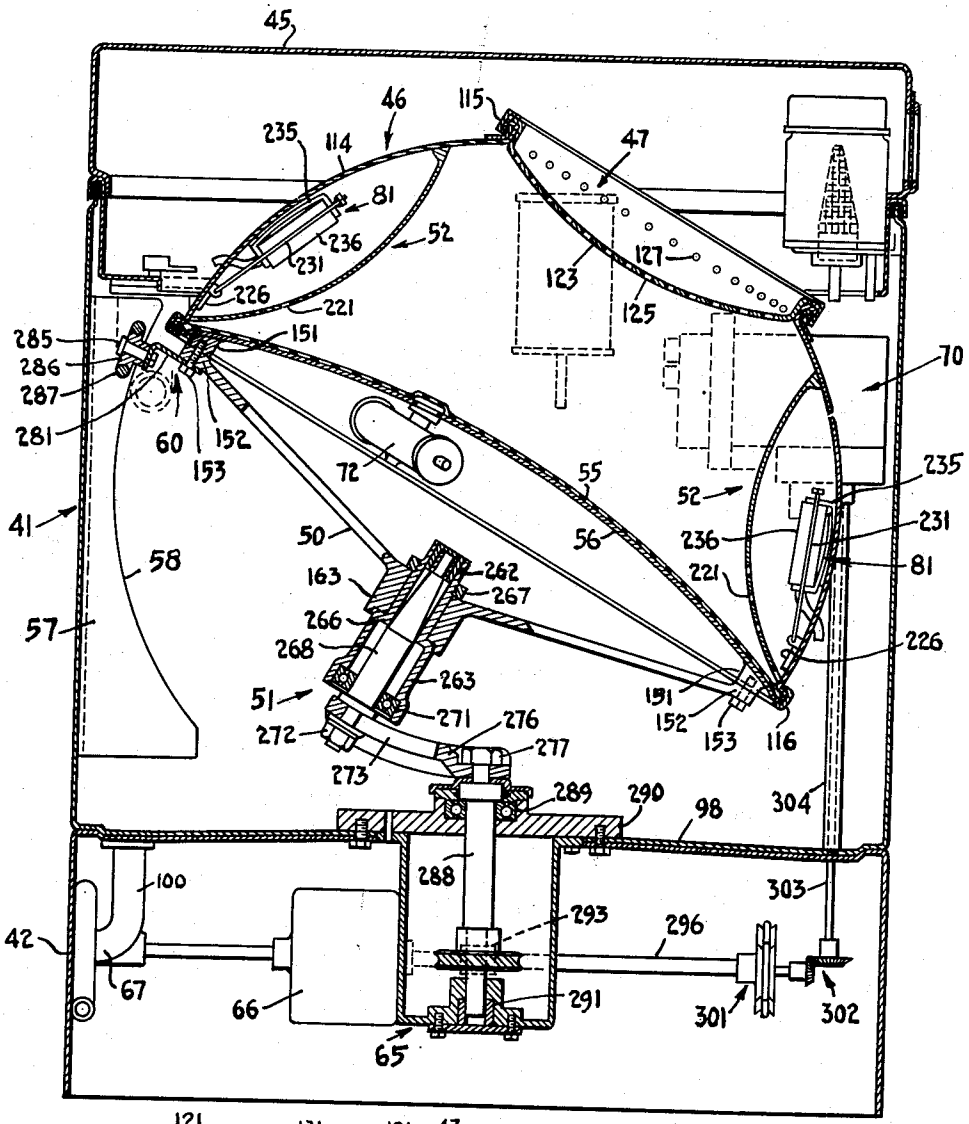
Dec. 22, 1953 G. C. GRAHAM 2,663,176

WASHING MACHINE

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FIG. 1



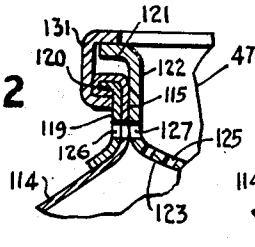


FIG. 2

