June 6, 1939. G. W. DUNHAM 2,161,619

WASHING MACHINE

Original Filed Jan. 31, 1936

Fig. 1.

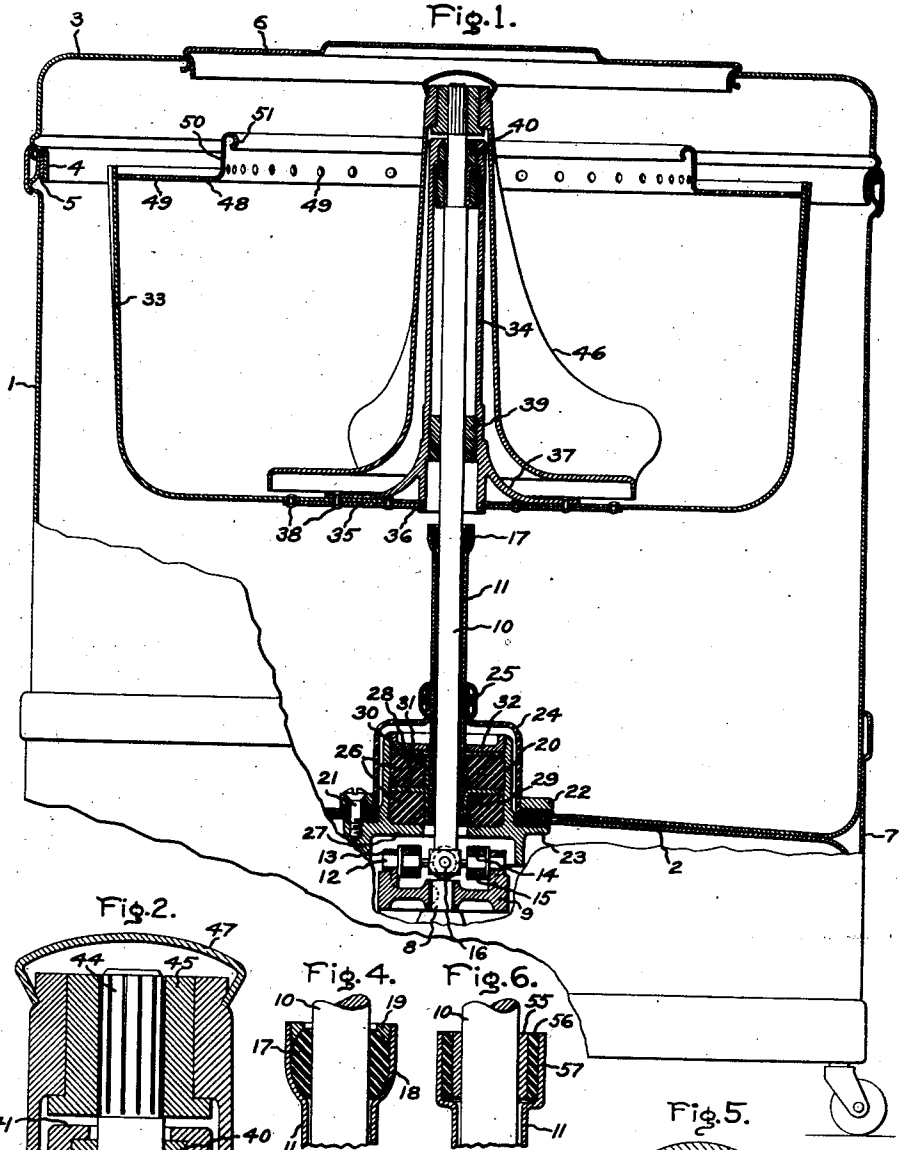


Fig. 2.

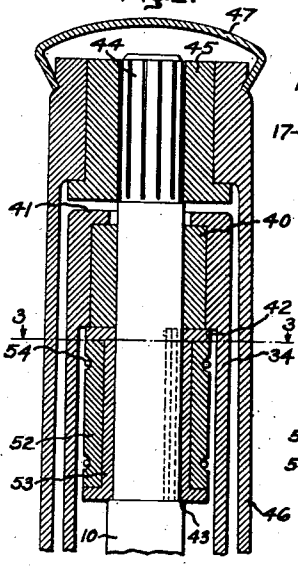


Fig. 4.

