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J. PEARCE
WASHING MACHINE

2,500,467

Filed Feb. 12, 1947

3 Sheets-Sheet 1

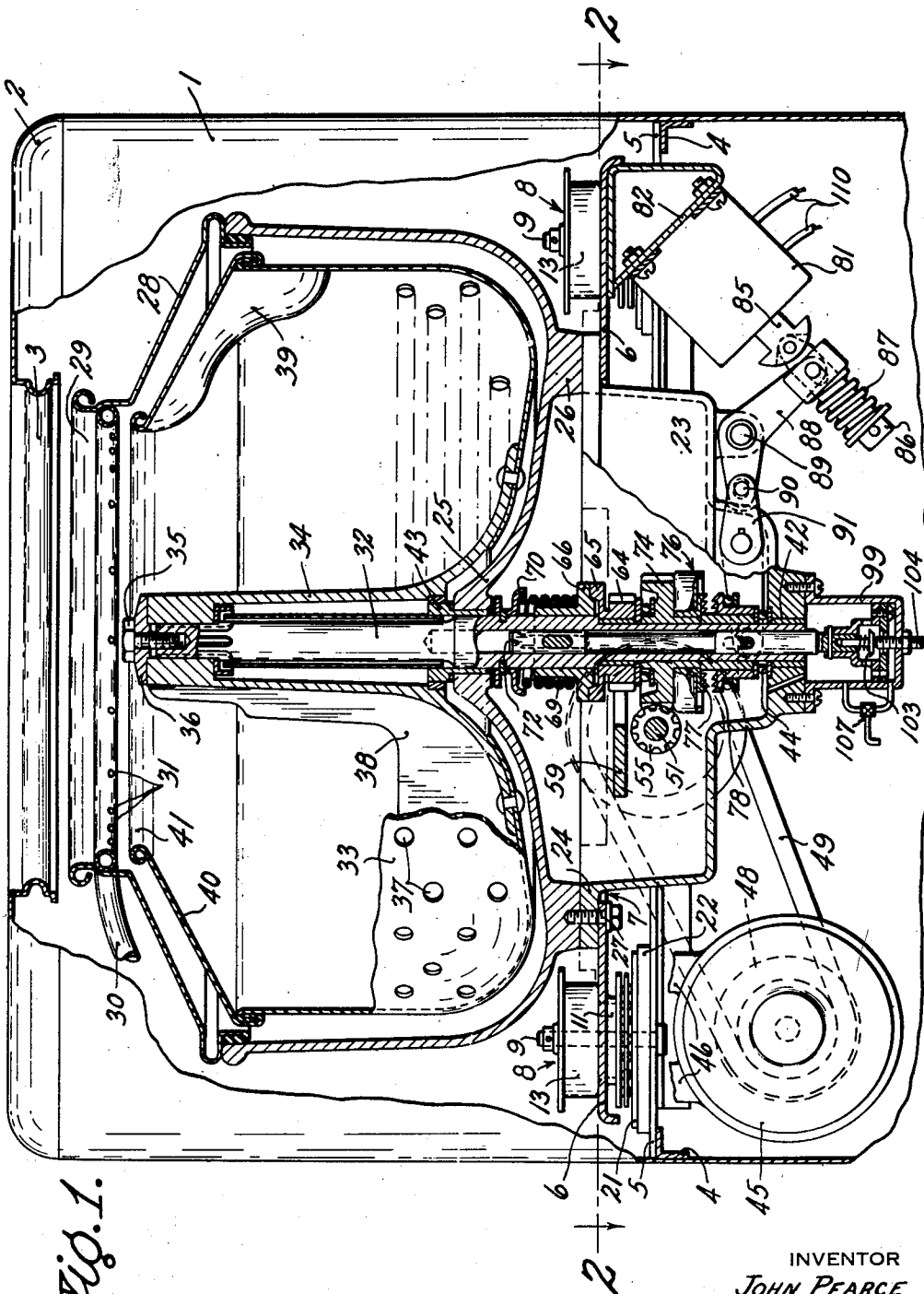


Fig. 1.

