

Dec. 30, 1941.

G. W. DUNHAM

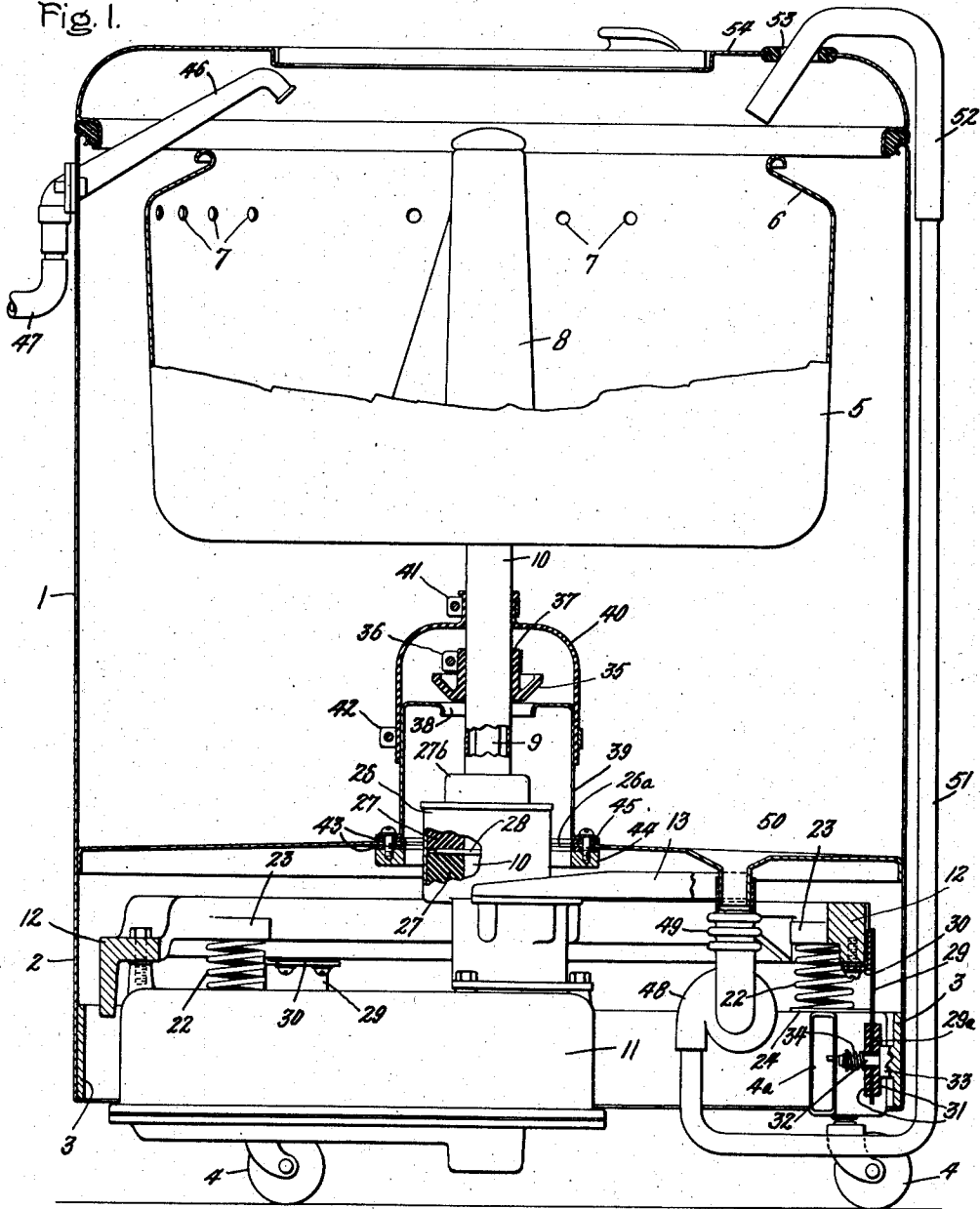
2,268,204

WASHING MACHINE

Filed March 8, 1941

2 Sheets-Sheet 1

Fig. 1.



