

May 15, 1956

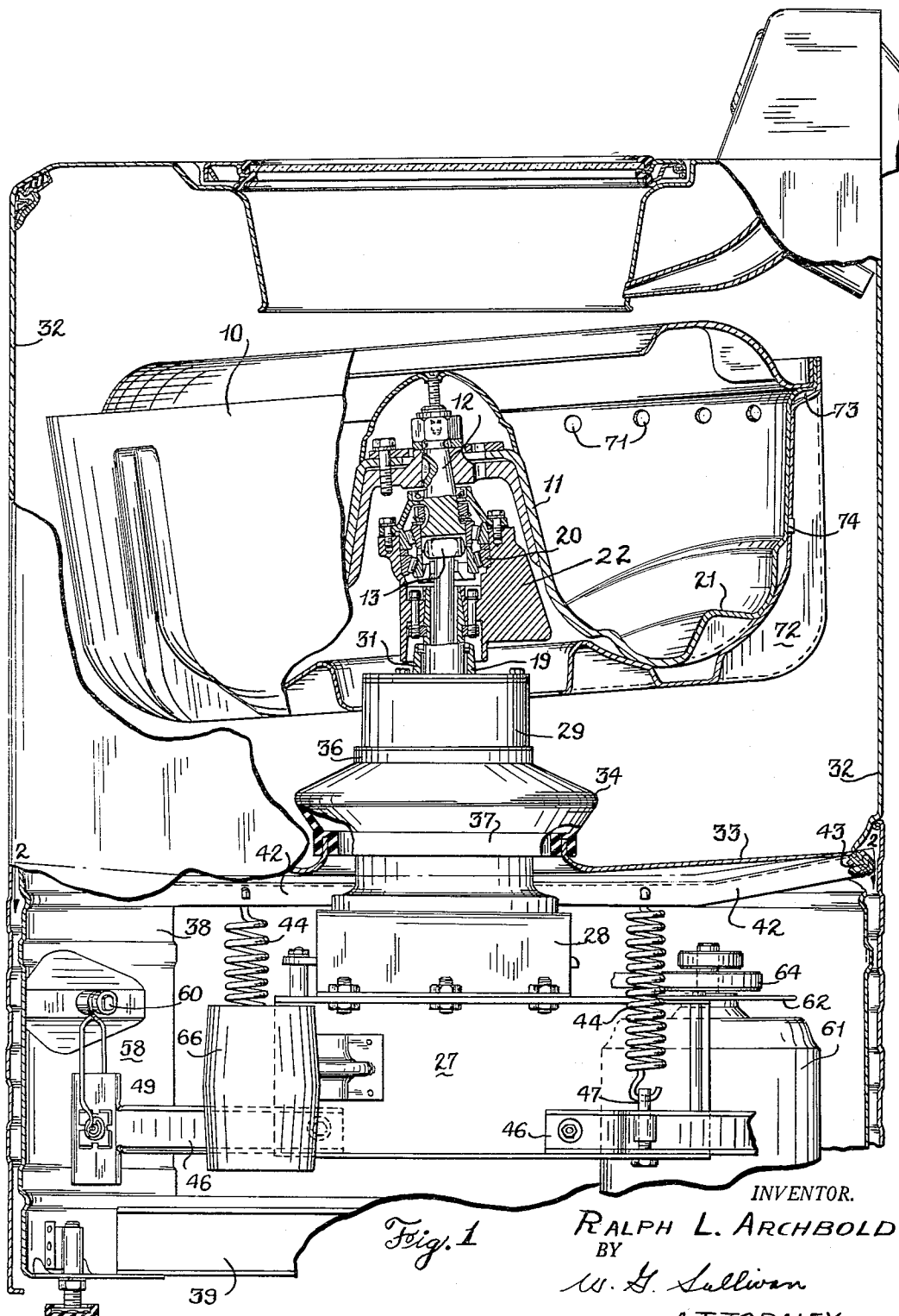
R. L. ARCHBOLD

2,745,273

SPRING MOUNTED WASHING MACHINE OF THE WATER BALANCE TYPE

Filed April 1, 1953

4 Sheets-Sheet 1



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SPRING MOUNTED WASHING MACHINE OF THE WATER BALANCE TYPE

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4 Sheets-Sheet 2

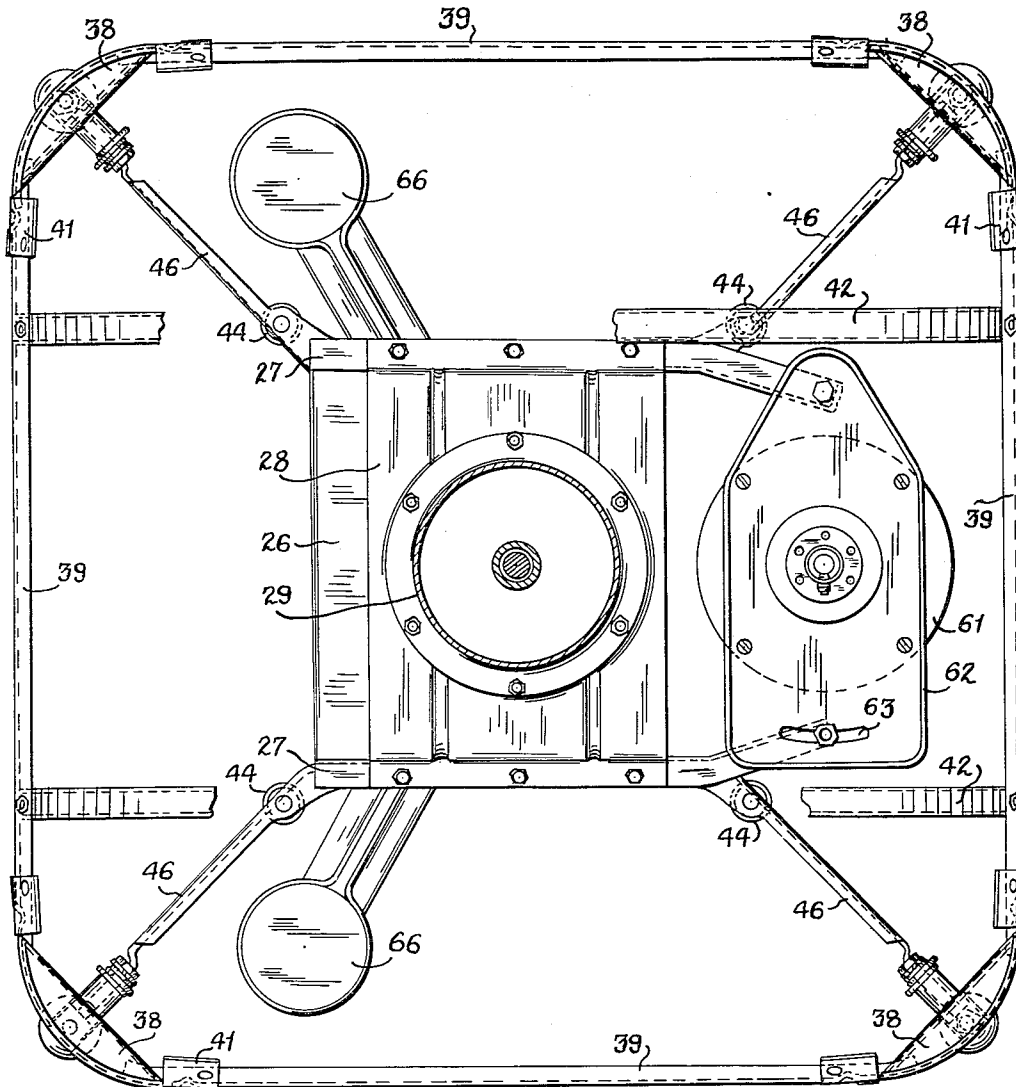


Fig. R

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4 Sheets-Sheet 3

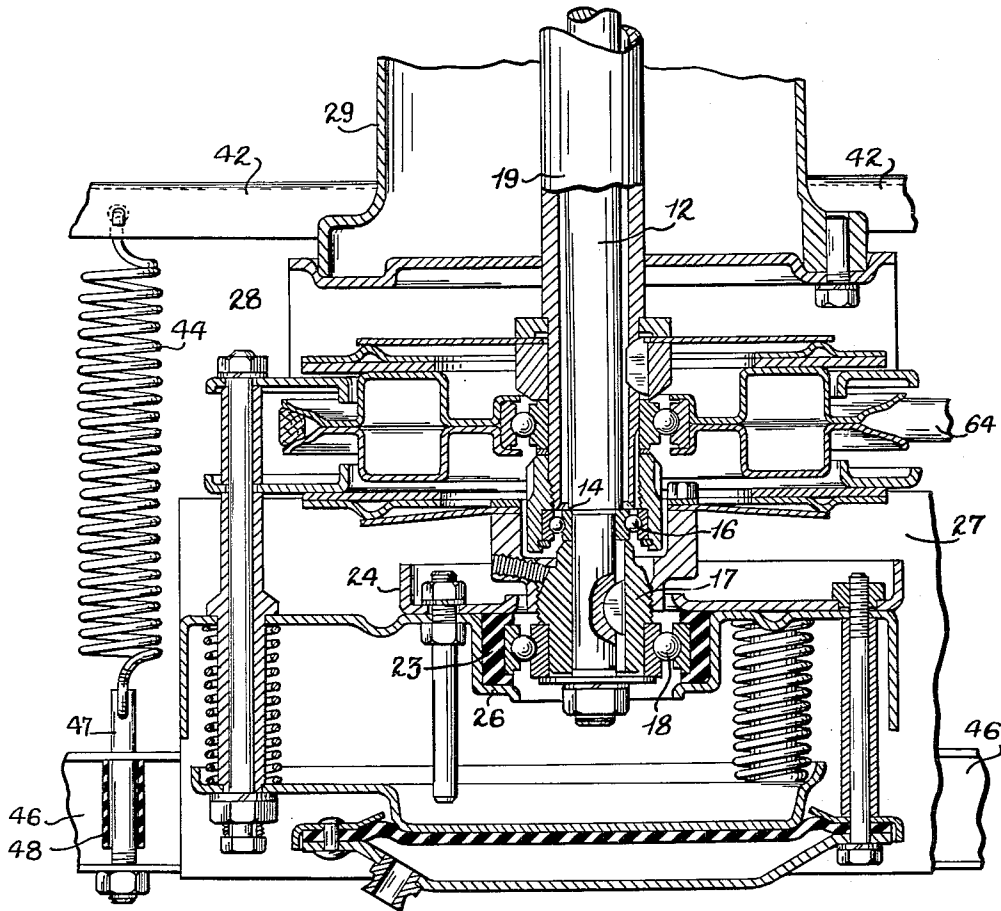


Fig. 3

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4 Sheets-Sheet 4

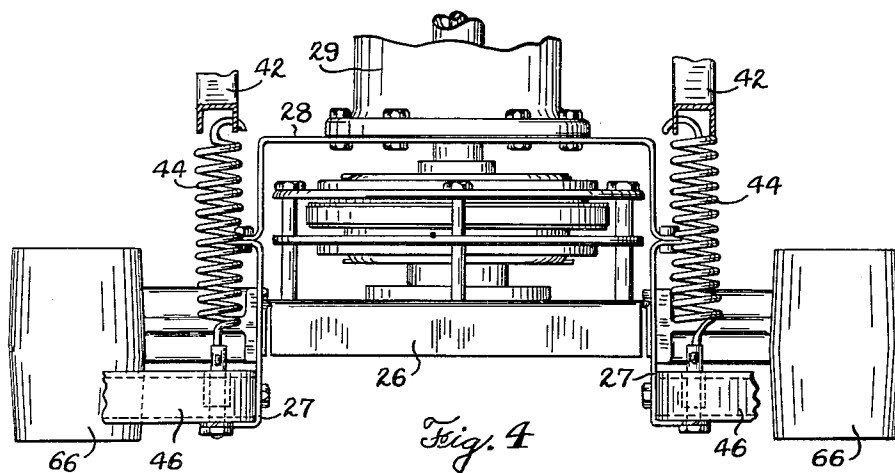


Fig. 4

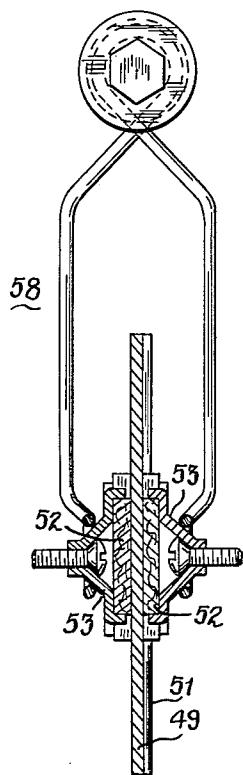


Fig. 6

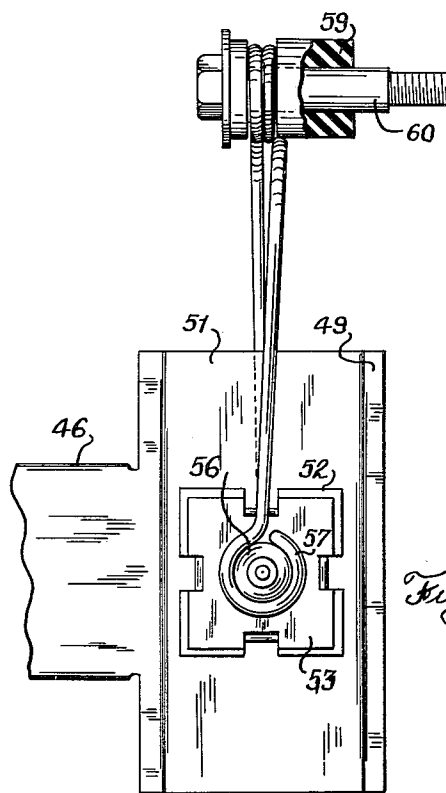


Fig. 5

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SPRING MOUNTED WASHING MACHINE OF THE WATER BALANCE TYPE

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Application April 1, 1953, Serial No. 346,145

3 Claims. (Cl. 68—23)

This invention relates to single tub, spin-drier type washing machines, and more particularly to means for mounting the clothes container and operating mechanism of such machines in a manner to minimize transmission of vibration.