INVENTOR
JOHN PEARCE
BY *Chapin & Neal*
ATTORNEYS

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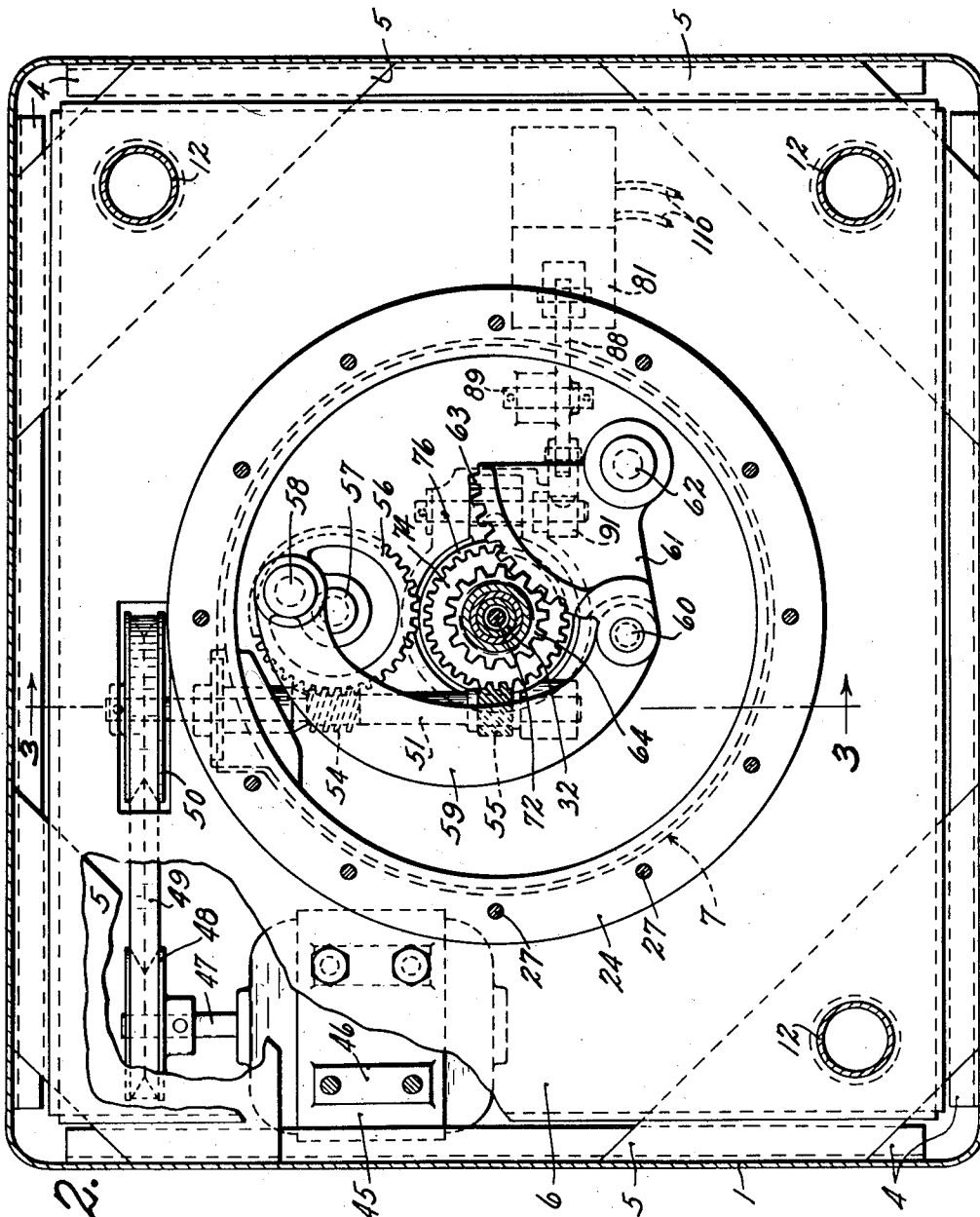


Fig. 2.

