

March 11, 1941.

C. R. VICK

2,234,836

WASHING MACHINE

Filed Sept. 28, 1936

3 Sheets-Sheet 1

Fig. 1.

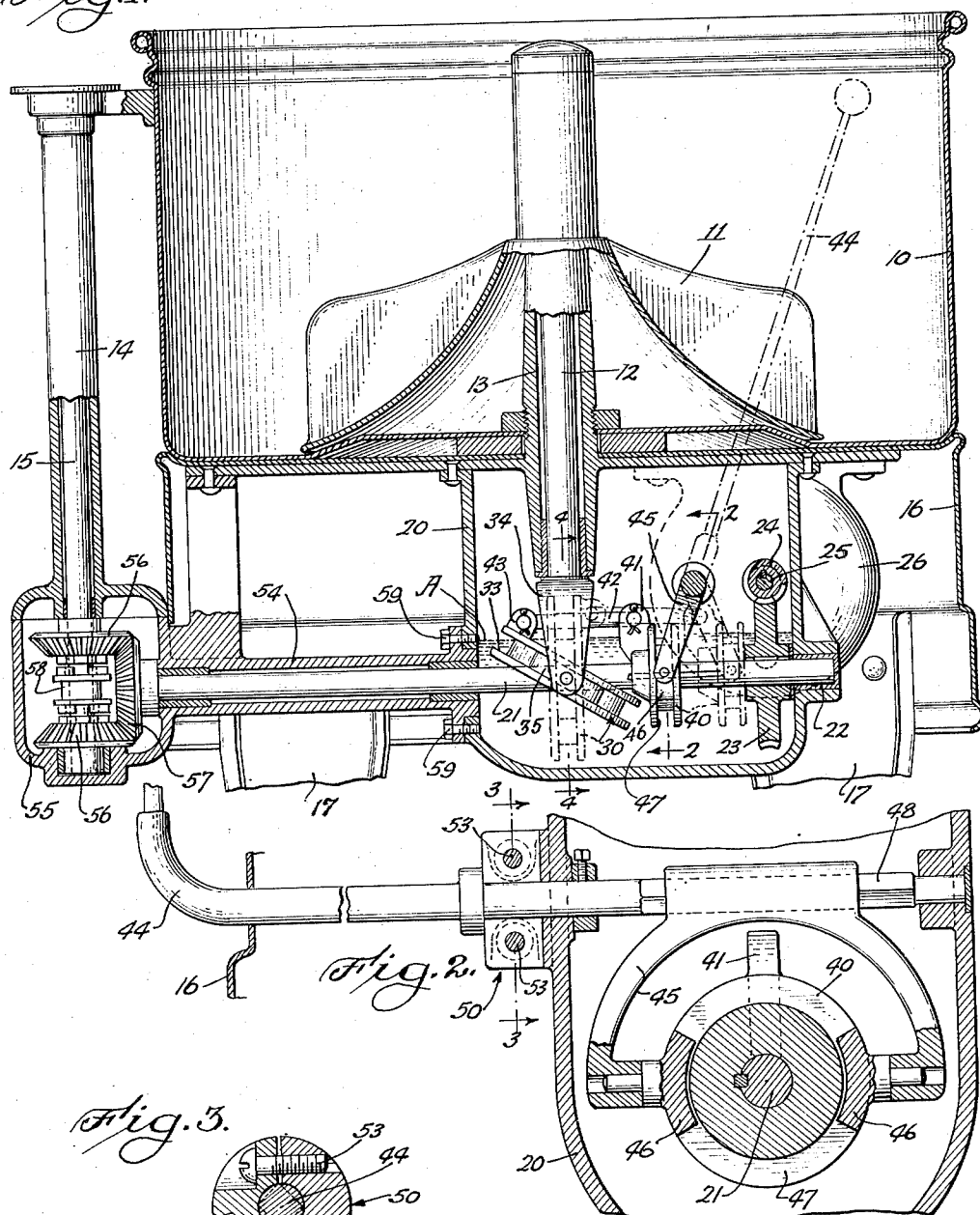


Fig. 2.

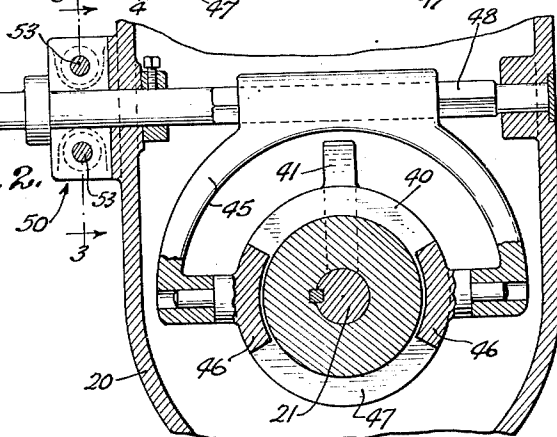
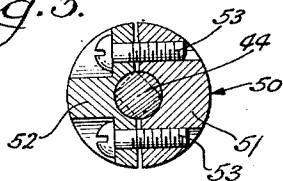


Fig. 3.



