

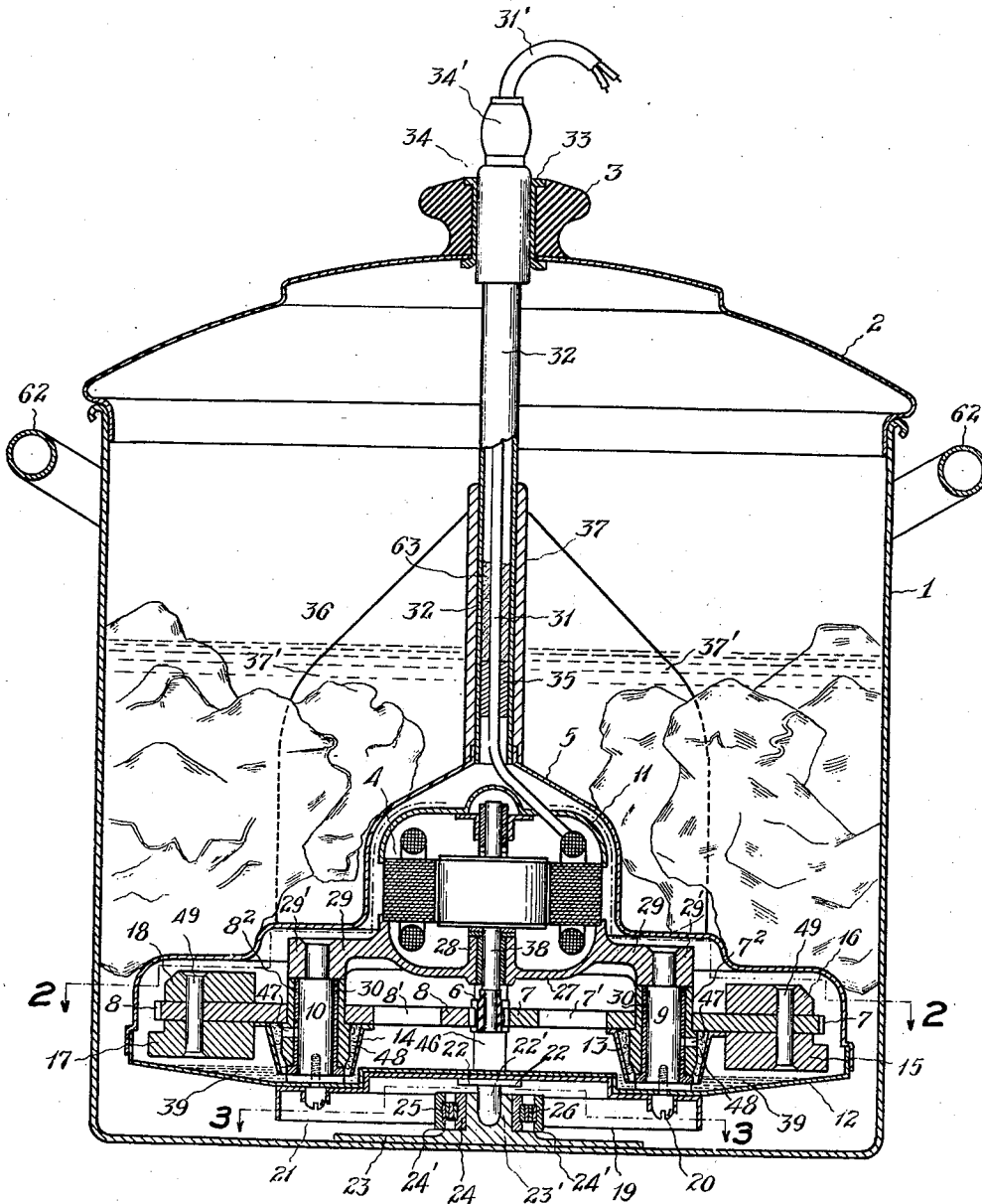
Aug. 27, 1940.

