

July 2, 1957

J. B. KIRBY

2,797,569

CLOTHES WASHING MACHINE

Filed June 9, 1951

4 Sheets-Sheet 1

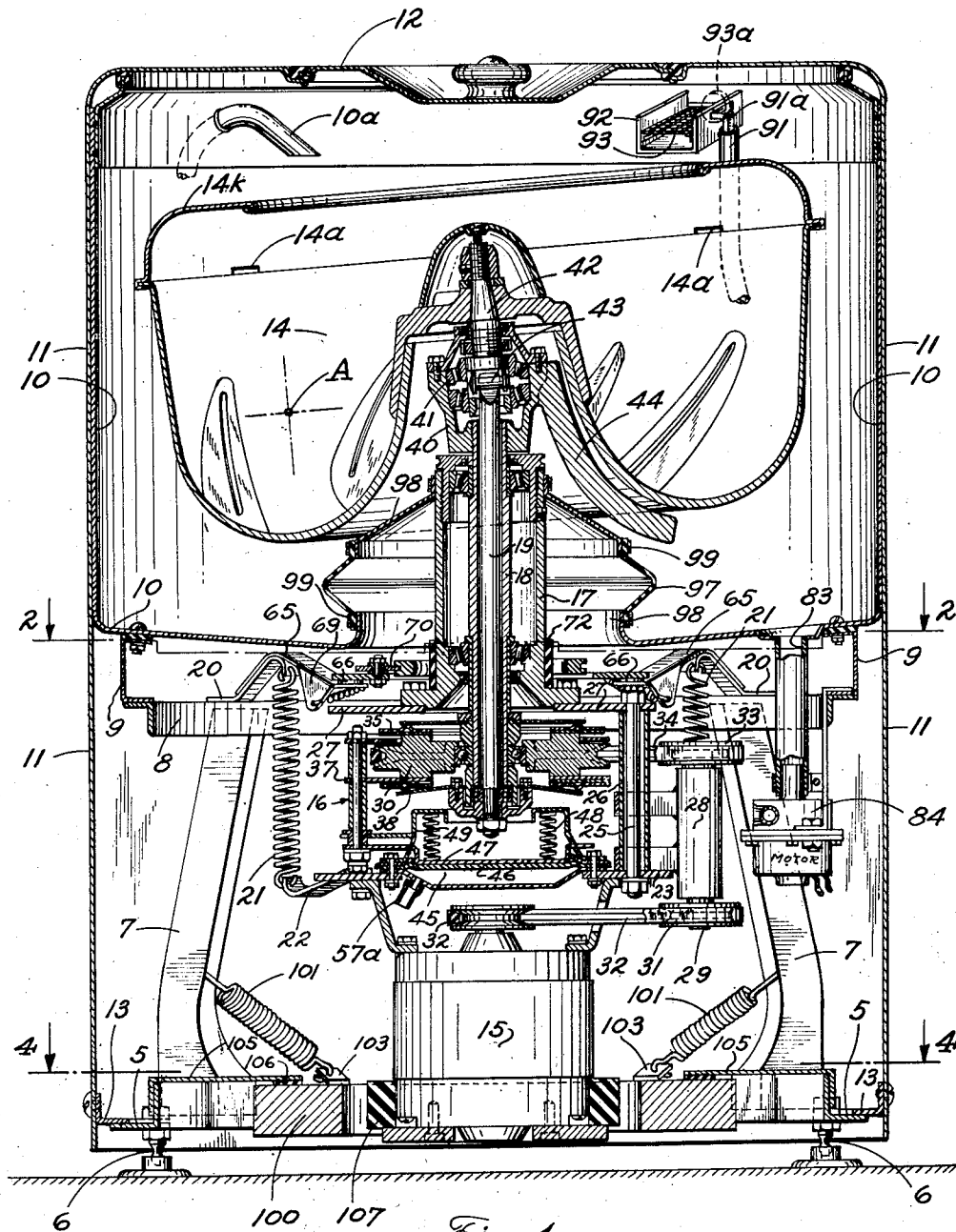


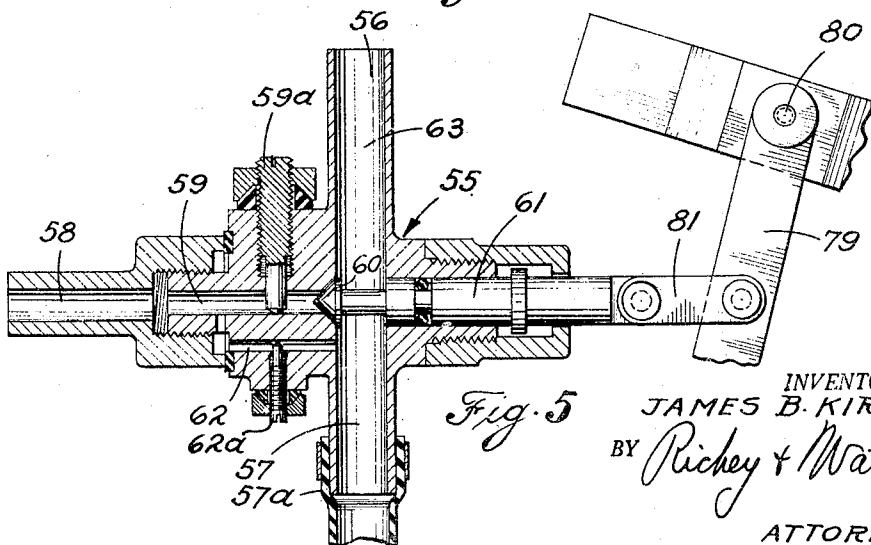
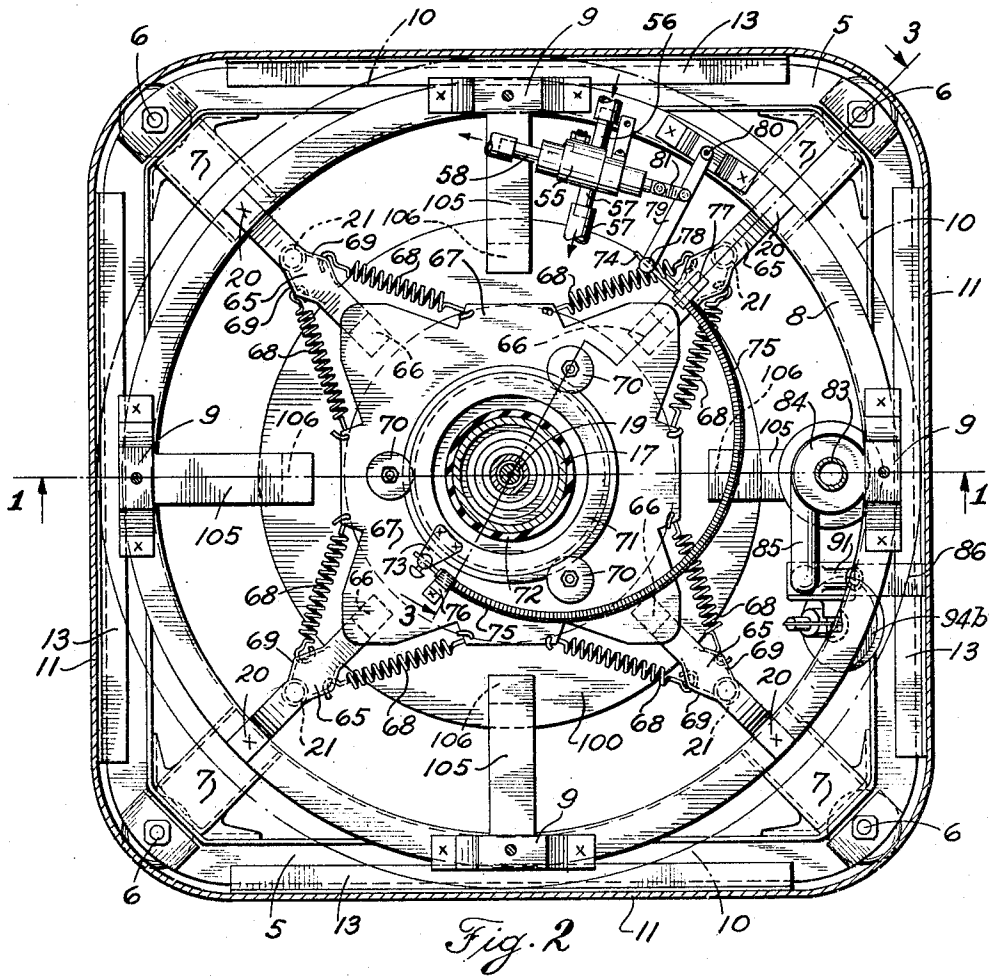
Fig. 1

