Nov. 10, 1953 J. B. KIRBY 2,658,372

WASHING MACHINE

Filed March 31, 1950 4 Sheets-Sheet 1

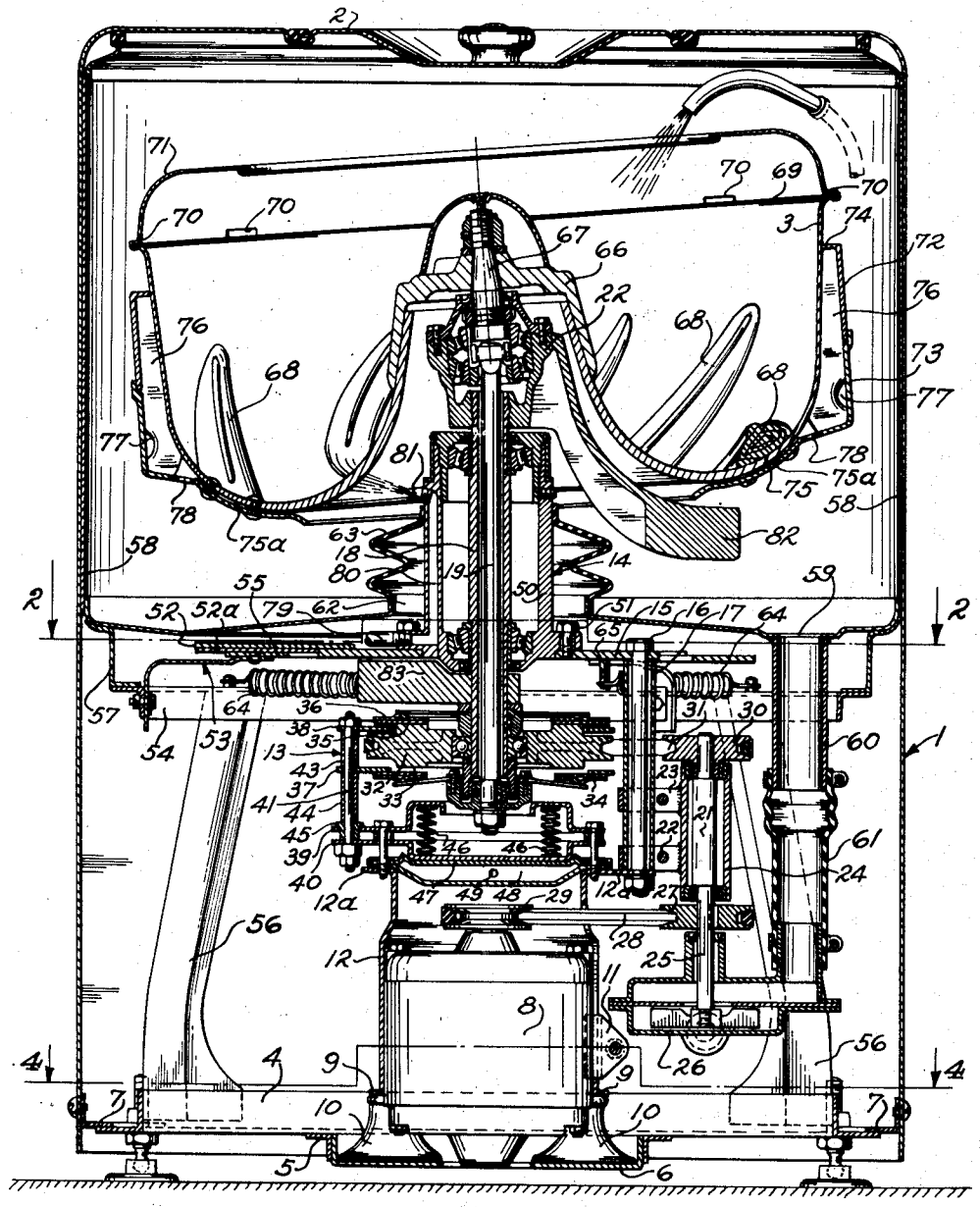


