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GEAR AND CLUTCH MECHANISM FOR SPINNER TYPE CLOTHES WASHING MACHINES

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Fig. 1.

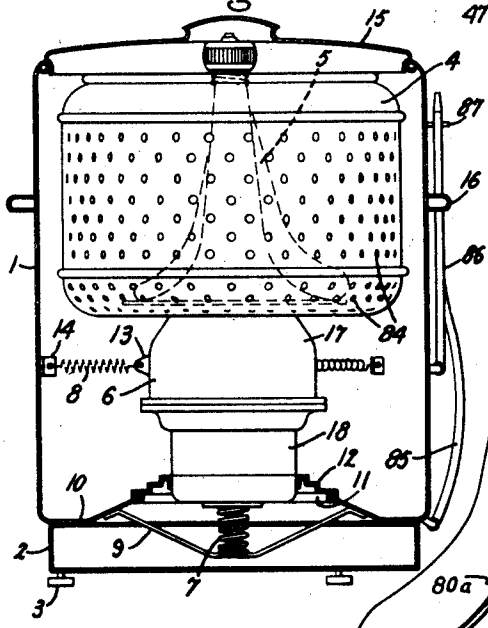

Fig. 2.

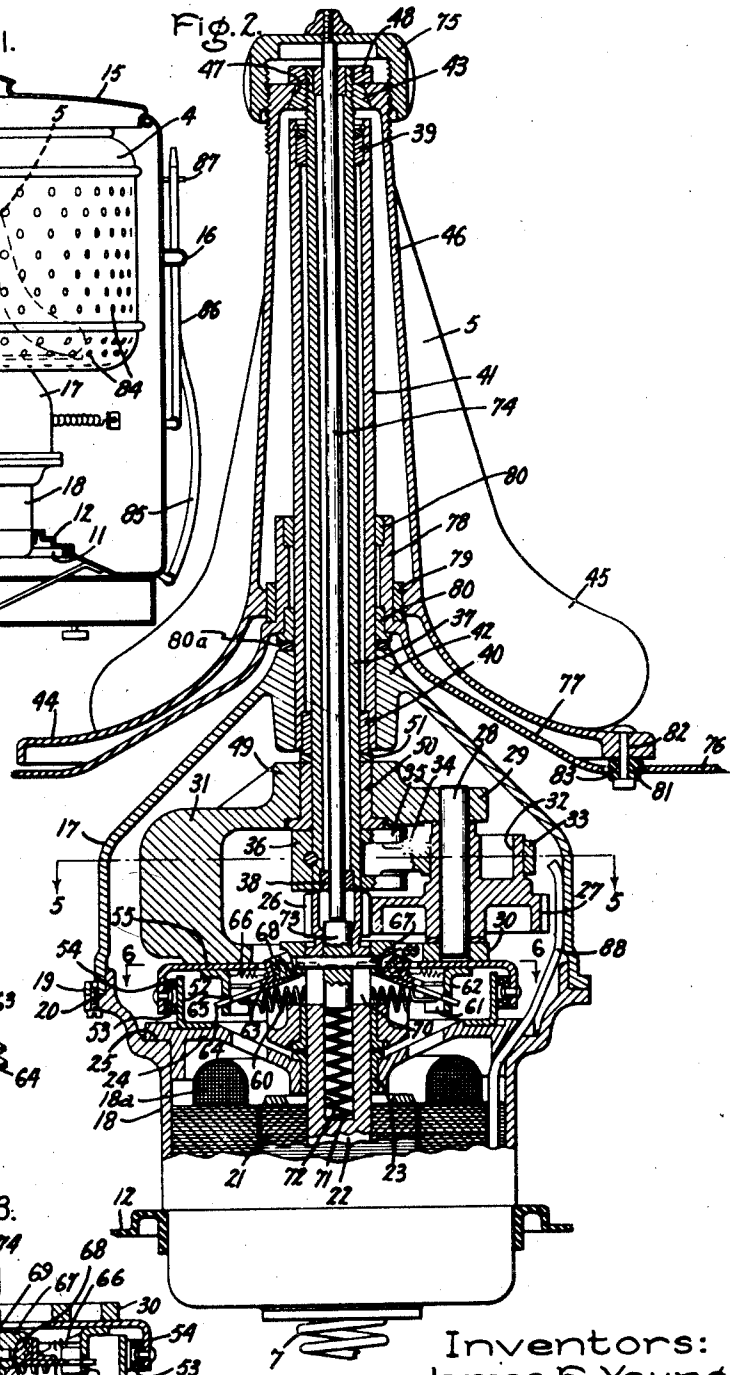

Fig. 4.