P. E. BARKER
MECHANICAL MOVEMENT

2,212,872

Original Filed April 3, 1935

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

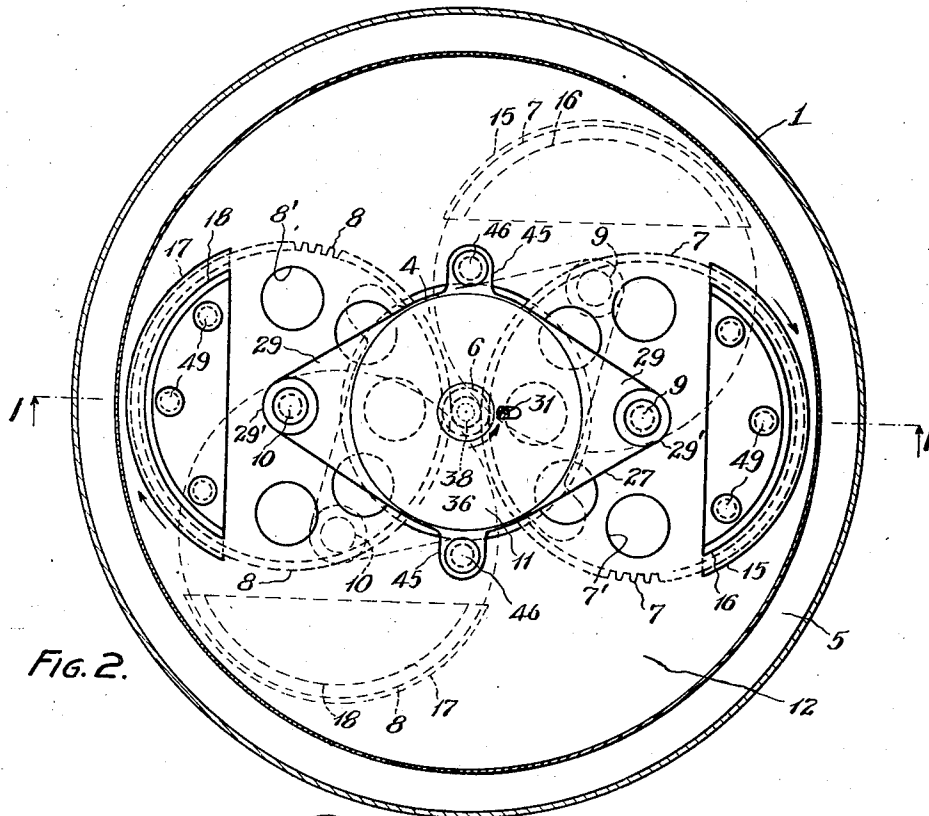


FIG. 2.

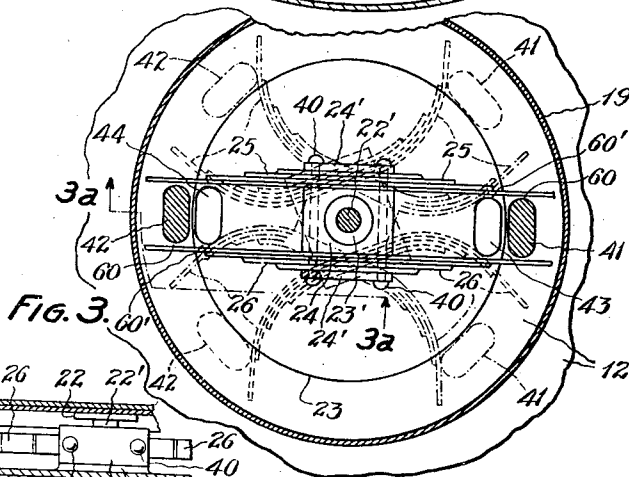


FIG. 3.

