

March 14, 1950

A. D. LUND

2,500,368

CLOTHES WASHING MACHINE WITH CHAMBERED RECIPROCATING WASHER
UNIT RECEIVING CLOTHES THROUGH RESTRICTED PASSAGEWAY

Filed Nov. 22, 1944

11 Sheets-Sheet 1

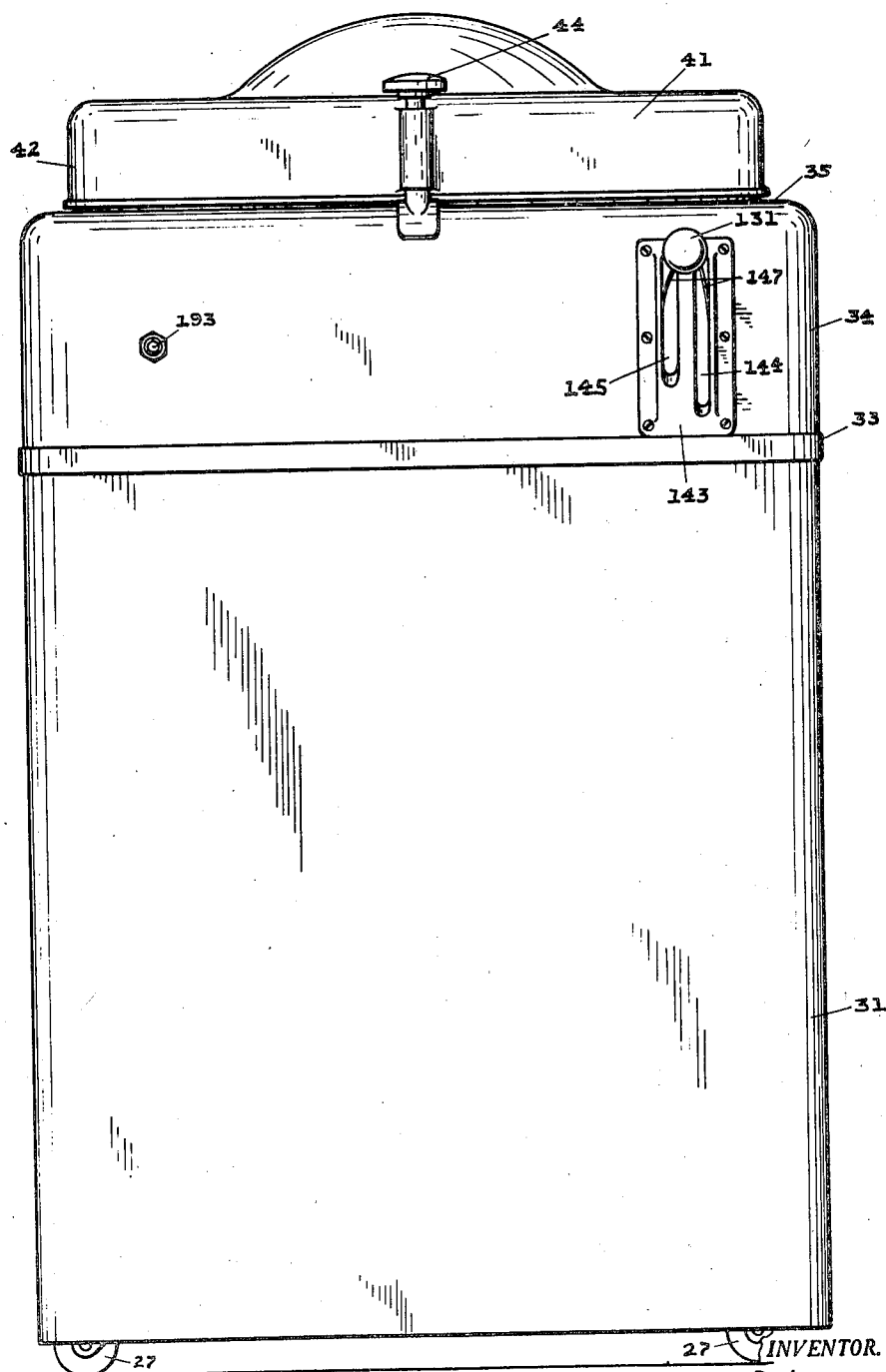


Fig. 1.

