

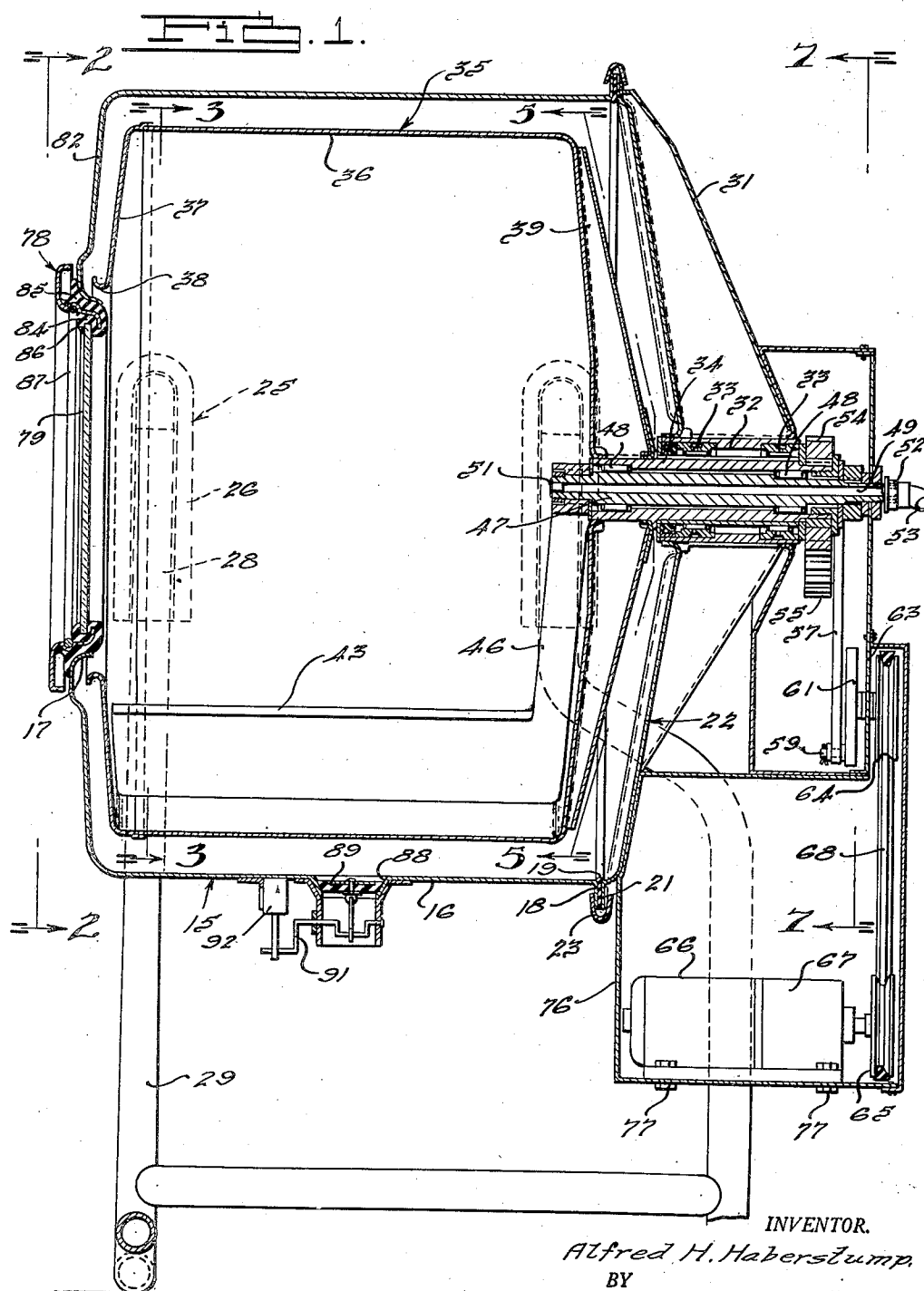
Sept. 5, 1950

A. H. HABERSTUMP
WASHING MACHINE FOR SQUEEZING FABRICS DURING
THE WASHING, RINSING, AND DRYING CYCLES

2,521,578

Filed Sept. 11, 1943

5 Sheets-Sheet 1



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5 Sheets-Sheet 2.

FIG. 2.