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March 11, 1941.

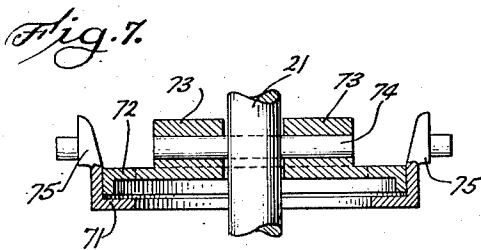
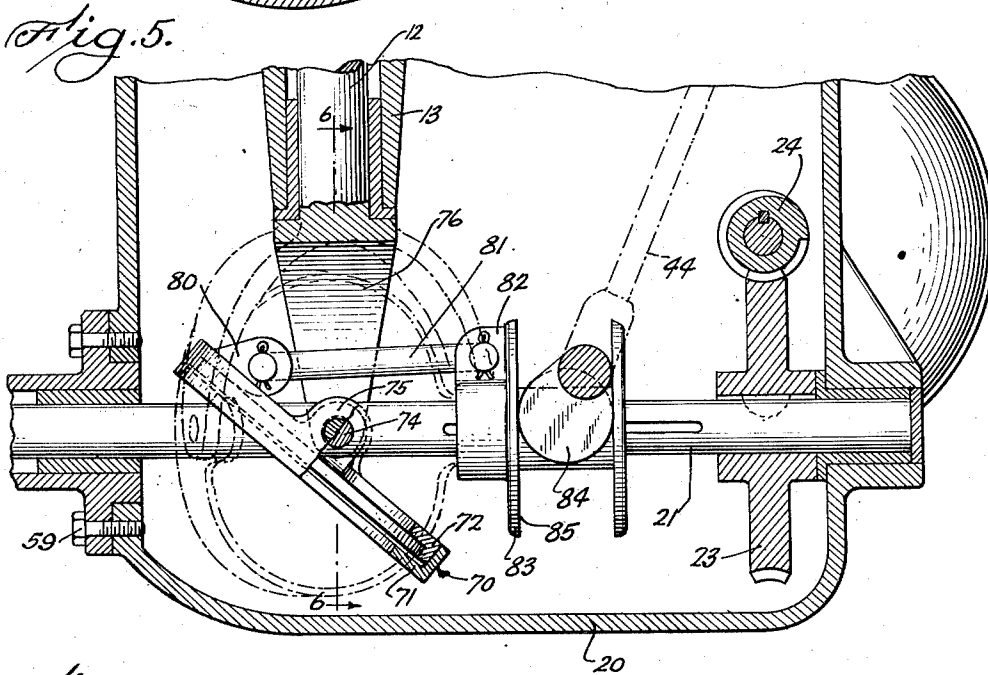
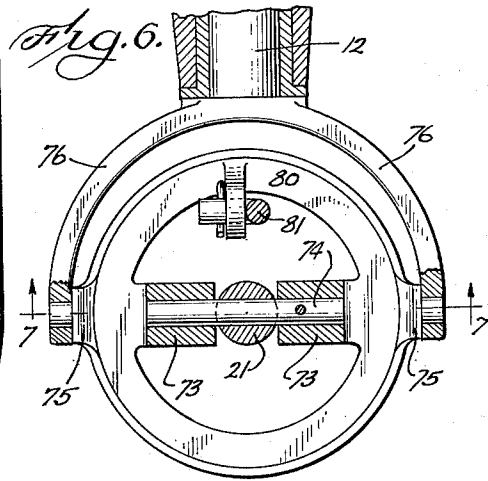
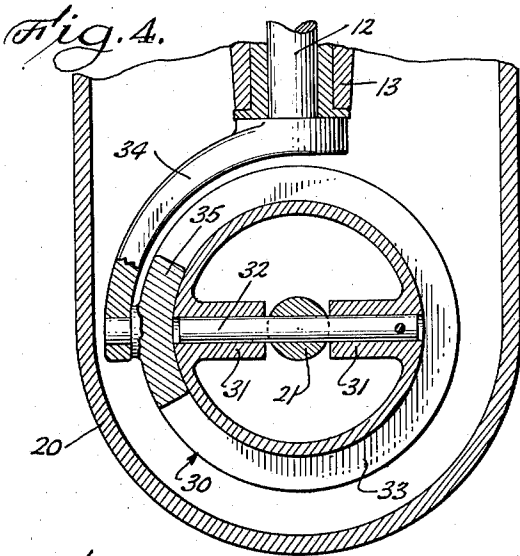
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WASHING MACHINE

