Oct. 29, 1940. K. P. CALDWELL 2,219,680

WASHING MACHINE

Filed Feb. 24, 1937 3 Sheets-Sheet 1

Fig. 1.

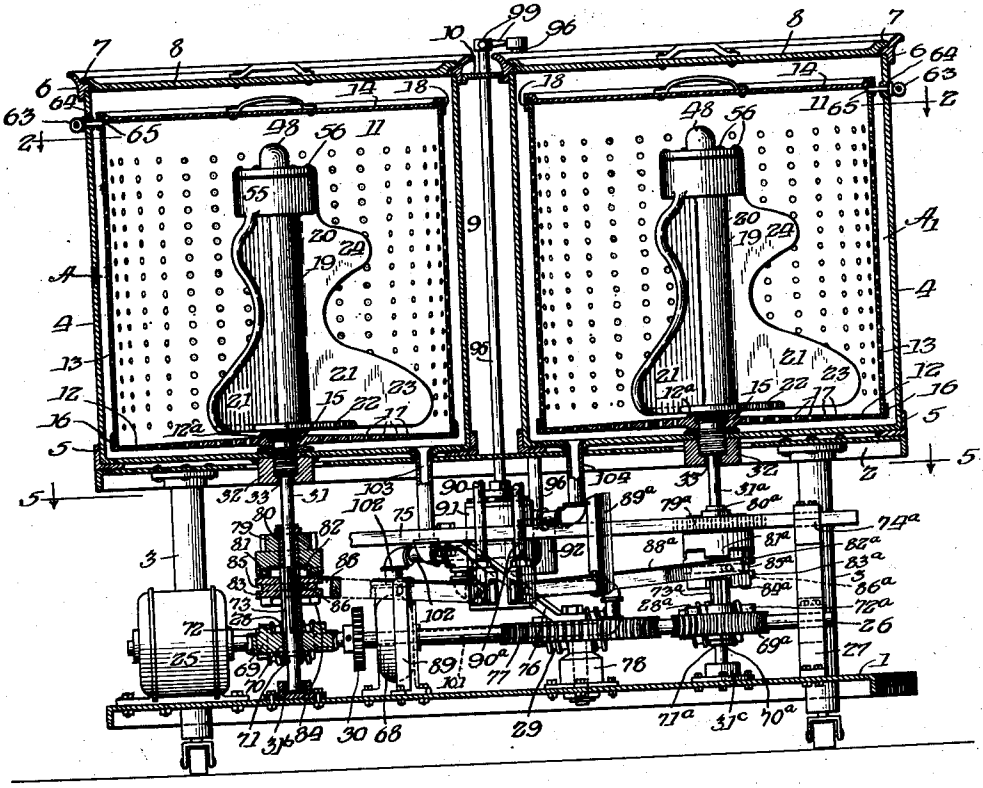

Fig. 2.

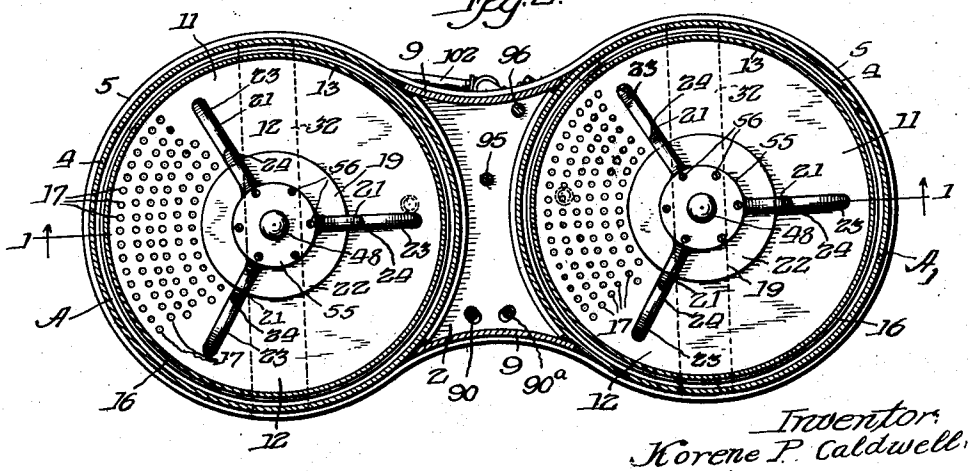

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Fig. 3.

