Dec. 15, 1936. E. W. FORSTROM 2,064,653

DRIVING MECHANISM FOR WASHING MACHINES AND THE LIKE

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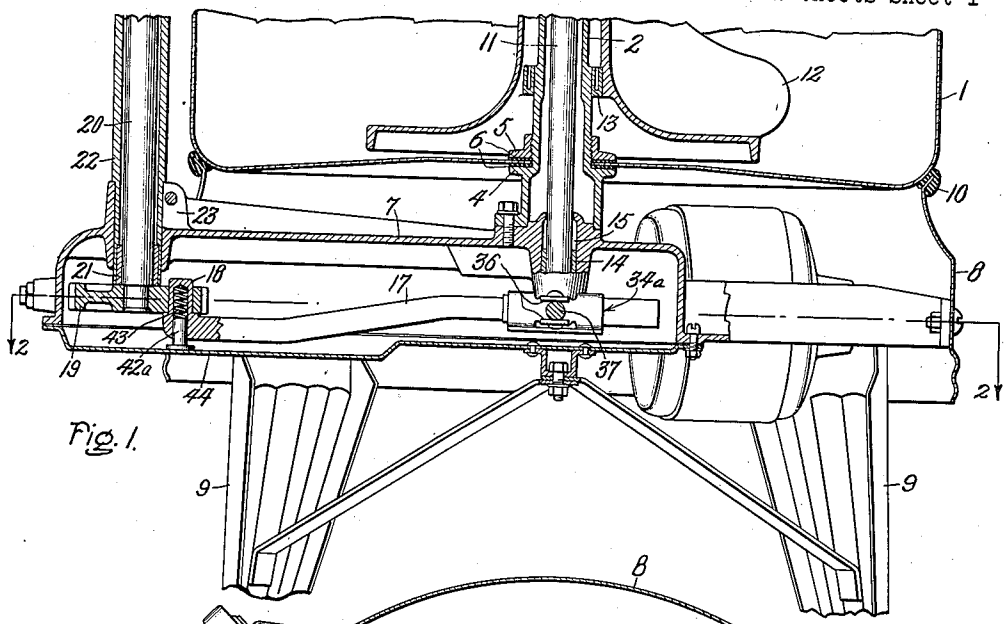


Fig. 1.