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3 Sheets-Sheet 2



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WASHING MACHINE

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3 Sheets-Sheet 3

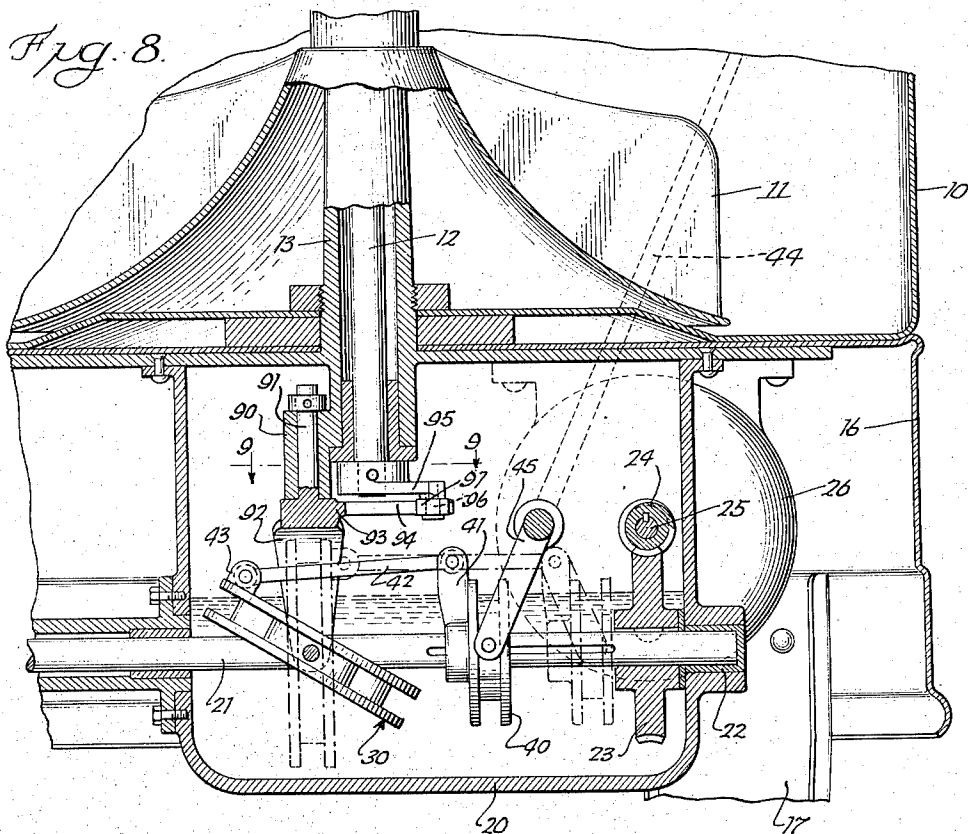


Fig. 9

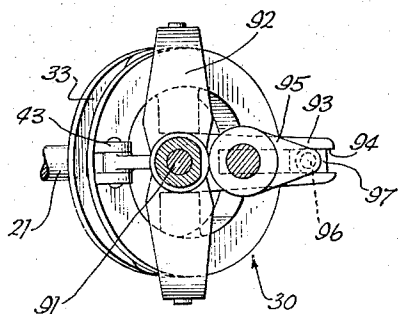
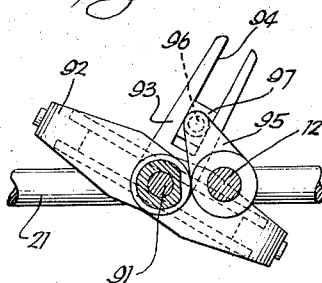


Fig. 10



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UNITED STATES PATENT OFFICE

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WASHING MACHINE

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13 Claims. (Cl. 74-70)

The invention relates generally to washing machines, and more particularly to a washing machine of the agitator type.

The general object of the invention is to provide a washing machine of this type in which the oscillation of the agitator is of the same character in both directions of movement, whereby a uniform water action is created and the articles being washed are evenly distributed throughout the tub.

It is also an object to provide a washing machine of the agitator type in which oscillation of the agitator automatically decreases or stops in case the machine is overloaded, thereby avoiding the danger of damaging either the articles being washed or the drive mechanism.

A further object is to provide an agitator type washing machine in which the point at which the oscillation of the agitator decreases or stops upon overload of the machine, may be adjusted to suit the circumstances.

