March 19, 1940. T. J. LITLE, JR 2,194,430

VARIABLE STROKE AGITATOR DRIVE MECHANISM FOR WASHING MACHINES

Filed May 17, 1939 2 Sheets-Sheet 1

FIG. 1.

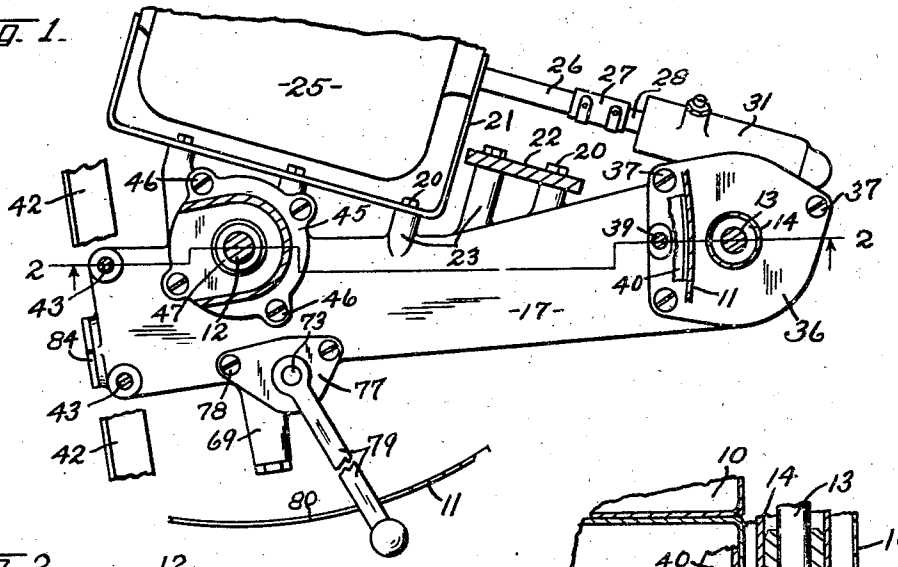


FIG. 2.

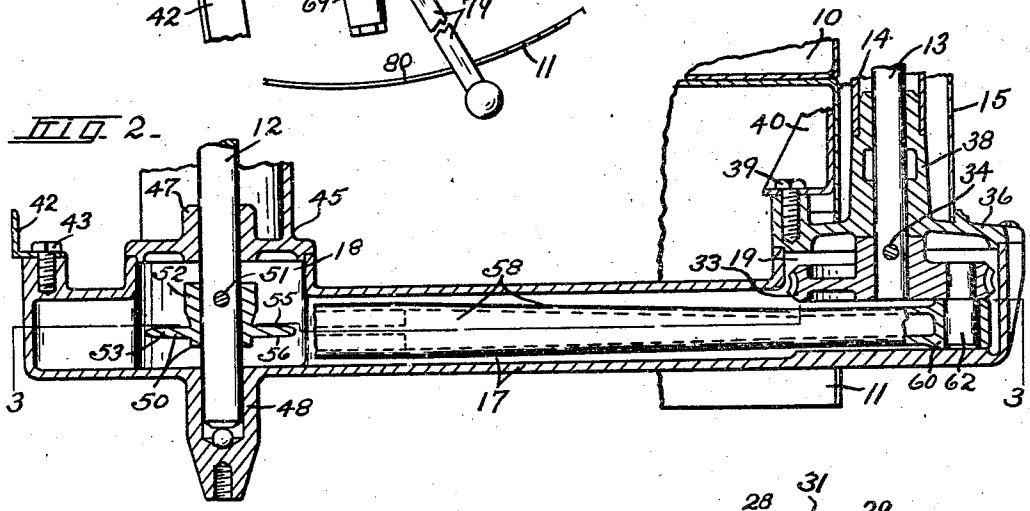
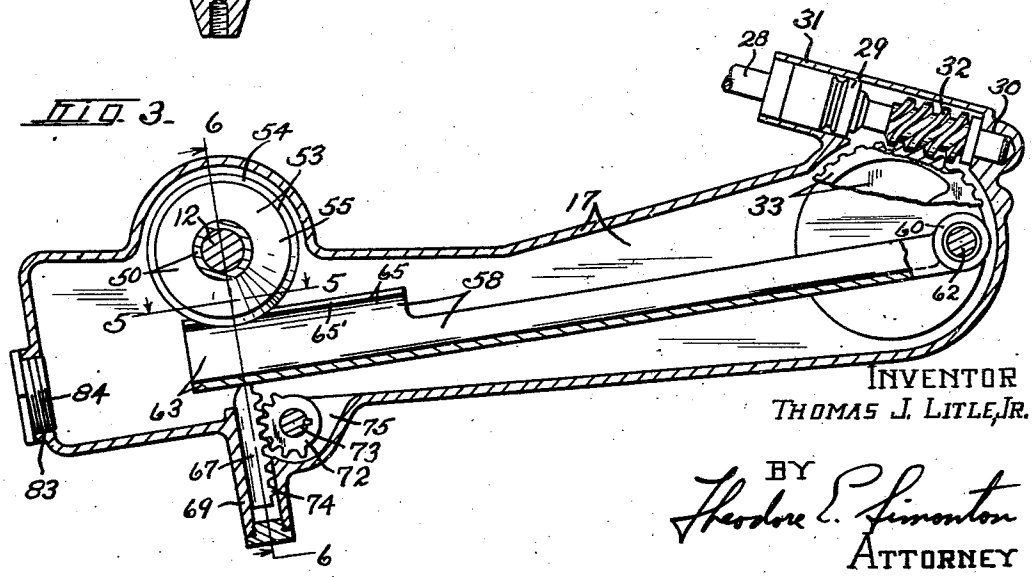