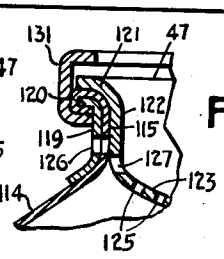


FIG. 3

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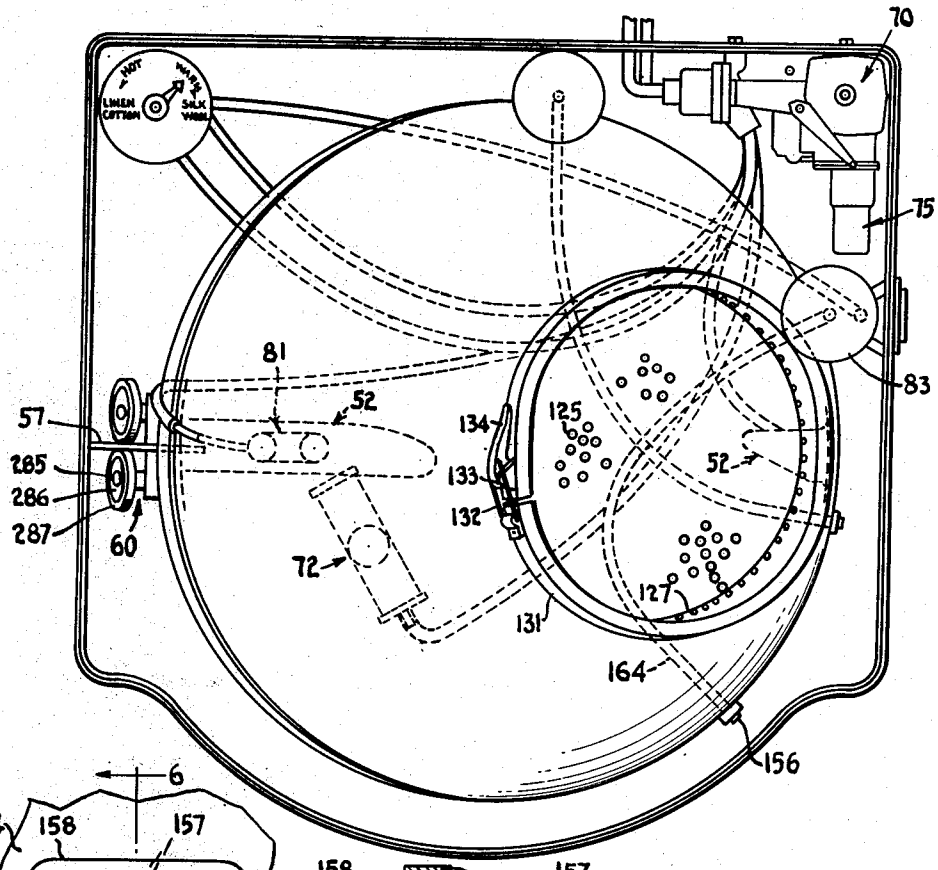
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WASHING MACHINE