INVENTOR

JOHN PEARCE

BY

Chapin & Neal
ATTORNEYS

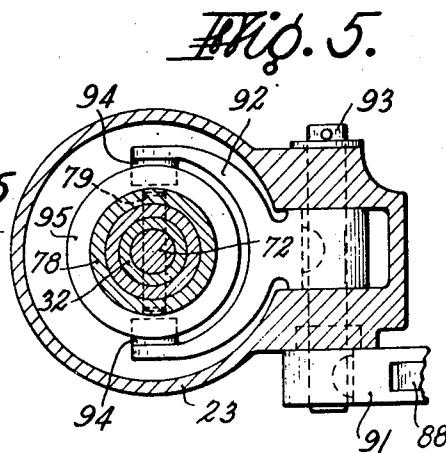
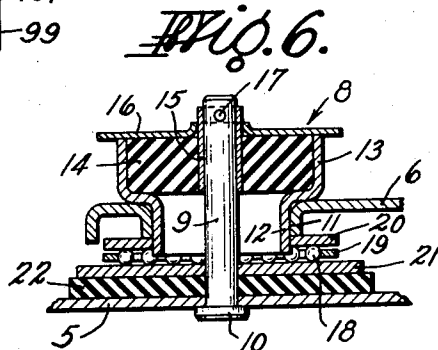
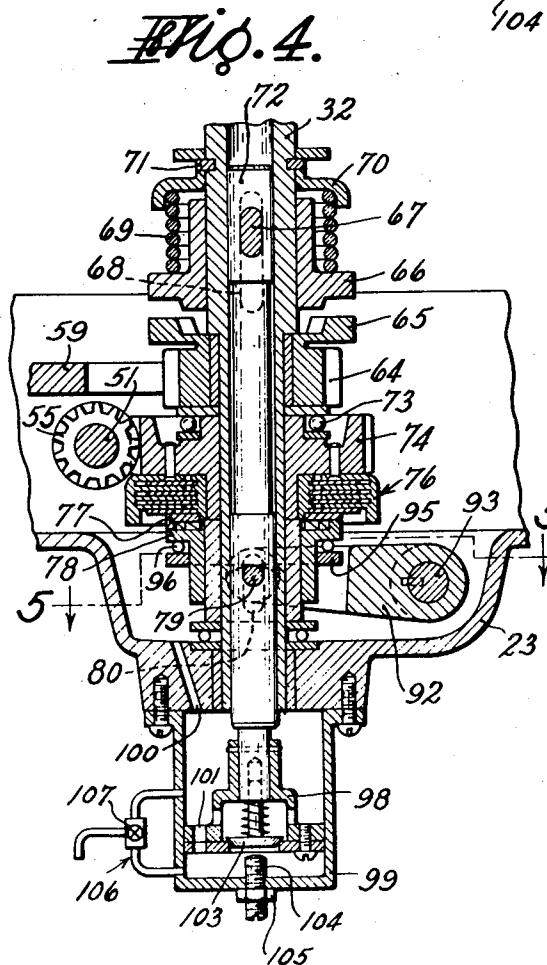
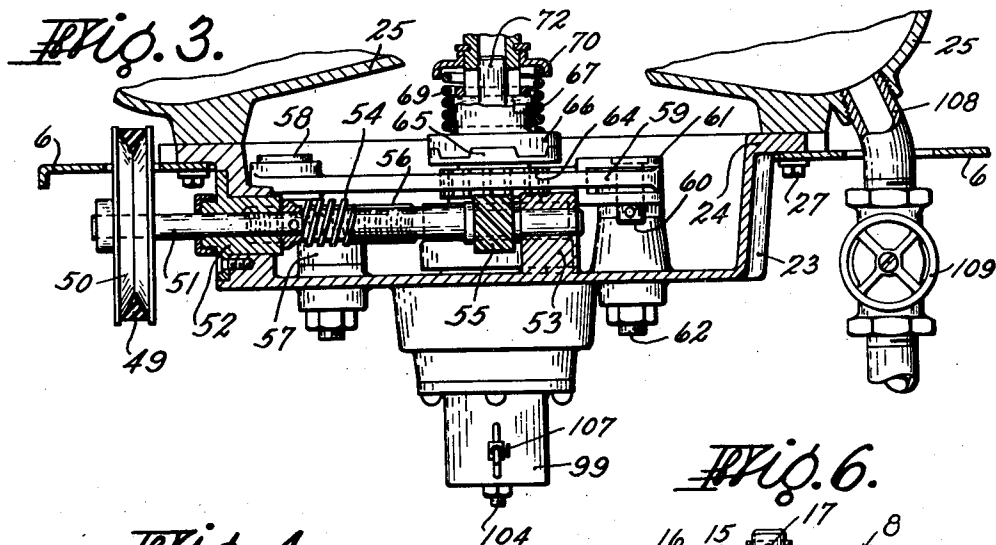
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INVENTOR
JOHN PEARCE
BY *Chapin & Neal*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,500,467