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2 Sheets-Sheet 2

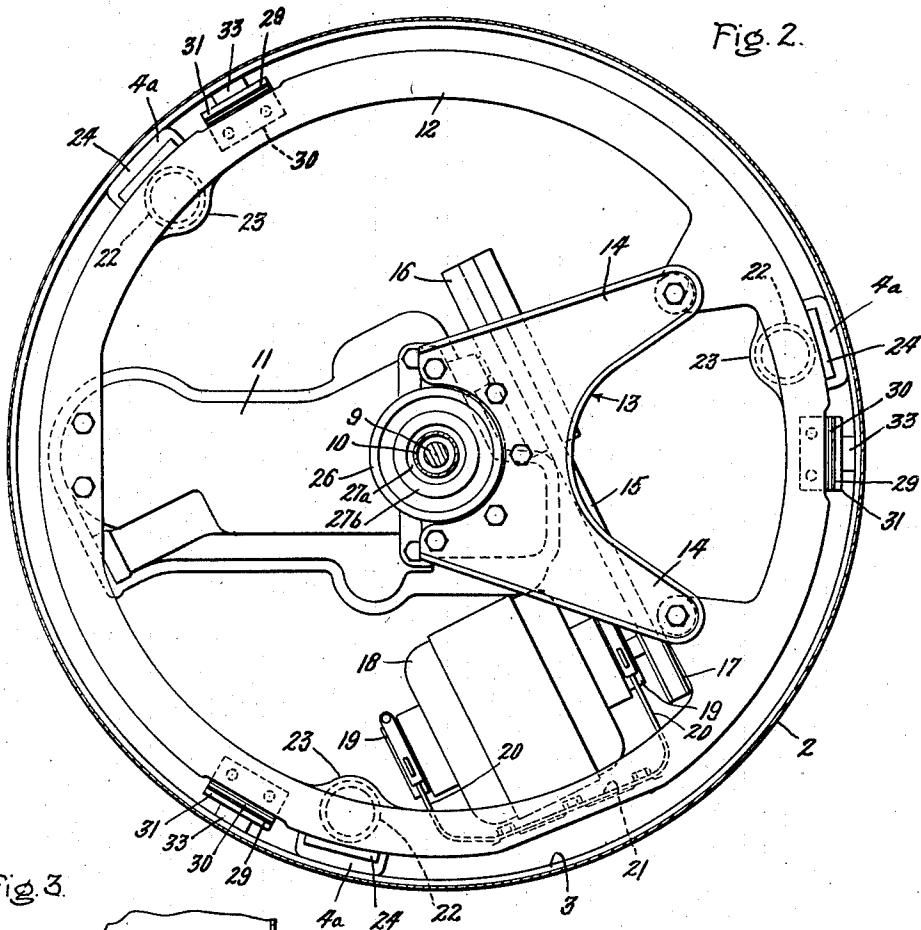
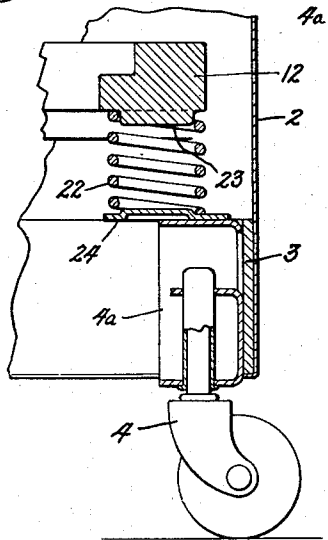


Fig. 3.



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# UNITED STATES PATENT OFFICE

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## WASHING MACHINE

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8 Claims. (Cl. 68—23)

The present invention relates to washing machines of the type in which clothes are washed and centrifugally dried in a rotatable tub or spinner basket.

The object of my invention is to provide an improved construction in machines of this type by means of which the vibration during centrifugal drying is decreased. For a consideration of what I believe novel and my invention, attention is directed to the following description and the claims appended thereto.

In the accompanying drawings, Fig. 1 is a sectional elevation of a washing machine embodying my invention; Fig. 2 is a top plan view of the frame carrying the driving mechanism; and Fig. 3 is a sectional elevation of one of the spring supports for the frame.