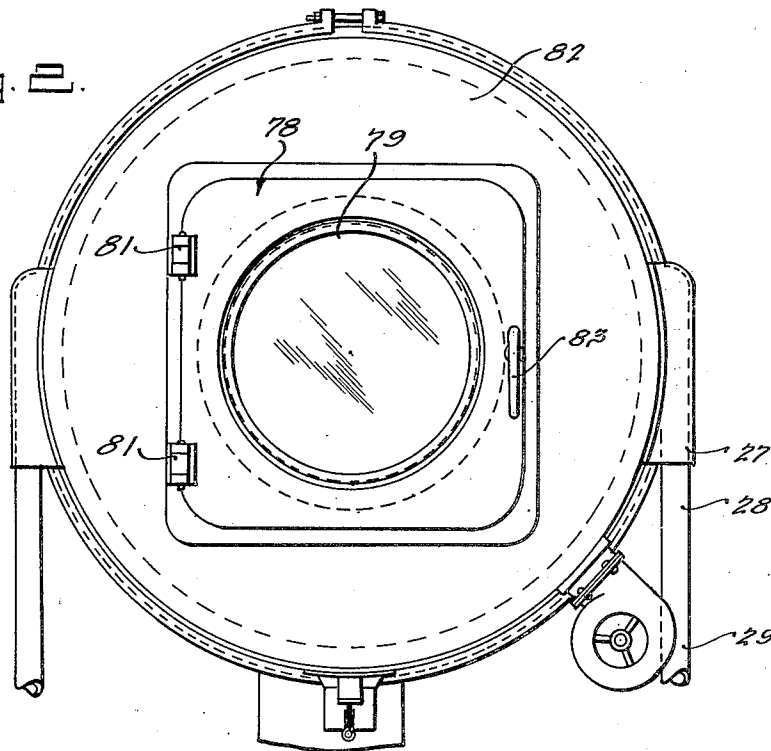
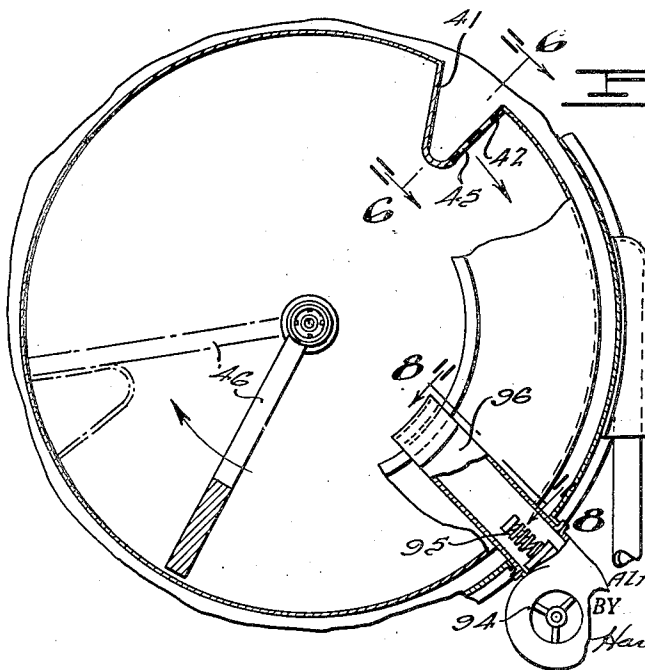


FIG. 3.



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5 Sheets-Sheet 3

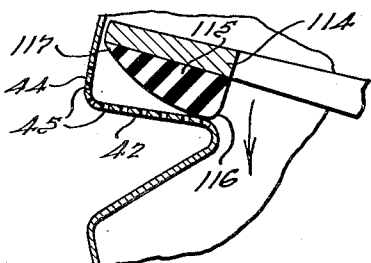


FIG. 4.

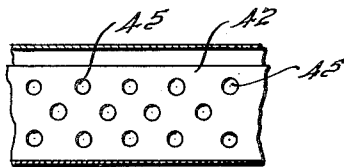


FIG. 5.

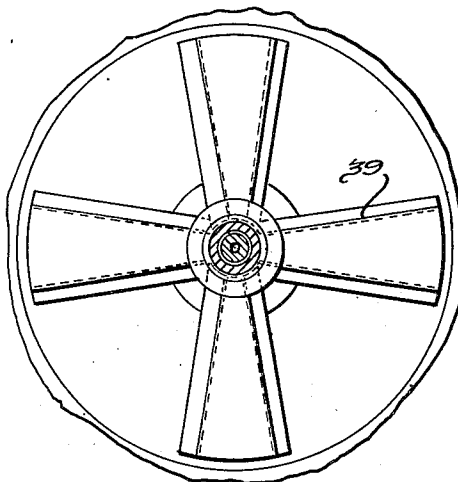


FIG. 6.