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FIG. 4



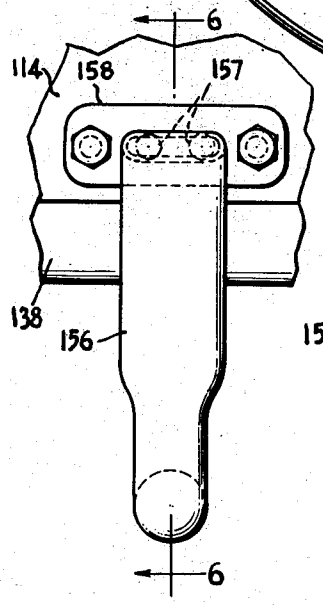


FIG. 5

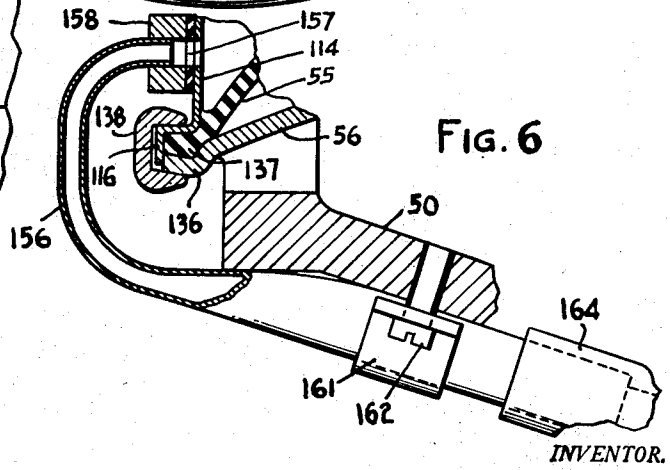


FIG. 6

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FIG. 7

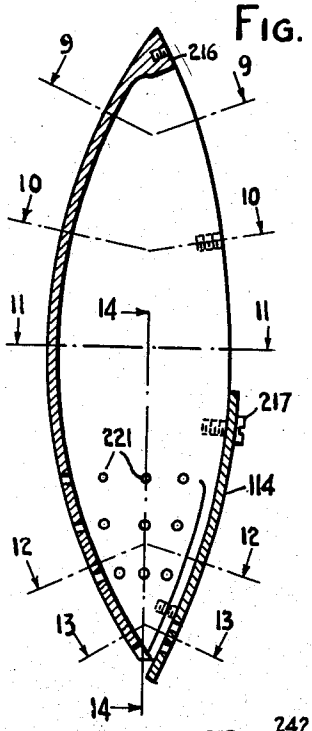
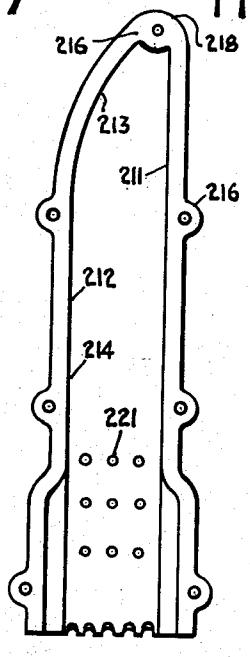


FIG. 8



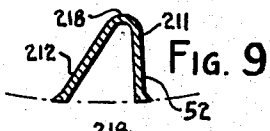


FIG. 9

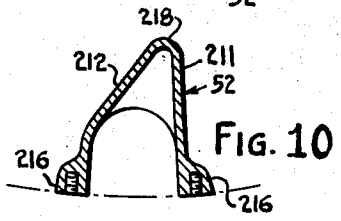


FIG. 10

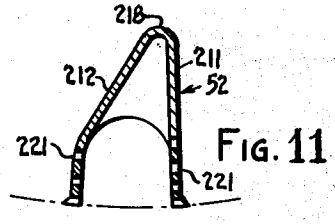


FIG. 11

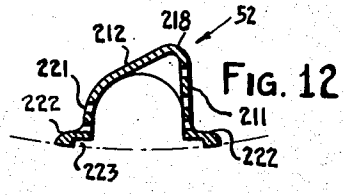


FIG. 12

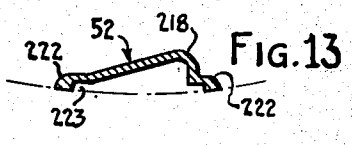
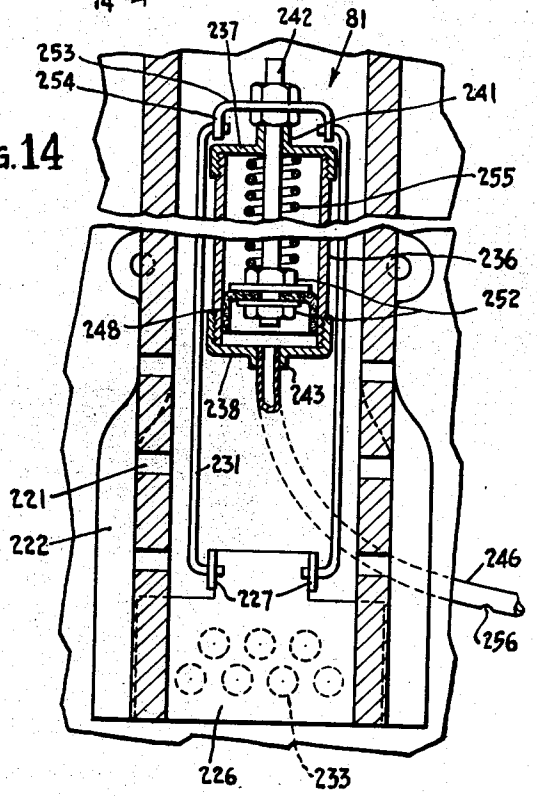


FIG. 13

FIG. 14



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Patented Dec. 22, 1953

2,663,176

UNITED STATES PATENT OFFICE

2,663,176

WASHING MACHINE

George C. Graham, Ridgewood, N. J., assignor to Graham & Barker, Ridgewood, N. J., a limited partnership

Original application July 26, 1944, Serial No. 546,596. Divided and this application November 15, 1948, Serial No. 60,117

5 Claims. (Cl. 68—171)

1

My invention relates to washing machines and is here illustrated, by way of example, in connection with a household laundry machine.

