

July 14, 1953

G. C. FIELDS

2,645,111

WOBBLE PLATE LAUNDRY MACHINE

Filed Nov. 5, 1947

3 Sheets-Sheet 1

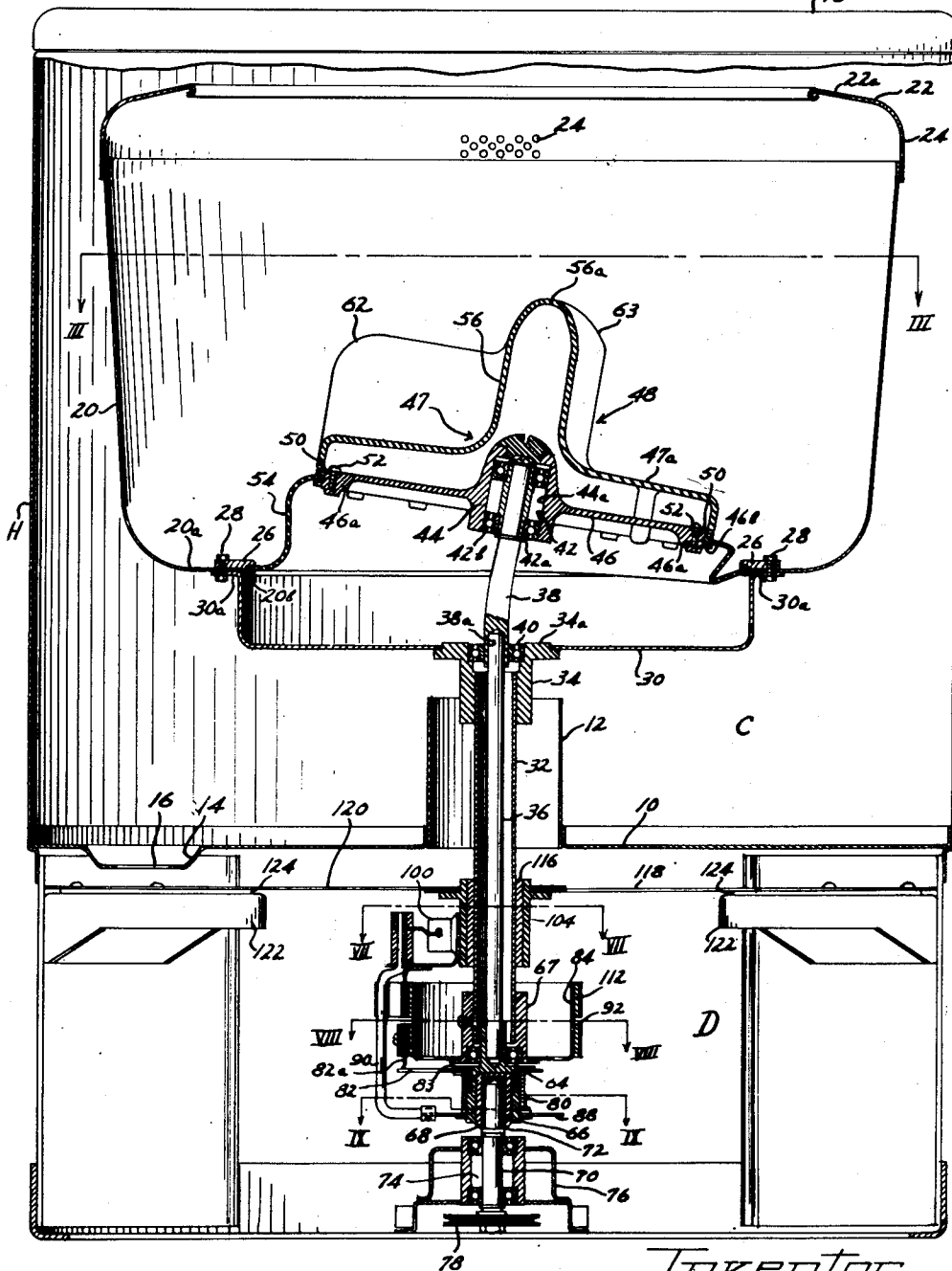


Fig. 1

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The Sign of Charles H. Hill