Fig. 1

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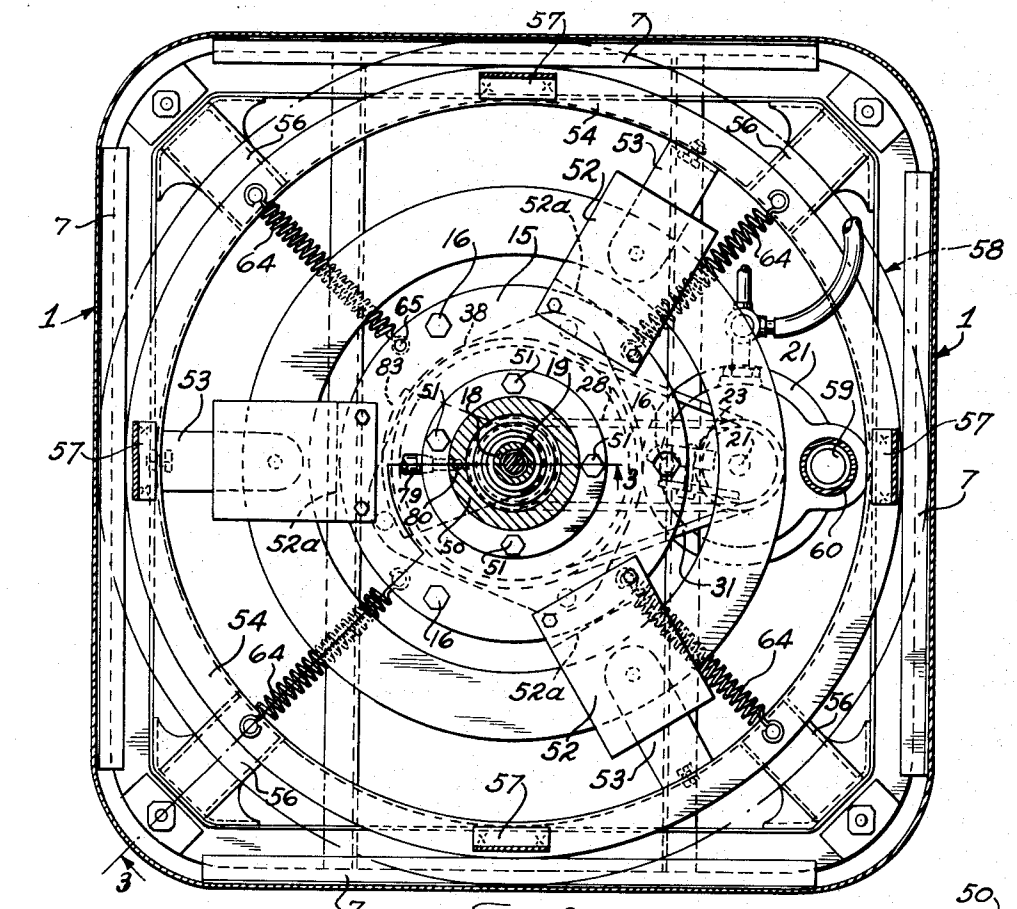