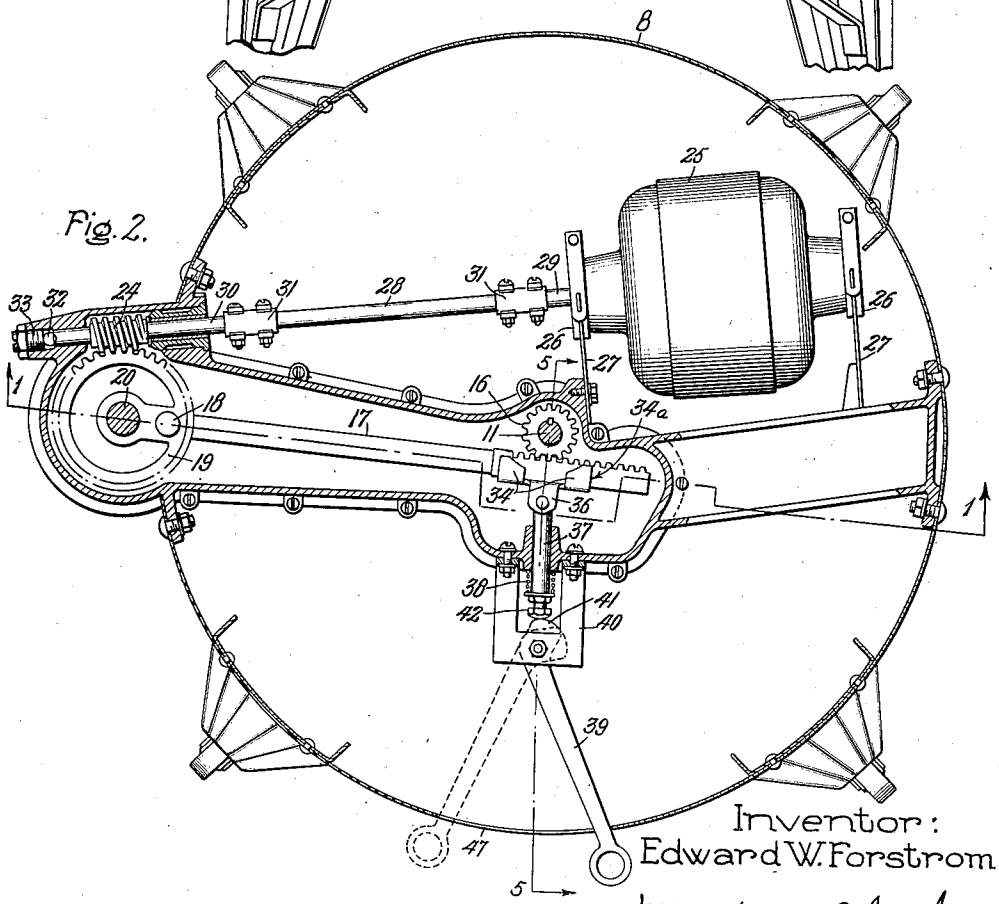


Fig. 2.

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Fig. 3.

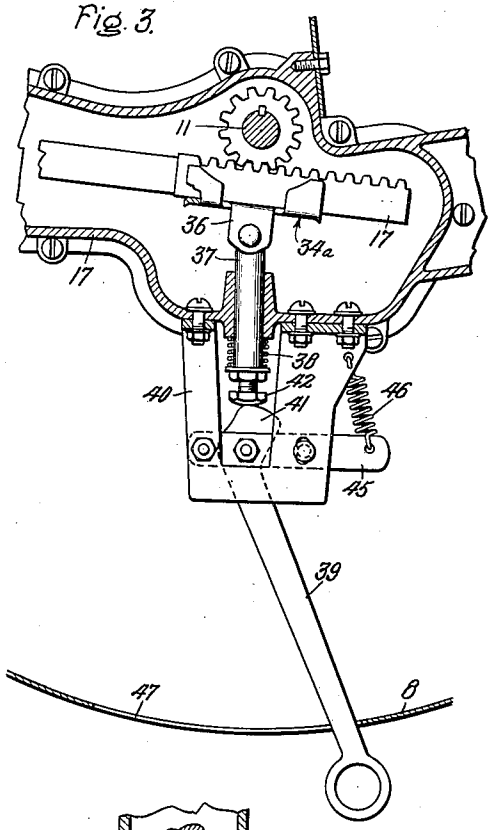
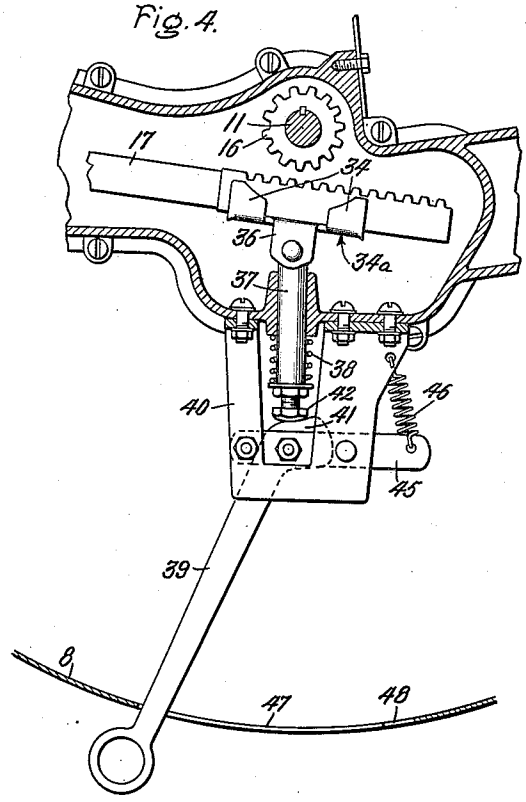


Fig. 4.