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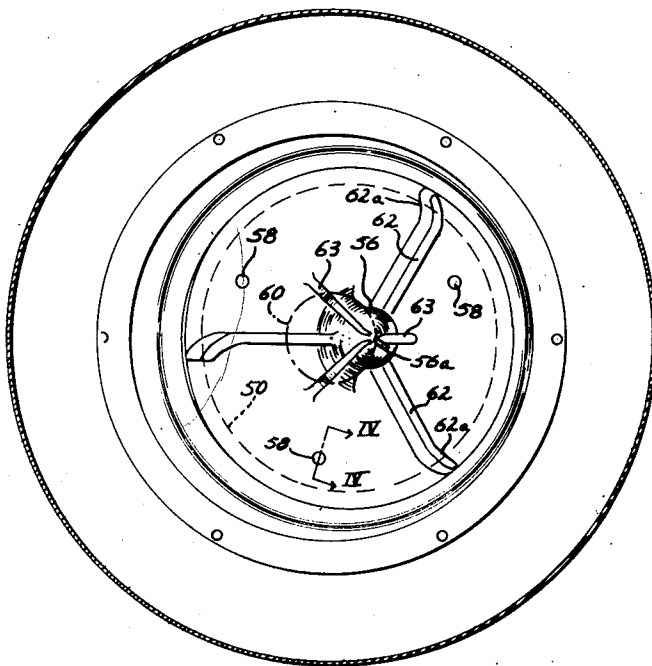
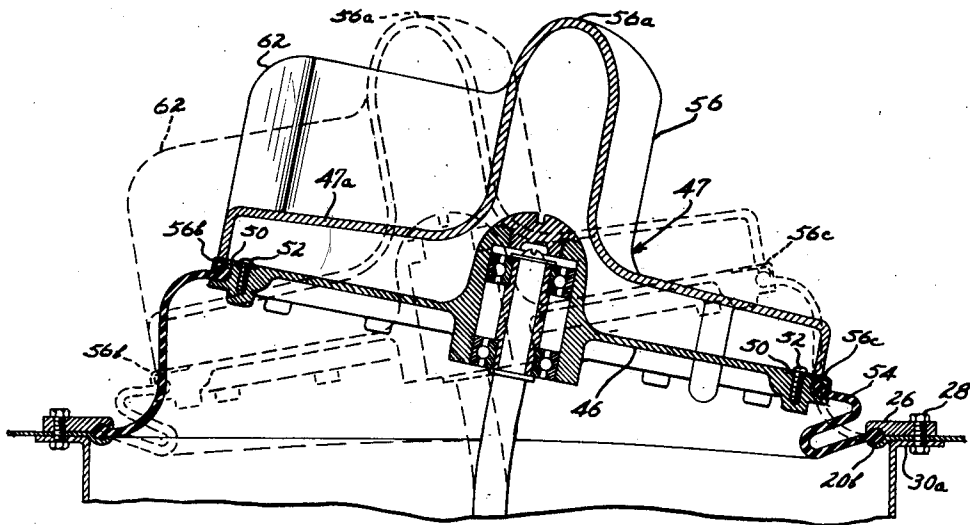
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WOBBLE PLATE LAUNDRY MACHINE