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11 Sheets-Sheet 2

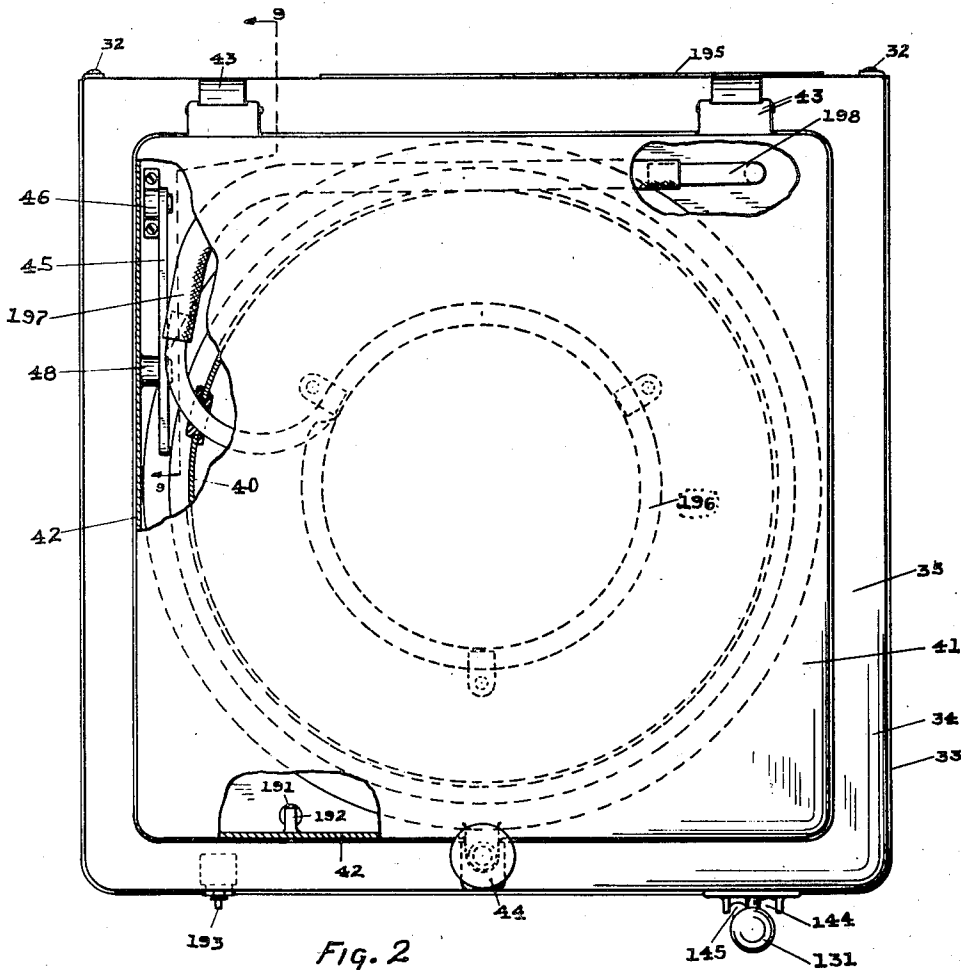


Fig. 2

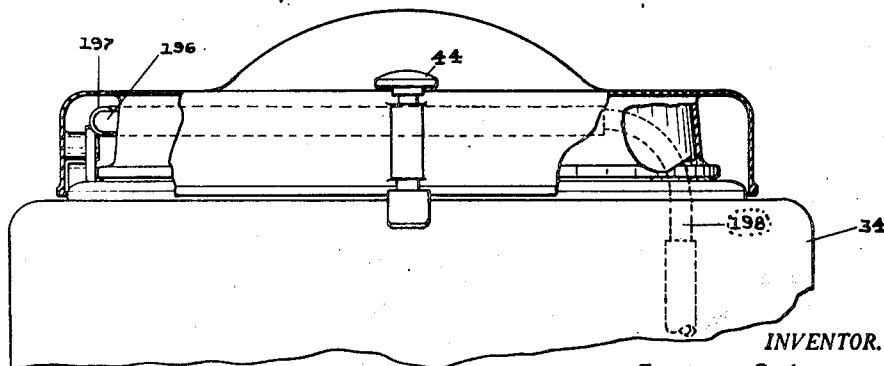


Fig. 3

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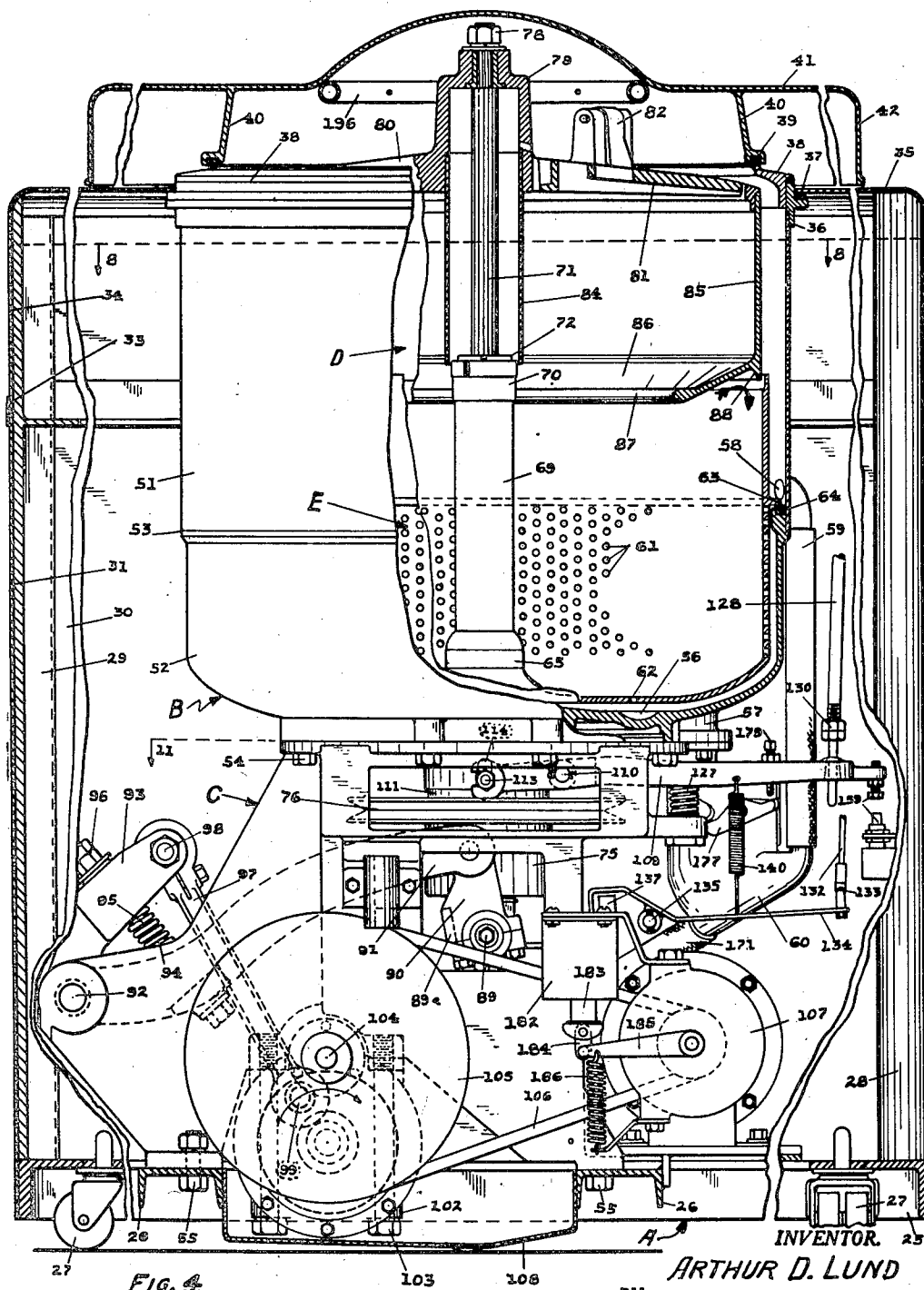


Fig. 2

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11 Sheets-Sheet 4

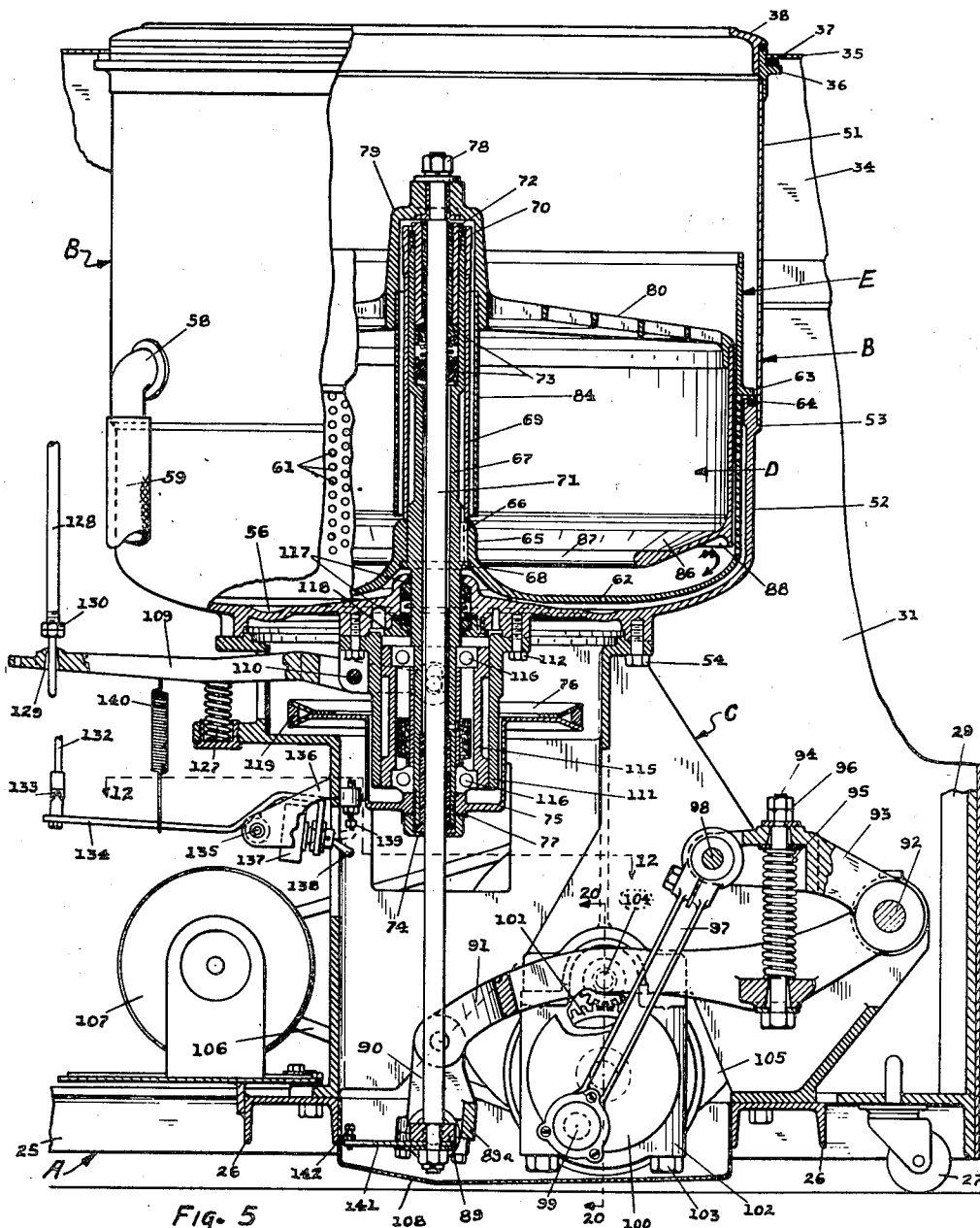


Fig. 5

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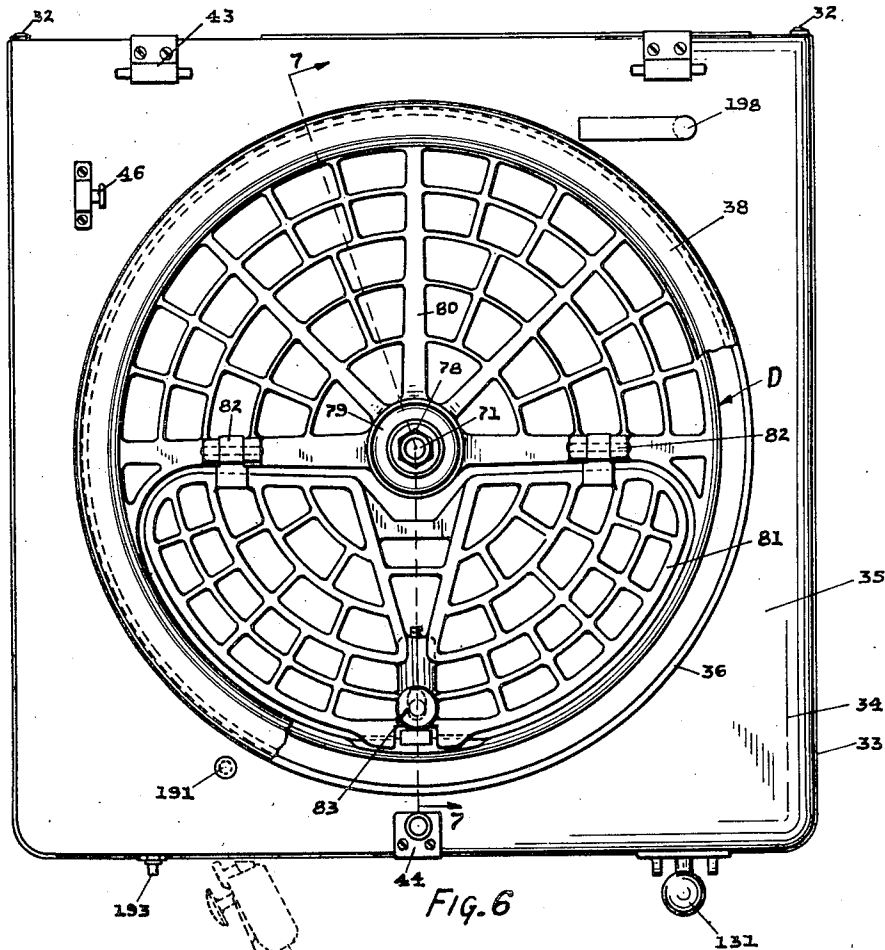