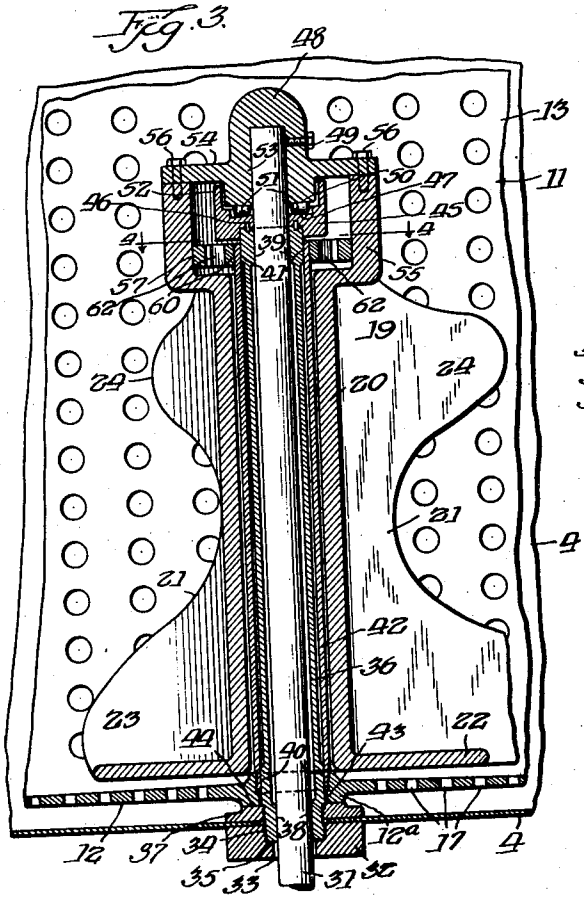


Fig. 4.

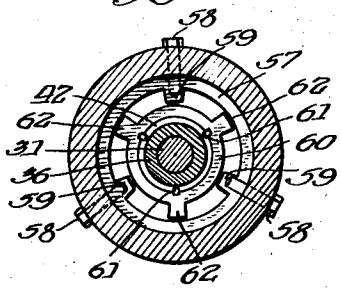
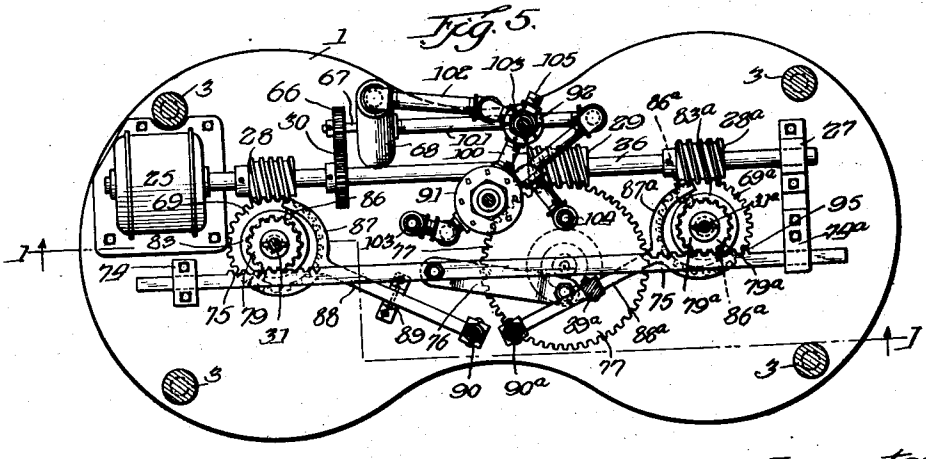


Fig. 5.