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3 Sheets-Sheet 2



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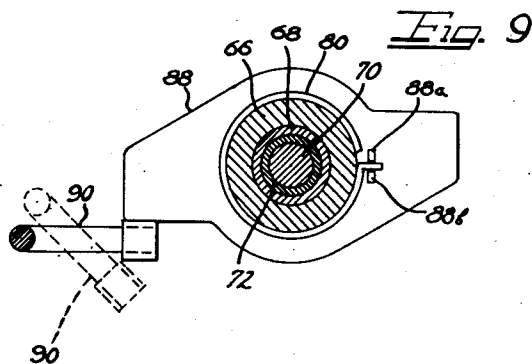
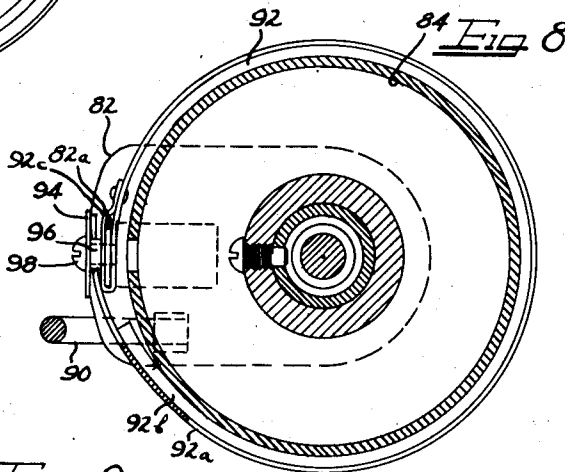
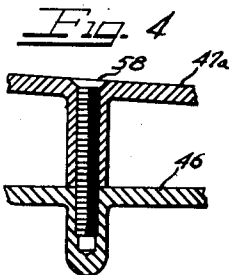
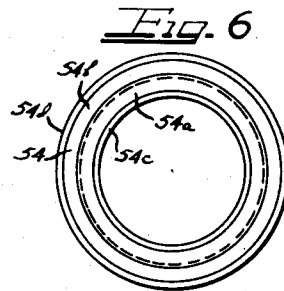
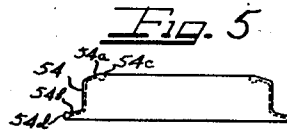
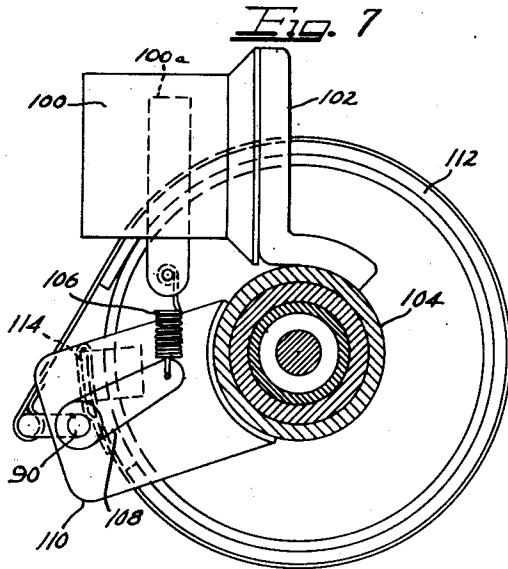
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WOBBLE PLATE LAUNDRY MACHINE

Filed Nov. 5, 1947

3 Sheets-Sheet 3



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2,645,111

WOBBLE PLATE LAUNDRY MACHINE

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Application November 5, 1947, Serial No. 784,135

5 Claims. (Cl. 68—23)

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My invention relates to a laundering machine having a wobble plate mechanism to agitate clothes or the like in laundering movements.

In one type of washing machine, tumbling movements are imparted to the clothes by means of an agitator positioned in a tub containing water or other washing fluid. These movements are made irregular in order that water shall not partake of the motion of the clothes but instead splashes thereagainst to achieve the contact necessary for effective washing. In accordance with the present invention, the clothes contained in a tub are caused to execute laundering movements by means of an agitator mounted for tilting or wobbling movements in the bottom of the tub. The edge of the agitator is held in fluid-tight relationship with the tub by a boot of water-tight flexible material held in fluid-tight engagement with the agitator and the tub. The agitator is mounted on a bent shaft extending upwardly through the bottom of the tub and is sustained thereon by suitable bearings. As the shaft is rotated the agitator is tilted in accordance with the successive positions assumed by the shaft, thereby executing rotational tilting or wobbling movements to accomplish an effective washing contact between the clothes and the water.