Referring to the drawings, there is shown a washing machine having an outer casing or tank 1 having a depending skirt 2 at its lower end within which is fixed a stiffening ring 3 carrying brackets 4a for casters 4. In the upper part of the outer casing is a rotatable tub or spinner basket 5 for receiving clothes to be washed and centrifugally dried. The side walls of the spinner basket flare upward and outward toward the top and terminate in an inwardly extending guard ring 6 which holds the clothes in the spinner basket during centrifugal drying. At the region of greatest diameter the side walls are provided with centrifugal discharge openings 7 which also serve as overflow openings defining the liquid level in the spinner basket during washing. Within the spinner basket is an oscillatory bladed agitator 8. The agitator is oscillated for washing and the spinner basket is rotated for centrifugal drying through a suitable mechanism associated with a vertical shaft 9 extending up from the bottom of the outer casing through a sleeve 10. Such mechanism is known and may, for example, be that disclosed in my Patent 2,161,618. The driving mechanism for the vertical shaft 9 is located within a gear casing 11 carried on a rigid supporting ring or frame 12 arranged within the skirt 2 of the outer casing. One end of the gear casing is bolted to the supporting ring. The other end of the gear case is bolted to a bracket 13 having arms 14 bolted to the supporting ring 12. The mechanism is driven through a belt 15 and pulleys 16 and 17 by means of an electric motor 18 supported in rubber rings 19 fixed to arms 20 of a base 21 bolted to the supporting ring 12. The supporting ring 12 is resiliently supported by three coil springs 22 arranged between seats 23

on the under side of the supporting ring and seats 24 fixed to the upper ends of the caster brackets 4a. The coil springs 22 are equally spaced around the ring so as to provide a stable support. Fixed to the upper side of the gear casing 11 is a cylindrical housing 26 projecting through an opening 26a in the bottom wall of the outer casing. Within the housing 26 are rubber rings 27 arranged on opposite sides of a flange 28 projecting from the sleeve 10. Tilting of the sleeve 10 in any direction about its lower end causes a compression of the rubber rings 27 resulting in a force tending to return the sleeve to an upright position. The rubber rings 27 accordingly resiliently support the spinner basket during centrifugal drying for gyratory movement which decreases the vibration due to unbalanced distribution of the clothes. As shown in Fig. 2, there is a clearance at 27a between the sleeve 10 and the top 27b of the housing 26 permitting the tilting or gyratory movement of the sleeve 10. The stiffness of the rubber rings 27 is preferably such that the critical speed is substantially below the normal extracting speed. By the above described construction the spinner basket is supported by the rubber rings 27 for gyratory movement relative to the supporting ring 12 and to the outer casing, and the spinner basket is also resiliently supported on the floor by means of the coil springs 22 arranged between the supporting ring 12 and the casters 4. The rubber rings 27 are primarily effective in reducing vibration due to unbalanced distribution of the clothes, while the coil springs 22 are primarily effective in preventing transmission of vibration to the floor. The coil springs 22, however, have the additional function of decreasing the gyration of the spinner basket at the critical speed and accordingly permit the bringing of the spinner basket up through the critical speed to its normal extracting speed with larger amounts of unbalance. The stiffness of the springs 22 is such that the natural frequency of the supporting ring 12 and the parts carried thereby on the springs does not coincide with or, in other words, is not resonant with any of the frequencies of vibration present during the operation of the machine.