The present invention is limited to top loaded or vertical axis type washing machines wherein the clothes container or basket is rotated at high speed about a generally vertical axis to extract liquid from the clothes, and is further limited to washing machines of this general type employing extracted liquid as a balancing agent.

In washing machines of the above general type, it frequently happens that the clothes are not uniformly distributed around the container resulting in an unbalanced load causing excessive vibration during spinning of the container. Such excessive vibration may cause considerable damage to the machine and in some instances may be sufficient to cause the machine to walk, even though supported on a relatively rigid surface. Various means have been suggested to reduce vibration, such as making the clothes container or supporting structure of considerable mass, permitting the container to sway and controlling swaying by snubbing means, and employing liquid extracted from the clothes or thrown from the container during spinning of the container as a means to counterbalance the out-of-balance due to the clothes load.

Employing a relatively heavy clothes container or supporting structure has obvious disadvantages in handling during production, in additional shipping charges, and in handling the machine at the point of installation. The above disadvantages are avoided by a machine employing extracted liquid as the balancing agent since a relatively light clothes container and supporting structure may be used. However, it has been found that the above described means are not sufficient in themselves to prevent excessive vibration under certain operating conditions and various supplement means have been suggested.

For example, I am aware that it has previously been suggested in a machine employing a relatively heavy clothes container to mount the container and operating mechanism on springs permitting these parts to move substantially in an axial or vertical direction whereby during washing, when the container has a considerable volume of water therein in addition to clothes, these parts will move downwardly to settle on and be supported by a stable base. After the washing action is completed and the container starts spinning, sufficient water is thrown from the container in a short period to permit the spring means to lift the container and operating mechanism from the support to prevent direct transmission of vibration. When these parts are spring supported during spinning, snubbing means are used to control or limit swaying. However, in machines of the water balanced type, an outer ring or pockets are formed integrally with the container adapted to receive and retain varying amounts of water thrown from the container to effect a desired counterbalance. It will be apparent that in this type machine, spring mounting permitting the container and op-

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erating mechanism to be supported on a stable base during washing would not be practical, since, if considerable unbalance was present at the completion of the washing action, the container might be spinning at relatively high speed before sufficient water was extracted from the container and balancing ring or pockets to permit the spring means to lift these parts from the stable support with the result that considerable vibration would be transmitted directly to the support. Various other problems occur in attempting to spring mount a machine of the water balance type, and particularly the type machine which will be used to illustrate the invention, and I am not aware that it has previously been suggested to spring mount a washing machine of this type.

