Feb. 2, 1954 O. E. KLING ET AL 2,667,777

WASHING MACHINE WITH END DUMP DOORS

Filed March 10, 1950 2 Sheets-Sheet 1

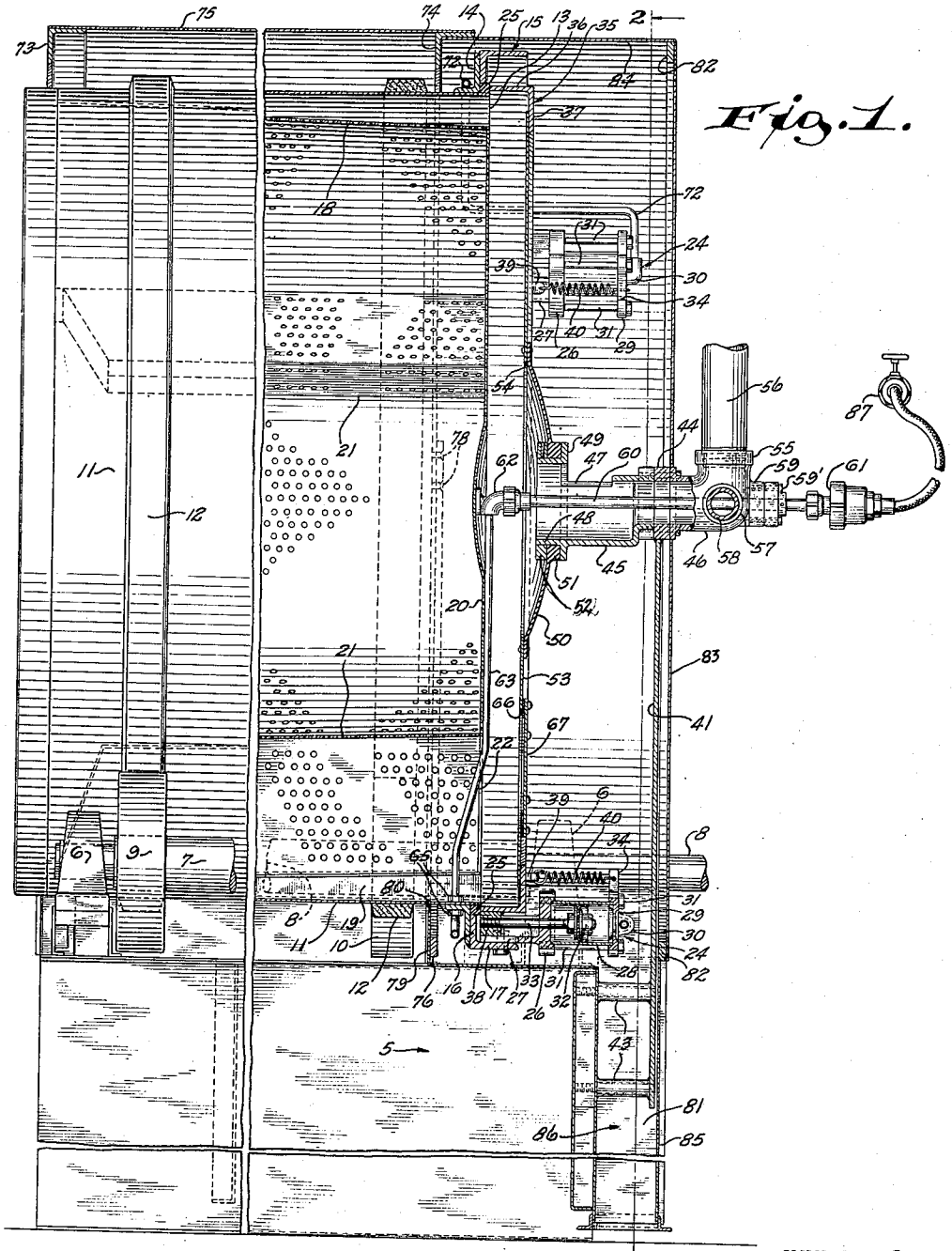

Fig. 1.