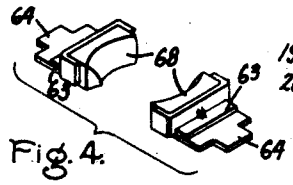

Fig. 3.

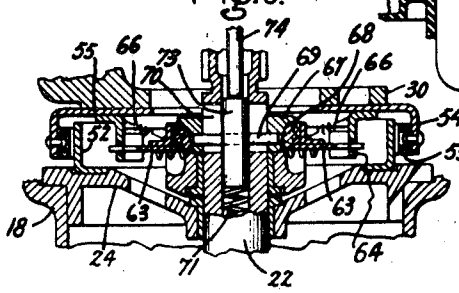

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Fig. 5.

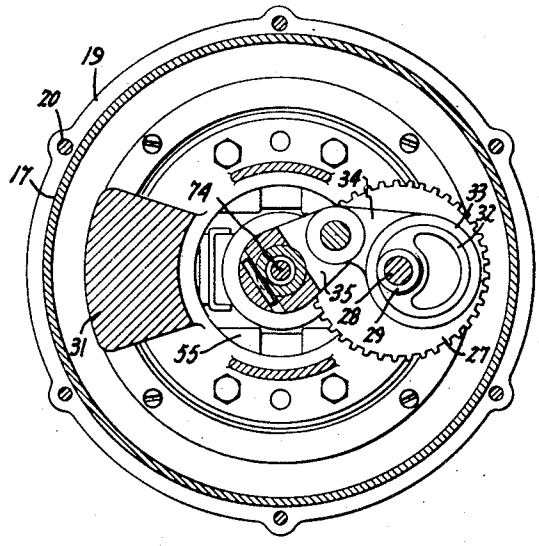


Fig. 6.

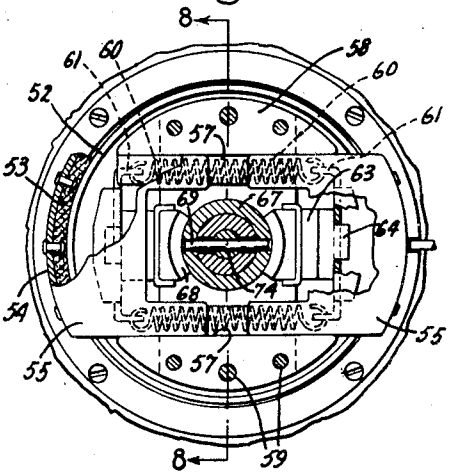


Fig. 7.

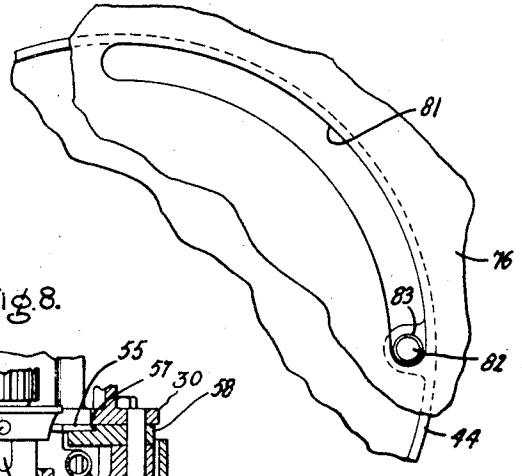
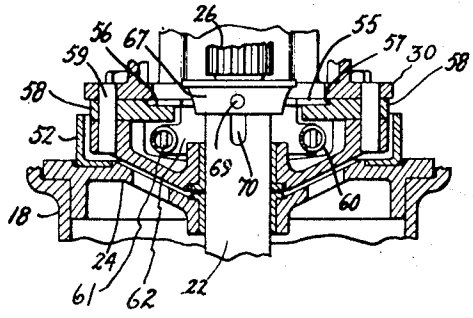


Fig. 8.



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2,497,686

GEAR AND CLUTCH MECHANISM FOR SPINNER TYPE CLOTHES WASHING MACHINES

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Application March 19, 1948, Serial No. 15,884

9 Claims. (Cl. 74—75)

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The present invention relates to clothes washing machines of the type wherein washing is performed in a basket by an agitator, the basket afterwards being rotated to extract centrifugally the water from the clothes.