FIG. 3.



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Filed May 17, 1939 2 Sheets-Sheet 2

FIG. 4.

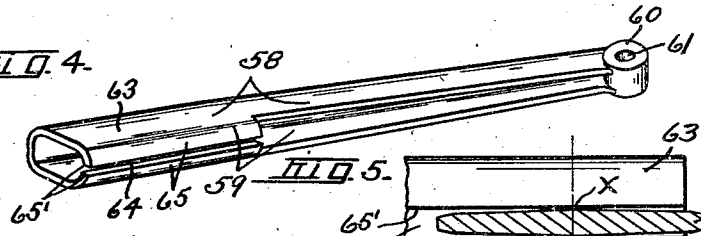


FIG. 5.

FIG. 6.

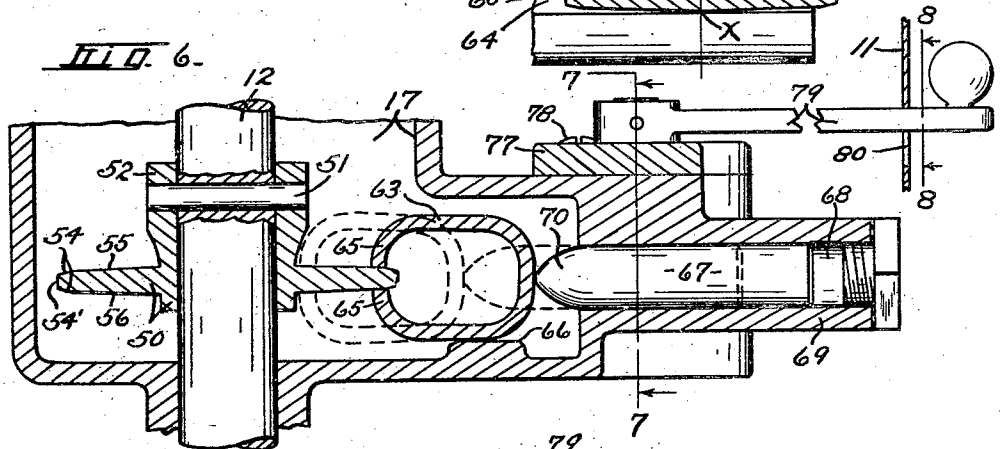


FIG. 7.

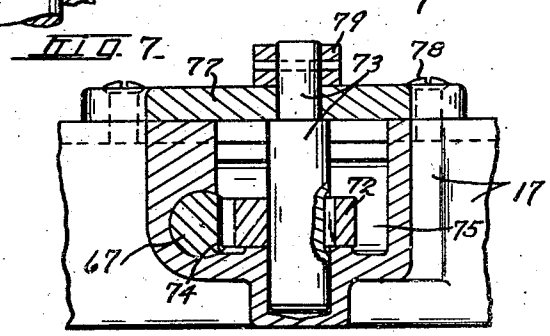
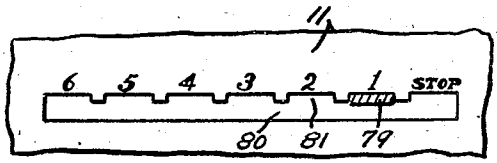


FIG. 8.