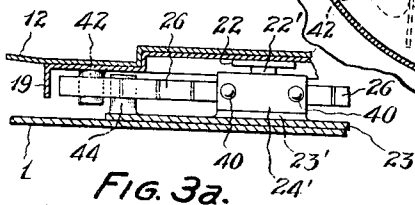


FIG. 3a.

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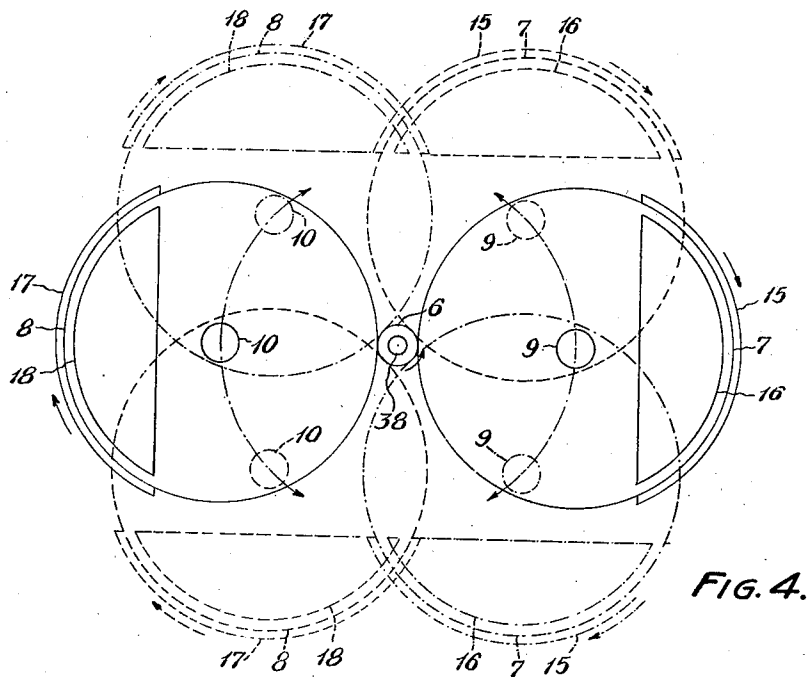
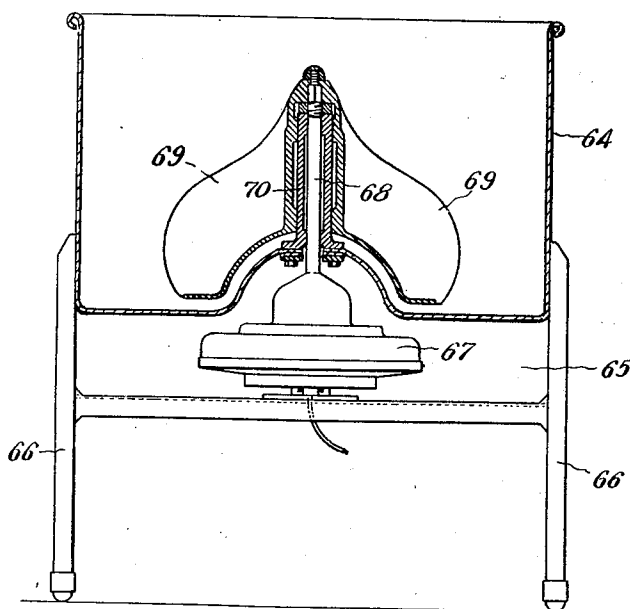
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MECHANICAL MOVEMENT

