Feb. 17, 1942. E. FABER 2,273,566

WASHING MACHINE

Filed Oct. 16, 1937

Fig. 1.

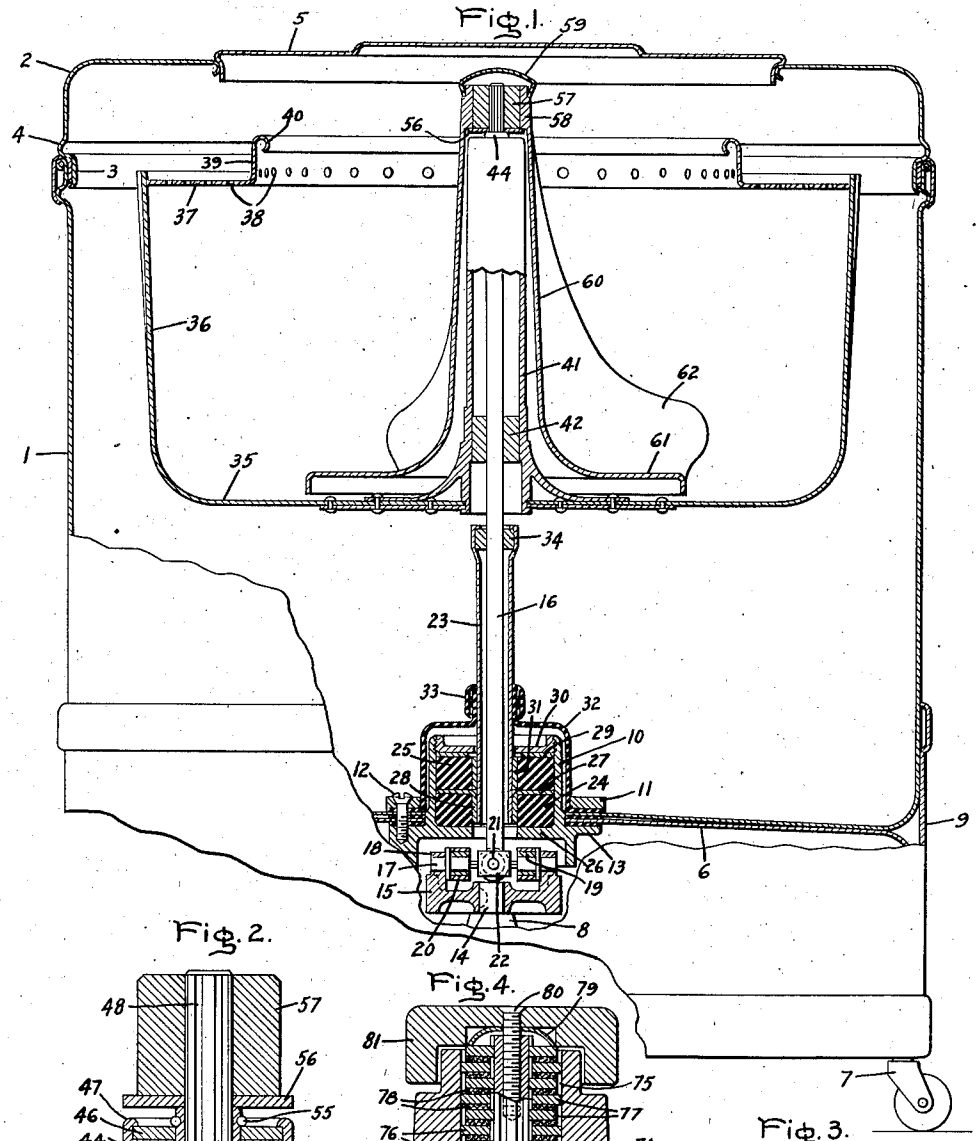



Fig. 2.

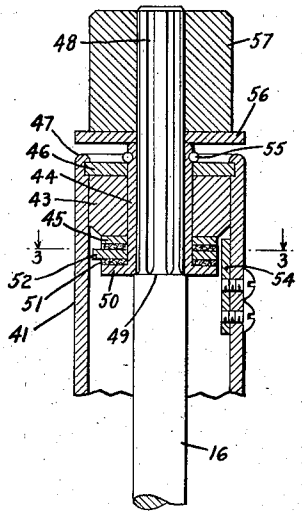



Fig. 4.