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WASHING MACHINE

Filed Feb. 24, 1937 3 Sheets-Sheet 3

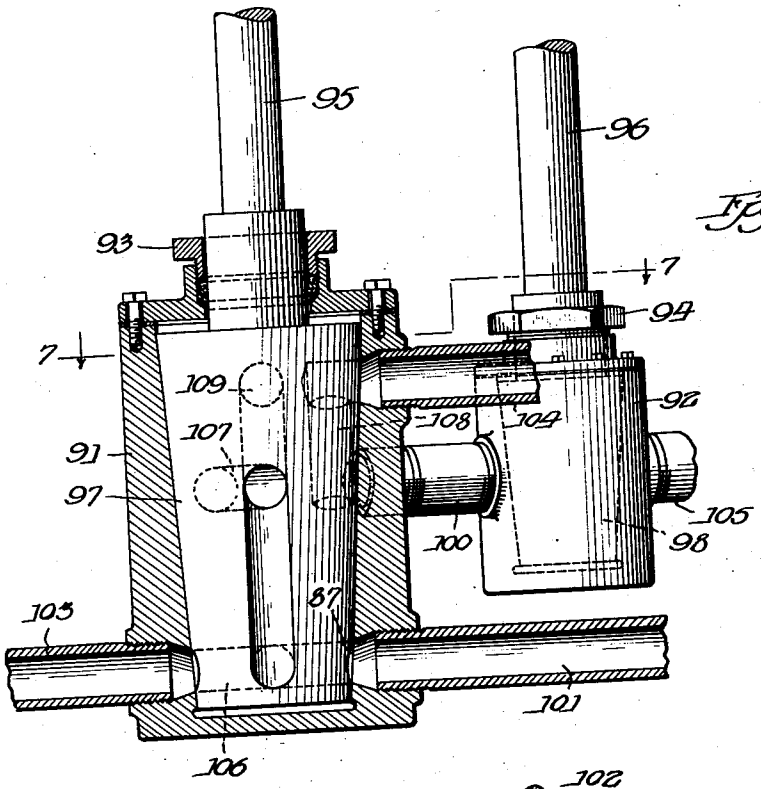

Fig. 6

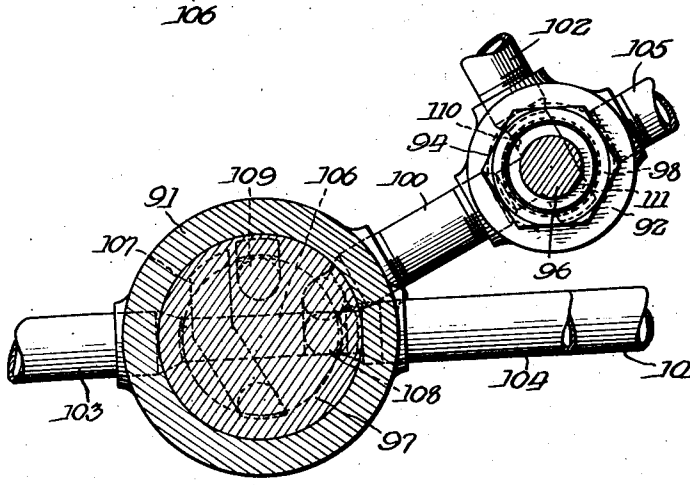

Fig. 7

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2,219,680

UNITED STATES PATENT OFFICE

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WASHING MACHINE

Korene Pendleton Caldwell, Bryn Athyn, Pa.

Application February 24, 1937, Serial No. 127,450

3 Claims. (Cl. 68—23)

This invention relates generally to a machine for washing clothes, and is characterized by the provision in duplicate of operable units which may be selectively used for the washing of clothes, rinsing and the subsequent damp-drying of them in the same container, and of means for transferring the washing fluid from one unit to the other.

In washing machines having a separate compartment for washing and for drying of clothes, it is necessary to transfer the wet clothes from the washing compartment to the drying compartment and from rinsing water in a stationary tub to the drying compartment. In my invention the same compartment is used for washing, rinsing and damp-drying and a means is provided for removing the washing fluid from the compartment instead of removing the clothes. I provide the compartments in duplicate in order that the washing fluid may be transferred from one to the other as desired, with the result that while one compartment is being used for rinsing and drying, the other may be used for washing. This also reduces the loss of washing fluid and the loss of heat from the fluid in that the transfer is effected directly between the two compartments.