The object of the invention is to provide an improved construction and arrangement in a washing machine of this type which is simple in structure, reliable in operation and capable of being manufactured at low cost. The invention is especially well adapted for small, portable lightweight machines adapted to be readily lifted manually and placed on a drain board, for example, when the machine is being used. However, the invention is not limited thereto necessarily.

More particularly, the invention has to do with an improved gear and clutch mechanism through the intermediary of which the motor is connected to the agitator and spin basket for effecting the washing and the extracting operation.

For a consideration of what we believe to be novel and our invention, attention is directed to the following specification and to the claims appended thereto.

In the drawing, Fig. 1 is a sectional view of a washing machine embodying our invention; Fig. 2 is a sectional view on a larger scale of the operating mechanism; Fig. 3 is a detail view of a part of the operating mechanism showing the parts in a position different from that of Fig. 2; Fig. 4 is a perspective view of the clutch levers for the mechanism; Fig. 5 is a sectional view taken on line 5—5, Fig. 2; Fig. 6 is a sectional view taken on line 6—6, Fig. 2; Fig. 7 is a fragmentary plan view showing the connection between the agitator and the spin basket; and Fig. 8 is a detail sectional view taken on line 8—8, Fig. 6.

Referring to the drawing, 1 indicates the tub of the washing machine which may be supported on a base 2 provided with feet or casters 3. In the tub is a unitary structure comprising a basket 4 in which the clothes are washed, an agitator 5 for performing the washing operation, and a sealed casing 6 in which is an electric motor and mechanism operated by it for oscillating the agitator to perform the washing operation, the basket being then stationary, and for spinning the basket and the agitator to extract the water from the clothes. This unitary structure may be supported in the tub in any suitable way, the specific supporting means forming no part of our present invention. In the present instance, it is shown as being supported by a base spring 7 and three side springs 8. Base spring 7 is positioned

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between a strap 9 fixed to the bottom wall 10 of tub 1 and the bottom of casing 6. The lower end of casing 6 projects through an opening 11 in the bottom wall 10. The space between the edges of opening 11 and the casing 6 is sealed by a suitable flexible diaphragm 12 attached at one edge to the wall surrounding opening 11 and at the other edge to casing 6. Springs 8 are tension springs and are connected at one end to ears 13 on casing 6, and at their other ends to ears 14 fixed to the inner surface of the side wall of tub 1. This arrangement serves to provide a yielding, resilient mounting for the unitary structure comprising casing 6, the mechanism therein, the basket 4 and the agitator 5. Tub 1 has an open top closed by a suitable cover 15, and handles 16 on its sides by which it may be lifted.

Casing 6 is shown as being formed in two sections, an upper section 17 and a lower section 18. The sections are provided with meeting flanges 19 which may be clamped together in sealing relation by studs 20. The motor for operating the mechanism is located in lower casing section 18. It comprises a suitable field structure 18a carried by casing section 18 and an armature 21 fixed on a shaft 22. Shaft 22 is supported in an upper bearing 23 carried by a diaphragm 24 which, at its edge, is supported on a shoulder 25 in casing section 18, and by a lower bearing which may be in the form of a suitable step bearing (not shown). Diaphragm 12 serves to hold casing 6 and field structure 18a from turning and to allow translation of casing 6 relative to bottom wall 10.

On the upper end of motor shaft 22 is a pinion 26 which may be formed integral with the shaft and which meshes with a gear wheel 27 mounted to turn on a stationary shaft 28 which is carried by upper and lower walls 29 and 30 of a gear cage or housing 31. Formed integral with gear wheel 27 is an eccentric 32 surrounding which is an eccentric strap 33 provided with an arm 34 which is connected to an arm 35 formed integral with a sleeve 36 fixed on the lower end of a vertical tubular shaft 37. The lower end of shaft 37 is closed by a plug 38 and rests upon the upper surface of pinion 26, i. e., the top of motor shaft 22, which forms a thrust bearing for shaft 37. Shaft 37 is mounted in spaced bearings 39 and 40 pressed into the upper and lower ends of a sleeve 41 which, at its lower end, is fixed in a flange 42 forming a part of the upper casing section 17. The upper end of sleeve 41 is above the normal wash water level in tub 1.

The upper end of shaft 37 is threaded to receive an agitator nut 43 having a triangular tapered

outer surface. Agitator 5 is of known construction, it being provided with a base 44, agitator blades 45, and a vertical post 46 which at its upper end is provided with a tapered opening 47 which fits over agitator nut 43 and is held thereon by a nut 48 threaded onto the upper end of shaft 37. Thus, the agitator is rigidly connected to shaft 37.