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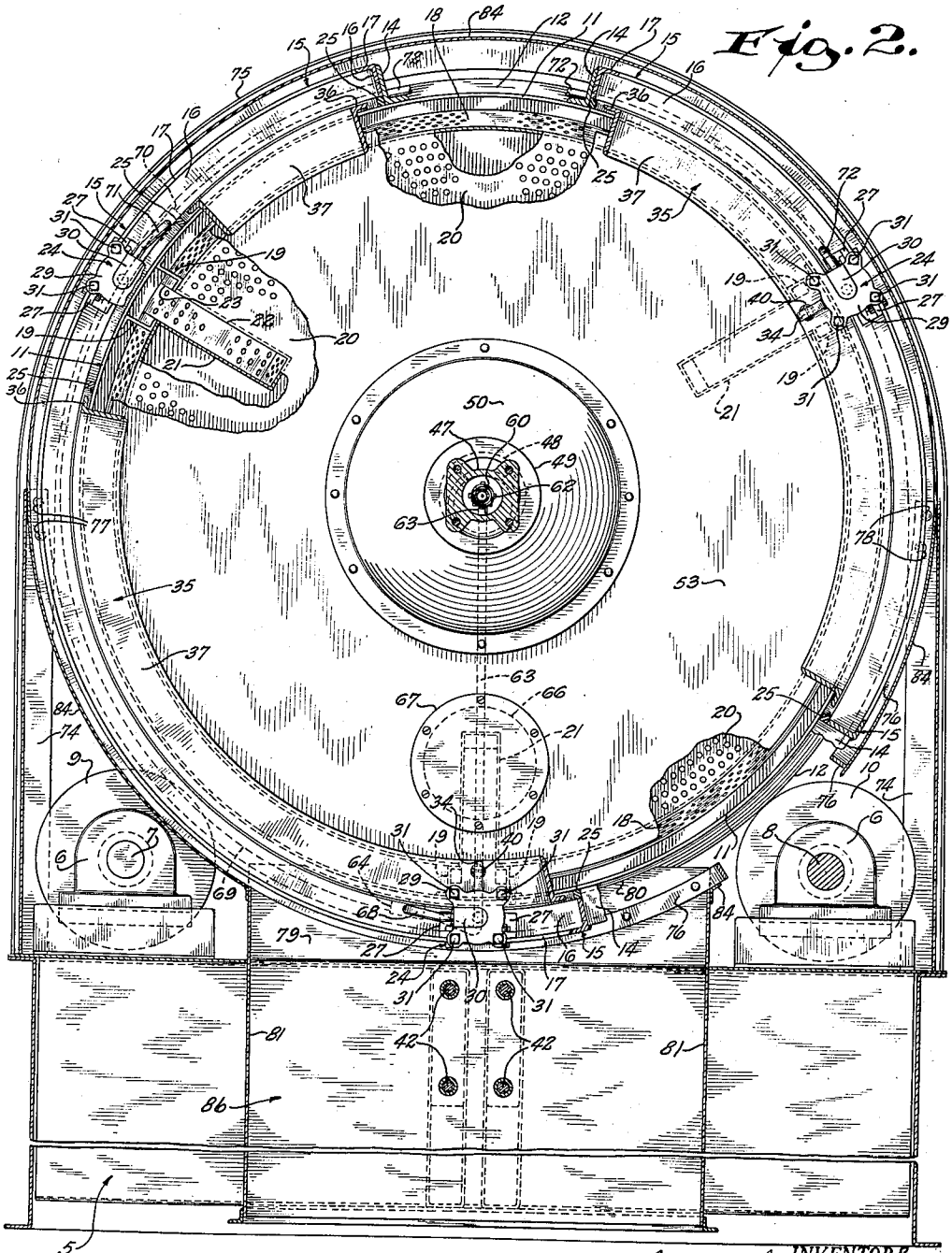
Fig. 2.



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WASHING MACHINE WITH END DUMP DOORS

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Application March 10, 1950, Serial No. 148,954

9 Claims. (Cl. 68—144)

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This invention relates to improvements in washing machines.

Patents numbered 2,313,152 and 2,426,455, issued to John P. Jorgenson, disclose washing machines which are provided with means for draining spent wash water therefrom. Each of these machines is provided with an imperforate, internally ribbed, cylindrical drum for holding both the washing water and the clothes to be washed.

It is a general object of the present invention to provide an improved washing machine construction including an imperforate rotating drum having an open inner end wherein there is a circular, imperforate dump door movable into and out of sealing engagement with the periphery of the open inner end of said drum and rotatable with the drum, said construction permitting rapid discharge of spent washing water from the drum through said open end.