The wobble plate washer of the present invention has the advantages over the oscillating agitator mechanism heretofore considered necessary in that no gear drive is required to impart reciprocating movements to the agitator and, moreover, the load on the drive unit is relatively constant rather than cyclically varying.

It is accordingly a general object of the present invention to provide an improved laundering machine having a wobble plate agitator.

Another object of the present invention is to provide an improved laundering machine wherein clothes are caused to execute effective washing movements without the interposition of oscillating parts.

Still another object of the present invention is to provide an improved laundering machine wherein clothes are caused to execute effective clothes washing movements but in which the mechanical load on the drive system is constant.

It is yet another object of the present invention to provide an improved laundering machine having a wobble plate agitator and which is particularly adapted for use as an automatic laundering machine.

Another object of the present invention is to provide an improved laundering machine having a tapered tub and wobble plate agitator coop-

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eratively related to execute clothes washing or clothes drying movements as desired.

Still another object of the present invention is to provide an improved agitator for use in washing machines wherein wobbling movements are imparted to the agitator.

Yet another object of the present invention is to provide an improved assembly for the agitator portion of a washing machine.

The novel features of my invention are pointed out with particularity in the appended claims. My invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is an axial cross-sectional view of a laundering machine incorporating the features of the present invention;

Figure 2 is an enlarged fragmentary cross-sectional view of the agitator portion of the machine of Figure 1 and showing by dotted lines the position of the agitator one-half cycle after it assumes the position of the solid lines;

Figure 3 is a cross-sectional view through the axis III—III, Figure 1, and showing the agitator in top plan view;

Figure 4 is a cross-sectional view through the axis IV—IV, Figure 3, showing how the agitator is held together;

Figures 5 and 6 are side elevation and top plan views respectively of the boot used in the mechanism of the present invention; and

Figures 7, 8 and 9 are cross-sectional views of the drive clutch mechanism of Figure 1 taken through axes VII—VII, VIII—VIII and IX—IX, Figure 1.

As shown on the drawings:

Referring now to Figure 1, there is shown a laundering machine including a housing H which defines an upper or clothes laundering chamber C and a lower chamber D. The latter chamber contains the drive elements for the mechanism. A horizontally disposed wall separating these two chambers is formed by the wall plate 10 which is open at its center to receive the vertically directed tube 12. The plate 10 is provided with a depression 14 having an opening 16 which is connected to a drain pipe (not shown) to drain water from the chamber C and prevent its accumulation above the top of the tube 12.

The top of the housing H is enclosed by a suitable horizontal top wall indicated at 18 and which has a centrally disposed opening to receive a mov-

able cover (not shown) to add or remove clothing from the chamber C. A clothes tub 20 is disposed within the chamber C with its axis vertically directed in alignment with the opening in the wall 18 to receive the clothing passed therethrough. As indicated in Figure 1, this tub is of cylindrical shape with inclined walls which expand to increased cross-sectional area at the upper portions thereof to define a tapered tub. An inwardly extending cap 22 is shaped to fit snugly over the tub 20 and is attached thereto by spot welding or other suitable means. This cap is provided with a plurality of horizontally directed holes 24 about its portion of greatest radius and in its top portion 22a extends radially inwardly to form a somewhat horizontal inwardly extending cap to prevent accidental loss of clothing over the top edge of the tapered tub 20.

At its lower portion, the tapered tub 20 is provided with an inwardly extending flange or bottom 20a which has a circular centrally disposed opening. A ring 26 is attached to the periphery of the edge of this opening by a plurality of mounting bolts 28. These bolts further sustain the outwardly extending flange 30a of the cup shaped member 30 which is mounted on the shaft 32 by the collar 34. The inner periphery of the bottom portion of the member 30 is attached to the flange 34a of the collar 34 by welding or other suitable means.