Fig. 6.

Fig. 3.

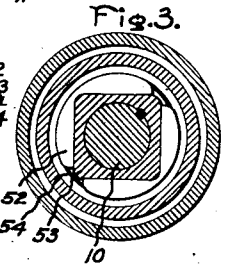
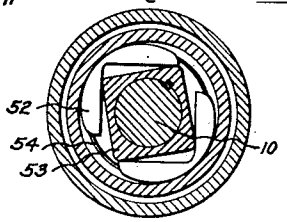


Fig. 5.



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UNITED STATES PATENT OFFICE

2,161,619

WASHING MACHINE

George W. Dunham, Westport, Conn., assignor to General Electric Company, a corporation of New York

Application January 31, 1936, Serial No. 61,635
Renewed January 10, 1939

25 Claims. (Cl. 68—23)

The present invention relates to washing machines of the type having a centrifugal extractor for drying the clothes.

The object of my invention is to provide an improved construction and arrangement in washing machines of this type, 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 view of the driving connections for the agitator and the rotatable receptacle as shown in Fig. 1; Fig. 3 is a sectional view taken on line 3—3 of Fig. 2 showing the clutch between the shaft and the rotatable receptacle in the disengaged position; Fig. 4 is an enlarged fragmentary view of the guide bearing for the vertical shaft; Fig. 5 is a sectional view taken on line 3—3 of Fig. 2 showing the clutch between the shaft and the rotatable receptacle in the engaged or driving position; and Fig. 6 is a modification of the guide bearing construction for the vertical shaft.

Referring to the drawing, the washing machine comprises a stationary tub 1 which is supported on a base 2. The upper end of the tub is partially closed by an annular cover 3 having a flange 4 which fits within the upper edge of the tub. Between the flange 4 and the tube is a suitable gasket 5. A cover 6 rests on the inner edge of the annular cover 3 and completes the closing of the top of the stationary tub. When clothes are to be inserted or removed from the washing machine, only the cover 6 need be removed. The cover 3 is removed when the inside of the stationary tub is to be cleaned. The base 2 is provided with a skirt 7 which extends above the bottom of the stationary tub and covers the abutting edges of the tub and the base.

Within the base 2 is supported a driving mechanism for the washing machine which is adapted to effect selective oscillation or rotation of a vertical shaft 8. Any suitable driving mechanism may be used, for example, the driving mechanism shown in my application S. N. 14,255, filed April 2, 1935. Keyed to the shaft 8 is a brake drum 9 which is connected by means of a suitable universal joint to the lower end of a vertical shaft 10 which extends through a sleeve 11. The universal joint comprises diametrically opposed pins 12 which are fixed in ears 13 on the upper side of the brake drum. The inner ends of the pins 12 are journaled in bearings 14 carried between plates 15 which form the intermediate member of the universal joint. The lower end of the shaft 10 is provided with diametrically opposed pins 16 which are spaced between the pins 12 and are likewise journaled in bearings carried between the plates 15 of the universal joint. With this construction, the vertical shaft 10 may have a gyratory movement with respect to the driving shaft 8. The sleeve 11 extends above the normal water level in the stationary tub 1. The upper end of the sleeve is provided with a spherical seat for a self-lubricating sleeve bearing 17 which guides the vertical shaft 10. This spherical seat, which is more clearly shown in Fig. 4, comprises a flared portion 18 of the sleeve and a collar 19 which is threaded into the upper end of the sleeve. This spherical seat permits alinement of the bearing 17 with the shaft 10 so that the bearing pressure is uniform regardless of the inclination of the shaft.