This invention has for its principal objects the provision of an improved form of washing machine adapted to wash, rinse and dry clothes in the same compartment without removing the clothes therefrom; the provision of a plurality of such compartments for washing, rinsing and drying clothes so that the washing fluid may be transferred from one to the other, allowing the simultaneous rinsing and drying of clothes in one such compartment and washing of clothes in another compartment; the provision of a plurality of such compartments and an improved means of transferring the washing fluid from one to the other; the provision of means within a compartment for washing clothes whereby the clothes are selectively subjected to oscillatory agitation in the presence of a washing fluid or to rotation after the removal of the washing fluid. This invention has for its further objects, the provision of an improved construction for operatively mounting a rotatable drying compartment within the washing compartment; the provision of an improved construction for operatively mounting an agitator in a washing machine which may selectively be given oscillatory or rotative movement; and the provision of an improved mechanism for imparting said rotative movement to said drying compartment and selectively said rotative or oscillatory movement to said agitator.

The foregoing and such other objects or advantages as may appear or be pointed out as this description proceeds are attained in a structural embodiment of the invention shown in the accompanying drawings in which:

Fig. 1 is a vertical sectional view of a structure incorporating the improvements of my invention taken along the line 1—1 as indicated in Figs. 2 and 5.

Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1 looking in the direction indicated by the arrows.

Fig. 3 is an enlarged sectional view of a washing compartment showing the detail of the operative elements and the means of supporting the same.

Fig. 4 is a detail sectional view taken on the line 4—4 of Fig. 3 looking in the direction indicated by the arrows.

Fig. 5 is a horizontal sectional plan view taken on the line 5—5 of Fig. 1 looking in the direction of the arrows, and showing in plan the detail of the mechanical means used to operate this invention.

Fig. 6 an enlarged vertical sectional view of the valves used to control the movement of the fluid.

Fig. 7 a horizontal sectional view taken along the line 7—7 of Fig. 6.

Referring now more particularly to the drawings and especially to Figs. 1, 2 and 3, I provide a supporting structure comprising a flanged steel plate 1 for generally supporting the operating machinery and a similar flanged steel plate 2 for supporting the washing compartments. These plates are conveniently made in the shape shown in Figs. 2 and 5, and are spaced apart and supported by four legs 3 as shown in Fig. 1.

The upper flanged plate 2 carries the two compartments generally indicated as A, A_1 which are in all respects duplicates of each other. Therefore only one will be described and the same index number is used to indicate the same part in each.

I provide a cylindrical outer container 4 made of sheet metal sides and bottom. The bottom corner is reinforced by an angle hoop 5 welded to the container. The top or open end is also provided with a flanged hoop 6 also welded to the sides of the container and providing an annular shoulder 7 which supports a removable cover 8. The two outer containers 4, 4 are joined together in spaced relation by the arcuate side

portions 9, 9, which are permanently fastened, as by welding to the containers 4, 4 as best shown in Figure 2. The top of the space enclosed by the containers 4, 4, and the arcuate side portions 9, 9 is closed by a cover plate 10 as best shown in Figure 1. This construction affords a housing for the control levers to be later described, and an exterior of pleasing appearance which is easy to keep clean. It also adds structural strength to the entire assembly.

Within each of the outer containers 4, I provide a cylindrical extractor unit 11 conveniently formed of a bottom 12 and cylindrical side wall 13 and provided with a removable cover 14. The bottom 12 is conveniently formed of a pressed or cast circular metal plate having a relatively thick center boss portion 12a whereby the extractor is mounted within the outer container as will later be described; and a circumferential flange 16 to which the cylindrical wall 13 is fastened. This bottom plate is also provided with a plurality of holes 17 to permit the washing fluid to pass readily into or out of the extractor. In order to reduce the amount of metal in the plate 12 it is conveniently tapered in thickness from the center to the circumference. The cylindrical wall 13 is of sheet metal and is fastened at the bottom within the flange 16 of the bottom 12 by any of the well-known means such as soldering or welding as may be convenient. The upper end is reinforced by the metal hoop 18 which also affords an annular seat for the cover 14. A plurality of holes are provided in the wall 13 to allow washing fluid to readily pass through it.