A further object of the present invention is to provide an improved washing machine construction of the class described having improved washing and draining actions which are made possible by the provision of a perforated drum positioned concentrically within the imperforate drum to provide an annular liquid retaining space therebetween, there being a perforated end wall closing the inner end of said perforated inner drum and spaced from the movable dump door of said outer drum to provide a cup-shaped water receiving space which includes the beforementioned annular water receiving space.

A further object of the invention is to provide a washer of the class described having a plurality of hollow, longitudinal, perforated ribs on the interior of the perforated drum, said ribs having open inner ends which extend through the perforated end wall and thereby communicate with the inner end water receiving space to further provide improved washing and draining action.

A further object of the invention is to provide in a washer of the class described, a perforated inner drum which is tapered, said drum having a smaller diameter near the inner dump door, whereby said drum with the ribs flares outwardly toward the unloading door at the opposite end to thereby aid in moving washed clothes toward said front unloading end during an unloading operation.

A further, more specific object of the invention is to provide a washing machine of the class described wherein there are fluid operated rams mounted on the periphery of the outer rotatable drum for supporting the dump door and for

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urging said door axially into sealing engagement with the open inner end of said outer drum.

A further, specific object of the invention is to provide, in a washing machine of the class described, spring means for opening the dump door upon release of the fluid pressure in the door operating rams.

A further object of the invention is to provide, in a washing machine of the class described, a dump door having a central aperture, there being a fixed, axially extending tubular supply fitting member communicating with the inner end water receiving space through said aperture and there being a centrally apertured, flexible diaphragm sealingly fixed to the margins of said door aperture and rotatably sealingly connected to the periphery of said connection member.

A further object of the invention is to provide an improved washing machine of the class described having a conduit for connecting the fluid rams on the rotatable outer drum to an external source of fluid pressure through the axial tubular supply fitting and through a rotating joint associated therewith.

A further object of the invention is to provide an improved washing machine of the class described wherein the dump door can be opened or closed either while the drums are rotating or at rest.

A further object of the invention is to provide an improved washing machine of the class described having a novel drain trough arrangement for catching the water drained from the drums during a dumping operation.

A further object of the invention is to provide a washing machine of the class described which is durably constructed, which is efficient and positive in operation, and which is otherwise well adapted for the purposes described.

With the above and other objects in view, the invention consists of the improved washing machine and all of its parts and combinations, as set forth in the claims.

In the drawing accompanying and forming a part of this specification in which is shown one complete embodiment of the preferred form of the invention, and wherein like characters of reference indicate the same parts in all of the views:

Fig. 1 is a fragmentary side elevational view of the improved washing machine, parts being broken away along the center line thereof, and shown in longitudinal vertical section; and

Fig. 2 is a fragmentary transverse vertical sectional view taken approximately along the line

2—2 of Fig. 1, parts being broken away for clarity.

Referring more particularly to the drawing, the numeral 5 indicates a generally rectangular base structure for the improved washing machine. Rotatably mounted in suitable bearings 6, adjacent opposite side edges of the upper surface of the base 5, is a pair of parallel shafts 7 and 8. The shaft 8 projects rearwardly of its rear bearing 6 and is connected to a suitable source of rotative power (not shown). Fixedly mounted on the shaft 7 is a pair of spaced rollers or wheels 9, and fixedly mounted on the shaft 8 are a pair of spaced wheels or rollers 10 which are preferably coplanar with the corresponding wheels or rollers 9.

An imperforate substantially cylindrical drum 11, having a pair of spaced endless belt tracks 12 extending therearound, is mounted for rotation on a horizontal axis on the rollers 9 and 10. It will be noted that the belt tracks 12 are alined with the rollers 9 and 10. Rotation of the shaft 8 by the source of power causes rotation of the drum 11 through frictional contact of the rollers 10 with the belt tracks 12.

The drum 11 may be provided with any suitable loading and unloading door structure (not shown) at its front end. The rear or inner end of the drum 11 is open, as at 13, and fixed to the periphery of said drum adjacent to but spaced inwardly from said end is an annular angle member 14 formed with an outwardly projecting annular flange. A second annular angle member 15 has a radially inwardly extending flange 16 fixed to the outwardly projecting flange of the member 14, and said member 15 also has an axially and rearwardly extending annular flange 17 projecting from the outer margin of the flange 16. The inner edge of the flange 16 is spaced from the outer surface of the drum 11 to provide an annular recess therebetween which is rectangular in cross section and in which is positioned an annular gasket 25. The latter may also be rectangular in cross-sectional shape.