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CLOTHES WASHING MACHINE

4 Sheets-Sheet 2



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CLOTHES WASHING MACHINE

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4 Sheets-Sheet 3

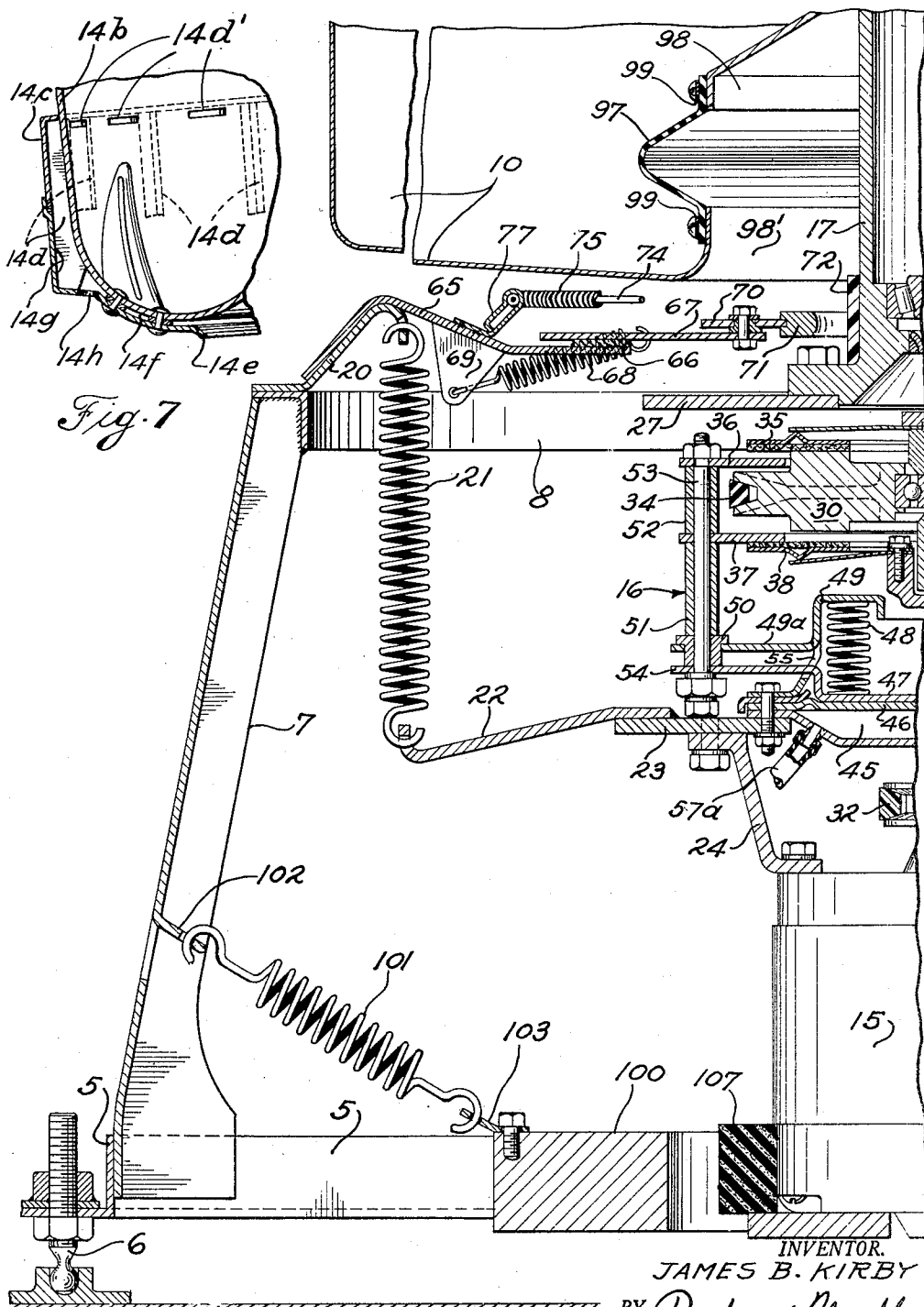


Fig. 3

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4 Sheets-Sheet 4

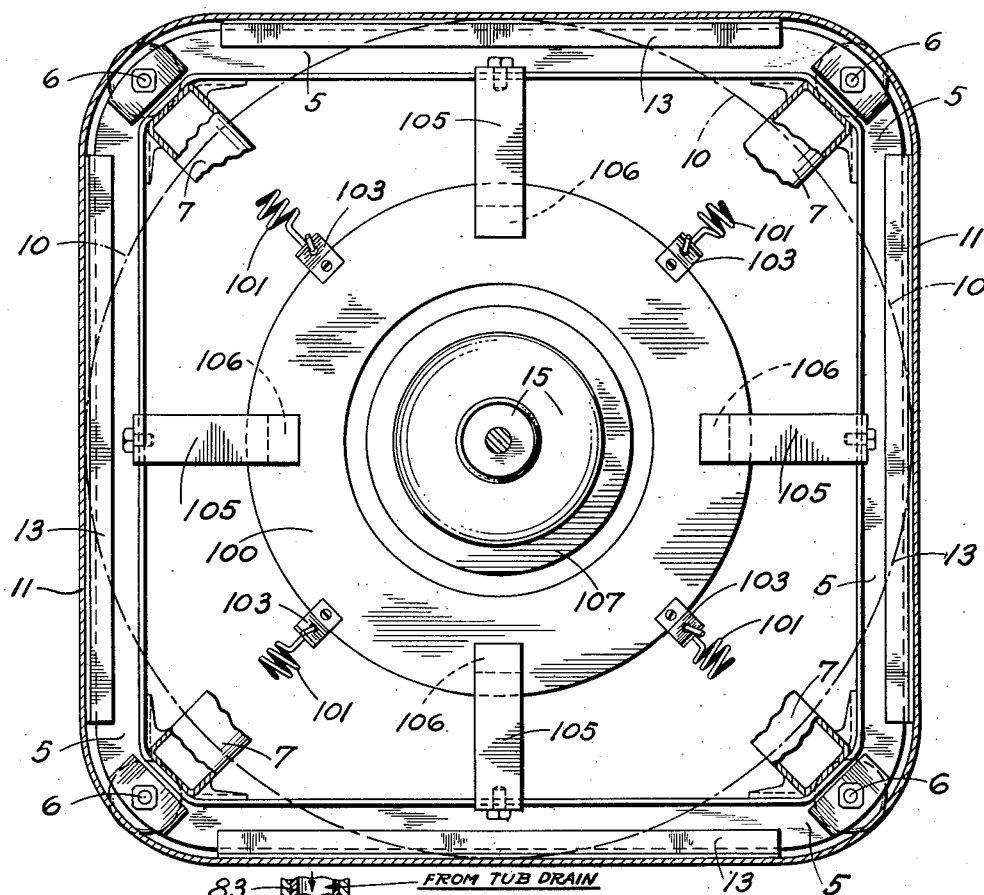


Fig. 4

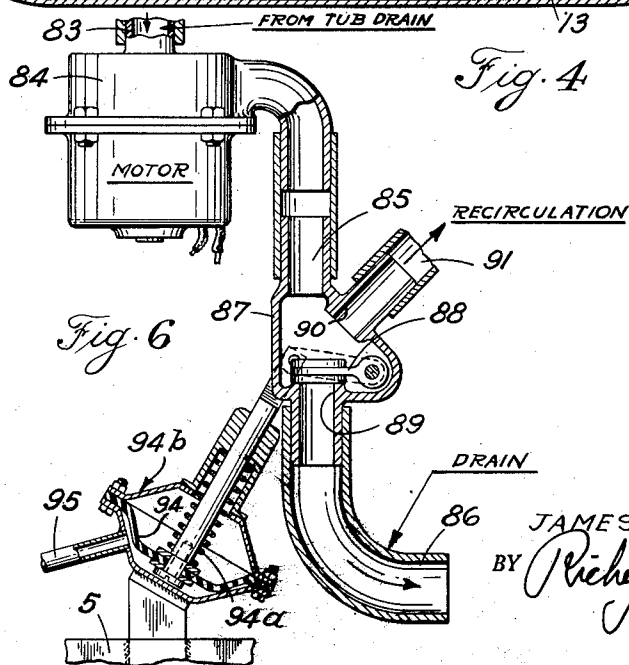


Fig. 6

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2,797,569

CLOTHES WASHING MACHINE

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Application June 9, 1951, Serial No. 230,769

5 Claims. (Cl. 68—23)

This invention relates to a washing machine, and more particularly, to a combined washing and extracting machine, wherein the clothes are washed and centrifugally dried in a single container.

The instant application is a continuation in part of the following co-pending applications:

Serial No.	Filed	Patent No.	Date of Issue
619,849.....	October 2, 1945 ¹		
671,779.....	May 23, 1946.....	2,699,660	Jan. 18, 1955.
720,372.....	February 18, 1947.....	2,614,410	Oct. 21, 1952.
760,555.....	July 12, 1947.....	2,645,917	July 21, 1953.
6,911.....	February 7, 1948 ¹		
41,210.....	July 29, 1948 ¹		
79,261.....	March 2, 1949.....	2,683,364	July 13, 1954.

¹ Now abandoned.

A type of washing machine which I have heretofore invented and which is in wide current use, comprises a machine having an up-right open top container for the clothes and washing fluid, wherein the clothes are washed by gyrating the container about a point on the central axis thereof, and at the same time restraining the container against rotation. The gyrating or wobbling of the container for washing the clothes is carried out at a rate which moves portions of the container with accelerations exceeding the acceleration due to gravity, and thus effects repeated impact and cavitation between the walls of the container and the clothes and fluid carried therein. After the clothes are washed, the container is rotated and the fluid is centrifugally discharged from the container through openings near the top of the container.