On the top wall 29 of the gear cage is a hub 49 having an opening in which is positioned a bearing 50 for shaft 37, there being a bearing and spacing ring 51 between bearing 50 and bearing 40.

Fixed to diaphragm 24 is a stationary brake ring 52 adapted to be engaged by brake facings 53 on the downturned ends 54 of a pair of sliding brake arms 55. Brake arms 55 are in the form of flat U-shaped plates (see Fig. 6) which at their edges are supported on ledges 56 (Fig. 8) and slide in grooves 57, the ledges and grooves being provided by plates 58 attached to the underside of the bottom wall 30 of gear cage 31 by suitable fastening means 59. Brake facings 53 are biased into engagement with the outer surface of brake ring 52 by springs 60 attached at their ends to inturned wings 61 at the extremities of depending ears 62 fixed to arms 55. They are moved from engagement with brake ring 52 by short levers 63 having ends 64 which are pivoted in openings 65 in ears 62. The shoulders at the opposite sides of ends 64 engage ears 62 at the ends of openings 65 to limit movement of ends 64 with respect to the ears. Levers 63 are biased to angular positions as shown in Fig. 2 by springs 66, movement of the levers being limited by ends 64 engaging the edges of openings 65. Levers 63 are arranged to be turned on their pivots to move brake facings 53 out of engagement with brake ring 52 by a sliding clutch collar 67 having a curved outer face adapted to engage similarly curved clutch pads 68 fixed to and carried by the free ends of levers 63. Pads 68 may be formed of any suitable clutch material. Clutch collar 67 surrounds and slides on motor shaft 22, being positioned beneath pinion 26. It is attached to shaft 22 by a pin 69 which extends through an elongated slot 70 in shaft 22, the slot being of a length to permit of the desired movement of clutch collar 67. The clutch collar is biased to a position wherein pin 69 engages the upper end of slot 70 by a coiled spring 71 located between the bottom of a socket 72 in shaft 22 and the lower end of a plug 73 located in socket 72 and having an opening through which pin 69 passes. Clutch collar 67 is actuated by an operating rod 74 which extends down through tubular shaft 37 and at its lower end engages the top of plug 73. The upper end of rod 74 projects beyond the upper end of shaft 37 and is provided with suitable means for moving it axially to actuate clutch collar 67. In the present instance, this means is shown as being in the form of a nut 75 attached to the end of rod 74 and engaging threads at the top of the agitator post so that by screwing the nut down or up, the rod may be lowered and raised. However, any suitable means may be used for actuating the rod.

The bottom wall 76 of basket 4 is dished inwardly and upwardly at its central portion, as is indicated at 77, and terminates in a sleeve 78 provided on its outer surface with a pressed on bearing 79 for the lower end of the agitator post 46. On its inner surface sleeve 78 is provided with upper and lower pressed-in bearings 80 which engage stationary sleeve 41, the basket being thus mounted for turning on sleeve 41.

Between lower bearing 80 and the top of flange 42 is a thrust washer 80a.

In the bottom wall 76 of spin basket 4 is an arcuate slot 81 (see Fig. 7) in which is located a pin 82 attached to agitator 5. On the pin is a sleeve 83 of suitable resilient material such as rubber, which stands in slot 81 and is adapted to engage its ends.

Spin basket 4 is provided with perforations 84 for flow of water to and from the interior of the basket. The tub is provided with two drain hoses, a drain hose 85 connected with the bottom of the tub and a drain hose 86 connected with the tub at a point somewhat below the bottom of basket 4. The hoses may be supported in vertical positions as shown in Fig. 1 by suitable clips 87 adjacent to the top of the tub. At 88 is a pipe through which lubricant may be discharged to lubricate the gearing, it being circulated through the pipe by suitable means (not shown) from a lubricant supply sealed in the casing 6.

For washing, the tub is filled with washing solution to a level about even with the top ring of holes 84 and the clothes to be washed are placed in the spin basket.

The mechanism for the agitator and the spin basket operates as follows:

Normally the parts stand in the positions shown in Fig. 2, clutch collar 67 being out of engagement with clutch levers 63 and brake facings 53 being held in engagement with brake ring 52 by springs 60. Spring 71 serves to hold clutch collar 67 in the position shown with pin 69 in engagement with the upper end of slot 70. The brake arms 55 serve to hold gear cage 31 stationary. Now when the motor is operating, agitator 5 will be oscillated through pinion 26, gear 27, and eccentric 32. Slot 81 is of a length slightly greater than the stroke of the agitator and during the washing period, pin 82 moves back and forth in slot 81, the basket being stationary due to its inertia and to water friction; or if desired, suitable means may be provided for holding it stationary during the washing period.