The operation of the machine in the region of the critical speed is improved by friction dampers arranged between the supporting ring 12 and the stiffening ring 3. Three friction dampers are shown uniformly spaced about the circumference of the supporting ring, although a greater number might be used. Each of the friction

dampers comprises a strip 29 depending from a bracket 30 fixed to the supporting ring 12. The strips 29 lie in vertical planes which extend tangentially to or circumferentially of the supporting ring. The lower ends of the strips 29 are received between friction disks or washers 31 on studs 32 projecting from bosses 33 on the stiffening ring 3. The friction disks 31 are pressed together and against the strips 29 by means of springs 34 on the outer ends of the studs 32. Vertical movement of the strips 29 relative to the friction disks 31 is permitted by an elongated slot 29a in the strips 29. Vertical movement of the supporting ring 12 on the springs 22 is accordingly frictionally resisted or damped by vertical movement of the strips 29 between the friction disks 31. Horizontal movement of the supporting ring 12 on the springs 22 is frictionally damped by pivotal movement of the strips 29 on the studs 32. Because there are three friction dampers arranged in circumferential planes around the supporting ring 12, horizontal movement of the supporting ring can be resolved into components in the planes of the strips 29, each component of which would tend to cause pivoting of the strips. The same result would obviously be obtained if more than three friction dampers were used. The friction dampers are primarily effective in reducing the large amplitude vibrations. This reduces the power required to bring the machine up through the critical speed or, from another aspect, permits the operation of the machine with larger amounts of unbalance.

The power required to bring the spinner basket up to the normal extracting speed is also decreased if the basket is started from a central position. In the present construction this is effected by a stabilizing construction which holds the spinner basket in a central position during washing. This construction comprises a conical rubber member 35 fixed to the sleeve 10 by means of a band 36 clamped around a cylindrical portion 37 integral with the member 35. When the spinner basket is filled with washing liquid the weight of the liquid is transmitted through the shaft 9 to the supporting ring 12, causing deflection of the springs 22. This brings the conical member 35 into engagement with a seat 38 on cylindrical post 39 secured to the bottom of the outer casing. If the spinner basket should be slightly tilted from the central position while it is being filled, it will be brought to a central position by the engagement of the conical member 35 with its seat. From a broad aspect, the conical member 35 and the seat 38 are cooperating surfaces for resisting tilting of the basket. The conical member 35 will be in engagement with the seat 38 at the start of the extracting operation and will so remain until sufficient of the washing liquid in the receptacle has been discharged to lighten the load on the supporting springs 22, after which the conical member 35 is raised clear of its seat. The springs 22 are preferably of such stiffness that the conical member 35 is not moved clear of its seat 38 until the spinner basket is through its critical speed. When the part 35 is clear of its seat 38, the spinner basket is then free to gyrate about its center of mass under the restraining influence of the rubber ring 27. With the above described construction the spinner basket will be automatically held in a central position during washing and at the start of the centrifugal drying, and the centralizing force will be removed during centrifugal

drying. Since the part 35 is made of resilient material, it acts to cushion the vibration at the start of the centrifugal extracting until it is moved clear of its seat 38. From this aspect the part 35 and its associated seat 38 can be considered as an arrangement for increasing the rigidity of the support for the spinner basket until the spinner basket is rotated above its critical speed.

During extracting, the liquid in the spinner basket is discharged through the openings 7 and falls into the bottom of the outer casing where it is stored below the bottom of the spinner basket. A rubber sleeve 40 secured by a clamp 41 to the sleeve 10 and by a clamp 42 to the cylindrical post 39 prevents leakage through the upper end of the post 39. Leakage at the lower end of the post 39 is prevented by gaskets 43 arranged between a clamping ring 44 and the under side of the outer casing and between a flange 45 on the post 39 and the upper side of the casing.

The spinner basket is filled through a nozzle 46 connected to a supply conduit 47. The machine is emptied by a pump 48 having its intake connected by a flexible hose 49 to a well 50 in the bottom of the outer casing and having its discharge connected to a conduit 51 having a swivelled gooseneck 52 at its upper end. When the tub is to be emptied, the gooseneck is hooked over a sink. During washing, the gooseneck is positioned to discharge into the spinner basket through an opening 53 in a cover 54 for the outer casing. The pump is preferably operated during washing so that any liquid overflowing through the discharge openings 7 is returned to the spinner basket. This maintains the liquid level in the spinner basket during washing.