In machines of the type described in the preceding paragraph, the reaction to the gyration of the container for washing has heretofore been transmitted through the supporting pedestal for the container, and thence through a relatively rigid frame structure to the floor or other supporting surface for the machine. In some installations, particularly in those cases where the machine is mounted on a wooden floor, the reaction in the pedestal and frame due to washing action in the container is found to be objectionable. To compensate for out of balance loads in the clothes container during the extraction phase of the laundry operation, the container has been heretofore constructed to provide water pockets which are filled from a water supply near the axis of rotation of the container. The water is directed into the container pockets which are located diametrically opposite the out of balance mass of clothes in the container. Such expedients have been found to be satisfactory for the extraction phase of the operation, but the valving arrangement for the water balance requires a rigid pedestal mounting which adversely affects the operation of the machine of my invention during the washing phase. Thus it will be appreciated that a free mounting of the pedestal and drive mechanism of the frame which would be most conducive to a satisfactory washing operation renders it difficult or impossible to utilize the water balancing arrangement above described.

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According to the present invention, I have found that the container, the supporting pedestal and drive means therefore, may be resiliently suspended as a unit within a rigid floor supported frame so that the reaction in the pedestal and the mechanism carried thereby due to the gyration of the container, improves the efficiency of the washing operation, and at the same time substantially prevents the transmission to the rigid supporting frame of such reactions. The isolation of the unit consisting of container, pedestal and drive means resulting from the resilient suspension of that unit in the frame as herein disclosed, results in a machine that operates quietly and smoothly during washing on all types of floors and requires no bolting or anchoring to the supporting surface.

I have also found that the mounting of the container, pedestal and drive as a unit as described in the preceding paragraph, accommodates the reactions in said unit resulting from out of balance in the container during extraction. According to my invention, the said unit is mounted in the frame so that during extraction the unit is free to precess about different points along its vertical axis, and thus accommodate the different reactions in the unit induced by different rotational speeds as the extractor accelerates from zero to a high speed extraction, such as for instance, 600 revolutions per minute. This arrangement results in low critical speeds during extraction and prevents the transmission to the supporting frame of forces causing movement in the flexibly mounted unit during the extraction phase of the machine's operation.

From the foregoing brief general description of my washing machine, it will be understood that I have provided a machine wherein the reactions imparted to the pedestal and drive mechanism unit by the washing and extracting operations are utilized to improve both the washing and extracting operations, and wherein all such reactions in the suspended unit are isolated with respect to the frame of the machine and the floor on which the frame is supported.

It is among the objects of my invention to provide a combined washing and extracting machine having a pedestal unit comprising a container for clothes and washing fluid, a washing means in the container and a drive means for washing and extracting, said pedestal unit mounted in a frame for limited movement with respect to the frame and wherein the movement between the unit and frame is utilized to control the drive means for extraction, whereby the acceleration during extraction is maintained within safe limits.

It is a further object of my invention to provide a machine according to the preceding object wherein the container is rotated to effect centrifugal extraction, and during said extraction is free to gyrate about any point along the axis of the resiliently suspended unit.

It is a further object of my invention to provide a machine according to the preceding objects, wherein the suspension of the unit permits the unit to precess or gyrate about any point along the vertical axis thereof, and wherein the unit in its entirety is free to be moved bodily in response to reactions therein caused by washing or drying.

It is a further object to provide a centrifugal extractor wherein a container for holding clothes, a pedestal for supporting same and a power unit including a clutch for rotating the container are flexibly mounted as a unit in a frame so as to be free to gyrate therein, and cooperating means carried by the unit and the frame are connected to the clutch so that gyrations beyond certain limits tend to disengage the clutch and thus limit the gyratory movement.

It is a further object of my invention to provide a machine according to the preceding objects, wherein the drive mechanism includes a friction clutch for rotating

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the clothes container, and the frame includes means responding to bodily movement of the unit with respect to the frame, which means is operatively connected to the friction clutch so that the rate of acceleration during the extraction phase of the machine's operation may be governed by the magnitude of the bodily movement of the unit with respect to the frame.

It is a further object of my invention to provide a washing machine according to the preceding objects, wherein fluid pressure is employed to effect friction clutch engagement, and wherein the bodily movement of the unit with respect to the frame controls the fluid pressure for clutch engagement.

Further objects and advantages relating to efficiency in operation and low costs of manufacture will appear from the following description and the appended drawings, wherein:

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

Fig. 2 is a plan view with parts in section taken as indicated by the plane 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional elevation taken on the plane indicated at 3—3 of Fig. 2;

Fig. 4 is a plan view with parts in section taken along the plane 4—4 of Fig. 1;

Fig. 5 is an enlarged sectional showing of a valve employed to vary the fluid pressure for clutch engagement;

Fig. 6 is an elevation with parts in section of the arrangement employed for recirculating and/or draining the washing fluid from the machine; and

Fig. 7 is an elevation with parts in section showing the clothes container with a water balance ring.

The washing machine of the present invention comprises a rigid frame including a square base member 5 having depending adjustable floor engaging support feet 6. Extending upwardly from the base member 5 and secured thereto at each corner are supporting legs 7 which are inclined inwardly somewhat toward the top thereof, where they are secured to each other by a circular frame member 8. The member 8 carries a casing support 9 which in turn supports the fixed tub 10 and casing 11. The frame and tub of the machine are surrounded by a shroud or casing 11 which is provided with a top opening and cover 12. The lower edge of the casing is provided with supporting brackets 13 which rest upon the outstanding flange of the frame member 5. The fixed tub 10 is preferably circular in cross section, and the space between the circular outline of the tub 10 and the corners of the square casing 11 may be utilized as conduits for control apparatus and as a housing for a fluid conduit 10a for conducting fluid into the washing container 14.