Fig. 6

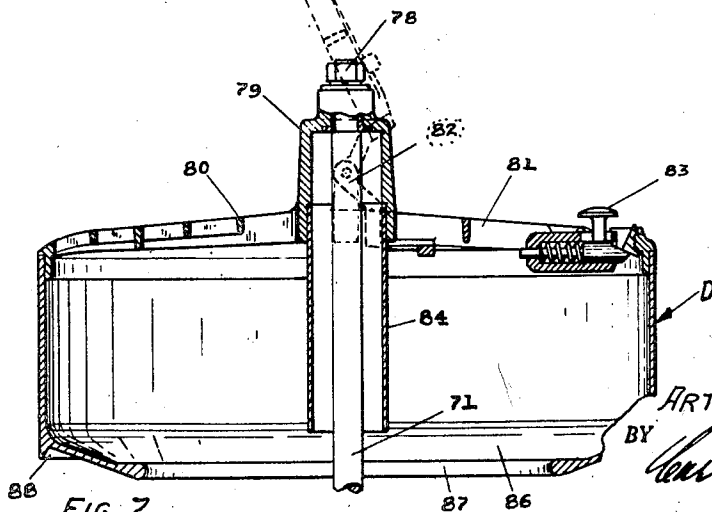


Fig. 7

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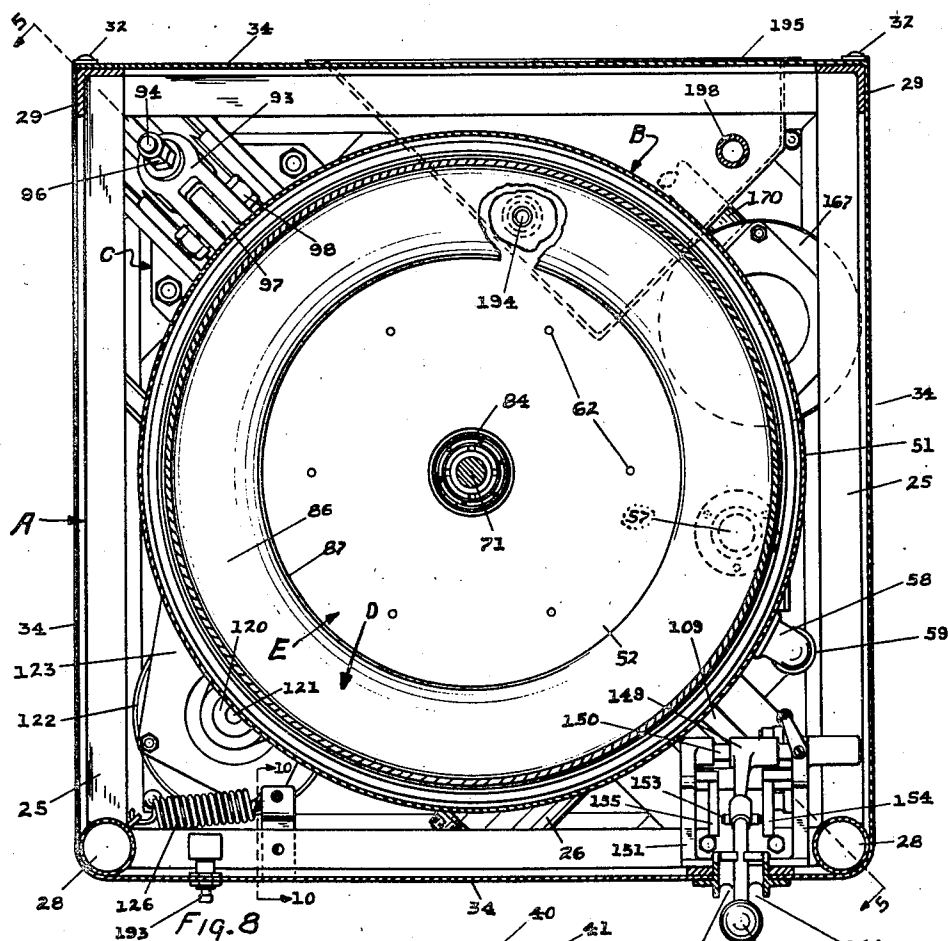
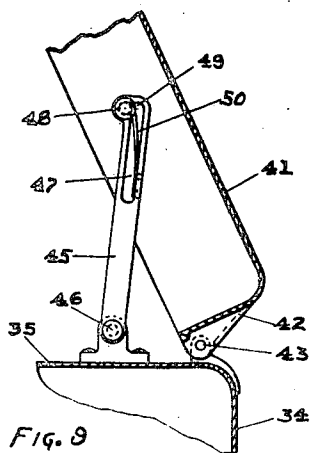
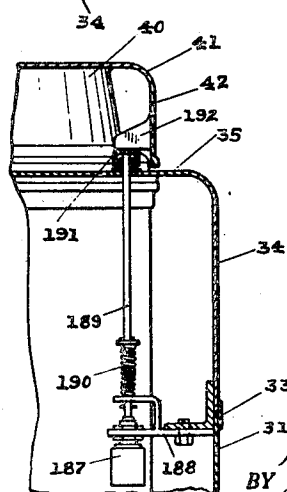
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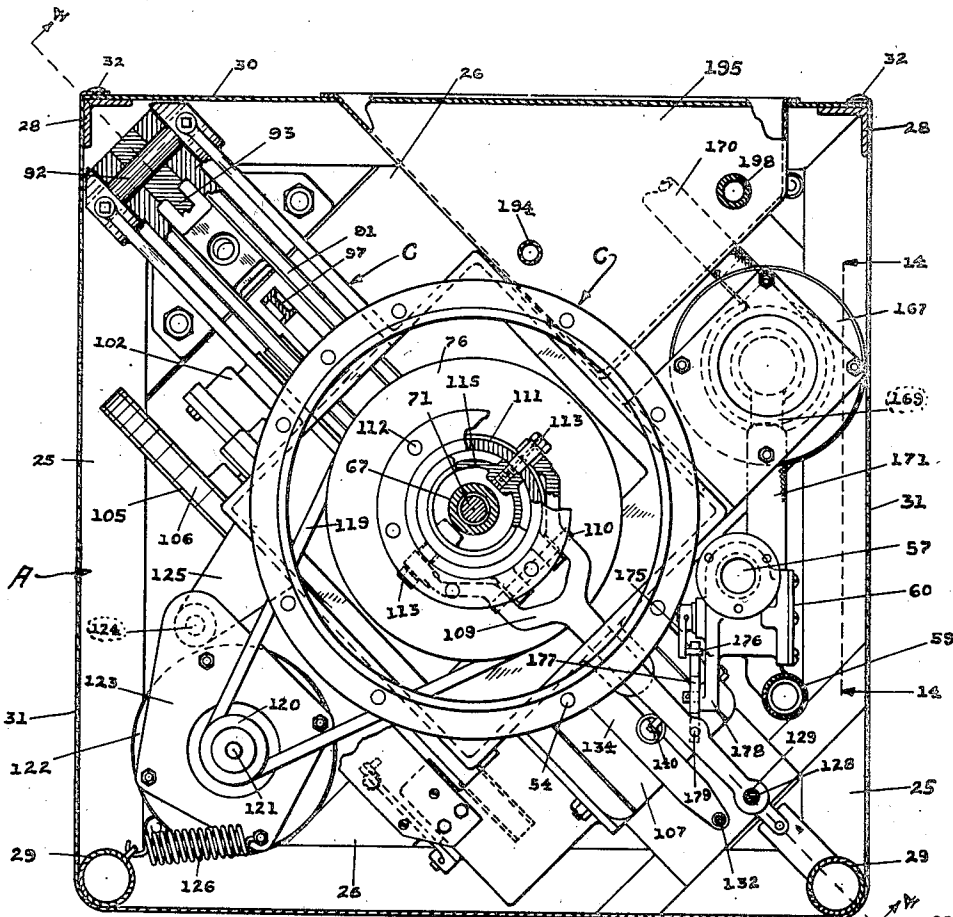