Fixedly mounted substantially coaxially within the drum 11 is a perforated drum 18 which is preferably frusto-conical in shape, having its smaller diameter at the rear or inner end. The drum 18 is held spaced from the drum 11 by three pairs of Z bars 19, the latter being spaced apart approximately 120°. The Z bars 19 diminish in height from their rear ends forwardly, corresponding to the taper of the perforated drum 18. A circular perforated wall 20 extends across the rear end of the drum 18, as shown, and is in substantially the same plane as the rear end of the drum 11.

Extending longitudinally of and projecting radially inwardly from the inner surface of the perforated drum 18 are preferably three hollow perforated ribs 21. The ribs 21 are preferably substantially equally spaced and are each positioned adjacent one of the pairs of Z bars 19. The ribs 21 are generally rectangular in cross-sectional shape, having open bottoms and having open rear end portions which join the end wall 20. The end wall 20 is formed with three peripheral rectangular cut-outs 22, each of which registers with the open rear end of one of the hollow ribs 21. The perforated drum 18 is formed with longitudinal slots 23, each of which registers with the open base of a rib 21, so that said ribs open exteriorly of the perforated drum 18 through the slots 23, as well as through the cut-outs 22.

A plurality (preferably three) of fluid operated ram assemblies 24 are mounted on the inner

surface of the flange 17 of the annular member 15 in any suitable manner, such as by bolting. The ram assemblies 24 each comprise a centrally apertured base member 26 having a pair of spaced attaching legs 27 projecting axially forwardly therefrom. The rear face of the member 26 is recessed to receive the end of a cylindrical tube 28. A cover 29 is recessed on one surface to fit over the rear end of the tube 28, and said cover is formed on its outer surface with a boss 30, said boss being bored to provide communication with the interior of the tube 28. The ram assembly 24 is held in assembled condition by four cap screws 31 which extend through the cover 29 and which are threaded into the member 26. A piston 32 is slidably positioned in the tube 28 and has a piston rod 33 connected thereto which slidably extends through the central aperture in the member 26. The cover 29 of each of the rams 24 is formed with a radially inwardly extending apertured lug 34, as shown.

Forming a part of the dump door 35 (to be later described) is an annular angle member which has an axially extending flange 36 and a radially inwardly extending annular flange 37. The forward edge of the flange 36 is sealingly engageable with the gasket 25, and the outer surface of the flange 36 is formed with outwardly projecting lugs 38 each of which is slidably positioned between the attaching legs 27 of one of the ram assemblies 24 to provide an axially slidable support for the dump door 35. The lugs 38 are apertured to threadedly receive the forward end of the piston rods 33. The outer surface of the flange 37 is formed with an apertured, rearwardly projecting lug 39 adjacent each ram 24, and connecting the corresponding lugs 39 to the lugs 34 are three helical tension springs 40. The springs 40 tend to draw the flange 36 of the annular member axially away from the gasket 25.

Fixedly supported on the rear wall of the base 5 is an upstanding plate or bar member 41 having four horizontally forwardly projecting connecting bolts 42 formed on its lower end, said bolts being suitably connected to the base 5 and having sleeves 43 positioned therearound which may be welded to said base and to the member 41. The upper end of the supporting bar 41 is formed with a ring 44 which is coaxial with the drums 11 and 18. Fixed to the opposite sides of the ring 44 by means of a bolted flanged connection, are an inner supply sleeve or casting 45 and an outer supply casting 46.

The inner supply casting 45 is tubular and is formed with a vent opening 47. The forward end portion 48 of the casting 45 is coaxial with the ring 44. The portion 48 is formed with a radially outwardly projecting annular flange 49 which is spaced from the forward end of the casting 45. A circular diaphragm 50, of rubber or other suitable flexible material, is centrally apertured and is formed around the margin of said aperture with an annular boss 51. The boss 51 has an inner diameter substantially equal to the outer diameter of the portion 48, and said boss has a slidable fit on said portion 48 adjacent the flange 49. A retaining ring 52 is fixed on the portion 48, as by set screws, and slidably engages the surface of the boss 51 opposite the flange 49. Any other suitable rotatable connection between the diaphragm 50 and the casting 45 may be used in place of that shown.