The inner or agitator shaft 36 extends upwardly through the outer tub shaft 32 and at its upper end is in a snug fit with the open end 33a of the bent shaft 38, the shaft 38 being supported from collar 34 by the ball bearing indicated at 40.

At its upper end the bent shaft 38 sustains the inner race 42a of the ball bearing 42. The outer race 42b of this bearing is seated in a cylindrical opening 44a in the inner flanged portion 44 of the bottom plate 46 of the agitator or wobble plate 48. The bottom plate 46 is of circular shape and has a thickened flange or ring 46a about its outer periphery. This ring is shaped to form an annular seat 46b facing upwardly and which cooperates with the ring 50 to define a somewhat toroidal groove extending about the outer periphery of the plate 46. The ring 50 is held in place by the screws 52, disposed at intervals about the periphery of plate 46. The shape of the ring 50, together with the positioning thereof relative to the agitator 48 is best seen in the enlarged view of Figure 2, taken in connection with dotted lines of Figure 3.

The agitator 48 is composed of a lower disk 46 to which is attached the upper assembly 47. The latter assembly is molded of plastic or the like and defines a lower disk portion 47a, Figure 1, disposed above and parallel to the disk 46, together with a central dome 56. In addition, six upstanding ribs are formed about the dome 56, the three ribs indicated at 62 being relatively wide and the three ribs indicated at 63 being relatively high. The ribs are spaced at angles of 60° about the dome 56, the wide ribs being interposed between the high ribs, as shown in the top plan view of Figure 3. The agitator ribs 62 each have a wing portion 62a bent in a common angular direction relative to the axis of dome 56.

The bottom plate 46 of the agitator 48 receives the upper inwardly extending peripheral portion of the boot 54 in fluid-tight engagement. The outer peripheral portion of this boot is held in fluid-tight engagement about the upper portion of the cup 30 by the ring 26 which cooperates with the lip formed by the inner periphery 20b of the bottom 20a of the tub 20. This lip and the ring

26 define a somewhat toroidal cavity which is of shape to receive this portion of the boot 54.

The assembly 47 of agitator 48 rests on the top of the lower or bottom plate 46 and is held in place thereon by three bolts 58 which extend through suitable tubes formed in the portion 56 of the agitator 48 and are in threaded engagement with the bottom plate 46. This structure is best seen in the view of Figure 4 which is an enlarged cross-sectional view along the axis of one of these bolts.

The construction of the boot 54 is best seen in the views of Figures 5 and 6 which are side elevational and top plan views respectively of this boot. As indicated, the boot naturally assumes a cylindrical shape with an inwardly extending upper flange or ring 54a and an outwardly extending lower flange or ring 54b. Each of these terminates in a band of increased thickness, ring 54a terminating in band 54c, and ring 54b terminating in band 54d.

The boot 54 is made of rubber or other flexible watertight material capable of flexing to accommodate the motions of the agitator 48 while maintaining the watertight integrity of the seal between the tub 20 and the cap 20. During rotations of the shaft 36, the edges of the boot 54 flex as indicated in the views of Figure 2 but since this flexure is distributed over a relatively long length of boot material, the wear thereon is not excessive.

Operation

In operation of the mechanism of the present invention, clothes are placed in the tub 20 by removing the cover from the top 18 of the housing H and passing them downwardly therethrough. The tub 20 is then filled with washing water to a level above the level of the clothes. The shaft 32 is then held against rotation by mechanism provided for the purpose, such as that described hereafter, and the shaft 36 is rotated.

Rotation of the shaft 36 causes the bent portion 38 to rotate and the agitator 48 to tilt or wobble in different directions as that shaft rotates within bearing 42. As previously described, the axis of the agitator 48 corresponds with the axis of the tip of shaft 38, thus causing the axis of agitator 48 to describe a conical locus when shaft 36 rotates. The agitator 48 is held against rotation by the boot 54, together with the resistance of the water and clothes in the tub to such rotation.

