April 8, 1941. J. P. WIED 2,237,919

AGITATOR DRIVE MECHANISM

Filed Nov. 3, 1938 2 Sheets-Sheet 1

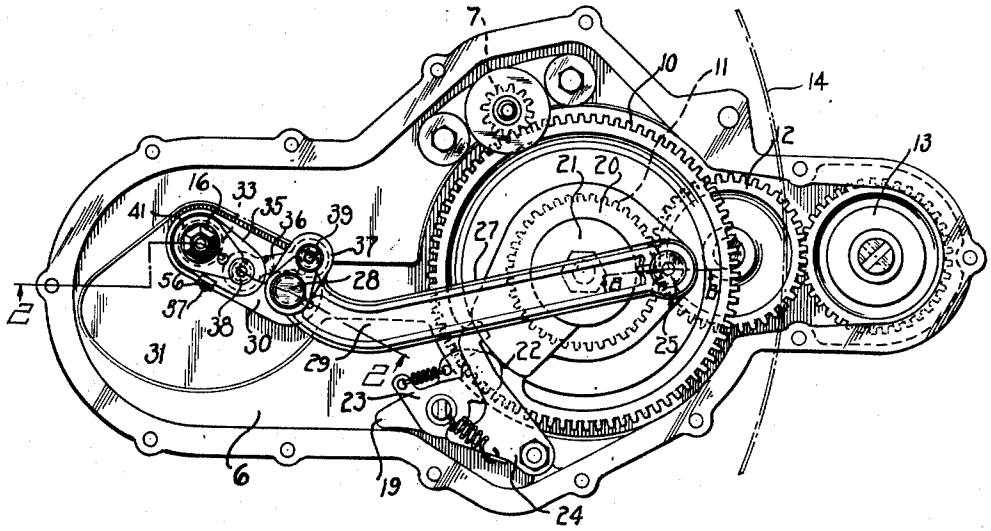


Fig-1

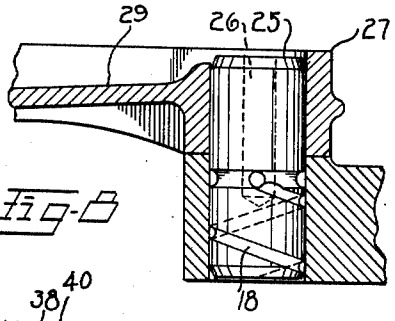


Fig-B

Fig-2

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AGITATOR DRIVE MECHANISM

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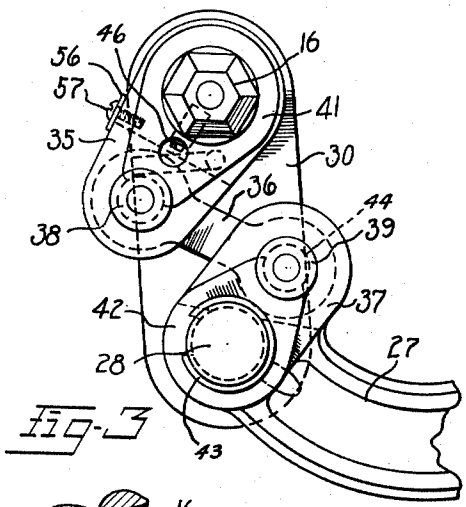