The container 14 and the pedestal and drive mechanism supporting the same is suspended as a unit within the rigid frame structure described in the preceding paragraph. The advantages of the yielding flexible support are pointed out in said co-pending application, Serial No. 6,911, filed February 7, 1948. For convenience, the term pedestal unit as used herein includes the motor 15, the driving mechanism indicated in its entirety as at 16, the supporting tube 17, the drive shafts 18 and 19, and the container 14 mounted at the top of the unit. To support the pedestal unit, four inwardly extending brackets 20 are welded or otherwise secured to the frame member 8 which surrounds the pedestal unit. The inner ends of said brackets are apertured to receive one end of a suspension spring 21, and the other end of said suspension spring is hooked to a laterally extending bracket 22 welded to the annular plate 23 at the base of the driving mechanism 16. Reference is made to my said co-pending application, Serial No. 729,372, filed February 18, 1947, in connection with the advantages of this type of mounting. The underside

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of the plate 23 carries spaced motor support brackets 24 which support the motor 15 in a vertical position in alignment with the driving shafts 18 and 19. It will be understood that the coaxial mounting of the motor and drive shafts results in an arrangement wherein the motor serves as a pendulum acting to stabilize the pedestal unit. A plurality of through bolts 25 and sleeves 26 support an annular plate 27 overhanging the driving mechanism 16 and the plate 27 which is centrally apertured, supports the tube 17 surrounding the driving shafts 18 and 19. At one side of the driving mechanism and secured to one of the sleeves 26 is a bearing 28 for a back shaft 29 arranged to transmit motor rotation to the pulley 30 of the driving mechanism.

The back shaft 26 has at its lower end a pulley 31 driven by belt 32 from the motor and has at its upper end a pulley 33 and belt 34. The driving mechanism whereby the rotation of the pulley 30 rotates the tubular driving shaft 18 for washing and rotates the inner drive shaft 19 for extraction corresponds substantially to that disclosed in my said co-pending application, Serial No. 41,210 filed July 29, 1948. As described in said co-pending application, the pulley 30 is mounted for rotation on the tubular drive shaft 18 at the lower end thereof. The tubular drive shaft 18 has fixed thereto a driven clutch member 35 so that when the clutch shifting ring 36 is lowered as shown in Fig. 3, the said driven clutch part 35 is brought to bear against the upper face of the pulley 30 so that rotation of the pulley 30 effects rotation of the shaft 18 for washing. When the clutch shifting ring 36 and a lower clutch shifting ring 37 is moved to an upper position, it raises the washing clutch part 35 away from the pulley 30 and permits the extraction clutch 38 to bear against the lower face of the pulley 30 so that rotation of the pulley 30 is transmitted to the shaft 19 for extraction.

The upper end of the tubular shaft 18 which is rotatably supported in the tube 17 by anti-friction bearings has fixed thereto a casting 40 which provides a housing for an inclined bearing 41 in which is journaled a stub shaft 42 fixed to the clothes container. The stub shaft 42 is coupled to the spin shaft 19 by means of a universal joint mounting as at 43. Integrally formed with the casting 40 is a counterweight 44 which rotates during washing so as to be 180° out of phase with the low point of the clothes container 14, and thus compensate or counter-balance a part of the thrust reaction in the pedestal assembly occasioned by the tilting or wobbling of the clothes container. The advantages of such counterweight in a resiliently suspended unit are pointed out in my said co-pending application, Serial No. 41,210, filed July 29, 1948. It will be understood that during washing the spin shaft 19 is restrained against rotation, and that the method of washing and extracting herein corresponds to the methods followed in my said co-pending applications.

During the extracting phase of the laundry operation, the tubular shaft 18 is restrained against rotation and the inner drive shaft 19 is rotated so as to spin the clothes container 14 and centrifugally extract the water from the clothes by throwing the water upwardly and outwardly through the openings 14a near the top of the clothes container 14. A guard portion 14k around the open top of the container 14 prevents the clothes from being discharged over the top edge of the clothes container during extracting.

The clutch shifting assembly for the driving mechanism includes a fluid pressure diaphragm chamber 45 having a flexible diaphragm 46 bearing against the underside of a clutch actuator plate 47. A spring cage 49 is arranged to overhang the plate 47 and compression springs 48 therein tend to urge the diaphragm 46 and the plate 47 carried thereby to its lowermost position. Laterally extending ears 49a carried by the spring cage provide a

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plurality of apertured supports for the clutch shifter assembly. Said assembly includes the members 50 each having a shoulder resting on the ears 49a and being proportioned axially so that they can move up and down a limited amount with respect to the ears 49a. Spacer sleeves 51 rest on the members 50 and in turn support the clutch shifting ring 37. Spacers 52 rest on the clutch shifter 37 and in turn support the clutch shifter ring 36. The spacers 51-52 and the shifting members 36-37 and members 50 are secured together as a unit by a series of through bolts 53.

The diaphragm plate 47 is provided with laterally extending ears 54 which project through openings 55 in the spring cage 49 to bear against the lower end of the member 50, and when fluid pressure is introduced to the diaphragm chamber 45, the ears 54 raise the clutch shifter rings 36 and 37 from the position shown in Fig. 3 which is the "wash position." In the uppermost or "extracting position," the member 36 disengages the clutch 35 with respect to pulley 30 and effects engagement so as to interrupt its rotation and act as a brake against further rotation of the tubular wash shaft 18. At the same time that the clutch disengagement at 35 is effected, the spin clutch 38 is free of the braking effect of member 37, so that rotation of the spin shaft 19 is effected upon engagement between member 38 and the rotating pulley 30.

The domestic water supply is utilized to provide the fluid pressure for the diaphragm chamber 45, and such fluid pressure may be admitted to the diaphragm chamber 45 at the end of the wash cycle and be controlled by a timing mechanism not shown. The path of fluid flow to the diaphragm chamber 45 from the water supply includes a valve 55. As shown, particularly in Figs. 2 and 5, the valve includes an inlet 56 leading from the domestic water supply line through passageway 63 to an outlet 57 leading to the diaphragm chamber 45. The valve 55 also includes a drain port 58 leading to the water disposal drain for the machine. The passageway 59 between the inlet and outlet of the valve is normally closed by the seat 60 carried by the valve plunger 61. During the normal spinning operation, that is, full clutch engagement, the fluid pressure in the diaphragm chamber 45 corresponds substantially to the line pressure existing between inlet 56 and outlet 57 of the valve. A relief or "bleed" passageway 62 is formed between the passageway 59 and the main bore 63 between the inlet and outlet. This provides that when the line pressure is cut off by interrupting the fluid pressure at the inlet 56 the fluid within the diaphragm chamber 45 is forced out through bleed passageway 62 and to the drain by the springs 48 in the diaphragm cage 49. The flow through passages 59 and 62 may be adjusted as at 59a and 62a respectively.