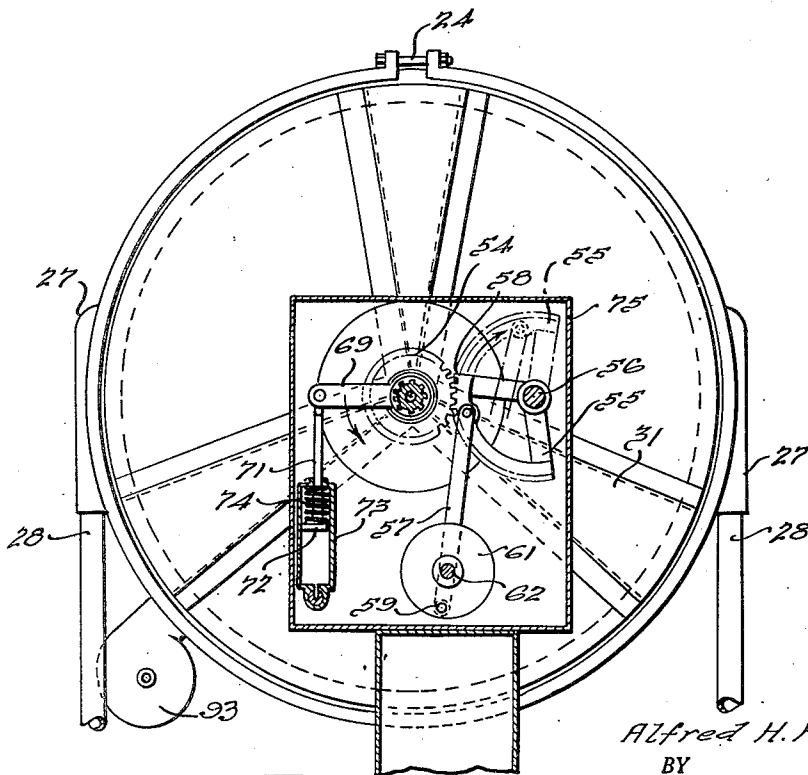


FIG. 7.

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5 Sheets-Sheet 4

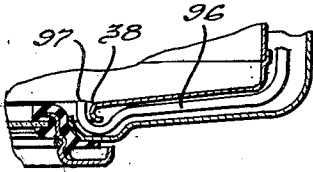


FIG. 8.

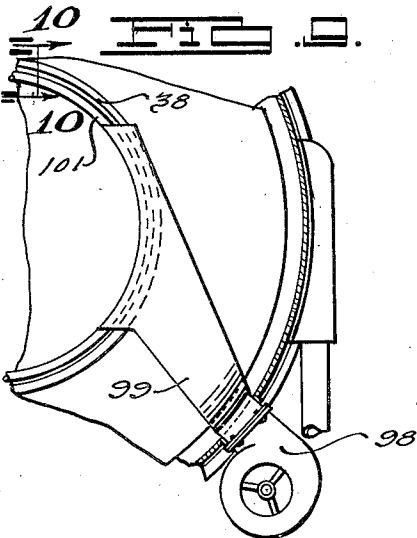


FIG. 9.

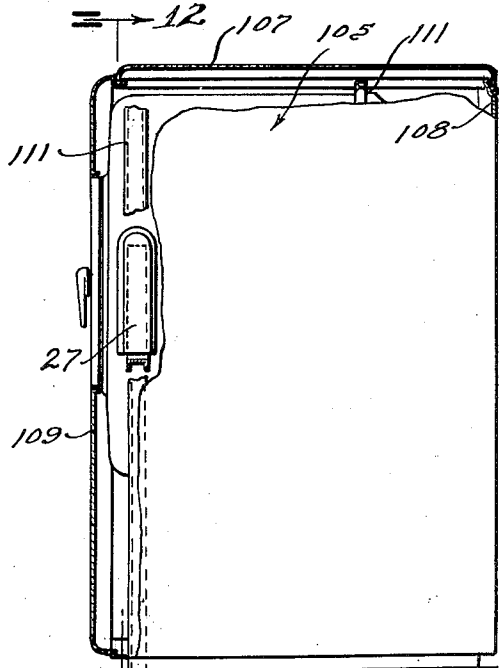


FIG. 10.

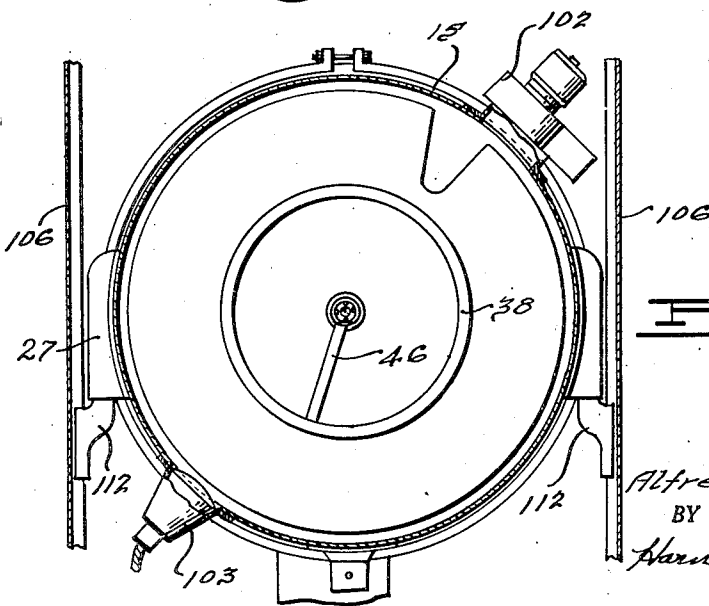
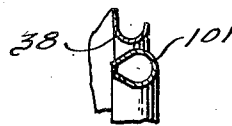


FIG. 12.