Fixed to the inner surface of the flange 37 is a circular plate 53. The plate 53 is normally spaced rearwardly from the perforated end wall

20 to form a circular rear end wall water receiving space which communicates with the annular water receiving space between the drums 11 and 12. The plate 53 is formed with a central aperture 54, and the periphery of the diaphragm 50 is riveted or otherwise fixed to the plate 53 adjacent the margins of the aperture 54, as shown. The flanges 36 and 37 and the plate 53 form a unit which will hereafter be referred to as a dump door 35.

The outer supply casting is formed with an upstanding water inlet connection 55 in which is threaded a conduit 56 leading to a suitable water supply. Extending radially and horizontally from the casting 46 is a soap and supply inlet connection 57 in which a conduit 58 is threaded. The casting 46 is formed with an axially outwardly projecting tubular extension 59, in which is mounted a thrust bearing 59' for supporting an axially extending fluid supply pipe 60. The outer end of the pipe 60 is connected to a suitable source of fluid (such as air) under pressure through a rotary joint 61 and a suitable control valve 67. The latter is preferably of the three-way type, having a port communicating with the atmosphere. The forward end of the pipe 60 is provided with a flexible elbow joint 62 which is fixed to the perforated end wall 20, as shown.

Extending radially outwardly from the joint 62, along the rear surface of the plate 20 and toward one of the cut out portions 22 therein, is a pipe section 63. The pipe 63 projects through one of the cut-out portions 22 and into the adjacent rib 21, then extends radially outwardly through that slot 23 which registers with the base of the rib 21, through the drum 11, and through the annular angle member 14. A pair of nuts 65 threaded on the pipe 63 on opposite sides of the drum 11 and member 14 hold said pipe securely in position. The pipe 63 then extends approximately two-thirds of the way around the periphery of the drum 11 as indicated by the numerals 69 and 72. The plate 53 is formed with a hand hole 66 adjacent the pipe 63, said hand hole being provided with a removable circular cover 67.

From the point 64 (see Fig. 2), a generally L-shaped branch line 68 projects axially rearwardly through a suitable aperture in the flanges 14 and 16 and thence transversely into the boss 30 of the adjacent ram assembly 24. From the point 70 which is adjacent another of the ram assemblies 24, a generally L-shape branch line 71 connects with the boss 30 of said ram 24 in the same manner as the line 68. The end of the arcuate pipe section 72 connects with the boss 30 of the third ram 24, as shown in Fig. 1.

Positioned on the base 5 and extending transversely over and around the drum 11 adjacent the front and rear ends, respectively, are a pair of spaced, inverted U-shaped angle members 73 and 74. A sheet metal U-shaped cover or hood 75 extends over the members 73 and 74 and follows the contours thereof. It will be noted that the angle member 74 has an inwardly projecting flange which is positioned forwardly of and overlaps the flange 14. A semi-circular flat bar 76 is bolted to the before-mentioned flange of the member 74, as at 77 and 78, and forms with the member 74 a complete circle substantially coaxial with the drum 11. It will be noted from Fig. 2 that the arcuate bar 76 also overlaps the flange 14 and is positioned forwardly thereof.

Fixed to the front surface of the lower portion

of the bar 76 is a vertical, transverse, generally rectangular plate 79. The plate 79 has an arcuate cut-out portion 80 in its upper edge which is positioned close to the periphery of the drum 11 and which conforms to the shape thereof, as shown. The plate 79 extends down into sealing contact with the upper surface of the base 5. A pair of generally L-shaped axially extending vertical plates 81 extend rearwardly from the side edges of the plate 79, along the upper surface of the base 5, and downwardly along the rear wall of the base 5, as shown.

A circular bar 82 (see Fig. 1) having a circular plate 83 of like diameter fixed to the peripheral margin thereof, is positioned adjacent the vertical supporting bar 41. The plate 83 is substantially coaxial with the drum 11 and is centrally apertured to permit the passage therethrough of the outer supply casting 46. An arcuate hood portion 84, which may be formed of an elongated rectangular piece of sheet metal, engages the inner surface of the axially extending flange of the member 74 and extends around the periphery of the bars 76 and 82, being fixed at its ends to the plates 81, as shown in Fig. 2. A generally rectangular transverse vertical plate 85 extends downwardly from the bar 82 between the walls 80 and 81 to form a rectangular vertical drain duct 86 along the rear wall of the base 5.