This application is a division of my co-pending application Serial No. 546,596, filed July 26, 1944, entitled Automatic Washing Machines, now Patent No. 2,453,707, issued November 16, 1948, to which reference may be had.

The present application has to do with the new and improved washing action and the unique construction of various parts of the washing machine. It will be recognized that the principle illustrated may be changed in various respects for different types of washers and for different fields of use, within the spirit and scope of my invention.

Among the objects of the invention are, to render the washing action more effective, as providing for obtaining a more or less energetic washing action, for the flushing off of scum, etc., from the wash water prior to rinsing, and the provision of improved baffle means in the washing chamber or tub.

Another object of the invention is to improve the draining facilities of a washing chamber whereby to better clean the wash batch, and to reduce the operating period.

Further objects of the invention are to provide a new and improved method of producing a gyratory tub movement, to arrange for the adjustment thereof as needed, and a new and improved water inlet arrangement which also is operable as a spray rinse for the washed clothes.

A still further object of the invention is to provide a washing machine of the above indicated character that shall be simple and durable in construction, economical to manufacture, and effective in operation.

The invention will be better understood from the following description, taken in conjunction with the accompanying drawings, in which—

Fig. 1 is a substantially central section in vertical plane of a machine constructed in accordance with one example of the invention, drawn to a considerably reduced scale, and certain parts being omitted for clarity of illustration;

Fig. 2 is an enlarged detail view of the relationship of the cover and the washing machine tub; and

Fig. 3 is a view similar to Fig. 2, with the parts thereof in different position;

Fig. 4 is a top plan view, with the top lid and intermediate shelf removed, and other parts omitted, of the structure of Fig. 1;

Fig. 5 is an enlarged detail view, in elevation, of an inlet conduit structure for the tub;

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Fig. 6 is a view, taken substantially along the line 6—6 of Fig. 5, and showing also the clamp of Fig. 1;

Fig. 7 is an enlarged view, in vertical substantially central plan section, of one of two baffle elements shown at the upper left and lower right hand portions, respectively, of the tub of Fig. 1;

Fig. 8 is a view, of the element of Fig. 7, taken at right angles thereto;

Figs. 9 to 13 inclusive are detail views in section, taken along the lines 9—9, 10—10, 11—11, 12—12 and 13—13, respectively, of Fig. 7; and

Fig. 14 is a sectional view, taken substantially along the line 14—14 of Fig. 7, showing, in addition thereto, an enlarged detail, partially in elevation and partially in section, of a valve indicated near the lower right hand portion of the tub shown in Fig. 1, the latter figure also showing a similar valve at its upper left hand side.

For convenience of cross reference, the following specification will use the same reference numerals for the several parts as are used in said application Serial No. 546,596.

Referring to the drawings, the illustrated machine comprises a watertight housing or outer container 41 supported upon an inclosing base 42 enclosed at the top by a lid 45. The clothes receiving tub 46 includes a non-corrosive sheet metal side wall 114 of substantially semi-spheroidal shape having parallel plane top and bottom perimeters 115 and 116 of substantially channel section and Z-section respectively.

The top perimeter 115 partially embraces a reinforcing neck ring 119 (Fig. 2) which has a lip 120. The cover 47 is floatingly received in the perimeter 115 and is of dish shape with a radially extending top flange 121 that overlies the perimeter 115 of the tub, an upright side wall 122, and a concave bottom wall 123 having perforations 125 therein.

The neck 119 and the corresponding portion of the tub side wall 114 have permanently registering apertures 126, and the lower portion of the side wall 122 of the cover 47 has apertures 127 for cooperation with the apertures 126, as will appear later.