FIG. 11

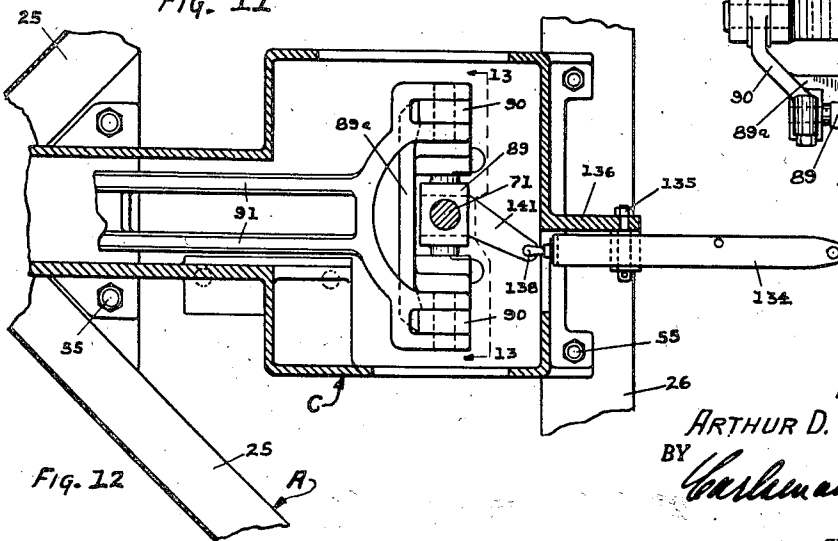


Fig. 12

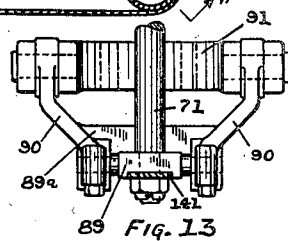


Fig. 13

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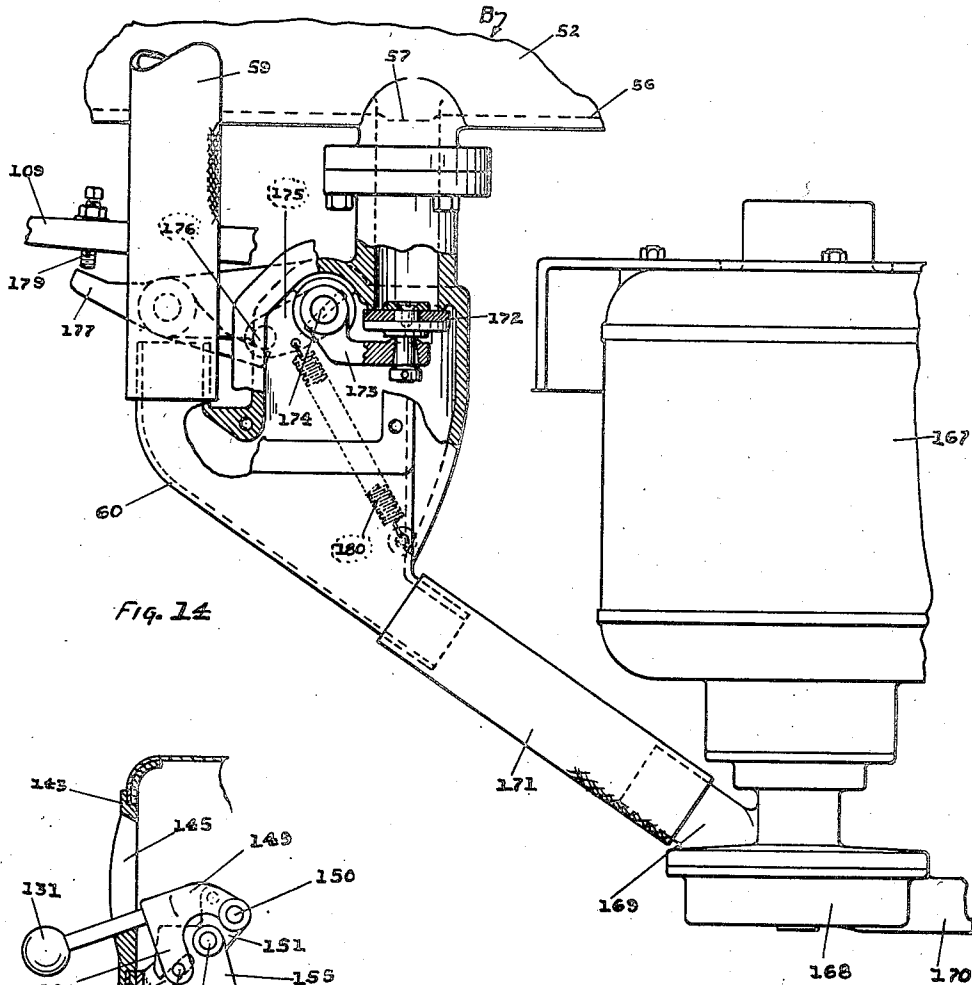


Fig. 14

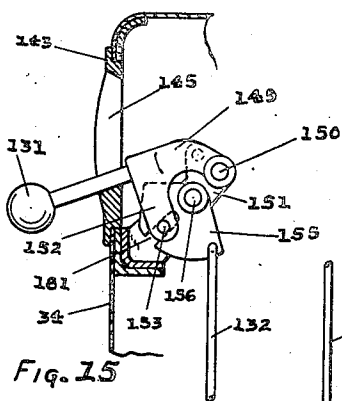
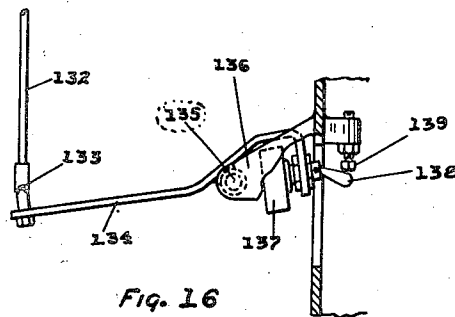


Fig. 15



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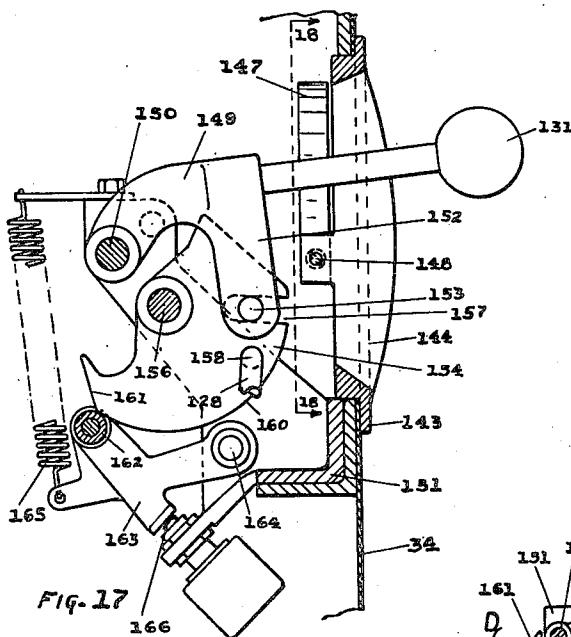