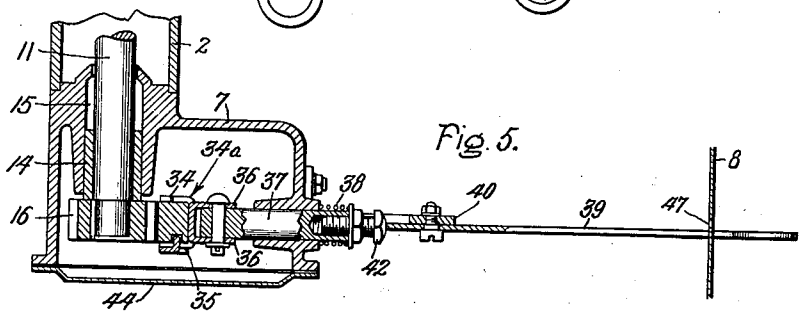


Fig. 5.

Fig. 6.

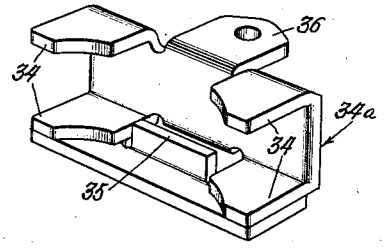
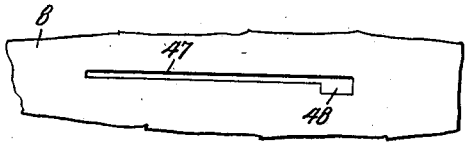


Fig. 7.



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UNITED STATES PATENT OFFICE

2,064,653

DRIVING MECHANISM FOR WASHING MACHINES AND THE LIKE

Edward W. Forstrom, Stratford, Conn., assignor to General Electric Company, a corporation of New York

Application February 25, 1936, Serial No. 65,597

19 Claims. (Cl. 74—78)

The present invention relates to driving mechanism for effecting an oscillatory movement of a shaft such as is used in washing machines and the like.

The object of my invention is to provide an improved construction and arrangement in driving mechanism of this type, and for a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto.

In the accompanying drawings Fig. 1 is a fragmentary elevation of a washing machine having a driving mechanism embodying my invention, in section along lines 1—1 of Fig. 2; Fig. 2 is a sectional top plan view taken on line 2—2 of Fig. 1; Fig. 3 is a top plan view of a modification of my invention showing the rack and pinion in the engaged position; Fig. 4 is a view similar to Fig. 3 showing the rack and pinion in the disengaged position; Fig. 5 is a sectional view taken on line 5—5 of Fig. 2; Fig. 6 is a perspective view of the guide for guiding the reciprocating movement of the rack, and Fig. 7 is a view of a slot for guiding the control lever.

Referring to the drawings, the tub 1 is supported at the center by a tubular post 2 which projects through a central opening in the bottom of the tub. The tub rests on a flange 4 on the post 2 and is clamped between the flange and a nut 5 which is threaded on the post. Suitable gaskets 6 are arranged between the tub and the flange 4 and the nut 5 to prevent leakage. The lower end of the post 2 is secured to the top of the gear casing 7 and is supported thereby. The gear casing extends diametrically across and is bolted at either end to the depending sides of a cylindrical skirt 8. Legs 9 for supporting the washing machine are secured to the skirt 8. The gear casing braces the skirt 8 and provides a rigid central support for the tub. The outer edge of the tub is tightly held against a rubber cushion 10 on the upper edge of the skirt 8. This provides additional support for the tub. The lower end of the tub projects within and is wedged against the upper rim of the skirt. This increases the lateral rigidity of the skirt and allows the use of lighter material for the skirt.