To prevent excessive gyration of the pedestal unit during the extraction phase of the laundry operation, I have provided an arrangement whereby gyration beyond predetermined limits reduces the fluid pressure in the diaphragm chamber 45. The apparatus for accomplishing this result includes a plurality of brackets 65 which extend inwardly towards the pedestal unit and which are mounted on the brackets 20 for the suspension springs 21. The inner extremity of each of the brackets 65 is provided with a friction material pad 66 disposed beneath the plate 67 surrounding the pedestal tube 17. As best shown in Figs. 2 and 3, the plate 67 is positioned on the friction pads 66 by a series of springs 68 having one end thereof anchored to the down turned ears 69 on the bracket 65 and the other end thereof anchored to the plate 67. As shown in Fig. 2 the springs 68 are disposed so as to diverge from the bracket 65 and thus exert a force tending to center the plate 67 and resiliently restrain rotation thereof.

The plate 67 is centrally apertured to loosely surround

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the pedestal 17 and near the edge of the aperture carries a plurality of rollers 70 which by fitting in a groove in ring 71 support the ring 71 for free rotation. That portion of the pedestal unit opposite the roller 71 is provided with an annular band 72 made of rubber or similar material. Since the inner diameter of the ring 71 exceeds the outer diameter band 72, the pedestal may gyrate or precess within the annular space thus provided a limited amount. When, however, the gyration of the pedestal 17 and the band 72 carried thereby exceeds the limits of the annular space, the rubber band 72 tends to turn the roller 71 in a clockwise direction as viewed in Fig. 2. The clockwise movement of the ring 71 as caused by the precession of the pedestal unit moves the bracket 73 which is carried by the ring and thus moves the wire 74. The wire 74 is surrounded by a flexible cable or sheath 75 secured to the plate 67 as at 76 and to one of the brackets 65 as at 77. One end of the wire 74 is anchored as at 78 to a lever 79 pivoted as at 80 to the frame member 8. Intermediate the ends of the lever 79 is a pivoted link 81 connecting the lever 79 to the movable plunger 61 of the valve 55.

The tendency of the ring 71 to be moved in a clockwise direction by precession of the pedestal causes the valve seat 60 to be moved away from the drain passage 59 and thus reduce the line pressure in the passageway 63. The resulting drop in pressure as in passageway 63 is reflected in the diaphragm chamber 45 so that the spin clutch member 38 is moved in a direction tending to disengage the same and thus prevent further acceleration during extraction. Under ordinary operating conditions, that is with a moderate out of balance in the container 14, there is a small amount of pressure reduction in the diaphragm chamber, and thus the container will, by slipping the clutch, maintain the rotation of the container but delay its acceleration. This delay in acceleration is advantageous in that water continues to be removed from the clothes and thus reduce the amount of out of balance without stopping the rotation of the container. Thus delay in acceleration removes the cause of the out of balance without interrupting the operation of the machine.

During extraction, the water discharged into the fixed tub 10 is directed downwardly through the tub outlet 83 to a pump 84, thence through passages 85 and 86 to the drain. During the washing operation it is preferable that an amount of water be employed for the washing which exceeds the amount required to fill the container 14 up to the openings 14a. The amount of wash water may be measured by the electric timer by means of a constant volume flow washer which corrects for line pressure variations. Such excess of water as it is introduced into the container 14 overflows into tube 10 and is recirculated by an arrangement as illustrated in Fig. 6. A valve body 87 includes a movable closure 88 which may be selectively moved to close the port 89 or the port 90. When the closure 88 covers the port 89 the pump 84 causes the washing fluid withdrawn from the fixed tub 10 to be recirculated through conduit 91 which terminates in a trough 92 arranged to discharge into the open top of the container 14 overflows into tub 10 and is recirculated tained in the full line position shown in Fig. 6 and the wash water is repeatedly recirculated through the container. One of the advantages of this arrangement is that lint removed from the clothes during washing is retained by the lint screen 93 disposed in the trough 92.

In connection with the construction and operation of the lint trap for the recirculated wash water, it will be noted that the recirculated wash water is introduced to the trough 92 in a flat stream by means of the nozzle 91a and that the lint screen 93 is spaced from the bottom of the trough 92. This arrangement provides that the water may fall by gravity through the screen 93 and be discharged into the container 14 in a lint free condition. The casing 11 and the fixed tub 10 are provided with

aligned slots corresponding to the width of the screen 93 so that the lint screen 93 may be removed by means of handle 93a at the exterior of the washing machine for cleaning the screen. In the event that the screen 93 should be covered with lint so as to impede the flow of water downwardly through the screen, the water may flow over the top surface of the screen 93 and the lint thereon and thence into the container 14. The lint trap construction which I have provided thus assures that a clogging of the lint trap will not prevent recirculation of the wash water.

During the extraction phase of the laundry operation, the valve member 88 closes the port 90 and is maintained in said closed position by the fluid pressure diaphragm 94 in diaphragm casing 94a. This arrangement provides that fluid pressure from the domestic supply line may be admitted through conduit 95 at the same time such fluid line pressure is admitted to the diaphragm chamber 45 for engaging the spin clutch. Conversely, when the spin clutch is disengaged by interrupting line pressure to diaphragm chamber 45, the closure 88 is moved to the full line position of Fig. 6 by spring 94a.

The fixed tub 10 is sealed with respect to the pedestal tube 17 projecting upwardly therein by means of a flexible bellows 97 which is secured at its lower end to the flange 98' formed in the apertured bottom of the tub 10. The pedestal tube 17 has fixed thereto at its upper end a conical member 98 which flares downwardly and outwardly, and the bellows 97 is secured to the periphery of the base of the conical member 98 as at 99. Since the machine is constructed and operated so that the pump operates to withdraw water from the tub 10 during washing and extracting, it is not contemplated that a fluid level will be established in the fixed tub 10 higher than the top of the bellows seal as at 99. The seal is preferably constructed so that it provides little or no resistance to movement of the pedestal assembly with respect to the tub 10. The flange opening in the tub bottom as at 98' is preferably formed so that by removing the container 14 from the pedestal and the seal 97, the entire assembly may be removed through the bottom of the machine to facilitate assembly and service of the machine.