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VARIABLE STROKE AGITATOR DRIVE MECHANISM FOR WASHING MACHINES

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Application May 17, 1939, Serial No. 274,265

9 Claims. (Cl. 74—78)

My invention relates to improvements in a drive mechanism for a clothes washing machine in which an agitator mounted on a shaft is oscillated from a continuously rotating drive member by means including a reciprocating drive element operatively connecting the drive member with the shaft of the agitator.

An object of the invention is to provide a simple and economically constructed mechanism for driving an oscillating member such as the agitator or dolly of a clothes washing machine by which the angle or degree of oscillation of the member may be readily changed within certain predetermined limits.

Another object of the invention is to provide a drive mechanism for transmitting motion from a motor operated continuously rotating drive element to an oscillating driven member which is so constructed that the degree of oscillation of the driven member may be reduced to zero without stopping the motor or the use of the usual drive clutch.

A further object of the invention resides in providing a drive mechanism of the above mentioned character which may be controlled by a single lever to vary the angle of oscillation or stroke of a driven member or to reduce the angle of oscillation or stroke thereof to zero.

Other objects and advantages pertaining to the construction of my drive mechanism and to the form and relation of the parts thereof will more fully appear from the following description taken in conjunction with the accompanying drawings, in which:

Figure 1 is a plan view of my novel drive mechanism applied to a clothes washing machine, portions of the washing machine adjacent thereto being broken away and shown in section.

Figure 2 is a detail vertical sectional view taken substantially in the plane of the line 2—2, Figure 1.

Figure 3 is a horizontal sectional view taken on line 3—3, Figure 2.

Figure 4 is a perspective view of my novel connecting rod or drive bar for operatively connecting a crank pin mounted on a continuously rotating drive member with an actuating disk operatively connected with the shaft of the agitator of the washing machine.

Figure 5 is a detail vertical sectional view taken on line 5—5, Figure 3, illustrating the manner in which the connecting rod operatively engages the disk on the agitator shaft.

Figure 6 is an enlarged detail transverse vertical sectional view taken substantially on line 6—6, Figure 3.

Figure 7 is a detail vertical sectional view taken on line 7—7, Figure 6.

Figure 8 is an elevation of a portion of the washing machine skirt as viewed substantially from line 8—8, Figure 6, the control lever being shown in section.

In the accompanying drawings, 10 indicates the tub of a washing machine for containing the washing fluid and an agitator (not shown) of any suitable construction. 11 represents a skirt associated with the bottom of the tub 10 for concealing the agitator drive mechanism. 12 is a vertically disposed agitator shaft which extends from a position below the tub 10 upwardly through the bottom of said tub for supporting the agitator in a manner well known to those skilled in the art. 13 indicates the usual wringer drive shaft which extends vertically adjacent the outside of the tub 10 through a spacing sleeve 14. The shaft 13 and sleeve 14 may, as indicated in Figure 2, be encased in a guard 15 for concealing the same.

Beneath the tub 10 is a housing or gear case 17 which is of novel construction in that it consists of a unitary casting or member provided with openings 18 and 19 adjacent the ends thereof for receiving therethrough the lower ends of the agitator shaft 12 and wringer shaft 13, respectively. The case 17 may be secured in position beneath the tub 10 in any suitable manner as by screws or bolts 20 passing through suitable holes provided in the motor bracket 21 and a pendent boss or rib 22 connected with the frame or base of the machine and which are screw-threaded in suitable bosses 23 formed on the case 17 exteriorly thereof, as shown in Figure 1.

The motor 25 for operating the washing machine mechanism and which is carried by bracket 21, has the armature shaft 26 thereof connected by a coupling 27 to a worm shaft 28 that is journaled in suitable bearings 29 and 30 provided in an extension 31 formed, in this instance, integral with the housing 17 at one side thereof. The worm 32 connected with the shaft 28 is in meshing engagement with a worm wheel 33 which is mounted in the housing 17 and secured, as by pin 34, to the lower end of the wringer shaft 13.

The opening 19 in the housing 17 is closed by a cover 36 secured to the housing 17 by screws 37. The cover 36 is provided with an upwardly extending boss 38 providing bearing members which rotatably support the lower end of the wringer shaft 13, as shown in Figure 2. The cover 36

may, as shown in Figures 1 and 2, be secured by a screw 39 to a bracket 40 which is connected by spot welding or other suitable means to the adjacent portion of the skirt 11.