The housing for the driving mechanism which is supported within the base 2 has a hollow post 20 which extends through central openings in the top wall of the base and the bottom wall of the stationary tub. The post 20 is secured to the bottom wall of the tub and to the base by means of screws 21 which are threaded through a clamping ring 22 into a flange 23 which is integral with the post 20. Suitable gaskets are arranged between the flange 23 and the base and between the base and the bottom wall of the tub. Leakage from the bottom of the tub is prevented by means of a rubber sleeve 24 which has its lower edge clamped between the ring 22 and the bottom of the tub and which has its upper edge clamped to the sleeve 11 above the post 20 by means of a clamp 25. Within the post 20 is a resilient mounting for the lower end of the sleeve 11 which comprises two annuluses 26 of rubber or other resilient material. The lower annulus is arranged between an inwardly extending flange 27 at the lower end of the post and a flange 28 projecting from a sleeve 29 secured to the sleeve 11. The upper annulus is arranged between the upper side of the flange 28 and a washer 30. The inner edge of the upper annulus 26 rests against a sleeve 31 which is fixed to the sleeve 11. The sleeve 31 is of the same dimensions as the sleeve 29 and is used so that the annuluses 26 may be of the same size. The resilience of the mounting is adjusted by means of a nut 32 which is threaded into the upper end of the post 20. This nut varies the compression of the rubber and thereby varies the stiffness of the mounting. With this mounting, the sleeve 11 is resiliently held in a central position and is free to tilt in all directions in order that the shaft 10 which is guided in the sleeve may have a gyratory movement.

In the upper part of the stationary tub is a rotatable tub or receptacle 33 for receiving liquid and material to be washed. The space between the bottom of the receptacle 33 and the bottom of the stationary tub 1 is sufficient to provide a storage space for all the liquid which

can be placed in the receptacle. At the center of the receptacle is a vertical sleeve 34 which serves as the hub for the receptacle. The upper end of the sleeve 34 projects above the water level in the receptacle. The lower end of the sleeve 34 fits into an opening in the bottom wall of the receptacle and an opening in a stiffening disk 35, both of which are held in position between a shoulder and a spun-over portion, as shown at 36. The lower end of the sleeve 34 is provided with a circular flange 37 which extends over the upper side of the bottom wall of the receptacle. The flange 37 and the stiffening disk 35 are secured to the bottom wall of the receptacle by means of rivets 38. The lower end of the sleeve 34 is guided by a self-lubricating bearing 39 which is fixed to the vertical shaft 10. The provision of the bearing 39 is not my invention, but is the invention of H. F. Bariffi, and is claimed in his application, S. N. 61,664, filed Jan. 31, 1936. The upper end of the sleeve 34 is guided on the shaft 10 by a self-lubricating sleeve bearing 40 which is pressed within the upper end of the sleeve against an inwardly extending flange 41 (see Fig. 2) formed thereon. The lower end of the sleeve bearing 40 bears on a hardened steel thrust collar 42 which is keyed to the shaft 10. The thrust collar is supported on the shaft by means of a shoulder 43 on the shaft. The weight of the receptacle and the material contained therein is transmitted to the thrust collar 42 by the bearing 40 and through the shoulder 43 to the shaft 10. From the shaft 10 the weight is transmitted through the universal joint and the shaft 8 to a suitable thrust bearing in the driving mechanism which is contained within the base 2. Obviously the bearings 39 and 40 provide a support for the receptacle which permits the receptacle to turn relative to the shaft through an angle of greater than 360°.

The shaft 10 projects above the sleeve 34 and the projecting end is provided with splines 44 which fit between complementary splines formed in a bushing 45 which is fixed in the upper end of the hub of an agitator 46. Leakage of water through the upper end of the agitator as the water is splashed about is prevented by a cup 47 which is snapped in place over the upper end of the agitator. The splines 44 provide a rigid driving connection for the agitator and at the same time permit the agitator to be easily lifted from the end of the shaft.

During washing, the shaft 10 is oscillated through the driving shaft 8 and thereby causes oscillation of the agitator 46 in the receptacle 33. During this oscillation of the agitator the receptacle remains substantially stationary due to inertia. The clothes are prevented from falling over the upper edge of the receptacle by means of an annular guard ring 48 which is located slightly below the upper edge of the receptacle. During washing, water may be continuously discharged into the top of the receptacle. The excess water will flow through openings 49 in the guard ring over the upper edge of the receptacle, carrying with it the scum which floats on top of the water. The inner edge of the guard ring 48 is provided with a vertical flange 50 having a rounded upper edge 51 which serves as a handle by means of which the receptacle may be lifted from the shaft 10.