The cover 47 is held upon the tub by means of a clamp ring 131 which is a channel section and engages beneath the lip 120 of the reinforcing ring. The ring 131 is split, as indicated in Fig. 4, the ring carrying at one side of the split a bail 132 which has pivotally mounted thereon one portion of a toggle link 133 and a handle 134. When the link is open, the ring 131 expands so that the cover may be removed from the tub, and when the clamp is in the other position, the ring 131

is clamped tightly against the neck 119. The ring 131 has a sufficiently deep channel section to permit the raising of the cover 47 so as to bring the holes 127 thereof in register with the holes 126 as shown in Fig. 2. When the cover is in its lower position, shown in Fig. 3, the holes 127 of the cover are below the perimeter 115 so as to communicate with the interior of the tub 46. In this position, the side wall 122 of the cover closes the apertures 126. During certain operations, as will be hereinafter described, the cover is in the upper position shown in Fig. 2 so that water in the tub drains through the holes 125 of the cover and the registering holes 126 and 127, and at other times the water which enters through the holes 125 drains back into the tub while the cover is in its lower position shown in Fig. 3.

The bottom wall 56 of the tub is arched upwardly toward the center of the tub from a peripheral shoulder 136; the bottom of the tub may be flat or concave, as well as the convex shape shown. A diaphragm 55 extends over the bottom and has a bead-like peripheral margin 137 which is received by the shoulder 136 (Fig. 6). The bead and shoulder fit beneath the offset perimeter 116 of the tub side wall 114, and all are clamped within a split ring 138 of channel section. The diaphragm is operated periodically, by means of fluid pressure supplied through diaphragm valve 72 to flush the tub and to dry the clothes, all as more fully explained in said application Serial No. 546,596.

As seen in Figs. 1 and 4, bosses 151 on the underside of the tub bottom wall 56, register with bosses 152 on the spider 50 for the reception of screws 153 whereby the tub is held in position supported on the spider. The tub 46 has a water inlet tube 156 which communicates with a pair of ports 157 in the tub side wall 114 adjacent the bottom thereof. The tube 156 is secured in place on the tub by means of coupling 158, and extends downwardly and thence inwardly along the underside of the spider 50, to which it is attached by a clip 161 and screw or screws 162. Flexible hose 164 connects to the end of tube 156 and at its other end the hose is connected to the bottom of a soap container 83 included in the fluid supply circuit as explained more fully in said application Serial No. 546,596.

Referring to Figs. 1, 4, and 7 to 14, inclusive, each of the baffles 52, of which there are two in the present machine disposed at diametrically opposite positions on the inner surfaces of the tub side wall 114, comprises a shell, as of cast metal, having a flat upright side wall 211 and an opposite wall 212 which slopes, or is rearwardly convex, from the wall 211, with a curved upper edge portion 213, as viewed in Fig. 8, merging into a straight edge lower portion 214. Viewed in the directions of section lines 9—9 to 13—13, inclusive, the development of the contour of each baffle 52 is shown in Figs. 7 to 13, inclusive, respectively. Lugs 216 receive screws 217 by which the baffle is secured to the tub side wall 114, with the open inner face of the baffle shaped in conformity to the spheroidal side wall 114 thereof. The walls 211 and 212 are joined, at the radially innermost portions thereof from the wall 114, by a rounded edge portion 218, and each of the walls 211 and 212 is provided with apertures 221 open at all times to the interior of the tub for the admission of water to the baffle for the purpose hereinafter explained.

The operation of the tub 46 is such that the water and clothes in the tub move in a clockwise direction, the flat sides 211 of the baffles face in the counterclockwise direction and extend transversely to the direction of motion in the tub. In the forward motion of the tub, the somewhat rotational movement of the clothes and water is interrupted twice as the clothes engage the flat sides 211 of the pair of baffles 52. The sloping sides 212 of the baffles, facing in the direction of rotation, more or less allow the clothes to slide off the baffles.

The purpose of the baffle valves about to be described is to control the draining of water from the tub at the bottom thereof. As the baffle valve structures are alike, it is only necessary to describe one, and of course only one may be used if desired.

At the lower portion, each baffle 52 is provided with laterally extended shoulders 222, which, in cooperation with the adjacent tub side wall 114, form a slideway 223 for a valve flap 226, as seen in Figs. 8, 12, 13 and 14. The flap has apertured wings 227 for pivotal connection to a pair of links 231. In its lower position, as indicated in Fig. 14, the flap 226 covers drain outlets 233 in the tub side wall 114 to prevent the escape of water from the interior of the baffle, and consequently, from the interior of the tub 46.