WASHING MACHINE

John Pearce, East Longmeadow, Mass., assignor
to Savage Arms Corporation, Utica, N. Y., a
corporation of Delaware

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2 Claims. (Cl. 210—63)

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This invention relates to washing machines of the spin dry type wherein a spinner basket is employed in a tub for the washing operation and also for expelling water therefrom by a centrifuging action.

Any suitable means may be provided for agitating the clothes in the washing operation and in the present embodiment I have shown means for oscillating the basket for this purpose together with means for imparting when desired, a relatively high speed rotation of the basket necessary for the centrifuging process.

One object of the invention is to provide a so-called floating support for the operating parts of the machine so as to minimize the effects of vibration and gyration upon the enclosing cabinet particularly during high speed rotation of the basket when unevenly loaded with the material to be spin dried. To this end the entire operating unit of the machine including the tub, basket, driving motor spinner shaft and operating connections thereto, is carried on a common support which in turn is carried on a second support by flexible mountings of special character hereinafter more particularly described. The resulting effect is that the operating unit and its support may float around in all directions horizontally on the second support, and under a yielding restraint which limits the extent of said movement. This permits the mass of the revolving spinner basket and load of wet clothes to revolve around a vertical axis that is determined by the state of balance of said spinner basket and its load, with the result that vibration of the unit due to out of balance condition of the clothes in the basket is transmitted to the outer cabinet and supporting structure to only a very slight degree.

A further object of the invention is to provide driving means for selectively oscillating at low speed or rotating at high speed, the spinner basket, and to automatically control the shift from high speed operation to low speed operation so as to take place only when the basket rotation has practically ceased. For this purpose a dash pot is operatively associated with a clutch shifter rod for delaying the movement of said rod in shifting from high speed operation to low speed operation.

In furtherance of the above objectives the operating unit of the machine comprises a vertically disposed spindle or spinner shaft which extends as a continuous integral member from the lower side of the floating support where it receives its drive from the motor and transmis-

sion, to a point well above said support where it is attached to the upper end of a central vertical column of the spinner basket for operating the same. In this manner the weighted parts of the operating unit are distributed above and below said floating support, and the center of the mass of said entire unit is relatively low. As a consequence thereof, the gyratory vibration of the centrifuging unit will in a large part be directed horizontally instead of vertically and will be dampened out by the flexible mountings of the floating support.

A feature of improvement of the present invention also resides in the arrangement of the water supply for filling the tub which is in the form of a circular perforated ring adjacent the entrance of said tub so as to be useful both for filling the tub and spraying the clothes in the basket for rinsing.

Further objects and advantages of the invention will be more clearly apparent in the following description taken in connection with the accompanying drawings, in which

Fig. 1 is a view in elevation of the cabinet partly broken away to show operating parts of the machine in section;

Fig. 2 is a view in horizontal section along line 2—2 of Fig. 1, showing the floating plate support in plan and partly broken away;

Fig. 3 is a transverse vertical section along line 3—3 of Fig. 2 to show the driving transmission;

Fig. 4 is a detail vertical section at the lower end of the spinner shaft somewhat enlarged from that shown in Fig. 1, and with the clutches in a different position than that shown in Fig. 1.

Fig. 5 is a detail horizontal section along line 5—5 of Fig. 4 to show the shifter fork for the clutches; and

Fig. 6 is a detail vertical section of one of the flexible mountings between the main support and the floating support.

Referring more particularly to the drawings, the outer enclosing cabinet of the machine is indicated at 1 with its top at 2 and entrance opening for clothes at 3. This entrance opening 3 may be closed by any suitable removable cover (not shown).