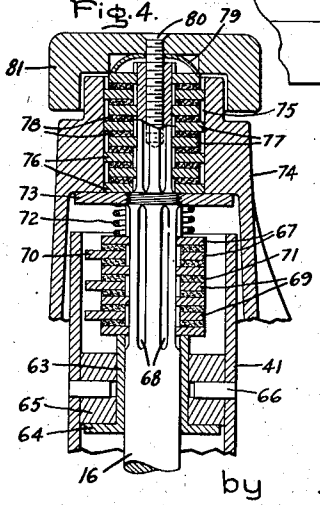
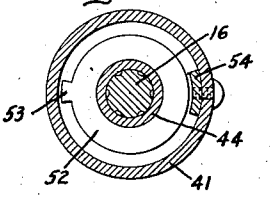



Fig. 3.

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# UNITED STATES PATENT OFFICE

2,273,566

## WASHING MACHINE

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Application October 16, 1937, Serial No. 169,421

5 Claims. (Cl. 68—133)

The present invention relates to washing machines of the type having a rotatable receptacle in which the clothes are washed and centrifugally dried, the washing being effected by an agitator in the receptacle and the drying being effected by rotating the receptacle.

The object of my invention is to provide an improved construction and arrangement for driving the agitator and receptacle, and for a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto.

In the accompanying drawing, Fig. 1 is an elevation, partly in section, of a washing machine embodying my invention; Fig. 2 is an enlarged sectional view of the upper end of the driving shaft showing the arrangement for supporting and driving the agitator and receptacle; Fig. 3 is a sectional view taken on line 3—3 of Fig. 2; and Fig. 4 is a sectional view of an alternative arrangement for driving and supporting the agitator and receptacle.

Referring to the drawing, I have illustrated my invention applied to a washing machine of the type shown in Patent Number 2,161,618, issued June 6, 1939. This machine has an outer casing or tub 1, the upper end of which is partially closed by an annular cover 2 having a flange 3 which fits within the upper end of the tub. The cover has a projecting bead 4 which rests on the upper edge of the tub. A cover 5 which rests on the inner edge of the annular cover 2 completes the closure of the upper end of the tub. Below the lower end of the tub 1 is a base 6 suitably supported, for example by casters 7. The base carries a gear casing 8 containing the mechanism for operating the washing machine which may, for example, be that of Patent Number 2,161,618, referred to above. The base carries a cylindrical skirt 9 which covers the junction between the base and the lower end of the tub.

Fixed to the upper side of the gear casing 8 is a tubular post 10 which projects upwardly through aligned openings in the base and the bottom of the tub. The tub and base are clamped to the post 10 by a clamping ring 11 on the upper side of the tub bottom by means of screws 12 threaded through the clamping ring into a flange 13 integral with the post 10. Suitable gaskets are arranged between the surfaces clamped between the flange and clamping ring.

Projecting from the gear casing 8 is a vertical drive shaft 14 having a brake drum 15 keyed thereto. The brake drum is connected to a vertical shaft 16 by means of a universal joint which comprises diametrically opposed pins 17 fixed in ears 18 integral with the brake drum. The pins are journaled in bearings 19 clamped between plates 20 which comprise the intermediate member of the universal joint. Midway between the pins 17 are diametrically opposed pins 21 projecting from the shaft 16 and likewise journaled in bearings 22 similarly clamped between the plates 20. With this construction, the vertical shaft 16 is free to tilt in all directions with respect to the drive shaft 14.

The shaft 16 projects upwardly through a sleeve 23 the upper end of which projects above the maximum water level in the tub 1. The lower end of the sleeve 23 is resiliently supported by a mounting which comprises annuluses 24 and 25 of rubber or other suitable resilient material arranged within the tubular post 10. The annulus 24 is arranged between an inwardly extending flange 26 integral with the post 10 and an outwardly extending flange 27 integral with a sleeve 28 fixed to the sleeve 23. The annulus 25 is arranged between the upper side of the flange 27 and a washer 29 which is clamped against the upper surface of the annulus by a nut 30 threaded into the upper end of the post. The inner surface of the annulus 25 bears against a sleeve 31 fixed to the sleeve 23. The sleeve 31 has the same outside diameter as the sleeve 28 so that the annuluses 24 and 25 may be of the same size. The flexibility of the resilient mounting for the sleeve 23 is adjusted by the nut 30 which varies the compression of the annuluses and thereby varies the stiffness of the mounting. With this arrangement the sleeve 23 is resiliently supported for gyratory movement about a vertical axis with respect to the driving shaft 14. Leakage around the lower end of the sleeve 23 is prevented by a cover 32 of flexible waterproof material one end of which is clamped between the clamping ring 11 and the bottom of the tub and the other end of which is clamped to the sleeve 23 by means of a clamp 33. In the upper end of the sleeve 23 is fixed a sleeve bearing 34 of self-lubricating material in which the shaft 16 rotates.