At the end of the washing period, the motor is stopped and the washing solution is drained from tub 1 by hose 86 to lower the level of the water in the tub to the point at which hose 86 connects with the tub. This brings the level below the spin basket to an extent such that a space is provided sufficient to hold the water to be extracted from the clothes without bringing the level up to the bottom of the spin basket. At this level, considerable water is left in the bottom of the tub to form ballast to assist in holding the tub stationary during the spinning operation. Following this, nut 75 is screwed down, forcing rod 74 down against plug 73 and lowering the plug and clutch collar 67 against the bias of spring 71. Clutch collar 67 engages clutch facings 68 on levers 63 and turns the levers on their pivotal connections in ears 62. The arrangement forms in substance a toggle lever, and as clutch collar 67 moves down, turning the levers 63, plates 55 are moved radially outward against the action of springs 60, moving brake facings 54 from engagement with stationary brake ring 52. At the same time, clutch collar 67 connects motor shaft 22 to gear cage 31 through the intermediary of clutch facings 68 and plates 55. Now, when the motor is operated, shaft 22 rotates shaft 37 through the intermediary of clutch collar 67, levers 63, arms 55 and gear cage 31, the gear cage and the gearing therein rotating as a unit. The

spin positions of the parts are shown in Fig. 3. As shaft 37 begins to rotate, sleeve 83 engages an end of slot 81 to effect rotation of the spin basket, the agitator and spin basket rotating as a unit.

When the spinning operation is completed, the motor circuit may be opened to permit the spin basket to come to rest, after which nut 75 may be turned to lift rod 74 to effect movement of clutch collar 67 from engagement with clutch facings 68 and permit brake facings 53 to again engage brake ring 52, thus restoring the parts to their initial positions.

It will be noted that the same springs 60 function to apply both the brake force and the clutch force, and that the clutch force increases as the toggle levers are straightened due to the stretching of springs 60. This enables the clutch surfaces to be engaged with a force ample to effect the drive. Application of either the brake or the clutch does not contribute any side thrust to the gear cage in relation to the motor shaft due to the fact that the springs act directly between the brake shoes. This is a desirable feature, since side thrust may cause gear noise and wear as well as higher friction losses.

The arrangement provides a self contained unit which is relatively simple in structure, compact, and reliable in operation. And the toggle lever arrangement enables the mechanism to be readily shifted from agitate to spin, and vice versa, the shifting being positive and effected with no clashing and no agitating at the start of the spin cycle.

In the present instance, the mechanism is shown as being embodied in a machine utilizing a single shaft 37 through which agitation and spin are effected. It is to be understood, however, that the invention may be embodied in machines having other shaft arrangements such as, for example, the known concentric shaft arrangement wherein the agitator and the spin basket have separate shafts.

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

1. For use in a clothes washing machine or the like of the type disclosed, a shaft and means for either oscillating or rotating the shaft comprising a casing into which the shaft projects, a gear cage rotatably mounted in the casing, an electric motor, gearing carried by the cage which connects the motor to said shaft for oscillating the shaft, means defining brake surfaces on said casing, sliding brake members on said gear cage, spring means biasing said brake members toward engagement with said brake surfaces, toggle lever means for sliding said brake members with respect to said brake surfaces against the action of said biasing spring means, clutch surfaces on said toggle lever means, a clutch collar connected with the motor shaft, and means for moving the clutch collar into engagement with said clutch surfaces for moving said toggle lever means.

2. For use in a clothes washing machine or the like of the type disclosed, a shaft, and means for either oscillating or rotating the shaft comprising a casing into which the shaft projects, a gear cage rotatably mounted in the casing, an electric motor, gearing carried by the cage which connects the motor to said shaft for oscillating the shaft, a brake ring on said casing, sliding brake members on said gear cage, spring means biasing said brake members toward engagement with said brake ring, toggle lever means for sliding said brake members with respect to said brake ring against the action of said biasing

spring means, clutch surfaces on said toggle lever means, a clutch collar slidable axially on and connected with the motor shaft, and means for sliding the clutch collar into engagement with said clutch surfaces for moving said toggle lever means to move the brake members out of engagement with said brake ring and connect the motor shaft through the clutch to said gear cage.