Another object is to provide a washing machine drive mechanism for actuating both a washing means and a wringer, the drive mechanism being enclosed in a casing and having a construction which simplifies the problem of retaining a lubricant within the casing.

Still another object is to provide a washing machine drive mechanism having relatively few parts which are of inexpensive construction and may be readily assembled, the parts cooperating to produce an efficient mechanism requiring but little care or attention when put into operation.

It is a still further object to provide a washing machine drive mechanism having a single drive shaft connected to the source of power, the agitator shaft, and the vertical shaft in the wringer post.

It is also an object to provide a drive mechanism for an agitator type of washing machine, which is capable of giving the agitator the same character of movement in both directions in its oscillation and a wide range of movement.

A still further object is to provide a drive mechanism for oscillating the agitator with the same character of movement in both directions and through a wide range, the oscillation being smooth and without excessive whip.

Other objects and advantages will become apparent from the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a fragmentary vertical sectional view of a washing machine embodying the features of the invention.

Fig. 2 is an enlarged fragmentary sectional view taken on the line 2-2 of Fig. 1.

Fig. 3 is a fragmentary sectional view taken on the line 3-3 of Fig. 2.

Fig. 4 is a fragmentary sectional view taken on the line 4-4 of Fig. 1.

Fig. 5 is an enlarged fragmentary sectional view similar to a portion of Fig. 1, but showing a modified form of construction.

Fig. 6 is a fragmentary sectional view taken on the line 6-6 of Fig. 5.

Fig. 7 is a fragmentary sectional view taken on the line 7-7 of Fig. 6.

Fig. 8 is a view similar to Fig. 1 but showing another modified form of construction.

Figs. 9 and 10 are fragmentary sectional views taken on the line 9-9 of Fig. 8 and showing the parts in different positions of movement.

The invention is embodied in a washing machine of the agitator type. Such a machine is shown in Fig. 1, and for purposes of illustration, comprises a tub 10 with an agitator 11 therein. The agitator is driven by an agitator shaft 12 extending through the tub bottom and journaled in an agitator post 13 secured to the tub bottom in a water-tight manner. Located adjacent the periphery of the tub is a wringer post 14 enclosing a wringer shaft 15. The tub is carried on suitable supporting structure comprising, in the present instance, a skirt member 16 and legs 17 rigidly secured thereto.

The preferred embodiment of the invention comprises a washing machine of the foregoing type having a drive mechanism capable of causing the agitator to oscillate with uniform acceleration and deceleration in moving in either direction, with the movement in both directions the same with respect to acceleration and deceleration. For this purpose, drive mechanism utilizing a wobble plate mounted on a drive shaft rotating at a constant rate of speed, is employed. The wobble plate has a driving connection with the agitator shaft 12, and the angularity of the wobble plate relative to the drive shaft is adjustable so that the stroke of the agitator may be varied for washing different types of articles. To adjust the angularity of the wobble plate relative to the drive shaft, a slidable member is mounted on the drive shaft for rotation therewith, and is connected to the wobble plate in a manner which permits the wobble plate to be shifted to a position of maximum angularity, whereby the maximum stroke of the agitator will be attained.

To shift the slidable member for adjusting the

angularity of the wobble plate, a hand lever is provided, and when the agitator becomes overloaded the sliding member and hand lever are shifted automatically by the pressure of the over-
 5 load on the wobble plate so that danger of damaging the clothes or the drive mechanism is thereby avoided. The hand lever is carried in a friction device which is adjustable so that the point at which the overload causes the wobble
 10 plate to shift back to a non-oscillating position may be adjusted.

The drive mechanism is mounted in a casing, preferably below the tub, and the drive shaft thereof is located in the lower part of the casing.
 15 The connection of the drive shaft with the source of power, and the hand lever extend through the gear casing at points well above the level of the drive shaft, whereby lubricant may be placed in the gear casing up to or slightly above the level
 20 of the drive shaft to fully lubricate all the mechanism therein without chance of its leaking out of the casing. The drive shaft is connected at one end to the source of power and carries the wobble plate intermediate its ends. The other
 25 end of the drive shaft extends adjacent the lower end of the wringer shaft 15. Thus a single horizontal shaft connects the source of power with the agitator shaft 12 and the wringer shaft 15.