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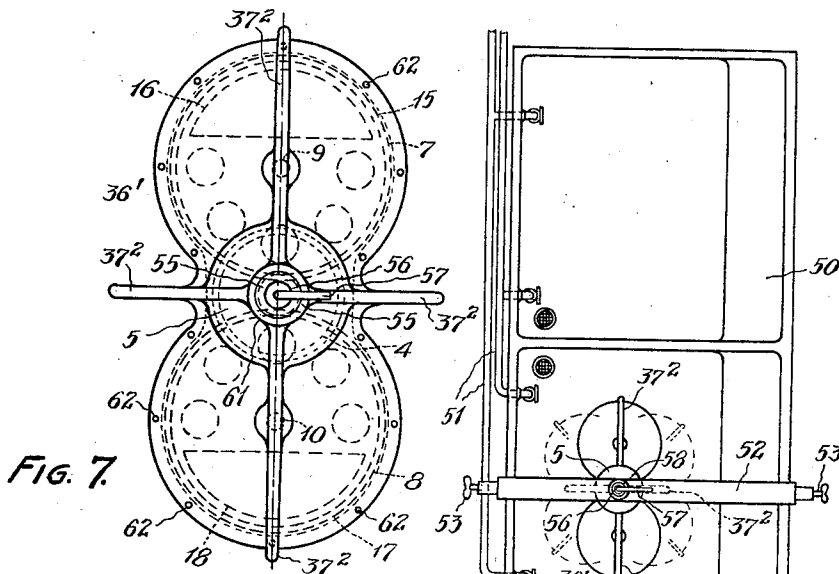
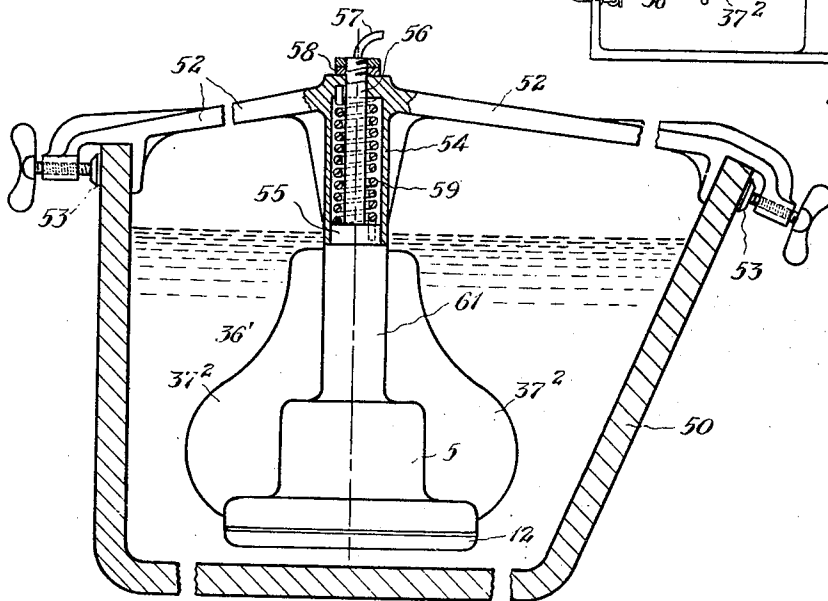


FIG. 6.

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UNITED STATES PATENT OFFICE

2,212,872

MECHANICAL MOVEMENT

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Original application April 3, 1935, Serial No. 14,464. Divided and this application January 13, 1939, Serial No. 250,791

15 Claims. (Cl. 74—70)

My invention particularly relates to improvements in mechanical movements, and the subject matter claimed in the instant application is a division of my pending application Serial No. 14,464, filed April 3, 1935, entitled "Washing machines."

The structure and functioning of the improved mechanical movement claimed in the instant application are illustrated by the use thereof in a washing machine of the agitator type in which the washing operation is performed by forward and backward movements of gyrator vanes which cause washing turbulence in the washing fluid. It will be noted that in this illustration of the claimed subject matter a gyrator assembly is provided in which all linkage and crank elements are eliminated and which, preferably, is wholly located in the washing tub or chamber. The gyrator assembly, which includes the new and improved mechanical movement, comprises a motor and its housing, gearing and other mechanism necessary to effect the movements and reversals of gyrator vanes, and an assembly casing, all as one compact unit which can be economically manufactured and assembled, and which, after being assembled, will be hermetically sealed, and in which all moving parts work in oil which is enclosed and protected from pollution by dust and injurious gases.