Fig-3

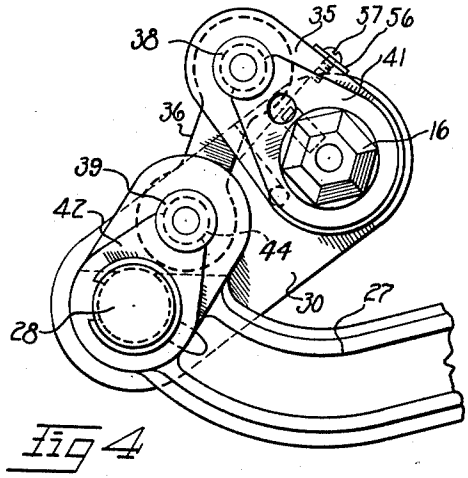


Fig 4

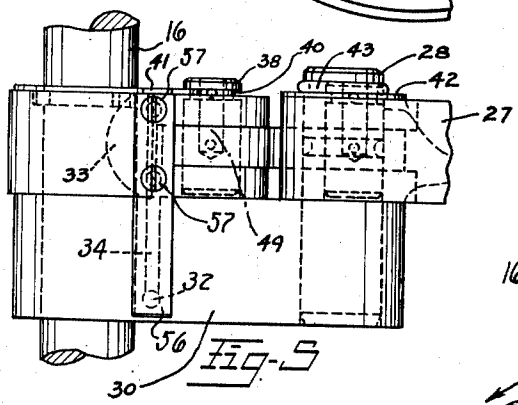


Fig-5

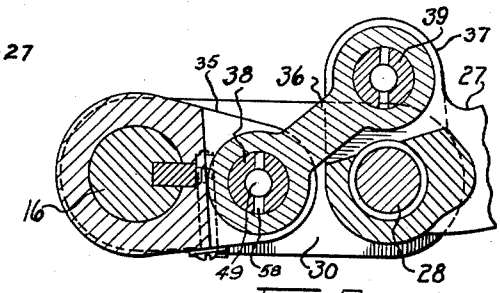


Fig-6

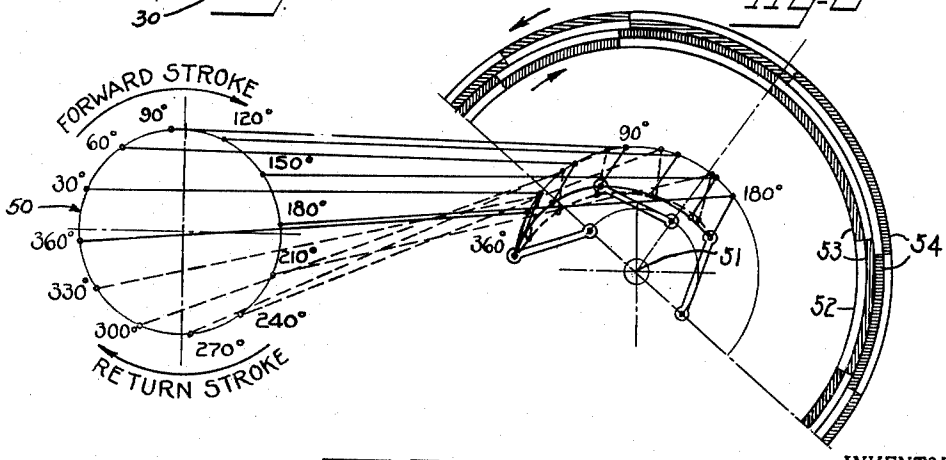


Fig-7

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Patented Apr. 8, 1941

2,237,919

UNITED STATES PATENT OFFICE

2,237,919

AGITATOR DRIVE MECHANISM

Julius P. Wied, East Cleveland, Ohio, assignor to The Apex Electrical Manufacturing Company, Cleveland, Ohio, a corporation of Ohio

Application November 3, 1938, Serial No. 238,640

4 Claims. (Cl. 74—75)

This invention relates to washing machines and more particularly to an agitator drive mechanism for a washing machine.

It is among the objects of my invention to provide an improvement in that type of agitator drive wherein a rotary motion supplied by a power unit is converted to oscillatory motion such as for instance the type shown in the patent to John W. Racklyeft, No. 2,019,582, issued November 5, 1935.

It is a further object of my invention to provide an agitator drive mechanism according to the preceding object in which a crank-driven pitman is connected to the agitator shaft by a link whereby the agitator partakes of movement in response to both the reciprocating and pivoting movements of the pitman.

It is a further object of my invention to provide an agitator drive mechanism wherein a crank-driven pitman is connected to an agitator shaft by means of a link whereby the agitator shaft is oscillated through an angle of substantially 180°.