As shown in the drawings, a drive mechanism
 30 is located under the tub 10 (see Fig. 1), and is enclosed in a gear casing 20 suspended from the tub supporting structure. In the lower part of the gear casing 20 is a horizontally extending drive shaft 21 supported at one end in a cup-
 35 shaped bushing 22 mounted in the gear casing 20. On one end of the drive shaft adjacent the bushing 22 is a worm wheel 23 driven by a worm 24 located above the worm wheel. The worm 24 is mounted on a shaft 25 constituting an extension
 40 of the shaft of a motor 26. The shaft 25 extends through a wall of the gear casing 20 and the motor 26 is preferably located outside the gear casing and is carried by the tub supporting structure. The drive shaft 21 is thus rotated at a
 45 constant speed by the motor 26.

The gear casing 20 is located so that the agitator shaft 12 extends therein, and the drive shaft 21 is positioned to intersect the axis of the agitator shaft. Pivotally mounted on the drive
 50 shaft 21 is a wobble plate, indicated generally at 30. The pivotal axis of the wobble plate is perpendicular to the axis of the shaft 21 and intersects said axis at the point of intersection therewith of the axis of the agitator shaft 12. In the
 55 present instance, the wobble plate 30 comprises a ring-shaped member having a pair of inwardly extending bosses 31 (see Fig. 4) carrying a pivot pin 32 extending through the drive shaft 21, whereby the angularity of the wobble plate relative
 60 to the drive shaft 21 may be varied.

To connect the wobble plate with the agitator shaft 12, a groove 33 is placed in the periphery of the wobble plate. On the lower end of the agitator shaft 12 is an arcuate arm 34 extending part
 65 way around the wobble plate. Pivotally supported at the free end of the arm 34 is a segmental shoe or block 35 fitting into the groove 33 in the periphery of the wobble plate. Thus upon
 70 rotation of the wobble plate when it is positioned at an angle to the drive shaft 12 other than 90°, the arm 34 is caused to swing about the axis of the agitator shaft 12 in following the movement, and the agitator shaft and agitator are thereby
 75 oscillated.

In the ordinary type of drive mechanism uti-

lized for agitator type washing machines which employ the usual crank and pitman for oscillating the agitator shaft, there is a difference in the acceleration and deceleration in one direction of movement of the agitator shaft from the opposite
 5 direction. This is due to the fact that one end of the pitman is connected to the crank, while the other end either has a rack bar meshing with a pinion on the lower end of the agitator shaft or has an equivalent connection. In the rotation of
 10 the crank to cause motion of the agitator in one direction, unequal arcs of crank movement are utilized for bringing the rate of motion of the agitator shaft from zero to the maximum, and then from the maximum back to zero. Thus
 15 when the agitator is moving in one direction, the acceleration is relatively slow and the deceleration relatively fast. In the other direction, the acceleration is relatively fast and the deceleration is relatively slow. Such movement of the
 20 agitator necessarily creates a non-uniform action of the washing fluid and the articles being washed, because of the combined effect of the agitator movement and the inertia of the washing fluid and the articles. Such action further has
 25 a tendency to cause the articles being washed to bunch.

With the wobble plate structure shown in the drawings, the agitator is accelerated and decelerated at the same rate, and the acceleration and
 30 deceleration in both directions are the same. This is, of course, because equal arcs of the wobble plate are utilized in accelerating and decelerating the agitator for both directions of movement of the agitator, and the wobble plate
 35 rotates at a constant rate of speed. Thus, the effect of the agitator upon the washing fluid and the clothes therein is uniform, and the clothes become uniformly distributed in the tub.

Another important feature of the invention is
 40 a construction whereby the angularity of the wobble plate 30 relative to the shaft 21 may be adjusted to vary the range of movement of the agitator. When the wobble plate is perpendicular to the drive shaft no oscillation will be imparted
 45 to the agitator, and the range of oscillation increases as the wobble plate is moved away from said perpendicular position. For such adjustment, a collar 40 is keyed to the drive shaft 21 for rotation therewith, but is slidable longitudinally thereof. The collar 40 is provided with a
 50 lug 41 which is connected by means of a link 42 to a lug 43 on the wobble plate 30. In order to permit the wobble plate to be adjusted to a position where it may give the maximum oscillation
 55 to the agitator, the lug 43 is located at the periphery of the wobble plate and on the face thereof which is opposite to the face adjacent the drive shaft 21. Thus the lug 43 does not interfere with the movement of the wobble plate toward
 60 the position of maximum oscillation shown in Fig. 1.

To provide for manual adjustment of the angularity of the wobble plate, a hand lever 44 extends from the interior of the gear casing 20 through
 65 one wall thereof and outwardly through the skirt 16 of the tub supporting structure, so that it may extend up the side of the tub. On the portion of the hand lever within the gear casing 20, there is secured a fork 45 (see Figs. 1 and 2) mounted on
 70 a squared portion 48 of the hand lever so that the two are rigid with each other. The fork 45 embraces the collar 40 and is provided at its ends with pivoted shoes or blocks 46 of arcuate form fitting into a groove 47 in the periphery of the
 75 tub.

collar 40. When the lever 44 is turned, the collar 40 is shifted longitudinally of the drive shaft 21 and adjusts the angularity of the wobble plate 30.