FIG. 11.

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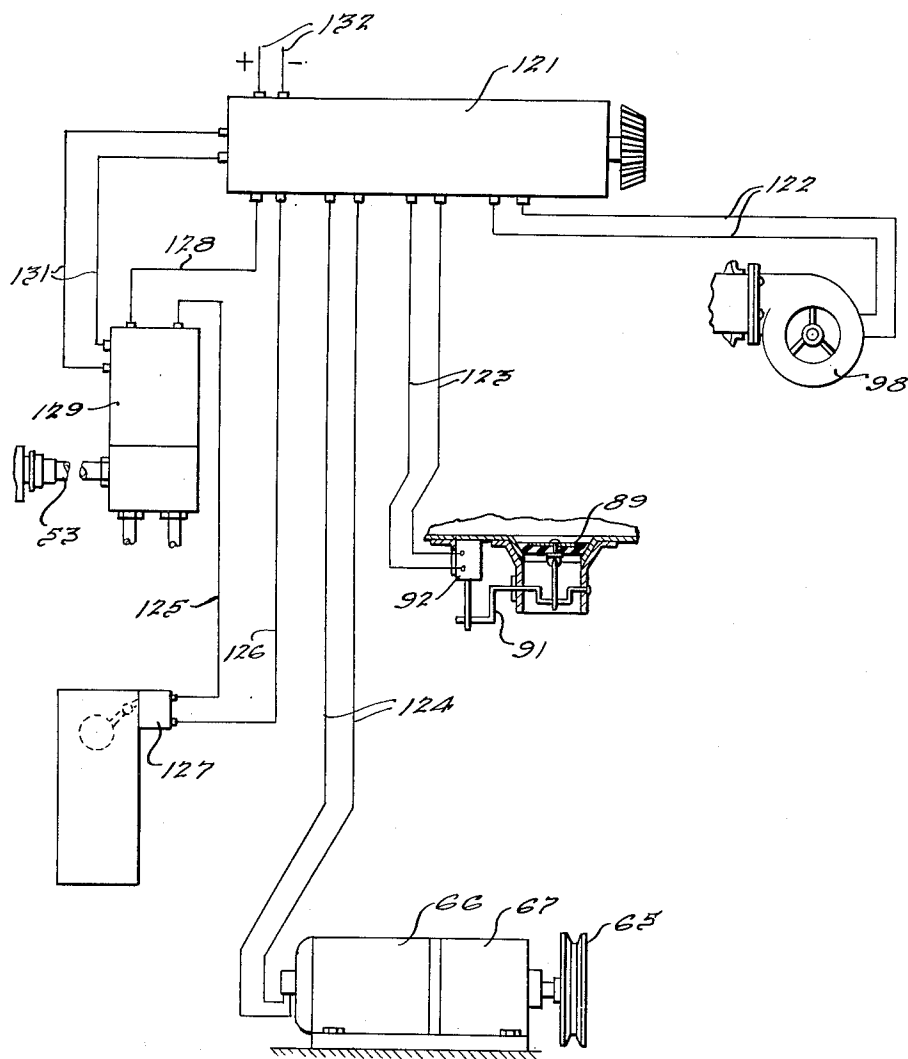


FIG. 13

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UNITED STATES PATENT OFFICE

2,521,578

WASHING MACHINE FOR SQUEEZING FABRICS DURING THE WASHING, RINSING, AND DRYING CYCLES

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Application September 11, 1943, Serial No. 501,919

5 Claims. (Cl. 68—19)

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This invention relates to washing machine and particularly to a washing machine of the squeeze bar type which tumbles and squeezes the clothes when washing, rinsing and wet drying the clothes during an automatic cycle.

The washing machine of the present invention employs the principle of agitating and squeezing the clothes, to force the water therethrough so as to carry the dirt particles from the interior of the clothes as well as from the exterior surface thereof.

For producing this action, the machine of the present invention embodies a cylindrical tub having its axis disposed horizontally and supported on a frame which engages the periphery of the tub in the plane of its axis. This leaves the ends of the cylinder free of any supporting structure.

The cylinder is preferably made from a pot-shaped stamping having the central portion of the end wall cut away providing an opening through which the clothes are placed within the cylinder. The opposite end of the cylinder is enclosed by a reinforced dish-shaped element having a bearing on its center axis. A rotor is mounted within the cylinder having a hollow shaft on the inner end which is journaled in the bearing on the closure element with the opposite end containing an opening aligned with the opening in the end wall of the tub. A door is mounted on the end wall of the tub for enclosing and sealing the opening thereof. The door may be provided with a window through which the machine operation may be observed. The rotor is provided with an inwardly projecting shoulder on its peripheral wall parallel to the rotor axis, having a plurality of holes therethrough through which the water, squeezed from the clothes, may pass.