The bracket 40 and screw 39 provide means for supporting the outer end portion of the housing 17. The inner end of the housing 17 may, as shown in Figures 1 and 2, be supported by an angle bar 42 connected in any suitable manner to the skirt 11 so as to extend across the inner end of the housing 17 and which is secured to said housing by two screws 43.

The opening 18, through which the agitator shaft 12 extends, is provided with a cover member 45 secured to the housing 17 by screws 46. The cover 45 is provided with a centrally disposed boss 47 which rotatably supports the adjacent portion of the agitator shaft 12. The shaft 12 extends downwardly from the cover 45 through the interior of housing 17 and has the lower end thereof journaled in a suitable bearing member 48 formed on the housing 17.

An actuating wheel 50 is mounted within the housing 17 on the shaft 12 between the bearing members 47 and 48. The wheel 50 may be secured to the shaft 12 in any suitable manner, as by a pin 51 extending through aligned openings provided in the shaft and the hub 52 of wheel 50. The wheel 50 is provided with a disk 53 which extends outwardly from the shaft 12 substantially normal thereto. This disk 53 is provided with a prominent tapered marginal edge portion 54 having a relatively narrow outer marginal edge 54'. The upper and lower surfaces 55 and 56 of the disk 53 extend inwardly from the tapered edge portion 54 to the hub 52 in slightly diverging planes so that the disk 53 is slightly wedge shaped in cross section. The actuating wheel 50 may be composed of cast iron, carbon steel or other suitable material and has the disk portion 53 thereof treated in any suitable manner to produce smooth, very hard, non-wearing clutch surfaces 55 and 56 and edge 54.

The actuating wheel 50 is operatively connected with the worm wheel 33 by a drive bar or connecting rod 58 which is preferably cast of iron, carbon steel or similar material. It will be understood, however, that this bar may be forged or otherwise made if desired. The bar 58 comprises a tubular body portion 59 and a cylindrical head 60 connected with one end thereof, said head being provided with a hole 61 extending therethrough substantially normal to the longitudinal center of the body portion 59. The drive bar 58 is rotatably connected with the worm wheel 33 by a crank pin 62 connected with the wheel eccentrically thereof and which is rotatably received in the hole 61 of the drive bar head 60, as shown in Figure 2.

The end portion 63 of the body 59 opposite the head 60 is formed with an elongated slot 64 that extends longitudinally through one side portion thereof and which provides the bar with opposed jaw members 65. The length of the slot 64 is preferably greater than twice the distance from the crank pin 62 to the axis of the wheel 33 while the normal width of the slot 64 is slightly greater than the outer edge 54' of the disk 53 and less than the width of the inner portion of said tapered edge adjacent surfaces 55 and 56. The drive bar 58 may be treated at opposite sides of slot 64 in any suitable manner to provide the jaws 65 with very hard, non-wearing clutch surfaces 65'. When the bar is made by casting, the jaws 65 will possess great resilience, so that when the jaws are separated slightly by movement thereof into engagement with the disk surfaces 55 and 56 they will be maintained in contact with said surface under considerable pressure. When the bar is forged or otherwise made, however, a similar result may be obtained by proper choice of material and tempering. The length of the connecting rod or bar 58 is such that the end portion 63 will lie in close proximity to the drive wheel 50 when connected to the worm wheel 33 by the pin 62. The end portion 63 of the rod is slidably supported so as to maintain the slot 64 in alignment with the marginal edge 54 of the drive wheel 50 by an upwardly extending boss 66 provided on the interior of the lower wall of the housing 17, as shown in Figure 6.

In order that the end portion 63 of the bar or rod 58 may be moved into and maintained in predetermined relation with the disk 53, I have provided an adjustable backstay or support 67 which, in this instance, is a cylindrical member slidably mounted in an elongated aperture 68 provided in the side wall of the housing 17 and an outwardly projecting boss 69 formed integral with said housing.

The support 67 has the inner end 70 thereof of more or less conical shape, as illustrated in Figures 3 and 6 for providing a surface of relatively small area for contacting the adjacent side portion of the drive bar or rod 58. The support 67 is moved longitudinally through the aperture 68 toward and from the actuating wheel 50 by a gear segment 72 mounted on a stub shaft 73 journaled in the housing 17, said gear segment having meshing engagement with rack teeth 74 provided on the support 67. The gear member 72 is mounted in a recess 75 provided in the housing 17 adjacent the aperture 68, and the shaft 73 extends upwardly through a cover plate 77 secured to the housing 17 by screws 78 for closing the chamber 75. The upper end of the shaft 73 has secured thereto one end of a lever 79 which extends outwardly through an elongated slot 80 provided in the adjacent portion of the apron 11. The upper wall of the slot 80 is provided with a series of recesses 81 adapted to receive the lever 79 therein for releasably maintaining said lever in a predetermined adjusted position.