Fig. 17

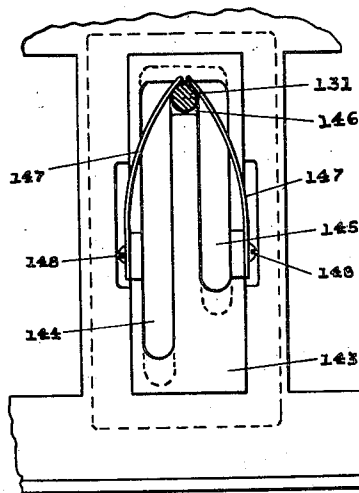


Fig. 18

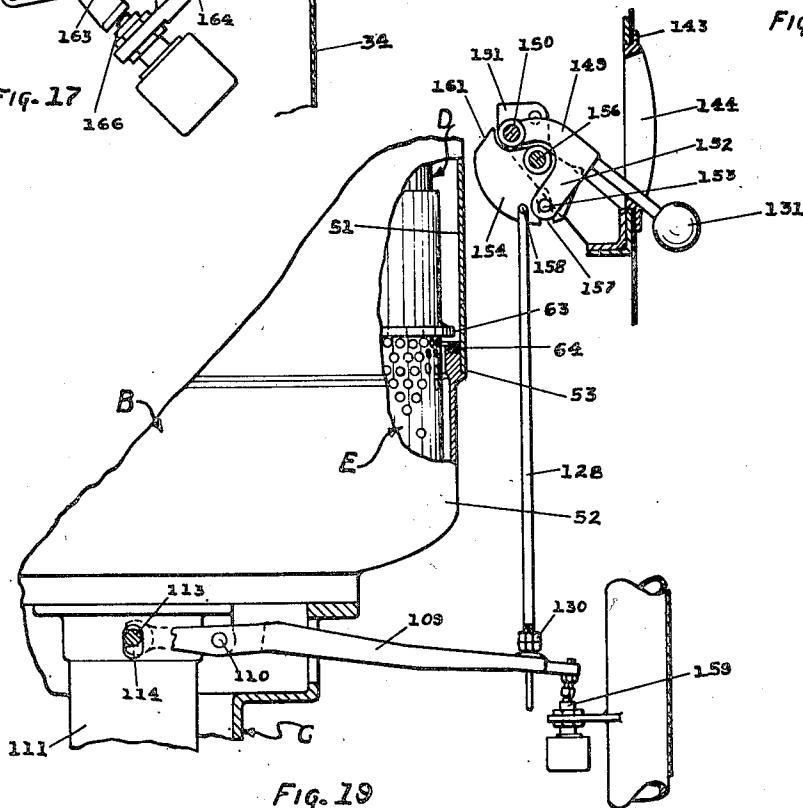


Fig. 19

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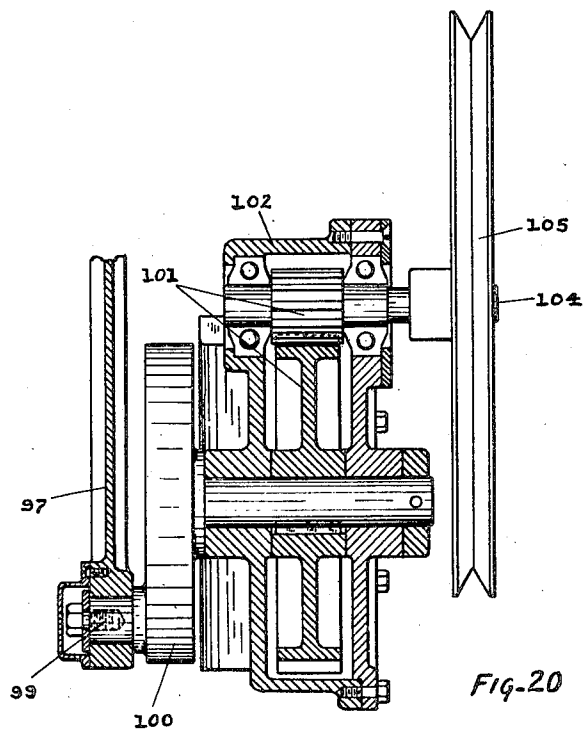


Fig. 20

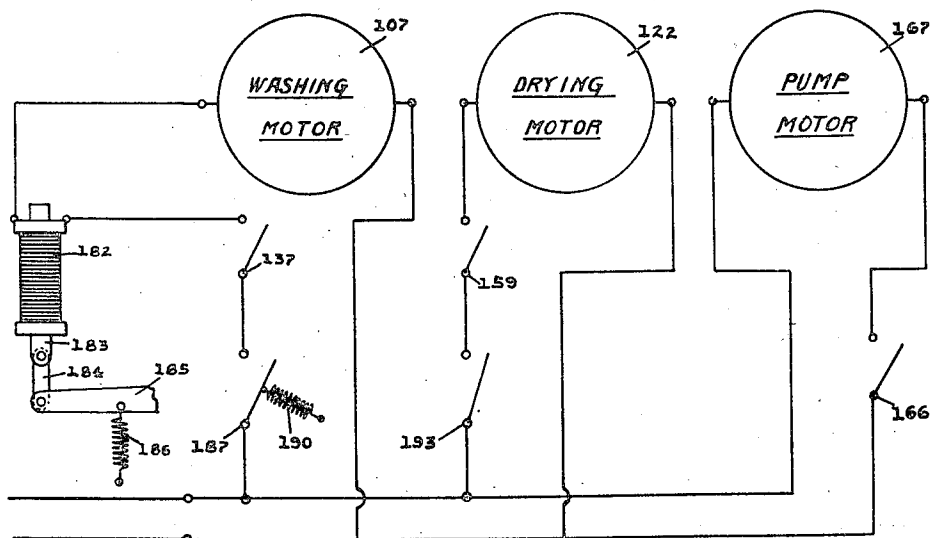


Fig. 21

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UNIT RECEIVING CLOTHES THROUGH RESTRICTED PASSAGEWAY

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UNITED STATES PATENT OFFICE

2,500,368

CLOTHES WASHING MACHINE WITH CHAMBERED RECIPROCATING WASHER UNIT RECEIVING CLOTHES THROUGH RESTRICTED PASSAGEWAY

Arthur D. Lund, Minneapolis, Minn., assignor to Solar Corporation, Milwaukee, Wis., a corporation of Delaware

Application November 22, 1944, Serial No. 564,580

4 Claims. (Cl. 68—23)

1

This invention relates to clothes washing machines, particularly of the type designed for home or domestic use, and the main object is to provide an efficient, practical and easily operated machine which will in one tub or chamber thoroughly wash the clothes; remove the scum from the wash water so that it will not contact and adhere to the clothes during draining; drain all free wash water from the clothes; rinse the clothes; drain the rinse water; centrifugally dry the clothes; and finally, with the cleaned clothes dried and removed, flush out the tub and its enclosed elements with clean water.

Another object is to provide a washing machine in which the clothes receptacle is mounted within the tub chamber, for rotational movement to centrifugally dry the clothes, but which is stationary during the washing and rinsing operation, the cleansing operations being performed by a separate washing element which does not revolve at any time but reciprocates vertically in the receptacle and cooperates therewith to produce a new and improved washing method.

A further object is to provide a washing machine in which the washing element within the receptacle is actuated by an electric motor through drive devices that are independent of another motor and drive devices connecting such second motor to the clothes receptacle to rotate the latter.

Another object is to provide a washing machine in which the clothes receptacle is normally disposed in a lowered stationary position in the surrounding tub during the washing operation, and is slightly raised for the draining and centrifuging operations, but wherein the tub is provided with an elevated drain whereby descumming may be accomplished while the receptacle is lowered and the main tub drain is closed.

Another object is to provide a washing machine in which the clothes receptacle remains stationary in the lower part of the tub while the washing element consists of an annular member having an inwardly projecting and inclined ledge or flange, and which annular member and ledge are vertically reciprocated adjacent the inner wall surface of the receptacle to produce an alternating flexing of the clothes and water circulation in an arcuately curved or toroidal path.

Another object is to provide a washer in which the vertically reciprocable, annular washing element is provided with an upper grill device which insures retention of the clothes in the zone of washing action, and is also operative to properly submerge the clothes in the wash water at each

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reciprocation as well as to hold the clothes below the water surface level during the descumming operation.

A further object is to provide a washer with a clothes receptacle in which the cleaning element operates with a piston like action but which is so formed as to prevent clothes or other articles being cleaned from entering or wedging in between the opposed annular surfaces of the receptacle and cleaning element.

The foregoing and still other and more detailed objects will be disclosed in the course of the following specification, reference being had to the accompanying drawings, wherein:

Fig. 1 is a front elevation of the machine with the cover closed and with the control lever in neutral position.

Fig. 2 is a top or plan view of the machine with fractional parts broken away and with some parts shown in dotted lines.

Fig. 3 is a detail elevation of the upper end of the machine with parts of the cover in section to better illustrate the construction thereof.

Fig. 4 is a sectional elevation of the machine illustrating many of its internal working parts, this section being taken diagonally as on the line 4—4 in Fig. 11.

Fig. 5 is a diagonal sectional elevation as on line 5—5 in Fig. 8.

Fig. 6 is a top or plan view of the machine with the cover and connected parts removed.

Fig. 7 is a sectional elevation on line 7—7 in Fig. 6.

Fig. 8 is a sectional plan view on line 8—8 in Fig. 4.

Fig. 9 is a detail section of the releasable cover retention device, as on line 9—9 in Fig. 2.

Fig. 10 is a sectional detail elevation of the cover circuit control device, on line 10—10 in Fig. 8.

Fig. 11 is a plan view of the machine, with the tub removed, and as seen on the section line 11—11 in Fig. 4.

Fig. 12 is a detail plan section on line 12—12 in Fig. 5.

Fig. 13 is a detail sectional elevation on line 13—13 in Fig. 12.

Fig. 14 is an enlarged detail elevation, partly in section, of the dual drain valve mechanism, as seen when looking in the direction of the arrows 14—14 in Fig. 11.

Fig. 15 is a detail elevation, partly in section, of the manual lever control unit.

Fig. 16 is a detail elevation of the control device which is operated by the unit shown in Fig. 15.

Fig. 17 is an enlarged detail sectional elevation of the control unit shown in Fig. 15 but as seen from the opposite side and with some parts in section.

Fig. 18 is a sectional detail elevation on line 18—18 in Fig. 17.

Fig. 19 is a detail elevation showing the clothes receptacle lift device and motor circuit control switch associated therewith.

Fig. 20 is an enlarged sectional elevation through a transmission mechanism, as on line 20—20 in Fig. 5.

Fig. 21 is a diagrammatic view of the wiring system and electrically actuated devices.

Fig. 22 is a sectional elevation of the center assembly, as shown in Fig. 5, but on an enlarged scale, and with some parts broken away.