Inside of the cylindrical extractor unit 11 I have provided an agitator generally indicated as 19 and mounted as will later be described so as to be oscillated within the extractor unit. This agitator is conveniently made of a single casting of some light metal such as aluminum and comprises a hollow center shaft 20, and a plurality of radial agitating vanes 21 spaced apart and supported by the shaft 20 and a circular base portion 22. The agitating vanes generally indicated as 21 are formed with major surfaces 23 at the bottom and relatively smaller agitating surfaces 24 adjacent to the top and just below the level of the washing fluid in the container 4. By providing these secondary agitating surfaces 24 near the upper level of the washing fluid I secure a more efficient cleansing action.

The structure by which the extractor unit 11 and the agitator unit 19 are mounted within the outer container 4; and the means by which either continuous rotation may be imparted to the extractor and agitator or oscillatory rotation may be imparted to the agitator alone, from a common driving shaft, comprise important features of my invention and will now be described in detail. Since the operating means for each of the two units is identical, but one will be described and the same index number given to the parts.

Referring now particularly to Figs. 1, 3 and 5, I provide the electric motor 25 mounted upon the base plate 1 and driving the shaft 26, carried by suitable bearings 27, also mounted on the base 1. Fixedly mounted upon the shaft 26 are the worms 28, 28a and 29, and the gear wheel 30 which drives the various mechanical movements as hereafter described.

As a means for imparting the desired movement to the agitators 19 and the extractors 11, I provide vertical shafts 31, 31a, the lower ends of which are mounted in bearings 31b, 31c, fastened to the supporting plate 1, and which extend upwardly through the bottoms of containers 4, 4, and within the hollow center shafts 20 of the agitator 19.

To form a rigid support and bearing for shafts 31, 31a, agitators 19 and extractors 11, I provide supporting members 32 extending diametrically between the flanges of the plate 2, to which they are rigidly fastened. The plate 2 is cut away so that this fastening is positioned immediately below the bottom of the container 4 to support the same. This supporting member may conveniently be a casting provided with a thickened center portion in which is a circular aperture 33 allowing the shaft 31 to pass through. The upper part of the aperture is enlarged as at 34 to form the annular seat 35, and the enlarged portion 34 is internally threaded. A tubular metal sleeve 36 encases the shaft 31 and is threaded at its lower end to screw into the hole 34, and these threads extend for a length sufficient to accommodate a circular bearing plate 37. An aperture is provided in the bottom of the container 4 large enough to allow the sleeve 36 to go through. Thus the bottom of the container is between the member 32 and the plate 37 and when the sleeve is screwed into position and the plate 37 screwed down tight after applying a coat of white lead or the like between the bottom of the plate 37 and the bottom of the container 4 a water tight joint is secured and the sleeve 36 is rigidly supported by the member 32.

The internal diameter of the sleeve 36 for the major portion of its length is greater than the diameter of the shaft 31. However at the upper and lower ends the thickness of the walls is increased and the internal surface machined to provide bearings at 38 and 39 for the shaft 31. Similarly on the exterior surface of the sleeve 36 the portions 40 and 41, adjacent to the upper and lower ends and having an external diameter greater than that of the major portion of the sleeve, are provided and machined to form bearings for a second cylindrical sleeve member 42.

Reverting now to the bottom 12 of the extractor 11, as shown in Figure 3 the thickened center boss 12a is provided with a circular hole 43 slightly larger than the outside diameter of the sleeve 36 and threaded at its upper portion to receive the complementally threaded lower end of the sleeve 42. Also the upper face of the plate 37 and the lower surface of the boss 12a are machined so that the plate 37 forms a bearing 44, for the rotation of the extractor 11 Since, as will be later described, rotation is imparted to the extractor 11 through the sleeve 42 it is necessary that the direction of the threaded connection between 42 and 12a be the same as the direction of rotation of the container. This threaded connection is merely a convenient construction as obviously pins, set screws or other means could be used to make this connection.