In order that the drive bar or connecting rod 58 may be readily mounted in the housing 17, I have provided said housing with an aperture 83 at one end adapted to receive the bar or rod therethrough and normally maintained closed by a plug 84.

Operation

It will now be obvious that the supporting member 67 may be moved longitudinally through the aperture 68 by swinging the lever 79 through the slot 80 due to the rotation of the shaft 73 and gear member 72 produced by said movement of the lever. When the lever 79 is at one end of the slot 80 in registration with the recess 81 designated "Stop" in Figure 8, the supporting member 67 will be in its outermost position in maximum spaced relation to the agitator shaft 12 and actuating wheel 50. When the supporting member 67 is in its outermost position, the end portion 63 of the drive bar 58 will be slightly spaced from the disk 53 so that the bar 58 may freely reciprocate independently of the actuating wheel 50.

When the drive bar 58 is reciprocated by rota-

tion of the worm wheel 33, the inner end portion 63 of the bar will slide in supporting engagement with the boss 66 and the supporting or positioning member 67 and when the member 67 is in its outermost position, the bar 58 will freely reciprocate in spaced relation to the disk 53 and without transmitting motion to said disk and shaft 12. As the supporting or positioning member 67 is moved inwardly, the adjacent portion 63 of the drive bar will be moved inwardly toward the shaft 12, and the jaws 65 of said bar will be moved into engagement with the disk 53.

During the initial movement of the drive bar toward the disk, jaws 65 will first engage the tapered edge portion 54 of the disk and then, as the drive bar continues its inward movement, said jaws will be gradually separated as they move over the tapered edge portion on to the side surfaces 55 and 56 of the disk. This separation of the jaw members 65 is permitted by the resiliency of the portion of the bar adjacent said jaws which in turn causes the jaws to pinch or frictionally grip the adjacent portion of the disk 53 between them and thereby transmit motion from the drive bar to the disk.

It will now be observed that inasmuch as the jaws are arranged in substantially tangential relation with the disk, and opposite sides 55 and 56 of the disk taper away from each other from the marginal edge portion 54 inwardly, the jaws 65 will have only a short line contact with the disk surfaces 65 and 66, as indicated at X, Figure 5, the length of the line of contact being equal to the thickness of the jaws 65. This line contact of the drive bar 58 with the disk 53 will lie in a plane passing through the axis of the disk 53 and normal to the jaws 65. If the jaws 65 were extremely sharp knife edges, it would be theoretically possible to have true point contact between the disk 53 and the jaws 65. In such case, the disk and jaws would move with a true rolling motion with respect to each other as the drive bar is reciprocated and the disk is rotated, and there would be no sliding motion therebetween with its consequent frictional wear. As a practical matter, however, the jaws 65 must have a fairly substantial thickness, and there is therefore a short line contact between the jaws and the disk as above described. Because of this line contact, and likewise because the line is necessarily of finite width, there is a slight amount of sliding motion between the disk and the jaws, but the principal motion therebetween is a rolling motion of the disk in the slot between the jaws which produces oscillation of the disk as the connecting rod is reciprocated. Due to the facts that the area of contact between the jaws and the disk approximates a point contact and the jaws are highly resilient, with a consequent slight amount of sliding motion, and due to the hardened surfaces of the jaws and disk, the wear on these surfaces is not a serious factor, as it would inevitably be in a drive which depended primarily on sliding friction for its action.

As the end portion 63 of the drive bar is moved inwardly from the outer tapered edge 54 toward the hub 52 the degree of oscillation of the disk 53 and, therefore, of shaft 12 and the agitator carried by said shaft will be correspondingly increased without changing the degree of reciprocating movement of the drive bar. As the angle of reciprocating movement of the disk increases, the tension of the sides of the drive bar adjacent the jaws 65 will increase which, in turn, increases the gripping action of the jaws with the disk and thereby prevents slippage between the jaws and disk as the oscillating movement of the disk and the power required for producing said movement are increased. Furthermore, it will be observed that owing to the inclination of the disk surfaces 55 and 56 from the hub 52 outwardly and the pressure engagement of jaws 65 therewith, the end portion 63 of the drive bar 58 will follow the support or positioning member 67 during the outward movement of said member. This gradually decreases the angle of oscillation of the disk until the drive bar moves out of engagement with the drive disk whereupon the oscillation of the agitator is reduced to zero although the motor may be in operation so that the usual drive clutch can be eliminated.