Referring to the drawings more particularly and by reference characters A designates the base of the frame structure, and said base includes a rectangular angle iron frame 25 and diagonally extended cross beams 26. This base is supported on casters 27 to facilitate movement. Extending upwardly from the four corners of the base are two forward tubular posts 28 and two rear angle iron posts or bars 29. The housing supported by the frame includes a back plate 30 and a three-sided or U-shaped lower plate 31. The rear end edges of the plate 31 are flanged to extend about the rear corners of the machine, and are there releasably secured by screws 32. With this construction it will be seen that by removing the screws 32 and slightly spreading the rear sides of the housing plate 31 the latter can be easily removed to expose all of the internal mechanism, which is not only economical construction but is neat, clean, and sanitary, and gives easy access to working parts for adjustment and repair. The upper edge of the plate 31 carries a rim 33 which closes a seam between the plate and the lower edge of a complementary top section 34 which may be more permanently secured to the frame. This section 34, aside from side wall parts, includes an integral horizontal flange 35 that extends inwardly to a circular ring 36 with respect to which it is sealed by a gasket 37.

The ring 36 has a complementary, inwardly and upwardly projecting ring 38 that forms a seat for the gasket 39 of a flange 40 depending integrally from and within a cover 41. The cover 41 is of inverted tray construction and has a peripheral flange 42 that extends down close to but preferably does not touch the top section flange 35. The cover is hinged to the housing, at 43, and has a suitable form of releasable fastening device 44. The cover is releasably supported in raised position by a link 45 (see Figs. 2, 6 and 9) pivoted at 46 to the casing, and at its other end having a slot 47 engaged by a pin 48 of the cover. The slot has an end notch 49 in which the pin 48 is releasably held by a spring 50.

The tub, B, includes an upper, cylindrical, sheet metal section 51, and a cast, cup shaped, lower section 52, rigidly connected together at seam 53. The upper end edge of the shell or section 51 is attached to ring 36, while the lower end of section 52 is mounted on a main or supporting frame C, to which it is secured by bolts 54. The frame C is of irregular construction to accommodate other operating mechanisms, and is mounted on the diagonal beams 26 to which it is secured by bolts 55.

The bottom surface of the tub section 52 is provided with an annular groove 56, with a discharge opening at 57, for draining the tub, while

the upper section 51 of the tub has a discharge opening 58, immediately above the seam line 53, which terminates in a drain hose 59. Both drains communicate with a control valve coupling or unit 60, the construction and purpose of which will presently be set forth.

The mechanism within the tub B includes a clothes receptacle E and an annularly formed dasher or piston like washing element D.

The receptacle E is a cup shaped member having a wide band of profusely distributed perforations 61, but having an imperforate upper portion and a dished bottom which is also solid except for a few drain holes 62. The peripheral surface of the receptacle has an annular rib or flange 63 which, when the receptacle is in lowered position (as in Figs. 4 and 5) has sealing contact with a rubber ring or gasket 63 secured in the upper inner edge of the tub section 52, but, when the receptacle is slightly lifted (as in Fig. 19), is out of contact with the gasket to provide clearance for drainage and permit spinning of the receptacle on its axis.

The center portion of the clothes receptacle has an integral upstanding hub 65 which is keyed at 66 to a hollow center post or standard 67 and rests on a flange 68 of that post. The hub is held down in firm contact with the flange by a sleeve 69 which fits over the hollow post and is clamped downwardly by a collar 70 that is threaded upon the upper end of the post.

A vertically reciprocating shaft 71 extends axially through the post 67 and slides through a bearing or bushing 72 which screws into the upper end of the post and clamps downwardly on a pair of spring separated packing rings 73 that seal out water and may contain a lubricant for the shaft. At the lower end of post 67, well below the bottom of tub B, the shaft 71 slides in bushing 74 which is held in place by the depending hub 75 of a pulley 76, such hub being threaded on the hollow shaft 67 and fixed thereto by lock nut 77 so that the pulley may rotate this shaft without rotating shaft 71.

At its upper extremity the reciprocating shaft 71 is firmly anchored, and secured by nut 78, to the hub 79 of a reticulated top or cover grill 80 of the washer unit D. This grill, as best shown in Figs. 4, 6 and 7, includes a lid or door 81 hingedly attached by upwardly offset hinges 82 and normally held closed by a latch 83. The hub 79 of the grill has a rigidly secured, depending sleeve 84 which is sufficiently large so that it may freely move up and down over the center post construction 69—70 of the clothes receptacle.

The annular wall 85 of the washer unit D is of such diameter that it may move freely within the clothes receptacle, and adjacent its lower end is provided with an integral annular shelf or baffle 86 which extends inwardly and slightly downwardly to its rounded inner edge 87. Immediately adjacent the baffle 86 the wall 85 has a tapered depending flange or extension 88, the purpose of which will be explained in connection with the operation of the machine.

Vertical reciprocating movement is imparted to the washer unit or plunger D by the shaft 71 which extends into the bottom extremity of the machine for connection with the operating mechanism now to be described.

The lower end of the shaft 71 is fastened in a cross piece 89 which is journaled in and between a pair of links 90 that are rigidly connected by member 89^a and depend from the inner bifurcated end of a lever arm 91. This arm 91 is fulcrumed

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to the main frame C, as at pivot 92, and such pivot also serves as a fulcrum for a comparatively shorter lever arm 93. The two lever arms 91 and 93 are tied together by a bolt 94 and a compression spring 95, that are so arranged that the two arms will operate together but one of them may yield, under the action of the spring, and when moved downwardly to thereby prevent breakage of parts should the driven arm 91 meet with abnormal resistance to downward movement. The effective length of the bolt 94 may be adjusted by turning and locking of nuts 96, and in this way the upper extremity of limit of movement of the plunger D may be adjusted.

The arm 93 is operated by a connecting rod 97 one end of which is pivoted to the arm, as at 98, while the other end is pivoted at 99 to a crank or eccentric pivot of a disk 100 of a speed reducing transmission 101 within a case 102 secured by bolts 103 to the frame C. The transmission includes a shaft 104 on which is mounted a comparatively large sheave 105 driven by a belt 106 from a motor 107. It may be noted that a pan 109 is attached between the beams 26 directly under the transmission case 102, and also extends under the center construction of the machine. The purpose of this pan is to catch oil or water drippings and to some extent keep out dust and dirt.

The mechanism for vertically adjusting and for spinning the clothes receptacle E will now be set forth. As previously noted when this receptacle is in normal washing or down position its flange 63 rests on the gasket 64 and consequently the receptacle does not and cannot rotate. When it is desired to spin the receptacle, to centrifuge and dry the clothes, it is lifted sufficiently to clear the gasket, and this is done by the same device that starts the centrifuging motor.

The required vertical adjustment of the receptacle is accomplished by a lever 109 which is fulcrumed at 110 to a sleeve 111 secured by bolts 112 to the tub B. The inner or forked end of this lever engages a pair of pins 113, movable in slots 114 of sleeve 111, and secured in a collar 115 that is vertically adjustable within the sleeve. Bearings 116 are disposed between the upper and lower ends of the collar 115 and a reduced section of the hollow post or standard 67, and these bearings act as thrust bearings to raise and lower the standard 67 while also permitting the standard to freely rotate with respect to the collar. It may be noted that the standard 67 is sealed with respect to the tub B by spring pressed packing rings 117, held up in place by a removable plate 118.

The pulley 76 which rotates the clothes receptacle E to dry the clothes is driven by a belt 119 which extends horizontally to and about a smaller pulley 120 on the shaft 121 of an electric motor 122. This motor is carried in a frame 123 which is pivoted as at 124 to a bracket 125 extending from the main frame C so that the motor is free to swing on this vertical pivot toward and away from the center of the machine. A spring 126 connects the motor frame 123 to one of the posts 29 and has for its purpose to keep the driving belt 119 at a proper tension.

Referring again to lever 109, attention is called to the fact that a spring 127 engages its longer end with a tendency to lift it upwardly. This in turn creates a spring action tending to hold the clothes receptacle down in its lowered position on the gasket 64. Thus the basket can only be lifted for spinning purposes by depressing the

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longer end of the lever 109, and that is done by a rod 128 having a reduced lower end engaging in an opening 129 in the lever and having an adjustable stop nut 130 for contact with the lever to push it downwardly. The rod 128 is operated by the hand lever 131 in a manner presently to be described.

The lever 131 also operates to control a rod 132, the lower end of which has a universal joint connection 133 to the outer end of a lever 134 which is fulcrumed as at 135 to a bracket extension 136 of the frame C. This lever 134 carries a motor control switch 137 having a control finger 138 that is movable into upper and lower positions with respect to the lever 134. An adjustable stop 139 is mounted in such a position that it may engage the finger 138 when the outer end of the lever 134 is pressed downwardly by the rod 132, as indicated in Fig. 16. However, the lever 134 is connected to the lever 109 by a vertical lever spring 140 which has a tendency to hold the lever 134 in the position shown in Fig. 5, in which case the switch finger 138 is in the downward position as shown by the full lines in Fig. 5. In Fig. 5 it will also be noted that the cross arm 39 in which the lower end of the shaft 71 is anchored is provided with an extension 141 having an adjustable contact bolt 142 which is so disposed that when the shaft 71 is moved to its upper extremity the contact 142 will engage the switch finger 138 and move it to its upper position regardless of the angular position of the lever 134. The object of this arrangement will be set forth more in detail in the description of the operation of the machine.