3. For use in a clothes washing machine or the like of the type disclosed, a tubular shaft, and means for either oscillating or rotating the shaft comprising a casing into which the shaft projects, a gear cage rotatably mounted in the casing, an electric motor, gearing carried by the cage which connects the motor to said shaft for oscillating the shaft, means defining brake surfaces on said casing, radially slidable brake members on said gear cage, spring means biasing said brake members radially inward toward engagement with said brake surfaces, toggle lever means for sliding said brake members radially outward from engagement with said brake surfaces against the action of said biasing spring means, clutch surfaces on said toggle lever means, a clutch collar which surrounds and is slidable axially on the motor shaft and is connected thereto, and a rod which extends down through said tubular shaft for moving the clutch collar axially on the shaft into engagement with said clutch surfaces for moving said toggle lever means to release said brake members and connect the motor shaft through the clutch to said gear cage.

4. For use in a clothes washing machine or the like of the type disclosed, a driven shaft, and means for either oscillating or rotating the driven shaft comprising a casing into which the driven shaft projects, a gear cage rotatably mounted in the casing, a driving shaft, gearing carried by the cage which connects the driving shaft to said driven shaft for oscillating the driven shaft, a brake ring on said casing, radially slidable brake members on said gear cage, spring means biasing said brake members toward engagement with said brake ring, levers pivoted at their outer ends on the brake members for sliding said brake members with respect to said brake ring against the action of said biasing spring means, clutch surfaces on the inner ends of said levers, a clutch collar connected with and axially slidable on the shaft, and means for moving the clutch collar into engagement with said clutch surfaces for moving said levers.

5. For use in apparatus of the character described, mechanism comprising a rotatably supported gear cage, gearing carried by the cage, a driving shaft connected to the gearing, brake means for holding said gear cage from turning, toggle lever means carried by the gear cage for releasing said brake means, a clutch face on said toggle lever means, a clutch member connected to and slidable axially on said driving shaft, and means for moving said clutch member into engagement with said clutch face to move the toggle lever means to effect release of said brake means and connection of the driving shaft to the gear cage.

6. For use in apparatus of the character described, mechanisms comprising a rotatably supported gear cage, gearing carried by the cage, a driving shaft connected to the gearing, a stationary brake ring, radially movable brake members carried by said gear cage, spring means biasing said brake members into engagement with the brake ring to hold said cage from turning, levers pivoted on said brake members and provided with

clutch surfaces, a clutch ring connected to and slidable axially on said driving shaft, and means for moving said clutch ring into engagement with said clutch surfaces to turn the levers to move the brake members from engagement with the brake ring and connect the driving shaft to the gear cage.

7. For use in apparatus of the character described, mechanism comprising a rotatably supported gear cage, gearing carried by the cage, a driving shaft connected to the gearing, brake means for holding said gear cage from turning, pivoted levers carried by the gear cage and movable on their pivots to release said brake means, clutch faces on said levers, a clutch member slidable axially on said driving shaft, means connecting the clutch member to the driving shaft, and means for moving said clutch member into engagement with said clutch faces to move the levers to effect release of said brake means and connection of the driving shaft to the gear cage.

8. For use in a washing machine or the like for effecting an oscillating and a spinning operation, mechanisms comprising a rotatably supported gear cage, gearing carried by the cage, a driving shaft connected to the gearing, brake means normally holding said gear cage from turning whereby the driving shaft may actuate the gearing, lever means carried by the gear cage for releasing said brake means, a clutch face on said lever means, a clutch member connected to and slidable axially on said driving shaft, and means for moving said clutch member into engagement with said clutch face to move the lever means to effect release of said brake means and connection of the driving shaft to the gear cage whereby the driving shaft may rotate the gear cage and gearing as a unit.

9. For use in a washing machine or the like for effecting an oscillatory and a spinning operation, mechanisms comprising a rotatably supported gear cage, gearing carried by the cage, a driving shaft connected to the gearing, means providing a stationary brake surface, radially movable brake means carried by said gear cage, spring means biasing said brake means into engagement with the brake surface to hold said cage from turning whereby the driving shaft may actuate the gearing, lever means pivoted on said brake means and provided with a clutch surface, a clutch member connected to and slidable axially on said driving shaft, and means for moving said clutch member into engagement with said clutch surface to turn the lever means to move the brake means from engagement with the brake ring and connect the driving shaft to the gear cage whereby the driving shaft may rotate the gear cage and gearing as a unit.

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No references cited.