As heretofore described, the pedestal unit is free to precess or gyrate about any point along the axis of the unit depending upon the nature of the reaction in the unit to washing and extracting loads. At the initiation of the extracting phase of operation, that is at relatively low speeds of rotation of the container 14, there is occasionally a tendency for the pedestal unit to gyrate about a point above the bottom of the fixed tub 10. To maintain such gyration or precession of the bottom of the pedestal unit within safe limits, I have provided a friction dampening arrangement around the base of the motor 15. According to the preferred form of dampening device, a ring 100 is suspended by four springs 101, each spring being anchored at one end as at 102 to an upright frame member 7 and at the other end as at 103 to the ring 100. As best shown in Fig. 4, inwardly extending brackets 105 are carried by the base frame member 5 and have their innermost ends overhanging the ring 100. Friction material pads 106 are interposed between the top surface of the ring 100 and the innermost end of the bracket 105. The inner diameter of the ring 100 exceeds considerably the outer diameter of the rubber bumper ring 107 carried by the end bell of the motor 15 so that during washing and during full speed extraction, there is no contact between the ring 100 and the bumper ring 107. The springs 101 tend to hold the ring in a stable position and spaced from the bumper ring 107. When, however, the load in the extractor and the speed of rotation of the extractor causes the ring 107 to bump the ring 100, the said ring 100 may be shifted laterally. Such lateral shifting of the ring 100 is retarded by the frictional engagement at 106 and the springs 101 restore the ring to its central position as soon as the extractor has passed through the particular rotational speed

which cause the bumping between the rings 100 and 107. I have found that the reactions in the pedestal unit caused by washing operations are insufficient to swing the lower end of the suspended unit into engagement with the dampening ring 100.

Although the form of my invention illustrated in Figs. 1-6 discloses a machine wherein the resilient suspension and clutch control operated by pedestal gyration is designed to compensate for out of balance loads during extraction, it will be understood that the container 14 may include a water balance ring so as to accommodate greater out of balance loads. In Fig. 7 I have shown a form of container provided with a water balance ring. The form shown in Fig. 7 follows generally the form disclosed in my co-pending application, Serial No. 153,166, filed March 31, 1950, wherein the water for the balance ring is introduced at the underside of the clothes container. My said co-pending applications, Serial No. 41,210, filed July 29, 1948 and Serial No. 79,261 filed March 2, 1949 disclose water balance rings arranged to be loaded by water centrifugally moved out of the container near the top thereof.

In the modification shown in Fig. 7, the container 14b is provided with an annular band 14c which is substantially parallel to the axis of the container 14b and which is spaced from the outer wall of the container by a plurality of (such as 10 to 15) vertically disposed baffles 14d. The baffles prevent surging of the balance ring water, but are notched near their lower ends as at 14g so as to permit fluid to move from one point to another around the circumference of the container. The water balance ring includes at its lower portion an intumed flange spaced from the bottom of the container 14b as is indicated at 14f. A down-turned edge 14e of the flange is adapted to receive water discharged from a nozzle underneath the container 14b as more fully disclosed in my said co-pending application, Serial No. 153,166. The water entering the balance ring is discharged centrifugally through the space 14f and forms a generally vertical wall within the balance ring 14c during rotation of the container. When the extractor is brought to rest, the water in the balance ring falls by gravity through the opening 14h and thus the extractor is free of the balance ring water load during the washing phase of the operation. The container 14b is provided with openings 14d' leading into the pockets formed between the baffles 14d. At the start of the extraction phase, water from the container is discharged centrifugally through the openings 14d' to supplement the water entering at the bottom of the balance ring.

In the operation of the machine of my invention, the clothes to be washed are placed in the container 14 and soap or other detergent added. The period of washing, rinsing and extracting and the control of the hot and cold water for such operations may be governed by any suitable timing mechanism and the details thereof form no essential part of the instant invention. The timing mechanism is set so as to introduce hot water into the container 14 holding the clothes and soap or detergent. In this connection, it is pointed out that the springs 21 are such that their combined effect resiliently supports the suspended pedestal unit in a higher position when the container 14 is empty than when it is loaded with clothes and water. The springs must be of such a character that when the container is loaded with clothes and water the bottom of the motor 15 will be spaced somewhat from the floor or other supporting surface. To accommodate the difference in elevation of the suspended unit due to loading of the machine, the ring 72 has considerable vertical extent as compared with the surrounding ring 71. After a measured quantity of water has been introduced to the container 14 to take care of recirculation of the wash water, the motor 15 is started by the timer and the clutch member 35 is engaged with the pulley 30, the wash tube 18 is rotated so as to wobble or progressively tilt the container 14 for washing. It will be noted from

reference to my said co-pending applications that the washing methods described here corresponds generally to that of my said co-pending applications. After the clothes are washed for a period as determined by the timing mechanism, the washing clutch 35 is disengaged and the spin clutch 38 is engaged so as to rotate the container 14. This clutch engagement of member 38 is effected by the introduction of fluid pressure to the chamber 45 as above described. At the same time the spin clutch is engaged for extraction, the water diverter valve at 88 is operated to interrupt the recirculation of wash water and direct the wash water to the drain.

During the washing operation, the wobbling or tilting of the container 14 by reason of the spring suspension of the pedestal unit causes a limited wobbling movement to be imparted to the pedestal unit. Such wobbling of the unit is accommodated by the springs 21 and no appreciable reaction due to washing is transmitted to the frame of the machine. At the initiation of the extraction phase however, the suspended unit tends to gyrate about a point near the container so that the ring 107 at the base of the motor may, during the acceleration of the container, bump the dampening ring 100. Thereafter, during the acceleration of the container 14, the point about which the suspended unit gyrates moves downwardly along the vertical axis of the suspended unit. As the rotating parts approach the critical rotational speed of the machine, the suspended unit gyrates about a point below the bottom of the fixed tub 10 so that the rubber ring 72 may engage the ring 71 and delay the acceleration of the container as heretofore described. Thus it will be understood that I have provided a means at the base of the machine to prevent excessive gyration at certain rotational speeds and a means near the central point of the suspended unit to prevent excessive gyration at certain other rotational speeds.