During extracting, the driving connection between the shaft 10 and the receptacle 33 is effected by means of a centrifugal clutch which is carried on the thrust collar 42. This clutch comprises two shoes 52 which are held against a squared cam surface 53 of the thrust collar by means of two split rings 54. During washing the agitator 46 is oscillated and the oscillation of the shaft 10 is at a relatively slow speed of the order of magnitude of 60 oscillations per minute, and the split rings 54 are strong enough to hold the shoes 52 against the squared portion 53. For wringing, the shafts 8 and 10 are rotated and as soon as the speed of rotation exceeds a few hundred R. P. M. the clutch shoes 52 move outwardly under the action of centrifugal force and touch the inner surface of the sleeve 34 which forms the hub of the receptacle 33. As soon as the shoes 52 contact the inner surface of the sleeve 34, their rotation is retarded and the squared surface 53 of the collar 42 cooperates with the inner surface of the shoes 52 and wedges the shoes tightly against the inner surface of the sleeve 34 to the position shown in Fig. 5. The pressure between the shoes and the sleeve is proportional to the torque exerted by the shaft 10. This effects a positive driving connection between the shaft 10 and the receptacle which causes the receptacle to be rotated. Similarly, when the speed of the shaft is retarded by the brake, in stopping, the shoes release and immediately wedge in the opposite direction.

In the use of the machine, the receptacle 33 is loaded with clothes and filled with a suitable washing solution. The driving mechanism is then adjusted so that the shaft 10 is oscillated. During this oscillating movement, the receptacle 33 remains substantially stationary due to inertia and the oscillation of the agitator relative to the receptacle causes the clothes to be washed. During the washing operation, the receptacle 33 may be tilted to one side due to the fact that the clothes are not uniformly distributed in the receptacle. This inclination is permitted by the resilient support for the lower end of the sleeve 11 and by the universal joint arranged between the driving shaft 8 and the lower end of the shaft 10. Water is preferably continuously discharged into the top of the receptacle 33 and allowed to flow continuously over the upper edge of the receptacle, thereby floating off the scum which collects on the top of the water. During the washing operation the bearing loss in the bearings 39 and 40 is negligible due to the low speed of oscillation of the shaft 10.

At the conclusion of the washing operation, the driving mechanism is adjusted so that the shaft 8 is rotated continuously in one direction. As soon as the speed of rotation of the shaft 8 exceeds a few hundred R. P. M. the clutch shoes 52 move outwardly under the action of centrifugal force and touch the inner surface of the sleeve 34 which forms the hub of the receptacle 33. As soon as the shoes 52 contact the inner surface of the sleeve 34, their rotation is retarded and the squared surface 53 of the collar 42 co-operates with the inner surface of the shoes 52 and wedges the shoes tightly against the inner surface of the sleeve 34. This effects a positive driving connection between the shaft 10 and the receptacle which causes the receptacle to be rotated.

Since the clothes may be nonuniformly distributed in the receptacle, the receptacle may be unbalanced. This unbalance will usually consist partially of a static unbalance which is equivalent to a single weight displaced from the axis