At the upper end of the sleeve 36 is provided a bearing member 45, fitted closely upon the sleeve 36 and removably fixed thereto by the pins 46. This bearing member is so formed as to provide an annular bearing surface 47 concentric with the shaft 31.

The upper end of the shaft 31 is fitted with a metal cap member 48 which may conveniently be a machined casting, and is removably secured to the shaft 31 by one or more set screws 49. This cap is provided with an annular bearing surface 50, complemental to the bearing surface 47

and between these surfaces is provided a set of roller bearings 51. The annular wall 52 of the bearing member 42 surrounding and spaced from the annular portion 53 of the cap 48 provides ample space for grease for the bearings and yet prevents any such grease from getting out of the bearing.

The cap 48 is further formed with an annular flange 54 which is securely fastened to a complemental annular wall 55, formed at the top of the agitator 19, by a plurality of stud bolts 56, as clearly shown in Figure 3.

It will thus be seen that the agitator 19 is fixedly mounted upon the shaft 31 and the assembly of these elements is rotatably mounted upon the sleeve 36 which carries the load of this assembly to the supporting member 32. Also, it will be seen that the extractor unit 11 is mounted upon the bearing 44 for rotation about the sleeve 36 by means of the sleeve 42 and that this assembly is also carried by the supporting member 32. The agitator member is fixedly connected to the shaft 31 and rotates with this shaft; the extractor unit 11 is rotatable about the sleeve 36 which acts as a support for the agitator.

In order to provide an operative connection between the extractor 11 and the shaft 31 whereby continuous rotation may be imparted to the extractor when desired, I provide, as best shown in Figure 4, a ring 57 fixedly mounted on the inside of the annular wall 55 of the agitator 19 by bolts 58. This ring is provided with a plurality of lugs 59 extending inwardly. A complemental ring 60 is fixedly mounted upon the sleeve 42 by means of keys 61, and is provided with a plurality of outwardly extending lugs 62 spaced complementally to the lugs 59 for engagement with the same.

As will be readily seen, this arrangement permits of oscillatory rotation of the shaft 31 and the agitator 19, through an arc limited by the space between the lugs 59 without any movement being imparted to the sleeve 42 and the extractor 11. However, when it is desired to operate the extractor, a continuous rotation imparted to the shaft 31 causes the lugs 59 to contact the lugs 62, and the agitator 19 and extractor 11 are rotated continuously together. When the agitator alone is being given oscillatory movement, the extractor 11 should be maintained in a stationary position by some locking means conveniently as shown in Figure 1 by a removable pin 63 passing through complementary holes 64 and 65 in the container 4 and the extractor 11, respectively. This locking means is so placed with relation to the rings 57 and 60 that when the containers 4 and 11 are fastened together and the shaft 31 is oscillated, the lugs 59 move only in the arc between adjacent lugs 62. When the pin 63 is removed, the extractor 11 is free to rotate continuously when such movement is given to the shaft 31.

For purposes of illustration the lugs 59 and 62 are shown at the third points of the circumference of the rings 57 and 60; it will be understood that the spacing and number of lugs employed may be varied as desired to permit satisfactory oscillatory movement of the agitator.