It is a further object of my invention to provide an agitator drive mechanism wherein an agitator shaft is oscillated through an angle of substantially 180° by a continuously rotating crank or eccentric without the interposition of gears between the agitator shaft and the crank or eccentric.

It is a further object of my invention to provide an agitator drive mechanism wherein one end of a crank-driven pitman is restricted to an arcuate path of movement, and the agiator shaft is connected to the pitman at one side of the arcuate path whereby the agitator oscillates through a greater angle than the end of the pitman.

It is a further object of my invention to provide an agitator drive mechanism wherein a driving member oscillating through an angle is connected to the agitator shaft so that the agitator oscillates through a greater angle than the driving member.

It is a further object of my invention to provide an agitator drive mechanism wherein a link is connected to the agitator shaft and to a driving member so that the agitator shaft acquires a greater angular velocity while moving in one direction than it does while moving in an opposite direction.

Additional objects relating to the lubrication of the mechanism, its simple, sturdy construction, efficiency of operation and economies of manufacture will appear from the following description and the appended drawings which show, merely by way of illustration, structure adapted for carrying out the objects of the invention and wherein:

Figure 1 is a plan view of an agitator drive mechanism constructed according to my invention;

Figure 2 is an enlarged sectional view taken along the line 2—2 of Figure 1;

Figure 3 is a partial plan view of the agitator shaft and driving mechanism showing the position of the parts after the pitman crank has advanced 90° from its Figure 1 position;

Figure 4 is a view similar to Figure 3, showing the position of the parts after the pitman crank has advanced 180° from its Figure 1 position;

Figure 5 is an elevation with parts broken away illustrating in detail the driving link arrangement and the oiling provisions therefor;

Figure 6 is a sectional view taken along the line 6—6 of Figure 2;

Figure 7 is a diagrammatic showing of the agitator shaft movements during a complete revolution of the driving eccentric;

Figure 8 is a sectional view taken on line 8—8 of Figure 1.

The domestic washing machine industry has generally adopted the oscillating agitator type of washing machine wherein a shaft projecting upwardly through the bottom of the tub is provided with an agitator adapted to oscillate to effect a washing action on the clothes. Among the mechanisms developed to oscillate the agitator shaft is the simple rack and pinion drive wherein a pinion fixed to the agitator shaft is oscillated by a rack or pitman connected to a continuously-rotating driving member. Further developments in agitator drive mechanisms include that shown in the Racklyeft patent above referred to. The latter constituted a marked improvement over the conventional rack and pinion drive and is enjoying wide current use. The Racklyeft drive, however, provides a geared drive between the agitator shaft and pitman and, therefore, retains some of the disadvantages such as gear tooth wear and the noise inherent in geared constructions. As pointed out in the above objects, the present invention will possess many of the advantages of the Racklyeft drive, particularly with respect to utilization of all pitman movements, without, however, using gears or other mechanism having the noise and wear characteristics of gear drives. I have attained the objects named by the use of a novel link arrangement and although it has heretofore been proposed to drive an agitator through a link mechanism, such prior art link drives have lacked

the capability of oscillating the agitator through a wide angle such as for instance 180°.

In that form of my invention employed for purposes of illustration, the lower section 6 of a gear case is provided with a main driving gear 10 which is adapted to be continuously rotated by a pinion 7 in mesh therewith. The gear case preferably includes a top part or cover 8 which is provided with a bearing 9 to receive the upwardly projecting portion of the agitator shaft 16. The section 6 of the gear case is also provided with an opening (not shown) in alignment with the pinion 7 to receive a shaft for driving the pinion. This shaft may be fitted with a pulley or the like (not shown) and is driven by an electric motor or other power unit (not shown) as is customary in the type of machines to which this invention relates. The gear case section 6 and its cover portion 8 may be secured to each other by means of bolts or the like as at 4 to form a fluid-tight casing structure adapted to retain a quantity of lubricant.