Fig. 2

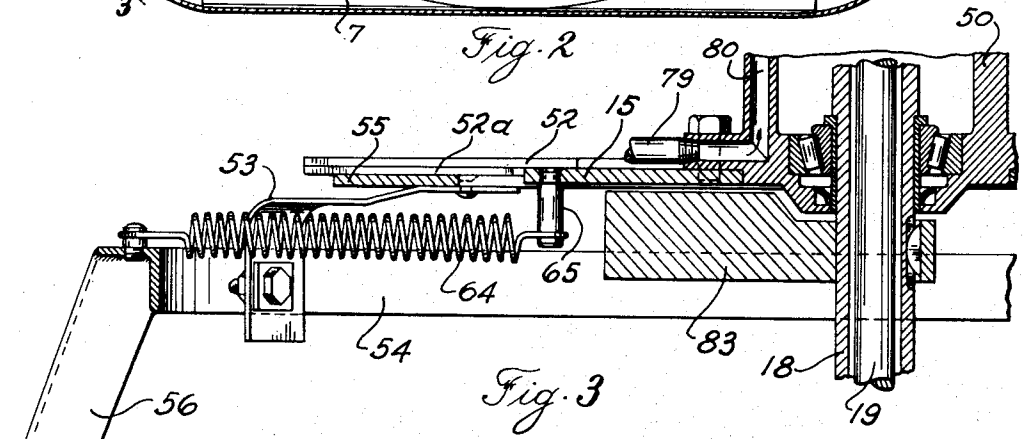


Fig. 3

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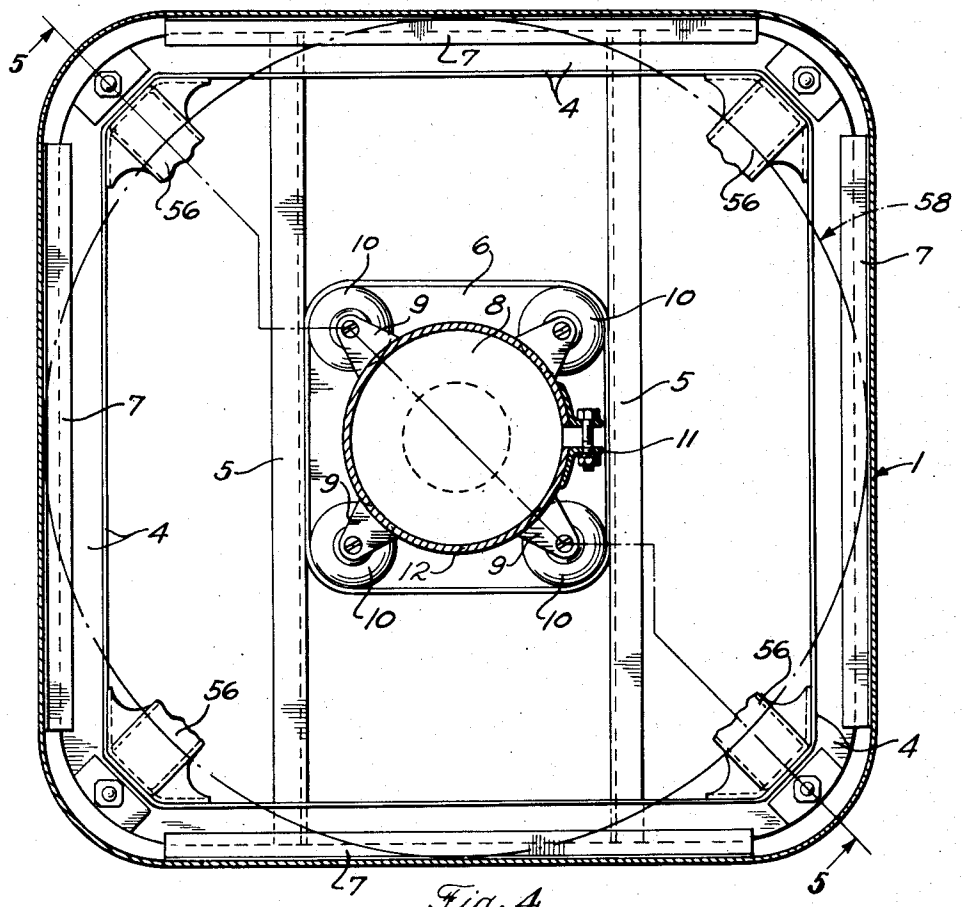