Above the upper end of the sleeve 23 is an imperforate receptacle 35 having outwardly flaring side walls 36. Below the upper edge of the walls 36 is fixed a guard ring 37 which keeps the clothes in the receptacle during washing and drying. During washing, water may be continuously discharged into the upper end of the receptacle, the excess water flowing out of the upper edge of the receptacle through perforations 38 in the guard ring. At the inner edge of the

guard ring is a vertical flange 39 terminating in an inwardly rolled edge 40 which provides a hand grip by means of which the receptacle may be lifted.

Fixed at the center of the receptacle is a vertical hub 41 the upper end of which projects above the upper ends of the side walls 36 and is therefore above the water level in the receptacle. In the lower end of the hub 41 is fixed a sleeve bearing 42 of self-lubricating material which bears on the shaft 16. In the upper end of the hub 41 is fixed a combined sleeve and thrust bearing 43, also of self-lubricating material, the inner surface of which bears on a sleeve 44 and the lower end of which bears on a washer 45. At the upper end of the bearing 43 is a washer 46 which is held in place by the spun-over portion 47 at the upper end of the hub 41. The sleeve 44 is provided with splines which engage the splined end 48 of the shaft 16 and non-rotatably secure the sleeve to the shaft. The lower end of the sleeve 44 rests on a shoulder 49 on the shaft. Projecting from the lower end of the sleeve 44 is a flange 50 on the upper side of which is arranged washers or disks 51 of friction material and an intermediate metal washer 52. The weight of the receptacle resting on the upper surface of the washer 45 clamps the washers against the flange 50 and provides a slip connection between the washer 52 and the sleeve 44. The washer 52 has a tongue or projection 53 which cooperates with a stop 54 fixed to the inside of the hub 41. As is evident from Fig. 3 the shaft 16 is normally free to oscillate through an angle of nearly 360° without causing engagement of the tongue 53 and stop 54. Upon continued rotation of the shaft the tongue 53 engages the stop 54 and provides a driving connection from the shaft 16 to the receptacle. The sleeve 44 and the parts assembled thereon are held in assembled relation by a snap ring 55 arranged in a groove on the sleeve on the upper side of the washer 46.

Bearing on the upper end of the sleeve 44 is a thrust washer 56 which supports a nut 57 provided with splines cooperating with splines 48 in the upper end of the shaft 16, and non-rotatably securing the nut to the shaft. The nut fits within a socket in the hub 58 of an agitator and non-rotatably secures the agitator to the shaft. The lower end of the agitator hub rests on the projecting portion of the thrust washer 56. A cap 59, snapped in place over the upper end of the agitator hub, prevents leakage of water around the shaft. The agitator has a downwardly flaring tubular portion 60 which terminates in a disk 61 adjacent the bottom of the receptacle. Projecting from the tubular portion 60 and disk 61 are vanes 62 which agitate the liquid and clothes in the receptacle to effect washing.

In the use of the washing machine, the receptacle is filled with liquid and clothes and the shaft 16 is oscillated through an angle of the order of 180° at a rate of the order of 60 complete oscillations per minute. The angle and rate of oscillation obviously depend on the design of the agitator and the washing speed desired. During this oscillation of the shaft 16, the receptacle is supported in rotatable relation to the shaft 16 by the bearings 42 and 43. It has been observed that the receptacle will have a slight rotational movement due to variations in the instantaneous speed of the oscillating shaft and to variations in the resistance offered by the clothes and liquid to the oscillation of the agitator. The rotation of the receptacle continues in one direction until the stop 54 on the receptacle hub is engaged between tongue 53 on the disk 52. Upon impact of the tongue 53 and stop 54 the receptacle is given an impulse which reverses the direction of its rotation and starts the rotation of the receptacle in the opposite direction. Due to the slip connection between the disk 52 and the shaft 16 provided by the friction disks 51, the impact between the tongue 53 and the stop 54 is cushioned and strains on the driving mechanism are decreased. At the completion of the washing operation the shaft 16 is rotated continuously in one direction. During the rotation of the shaft the tongue 53 engages the stop 54 and completes the driving connection to the receptacle. The slip connection to the disk 52 cushions the impact between the tongue 53 and stop 54 and permits a gradual acceleration of the receptacle.