A vertical shaft 11 for driving an agitator 12 extends upwardly through the post and is supported by a suitable thrust bearing (not shown) at the upper end of the post. The agitator has a depending tubular portion which extends downwardly around the post. A collar 13 which is secured to the agitator at the lower end guides the movement of the agitator. The lower end of the agitator shaft 11 is carried in a bearing 14 in the upper wall of the gear casing 7. A chamber 15 is provided above the bearing 14 to collect lubricant which may be carried above the bearing. This lubricant is returned to the gear casing through a suitable passage (not shown) in the upper wall of the gear casing. The agitator shaft 11 extends within the gear casing 7 and has a pinion 16 keyed to the lower end which is adapted to mesh with a reciprocating rack 17 to cause oscillation of the agitator. The left end of the rack is provided with a crank pin 18 which is rotatable in a bearing eccentrically located in a worm wheel 19. The worm wheel is keyed to the lower end of a vertical shaft 20 which is journaled in the bearing 21 in a tubular wringer post 22. The upward thrust of the worm gear is taken by the lower edges of the bearing 21 which serves as a thrust bearing. The wringer post is clamped to the upper wall of the gear casing by a split clamp 23 integral with the upper wall of the gear casing. The worm wheel 19 is rotated by a worm 24 which is driven by an electric motor 25 carried on the gear casing by rubber rings 26 clamped to supports 27. An intermediate shaft 28 is connected between the motor shaft 29 and the worm shaft 30 by flexible couplings 31. A thrust ball 32 is provided at the end of the worm shaft 30. The thrust ball is adjusted by a screw plug 33. With this arrangement, the worm wheel 19 is continuously rotated in one direction by the motor, and the crank pin 18, bearing in the worm wheel, causes the rack 17 to be reciprocated. The body of the rack 17 is offset and rigid so that although the end of the rack carrying the crank pin 18 is below the teeth of the worm wheel 19, the teeth of the rack and the bearing of crank pin 18 are in line with the teeth of the worm wheel 19. This reduces the load on the bearings of the shaft 20 and eliminates vertical forces in the rack thrust which would have a tendency to cause slaps resulting in objectionable noises.

The reciprocating movement of the rack 17 is guided by a guide 34*a* shown in Fig. 6. The guide has flanges 34 which extend over the upper and lower sides of the rack. Secured to the lower flanges is a tongue 35 which slides in a groove on the under side of the rack and holds the rack in the guide. From the rear edge of the guide extend ears 36 which are pivoted on the inner end of a plunger 37 slidable in the

walls of the gear casing 7. The ears 36 support the rack on the plunger and the pivotal connection between the ears 36 and the plunger permit pivotal movement of the guide during the reciprocating movement of the rack. The outer end of the plunger 37 projects through the side wall of the gear casing, and the plunger is urged outward by a spring 38 arranged between the gear casing and the outer end of the plunger. The spring 38 thereby tends to move the plunger to a position in which the rack is out of mesh with the pinion. The plunger is moved inwardly to the position shown in Fig. 2 by means of a control lever 39 pivoted on a bracket 40 secured to the outside of the gear casing. The end of the control lever is provided with a cam 41 which engages a set screw 42 threaded into the end of the plunger 37. When the control lever is in the position shown in full lines in Fig. 2, the rack is pressed into engagement with the pinion. When the control lever is in the position shown in dotted lines, the spring 38 moves the plunger outwardly, thereby moving the rack out of engagement with the pinion.

Among the advantages of this arrangement for moving the rack into and out of mesh with the pinion are the ease of adjustment which is effected by turning the set screw 42 and the accessibility of the operating mechanism which is located outside the gear casing. Also, since the rack is supported by the guide 34*a*, the weight of the rack is supported by the bearing for the plunger 37. This is a simple and effective arrangement for maintaining the rack teeth in alignment with the teeth of the pinion.