Fig. 4

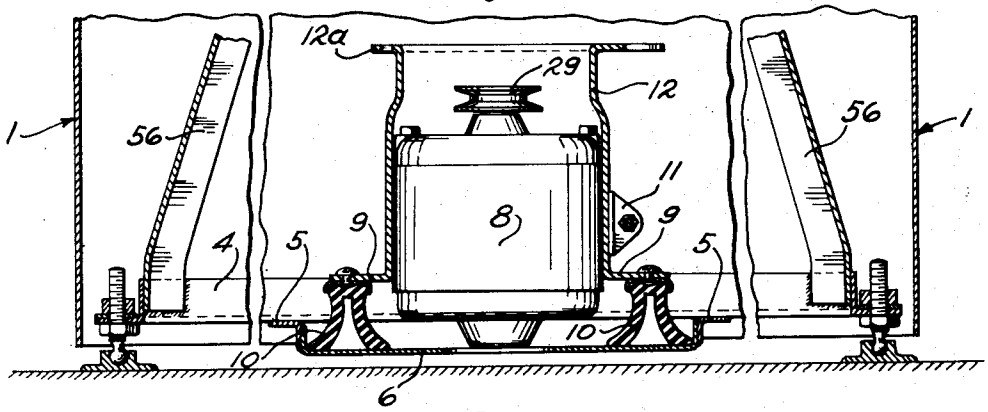


Fig. 5

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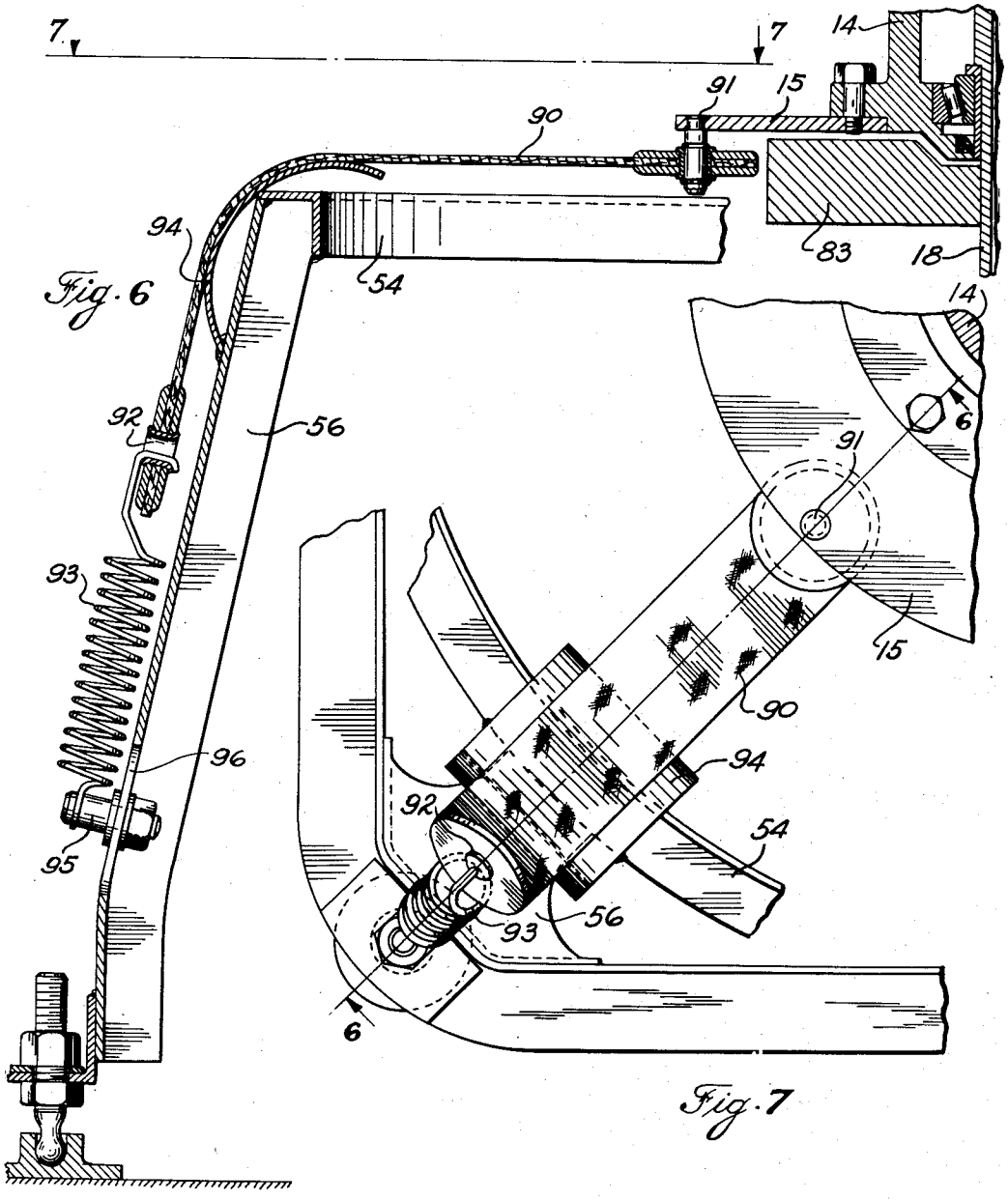


Fig. 6

Fig. 7

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UNITED STATES PATENT OFFICE

2,658,372

WASHING MACHINE

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Application March 31, 1950, Serial No. 153,166

6 Claims. (Cl. 68—23)

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This invention relates to domestic laundry machines such as washing machines of the single tub, washing-extracting type where the clothes are washed and thereafter centrifugally dried in the same container.

The principal object of the present invention is to eliminate or minimize the vertical components of vibratory forces at the supporting feet of the domestic laundry machine. Lateral vibration forces such as those produced by out-of-balance loads in a rapidly rotating extractor basket tend to tip machines of this type in the direction in which the out-of-balance force is acting at any given instant and thus produces vertical vibratory force components in the supporting legs or feet. Such vertical vibrations prevent the use of such machines on vertically yieldable supporting surfaces such as ordinary wooden floors without special means for clamping or bolting the machine to the floors. Even with such special precautions undesirable noises and vibrations are produced in the floors. These vertical vibratory forces also tend to cause "walking" of the machines even on rigid or cement floors so that some means of cementing or fastening the machines to the floor is ordinarily required.

In accordance with the present invention the vertical components of vibratory forces produced by out-of-balance loads are eliminated or minimized by yieldably supporting the pedestal unit including the motor, drive mechanism and container adjacent the vertical axis of the pedestal within the area defined by the supporting feet and in a horizontal plane closely adjacent the supporting surface so that the vibratory forces are transmitted to the supporting surface substantially entirely as laterally directed forces. Floors including conventional wooden floors are extremely rigid in directions parallel to the surface of the floor so that vibrations of the machine are resisted without noise or perceptible vibration in the flooring itself.