According to the invention, a machine of the water balance type, wherein a clothes container adapted to spin about a generally vertical axis, has an outer ring or pockets formed integrally with the container to receive water thrown from the container to counterbalance unbalanced clothes loading, has the container and operating mechanism spring mounted so that these parts are spring supported both during washing and spinning. Snubbing means are provided to limit swaying. The operating mechanism includes a spin shaft, a wash shaft, clutch and brake means, motor and the like. The motor is mounted eccentrically of the vertical axis of the machine and to counterbalance the motor weight and provide a relatively stable platform at the lower portion of the machine, weights approximating the motor weight are associated with a structural unit forming a support for the operating mechanism. The structural unit is supported by a plurality of springs, such as four, engaging the machine frame and radial arms which extend from the structural unit. Snubbing means in the form of frictional pads engage the ends of these arms along generally vertical planes and yieldingly resist any tendency of the unit to tilt or move laterally. I have found that a mounting arrangement of this type for water balanced washing machines of the general class described permits the machine to operate on a relatively non-rigid supporting surface without transmission of substantial vibration to such surface.

It is a primary object of the invention to provide spring mounting means for a spin-drier washing machine of the water balance type whereby the machine may successfully operate on a relatively non-rigid surface and without substantial transmission of vibration to such surface.

Another object of the invention is to provide spring mounting means for a clothes washing machine of the above type which is effective to substantially reduce transmission of vibration to a supporting surface both in washing and extraction of liquid from clothes.

Another object of the invention is to provide spring mounting means for washing machines of the above type which will prevent a tip-over action of the clothes container and associated mechanism when the container is loaded with clothes and water.

Other objects of the invention and the invention itself will be increasingly apparent from a consideration of the following description and drawing wherein:

Figure 1 is an elevational view of a washing machine embodying the invention with parts broken away for clearness of illustration;

Figure 2 is a transverse section taken generally along a plane indicated at 2—2 of Fig. 1;

Figure 3 is a fragmentary, sectional view of a spring supported structural unit and associated parts;

Figure 4 is a fragmentary left-hand end elevational view of the structural unit and spring means illustrated in Fig. 1;

Figure 5 is an elevational view of snubbing means I may employ; and

Figure 6 is an end view, partially in section, of the snubbing means illustrated in Fig. 5.

Referring now to the drawings, and particularly Figs. 1 to 3 inclusive, I have indicated generally at 10, a clothes container or basket having a central hub portion 11 by which it is secured to and supported by spin shaft 12. The upper portion of the spin shaft is connected to the lower portion thereof through a universal joint 13. The lower portion of the spin shaft is reduced in diameter to provide a shoulder 14 which engages the inner race of a ball bearing 16. Axial load or thrust is transmitted from this bearing through a spacing sleeve 17 to a second ball bearing 18. A tubular wash shaft 19 loosely encircles spin shaft 12 and axial load or thrust thereon is transmitted to the outer race of bearing 16 and resultantly to bearing 18.

The spin and wash shafts are operated by a clutch and brake mechanism of the type more fully illustrated and described in a co-pending application Serial No. 64,108, filed December 8, 1948, now Patent No. 2,665,575, dated January 12, 1954, whereby during washing the spin shaft is held and the wash shaft is rotated at a speed such as 600 R. P. M. The upper end of the wash shaft is connected to a housing for a double roller bearing 20, the axis of the housing being disposed at a slight angle to the vertical, such as 4 degrees, so that as the bearing housing is rotated the spin shaft portion above universal joint 13, although held against rotation, will be caused to travel in a conical path. Since the clothes container 10 is secured to this spin shaft portion, it is caused to wobble at high speed and at a speed, particularly adjacent the container periphery, to effect cavitation or cause an area of the base of the container to successively drop away from the load of clothes and water and then slap the water and clothes to give a geyser type action to the water. At the same time, inclined ribs 21 in the container cause a progressive movement and roll-over action of the clothes. This washing action is more fully described in a co-pending application Serial No. 619,849, filed October 2, 1945. A counterweight 22 disposed at the high side of the container rotates with the wash shaft 19 in phase with the high side of the container and exerts a radial force tending to compensate for the force created by the wobbling motion of the container.