of rotation of the receptacle and partially of dynamic unbalance which is equivalent to the couple produced by vertically spaced weights of equal size located on opposite sides of and equidistant from the axis of rotation of the receptacle. The static unbalance will tend to cause gyration of the receptacle about its axis so that the receptacle rotates about its center of mass. The dynamic unbalance will tend to cause tilting of the receptacle so as to bring the receptacle into a position in which there is no unbalanced couple. The resilient mounting provided for the lower end of the sleeve 10 permits gyration of the receptacle about its axis so that the receptacle rotates about its center of mass, neutralizing the effect of static unbalance. Since the resilient mounting has some stiffness, the gyration of the receptacle about its axis is not sufficient to permit the receptacle to rotate about its center of mass, but the resilient mounting does permit sufficient gyration of the receptacle so that the vibration due to static unbalance is considerably decreased, since the sleeve bearings 39 and 40 prevent tilting of the receptacle with respect to the shaft 10 and the receptacle will cause vibration due to the dynamic unbalance. This tendency of the receptacle to tilt causes heavy bearing pressure on the bearings 39 and 40, but since there is no relative rotation between the bearing surfaces of these bearings, this pressure causes no bearing loss. Most of the force due to the dynamic unbalance of the receptacle will be transmitted through the universal joint at the lower end of the shaft 10 to the shaft 8. This force is taken by the bearings in which the shaft 8 rotates. Since the bearings for the shaft 8 are a considerable distance from the receptacle 33, the force on the bearings due to the unbalanced couple is less than it would be at a point nearer the receptacle. This means that the bearing loss due to the unbalanced couple is decreased. Also, these bearings are located below the stationary tub 1 and are therefore not subjected to the humid atmosphere within the tub and are more easily lubricated. Some of the force due to the dynamic unbalance or unbalanced couple is transmitted to the sleeve 11. However, since this sleeve is resiliently supported, these vibrations are cushioned. The cushioning action decreases the bearing pressure on the bearing 17 and thereby decreases the bearing loss.

In previous constructions, the receptacle has been supported on a sleeve surrounding the driving shaft by means of a thrust bearing between the receptacle and the upper end of the sleeve and the lower end of the receptacle has been guided on the sleeve by means of a sleeve bearing between the receptacle and the sleeve. With this construction, the thrust bearing has had to be large enough to withstand the bearing loads resulting from high speed rotation of the receptacle and the tendency of the receptacle to tilt due to dynamic unbalance has resulted in heavy bearing pressures between the sleeve bearing between the lower end of the receptacle and the guiding sleeve for the vertical shaft. Due to the heavy pressures, the bearing losses in this bearing have been large and in some cases have amounted to more than one-quarter of the total power required to rotate the receptacle.

In the present construction, during extracting there is no relative rotation between the bearing surfaces of the thrust bearing 40 which supports the receptacle on the shaft or between the bearing surfaces of the sleeve bearing 39 which guides the lower ends of the receptacle on the shaft. There is therefore no bearing loss in these bearings during extracting. Also, due to the resilient support for the sleeve 11 the bearing pressures on the bearing 17 are reduced with the result of decrease in bearing loss.

Since the sleeve 11 is resiliently supported at a point spaced from the universal joint through which the shaft 10 is driven, the gyrating movement of the shaft 10 causes the sleeve bearing 17 to turn in its spherical seat in order to provide uniform bearing pressure. If some means were not provided for permitting the sleeve bearing 17 to align itself with the shaft 10, the gyrating movement of the shaft would cause nonuniform bearing pressures.

At the conclusion of the extracting operation the power supplied to the driving mechanism is cut off and rotation of the receptacle is retarded, for example, by a braking force applied to the brake drum 9. When this braking force is applied, the receptacle 33 tends to rotate faster than the shaft 10. This causes the shoes 52 to be rotated in the opposite direction relative to the squared surface 53 and to be wedged between this surface and the inner surface of the sleeve. The force with which the shoes 52 are wedged against the inner surface of the sleeve 34 is proportional to the torque which is being transmitted through the clutch shoes. When the rotation of the receptacle is completely retarded there is no torque being transmitted through the clutch shoes and the clutch shoes may be easily returned to the neutral position by turning the receptacle or the shaft 10 in the reverse direction.

Fig. 6 shows a modified self-aligning bearing for guiding the vertical shaft 10 in the sleeve 11. In this construction the sleeve bearing 55 is supported by a rubber ring 56 which is supported by a flared portion 57 at the upper end of the sleeve 11. The operation of this bearing is the same as the bearing 17 shown in Fig. 4.

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

1. In a washing machine, a vertical shaft, a receptacle for receiving liquid and material to be washed, means for supporting said receptacle in rotatable relation to said shaft, an agitator in said receptacle, a driving connection between the shaft and the agitator whereby the agitator is oscillated in said receptacle for washing upon oscillation of said shaft, and a clutch between said shaft and said receptacle for rotating said receptacle upon rotation of said shaft, said clutch being responsive to a speed in excess of the speed of the shaft during washing.