Another object of the present invention is to convert both laterally and vertically directed vibration forces occurring in the clothes container into laterally directed forces at the supporting feet. This feature of the present invention is of particular importance in connection with washing machines of the type disclosed in my copending application, Serial No. 619,849 filed October 2, 1945, in which vertical components of force are developed during the washing action in addition to the lateral forces produced by unbalanced loads in the extracting operation. The latter occur not only in machines of this type

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but also in machines of the type shown in my prior patents, 2,109,620 and 2,067,572.

Another object of this invention is to stabilize the pedestal unit carrying the clothes container by combining the motor, drive mechanism and container in a relatively rigid pedestal unit which is resiliently supported at its lower end adjacent the supporting floor surface with the motor at the lower end of the pedestal with its heavy rotating armature vertical and substantially in alignment with the axis of the pedestal.

Another object of this invention is to effectively support the pedestal at its lower end for both lateral and tilting movements so that vibratory forces in all types are converted into lateral forces in the supporting feet, by supporting the pedestal on a series of resilient members of rubber or the like arranged around the pedestal, each of which is yieldable vertically in either direction and also laterally in all directions.

Other objects of the present invention are to eliminate objectionable or perceptible vibrations in the extracting operation by supporting the pedestal unit so as to convert vibrations during the initial acceleration of the container into lateral forces at the feet, rotating the container at speeds in excess of its critical speed for extracting, and balancing the container with a liquid balancing ring at its operating speed, and to improve the operation of the liquid balancing ring by supplying the same with liquid from a source independent of the wash water during the extracting operation so that the container may be accelerated beyond its critical speed as the ring is being filled with liquid.

It is a further object of my invention to prevent the transmission of washing and extracting vibrations to the floor or other supporting surface for the machine by supporting the motor, the drive mechanism, the pedestal from the drive mechanism to the container and the container coaxially as a unitary assembly so it may have a limited tilting movement about the lower end of the assembly and frictionally and resiliently restraining such tilting in a plane about the midpoint of the height of the assembly.

Other objects and advantages relating to economy in manufacture and efficiency in operation will appear from the following description and the appended drawings wherein:

Fig. 1 is an elevation with parts in section of a washing and extracting machine made according to my invention;

Fig. 2 is a sectional view showing support struc-

ture details taken on the plane indicated at 2—2 of Fig. 1;

Fig. 3 is a sectional view on a vertical plane taken as indicated at 3—3 of Fig. 2;

Fig. 4 is a sectional view showing base details taken on the plane at 4—4 of Fig. 1;

Fig. 5 is a vertical section taken as indicated at 5—5 of Fig. 4;

Fig. 6 is an elevation with parts in section showing a modified form of resilient centering means for the washing and extracting mechanism; and

Fig. 7 is a plan view of the modification of Fig. 6.

Referring to the drawings, an upright square casing 1 is provided with a removable cover 2, through which the clothes are introduced to the extractor-container 3. At its lower end the casing 1 is provided with four inwardly projecting ledges 7 which rest upon the horizontal web of a rectangular floor base 4 formed of angle iron. A pair of transverse angle irons 5 are welded or otherwise secured across the base 4 (as shown best in Figs. 4 and 5) and the members 5 in turn support a square motor pan 6. A split supporting sleeve surrounds the motor 8 and is clamped therearound by a bolt or the like extending through clamping ears 11. Laterally extending ears 9, each of which are provided with a rubber suction cup 10, are bent outwardly from the lower end of the sleeve 12. The upper end of the sleeve 12 is formed with an outwardly projecting flange 12*a* to support the clutch and drive mechanism indicated in its entirety as at 13, the pedestal assembly indicated as at 14, and the clothes container 3 carried by the pedestal.

The flange 12*a* is apertured at each of three equally spaced points to receive a through bolt and tube assembly secured to the plate 15 attached to the pedestal assembly 14. The through bolts, last referred to, are indicated as at 16 and the tube support surrounding the through bolt is indicated as at 17. The arrangement last described provides a supporting structure for the pedestal which surrounds the drive mechanism 13.

As will be understood by reference to my copending applications, above referred to, the washing operation according to this invention is effected by successively tilting the container 3, and to carry out this washing operation the tubular shaft 18 is rotated and the solid shaft 19 within the tubular shaft is held against rotation so that the inclined bearing 20, fixed to the upper end of the tubular shaft, progressively tilts the container with respect to the vertical axis of shaft 19. During extraction the tubular shaft 18 is held against rotation and the inner solid shaft 19 is rotated so that the container 3 is turned about its axis so as to centrifugally extract the fluid from the clothes.