On the under side of the crank pin 18 is a pin 42*a* which is pressed by a spring 43 against the cover 44 of the gear casing. The friction between the pin 42*a* and the cover of the gear casing opposes the reciprocating movement of the rack and thereby tends to prevent overtravel of the reciprocating rack and reduces the backlash between the worm and the worm gear. The friction between the pin 42*a* and the cover of the gear casing also tends to retard the rotation of the crank pin and thereby tends to hold the crank pin against its bearing in the worm wheel during all parts of the reciprocating movement of the rack and particularly during the reversal of the reciprocating movement of the rack. The frictional force between the crank pin and its bearing is always in the same direction, and causes the rack to bear against the back of the guide 34*a*, thus preventing wobbling of the rack in the guide and eliminating noise from this source. When the rack is being reciprocated, it is continuously held against the back of the guide 34*a* and the tongue 35 is then merely a means for making sure that the rack is pulled out of mesh with the pinion in case of binding between some of the parts. The spring pin 42*a* also prevents the crank pin 18 falling from its bearing in the worm wheel 19. The pin 42*a* supports the wringer shaft 20, eliminating the need for a thrust bearing to support the gravity component of the worm gear and shaft thrust. It would be inconvenient to provide such a thrust bearing at the bottom of the wringer shaft, and if the thrust bearing were provided at the top of the wringer shaft, it would be difficult to prevent excessive play between the bearing and the shaft due to expansion and contraction of the shaft and the wringer post. The pin 42*a* also prevents vertical movement of the shaft due to variations in the vertical reaction between the worm 24 and the worm wheel 19 caused by the variable load taken by the reciprocating rack. If this vertical movement were not prevented by the pin 42*a* it would produce a gear noise due to the change in mesh between the worm 24 and the worm wheel 19, and it would also produce a knock on the thrust bearing used to take the variable upward thrust of the worm gear.

The modification shown in Figs. 3, 4, and 5 is of the same construction as that shown in Figs. 1 and 2 except that the control lever 39 is pivoted on a lever 45 which is pivoted on the bracket 40. A helical spring 46 is arranged between the right-hand end of the lever 45 and the bracket 40. The function of the spring 46 is to limit the pressure which can be exerted on the plunger 37 by the cam 41. This prevents injury of the side walls of the gear casing and decreases the need for adjusting the length of the plunger 37. The control lever 39 is guided in a slot 47 in the skirt 8. The slot has a notch 48 into which the control lever fits when in the position shown in Fig. 2, thereby holding the lever in this position.

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

1. In combination, a rack, a crank for reciprocating the rack, a guide for guiding the reciprocating movement of the rack, and friction means carried by the rack and bearing on a stationary surface for opposing the rotation of the crank end of the rack.

2. In combination, a rack, a crank for reciprocating the rack, a guide for guiding the reciprocating movement of the rack, and friction means carried by the crank end of the rack and bearing on a stationary surface.

3. In combination, a rack, a crank for reciprocating the rack, a guide for guiding the reciprocating movement of the rack, a gear casing for the rack, and friction means carried by the crank end of the rack and bearing on the gear casing.

4. In combination, a rack, a crank for reciprocating the rack, a guide for guiding the reciprocating movement of the rack, a gear casing for the rack, and a spring pressed pin carried by the crank end of the rack and bearing on the gear casing.

5. In combination, a rotatable member having bearing eccentrically located therein, a rack on the under side of said member having a pin fitting in said bearing, a guide for guiding the reciprocating movement of the rack, a gear case for the rack, and resilient means carried on the under side of said pin and bearing on the gear case for producing a uni-directional force holding the rack against the guide during its reciprocating movement.

6. In combination, a gear casing, a rack and pinion within the casing, a plunger slidable in the walls of the casing, a guide supported on the inner end of said plunger for guiding the reciprocating movement of the rack and for supporting the rack, and means outside the casing adapted to engage the outer end of said plunger for effecting reciprocation of the plunger whereby the rack is moved into and out of mesh with the pinion.