The suspension springs 21 in addition to supporting the static load of the clothes and water should be spaced from the central axis of the suspended unit a distance sufficient to maintain the container in a stable position. I have found that where the springs are mounted near the center of mass of the suspended unit, that the clothes are not evenly distributed during washing and may gather at one side of the washing container 14. The clothes container is shaped to provide an annular space for washing the clothes. The central axis of the annular mass of clothes and water is indicated as at A, and for the purposes of this description, will be referred to herein as the axis of the generatrix. Preferably, the pedestal unit is supported in the frame with the spaced springs at a greater distance from the vertical axis of the pedestal than the axis of the generatrix A. This insures that the clothes and water will not flow to one side of the container and positions the springs so that they will have a restoring force to stabilize and maintain the container generally horizontal for efficient washing action. It is also preferred that the springs be spaced outwardly from the vertical axis of the pedestal unit at a radius less than the maximum diameter of the container forming the annular space, such as for instance, about half of the distance between the axis of the generatrix and maximum container diameter. This mounting, at the same time, permits free gyration of the suspended unit during both washing and extracting. Moving the springs 21 inwardly, that is, nearer to the vertical axis of the unit than the axis of the generatrix A would adversely affect the stability required for washing, whereas moving the springs outwardly beyond the maximum diameter of the container would adversely affect the freedom of the unit for such gyration. The mounting I have shown wherein the springs are between the maximum diameter of the container and the axis of the generatrix A provides an optimum arrangement for washing and extracting and one wherein the reactions in the unit are not transmitted to the frame and one wherein the critical speed of extraction is low.

The farther that the springs are spaced from the center axis of the machine, the greater the stabilizing influence of the springs. Reference is made to my said co-pending application, Serial No. 729,372 which discloses a spring suspended unit wherein the maximum stability may be obtained by supporting the suspended unit at the four corners of the machine frame. By mounting the motor at the base of the suspended pedestal unit, the motor serves as a pendulum in its spring supported mounting, effecting a stabilizing action on the suspended unit during both washing and extracting. This mounting of the motor provides a mass near the base of the unit which resists the displacement of the suspended unit with respect to the vertical axis of the unit and further provides a mass which cooperates with the dampening ring 100 tending to restore the suspended unit to its vertical position. During both washing and full speed extraction, the suspended unit is isolated with respect to the frame except for the suspension springs 21, which results in smooth and efficient operation throughout washing and extracting.

Although I have shown and described an embodiment of my invention in considerable detail, it will be appreciated by those skilled in the art that numerous modifications or variations may be made therein without departing from the scope of the invention as defined in the following claims.

What is claimed is:

1. A centrifugal extractor comprising a frame, an extractor unit resiliently mounted within the frame for gyratory movement with respect to the frame, said unit including an upright pedestal having a clothes container mounted at the upper end thereof for rotary motion with respect to the pedestal, a motor mounted at the lower end of the pedestal operatively connected by means including a clutch to the container to rotate the same, a ring supported by the frame loosely surrounding the pedestal so as to accommodate limited gyratory movement of the pedestal without contacting same, said ring mounted on the frame for limited rotary movement, said ring being moved by the pedestal in response to pedestal gyrations exceeding said limited gyratory movement, and means operatively connecting said ring and clutch to control the clutch by pedestal gyrations exceeding said limited gyratory movements.

2. A washing and extracting machine comprising a rigid floor-supported frame, an extractor unit resiliently mounted within the frame for gyratory movement with respect to the frame, said unit including an upright pedestal having a clothes container mounted at the upper end thereof for rotary motion for extraction and for a progressive tilting motion for washing, a motor mounted at the lower end of the pedestal operatively connected by means including a pair of clutches to the container to rotate or progressively tilt the same, a ring supported by the frame loosely surrounding the pedestal so as to accommodate limited gyratory movement of the pedestal without contacting same, said ring mounted on the frame for limited rotary movement, said ring being moved by said pedestal in response to pedestal gyrations having a diameter exceeding the inside diameter of the ring, and means operatively connecting said ring and the clutch for rotating the container, whereby the rate of rotational acceleration of the container is controlled.

3. A washing and extracting machine comprising a rigid floor-supported frame, an extractor unit resiliently mounted within the frame for gyratory movement with respect to the frame, said unit including an upright pedestal having a clothes container mounted at the upper end thereof for rotary motion for extraction and for a progressive tilting motion for washing, a motor mounted at the lower end of the pedestal operatively connected by means including a pair of clutches to the container to rotate or progressively tilt the same, a member supported by the frame adjacent said pedestal so as to accommodate limited gyratory movement of the pedestal

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without contacting same, said member being moved by gyratory movement of the pedestal exceeding said limited gyratory movement and means operatively connecting said member and the clutch for rotating the container whereby the rate of rotational acceleration of the container is determined by the gyratory movement of the pedestal.

4. A washing and extracting machine comprising a rigid floor-supported frame, an extraction unit resiliently mounted within the frame for gyratory movement with respect to the frame, said unit including an upright pedestal having a clothes container mounted on the upper end thereof for rotational motion for extracting, said container including agitator means adapted to engage clothes in said container mounted for agitating motion for washing, a motor mounted on the lower end of the pedestal operatively connected by means including a pair of clutches to the container and agitating means to rotate or agitate the same, a member supported by the frame adjacent to said pedestal so as to accommodate limited gyratory movement of the pedestal without contacting same, said member being moved by gyratory movement of the pedestal exceeding said gyratory movement, and means operatively connecting said member and the clutch for rotating the container whereby the rate of rotational acceleration of the container is determined by the gyratory movement of the pedestal.

5. A washing machine comprising a floor-supported frame, a fixed tub having a central opening in the bottom thereof secured to said frame, a washing and extracting unit carried by said frame, said unit including an upright pedestal extending through said bottom opening of said fixed tub, a container for clothes mounted at the top of said pedestal shaped to provide an annular space for clothes and water, washing means within the container, drive shaft means disposed within said pedestal

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for driving said washing means and rotating said container, a clutch and power unit secured to the lower end of said pedestal, said unit being supported within said frame by spaced springs arranged vertically outside the axis of the generatrix of the clothes and water, whereby the unit may move with respect to the frame in response to reactions in the unit occasioned by washing and extracting, a ring supported by the frame, means carried by the pedestal extending within the ring and being loosely surrounded by the ring so that the ring will accommodate limited gyratory movement of the means carried by the pedestal without contacting the ring, said ring being mounted on the frame for limited movement with respect to the frame, said ring being moved by said pedestal carried means in response to gyrations of the pedestal exceeding said limited gyratory movement, and means operably connecting said ring and said clutch to slip the clutch and decrease the rate of acceleration of the rotation of the container an amount corresponding to the magnitude of the ring movement.

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