The outer race of ball bearing 18 is encased in a rubber or the like mounting ring 23 which is clamped between an upper plate element 24 and a lower plate element 26. Plate element 26 is bolted or otherwise suitably secured to a structural unit including a pair of side channel members 27. A generally U-shaped cross member 28 is bolted or otherwise secured to the top flanges of side members 27 and forms a seat for a pedestal 29. At its upper end, the pedestal is provided with a bearing 31 for wash shaft 19. The container 10 is disposed in a generally box shaped casing having side walls 32 and a base 33, the base being centrally perforated to permit pedestal 29 to project therethrough in spaced relation. To prevent leakage of liquid from the casing and permit movement of the pedestal relative to the casing, a rubber or the like ring 34 encircles the pedestal and is sealingly clamped thereto and to the base 33 as indicated at 36 and 37. The casing is supported by a lower frame comprising four curved legs 38 connected at their lower ends by channel members 39.

The upper ends of the legs have inwardly bent tabs 41 which form a seat for and are bolted to the abutting outwardly bent flanges of the case side walls 32 and base 33. These flanges form a rigid connection for the top portion of the frame. A pair of channel section cross bars 42 are bolted to the casing flanges as indicated at 43. Hooked, or otherwise suitably secured, to each of bars 42 are a pair of tension springs 44. Four generally channel shaped arms 46 extend generally radially towards the corners of the frame or towards legs 38 and are bolted or otherwise secured to the side members 27 of the structural

unit. A bolt 47 extends to the upper and lower flanges of each arm 46 and the lower end of each spring 44 is secured to its associated arm by hooking to the bolt. The bolt portion within the flanges of arm 46 is preferably sheathed with a rubber tube as indicated at 48. Although, as will be subsequently explained, the location of springs 44 is important, it is understood if the structural unit were somewhat enlarged, the springs could be directly secured to this unit. Each arm 46 is of generally T shape, forming a radially outer portion 49 having a slightly offset vertical section 51 adapted to engage a pair of friction pads 52. The pads 52 are clamped to metal elements 53 preferably by providing generally U-shaped notches in the pads and bending over tabs from elements 53 at the notches. Elements 53 are formed with frusto conical portions 56 forming bearings for loops 57 of spring means generally indicated at 58. Means 58 preferably comprise a single piece of relatively stiff spring wire double looped at the top to tightly encircle a rubber or the like bushing 59 and with the intermediate portion formed as indicated at 56 to exert pressure on pads 52. Arms 46, or at least the portion 49 thereof, is preferably formed of copper plated steel and pads 52 of brake lining material. Tube 59 is supported by a bolt 60 threaded into a pressed-in or reinforced portion of leg 38 and secured by a nut.

For practical reasons, the motor indicated at 61 is mounted eccentrically of the vertical axis of the machine, the motor being supported by a plate 62 engaging side members 27. An elongate slot 63 in plate 62 permits limited swinging movement of the motor to adjust the tension of belt 64. To counterbalance the motor, I provide spaced weights 66 preferably formed of cast metal and each comprising a barrel portion and an arm portion bolted to side members 27. In the present instance, the two weights are each spaced 120 degrees from the motor and from each other with the foot pounds of each weight based on the distance of its center of gravity of the vertical axis of the machine substantially corresponding to the foot pounds exerted by the motor.