To carry out the selective rotation of the shafts 18 and 19, I have provided the drive mechanism indicated generally at 13 which includes a countershaft 21 supported by the tube 17. A pair of laterally-extending clamps 22 and 23 are secured to the tube 17 and the clamps in turn are welded to a bearing tube 24. The countershaft 21 is mounted in suitable bearings carried by the bearing shaft 24, and the shaft 21 is proportioned so as to extend downwardly and provide a shaft extension 25 which constitutes a drive shaft for the pump 26. A pulley 27 is secured to the countershaft 21 and is belted, as at 28, to the pulley 29 on the motor shaft. The rotation of the countershaft is transmitted through pulley 30 and belt 31 to pulley 32 mounted for free rotation about the lower end of the tubular shaft 18. The upper and lower faces of the pulley 32 serve as driving clutch faces, the lower face, as at 33, being adapted to engage with a driven clutch part 34 secured to the drive shaft 19. The upper face of the pulley face 32, namely face 35, is adapted to be engaged with a driven clutch part 36 secured to the tubular shaft 18. As shown in Fig. 1, the driven clutch part 36 is in clutched engagement with the driving pulley 32 so that the tubular sleeve 18 is rotated and the washing operation carried out.

The shifting of the drive mechanism from the wash position, as shown, to an extracting drive position is effected by a clutch shifter assembly that is supported on the brackets 11—12 carried by the motor housing. The clutch shifter assembly includes a pair of spaced rings 37 and 38 carried by a through bolt and tube assembly supported by a pair of clutch actuating plates 39 and 40. The through bolt for the clutch shifting mechanism is indicated at 41 and extends downwardly through the ring 38, the tube 43, thence through ring 37 and tube 44, the lower end of the latter resting on bushing 45 mounted in the clutch actuator plate 39. The clutch actuator plates 39 and 40 comprise a pair of oppositely facing members resiliently urged away from each other by springs 46, and the lower plate 40 rests upon a flexible diaphragm 47 which is secured at its edges to a fluid chamber 48 having a fluid inlet 49.

It will be noted that in the position shown in Fig. 1 the clutch actuating plate 40 is pressed downwardly by the springs 46 bearing against the upper actuating plate 39, and that when fluid under pressure is admitted through opening 49 to the fluid chamber 48 the flexible diaphragm 47 is moved upwardly compressing the springs 46 and by moving the through bolt and tube assembly carried thereby moves the spaced rings 37 and 38 upwardly. Such upward movement of the clutch engaging rings 37 and 38 operatively controls the two driven clutch members 34 and 36 carried by shafts 19 and 18, respectively. The effect upon driven clutch member 36 is to move it out of driving engagement with the face 35 of the pulley 32 and, at the same time, act as a brake to retard the rotation of the driven clutch member 36.

The upward movement of the ring 37 permits the driven clutch part 34 to come into driving engagement with the lower face 33 of the pulley 32 so as to establish rotation of the solid shaft 19 and, thus, set up the extracting phase of the laundry operation. When the extraction phase is completed, the fluid under pressure is released from the fluid chamber 48 and a downward movement of the clutch shifting assembly is effected. As the ring 37 moves downwardly into the position shown, it serves to interrupt the drive to the shaft 19 and, at the same time, acts as a brake to retard the rotation of the driven clutch member 34. It will be understood that a timing device, such as an electrical timer, may be used to control the flow of fluid under pressure to the hydraulic chamber 48 so as to time the washing and extracting operations.

The pedestal assembly 14 includes an upright bearing sleeve 50 having a flange at its lower end secured to the plate 15 as at 51. The plate 15 is provided with three spaced laterally-extending

plates 52 arranged to project from the plate 15 so as to overhang the ring 55, which is supported by inwardly-extending resilient members 53 carried by a supporting ring 54. The underside of plates 52 are provided with friction material 52a.

At each corner of the base member 4 there is provided an upwardly and inwardly inclined channel-shaped support 56 and the uppermost ends of said supports 56 are welded or otherwise secured to the supporting ring 54. The horizontal surface of the angular supporting ring 54 carries brackets 57 which support the tub 58, which is arranged to catch the fluid removed from the container 3 during extraction. The outlet for the fluid caught by the tub 58 is indicated at 59 and leads downwardly through tube 60 and flexible connection 61 to the pump 26. The bottom of the tub 58 is apertured, as at 62, and a flexible seal 63 extends from this aperture to engage the outer wall of the pedestal member 50. This arrangement prevents any loss of water from the tub 58 through the space between the sides of the pedestal and opening in the tub bottom. It will be noted that the diameter of the tub opening 62 is greater than the outer diameter of the pedestal member 50 so that the pedestal assembly and drive mechanism and the motor may have considerable movement with respect to the tub 58 and the main casing 1. Such movement is restrained and the entire assembly resiliently urged to an upright position by tension springs 64, one end of each of said springs being anchored to the supporting ring 54 adjacent the upper end of the supporting legs 56 and the other end thereof being secured to pins 65 depending on the underside of plate 15.