Although I have shown and particularly described a specific embodiment of my invention, I do not wish to be limited to the exact construction shown as various changes in the details thereof may readily be made without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. In a drive mechanism for transmitting motion from a continuously rotated drive member to an oscillating driven member, in combination, an actuating member connected with the oscillating member to oscillate in unison therewith, a drive element connected with said drive member to be reciprocated thereby through strokes of uniform length, and said actuating member and said drive element having coacting gripping clutch surfaces having substantially point contact and so constructed and arranged that reciprocative movement of the drive element will produce oscillating movement of the actuating member and the driven member connected therewith by substantially rolling motion only between said actuating member and said drive element.

2. A drive mechanism as defined in claim 1 having means for changing the position of the drive element with respect to the axis of oscillation of the actuating member so that the angle of oscillation of the actuating member and driven member may be changed.

3. In a drive mechanism for producing oscillatory movement of a driven member, a disk connected with said driven member to move therewith, a drive bar for actuating said disk, said bar having opposed resilient jaws adapted to frictionally receive the disk between them, and means for reciprocating said drive bar.

4. A drive mechanism as defined in claim 3 having means for producing relative movement of the drive bar and disk to vary the position of the jaw members with respect to the axis of oscillation of the disk for changing the angle of oscillation of said disk and the driven member connected therewith.

5. In a drive mechanism for producing oscillatory movement of a rotatably mounted driven member, an actuating element connected with said member to transmit motion thereto, said actuating element including a disk mounted coaxially with the driven member, said disk having opposite side surfaces extending in diverging planes from the outer edge thereof inwardly, a drive bar having jaw members normally spaced apart a distance less than the distance between said side surfaces of the disk, means for reciprocating the drive bar through strokes of uniform length, and means for producing relative movement of the disk and bar to cause the jaw members to move along the side surfaces of the

disk from the outer edge portion thereof inwardly to vary the angle of oscillatory movement of the disk.

6. In a drive mechanism for producing oscillatory movement of a rotatably mounted driven member, an actuating element connected with said member to transmit motion thereto, said actuating element including a disk mounted coaxially with the driven member, said disk having an abrupt tapered edge portion and opposite side surfaces extending inwardly from said tapered edge portion in diverging planes, a drive bar having jaw members spaced from the disk and normally spaced apart a distance less than the distance between said side surfaces of the disk, means for producing relative movement of the disk and bar to cause the jaw members to move over said tapered edge portion into engagement with said side surfaces of the disk, and means for reciprocating the drive bar.

7. In a variable agitator drive mechanism adapted for use in a washing machine having an agitator drive shaft for oscillating the agitator, in combination, an actuating element connected with the agitator shaft for oscillating the same, said actuating element having opposed clutch surfaces inclined in opposite directions with respect to each other, a drive member having substantially straight parallel clutch surfaces adapted to operatively engage the clutch surfaces of the actuating member under yielding pressure, positioning means engageable with the drive member for moving the clutch surfaces thereof along the clutch surfaces of the actuating member in the direction of said inclination, and means for reciprocating the drive member.

8. A variable agitator drive mechanism as set forth in claim 7 wherein said positioning means is so constructed and arranged as to permit the drive member to move to a position to bring the clutch surfaces thereof out of engagement with the clutch surfaces of the actuating element so that no motion is transmitted to said actuating element and said agitator when said drive member is in motion.

9. In a variable agitator drive mechanism adapted for use in a washing machine having an agitator drive shaft for oscillating the agitator and a rotatable drive member, in combination, a disk connected with the agitator shaft for oscillating the same, said disk having opposed clutch surfaces extending in diverging planes from the outer edge thereof inwardly, a connecting rod for actuating the disk pivotally connected with the drive member to be reciprocated thereby, said connecting rod having a pair of opposed clutch surfaces normally spaced apart a less distance than said clutch surfaces of the disk so that they will engage the clutch surfaces of the disk under pressure when moved into engagement therewith, means including a reciprocating member engageable with the connecting rod for moving the same toward the disk to bring the clutch surfaces of said rod into engagement with the clutch surfaces of said disk, said reciprocating member having substantially a point contact with the connecting rod to permit free swinging and reciprocating movements of the bar.

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