The shape of the cabinet 1 may be either round or square as may be desired. In the present embodiment it is square and at the inner four sides thereof there are mounted angle iron shelf-like supports 4. At the four corners of the cabinet (see Fig. 2) corner webs or plates 5 are fastened to bridge across the adjacent angle

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irons 4 as shown, and the structure thus described constitutes the main base support for the operating parts enclosed by the cabinet.

Above the main supporting structure 4, 5 there is provided a horizontal plate 6 having turned down marginal edges conforming to the shape of said cabinet but spaced from the side walls thereof and formed with a central circular opening at 7. This plate 6, which is shown in plan in Fig. 2 constitutes the supplemental or floating support for the entire operating unit of the machine. At equal distances from its center and preferably at each of the four corners of said plate 6 there is arranged a flexible mounting device indicated generally at 8 and being of identically the same construction.

As shown in Fig. 6, the corner web 5 of the main support has projecting upwardly therefrom a centering pin 9 with a head 10 engaging the underside of the web 5. The plate 6 is formed with a downwardly flanged opening at 11 adapted to receive therein in fixed relation the smaller or reduced tubular end 12 of a stepped tubular member or holder 13. The enlarged or cup-like tubular end of this holder 13 receives snugly seated therein an annular rubber cushion 14 which is in snugly embracing relation with the centering pin 9. A thin bearing sleeve 15 may be provided between the said rubber cushion and pin 9 as shown, and it will be noted that the reduced tubular end 12 of said holder 13 has a substantially spaced surrounding relation with said pin 9. A loose slidable cover 16 is provided for the top of said rubber cushion 14, and a cross pin 17 through the upper end of centering pin 9 serves to retain the assembled parts together. The construction described permits a substantially free movement in all horizontal directions of the support 6 upon the support 5 under the limiting resistance of said pin 9 and rubber cushion 14. To eliminate noise of friction caused by such movements, an annular ball bearing comprising balls 18 and ball retainer 19 is positioned between a bearing plate 20 at the lower edge of the flanged opening 11 and a bearing plate 21 which rests upon the support 5 through an intervening pad of rubber 22. This annular ball bearing surrounds the lower reduced end 12 of the tubular holder and is thereby held in position between the plates 20 and 21. The pad of rubber 22 will provide for slight vertical play between the main support 5 and floating support 6.

A gear case 23 projects downwardly through the center opening 7 of the plate 6 and rests thereon by its flanged rim 24. The tub 25 of the machine is formed with an annular base ridge 26 which rests upon the flanged rim 24 of said gear case and said parts are firmly secured to the plate 6 by a plurality of bolts such as 27, whereby the bottom of the tub 25 serves as the top for the enclosed gear case 23. The tub 25 is of the circular shape and is provided with a top member 28 inclined upwardly and centrally thereof to a circular entrance opening 29. Mounted at this entrance opening 29 of the tub is a water supply pipe 30 in the form of a ring extending around said entrance 29 and having perforations 31 therein for supplying water to the basket and tub.

A vertically disposed spindle or spinner shaft 32 has its bearings in said gear case and extends as a continuous member from the bottom of said gear case upwardly thereof to a point adjacent the top entrance 29 of said tub 25. The spinner basket 33 also circular in shape is formed with

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a central column 34 which at its top end is detachably fastened to the upper end of the spinner shaft 32 by means of bolt 35 and washer 36. The upper end of said shaft 32 is fluted to receive corresponding key ridges in column 34 whereby the spinner basket will partake of all rotative and oscillatory motions imparted to said spinner shaft 32. The walls of the spinner basket are perforated as shown at 37, and said basket is provided with agitating vanes 38 and 39 as shown for the washing operation. The basket 33 is also provided with an upwardly tapering top 40 which has a circular entrance 41 coinciding axially with that of the tub and cabinet for the introduction of clothes and water into the basket.

The lower bearing of the spinner shaft 32 is at 42 in the base of said gear case 23 and the upper bearing for said spinner shaft is at 43 within the bottom of the stationary tub 25. A ball bearing 44 at the bottom of the gear case takes the weight and end thrust of said spinner shaft 32. Means are provided for selectively oscillating the spinner shaft at relatively low speed for the washing operation or for rotating the same at relatively high speed for the centrifuging action which will now be described.