A squeeze bar is mounted in the rotor in position to engage and squeeze the clothes against the shoulder. A shaft is attached to the squeeze bar and is journaled in the hollow shaft of the rotor beyond which it extends exteriorly of the cylinder closure element. Mechanism is provided for driving the rotor in oscillation through substantially 270° of arc. An additional mechanism is employed engaging the squeeze bar shaft for applying elastic resistance to its movement. The mechanisms are mounted on the cylinder closure element within a casing supported thereon. A solenoid operated drain valve is provided on the bottom of the tub and a float actuated switch controls the water level within the tub. A motor is employed for driving the rotor operating mechanism and a time switch is utilized for operating the machine through an entire clothes washing, rinsing and drying cycle.

Solenoid operated hot and cold water valves, which are thermostatically controlled, are attached to the inlet opening of the machine. This

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may be a passageway through the shaft attached to the squeeze bar. A blower and heating element may be employed on the tub for agitating the air and applying heat to the clothes within the cylinder and rotor during the drying cycle.

When clothes are to be washed, they are placed within the rotor through the aligned openings in the end walls of the rotor and the tub and the door on the tub is closed. Lukewarm water is conducted to the tub and the rotor is oscillated to tumble and squeeze the clothes during the soaking cycle. Thereafter soap is placed within the rotor and the time switch is set to operate the machine through the entire washing cycle.

Water is first introduced to the tub through the inlet valves which are actuated by a solenoid after the drain valve is closed. The water sprays over the clothes until it rises to a predetermined level, controlled by a float that actuates a switch which de-energizes the solenoid of the inlet valves. These are moved to closed position and the motor is then driven to operate the rotor in oscillation. The clothes are tumbled when the rotor is moved in a direction to move the shoulder away from the squeeze bar and upon the reverse cycle of oscillation, some of the clothes are picked up by the shoulder and moved against the squeeze bar to force the water therefrom as the clothes are further squeezed as the squeeze bar movement is increasingly resisted. The clothes are continuously tumbled and squeezed within the wash water for a predetermined time, after which the drain valve is opened to permit the wash water to pass to the drain. Thereafter, the valves are opened to admit rinse water into the tub, which is sprayed over the clothes for a time to wash the suds and wash water therefrom. Thereafter, the drain valve is closed and the water rises to the predetermined height until the valves are again closed by the operation of the float actuated switch. The continued operation of the machine tumbles and squeezes the clothes in the rinse water for a predetermined time until the drain valve is again opened and the water flows to the drain. The rinsing cycle may be repeated, if desired, but usually a single rinse cycle is sufficient.

The continued operation of the machine tumbles and squeezes the clothes to produce the wet drying cycle. This operation may be augmented by the agitation of air in the rotor and tub and the application of heat thereto. The air may be withdrawn from the rotor or may be forced therein and in the latter case this air may be heated by an electric element associated with the blower. The heat may be applied from a separate electric heating element, or from an infrared ray lamp disposed in the wall of the tub. After a predetermined time, the operation of the rotor is interrupted and the door on the tub may then be

opened and the clothes removed to complete the clothes washing cycle.

Accordingly, the main objects of this invention are: to provide a washing machine which tumbles and squeezes the clothes automatically through a washing, rinsing and drying cycle; to provide a washing machine having a tub with a bearing in one end wall in which a hollow shaft is mounted for oscillating a rotor within the tub against a squeeze bar having a shaft journaled in the hollow rotor which offers elastic resilience to the squeezing of the clothes as the clothes are tumbled and squeezed during the operating cycles; to mount a tub on a support and a rotor and squeeze bar therewithin on the end wall of the tub on which the mechanism for driving the rotor and applying the elastic resistance to the movement of the squeeze bar is supported; and, in general, to provide a washing machine which automatically tumbles and squeezes the clothes through an entire washing cycle which is simple in construction, positive of operation and economical of manufacture.

Other objects and features of novelty of this invention will be specifically pointed out or will become apparent when referring, for a better understanding of the invention, to the following description taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a sectional view of a washing machine embodying features of this invention;

Fig. 2 is a front view in elevation of the machine illustrated in Fig. 1;

Fig. 3 is a sectional view of the structure illustrated in Fig. 1, taken on the line 3—3 thereof;

Fig. 4 is a broken sectional view of structure, similar to that illustrated in Fig. 2, showing a modified form thereof;

Fig. 5 is a sectional view of the structure illustrated in Fig. 1, taken on the line 5—5 thereof;

Fig. 6 is a sectional view of the structure illustrated in Fig. 3, taken on the line 6—6 thereof;