Th main driving gear 10 is adapted through an integrally-formed gear 11 to drive an idle gear 12 which in turn drives a wringer gear 13. Ordinarily the gear case portion enclosing gear 13 projects beyond the outline of the tub as indicated at 14 and a wringer column shaft (not shown) projects upwardly therefrom to drive a wringer (not shown) mounted at the top of the machine as is also customary in the art to which this invention relates.

The gear case section 6 is provided as at 15 (Fig. 2) with a boss which forms a bearing to receive the lower end of the agitator shaft 16 which is arranged to project upwardly through the tub bottom and oscillate an agitator (not shown) therein. To effect an oscillating movement of the agitator shaft 16 by means of the main driving gear 10, the driving gear is provided with an eccentric or crank member 20 rotatably mounted on the boss 21 of the driving gear and releasably connected to the periphery of the driving gear by means of a clutch assembly comprising a plunger 22 and plates 19—23—24 to control the same. The specific clutch arrangement is the invention of Walter A. Frantz and reference is made to the copending application of said Walter A. Frantz, Serial No. 199,678, filed April 2, 1938, for a more detailed description of such parts. The said Frantz application is assigned to The Apex Electrical Manufacturing Company, the assignee of the present application.

For the purpose of the instant application, it is sufficient to state that when it is desired to operate the agitator, the clutch plates 19—23—24 are positioned so as to permit the plunger 22 to enter a notch formed in main driving gear 10. When the plunger is arranged in the said notch the eccentric member 20 will be constrained to rotate with the driving gear 10. The eccentric member 20 is provided with a bearing to receive the pin 25 carried by one end of a pitman 27. The other end of the pitman is pivotally mounted upon a pin 28 carried by a radius member 30 which in turn is pivotally mounted on the agitator shaft 16. It will be observed by reference to Figures 1, 3 and 4 that the member 30 restricts the free end of the pitman to an arcuate path of oscillation about the axis of the agitator shaft 16.

Fixed to the agitator shaft by means of a key 33 is an arm 35 which is formed to receive a link 36. Vertical pins 38 and 39 serve to pivotally connect the ends of the link 36 to the arms 35 and the offset portion 37 of the pitman, respectively. As the pitman reciprocates, it also oscillates about pivot pin 28 as an axis and due to the connection of the arm 35 to the offset 37 on the pitman such oscillating movement will supplement the reciprocating movement of the pitman so as to move the arm 35 through a greater angle than the angle described by the pin 28 as it oscillates about the agitator shaft. Thus it will be observed that both the reciprocating and oscillating movement imparted to the pitman will be reflected in angular movement of the agitator shaft about its axis.

I have found that the angular oscillation imparted to the agitator shaft according to my invention may be varied up to a relatively wide angle such as for instance 220°. In the embodiment illustrated, however, I have shown an arrangement proportioned to oscillate the agitator shaft about 180° since this is an efficient practical angle for washing clothes and an angle which will insure free operation with relatively low bearing pressures.

Preferably the pin 38 has a free turning fit in both the arm 35 and the link 36 although it will be observed that the pin could have a tight-pressed fit in one or the other of these parts without altering the driving action of the linkage. In the form of the invention illustrated the pin 39 has a free-turning fit in both the link 36 and the offset portion 37 of the pitman. To maintain the pin 38 in position as shown it is provided with an annular groove 40 to receive the bifurcated end of a plate 41 carried by the agitator shaft. A similar fastening plate 42 is carried on the pin 28 by means of a snap ring 43. The bifurcated end of the plate 42 extends into the groove 44 of pin 39 to prevent axial movement of pin 39 in its assembled position.

A further advantage associated with an agitator drive constructed according to my invention is that relating to the speed differences during oscillation of the shaft. Numerous expedients have been provided to improve the distribution and circulation of the clothes during washing. Certain agitators have been constructed to effect a progressive travel or circulation of the clothes around the tub during washing. It has also been proposed to move the agitator farther in one direction in its oscillation than in the other. It will be understood that with a conventional agitator having vertically disposed blade areas, a faster movement in one direction than in the opposite direction will tend to progress the clothes around the tub and thus effect their even distribution. This progression may be compared to a "ratchet-like" action of the agitator upon the clothes and water in the tub. For example, it will be appreciated that if an agitator moves 180° in one direction in half the time it takes the agitator to move 180° in the other direction there will be a marked difference in effect upon the tub contents during the fast and slow phases of the oscillation.