2. In a washing machine, a vertical shaft, a receptacle for receiving liquid and material to be washed and having a hub surrounding said shaft, a thrust bearing between said hub and said shaft, an agitator in said receptacle, a driving connection between the shaft and the agitator whereby the agitator is oscillated in said receptacle for washing upon oscillation of said shaft, and means including a clutch between said shaft and said hub for rotating said receptacle upon rotation of said shaft, said clutch being responsive to a speed in excess of the speed of the shaft during washing.

3. In a washing machine, a vertical shaft, a receptacle for receiving liquid and material, a clutch shoe between said shaft and said receptacle arranged to be wedged between said receptacle and said shaft by the driving torque upon

frictional contact with said receptacle, means utilizing the shaft torque for wedging the shoe between the shaft and the receptacle upon frictional contact of the shoe with the receptacle, and means for holding said shoe out of contact with said receptacle until said shaft has attained a predetermined speed.

4. In a washing machine, a vertical shaft, a receptacle for receiving liquid and material, a driving connection between said shaft and said receptacle including a member carried by said shaft, a clutch surface carried by said receptacle and a shoe adapted to be wedged between said member and said surface by the driving torque, means utilizing the shaft torque for wedging the shaft between said surface and said member and means for preventing wedging of said shoe between said surfaces until the shaft has attained a predetermined speed.

5. In a washing machine, a vertical shaft, a receptacle for receiving liquid and material, a clutch surface on said receptacle, a shoe, a cam surface on said shaft adapted to co-operate with said shoe and force said shoe against said clutch surface upon relative rotation between said shaft and said shoe, and speed responsive means for preventing frictional contact between said shoe and said clutch surface until said shaft has attained a predetermined speed.

6. In a washing machine, a vertical shaft, a receptacle for receiving liquid and material having a hub surrounding said shaft, a thrust bearing at the upper end of said hub for supporting the receptacle on said shaft in rotatable relation thereto, an agitator in said receptacle, a driving connection between the shaft and the agitator whereby the agitator is oscillated in said receptacle upon oscillation of said shaft for washing, a clutch shoe carried on said thrust bearing, said bearing having a cam surface adapted to force said shoe against said hub upon relative rotation between said shoe and said bearing, and speed responsive means for holding said shoe out of contact with said hub until said shaft has attained a predetermined speed in excess of the speed of the shaft during washing.

7. In a washing machine, a vertical shaft, a receptacle for receiving liquid and material to be washed, an agitator in said receptacle fixed to said shaft, means for selectively oscillating said shaft for washing and for rotating said shaft, a driving connection between said shaft and said receptacle including a clutch surface carried by said shaft, a clutch surface carried by said receptacle and a shoe adapted to be wedged between said surfaces by the driving torque, means utilizing the shaft torque for wedging the shoe between said surfaces, and means for preventing wedging of said shoe between said surfaces until the shaft has attained a predetermined speed in excess of the speed of the shaft during washing.

8. In a washing machine, a tub, a vertical shaft extending upward from the bottom of the tub, a receptacle in the tub for receiving liquid and material, means for supporting said receptacle on said shaft in rotatable relation thereto, a driving connection between said receptacle and said shaft whereby said receptacle is rotated to extract liquid from the material contained therein upon rotation of the shaft, means including a sleeve surrounding said shaft, a self-aligning bearing between said shaft and said sleeve providing for gyratory movement therebetween, and means for resiliently supporting the sleeve for gyratory movement relative to the tub whereby said bearing supports the shaft for gyratory movement relative to the tub.

9. In a washing machine, a vertical shaft, means for driving said shaft arranged to permit gyratory movement of said shaft, a receptacle for receiving liquid and material, a driving connection between said receptacle and said shaft whereby said receptacle is rotated to extract liquid from the material contained therein upon rotation of said shaft, means including a sleeve surrounding said shaft for resiliently supporting said shaft for gyratory movement, the axis of gyration of said sleeve being spaced from the axis of gyration of said shaft, and a self-aligning bearing between said shaft and said sleeve.