The tilt imparted to the agitator 48 as the shaft 36 rotates consists of a constant amount as measured from the axis of shaft 36, this amount determined by the bend of shaft 38. Rotation of shaft 36 orients this tilt in different directions relative to the housing H and the tub 20. The tip 56a of the agitator 48 thus describes the circular path of movement indicated at 60, Figure 3, while each peripheral edge portion describes nearly vertical up and down movements.

The movement of the agitator 48 will be further evident from examination of the view of Figure 2, which shows in solid lines the position of the agitator at one instant of time and in dotted lines the position of the agitator after the shaft 36 has described 180° rotation. From this view it will be evident that the tip 56a of the agitator has shifted horizontally to the left during the time this rotation of the shaft 36 has taken place and that the edge portions 56b and 56c of the agitator have described more nearly vertical up and down motions. Intermediate portions of the agitator, such as the upstanding

flanges 62, execute combined horizontal and vertical movements.

The foregoing movements of the agitator 48 impart irregular wobbling motions to the clothes and the water contained in the tub 20 during the clothes laundering operations. These motions cause a complete mixing or tumbling of the clothes and the water and result in a good laundering action.

Upon completion of the washing operation, the shafts 36 and 32 are simultaneously rotated, thus imparting rotation to tapered tub 20 and the agitator 48. This rotation creates centrifugal forces on the water contained in the tapered tub 20, causing the surface thereof to assume a parabolic surface configuration. As the speed of rotation increases, the water is driven through the openings by centrifugal force, and falls into the upper chamber C of the housing H. The water then passes out through drain opening 16.

Drive mechanism

The drive mechanism for shafts 36 and 38 forms no part of the present invention and is disclosed and claimed in the patent application of David A. Johnson, Serial No. 784,109, filed November 5, 1947, issued May 29, 1951 as Patent No. 2,554,573, entitled "Clutch and Brake Mechanism" and assigned to the same assignee as the present invention.

As shown in Figure 1, the shaft 36 is supported relative to shaft 32 by the upper bearing 40 located in the collar 34 and by a lower bearing 64 which has its outer race supported from the collar 67 and its inner race supported on the collar 66. The collar 66 is provided with a downwardly facing cylindrical opening which receives the insert 68. The insert 68 receives a further insert 72 which in turn rides on the upper end of the shaft 70.

The shaft 70 rides on the inner races of bearing 74, the outer races of which are supported from the cap 76. A pulley 78 is mounted at the lower end of the shaft 70 for engagement with a suitable belt to drive the shaft 70 and the remaining portions of the mechanical system.

The drive mechanism for selectively driving agitator 48 in clothes laundering movements and driving the tub 20 in clothes drying movements can best be understood by reference to Figure 1 taken in view of the cross-sectional views of Figures 7, 8 and 9. As will be evident from these views, the shaft 70 is connected through the inserts 72 and 68 to the collar 66 which drives the inner shaft 36. In addition, however, the shaft 70 is connected to drive the shaft 32 through the locking spring 80, the plate 82, the clutch and brake drum 84, and the collar 67.

The sleeve 83, Figure 1, has a downwardly extending sleeve portion which encircles the collar 66 and is separated therefrom by a bearing sleeve to permit free relative movement between collar 66 and sleeve 83. This sleeve portion of sleeve 83 is of the same outer diameter as the lower portion of the collar 66 and is in abutting relationship with that portion of the collar. Moreover, sleeve 83 has a radially extending flange portion at its upper end which engages the disk 82 and is held against rotation relative thereto by welding or other suitable attachment. The spring 80 is wrapped around the sleeve portion of sleeve 83 and extends downwardly in contact with the lower portion of collar 66 as is seen in Figure 9. As further shown in that figure, the bottom of the spring 80 is held in engagement with the up-

standing members 88a and 88b of the catch plate 88. The latter plate is shaped to engage the arm 90 when positioned as shown in the solid lines of Figure 9, thereby holding the end of spring 80 against rotation. When the arm 90 is shifted to the position shown in the dotted lines of Figure 9, the catch plate 88 swings free of that arm and is free to rotate, thereby permitting the spring 80 to assume its normal wound and tightened condition.