The present mode of adjustment of the angularity of the wobble plate is such that when the agitator is overloaded, the wobble plate is forced to a non-oscillating position, thus automatically sliding the collar 40 along the drive shaft 21 and throwing the hand lever 44 to a stop or non-oscillating position. With such a construction, the danger of tearing articles being washed, or of damaging the drive mechanism, is eliminated.

In order to regulate the point at which overload becomes effective to move the parts to a non-oscillating position, friction means is provided which resists turning movement of the hand lever 44. Preferably such means, indicated generally at 50 in Figs. 2 and 3, is adjustable so that the point at which the overload becomes effective to stop oscillation of the agitator, may be varied to suit the particular type of article being washed. For example, light silks and laces may be washed in the present machine by adjusting the friction means so that very little force is required to stop oscillation of the agitator. With stronger articles such as overalls, or the like, which are not apt to tear and need a thorough and vigorous washing, the friction means may be adjusted to require a larger force due to overload to stop oscillation.

As shown herein, the friction means comprises a block 51 rigid with the gear casing 20 and a clamping block 52 secured thereto as by screws 53. The rigid block 51 and the clamping block 52 are normally slightly separated and clamp the hand lever 44 therebetween. Thus, when the screws 53 are tightened, the blocks 51 and 52 frictionally resist turning movement of the hand lever 44, and by varying the pressure exerted by the screws 53, the friction resisting turning movement of the hand lever 44 is varied. With a variation of friction on the hand lever, the point at which overload of the agitator stops oscillation may be varied.

Another feature of the invention lies in the fact that lubricant may be held in the gear casing 20 without chance of leakage. Thus, the gear casing may be filled with lubricant to a level slightly above the level of the horizontal drive shaft 21, as indicated at A in Fig. 1, to thoroughly lubricate all the moving parts in the gear casing. Such a level for the lubricant, however, is below any aperture in the gear casing through which a moving part extends. In the present instance, the only moving parts extending from the gear casing are the hand lever 44 and the motor shaft 25, and these are well above the oil level. It therefore becomes unnecessary to use stuffing boxes or the like at these points. The right hand end of the drive shaft 21, where it is supported by the gear casing, is effectively sealed by means of the cup-shaped bushing 22.

Another prominent feature of the invention resides in the fact that the single drive shaft 21 serves to connect the source of power with the agitator shaft 12 and with the wringer shaft 15. From the foregoing description, it will be seen that the drive shaft is connected at one end to the source of power, and intermediate its ends has a connection with the agitator shaft 12. To connect with the wringer shaft 15, the drive shaft 21 extends through a tubular extension 54 of the gear casing 20, the outer end of the extension 54 being enlarged as at 55, and secured to the lower end of the wringer post 14. The wringer shaft 15

extends down into the enlarged portion 55 and has a pair of bevel gears 56 mounted thereon and meshing with a bevel gear 57 carried on the outer end of the drive shaft 21. The bevel gears 56 may be loose on the wringer shaft 15 and adapted to be selectively connected thereto by a shiftable clutch collar 58 carried on the wringer shaft for rotating the wringer shaft in either direction.

Preferably the tubular extension 54 of the gear casing 20 is a separate part from the gear casing proper in order that the parts may be more readily assembled. With this construction, the tubular extension 54 is secured to the gear casing proper as by screws 59 which hold the tubular extension firmly against the gear casing and prevent leakage of lubricant therefrom. The enlarged portion 55 at the outer end of the tubular extension is preferably constructed of such a height that it extends above the lubricant level in the gear casing 20. Thus any seepage of oil through the tubular extension 54 and into the enlarged portion 55 cannot escape therefrom.

In the modified structure shown in Figs. 5, 6, and 7, the wobble plate, indicated generally at 70, comprises a pair of dish-shaped members 71 and 72, the dish-shaped member 72 being telescoped inside of the dish-shaped member 71. The member 72 is provided with a pair of radially extending lugs 73 supporting a pivot pin 74 extending through the drive shaft 21. The member 71 is provided with a pair of outwardly extending lugs 75 axially aligned with the pin 74, and is embraced by a pair of arcuate arms 76 formed on the lower end of the agitator shaft 12, the free ends of the arms 76 being pivoted on the lugs 75. With this construction, the agitator shaft 12 and its arms 76 are held in proper relation to the plate 72, since the latter is telescoped within the plate 71 to which the arms 76 are attached.