The driving motor 45 is mounted in hanger 46 attached to the floating support plate 6. The motor shaft 47 by means of pulley 48, belt 49 and pulley 50 operates a drive shaft 51. As shown in Fig. 3, this drive shaft 51 has its bearings at 52 and 53 within the gear case 23, and is provided on one portion thereof with a worm gear 54 and at another portion thereof with helical gear 55. The worm gear 54 meshes with crank pinion 56 rotatable on stud bearing 57 and carrying thereon a crank pin 58. A curved link 59 (see Fig. 2) connects the crank pin 58 with a wrist pin 60 upon a rocking sector 61 mounted for oscillating movement on bearing stud 62. The sector 61 is provided with toothed rack 63 which meshes with an oscillating pinion 64 having a free bearing on the outside of the spinner shaft 32. The upper side of said oscillating pinion 64 is formed integral with a clutch member 65 (see Fig. 4). Facing said clutch member 65 is a coacting clutch member 66 which is slidable for short vertical movement on the outside of spinner shaft 32, but is keyed to said shaft by a flat key 67 so as to rotate therewith. The key 67 is fast at both ends to clutch member 66, but is vertically slidable in an elongated slot 68 in shaft 32 through which said key extends. A clutch closing spring 69 is interposed between said clutch member 66 and a spring seat 70, the latter being held fixed on the spinner shaft 32 by a snap lock ring 71. The clutch spring 69 tends at all times to move the clutch member 66 downwardly for engaging clutch member 65 and thus connect the spinner shaft 32 to pinion 64 for oscillation therewith.

A clutch shifter rod 72 is fitted for vertical slidable movement within an axially cored out chamber in the lower end of the spinner shaft 32. The flat key 67 extends through a tight fitting hole in the upper end of rod 72 so as to tie the said shifter rod to clutch member 66 for vertical movement therewith. It is obvious from the construction described that the vertical position of shifter rod 72 determines whether the clutch members 66 and 65 shall be in or out of engagement.

Below the oscillating pinion 64 and spaced therefrom by an annular ball bearing 73 is a rotating pinion 74 which has a free bearing on the outside of said spinner shaft 32. The helical

gear 55 on driving shaft 51 is in mesh with said pinion 74 for rotating the same, and it will be understood that said pinion 74 will have imparted to it a rotation in one direction only and at relatively higher speed than the movements of said oscillating gear 64. The pinion 74 is adapted to be connected to said spinner shaft 32 by a clutch structure comprising a conventional type of friction disk clutch assembly at 76 and toothed clutch member 77 all carried with the pinion 74. The clutch member 77 is adapted to coast with a lower toothed clutch member 78, and the friction clutch 76 serves to soften the connection between the high speed pinion 74 and spinner shaft 32. Clutch member 78 has a bearing on the outside of spinner shaft 32 for vertical sliding movement and is keyed to said shaft for rotation therewith by cross pin 79. The spinner shaft 32 is formed with an elongated slot 80 through which said pin 79 extends in fixed connection to its clutch member 78 (see Fig. 5). The cross pin 79 of clutch member 78 is also fixed to the clutch shifter rod 72 so as to move vertically therewith together with the aforesaid clutch member 66. When shifter rod 72 is in its upper position, as shown in Fig. 4, the clutch members 66, 65 will be disengaged and the clutch members 77, 78 will be engaged, and when said shifter rod 72 is in its lower position, as shown in Fig. 1, the reverse conditions of said clutches will obtain. It will be understood that with the motor in operation the oscillating pinion 64 will be constantly oscillated, and likewise the rotating pinion 74 will be in constant rotation, and that the spinner shaft may thus be selectively connected to either pinion 61 for oscillation or to pinion 74 for high speed rotation by appropriate movement of shifter rod 72.