7. In combination, a gear casing, a rack and pinion within the casing, a plunger slidable in the walls of the casing, a guide pivoted on the inner end of the plunger for guiding the reciprocating movement of the rack and for supporting

the rack, a cam on the outside of the casing adapted to engage the outer end of the plunger and move the rack into engagement with the pinion, and a spring between the gear casing and the outer end of the plunger for moving the rack out of mesh with the pinion.

8. In combination, a gear casing, a rack and pinion within the casing, a plunger slidable in the walls of the casing, a guide supported on the inner end of said plunger for guiding the reciprocating movement of the rack and for supporting the rack, a lever outside the gear casing, means carried by said lever adapted to engage the outer end of said plunger for effecting reciprocation of the plunger whereby the rack is moved into and out of mesh with the pinion, and a spring for limiting the pressure exerted by the plunger.

9. In combination, a rack and pinion, means for reciprocating the rack, a plunger slidable in a bearing, a guide carried by the plunger for guiding the reciprocal movement of the rack and for supporting the rack, and means for effecting reciprocation of plunger whereby the rack is moved into and out of mesh with the pinion.

10. In combination a rack, a crank for reciprocating the rack, gearing for rotating the crank, and a friction means carried by the rack and bearing on a stationary surface for opposing the reciprocating movement of the rack for decreasing the back-lash in said gearing.

11. In combination a rack, a crank for reciprocating the rack, gearing for rotating the crank, and friction means carried by the crank and bearing on a stationary surface for opposing the reciprocating movement of the rack and thereby decreasing the back-lash in said gearing.

12. In combination, a reciprocable member, a crank for reciprocating said member, means for continuously rotating said crank whereby said member is reciprocated, and friction means carried by said member and bearing on a stationary surface for opposing the rotation of the crank end of said member.

13. In combination, a reciprocable member, a crank for reciprocating said member, means for continuously rotating said crank whereby said member is reciprocated, and friction means carried by the crank end of said member and bearing on a stationary surface.

14. In combination, a reciprocable member, a crank for reciprocating said member, means for member is reciprocated, a gear casing for said member, and friction means carried by the crank end of said member and bearing on the casing.

15. In combination, a rotatable member having a bearing eccentrically located therein, a reciprocable member on the underside of said rotatable member having a pin fitting in said bearing, and resilient means carried on the underside of said pin and bearing on a stationary surface for holding said pin in said bearing.

16. In combination, a worm gear having a bearing eccentrically located therein, a worm driving said worm gear, vertical shaft means fixed to said worm gear, a thrust bearing for taking the upward thrust of said worm gear, a reciprocable member on the underside of said worm gear having a pin fitting in said bearing, and resilient means carried by said pin and bearing on a stationary surface for overcoming the gravity component of the worm gear and shaft thrust.

17. In combination, a worm gear having a bearing eccentrically located therein, a worm driving said worm gear, vertical shaft means fixed to said worm gear, a thrust bearing for taking the upward thrust of said worm gear, a crank connected to said worm gear for driving a reciprocable member, and resilient means carried by said crank and bearing on a stationary surface for overcoming the gravity component of the worm gear and shaft thrust.

18. In combination, a rotatable member having vertical shaft means and a worm gear fixed thereto, a crank connected to said rotatable member for driving a reciprocable member, a thrust bearing for taking the upward thrust of said rotatable member, and resilient means carried by said crank and bearing on a stationary surface for overcoming the gravity component of the worm gear and shaft thrust.

19. In combination, a rotatable member having vertical shaft means and a worm gear fixed thereto, a crank connected to said rotatable member, a reciprocable member driven by said crank, a thrust bearing for taking the upward thrust of said rotatable member, and resilient means carried by the crank end of said reciprocable member and bearing on a stationary surface for overcoming the gravity component of the worm gear and shaft thrust.

CERTIFICATE OF CORRECTION.

Patent No. 2,064,653. December 15, 1936.

EDWARD W. FORSTROM.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 1, claim 14, strike out the word gear; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of March, A. D. 1937.

(Seal)

Henry Van Arsdale
Acting Commissioner of Patents.