The spring 80 is of a type shaping itself in the unstressed condition to a diameter less than that of the collar 66 and the sleeve portion of sleeve 83. Thus when this spring is unwound, placed about these members, and then released it winds up to achieve a tight frictional gripping engagement with each and thus causes the plate 82 to be driven from the collar 66. However, when the arm 90 is swung to the position indicated by the solid lines of Figure 9, the bottom portion of the spring is held against rotation while the upper portion tends to rotate by reason of the frictional engagements with the collar 66. This unwinds the spring and causes these engagements to release to the point wherein only a relatively small force tends to rotate the arm 90 and there is no tendency to rotate the disk 82. Thus as the arm 90 is shifted, the disk 82 is either driven or released.

It is the function of the clutch member 92 which rides on brake and clutch drum 84 to engage and provide a slip drive for the shaft 32 when the plate 82 rotates in the direction corresponding to the rotation of shaft 70. The operation of this mechanism is best shown in Figure 8. As indicated in this figure, the clutch member 92 comprises an outer band 92a of steel or the like and which encircles the drum 84 and a friction member or shoe 92b mounted on the inside of this band. End 92c of the band 92a is wrapped about upwardly extending arm 82a which is attached to the disk 82 whereas the other end is of bifurcated shape to be received between the washer 94 and the opposite end 92c of the band 92a. The washer 94 is held in spaced relation with the end 92c of the band 92a by collar 96. The entire assembly is held on the arm 82a of plate 82 by screw 98.

From the foregoing it will be seen that when the arm 82a is rotated as a result of the engagement of the spring 80, the clutch member 92 wraps around the drum 84 and grips that drum with a frictional engagement. To accomplish this result it is of course necessary that rotation of the arm 82a be in the counter-clockwise direction relative to the drum 84 as seen in Figure 8.

The slipping frictional engagement between the band 92 and the drum 84 permits the tub 20 to be accelerated without overloading the drive mechanism. This feature is described and claimed in the copending application of Eduard P. Geldhof entitled "Laundering Machine," Serial No. 787,060, filed November 20, 1947, issued September 16, 1952 as Patent No. 2,610,493, assigned to the same assignee as the present invention.

Selective movement of the arm 90 to engage or disengage the driving engagement for the rotation of shaft 32 is achieved by the solenoid 100 which is best seen in the view of Figure 7. This solenoid is supported on post 102 which is welded or otherwise attached to the collar 104 and contains a plunger 100a which is attached through the spring 106 to the crank arm 108. This crank

arm is attached to the arm 90 to rotate the latter in accordance with the movements of the plunger 100a. The arm 90 is supported for rotation by the plate 110 which is suitably attached to the stationary collar 104.

It will thus be evident that energization of the solenoid 100 controls rotation of the shaft 32, that shaft being rotated when the solenoid is de-energized.

It is the function of the brake band 112 to engage the brake drum 84 to oppose rotations of the tub 20 when the shaft 32 is not being rotated. To this end the band 112 is attached at one end to the post 114 which extends downwardly from the plate 110 and at the other end to the arm 90 which acts as a crank to tighten or loosen this band and thus brake the drum 84 to prevent rotation of the basket 20.

Further support for the shaft 32 is provided by the collar 104 which receives the sleeve bearing 116 upon which shaft 332 rides. This collar is supported by two crossed plates 118 and 120 which extend to opposite corners of the housing H and are held in frictional engagements therewith by the bracket 122. These engagements may be provided, for example, by friction shoes 124 which are inserted between the plates 118 and 120 and the brackets 122, the entire assembly being forced together by suitable tightening screws with interposed springs (not shown).