Figs. 1 and 5 illustrate a preferred embodiment of a convenient type of operating mechanism for selectively rotating and oscillating shafts 31, 31*a*. Other apparatus within the concept of this invention will be apparent to those skilled in the art. For clearness of understanding the suffix "*a*" is added to the reference characters to indicate mechanism actuating compartment A_1. Gear wheel 30 mounted on shaft 26 is in mesh with a spur gear 66 mounted on pump shaft 67 adapted to drive continuously a centrifugal water pump 68. Meshing with worms 28 and 28*a* carried on shaft 26, as previously described, are spur gears 69 and 69*a*, respectively journaled on cylindrical sleeves 70 and 70*a*, carried on shafts 31 and 31*a* and supported by annular members 71, 71*a*. Gears 69, 69*a* are provided with toothed engaging faces 72, 72*a*. Slidably mounted in bearings 74 and 74*a*, mounted on base plate 1, is a horizontally extending rack 75 connected by a crank 76 to a spur gear 77, journalled in a bearing 78, and gear 77 is in mesh with worm 29 on shaft 26. Shafts 31, 31*a* are provided with enlarged splined sections 73, 73*a*. Rack 75 is in mesh with spur gears 79, 79*a*, journaled on sleeves 80, 80*a* on shafts 31, 31*a* above gears 69, 69*a*. Gears 79, 79*a* are provided with toothed faces 81, 81*a* adapted to engage complementary faces 82, 82*a* of the double faced clutches 83, 83*a* carried on the splined sections 73, 73*a* of shafts 31, 31*a*, and movable axially thereon. The lower faces 84 and 84*a* of the clutches are likewise provided with portions adapted to engage faces 72, 72*a* of the gears 69, 69*a* when the clutches are in their lowermost positions. The clutches are provided with peripheral grooves 85, 85*a* adapted to receive roller pins 86, 86*a* carried by yokes 87, 87*a* of the clutch levers 88, 88*a*, permitting rotary movement of said clutches within the roller pins. The clutch levers 88, 88*a* are pivotally supported on standards 89, 89*a* and are pivotally connected to control arms 90, 90*a* extending upwardly along the sides of compartments A and A_1 and equipped with handles (not shown) adapted to raise and lower the control arms.

A pair of valves 91 and 92 are adapted, by means of pump 68, to withdraw washing or rinsing fluid from compartment A and transfer it to compartment A_1 or the sewer and likewise to withdraw washing or rinsing fluid from compartment A_1 and transfer it to compartment A or the sewer. The valves are provided with collars 93, 94 machined to house rods 95, 96 controlling valve plugs 97, 98 rotatable within the valve casings. Control rods 95 and 96 extend upwardly between compartments A and A_1 through the cover plate 10 and are provided with handles 99 to rotate the control rods. A fluid conduit 100 connects valves 91 and 92. The inlet of pump 68 is connected to valve 91 by conduit 101, and conduit 102 connects the outlet of the pump 68 to valve 92. Drains 103, 104 are tapped into the bottoms of containers 4, 4 of compartments A and A_1 and lead to valve 91. Valve 92 is provided with an outlet 105 to the sewer. Valve plug 97 is provided with a plurality of ports; port 106 adapted to connect conduits 101 and 103; port 107 connecting conduits 100 and 103, port 108 connecting conduits 100 and 104, and port 109 connecting conduits 101 and 104. In the position shown in Figs. 6 and 7, ports 106 and 108 are in operative position; by rotating plug 97 approximately 90° in a clockwise direction, ports 106 and 108 are disconnected, and ports 107 and 109 are brought into register with their respective conduits.

Valve plug 98 is provided with a pair of ports 110 and 111. As shown in Fig. 7, port 110 connects conduits 100 and 102. By rotating plug 98 approximately 180°, port 111 may be brought into operative relationship connecting conduits 102 and 105.

It will thus be seen that to transfer washing

fluid from compartment A to compartment A_1 the fluid is withdrawn through conduit 103, port 106, pump inlet 101, the pump 68, the outlet 102, port 110, conduit 100, port 108 and conduit 104 into compartment A_1. To direct the washing fluid or rinsing water from compartment A to the sewer, plug 98 is rotated 180°, and the water passes from the pump 68 through the pump outlet 102, port 111, to the drain outlet 105.

To transfer washing fluid from the compartment A_1 to the compartment A, valve plug 97 is rotated in a clockwise direction substantially 90° from the position shown in Figs. 6 and 7; valve plug 98 is maintained in the position shown in Fig. 7. In this case the fluid is withdrawn from compartment A_1 through conduit 104, through port 109, pump inlet 101, pump 68, pump outlet 102, port 110, conduit 100, port 107, and conduit 103 to compartment A. To pass washing fluid or rinsing water from compartment A_1 to the sewer, valve plug 98 is rotated 180°, and the water will pass from the pump outlet 102 through port 111 to the drain outlet 105.