In the present embodiment the shifter rod 72 is moved upwardly for engaging the rotating drive clutch 77, 78 by means of a solenoid 81. As shown in Fig. 1, this solenoid is hung by a bracket 82 to the underside of a floating support plate 6, and has its plunger armature 85 yieldingly connected by a link 86 and spring 87 to a bell-crank lever 88 pivoted at 89 to the underside of the gear case. Lever 88 is connected by pin 90 to the arm 91 of a shifter fork 92 which has its fulcrum bearing at 93 within a lower extension of the gear case 23 as shown in Fig. 5. The shifter fork 92 has bosses 94 at its forked ends which engage beneath a clutch ring 95 separated by an annular ball bearing 96 from the underside of said clutch member 78. Thus when the solenoid is energized, the forked ends of the shifter fork 92 will serve to throw said clutch member 78 upwardly for engagement with clutch member 77. Since clutch member 78 is pinned to shifter rod 72 as described, the latter will also move upwardly and through key 67 will shift the clutch member 66 upwardly against the force of its spring 69 and thus disengage the same from clutch member 65. Also when the solenoid 83 is de-energized the clutch spring 69 will operate to move the parts in a reverse direction.

It is desirable that when said parts are operated in said reverse direction that is, in a direction for unclutching the rotating drive which is at relatively high speed for the spin dry operation, and then clutching the oscillating drive for the washing operation, that the latter clutching operation shall not take place until after the high speed rotation of the spinner shaft shall have slowed down sufficiently to allow the oscillating clutch engagement with-

out damage to the parts. For this purpose the shifter rod 72 is provided at its lower end with a dash pot piston 98 working in the fluid (not shown) of a dash pot cylinder 99 fastened to the lower side of the gear case 23. The upper end of the cylinder 99 may be vented by a narrow passage 100 as shown. The piston has the usual restricted ports 101 for allowing a relatively slow movement of the piston in said dash pot cylinder under the force of the spring 69.

It is desired, however, that this dash pot action after a brief period sufficient to allow slowing down of the rotating spinner basket, will then be accelerated so as to allow the oscillating clutch to firmly engage. For this purpose the dash pot piston is provided with a spring pressed relief valve 103 which is adapted to strike against a stud 104 adjustably mounted in the lower end of the dash pot cylinder so that said dash pot piston will be rendered wide open and encounter no further resistance in going to the bottom of said cylinder. The stud 104 is screw threaded into the bottom of the dash pot cylinder 99 and is locked in its adjustment by a nut 105 so that it may be positioned for the proper timing of the relief valve 103. 106 indicates piping with a hand valve at 107 operable for introducing or discharging fluid into and out of the dash pot cylinder 99 or for by-passing pressure around the dash pot piston as may be desired.

As shown in Fig. 3, the tub 25 is provided with a drain outlet pipe at 108 and valve 109. The circuit connections for operating the solenoid 83 are only partially indicated at 110 and it is to be understood that such circuits may be arranged for hand operation or for automatic operation under the control of a suitable timer in a manner well understood.

What I claim is:

1. In a washing machine of the spin dry type in combination, a centrifuge operating unit comprising a tub, a spinner basket rotatable on a vertical axis and driving means for said basket all carried on a common horizontally disposed support, a second horizontally disposed support, a plurality of coupling devices between said supports for reducing the effect on said second support of the gyratory action of said rotating basket, each of said coupling devices comprising a centering pin projecting from one of said supports, an annular rubber cushion in embracing relation with said pin, a holder for said cushion, said holder being in the form of a stepped tubular member the smaller tubular end of which is secured in an opening of said other support and the larger tubular end of which provides a retaining seat for said rubber cushion.

2. In a washing machine of the spin dry type in combination, a centrifuge operating unit comprising a tub, a spinner basket rotatable on a vertical axis and driving means for said basket all carried on a common horizontally disposed support, a second horizontally disposed support, a plurality of coupling devices between said supports for reducing the effect on said second support of the gyratory action of said rotating basket, each of said coupling devices comprising a centering pin projecting from one of said supports, an annular rubber cushion in embracing relation with said pin, a holder for said cushion, said holder being in the form of a stepped tubular member the smaller tubular end of which is secured in an opening of said other support and the larger tubular end of which provides a retaining seat for said rubber cushion, and an annular ball

bearing positioned between said supports and in surrounding relation with the smaller end of said stepped tubular holder.

JOHN PEARCE.

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