10. In a washing machine, a receptacle for receiving liquid and material to be washed, a vertical shaft, an agitator in said receptacle connected to said shaft, means for supporting said receptacle in rotatable relation to said shaft for rotation through an angle of greater than 360°, means for oscillating said shaft for washing, means for rotating said shaft at a relatively high speed, and a speed responsive clutch between said shaft and said receptacle conditioned for rotating said receptacle during the rotation of the shaft, said clutch being ineffective to move the receptacle during the oscillation of the shaft during washing.

11. In a washing machine, a receptacle for receiving liquid and material to be washed, a vertical shaft, an agitator in said receptacle connected to said shaft, means for supporting said receptacle in rotatable relation to said shaft for rotation through an angle of greater than 360°, means for oscillating said shaft for washing, means for rotating said shaft at a relatively high speed, and means operative during the rotation of the shaft to rotate the receptacle, said means being ineffective to move the receptacle during the the oscillation of the shaft during washing.

12. In a washing machine, a vertical shaft, a receptacle for receiving liquid and material, a clutch surface carried by said receptacle, a cam surface on said shaft, and a shoe between said surfaces and arranged to be wedged against said clutch surface by said cam surface upon rotation of the shaft.

13. In a washing machine, a vertical shaft, a receptacle for receiving liquid and material, a clutch surface carried by said receptacle, a cam surface on said shaft, a plurality of shoes between said surfaces and arranged to be wedged against said clutch surface by said cam surface upon rotation of the shaft, and annular resilient means around said shoes for holding said shoes against said cam surface until the shaft has attained a predetermined speed.

14. In a washing machine, a vertical shaft, a receptacle for receiving liquid and material, a clutch surface carried by said receptacle, a squared surface on said shaft, clutch shoes fitting against opposite corners of said squared surface, said shoes being adapted to be wedged against said clutch surface by said squared surface upon rotation of the shaft, and annular resilient means around said shoes for holding said shoes against said squared surface until the shaft has attained a predetermined speed.

15. In a washing machine, a shaft, a receptacle for receiving a liquid and material to be washed, means for supporting the receptacle in rotatable relation to the shaft, a washing element in the receptacle, a driving connection between the washing element and the shaft where-

by the washing element may be operated by the shaft for washing, and a clutch between the shaft and the receptacle responsive to a speed in excess of the shaft speed during washing for rotating the receptacle upon rotation of the shaft for extracting.

16. In a washing machine, a vertical shaft, a receptacle for receiving material to be washed, a washing element in the receptacle operable by rotation of the shaft relative to the receptacle, and a clutch between the shaft and the receptacle responsive to a speed in excess of the shaft speed during washing for rotating the receptacle on high speed rotation of the shaft.

17. In a washing machine, a vertical shaft, a receptacle for receiving material to be washed, a washing element in the receptacle operable by rotation of the shaft relative to the receptacle, and a clutch between the shaft and the receptacle for rotating the receptacle to extract liquid from the material contained therein, said clutch comprising clutch surfaces on the shaft and receptacle and a clutch shoe therebetween, said surfaces and shoe cooperating to wedge the shoe therebetween in response to relative rotation of the shaft and receptacle in either direction, and means for preventing said wedging of the shoe during washing.

18. In a washing machine, a vertical shaft, a receptacle for receiving material to be washed, a clutch shoe between the shaft and the receptacle, means responsive to torque tending to produce relative rotation of the receptacle and shaft in either direction for wedging the shoe therebetween upon frictional contact of the shoe with the receptacle, and means for holding the shoe out of contact with the receptacle.

19. In a washing machine, a vertical shaft, a receptacle for receiving material to be washed having a hub surrounding the shaft, a thrust bearing for supporting the receptacle on the shaft in rotatable relation thereto, a washing element in the receptacle operable by rotation of the shaft relative to the receptacle for washing, a clutch between the shaft and the receptacle comprising clutch surfaces on the shaft and receptacle and a clutch shoe therebetween, means responsive to torque tending to produce relative rotation between the clutch surfaces in either direction for wedging the shoe therebetween upon frictional contact of the shoe with the clutch surfaces carried by the receptacle, and means for holding the shoe out of contact with the clutch surface carried by the receptacle during washing.