For adjusting the angularity of this form of wobble plate, a lug 80 extends from the outer face of the plate 72 and is connected by means of a link 81 to a lug 82 formed on a collar 83 slidable on the drive shaft 21. To adjust the collar 83 longitudinally of the shaft 21, the hand lever 44 in the present instance is provided with an eccentric 84 on its inner end which works in a groove 85 in the collar.

The modified form of construction shown in Figs. 8, 9, and 10, is capable of producing a wide range of oscillation for the agitator, the movement being smooth and without excessive whip. To these ends, the lower end of the agitator post 13 is provided with a boss 90 at one side thereof. Journaled in the boss 90 on an axis parallel to the agitator shaft 12 is a stub shaft 91 carrying at its lower end a yoke 92 embracing the wobble plate 30 and adapted to be oscillated thereby. The stub shaft 91 is connected with the agitator shaft 12 by a motion-multiplying device comprising an arm 93 extending laterally from the stub shaft 91 across the lower end of the agitator shaft, the arm 93 being provided with a longitudinal slot 94. On the lower end of the agitator shaft 12 is mounted a crank arm 95 having at its free end a crank pin 96 provided with a block 97 adapted to slide in the slot 94.

Because of the eccentricity of the stub shaft 91 and the agitator shaft 12, the crank arm 95 carried on the agitator shaft is shorter than the arm 93 carried on the stub shaft 91. When the arm 93 is caused to oscillate by movement of the wobble plate through a predetermined angle, 75

the crank arm 95 is caused to oscillate through a much wider angle, as will be noted in Figs. 9 and 10. Thus, a wide range of oscillation may be given to the agitator shaft 12. The angular relation between the arms 93 and 95 also tends to make the oscillation of the agitator shaft 12 smooth and avoids excessive whip therein during its movement.

In the operation of the structure shown in Figs. 1 to 4, the motor through the worm 24 and worm wheel 23 causes the drive shaft 21 to rotate at a constant speed. The wobble plate 30 mounted on the drive shaft 21 swings the arm 34 of the agitator shaft 12 from one side to the other, thus causing oscillation of the agitator shaft and agitator. Since the length of arc of the wobble plate which swings the arm 34 from the end of its stroke to the point where it reaches its maximum speed is the same as the arc of the wobble plate which causes the arm 34 to move from its point of maximum speed to the end of the stroke, the acceleration and deceleration of the agitator in one direction of movement are the same. Moreover, the back stroke of the agitator is the same in all its characteristics as the forward stroke of the agitator, due to the wobble plate. For this reason, the agitator has a uniform action on the washing fluid and the clothes therein, and the clothes therefore tend to become evenly distributed within the tub.

Should the load on the agitator become excessive, the resistance thereof to oscillatory movement will force the wobble plate to change its angularity to a point where no oscillation is produced, such point being where the wobble plate is positioned in a plane perpendicular to the axis of the drive shaft 21. Such pressure on the wobble plate shifts the collar 44 along the drive shaft 21 and throws the hand lever 44 back to the non-oscillating or stop position. To vary the amount of overload at which this occurs, the friction means 50 may be adjusted to vary the friction resisting turning movement of the hand lever 44. The connection of the collar 40 by means of the link 42 with the wobble plate is such that it does not interfere with permitting the wobble plate to move to a position where it produces the maximum oscillation, since the connection of the link 42 is on the face opposite that adjacent to the shaft 21.

The drive mechanism is of a simple character to construct since the single drive shaft 21 connects the motor with the agitator shaft 12 and the wringer shaft 15. Thus relatively few gears are required. Moreover, lubricant may be placed in the gear casing 20 to a level slightly above the shaft without involving difficulties in preventing leakage of the lubricant from the casing. Since there are no moving parts protruding from the gear casing, except at a point above the level of the lubricant where the hand lever 44 and the motor shaft 45 extend through the casing wall, no stuffing boxes or other expensive sealing devices are required.

In the modified form shown in Figs. 5, 6, and 7, the wobble plate 70 comprising the two telescoping plates 71 and 72, provides a simple construction for such a device and inherently tends to hold the arm 76 of the agitator shaft 12 in proper relation to the axis of the drive shaft 21. Moreover, the hand lever 44 with its eccentric 84 provide a simple means for shifting the collar 83 to adjust the angularity of the wobble plate. The modified form of construction shown in

Figs. 8, 9, and 10, is capable of producing a wide range of oscillation of the agitator because of the angular relation between the arms 93 and 95. This arrangement of the arms 93 and 95 also provides a relatively smooth movement for the agitator shaft 12 and avoids any tendency of the agitator blades to whip the articles being washed.