In the use of the machine the spinner basket 5 is filled through the nozzle 46 with the pump 48 operating and the gooseneck 52 positioned to discharge into the spinner basket until sufficient liquid overflows through the openings 7 to cause a steady flow through the gooseneck. This assures the proper liquid level in the spinner basket for washing. The clothes are then added and the agitator 8 is oscillated by the vertical shaft 9. At the conclusion of the washing operation the pump 48 is stopped and the spinner basket is rotated by the shaft 9. At the start of the extracting operation the spinner basket is held in a central position by the engagement of the conical member 35 with its seat 38. As the speed of rotation of the spinner basket increases, the liquid contents are centrifugally discharged through the openings 7, decreasing the weight of the basket and accordingly decreasing the deflection of the springs 22 so that the part 35 is raised clear of its seat 38. Preferably this condition obtains when the speed of rotation of the spinner basket is above its critical speed. Thereafter the vibration is cushioned by the rubber rings 27 and the springs 22, and large amplitude vibrations are damped by the friction dampers 29. During the extracting operation the liquid centrifugally discharged from the spinner basket falls into the bottom of the outer casing, whence it may be returned to the spinner basket to wash a succeeding batch of clothes.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a single tub washer and drier, a spinner basket for receiving clothes to be washed and centrifugally dried, a frame, means supporting the basket on the frame for tilting movement

relative to the frame, means resiliently supporting the frame on a floor or the like, and means responsive to movement of the frame due to deflection of its supporting means under the weight of the washing liquid in the basket for resisting tilting of the basket relative to the frame until the basket is at least partially emptied.

2. In a single tub washer and drier, a spinner basket for receiving clothes to be washed and centrifugally dried, means yieldably supporting the basket for gyratory movement about a vertical axis, and means responsive to the presence of washing liquid in the basket for resisting movement of the basket from said axis until the basket is at least partially emptied.

3. In a single tub washer and drier, a spinner basket for receiving clothes to be washed and centrifugally dried, means yieldably supporting the basket for gyratory movement about a central position, and stabilizing means actuated by the introduction of washing liquid into the basket for holding the basket in said central position until the basket is at least partially emptied.

4. In a single tub washer and drier, a spinner basket for receiving clothes to be washed and centrifugally dried, vertical shaft means connected to the basket, a sleeve supporting the shaft, means resiliently supporting the basket on a floor or the like, and stabilizing means for holding the basket in an upright position during washing comprising cooperating surfaces, one of which is carried by said sleeve and is brought into engagement with the other surface by deflection of said supporting means under the weight of the washing liquid in the basket.

5. In a single tub washer and drier, an outer casing, a spinner basket therein for receiving clothes to be washed and centrifugally dried, means for resiliently supporting the basket in the casing for vertical and gyratory movement relative to the casing, and stabilizing means for centering the basket with respect to the casing during washing comprising engageable surfaces,

one of which is carried by the casing and the other of which is moved into engagement with the first by vertical movement of the basket on its supporting means under the weight of the washing liquid.

6. In a single tub washer and drier, a spinner basket for receiving clothes to be washed and centrifugally dried, a casing surrounding the basket, an opening in the bottom wall of the casing, a ring below the casing supporting driving mechanism and a vertical shaft means extending therefrom through said opening to the basket, spring means resiliently supporting the ring on a floor or the like, and stabilizing means for holding the basket in a central position comprising a seat on said casing and a conical rubber member surrounding said shaft means and movable into engagement with said seat by deflection of said spring means under the weight of the washing liquid in the spinner basket.

7. In a single tub washer and drier, a spinner basket for receiving clothes to be washed and centrifugally dried, means resiliently supporting the spinner basket for gyratory movement, said means being constructed and arranged so that the critical speed is below the normal operating speed, and means responsive to the weight of the liquid in the spinner basket for increasing the resistance to gyratory movement of the spinner basket at speeds below the critical speed.

8. In a single tub washer and drier, a spinner basket for receiving clothes to be washed and centrifugally dried, means resiliently supporting the spinner basket for gyratory movement, said means being constructed and arranged so that the critical speed is below the normal operating speed, additional means for resiliently resisting gyratory movement of the spinner basket comprising engageable elements, and means responsive to the weight of the liquid in the spinner basket for effecting engagement of said elements at speeds below the critical speed.

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