The container 3 for the clothes and washing fluid preferably includes a re-entrant bottom portion which surrounds the inclined bearing member 20 on the upper end of the pedestal and a cap 66 fixed to the stubstaft extension 67 that is driven by the shaft 19. The container also includes inclined ribs 68, and the walls of the container 3 slope upwardly and outwardly toward the maximum diameter area indicated at 69. A plurality of openings 70 are provided in this maximum diameter area to permit the escape of washing fluid when the container is rotated on its axis. The tub portion 71 above the maximum diameter area is inturned toward the center so as to guard against the loss of clothing from the basket during either washing or extraction.

A water-balance ring is secured to the outer wall of the container 3 and comprises upper and lower sections 72 and 73, respectively. The upper section is inturned and secured to the tub wall, as at 74, and the lower section is inturned and curved downwardly, as at 75, to conform to the rounded underside of the container 3. At spaced intervals vertical baffle plates 76 are secured to the members 72 and 73. The vertical baffle plates 76 are apertured, as at 77, to facilitate redistribution of the fluid in the water-balance ring during extraction. Circumferential slots are provided on the underside of the water-balance ring, as at 78, to limit the quantity of water held in the ring and to permit drainage of the water-balance ring when the container 3 is brought to rest at the conclusion of the extracting operation. The lower inturned portion 75 is spaced from the tub bottom, as shown, to provide an inlet space 75a for the ring.

To fill the water-balance ring, a water supply conduit 79 directs water upwardly through the passageway 80 formed in the pedestal section 50, and at the upper end of this passage 80 is fixed a nozzle or jet 81 arranged to discharge fluid against the underside of the casing 3. The control valve for the conduit 79 and the fluid supply is operated in timed relation to the shifting of the clutch for the extracting operation so that whenever the clutch ring 37 is moved so as to bring the driven clutch member 34 into driving engagement with the pulley 32 and thus spin the container 3, the valve is opened admitting fluid under pressure into the conduit 79. The fluid thus discharged from the nozzle 81 is by centrifugal force thrown outwardly into the space 75a between the portion 75 of the balance ring into the underside of the tub bottom. Centrifugal force causes such fluid to fill the water-balance ring so that it may compensate for any out-of-balance that may occur in the container 3 during extraction. It will be understood that as the out-of-balance load in the container may change or shift from time to time during extraction, that the fluid in the balance ring may also shift so as to evenly balance the container all during the extraction.

In the event that the extraction phase of the laundry operation is interrupted at any time so that the container 3 is brought to rest, the fluid in the balance ring will drain by gravity through the opening 78. When the extraction operation is resumed, the discharge of water from the jet 81 will be resumed and will again fill the balance ring and continue to maintain it in filled condition as long as the container 3 is rotating.

During the washing phase of the laundry operation, vibrations in the pedestal assembly are counteracted or minimized by the oppositely disposed weights 82 and 83 carried by the tubular shaft 18, the weight 82 being secured at the upper end of the shaft through the medium of the inclined bearing member 20 and the weight 83 being secured near the lower end of the tubular shaft 18. Such oppositely disposed weights are designed with respect to the load being washed so as to set up a force couple to compensate for the effect of the forces and resulting vibrations characteristic of this method of washing. As will be noted, the weight 82 is opposite the low side of the container 3 and that when the container tilts to an opposite position so that the low side is at the right hand of Fig. 1, the weight 82 will be disposed at the left hand side of Fig. 1. Weight 83, being disposed 180° angularly from weight 82, follows the low side of the basket in its tilting movement. All of the forces imparted to the pedestal assembly by the eccentric weight motion and by the washing action are accommodated by the resilient and flexible mounting provided for in the construction of the present invention. This construction permits the assembly of motor, drive mechanism and pedestal to tilt within limits as provided by the resilient rubber cups 10 and the restraining springs 64 and the resilient supports 53. Such tilting is frictionally dampened, as at 52a, during extraction. Vibrations of another character may be introduced due to out-of-balance occurring in the container 3. Any out-of-balance during extraction tends to cause the pedestal and its assembly to gyrate, and the resilient flexible mounting which I have provided accommodates such gyration and provides friction dampening to limit such gyration.