In Fig. 4, is shown an alternative arrangement for supporting and driving the agitator and receptacle. In this construction there is fixed to the shaft 16 a sleeve 63 having an inwardly extending flange 64 at its lower end on which rests a combined sleeve and thrust bearing 65 of self-lubricating material, pinned to the receptacle hub by pins 66. The vertical portion of the sleeve 63 guides the rotation of the receptacle, and the flange 64 takes the thrust. Above the upper end of the sleeve 63 is arranged a series of metal washers or disks 67 keyed to the shaft 16 by means of splines 68. Intermediate the disks 67 are metal disks 69 each of which is provided with a tongue 70 of the same construction as the tongue 53 of the disk 52. The disks 69 are loose on the shaft 16. Between the disks 67 and 69 are arranged friction disks or washers 71 which are likewise loose on the shaft 16. The disks are pressed against the upper end of the sleeve 63 by a coil spring 72 arranged between the top washer 67 and a nut 73 threaded on the shaft 16. As in the previously described construction, the tongues 70 cooperate with the stop 54 fixed to the inside of the receptacle hub 41. This arrangement provides a slip connection between the shaft 16 and the receptacle hub which functions in the same manner as the construction shown in Figs. 2 and 3. The friction between the disks is adjustable by varying the compression of the spring 72 by means of the nut 73.

Above the upper end of the receptacle hub 41 is the hub 74 of an agitator which may have the same general construction as the agitator shown in Fig. 1. The lower edge of the agitator hub 74 rests on the upper surface of the nut 73, the nut serving as a thrust bearing for the agitator. The hub 74 is provided with a socket 75 in which are splined metal disks 76. Intermediate the disks 76 are metal disks 77 which are splined on the upper end of the shaft 16. The disks 76 are loose with respect to the shaft 16 and the disks 77 are loose with respect to the agitator hub 74. Between the disks 76 and 77 are disks 78 of friction material, loose or free with respect to the shaft and hub, which provide a friction or slip connection between the disks. The disks are pressed together by a cup-spring 79 arranged between the top disk 77 and a screw 80 threaded into the upper end of the shaft. The screw is fixed in a cap 81 which provides a convenient grip for the operator for adjusting the pressure between the disks. By adjusting the cap 81 pressure between the disks may be

varied from a position in which the disks are loose, in which case the agitator will remain stationary during the oscillation of the shaft, to a position in which the disks are so tightly pressed together that the agitator is in effect solid with respect to the shaft. In the intermediate positions of the cap 81, the friction between the disks will be such that the disks will slip relative to each other at a predetermined force. With this arrangement, it is obvious that the angle of oscillation of the agitator can be varied from zero to a full stroke, thus securing a variation in the washing action of the agitator. During the full stroke of the oscillation of the agitator the maximum washing action will be obtained while during the partial stroke of the oscillation of the agitator a less severe washing action will be obtained. The less severe washing action is more suitable for the more fragile clothes. The friction drive between the drive and the agitator also has the effect of reducing the shock on the driving mechanism on reversal of the shaft, which decreases the strain on the driving mechanism and also decreases the noise which may arise due to clearance in the parts of the oscillating mechanism.

The receptacle drive is claimed in a divisional application Serial No. 339,972, filed June 11, 1940, now Patent Number 2,258,244, issued October 7, 1941.

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

1. In a washing machine, a shaft, means for oscillating the shaft, an agitator having a hub surrounding the shaft and having its inner walls spaced from the shaft and providing an annular space therebetween, and a slip connection between the hub and shaft including a friction disk connected to the hub, and a friction disk connected to the shaft, said disks being telescoped over the shaft and located in the space between the hub and shaft.

2. In a washing machine, a shaft, means for oscillating the shaft, an agitator having a hub surrounding the shaft and having its inner walls spaced from the shaft and providing an annular space therebetween, a disk non-rotatably fixed to the hub, a disk non-rotatably fixed to the shaft, a free disk therebetween, said disks being telescoped over the shaft and located in said space, and means pressing the disks together providing a slip drive between the hub and the shaft.

3. In a washing machine, a shaft, means for oscillating the shaft, an agitator having a hub surrounding the shaft, a drive between the hub and shaft comprising engaging friction surfaces, and means for adjusting the pressure between said surfaces whereby the angle of oscillation of the agitator is adjustable.

4. In a washing machine, a shaft, means for oscillating the shaft, an agitator having a hub surrounding the shaft, a drive between the hub and the shaft comprising engaging friction surfaces, spring means pressing said surfaces together, and a manually operable member for varying the pressure exerted by the spring whereby the angle of oscillation of the agitator is adjustable.

5. In a washing machine, an agitator, means for oscillating the agitator including a friction drive having frictionally engaging parts arranged between the agitator and an oscillatory driving member, and manually operable means for adjusting the pressure between said parts to values between zero and the pressure at which no slippage occurs between frictionally engaging parts whereby the angle of oscillation of the agitator is adjustable, said manually operable means including provisions for maintaining its adjusted position.

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