From the foregoing detailed description it is apparent that the washing mechanism of compartments A and A_1 may be operated simultaneously, that the centrifuged dryers of compartments A and A_1 may be operated simultaneously, and that the washing mechanism of either compartment may be operated at the same time as the dryer mechanism of the other compartment. To oscillate the washing agitator of compartment A the control arm 90 is placed in its lowermost position, as shown in Fig. 1, thereby raising the clutch member 83 bringing the clutch face 82 into engagement with the complementary face 81 of the spur gear 79 imparting oscillatory movement to shaft 31 and agitator 21 through rack 75. After the material to be laundered in compartment A has been sufficiently washed, the washing fluid may be transferred to compartment A_1, as previously described, and the washing mechanism of compartment A_1 actuated by lowering control arm 90*a* and imparting oscillatory movement to the shaft 31*a* and the agitator 21 through the mechanism similar to that just described in connection with the washing mechanism of compartment A. The material in compartment A may then be rinsed and the rinsing water disposed of to the drain through outlet 103, valves 91, 92 and the drain outlet 105. The material in compartment A is dried by raising control arm 90, thereby bringing the face 84 of clutch 83 into engagement with the complementary face 72 of spur gear 69 imparting rotary movement to shaft 31, agitator 21 and drier 11.

After the material in compartment A has been sufficiently dried it may be manually removed and a second batch of soiled material inserted in drum 11. The washing fluid in compartment A_1 may then be transferred to compartment A in the manner previously indicated and the agitator 21 oscillated by lowering control arm 90, as previously described. The material in compartment A_1 may then be rinsed and subjected to the drying action of the centrifuged dryer 11 by elevating control arm 90*a*, thereby lowering the engaging face 84*a* of clutch 83*a* into engagement with the engaging face 72*a* of spur gear 69*a* imparting rotary motion to shaft 31*a*, agitator 21 and the dryer 11. It is to be understood that before agitators 21 in either compartment may be actuated, pin 63 must be inserted in holes 64 and 65 of wall 4 of the compartments and the wall 13 of drum 11, respectively, in order that the agitator may oscillate in the arc between lugs 62 carried by ring 60 of sleeve 42 without moving drum 11.

In case the material to be laundered does not exceed the capacity of compartments A and A_1, it will be understood that the washing mechanism of compartments A and A_1 and subsequently the rinsing and drying mechanism of compartments A and A_1 may be operated simultaneously, thereby cutting the normal washing, rinsing and drying time in half.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. In a device of the character described, a container for a washing fluid, a perforated drum within said container, a motor-driven shaft centrally disposed within said container and drum, an agitator supported on said shaft within said drum, a sleeve enclosing said shaft rigidly carried in the bottom of said container, a second sleeve enclosing said shaft and first mentioned sleeve and secured to said drum, an annular member secured to said agitator and carrying a plurality of short lugs within said drum, a second annular member secured to said second mentioned sleeve and carrying a plurality of short lugs within said drum and complementary to and adapted to be engaged by said first mentioned lugs, whereby said agitator may be oscillated within the arc between said second mentioned lugs and may rotate with said second mentioned sleeve and drum.

2. In a device of the character described, a container for a washing fluid, a perforated drum within said container, a motor-driven shaft centrally disposed in said container and drum, an agitator supported on said shaft within said drum, a sleeve enclosing said shaft fixedly carried in the bottom of said container, a second sleeve enclosing said shaft and the first mentioned sleeve and secured to said drum, a ring carried by said agitator and having a plurality of equally spaced short lugs within said drum, a second ring mounted on said second mentioned sleeve carrying a plurality of equally spaced short lugs within said drum and complementary to and adapted to be engaged by said first mentioned lugs, and means for oscillating said agitator within the arc of said second mentioned lugs and for rotating said agitator and said drum.

3. In a washing machine, a washing compartment, washing mechanism within said compartment, drying mechanism within said compartment, a vertical driven shaft extending into and below said compartment and supporting said washing mechanism, a sleeve member enclosing, actuated by said driven shaft and carrying said dryer, means operatively connecting said driven shaft and said sleeve member, whereby said washing mechanism may be oscillated independently of said dryer and said dryer and said washing mechanism may be rotated, a driving shaft cooperating with said driven shaft, and gear members cooperating with said driving shaft and said driven shaft adapted to selectively impart rotary or oscillatory motion to said driven shaft.

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