The valve 81, which controls the upward and downward movements of the valve flap 226, comprises a cylinder 236, fixed in position on the tub wall 114 by brackets 235 (Fig. 1). The cylinder 236 has an end cap 237 (Fig. 14) provided with a tubular portion 241 constituting a slide bearing for a piston rod 242, and an end cap 238 which has a tubular inlet 243 from which a water supply hose 246 extends through a suitable opening in the tub side wall 114 to the mechanical automatic control valve 70. A piston head 248 is secured to the rod 242 within the cylinder 236, as by nuts 252. Similarly secured to the piston rod 242, outside the cylinder 236, is a cross piece 253 having ears 254 for pivotally receiving the upper ends of the links 231. The pivotal connections of the links allow the flap 226 to slide in the guide 223 notwithstanding the angular mounting of the cylinder 236 due to the curved contour of the tub.

When the tub is to be drained by this means, water is admitted through the hose 246 into the cylinder 236, the piston head 248 and the rod 242 move upwardly, as viewed in Fig. 14, thus moving the valve flap 226 upwardly to allow water to drain through the apertures 233 into the outer container 41. When the water supply to the cylinder 236 is cut off, the piston head 248 and the flap 226 move to the lower closed position under the action of the spring 255, the water in the cylinder escaping into the outer tub 41 through the small bleeder opening 256.

The tub operating mechanism 51, as better seen in Fig. 1, comprises a tubular sleeve having a portion 262 of small diameter fitting in the spider bearing 163, and a portion 263 of large diameter outside the bearing, thereby providing a shoulder 266. A nut 267 cooperating with a screw threaded part of the sleeve portion 262 secures the sleeve to the bearing 163. An inclined shaft 268, journaled by a ball bearing 271 in the sleeve portion 263 and at its upper end in the sleeve portion 262, is adjustably held by a nut 272 in a slot 273 of an arcuate arm 276 that is secured, as by a nut 277, to the upper end of a drive shaft 288.

The shaft 288 is journaled in a bearing 289 that is mounted in a plate 290 on the bottom 98 of the outer container, and in a thrust bearing 291, mounted in the gear housing 65. This housing encloses a worm wheel mounted on the shaft 288, for cooperation with a worm 293 fixed on a shaft 296 of the motor 66. The worm and worm wheel are symbolical of any suitable gear reduction mechanism that may be used between the motor and the tub drive shaft. The motor shaft also extends to the centrifugal pump 67 for driving the latter at the speed of the motor.

At this point it may be mentioned that the shaft 296 is further connected, through a suitable speed reducing mechanism, here shown as a belt and pulley device 301, and bevel pinions 302, to a vertical shaft 303 for actuating the mechanical automatic control valve unit 70, and the booster pump 75 hereinafter described. The shaft 303 is enclosed within a standpipe 304 having a water tight connection with the bottom of the outer tub 41.

As the shaft 288 rotates the arm 276 revolves which, by reason of the inclination of the shaft 268, produces a gyrating or "wobble" movement of the tub 46 in cooperation with the tub guiding means 60. This guiding means comprises a bracket 281 secured to one of the bosses 152 of the spider 50 and carrying shafts 285 on which are journaled rollers 286 having rubber peripheral rings or tires 287 bearing at opposite sides of the stationary guide plate 57. The latter has an inner edge 58 drawn on an arc about the point of oscillation of the tub, and the guiding rollers 286 are held to up and down movement by the plate 57 so that the tub does not rotate on its own axis.

By loosening nut 272, shaft 268 can be adjusted in arm 276 to vary the inclination of the tub and thereby obtain different degrees of "wobble" movement, resulting in more or less energetic washing action. This means is only symbolical of other adjusting means that may be used to allow for different washing actions according to the types of articles being washed in tub 46.

In the operation of the washing machine, after it is filled with clothes and water for washing fluid to the proper level, energization of the motor 66 will cause rotation of the shaft 288 and with it the crank arm 276. As the inclined shaft 268 travels in its orbit, the tub 46 describes a gyratory motion in a clockwise direction, and the tub is kept from rotating on its own axis by cooperation of the rollers 286 and vertical guide plate 57. The action of the baffles in agitating the clothes and water as the tub gyrates has been described.

After the washing action is completed, the wash water is drained from the tub, which, in this instance, may be done in two ways. Fluid under pressure is admitted behind the diaphragm 55 to raise it from the bottom of the tub, which will lift the clothes and water toward the top of the tub, thus flowing the water out through the perforated cover and overflowing it into the outer container 41. Eventually, in this operation, the cover 47 will be pushed upwardly to bring about registry of the openings 126 and 127 to complete the draining action through the top of the machine. This action is also known as flushing by reason of the fact that without the addition of any water the floatable foreign matter and soil will pass out of the tub before contacting the clothes to streak, spot and stain.

