls parallel circuits, one circuit 192 passing through the inlet float switch 176 to the inlet valve solenoids 164 and 166 in parallel and thence to ground, and the other circuit 194 passing independently of and shunting the float switch 176 through the lock solenoid 110 to ground; thus the lock 108 is released whenever the inlet valve circuit 192 is closed, regardless of the float switch 176.

Contact 2 controls a circuit 196 through the solenoid 106, contact 3 controls a circuit 198 through the gearshift solenoid 154, contact 4 controls a circuit 200 through the solenoid 104, contact 5 controls parallel circuits 202 and 204 respectively through the inlet valve solenoids 164 and 166 and through the drain valve solenoid 186 respectively, and contact 6 controls a circuit 206 through the gear shift solenoid 156. Both circuits 198 and 206 are also connected by lines 208 and 210, through the motor 140 to ground,

so that closing either one of said circuits **198** and **206** will cause operation of the motor.

There may also be a parallel circuit **212** from line **190** shunting the multiple switch **188** through a manually operable switch **214** direct to the drain valve solenoid **186**, to facilitate draining the machine at the end of a period of use.

If desired, the machine may also be provided with a rheostat **216** (Figure 4) in the circuit of motor **140**, to vary the motor speed.

In operation, the machine is filled with materials to be washed, sufficient soap powder or the like is supplied, cover **24** is placed firmly in position, and switch **188** turned far enough ahead to start its motor running, to turn its bank of cams through one revolution. The basket at this time is locked in its upper position.

This closes contact **1** through circuits **192** and **194**, causing injection of wash water through the inlet ring **28** until the float valve **176** cuts out, the water passing through the load with a flushing and soaking action, and withdraws the lock plunger **108** ready to lower the basket. Then contacts **2** and **3** close without opening contact **1**, contact **2** only closing momentarily. This raises the plunger **46** to release the lock **44** between shaft **42** and the basket and thereby permits the basket to return to its lowermost position, and shifts the gears to drive disk **88** to reciprocate the agitator **40**, at the same time starting the motor **140**.

Thereafter, for some time, the agitator **40** continues to reciprocate to wash the clothes. Just at the end of this period the contact **4** closes momentarily, closing circuit **200** through the solenoid **104**, so that on the last upward stroke of shaft **42** the basket is raised with it out of the wash water. At the end of the wash period, the spring lock **108** is released by the opening of contact **1** and the motor is stopped by the opening of contact **3**.

Immediately thereafter contact **5** closes, causing rinse water to be injected through the ring **28** and also opening the drain valve. Near the end of this rinse period the contact **6** closes circuit **206** through solenoid **156**, shifting gears to cause the disk **50** to rotate the basket at high speed, at the same time starting motor **140** again.

Shortly after rotation of the clothes basket starts, contact **5** opens again, closing the inlet valves and the drain valve. Some of the cleanest of the rinse water is thus retained in the tub, as it is centrifugally forced from the clothes, to be used as part of the wash water of the next cycle.

While one illustrative embodiment has been described in detail, it is not the intention to limit the scope of the invention to that particular embodiment, or otherwise than by the terms of the appended claims.

I claim:

1. An automatic machine comprising a tub, a basket in said tub mounted for rotation about a vertical axis and for reciprocation in the direction of said axis, a lock device movable to a position to hold the basket in its upper position, an agitator within said basket, a source of power, means for operating the agitator and for raising and lowering the basket and for rotating the basket by power from said source, including a two speed transmission, electrical devices for changing the transmission speed, an automatic control device driven through a predetermined cycle, and connections rendered operative by the control device for releasing the lock device and lowering the basket and operating the agitator while the basket remains in its lower position and for then raising the basket to an upper position and re-engaging the lock device and rotating the basket to dry the contents centrifugally, said connections including a circuit having said power means and the electrical means for shifting the gears to drive the agitator arranged in parallel relationship and another circuit having said power means and the electrical means for shifting the gears to rotate the basket arranged in parallel relationship.

2. A washing machine comprising a tub having a drain with a control valve, an open-top basket inside the tub mounted for rotation about a vertical axis and for movement in the direction of that axis, means operable when the basket is in its lower position for agitating the contents of the basket, means for rotating the basket when in its upper position, power means for operating the basket and the agitating means, an annular water inlet fitting inside the open top of the basket when in its upper position to spray water through the contents with the drain open to rinse them by a flushing action, an electrically operated control valve for said inlet, and an automatic electrical control device for said valves and power means arranged to cause agitation of the clothes with the basket in its lower position and with the tub provided with water by closing the drain valve and opening the inlet valve, and for thereafter raising the basket and opening both valves to rinse said contents, and for finally rotating the basket at high speed with the inlet valve closed to dry the contents centrifugally.

3. A washing machine comprising a tub, a basket in the tub, an agitator within the basket, coaxial vertical hollow shafts connected respectively to the basket and to the agitator, the inner shaft extending below the tub, a clutch at the upper ends of said shafts for connecting them together, operating means for said clutch extending axially downward through the inner one of said shafts, and means below the tub for actuating said operating means.

4. A washing machine comprising a tub, a basket in the tub, an agitator within the basket, coaxial vertical hollow shafts connected respectively to the basket and to the agitator, the inner shaft extending below the tub, a clutch at the upper ends of said shafts for connecting them together, an operating rod for said clutch extending axially downward through the inner one of said shafts, and an electrically-controlled device for actuating said rod supported by said inner shaft below the tub.

5. A washing machine comprising a tub, a basket mounted within said tub, an agitator mounted within the basket, a shaft extending upwardly through the bottom of the tub and having the agitator mounted at its upper end, a hollow shaft surrounding the first shaft and secured to the basket at its lower end and having at its upper end a clutch for connecting it to the first shaft, an operating rod for said clutch extending axially downward through the inner one of said shafts, an electrically-controlled device for actuating said rod supported by said inner shaft below the tub, a motor, connections from the motor to reciprocate and to rotate the first shaft, and automatic control means for engaging and disengaging the clutch and controlling said connections and timed to cause operation of the agita-

tor with the basket in a lower position and then to raise the basket to an upper position and rotate it.

6. A washing machine comprising in combination with a tub having a rotatable and vertically-movable basket arranged therein and with an agitator within the basket, power-driven means for raising and lowering and rotating the basket and for operating the agitator, a multiple timer switch having a plurality of leads therefrom, water-inlet means for the tub having an electric control device, a float controlled by the water level in the tub and actuating an electric control device, said devices connected in series with one of said leads, a lock for holding the basket in its upper position having an electric control device connected to the same lead in parallel with said other control devices, connections from others of said leads for controlling the power-driven means, and a drain valve having an electric control device connected to another of said leads.

7. A washing machine comprising, in combination with a tub having a rotatable and vertically-movable basket arranged therein and with an agitator within the basket, power-driven means for raising and lowering and rotating the basket and for operating the agitator, a multiple timer switch having a plurality of leads therefrom, water-inlet means for the tub having an electric control device, a float controlled by the water level in the tub and actuating an electric control device, said devices connected in series with one of said leads, a lock for holding the basket in its upper position having an electric control device connected to the same lead in parallel with said other control devices, connections from others of said leads for controlling the power-driven means, a drain valve having an electric control device connected to another of said leads, and a connection from another of said leads to the control device of the water-inlet means bypassing the control device of said float.

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