Referring to Figure 7 the circle 50 represents the path described by the eccentric pin 25 and the point 51 represents the axis of the agitator shaft. The arc 52 indicates the path described by a fixed point on the periphery of the agitator during each oscillation of the agitator shaft. The two inner rows of segments 53 indicate that portion of the path 52 traveled during each 30 degrees of movement of the crank pin 25 as the agitator turns in one direction and the two outer rows of segments 54 indicate that portion of the

path 52 traveled during each 30 degrees of movement in an opposite direction. The two inner rows 53 will be referred to as the travel on forward stroke or clockwise movement of the agitator and the outer rows 54 as the return or counter-clockwise movement. By comparing the distances along the path 52 it will be observed that as the crank pin 25 moves from its 180° position to its 270° positon a point on the agitator moves farther than when the eccentric pin moves from its 0° position to its 90° position. In other words on the counter-clockwise stroke of the agitator a point thereon moves farther during the first 90° of eccentric movement than the same point moves during the first 90° in a clockwise direction. In terms of speed, this means that a point on the agitator moves faster during the first half of the return stroke than during the first half of the forward stroke. This speed differential effects the advantageous washing action above described.

To lubricate the drive linkage constructed according to my invention I prefer to utilize the different rates of movement in the radius member 30 and the agitator arm 35. Referring particularly to Figures 1, 3 and 4, it will be observed that although the member 30 and the arm 35 oscillate in the same direction they do so at different rates and through different angles. In the position shown in Figure 1, the arm 35 is substantially in alignment vertically with the member 30. In Figure 3 the arm 35 has moved clockwise through a greater angle than the member 30. The arm 35 continues to move away from the member 30 until at the end of the stroke the arm is substantially 90° removed from the member 30. The radius member 30 is disposed to oscillate in a depression or sump 31 in the bottom of the gear case section 6 and this sump is normally filled with lubricating oil. A horizontal passage 32 is formed in the member 30 which joins a vertical passage 34. When the arm 35 and radius member 30 are in substantial vertical alignment, the upper end of the passage 34 in the latter is disposed in alignment with a passage 46 formed in the arm. (See Fig. 2.)

The arm 35 is provided as at 56 with a flat-leaf spring which is disposed downwardly along the side of the radius member 30 opposite the horizontal passage 32 formed therein. The leaf spring may be detachably secured to the arm 35 by means of screws or the like 57. As the arm 35 moves counter-clockwise from the position shown in Figure 3, to the position shown in Figure 1, the depending leaf spring 56 sweeps oil into the passageway 32. Since the leaf spring 56 is away from the passageway 32 as the radius member 30 moves clockwise, oil is scooped into the passageway 32 by reason of its own movement. Thus it will be observed that on both the clockwise and counter-clockwise movements oil is moved into the passageways 32, 34 and thence up through 46 where it is permitted to flow laterally. In its lateral flow, the oil reaches a point where it runs down the outside of pin 38 to lubricate the surface between the pin 38 and the arm 35. A portion of the laterally-flowing oil enters the hole 48 in the groove 40 and flows downwardly to fill the bore 49. Near the bottom of the bore 49 a passageway 58 leads to the bearing surface between the pin 38 and the link 36 and the lubricant filling the bore may flow laterally to lubricate said bearing surface.