Fig. 7 is a sectional view of the structure illustrated in Fig. 1, taken on the line 7—7 thereof;

Fig. 8 is a sectional view of the structure illustrated in Fig. 3, taken on the line 8—8 thereof;

Fig. 9 is a view of structure, similar to that illustrated in Fig. 2, showing a modified form thereof;

Fig. 10 is an enlarged sectional view of the structure illustrated in Fig. 9, taken on the line 10—10 thereof;

Fig. 11 is a view of structure, similar to that illustrated in Fig. 1, with the washing machine mounted within a cabinet;

Fig. 12 is a sectional view of the structure illustrated in Fig. 11, taken on the line 12—12 thereof; and

Fig. 13 is a diagrammatic view of the driving and control elements of the machine illustrated in Fig. 1, which produces the time cycle of operation.

The washing machine, as illustrated in Figs. 1 to 8, inclusive, embodies a tube 15 constructed from a pot-shaped stamping 16 having an inwardly flanged opening 17 in its end wall. The opposite end of the stamping 16 is provided with an outwardly projected flange 18 against which a rubber sealing element 19 is pressed by a flange 21 on the end closure element 22. An annular U-shaped band 23 spans the flanges 18 and 21 and draws the flanges tightly against the sealing element 19 when a bolt 24, illustrated in Fig. 7, draws the ends of the bands together.

Sheet metal channel elements 25 provided with

a lateral flange 26 are welded to the periphery of the stamping 16 to form sockets 27 which are open at the bottom for receiving the ends 28 of a pipe frame 29 which supports the tub. The closure element 22 is provided with channel-shaped stampings 31, as illustrated in Figs. 1 and 7, for reinforcing the closure element and providing a support for a centrally disposed bearing supporting sleeve 32. Roller bearings 33 are mounted within the sleeve 32 in engagement with a hollow shaft 34, the inner end of which is attached to a rotor 35 disposed within the tub 15.

The rotor is constructed from a pot-shaped stamping 36 having an end element 37 provided with a flanged opening 38 aligned with the opening 17 in the tub. Reinforcing ribs 39 are provided on the supported end of the rotor, as illustrated in Fig. 5. The rotor has a portion of its end peripheral wall extending inwardly at 41, as illustrated in Figs. 3 and 4. This inwardly extending portion of the periphery forms a shoulder 42 parallel to the axis of the rotor and aligned with a squeeze bar 43 having an area substantially equal to that of the shoulder. The shoulder and the adjoining wall portion 44 are provided with a plurality of apertures 45 through which the water squeezed from the clothes may pass to within the tub. The squeeze bar 43 has an arm 46 adjacent to the wall of the rotor, the end of which is mounted on a shaft 47 which is journaled in the shaft 34 on roller bearings 48. The shaft 47 contains a passageway 49 for the water which is to be conducted into the tub. The inner end of the shaft 47 is provided with a spray nozzle 51 while the outer end of the shaft has a connector 52 for attaching a flexible conduit 53 thereto.

A gear 54 is mounted on the shaft 34, the teeth of which are in mesh with the teeth of a gear segment 55, which is supported on a stub shaft 56. A pitman 57 is pivoted on the pin 58 on the gear segment 55 and on a pin 59 on a disc 61. The disc is attached to a shaft 62 which is journaled on a plate 63 and driven by a pulley 64 attached to the shaft 62. The pulley is aligned with the pulley 65 on a motor 66 having a gear reduction unit 67 mounted in extension thereof for driving a belt 68 at reduced speed. The belt drives the pulley 64 for oscillating the gear segment 55 which oscillates the gear 54 and the rotor 35.

The shaft 47 has an arm 69 secured thereto which is connected to a piston rod 71 on a piston 72 mounted within an oscillatable cylinder 73. A spring 74 is mounted between the piston 72 and the top of the cylinder to act as a buffer for the squeeze bar 43. The arm 69, cylinder 73, gear 54, segment 55, pitman 57 and disc 61 are mounted within a housing 75 supported on the closure element 22 of the tub. The element also supports a housing 76 upon which the motor 66 is supported by bolts 77 and which encloses the pulleys 64 and 65 and the belt 68.

A door 78, containing a window 79, is mounted by a pair of hinges 81 on the end wall 82 of the tub 15. A latch is mounted on the door, operated by a handle 83 by which the door is retained in sealed relation with the flanged opening 17 provided in the end wall. The door 78 is made from a stamping having an inwardly directed flange 84 which projects into a slot in a rubber sealing element 85. A slot 86 in the sealing element receives the window 79 and the rubber sealing element is retained in position by a split clamping ring 87.

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As illustrated more specifically in Fig. 1, a drain opening 88 is provided in the bottom of the tub, in which a drain valve 89 is seated and operated by a crank 91 and a solenoid 92. In Fig. 7, a blower 93 is illustrated attached to the peripheral wall of the tub 15 for forcing air into the tub and rotor during the drying operation.