In the modified form of centering apparatus, shown in Figs. 6 and 7, a resilient yieldable centering and snubbing action is obtained. A flexible strap 90 is anchored at one end thereof to

the plate 15 carried by the pedestal 14, as indicated at 91, and the other end of the strap 90 is secured through the medium of tension spring 93 engaging eyelet 92 of the strap to the upright supporting leg 56. An arcuately rounded metal plate 94 is secured to the upper end of the leg 56 and to the ring 54 so as to provide a snubbing surface for the midportion of the strap 90. The tension exerted by the spring 93 on the strap 90 may be varied within limits by adjustment of the spring anchor bolt 95 carried in the slot 96 of the leg 56. As shown in Fig. 7, the width of the plate 94 exceeds the width of the strap 90 so that limited oscillatory movement of the pedestal within the frame is accommodated. The arrangement shown in the modification of Figs. 6 and 7 provides for convenient adjustment of both the centering tension on the pedestal and the frictional dampening or the snubbing of the movement of the pedestal within the frame.

Although I have described my invention in considerable detail, modifications may be made therein without departing from the scope of the invention as defined by the following claims.

What I claim is:

1. A domestic laundry machine comprising a frame having supporting feet adapted to rest upon a floor surface, a pedestal including a motor, drive mechanism and rotatable container assembled as a unit, resilient means supporting the lower end of said unit on said frame adjacent the vertical axis of said pedestal and in a horizontal plane adjacent the floor engaging surfaces of said supporting feet, and cooperating friction members connected to said frame and said pedestal intermediate the height thereof, frictionally resisting the relative movement between said frame and said pedestal, said connection between the friction members and the frame including resilient means urging said pedestal to a central position with respect to the frame.

2. An extracting machine comprising a frame having supporting feet adapted to rest upon a floor surface, a pedestal having a rotatable container mounted on the upper end thereof and including a motor and drive mechanism, resilient means supporting the lower end of said pedestal on said frame adjacent the vertical axis of said pedestal and in a horizontal plane adjacent the floor engaging surfaces of said supporting feet, said motor and drive mechanism being arranged to rotate said container at a speed exceeding the critical speed of rotation thereof, and a liquid balancing ring carried by said container, a flange at the lower edge of said balancing ring projecting beneath the bottom of the container, water supply means beneath said container discharging water into said ring during rotation of said container, said water supply means being mounted eccentric with respect to the axis of the container and being fixed with respect to the rotation thereof.

3. A laundry machine comprising a container for clothes and washing fluid, means to wash the clothes in said container, the side walls of said container having apertures for the centrifugal discharge of fluid upon the rotation of the container, a water-balance ring for said container comprising an annular chamber surrounding the container and including an imperforate outer wall coaxial with the container, a flange depending from the lower edge of said outer wall, and water supply means arranged eccentrically with respect to the axis of the container and being fixed beneath the container and arranged to discharge water radially outward against said flange during the rotation of said container.

4. A domestic laundry machine comprising a frame having supporting feet adapted to rest upon a floor surface, a pedestal unit including a motor at the lower end thereof, and a rotatable container at the upper end thereof, resilient means supporting the lower end of said unit on said frame adjacent the vertical axis of said pedestal and in a horizontal plane adjacent the floor engaging surfaces of said supporting feet, and yieldable centering means connected to said frame and to said pedestal intermediate the height thereof comprising a plurality of radially spaced flexible straps, each strap having one end thereof secured to said pedestal and the other end thereof secured to a tension spring carried by said frame.

5. A domestic laundry machine comprising a frame having supporting feet adapted to rest upon a floor surface, a motor resiliently mounted centrally of said frame in a horizontal plane adjacent the floor engaging surfaces of said supporting feet with the armature of said motor being disposed vertically, a pedestal mounted on said motor coaxially thereof, a rotatable container mounted at the upper end of said pedestal, and yieldable centering means connected to said frame and to said pedestal intermediate the height thereof comprising a plurality of radially spaced, rounded snubbing members carried by said frame, a plurality of radially spaced flexible straps, each strap having one end thereof secured to the pedestal and the other end resiliently thereof secured to the frame with the midportion of said strap in frictional engagement with said rounded snubbing members.

6. Centering means for a laundry machine pedestal comprising upright frame members surrounding said pedestal, a plurality of radially spaced snubbing members carried by said frame in a plane intermediate the height of said pedestal, a plurality of radially spaced flexible straps having their inner ends secured to said pedestal, their intermediate portions frictionally engaging said snubbing members and their outer ends turned downwardly and secured by means of springs to said upright frame members, whereby the pedestal is yieldingly biased to a vertical position and lateral movement thereof with respect to the frame frictionally resisted.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,521,858	Bock	Jan. 6, 1925
1,604,748	Grauer	Oct. 26, 1926
2,224,241	Verdier	Dec. 10, 1940
2,318,806	Sisson	May 11, 1943
2,375,635	Dyer	May 8, 1945
2,461,643	Hemmeter	Feb. 15, 1949
2,498,420	Hemmeter	Feb. 21, 1950
2,513,844	Castner	July 4, 1950
2,534,194	Emmert et al.	Dec. 12, 1950