Operation

In operation, the clothes to be washed are placed in the perforated drum 12 through the front end loading door (not shown), said door being thereafter closed. The valve 67 is then turned to permit fluid (such as air) under pressure from a suitable source to force the pistons 32 of the rams 24 forwardly. As the pistons 32 move forwardly, the piston rods 23 move the dump door 35 to closed position in which the flange 36 sealingly engages the gasket 25. During this forward movement the springs 40 are stretched from their normal condition.

Water is then introduced into the drums 11 and 12 through the conduit 56 and through the supply castings 45 and 46, and the drums 11 and 12 are started rotating on the rollers 9 and 10 by actuation of the drive shaft 8.

During rotation of the drums 11 and 12 the pipe 60 and the dump door rotate therewith. The joint 62 is a ball and socket or similar type to permit compensation for any slight eccentric or wobbling movement of the drums, whereas the thrust bearing 59' prevents substantial axial movement of the drums. Also, during rotation of the drums the boss 51 of the diaphragm 50 slidably rotates on the tubular portion 48 of the inner supply casting 45.

Soap and other necessary washing materials are then added through the conduit 58 and supply castings. The combination of the perforated drum 12 with the imperforate drum 11 accomplishes a thorough washing action, said combination having the combined advantages of the perforate and imperforate drum type washers.

When the washing cycle is completed, the valve 67 is turned to cause the pipe 60 to communicate with the atmosphere and thereby release the fluid pressure in the rams 24. The weight of the water in the drum 11, plus the tension of the springs 40, causes the dump door 35 to be moved axially rearwardly out of contact with the sealing gasket 25. During this movement of the dump door, the diaphragm 50 flexes rearwardly to adapt itself to the new position of said dump door. The water

in the drum 11 then flows rapidly from the open rear end of the drum 11 through the space between the flange 36 of the opened dump door and the gasket 25 and then into the drain duct 86.

There are a number of features of the improved washing machine which aid in rapid drainage of water therefrom. By having the drum 18 perforated and of less diameter than the drum 11, the water can flow freely from the clothes into the annular water receiving space therebetween and then out of the open rear end of the drum 11. In addition, the perforations in the end wall 20 greatly aid in drainage of the water into the rear end wall water receiving space and thence into drain 86. Another factor aiding in the quick drainage of the improved washing machine is the feature of having the ribs 21 perforated, and having their ends and bases open through the end wall 20 and through the side wall respectively of the drum 18.

After the washing cycle, the improved washing machine may be put through one or more rinsing cycles, with the rinsing water being drained from the drums by opening the dump door in the manner heretofore described. During the draining operation which follows the rinsing operations the drums are rotated. The frusto-conical configuration of the perforated drum 11 gives an angular disposition to the ribs 21 which causes the clothes in the drum 18 to be moved toward the forward end adjacent the loading and unloading door (not shown) to aid in unloading. Upon stopping the drums and upon opening the loading door, the washed and rinsed clothes can be readily removed.

Various changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated, as may come within the scope of the claims.

What we claim is:

1. In a washing machine: a rotatable drum having an open end; a dump door for closing said open end, said door being formed with a central aperture; fluid pressure operated means on the drum for moving said dump door axially into and out of closing relationship with respect to said open end; a stationary sleeve extending through said dump door aperture for introducing washing liquid into said drum; a fluid pressure supply conduit extending axially through said sleeve and connected to said fluid pressure operated door moving means, there being a rotating joint in said supply conduit located axially of said sleeve; and a flexible centrally apertured diaphragm closing said dump door aperture and embracing the periphery of said sleeve, said diaphragm being adapted to flex in a manner to adjust itself to the open and closed positions of the dump door.

2. In a washing machine: a rotable drum having an open end; a dump door for closing said open end, said door being formed with a central aperture; means including a fluid pressure operated ram on the drum for moving said dump door axially into and out of closing relationship with respect to said open end; a stationary sleeve extending through said dump door aperture for introducing washing liquid into said drum; a rotatable fluid pressure supply conduit extending through said sleeve and connected to said fluid ram; and a flexible centrally apertured diaphragm closing said dump door aperture and embracing the periphery of said sleeve, said diaphragm being adapted to flex in a manner to adjust itself to the open and closed positions of the dump door.