In Fig. 3, a blower 94 is illustrated having an electrically operated heating unit 95 disposed in an air passageway 96. As illustrated in Fig. 8, the passageway terminates in a nozzle 97 which extends through the opening 38 in the rotor for directing the air onto the clothes.

In Fig. 9, a blower 98 is illustrated having a passageway 99 which is joined to an annular nozzle 101 disposed within the opening 38 of the rotor. An annular stream of air is directed by the nozzle 101 into the rotor as the clothes are tumbled therein during the drying operation.

In Fig. 12, an air suction device 102 is mounted on the peripheral wall of the tub 15 for drawing air from the tub during the drying operation. An infrared ray lamp 103 is mounted in the peripheral wall of the tub 15 for providing heat to the rotor and clothes during the drying operation.

In Figs. 11 and 12, a cabinet 105 is illustrated, made up of side panels 106, a top panel 107, a rear panel 108 and a front closure panel 109. Vertically disposed channel frame elements 111 are provided on the side panels 106 aligned with the sockets 27. The frame elements have offset supporting arms 112 which project into the sockets 27 and support the tub and the operating mechanism within the cabinet.

In Fig. 4, a squeeze bar 114 is illustrated which is similar to the squeeze bar 43, but which has a soft pad 115, of rubber or other material, attached to the shoulder engaging face thereof. The pad has a thick end portion 116 at the inner edge from which the surface tapers to the outer end at 117. With this construction, the end 116 first engages the clothes to force them against the inner end of the shoulder 42, and as the rotor continues to move upwardly, as viewed in the figure, the pad applies increasing pressure to the clothes from the inner end of the shoulder toward the outer or wall engaging portion thereof, as the squeeze bar offers increasing resistance to the rotor movement. This occurs during the downward movement of the plunger 72 compressing the air in the cylinder 73. With this construction, the water is trapped at the inner end of the shoulder and is progressively forced toward the outer end and through the openings 45 in the shoulder and the adjoining wall portion 44. The water passing through the openings will run off into the tub and pass to the drain. This trapping and forcing of the water through the apertures 45 provides greater efficiency for the drying operation. The water is prevented from moving from the portion of the clothes being squeezed to the unsqueezed portion. This might occur if the clothes were not sealed by the application of greater pressure at the outer end of the shoulder as provided by the structure of Fig. 4.

In Fig. 13, a schematic diagram illustrates the operation of the machine for performing a completely automatic washing cycle. A time control switch 121 is of conventional form and is provided with an escapement movement and a plurality of contacts which operate in sequence after a predetermined lapse of time. One set of contacts is connected through the conductors 122 to the blower 98. Another set of conductors 123 are

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joined to the solenoid 92 of the drain valve 89. Another set of conductors 124 are joined to the motor 66. Another set of conductors 125 and 126 are connected to a float operated switch 127. The conductor 125 and a conductor 128 are connected to the solenoid operated hot and cold water mixing valves 129 from which a set of conductors 131 are joined to the time control switch 121. Current is supplied to the time switch 121 by the conductors 132.

When a washing operation is to be performed by the machine, the clothes are first inserted in the rotor 35 and the door 78 is moved to closed, sealed position with the wall 82 of the tub 15. The time switch is operated to open the mixing valves 129 to introduce lukewarm water into the tub, after which the machine is operated to tumble and squeeze the clothes during a soaking cycle. After a predetermined time, the drain is opened to permit the soaking water to pass from the tub. Soap is then introduced into the tub and the time switch is set to perform the automatic washing cycle. The drain valve is closed and the mixing valves 129 are opened to introduce hot water through the flexible conductor 53, the passageway 49, the nozzle 51 to the clothes within the rotor. The water will continue flowing in this manner until the float switch 127 is actuated by the float which controls the height of the water within the tub 15. The actuation of the switch 127 operates the mixing valves 129 to closed position and completes a circuit through the switch 121 to the motor 66 for producing its operation. The motor oscillates the rotor which tumbles the clothes and moves a portion of the clothes against the squeeze bar 43. This redistributes the clothes and compacts them within the wash water for a predetermined time. After sufficient time has elapsed, the circuit 123 is energized to operate the solenoid 92 for opening the drain valve 89 and permitting the wash water to flow to the drain. At the same time, the circuit to the solenoid of the mixing valves 129 is closed for opening the valves and permitting fresh water to again pass from the nozzle 51 into the rotor. The flow will continue for a predetermined time to wash out the suds and wash water from the clothes and the tub wall. Thereafter, the circuit 123 is opened to de-energize the solenoid 92 to permit the drain valve 89 to close and collect the water within the tub. The height of the water will increase until the float operates the switch 127 to de-energize the solenoid of the mixing valves 129 which move to closed position. During this time the rotor continues to oscillate to tumble and squeeze the clothes through the rinsing cycle. After a predetermined time, the drain valve 89 is opened to permit the water to pass to drain and the operation is continued to perform the wet drying cycle. In this cycle, the clothes are tumbled and squeezed to force the water through the apertures in the shoulder and the edge adjacent thereto, which operation may be augmented by the use of heat and air. A suction device or blower may communicate with the interior of the tub and rotor for moving the air therein and heat from an electric heating element or infrared ray lamp may be introduced to the tub directly or by heating the air in the blower passage. After a predetermined time, the operation is interrupted and the entire washing and drying cycle has then been completed. It is only necessary for the operator to open the door, remove the clothes from the machine and hang them on a line for final drying.