The manually operated mechanism for controlling the machine and its various operations is illustrated in Figs. 1, 8, 15, 17, 18, and 19, and includes the aforementioned single control lever 131. This lever extends through a guide plate 143 in the front wall of the machine, and is movable selectively in two vertical guide slots 144 and 145 as well as horizontally in an upper connecting cross slot 146. A pair of springs 147, anchored at 148, releasably center and secure the lever 131 in neutral position, as shown in Fig. 18, but are flexible at their free upper ends to permit movement of the lever into either of the slots 144 and 145.

The inner end of the lever 131 includes a casting 149 that is slidably and oscillatably mounted on a cross bar 150 secured in a frame 151, and this casting 149 is further provided with a depending arm 152 having a pin 153 extending therethrough and from both sides thereof. The arm 152 operates between two cams or plates 154 and 155, both of which are independently rotatably supported on a shaft 156 also mounted in frame 151.

The plate 154 has a slot 157, extending radially with respect to the shaft 156, and this slot is adapted to be engaged by one end of the pin 153 when the lever handle 131 is moved to the right, as viewed in Fig. 1, or into the left or longer slot 144, as viewed in Fig. 18. Thus the hand lever may be employed to oscillate the plate 154, the slot 157 compensating for the eccentric relationship of shaft centers 150 and 156. When the hand lever 131 is thus moved into the slot 144 and pushed to its bottom it oscillates the cam plate 154 to do several things. First, it actuates the roller 162 to depress the lever 163 and thereby close a switch 166 to energize a pump motor 167. It then depresses the rod 128, which pivots in the plate at point 158, to push down the lever

109 and thus raise the basket or clothes receptacle E to spinning position, continued movement of the rod 128 then causes the lever 109 to actuate an electric switch 159 which with a switch 193 controls a circuit to energize the motor 122, thus starting the centrifugal drying operation.

The lever action just referred to operates to open the drain 57 and to energize the drainage pump, as follows: The plate 154 has an arcuately curved edge 160 terminating at one end in a cam edge 161, for engaging a roller 162. This roller is mounted upon one end of the lever 163 which is fulcrumed at 164 and is yieldably held upwardly by a spring 165. This lever is arranged to contact and close the switch 166, when depressed by the cam edge 161 and will maintain circuit closing engagement as long as the roller 162 is in contact with the edge 160. The closing of this switch 166 controls a circuit to energize a motor 167 (Figs. 11, 14 and 21) which operates a centrifugal pump 168 having an inlet 169 and an outlet 170. The inlet 169 is connected by hose 171 to the outlet of the valve case 60.

The downward movement of the lever 109 performs still another function, and that is to open the drain opening 57 to the pump 138, and this is done by devices shown in Figs. 4, 11, and 14. The case 60 is open so that water can pass through freely from the drain hose 59 to the hole 171, but the opening 57 is normally closed by a valve head 172 mounted on the inner end of a lever 173, fulcrumed at 174, and having an outer end or arm 175. This arm 175 has a pin 176 adapted for engagement by one end of a lever 177 fulcrumed on an arm 178 of the valve case. The other end of lever 177 is so disposed that it will be engaged by an adjustable set screw 179 mounted in the lever 109, and a spring 180 tends to hold all these parts with the valve 172 in its closed position. It will be evident however that when lever 177 is actuated by set screw 179 it will operate to open the valve 172 so that the tub B can drain into the pump 168. Also that when the lever 109 is again released so that it can be raised by action of the spring 127 then the valve 172 will again be closed by action of spring 180. It may here be noted, with particular reference to Figs. 17 and 19, that when the hand lever 131 is pushed completely down its pivot point 158 will pass dead center position with respect to points 156 and 130 with a result that the parts will stay locked until released by the manual operation of lever 131.

Returning again to the control unit it will be observed that when the hand lever 131 is moved through the cross slot 146 into vertical slot 145 it slides on shaft 150 until the pin 153 in arm 152 disengages the slot 153 in plate 154, whereupon continued movement beyond the neutral position causes the other end of the pin 153 to move into engagement with a slot 181 in the plate 155. Vertical movements of the lever 131 will now impart oscillating movement to the plates 155 and vertical reciprocation to the rod 132, and since the rod may pass back of dead center with respect to points 133 and 156 (Figs. 15-16) it will of course be evident that the parts will remain in this position until manually released.

When the lever 134 is depressed the finger 138 engages the stop 139 and this action operates to close the switch 137 to energize the motor 107 which in turn operates the transmission and leverage mechanism to actuate the reciprocating washer member D.

Closing the switch 137 also operates to close a circuit (see Fig. 21) to a solenoid 182, the re-

ciprocating core 183 of which is connected by a short link 184 of a lever 185 that operates a conventional brake (not shown) for the motor 107, and this brake arm or lever 185 is normally held in brake applying position by a spring 186. Thus, when the circuit is closed it energizes the motor 107 to operate the dasher D, and simultaneously activates the solenoid 182 to release the brake, but when the circuit is subsequently opened the motor is deenergized and the brake is simultaneously applied by the spring 186 to not only stop the motor but to prevent it from overrunning a predetermined point by reason of its momentum, as will be presently explained.

The washer circuit includes still another control switch, namely, 187, (Figs. 10, 21) that is mounted in a bracket 188 within the housing. This switch is controlled by a rod 189 and is normally held in circuit opening position by a spring 190. The rod extends upwardly through the casing flange 35 where it is provided with a cap 191 that is engageable by a lug 192 on the inner side of the cover flange 42. When the cover is down the switch 187 is closed and the washer circuit may be energized by closing the switch 137, but when the cover is open it will be impossible to energize the washer circuit. The reason for this is to insure that the cover is closed before washing action can take place, because otherwise the vertical reciprocation of the dasher D would throw water up and out of the machine.

It may here be noted that the drying motor (122) circuit also has two control switches, namely, 159, previously referred to, and 193. The switch 193 is a manually operated switch, located at some convenient place on the outer housing, and is preferably of the double action push button type wherein one push of the button will close the switch and a second push will open it.

It will of course be necessary that both switches 159 and 193 be closed before the drying motor 122 can be energized, and the main reason for switch 159 is to prevent starting of the spinning motor while the clothes receptacle E is resting on the gasket 64. For that reason switch 193 is usually employed as the primary control switch and by it the motor is started and stopped while the receptacle is raised and the switch 159 is closed. Should an attempt be made, however, to start the drying operation without the control lever 131 being in proper position then the resulting open position of switch 159 will prevent damage of parts by spinning the basket when in its lowered position.

Parts of the machine which have not heretofore been specifically identified will be described in connection with the operation of the machine which is substantially as follows:

When a batch of clothes is to be washed and dried the cover 41 and lid 81 are first opened. The required amount of soap is then placed in the tub and hot water is admitted through a pipe 194 (Figs. 8 and 11) in the bottom of the tub. This inlet pipe 194 extends down into a generally triangular pocket or chamber 195 that is inserted in through the back of the housing and opens outwardly. A hose (not shown) may be attached to the pipe, for connection to a laundry room faucet, and when not in use may be coiled up and placed in this receptacle.

The water is filled into the tub preferably to a level just above the washer unit D when the latter is in its lowermost position, and after the clothes or other objects to be washed are also placed in the washer unit the grilled lid 81 is

closed and latched at 83, after which the cover 41 is also closed and latched at 44.

The operator now grasps the projecting ball shaped end of the lever 131, which is in neutral position as shown in Fig. 1, moves it laterally and down to the bottom of the shorter slot, 145. This action operates through the parts 149, 152, 153, 155, 132 and 133 to depress the long end of lever 134 and move the switch mounting up until finger 138 is moved down by stop 139 to close the switch 137. Since switch 187 has already been closed, by the cover, the circuit is closed to the motor 107 and solenoid 182. Energization of the solenoid releases the motor brake, through arm 185, and starts the motor 107. Rotation of the motor shaft operates to impart a vertical reciprocating motion to the washer or dasher unit D through the medium of belt 106, pulley 105, reduction transmission 101, crank pin 99, connecting rod 97, lever mechanism 93, 95, 91, 90, 89, and shaft 71.

The intermittent or up and down movement of the unit D produces a turbulent agitation of the water within the units D and E that causes the soap to quickly dissolve in the water, and also produces what appears to be a new and very novel and efficient washing action.

Thus, as the washer unit D moves upwardly the solution, including the clothes, moves relatively downwardly, and as it does so is guided radially inwardly by the sloping ledge 86 into and through the restricted annular opening between the edge 87 and the center post construction. As the contents settle in the bottom of receptacle E they spread out to fill the lower portion thereof. When the plunger D now again descends in the receptacle the ledge 86 engages the outer part of the water body and compresses it downwardly, thus squeezing the clothes and solution in such a manner as to cause them to move upwardly past the edge 87. It should here be noted that the flange 88 plays an important part in the action since it initiates an inward circulatory movement of the water, as indicated by arrows in Figs. 4 and 5, and thereby not only prevents clothes from wedging in between the adjacent wall surfaces of members D and E, but also insures the proper and highly desirable movement of liquid and materials inwardly so as to be caught up by the upwardly moving column of water.