It will now be understood that the clothes container and all operating mechanism for the machine is spring mounted or spring supported and that the only vibrations which can be transmitted to the frame and resultantly to a supporting surface are through the snubbing means and the mounting springs. Also, it will be noted that the springs 44 are disposed a substantial distance inboard of the snubbing means and generally at the mid-zone between the vertical axis of the machine and the frame legs 38. I have found that in a machine of the type described, location of the spring means and the rating of the springs is of considerable importance. For example, the spring mounting must substantially isolate vertical pulsations due to the washing action, and to effect this, the vertical critical should not exceed one-third of the vertical operating frequency to lower the transmission of vibration through the springs as much as possible. If the springs have too low a rating, the vertical movement will be too great between an empty machine and one with a complete load of clothes and water in the container or the distance which must be allowed for vertical movement of the container and operating mechanism would be too great from a practical standpoint. The vertical length of the springs must be sufficient to permit a pendulum or swinging critical frequency which will not exceed one-sixth of the operating frequency. At the same time the pendulum critical must be sufficiently low to prevent the forces being too great at the start of the extraction cycle or before the container reaches critical speed to insure that transmission of extraction forces will be low. In other words, the rating of the spring, the placement of the springs, and the vertical length of the springs control the critical frequency of the suspended mass to avoid creation of excessive forces when the machine is being accelerated during the extraction cycle. For example, if springs of the rating used in the machine il-

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illustrated were disposed at the ends of arms 46, the critical frequency would be raised considerably. On the other hand, if springs of a lower rating were disposed as shown, undue vertical clearance would be required between the high and low positions of the container and operating mechanism or the empty and fully loaded positions. Further, if springs 44 were moved inboard an appreciable amount, the tip-over tendency of the container, particularly when loaded, would be substantially increased.

A light-weight container is required in a machine having the type of washing action described to prevent heavy power requirements and with a light-weight container a stable platform is necessary at the structural unit zone to minimize motion and vibration in the wash and spin cycles, and this is primarily effected by the motor 61 and spaced counterweights 66.

The mounting means described is equally adaptable to a water balance type machine having an oscillating agitator to effect washing, but in this type machine the forces or vibrations created during the washing cycle are not a serious factor and the forces created during the spin cycle are controlling. In the machine illustrated if the basket wobbles at 600 R. P. M., it spins at the same speed, and the rapid down thrust during the washing cycle is at least as serious a factor in creating vibration as the forces created during spinning of the container.

Water balance means for washing machines of the type described are well-known and only a brief description will be given herein. If a load of clothes is unbalanced at the right hand side of the container (Fig. 1) during spinning, extracted water discharged through holes 71 will be received in or travel to pockets 72 disposed in a zone diametrically opposite the unbalanced load. The pockets are interconnected by passages 73. The pockets will continue to fill so long as unbalance exists until it reaches overflow pockets 74.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

What I claim is:

1. The combination with a washing machine of the type having a relatively rigid frame, a clothes container rotatable about a generally vertical axis to extract water from clothes, means integral with the container adapted to receive extracted water to counterbalance unequal loading of clothes in the container, and operating mechanism including a motor for effecting agitation of clothes disposed in said container during a washing period and

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rotating said container during an extraction period, of means for mounting said container and operating mechanism to minimize transmission of vibration to said frame during operation of the machine, said mounting means comprising a structural unit within the frame supporting the container and operating mechanism including a plurality of spaced arms each extending radially outwardly to a point adjacent the frame, the motor being secured directly to the structural unit eccentrically of the vertical axis of the machine, weights substantially corresponding in foot pounds to the foot pounds exerted by the motor and secured to the structural unit in substantially equally spaced relation to each other and the motor to provide a relatively stable platform, spring means supported at their upper ends from the frame and engaging said unit at their lower ends whereby said unit, operating mechanism and container are spring-supported both during washing and extracting periods, the spring means having a rating and being of a length to provide the spring-supported parts with a swinging frequency having a maximum value of one-sixth of the container operating frequency at extraction speed, snubbing means mounted on the frame and engaging the end portions of the arms to limit both vertical and lateral movement of said structural unit, and said spring means being located a substantial distance inboard from the snubbing means.

2. The combination as described in claim 1 and wherein the frame is generally square, four arms are provided each extending towards a different frame corner, and four tension springs are provided with each being disposed substantially at the mid-zone between the vertical axis of the machine and the frame corners.

3. The combination as described in claim 1 and wherein the structural unit comprises spaced channel members and cross members, the said unit supporting bearing means, shaft means supported by the bearing means for supporting and rotating the container, the snubbing means comprising a vertical portion at the radially outer end of each arm, a pair of friction pads engaging each said portion, and resilient means mounted on the frame forcing the pads into frictional engagement with said portion.

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