What is claimed is:

1. In a clothes washing machine, a tub having a horizontal axis, a support for said tub, a rotor in said tub having a peripheral wall and spaced end walls, a hollow shaft for supporting said rotor at one end journaled in one wall of the tub, a shoulder on said peripheral wall extending inwardly toward said rotor axis an amount less than one-half the distance between said axis and peripheral wall, a squeeze bar of a width substantially equal to the height of said shoulder, an arm on one end only of said squeeze bar extending along the end wall of the rotor to which said hollow shaft is secured, a stub shaft extending through said hollow shaft and engaging said arm for supporting said squeeze bar for movement toward and away from said shoulder, means for driving said rotor for producing relative oscillation between said squeeze bar and shoulder while driving said rotor for squeezing fabrics between said squeeze bar and shoulder as other of the fabrics tumble thereover as a result of the driving of said rotor, resilient means for controlling the pressure produced during each squeezing operation, said driving means being supported solely by said tub, and a casing for enclosing said driving means supported by said tub independent of its support.

2. In a clothes washing machine, a cylindrical tub having a horizontal axis and having a peripheral wall enclosed at one end by a wall containing an opening and at the opposite end by a removable wall, a bearing on the axis of said removable wall, a hollow shaft in said bearing, a rotor supported by said hollow shaft, said rotor having a shoulder projecting inwardly from the peripheral wall but spaced from the axis of the rotor an amount greater than one-half the distance between the peripheral wall and axis, a squeeze bar within said rotor having a width equal substantially to the height of said shoulder, an arm projecting from one end only of said squeeze bar to the axis of the rotor, a stub shaft journaled within the hollow shaft to which said arm is attached for permitting relative swinging movement between said squeeze bar and shoulder, means for driving said rotor supported on the removable end wall of the tub, and a casing enclosing said driving mechanism secured to said removable end wall.

3. In a clothes washing machine, a cylindrical tub having a horizontal axis and having a peripheral wall enclosed at one end by a wall containing an opening and at the opposite end by a removable wall, a bearing on the axis of said removable wall, a hollow shaft in said bearing, a rotor supported by said hollow shaft, said rotor having a shoulder projecting inwardly from the peripheral wall but spaced from the axis of the rotor an amount greater than one-half the distance between the peripheral wall and axis, a squeeze bar within said rotor having a width equal substantially to the height of said shoulder, an arm projecting from one end only of said squeeze bar to the axis of the rotor, a stub shaft journaled within the hollow shaft to which said arm is attached for permitting relative swinging movement between said squeeze bar and shoulder, means for driving said rotor supported on the removable end wall of the tub, a casing enclosing said driving mechanism secured to said removable end wall, spaced means on opposite sides of said tub by which said tub is supported, and a base secured to said spaced means.

4. In a clothes washing machine, a cylindrical tub having a horizontal axis and having a peripheral wall enclosed at one end by a wall containing an opening and at the opposite end by a removable wall, a bearing on the axis of said removable wall, a hollow shaft in said bearing, a rotor supported by said hollow shaft, said rotor having a shoulder projecting inwardly from the peripheral wall but spaced from the axis of the rotor an amount greater than one-half the distance between the peripheral wall and axis, a squeeze bar within said rotor having a width equal substantially to the height of said shoulder, an arm projecting from one end only of said squeeze bar to the axis of said rotor, a stub shaft journaled within the hollow shaft to which said arm is attached for permitting relative swinging movement between said squeeze bar and shoulder, means for driving said rotor supported on the removable end wall of the tub, a casing enclosing said driving mechanism secured to said removable end wall, spaced, downwardly presenting sockets on opposite sides of the tub, and a base having upwardly projecting fingers which extend into said sockets for providing the sole support for said machine.

5. In a clothes washing machine, a tub, a rotor in said tub mounted for rotation about a horizontal axis and having an open end and at least one inwardly projecting shoulder, means for driving said rotor, a squeeze bar in said rotor for pressing clothes against said shoulder for washing and drying the clothes, means yieldably supporting said squeeze bar, means for circulating air through the tub and rotor while the rotor is being driven during the drying operation, said circulating means embodying a blower, and a ring-shaped nozzle projecting into the open end of the rotor adjacent to the marginal edge thereof.

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