3. In a washing machine: an outer imperforate substantially cylindrical drum rotatable on a generally horizontal axis and having an open end; a perforated frusto-conical inner drum of smaller diameter mounted coaxially within and spaced from said outer drum, said inner drum having its smaller end adjacent the open end of said outer drum to form an annular water receiving space between said drums, the thickness of which increases adjacent the open end of said outer drum, said inner drum having a perforated end wall at its smaller end; a dump door for closing the open end of the outer drum; means for moving said dump door axially into and out of closing relationship with respect to said end opening, said outer drum being adapted to confine a quantity of liquid when said door is closed.

4. In a washing machine: an outer imperforate substantially cylindrical drum rotatable on a generally horizontal axis and having an open end; a perforated frusto-conical inner drum of smaller diameter mounted coaxially within and spaced from said outer drum, said inner drum having its smaller end adjacent the open end of said outer drum to form an annular water receiving space between said drums, the thickness of which increases adjacent the open end of said outer drum, said inner drum having a perforated end wall at its smaller end; a dump door for closing the open end of the outer drum, said door being spaced from the perforated end wall of said inner drum to form an end wall water receiving space therebetween which communicates with said annular water receiving space; means for moving said dump door axially into and out of closing relationship with respect to said end opening, said outer drum being adapted to confine a quantity of liquid when said door is closed.

5. In a washing machine: an outer imperforate substantially cylindrical drum rotatable on a generally horizontal axis and having an open end; a perforated frusto-conical inner drum of smaller diameter mounted coaxially within and spaced from said outer drum, said inner drum having its smaller end adjacent the open end of said outer drum to form an annular water receiving space between said drums, the thickness of which increases adjacent the open end of said outer drum, and said inner drum having a perforated end wall at its smaller end; axially extending hollow perforated ribs in said inner drum, said inner drum being formed with longitudinal slots providing communication between the interiors of said ribs and said annular water receiving space; a dump door for closing the open end of the outer drum; means for moving said dump door axially into and out of closing relationship with respect to said end opening, said outer drum being adapted to confine a quantity of liquid when said door is closed.

6. In a washing machine: a rotatably mounted drum having an open end; a dump door axially slidably mounted on said drum for rotation therewith and movable axially between a closed position with respect to said open end and an open position spaced axially outwardly from said open end; spring means connected to said door and drum in a manner to urge said door axially outwardly toward said open position; fluid pressure operated mechanism mounted on said drum and connected to said door and releasably holding the latter in said closed position against the action of said spring means, said spring means

being operable to move said door to open position upon release of said fluid pressure operated mechanism; and means for conducting fluid under pressure from a remote source to said mechanism while the drum is rotating.

7. In a washing machine; a rotatably mounted drum having an open end; a dump door axially slidably mounted on said drum for rotation therewith and movable axially between a closed position with respect to said open end and an open position spaced axially outwardly from said open end; at least one spring connected to said door and drum in a manner to urge said door axially outwardly toward said open position; at least one fluid pressure operated single acting ram connected to said door and normally holding the latter in said closed position against the action of said spring; and means normally conducting fluid under pressure from a remote source to said rams while the drum is rotating, said means including a two way valve for alternatively venting said rams to the atmosphere, said springs being responsive to venting of said rams to move said door to open position.

8. In a washing machine: a rotatably mounted drum having an open end; a dump door for closing said open end, said door being formed with a central aperture; fluid pressure operated means on the drum for moving said dump door axially into and out of closing relationship with respect to said open end; a fixedly mounted sleeve adjacent and coaxial with said dump door aperture for introducing washing liquid into the drum, said sleeve having a diameter substantially smaller than said door aperture; a fluid pressure supply conduit extending axially through said sleeve and connected to said fluid pressure operated door moving means; and a centrally apertured axially flexible diaphragm closing said dump door aperture and sealingly and rotatably embracing the periphery of said sleeve, said diaphragm being adapted to flex in a manner to adjust itself to the open and closed positions of the dump door.

9. In a washing machine: a rotatably mounted drum having an open end; a dump door for closing said open end, said door being formed with a central aperture; means including a fluid pressure operated ram mounted on the drum and connected to the dump door for moving the latter axially into and out of closing relationship with respect to said open end; a fixedly mounted sleeve positioned adjacent and coaxial with said dump door aperture for introducing washing liquid into said drum; a fluid pressure supply conduit extending through said sleeve and connected to said fluid ram; and a flexible centrally apertured diaphragm closing said dump door aperture and sealingly and rotatably embracing the periphery of said sleeve, said diaphragm being adapted to flex in a manner to adjust itself to the open and closed positions of the dump door.

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