I claim as my invention:

1. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising, in combination, a drive shaft, a wobble plate mounted on said drive shaft and having a driving connection with said agitator shaft, means for adjusting the angularity of the wobble plate including a hand lever, and friction means tending to resist movement of the hand lever.
2. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising, in combination, a drive shaft, a wobble plate mounted on said drive shaft and having a driving connection with said agitator shaft, and means for adjusting the angularity of said wobble plate comprising a member rotatable with said drive shaft but slidable longitudinally thereof, said member being connected to said wobble plate, a hand lever for shifting said member longitudinally of the drive shaft, and friction means resisting movement of the hand lever.
3. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising, in combination, a drive shaft, a wobble plate adjustably mounted on said drive shaft and having a driving connection with said agitator shaft, a collar slidably mounted on said drive shaft and having a connection with said wobble plate, said collar being movable longitudinally of the drive shaft for adjusting the angularity of the wobble plate, a hand lever for shifting said collar longitudinally of the drive shaft, said collar and hand lever being automatically shifted to a non-oscillating position by overload of the agitator shaft, and friction means tending to hold said lever against movement, said friction means being adjustable whereby the point at which overload shifts said collar may be adjusted.
4. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising a drive shaft, means for connecting said drive shaft with said agitator shaft, said means being adjustable to vary the oscillatory movement of the agitator shaft from zero to a maximum and adapted to be moved to the zero position under an overload on the agitator shaft, a hand lever for adjusting said means, and friction supporting means for said hand lever, said friction means being adjustable to vary the point of overload which causes the oscillatory movement of the agitator shaft to be reduced.
5. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising, in combination, a drive shaft connected to a source of power, a wobble plate mounted on said drive shaft and having a connection with said agitator shaft, and means for adjusting the angularity of said wobble plate comprising a collar rotatable with but longitudinally slidable on said drive shaft, a link connecting said collar and said wobble plate, a hand lever for sliding said collar longitudinally on said shaft, and adjustable friction means rotatably supporting said hand lever.
6. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising, in combination, a rotatably driven wobble plate, 75

a stub shaft connected with and oscillated by said wobble plate, and a motion-multiplying device connecting the stub shaft with the agitator shaft to give the agitator shaft a wide range of oscillation.

7. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising, in combination, a stub shaft mounted parallel to said agitator shaft, a rotatably driven wobble plate for oscillating said stub shaft, a pair of arms respectively connected to the stub shaft and the agitator shaft with the free end of the arm on the agitator shaft slidably connected to the arm on the stub shaft.

8. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising, in combination, a stub shaft mounted parallel to said agitator shaft, a rotatably driven wobble plate for oscillating said stub shaft, an arm carried by said stub shaft and extending across the end of the agitator shaft, and a crank arm carried on said agitator shaft and having at its free end a slidable connection with the arm on the stub shaft.

9. Drive mechanism for a washing machine having an oscillatory agitator shaft, comprising, in combination, a stub shaft mounted parallel to said agitator shaft, a rotatably driven wobble plate for oscillating said stub shaft, a pair of arms respectively carried by the stub shaft and the agitator shaft with the arm carried by the agitator shaft shorter than the stub shaft arm and slidably connected thereto to give the agitator shaft a wide range of oscillation.

10. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising, in combination, a drive shaft, a wobble plate mounted on said drive shaft and having a driving connection with said agitator shaft, and

means for adjusting the angularity of the wobble plate including a frictional device for holding said means in any position of adjustment, the friction applied to said device also being adjustable.

11. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising, in combination, a drive shaft, a wobble plate mounted on said drive shaft and having a driving connection with said agitator shaft, means for adjusting the angularity of the wobble plate, said means being frictionally held in any position of adjustment, and means for adjusting the friction.

12. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising a drive shaft, means for connecting said drive shaft with said agitator shaft, said means being adjustable to vary the oscillatory movement of the agitator shaft from zero to a maximum and adapted to be moved to the zero position under an overload on the agitator shaft, and a friction device resisting adjustment of said means, said friction device being adjustable to vary the point of overload which causes the oscillatory movement of the agitator shaft to be reduced.

13. Drive mechanism for a washing machine having an oscillatory agitator shaft comprising a drive shaft, and means for connecting said drive shaft with said agitator shaft, said means being adjustable to vary the oscillatory movement of the agitator shaft from zero to a maximum and adapted to be moved to the zero position under an overload on the agitator shaft, said means being frictionally held normally in any position of adjustment and including means for varying the friction to adjust the point of overload which causes the oscillatory movement of the agitator shaft to be reduced.

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