Second, fluid under pressure may be admitted to the drain valve cylinders 81 to raise the flap valve 226 so that water will drain through the perforated hollow baffles 52 and the drain openings 233 in the side wall of the tub, this water also flowing into the outer container 41. It will be borne in mind that the tub is being continuously operated so that all water is drained from the tub. Furthermore, the motor 66 operates the centrifugal pump 67 that is connected by pipe 100 to the interior of the outer container 41 whereby to discharge the water from that container to a suitable waste drain disposal.

After the draining is completed, the diaphragm returns to its normal position of rest, and rinse water is admitted to the tub through water inlet tube 156, this water spraying over the clothes as the tub is being filled with rinse water, and again, since the tub is being continously wobbled, the clothes mass receives an effective spray rinse. If the drain valves 81 have not been closed, at least part of this preliminary rinse water will immediately pass out of the tub. When the drain valves are closed, the tub will be filled with water, and the clothes will receive a thorough rinsing by reason of the agitation of the clothes in that water. The supply of rinse water may continue until the water overflows through the perforated cover 47 and the rinsing completed in the flowing water. Upon completion of the rinse operation, the tub is again drained in the same manner and the squeezing of the clothes by the diaphragm may be such as to bring the clothes to a semi-dry condition ready for final drying either in the air or mechanically.

The adjustability of the inclined shaft 268 in its mounting will vary the orbit of that shaft to thereby produce the more or less energetic washing action adaptable to the fabrics being laundered.

I claim:

1. In a washing machine, a tub including a wall portion having drain outlets therein, motor operated means to wobble said tub for producing washing action on articles in the tub, baffle means in the tub including a hollow baffle secured to the wall of said tub over said outlets and having inlets therein for admitting fluid from the tub to the baffle, a guide in said baffle adjacent the wall of the tub, a shutter operable in said guide for controlling the opening and closing of said outlets, a fluid operated piston operating said shutter, and control means located outside said tub and connected to said piston for actuating the same.

2. In a washing machine, a tub having a substantially semi-spheroidal wall, means oscillating and wobbling said tub for effecting a washing action on articles therein, and baffle means in the tub including a radial baffle having a surface conforming to said spheroidal wall and secured thereto, and having a radially inner edge curved in direction between its upper and lower ends and rounded transversely to said direction, a flat leading surface extending substantially parallel to a radius of the tub axis between the tub side and said edge, and a trailing surface sloping relative to said leading surface between the tub side and said edge.

3. In a washing machine, a tub including a side wall having spaced apart drain outlets therein, means including motor operated elements for causing oscillation and wobbling of said tub about a horizontal axis for producing a washing action of articles and fluid in said tub, baffle means in the tub including a hollow baffle secured to the

wall of said tub over said outlets and having inlets therein for admitting fluid from the tub to the baffle, a guide in said baffle adjacent the wall of the tub, and means operable in said guide for controlling the opening and closing of said outlets, whereby the draining of the tub through said outlets is facilitated.

4. In a washing machine, a tub including a side wall having spaced apart drain outlets therein, an inclined shaft upon which the tub is mounted, a vertical motor driven shaft, a member rotated by the motor shaft upon which the inclined shaft is eccentrically mounted, means for preventing rotation of the tub about its own axis including a stationary vertical guide plate, a pair of rollers connected to said tub and adapted to engage said plate between them and to roll on respective sides thereof, baffle means in the tub including a hollow baffle secured to the wall of said tub over said outlets and having inlet ports for admitting fluid from the tub to the baffle, and means for controlling the opening and closing of at least one of said outlet and inlet ports, whereby the draining of the tub through said outlets is facilitated.

5. In a washing machine, a tub having a substantially semi-spheroidal side wall, means for wobbling the tub about a horizontal axis including an inclined shaft upon which the tub is mounted, a vertical motor driven shaft, a member rotated by the motor shaft upon which the inclined shaft is eccentrically mounted, a stationary vertical guide plate, a pair of rollers connected to said tub and adapted to engage said plate between them and to roll on respective sides thereof such means producing a motion of the contents of the tub about the axis of the tub, and stationary baffle means in the tub in alignment with said guide having a leading surface transverse to the direction of motion and a sloping trailing surface.

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