20. In a washing machine, a tub, a vertical shaft extending upward from the bottom of the tub, a receptacle in the tub for receiving material to be washed, means for supporting the receptacle in rotatable relation to the shaft, a driving connection between the shaft and the receptacle whereby the receptacle is rotated to extract liquid from the material contained therein, a driving shaft at the lower end of the vertical shaft, a universal joint connecting the shafts, a sleeve surrounding the vertical shaft, a self-aligning bearing between the vertical shaft and sleeve providing for gyratory movement therebetween, and means for resiliently supporting the sleeve for gyratory movement relative to the tub whereby said bearing supports the shaft for gyratory movement relative to the tub.

21. In a washing machine, a vertical shaft, a receptacle for receiving material, a clutch surface carried by the receptacle, a cam surface on the shaft, and a shoe between said surfaces and arranged to be forced outward into engagement with the clutch surface and wedged between the surfaces by relative rotation of the receptacle and shaft in either direction.

22. In a washing machine, a receptacle for receiving material, a vertical shaft, means supporting the receptacle in rotatable relation to the shaft, provisions whereby the receptacle is rotated by the shaft to extract liquid from the material contained therein, brake means for retarding the rotation of the shaft, and a torque responsive clutch between the shaft and receptacle operable to connect the shaft and receptacle in a direction to retard the rotation of the receptacle.

23. In a washing machine, a vertical drive shaft, a vertical driven shaft, a universal connection therebetween, means for supporting the driven shaft for gyratory movement relative to the drive shaft, a receptacle for receiving material to be washed supported in rotatable relation to the driven shaft, a washing element in the receptacle connected to the driven shaft and operable by rotation relative to the receptacle, a clutch between the driven shaft and the receptacle for rotating the receptacle to extract liquid from the material contained therein, said clutch comprising clutch surfaces on the shaft and receptacle and a clutch shoe therebetween, said surfaces and shoe cooperating to wedge the shoe in response to the torque transmitted therebetween upon relative rotation of the shaft and receptacle in either direction, and brake means on said drive shaft for retarding the rotation of the receptacle.

24. In a washing machine, a vertical drive shaft, a vertical driven shaft, a universal connection therebetween, means for supporting the driven shaft for gyratory movement relative to the drive shaft, a receptacle for receiving material to be washed supported in rotatable relation to the driven shaft, a washing element in the receptacle connected to the driven shaft and operable by rotation relative to the receptacle for washing, a clutch between the driven shaft and the receptacle comprising clutch surfaces, a shoe therebetween, and provisions utilizing the shaft torque for wedging the shoe between the clutch surfaces, means for preventing wedging of the clutch shoe during washing, and brake means on said drive shaft for retarding the rotation of the receptacle.

25. In a combined washing and drying machine, a tub, a shaft extending within the tub, a receptacle in the tub surrounding the shaft for receiving material to be washed, a washing element in the receptacle, driving connections between one end of the shaft and the receptacle and washing element whereby the shaft selectively operates the washing element for washing and rotates the receptacle for extracting, a driving shaft at the other end of the first shaft, a universal joint connecting the shafts, a sleeve surrounding the first shaft, a self-aligning bearing between the first shaft and sleeve providing for gyratory movement therebetween, and means for resiliently supporting the sleeve for gyratory movement relative to the tub about an axis above the universal joint whereby said bearing supports the first shaft for gyratory movement relative to the tub.

GEORGE W. DUNHAM.

CERTIFICATE OF CORRECTION.

Patent No. 2,161,619. June 6, 1939.

GEORGE W. DUNHAM.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 31, for the word "tube" read tub; page 4, first column, line 16, claim 4, for "shaft" read shoe; same page, second column, line 41, claim 11, for "the the" read the; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of July, A. D. 1939.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)