The resultant effect of the continued vertical reciprocations is to provide a toroidal motion, in which submerged clothes are alternately compressed and expanded while also being thoroughly flushed through the solution, and all of which produces a thorough cleansing action without wearing or harmful contact between the articles being washed and metal parts.

The reticulated character of the grill 80 is such that it will permit the free upward passage of air and water therethrough without permitting passage or escape of the articles being washed, and this is of considerable importance since if this cover plate were imperforate it would have a piston-like action that would preclude the desired surging and free washing action.

During the washing operation the valve 172 is closed so as to prevent the escape of fluid through the drain port 57 in the tub. The outlet 58 is not stopped by any such valve, and some water that splashes over the rim of receptacle 58 may go into this drain. The flow through this opening will not be substantial, however, since it is customary to hook the discharge end of the drain

hose 170, from pump 168, up at an elevation higher than the port 58 and consequently any water thus passing into the drainage pump or system will be retained until actual drainage is desired.

It may also be observed that the annular space between receptacle E and tub B (below flange 63), will permit a limited amount of water to fill this space. Such fluid, however, is not of any significant amount and plays no material part in the washing operation, being virtually dormant until complete drainage is effected.

When the washing operation has been completed, usually after a predetermined period of time, the control lever 131 is returned to its neutral position. This act does not by itself deenergize the motor 107 since lifting the outer end of lever 134 merely separates the finger 138 from stop 139. However, as the shaft 71 goes up on its next succeeding stroke the actuator 142 engages the finger 139 and by pushing it upwardly opens the switch 137 which thereby simultaneously shuts off the motor and applies the brake with the unit D in its uppermost position.

It may be desirable to provide means for automatically stopping the washer in its lowermost position. For purpose of the present disclosure, however, only the upper position stop is shown, and to lower the washer unit, as is now required, the cover 41 is lifted and the switches 137 and 187 are momentarily manipulated until the desired bottom position is assumed.

With the cover 41 still open, if so desired, and with the clothes held down below the water surface by the grill 80 fresh water is now turned into the tub B and receptacle E through the inlet 194, and at about the same time the control lever 131 is moved to the position shown in Fig. 17, where it closes the switch 166 in the circuit to the pump motor 167. This position does not, however, open the valve 172 or raise the clothes receptacle, because stop nut 130 has not as yet contacted the lever 109.

In the condition of the machine as now set forth, the clothes are all submerged in the solution and as fresh water continues to flow into the tub through the inlet 194 it overflows upwardly and outwardly over the edge of the clothes receptacle E and thereby removes and carries with it the scum which it is found so desirable to remove from contact with the articles being washed. As the overflowing liquid drops down into the annular channel between the upper portion of the receptacle E and the adjacent side wall portion of the tube B it drains through the opening 58 and is forcefully drawn down by the pump 168 that is now running, and ejected through the hose 170 which at this time is so located that it can properly discharge its contents into the sink or floor drain in the laundry room.

After the descumming has been entirely completed the control lever 131 is moved down to the bottom of the slot 144, or as shown in Fig. 19. This action lifts the clothes receptacle E and closes the switch 159. It also causes the lever 109 to actuate the similar lever 177 to open the valve 172. Opening of the valve 172 results in bottom draining of the tub through the vent 57 and when the switch 193 is now also closed, the drying or spinning motor 122 is energized with a result that the receptacle E is now very rapidly rotated to centrifugally separate the wash water from the clothes. It is ordinarily not intended to completely centrifuge the clothes at this stage of the washing process, and in fact it may be sufficient

to merely drain the tub under the action of the pump 167 without spinning the receptacle E at all, and this is particularly true where in the descumming process enough water has been circulated upwardly through the clothes to substantially free them from the washing solution.

In any event, after the wash water has been sufficiently extracted from the clothes and drained from the tub the switch 193 is operated to deenergize the circuit and the control lever 131 is reinstated to its neutral position.

The next operation is that of rinsing the clothes, and for that purpose clean and fresh water is introduced either through the intake pipe 194 or through the flushing ring presently to be described. In any event the water is filled in to substantially the same level as was the washing solution for the washing operation. With the cover 41 and lid 81 again locked closed, the control lever 131 is now again moved down into the slot 145 whereupon the same identical action takes place within the tub as occurred during the primary or washing operation. Thus the clothes are thoroughly subjected to the toroidal circulating currents until they are entirely freed from soap or other undesirable matter from the cleansing solution. Ordinarily there is no necessity for descumming the rinsing water, and when it has served its purpose it is immediately drained out through the bottom of the tub, and as the hand lever is actuated to control this action the pump motor is again energized and the centrifuging again comes into play. In this instance, however, when the rinsing has been completed, it is quite essential that the washer unit D be stopped in its uppermost position and for that reason the automatic switch control 138-142 is provided and comes into play. With the washer unit now up entirely out of the way the basket or clothes receptacle E will be spun at such speed and for such length of time as may be necessary to completely extract all of the free moisture and such moisture is immediately drained off from the tub and forcefully ejected from the machine.

When the drying or centrifuging period has expired the control lever is again restored to neutral position to stop the motors, and after the cover 41 and lid 81 have again been opened the dry or substantially dry clothes are removed from the clothes receptacle.

It is now desirable to wash or flush out the entire machine and for that purpose there is provided an overhead perforated shower ring 196 that is suitably secured in the cover 41 within the flange 40. This ring is connected to and supplied by a flexible hose 197, the other end of which attaches to a standpipe 198, the lower end of which extends into the receptacle for connection with an outside supply hose (not shown). When water is now supplied under pressure to the ring 196 it will be sprayed over and throughout all of the interior working surfaces of the machine. To more thoroughly effectuate such cleaning or flushing the spinning circuit may again be energized, and of course the flushing water will be drained away the same as with the washing and rinsing liquids.

It should here be noted that while the various operations of this machine might be performed with a single motor, as has been done heretofore in numerous designs of clothes washing machines, there are several definite advantages in using separate motors and connecting them up in such manner that they will be independently operated and wherein one motor will have as its primary function to operate the clothes washing unit or

agitator, while a second motor will be arranged to spin the clothes receptacle to produce the necessary centrifuging.

Thus with the use of two motors, connected to separately operate the receptacle and agitator much is eliminated in the way of speed change gearing, clutches and other friction producing transmission and control mechanisms that are absolutely essential to a single motor arrangement and the cost and maintenance of which exceeds that of two smaller motors with their direct drive connections to the respective devices.

It is understood that suitable modifications may be made in the design and structural details of the invention as herein disclosed, and in the method of operation set forth, providing such modifications come within the spirit and scope of the appended claims. Having now therefore fully illustrated and described a preferred embodiment of the invention, what I claim to be new and desire to protect by Letters Patent is:

1. In a washing machine, a tub, a receptacle mounted in the tub and adjustable vertically into two positions, said receptacle having a perforated lower section and an imperforate upper section, means at the juncture of said sections for providing an annular seal between the receptacle and tub when the receptacle is in its lower position, means for raising the receptacle to break contact with the tube at the seal and to rotate the receptacle, and a washer dasher mounted for vertical reciprocation in the receptacle when the latter is in its lowermost position.

2. In a washing machine, a tub, a receptacle mounted in the tub and adjustable vertically into two positions, said receptacle having a perforated lower section and an imperforate upper section, means at the juncture of said sections for providing an annular seal between the receptacle and tub when the receptacle is in its lower position, means for raising the receptacle to break contact with the tub at the seal and to rotate the receptacle, and a washer dasher mounted for vertical reciprocation in the receptacle when the latter is in its lowermost position, said tub having a bottom drain, and having a second drain in its side wall above the level of said annular seal.

3. In a clothes washing machine, a receptacle forming a lower chamber for containing cleansing fluid and articles to be washed, a plunger mounted for vertical reciprocation in the receptacle and forming an upper chamber adapted to receive such fluid and articles when the plunger is moved down into the lower part of the receptacle, said plunger having flange means extending under the upper chamber to form a passageway for clothes and water the cross-sectional area of which passageway is less than the cross-sectional area of either chamber, whereby the articles being washed will be squeezed and flexed as they pass from one chamber into the other, and means for reciprocating the plunger whereby the clothes and water will be effectively pumped from one chamber into the other alternately, said plunger having a perforated top extending over the entire upper end opening thereof in all horizontal directions so that it will permit the passage of water therethrough but which will prevent upward escape of articles being washed.

4. In a clothes washing machine, a generally upright receptacle having a water and clothes chamber in its lower end, a washer unit mounted for vertical reciprocation in the receptacle in close

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proximity to the sides thereof so as to produce a piston action when reciprocated, said washer unit forming an upper chamber of sufficient capacity to receive substantially all of the water and clothes when the unit is moved down into the lower end of the receptacle, said washer unit being formed in part by an inwardly directed flange which extends under the upper chamber and forms a restricted passageway for the movement of water and clothes alternately from one chamber to the other when the washer unit is reciprocated, and power means for reciprocating the washer unit, said washer unit having a grill like top member completely covering the upper chamber so as to retain clothes therein while having perforations of such size as to only permit the upward escape of water therefrom.

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