The frictional engagements supporting the plates 118 and 120 act as damping or snubbing devices to dampen any vibrating imparted to the shafts 32 and 36. Moreover, the insert 68 between shaft 70 and collar 66 is made of flexible material, such as rubber, and acts to absorb this vibration to isolate pulley 78 and the remainder of the drive mechanism therefrom.

While I have shown a particular embodiment of my invention, it will, of course, be understood that I do not wish to be limited thereto since many modifications both in the elements employed and their cooperative structure may be made without departing from the spirit and scope of my invention. I, of course, contemplate by the appended claims to cover all such modifications as fall within the true spirit and scope of my invention.

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

1. In a laundry machine, a tub to contain clothes having an open bottom, an agitator mounted within said tub, a flexible boot secured adjacent the periphery of the open portion of the bottom of said tub at one of its ends, and to said agitator adjacent its opposite end, and with said agitator closing the bottom of said tub, and restraining said agitator from rotatable movement, and means for moving said agitator in a back and forth direction within said tub and orbitally moving the upper end thereof against the boot including a shaft journaled for rotation about a fixed vertical axis, means for continuously driving said shaft in one direction during the washing operation, said shaft having an orbitally movable upper end portion extending within said tub and inclined with respect to the axis of rotation of said shaft, and bearing means on the orbitally moving inclined upper end portion of said shaft journalling said agitator on said orbitally moving upper end portion of said shaft.

2. In a laundry machine, a tub to contain clothes having an open bottom, an agitator within said tub, a flexible boot secured at one of its

ends to said agitator and at its opposite end to the bottom of said tub adjacent the boundaries of the open portion thereof and with said agitator closing the bottom of said tub and restraining said agitator from rotatable movement, said agitator having a relatively wide base having said boot secured thereto in fluid tight relationship and having an upright central portion with radially spaced blades extending therefrom, and means for horizontally and vertically moving said agitator back and forth within said tub and orbitally moving the upper end thereof against said boot including a vertical shaft, means for continuously driving said shaft in one direction during the washing operation, said shaft having an orbitally travelling upper end portion extending within said tub and inclined with respect to the axis of rotation of said shaft, and bearing means journalling said agitator at its center on the orbitally movable upper end portion of said shaft.

3. A laundering machine including in combination, a tub to contain clothes or the like to be laundered, said tub having an opening in the bottom thereof, a rotatably journaled shaft extending upwardly through said opening within said tube and having an orbitally traveling upper end portion within said tub, a bearing on the upper end portion of said shaft, an agitator mounted on said bearing, a flexible boot attached to said agitator and to said tub to form a water tight seal therebetween and to restrain said agitator from rotatable movement, and means for rotatably driving said shaft to impart wobbling clothes laundering movements to said agitator.

4. A laundering machine including in combination, a tub to contain clothes or the like to be laundered, said tub having an opening in the bottom thereof, a rotatably journaled shaft extending upwardly through said opening and having an orbitally traveling upper end portion extending within said tub, an agitator on the orbitally traveling upper end portion of said shaft, said agitator having a lower disk portion, a central dome portion, and a plurality of upstanding ribs, a bearing interposed between said shaft and said agitator journalling said agitator on the orbitally moving upper end portion of said shaft, a flexible boot extending from said disk portion of said agitator to said basket to form a watertight seal therebetween and to restrain said agitator from rotational movement, and means for rotatably driving said shaft to impart wobbling clothes washing movements to said agitator.

5. A washer comprising: a supporting means, a basket mounted on said supporting means, a shaft mounted concentrically with said basket and with one end thereof extending into said basket, said end being provided with an inclined bearing, an agitator journaled on said bearing within said basket, said agitator being fastened and sealed to said basket by a deformable ring whereby said agitator is free to wobble relative to said basket, and means for rotating said shaft relative to said agitator.

GEORGE C. FIELDS.

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