To lubricate the bearing surfaces between the pitman and pin 28 I preferably employ the crank pin 25 as an oil pump to raise the oil to the top surface of the pitman where means are provided to conduct the oil laterally along the pitman. As shown in Figure 8, the crank pin 25 is provided with a spiral groove 18 in that portion of the pin beneath the normal oil level in the gear case. Oil pumped by this groove fills the vertical bore 26 in the pin 25 and since the top of this pin is below the top surface of the pitman, the oil flows into the longitudinal groove 29 formed throughout the upper surface of the pitman. At the end of the pitman adjacent the pin 28, a portion of the lubricant is adapted to flow into the bearing surfaces between the pin 28, the pitman 27 and the radius member 30. A part of the oil at this end of the pitman is also adapted to flow laterally along the plate 42 to the pin 39 which is formed with horizontal and vertical passages similar to the pin 38. From the above it will be understood that the pitman and its associated pins 25, 28 and 39 are lubricated by means of the crank pin pump and that the bearings adjacent the agitator shaft are lubricated by means of the leaf spring pump 56.

The foregoing description and the accompanying drawings to which it relates, describe what might be termed the preferred mode of practicing the invention. It is to be clearly understood, however, that the invention includes each and every novel feature or combination of novel features herein disclosed, subject only to the restrictions of the prior art, and that the invention may assume other forms and it is not to be limited to the particular and specific structure shown and described herein.

Having thus described my invention, what I claim is:

1. Mechanism to convert rotary motion to oscillatory motion comprising a rotating driving member and an oscillating driven member, said driving member having an eccentric, a pitman having one end pivotally connected to said eccentric and thereby rotated, means constraining the other end of said pitman to oscillation in an arcuate path adjacent said driven member, an arm on said pitman having a pivot, means fixed to said driven member, and a link pivoted at one end to said last-named means and pivoted at its other end to said arm pivot, said arm pivot, link and last-named means constructed and arranged to maintain said arm pivot at one side of a line between the said other end of the pitman and the pivotal connection between said last-named means and link whereby a straight line driving connection through the arm and link is prevented.

2. Mechanism to convert rotary motion to oscillatory motion comprising a rotating driving member and an oscillating driven member, said driving member having an eccentric, a pitman having one end pivotally connected to said eccentric and thereby rotated, means constraining the other end of said pitman to oscillation in a curved path adjacent said driven member, an arm on said pitman extending transversely of the longitudinal axis of the pitman and having a pivot on the end of the arm remote from said pitman axis, an arm carried by the said oscillating driven member and a link connected at one end to said last-named arm and at its other end to the pivot on the pitman arm, said arms and link proportioned and arranged to maintain the end of the pitman arm at one side of a line extending between said other end of the pitman and the pivotal connection between the

link and the arm on the driven member, to prevent a straight line driving connection through the pitman arm and the link.

3. Mechanism to convert rotary motion to oscillatory motion comprising a rotating driving member and an oscillating driven member, a pitman having one end thereof pivotally connected to said driving member, said pitman having a portion offset with respect to its longitudinal axis, said offset portion constrained to oscillate in an arcuate path adjacent said driven member, an arm on said offset portion, an arm on said oscillating driven member, a link pivotally connected at one end to said last-named arm and pivotally connected at its other end to the first-named arm, said arms, link and pitman constructed and arranged to maintain the axis of the pivotal connection between the pitman arm and the link at the same side of a line extending from the pivotal connection between the link and the second-named arm and the oscillating end of the pitman, whereby a straight line driving connection between the oscillating end of the pitman and the second-named arm is prevented.

4. Mechanism to convert rotary motion to oscillatory motion comprising a rotating driving member and an oscillating driven member, said driving member having an eccentric, a pitman having one end pivotally connected to said eccentric, and thereby rotated, means constraining the other end of said pitman to oscillation in a curved path adjacent said driven member, a portion of said pitman adjacent said other end thereof offset transversely of the longitudinal axis of the pitman and having a pivot on said portion remote from said pitman axis, an arm carried by said oscillating driven member and a link connected at one end of said last-named arm and at its other end to the pivot on the offset pitman portion, said arm, offset pitman portion and link proportioned and arranged to maintain the pivot of the offset pitman portion at one side of a line extending between said other end of the pitman and the pivotal connection between the link and the arm on the driven member, to prevent a straight-line driving connection through the offset pitman portion and the link.

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