The illustrated structure and functioning of the improved mechanical movement includes also illustrative means for controlling the character of the action induced by the functioning of the movement, the particular illustrative controlling means being adapted to cushion the energy that is generally abruptly expended and comparatively slowly recovered in starting and stopping an agitator incident to the periodic reversals of the directions of movement of the agitating vanes.

Other and related objects of my invention will appear from the detailed description of the construction and operation thereof hereinafter given, by reference to the accompanying drawings.

The annexed drawings and the following description set forth in detail certain means embodying my invention, such means constituting, however, but three of the various mechanical forms in which the principle of the invention may be illustrated.

In said annexed drawings:

Figure 1 is a central vertical section of a portable type of washing machine embodying my improved mechanical movement, and in which the

entire gyrator assembly is located in the washing chamber, the figure being taken in the plane indicated by the line 1—1, Figure 2;

Figure 2 is a horizontal section, taken in the planes indicated by the line 2—2, Figure 1, one of the extreme positions taken by certain elements, incident to the reversing action, being shown in broken lines;

Figure 3 is a broken horizontal section, taken in the planes indicated by the line 3—3, Figure 1, two extreme positions of certain spring elements and related parts during the reversing actions of the gyrator being shown in broken lines and in dot-and-dash lines, respectively;

Figure 3a is a fragmentary central vertical section, taken in the planes indicated by the line 3a—3a, Figure 3;

Figure 4 is a diagrammatic view illustrating the effect upon certain movable bearings of certain weights eccentrically secured to certain rotating parts of my gyrator assembly, the weights cooperating with certain spring members which alternately assist and oppose the movements of the bearings which are induced by the inertia of the eccentrically mounted rotating weights;

Figure 5 is a fragmentary central vertical section of another form of washing machine embodying my improved mechanical movement and in which the agitator actuating mechanism is located in a chamber separate from the washing chamber;

Figure 6 is a central vertical section, partially in elevation, of a form of washing apparatus embodying my improved mechanical movement which is applied to a compartment of a standard laundry tray;

Figure 7 is a plan view of the gyrator assembly shown in Figure 6; and

Figure 8 is a plan view of two compartments of a laundry tray in one of which is mounted a gyrator assembly embodying my improved mechanical movement, certain extreme positions assumed by the assembly during the reversing actions being indicated in broken lines.

Referring to the annexed drawings in which the same parts are indicated by the same respective numbers in the several views, and particularly referring to Figures 1, 2, 3, 3a, and 4, a tub 1, which may be any suitable vessel of practicable size and material, serves as a washing chamber, and is provided with a close fitting cover 2 having an exterior central knob portion 3 forming a support for an upper bearing 33. The tub 1 is provided with handles 62. Within

this tub, I position a gyrator assembly 36 which is adapted to turn in the upper bearing 33 and in a lower opposed bearing 23' formed in an upwardly extension of a base plate 23 secured to the inner wall of the bottom of the tub 1. A plate 22 is secured to the bottom of the gyrator casing and is formed with a downwardly-extended trunnion 22' which is journaled in the bearing 23'. The gyrator assembly includes an enclosed outer casing comprised of a saucer-shaped base member 12 upon which is erected an upper member 5 which converges inwardly and upwardly and at its upper central portion merges into a tube 32 extended upwardly through a sleeve 34 which is journaled in the upper bearing 33. The tube 32 is provided with an electric socket (not shown) which is adapted to removably accommodate a plug 34' in which are secured electric conductors 31'. Downwardly extended through the tube 32 and through a plug 35 tightly fitted within the tube 32 and disposed adjacent the bottom of the tube are electric conductors 31 running to a motor 4, the motor being of suitable R. P. M. to effect, through the speed reduction gearing used, to and fro movements of the gyrator vanes at a washing frequency, which frequency, as is well known, is comparatively low as compared with a vibrating frequency. The conductors 31 above the plug 35 and within the tube 32 are enclosed by an airtight sleeve 63 of sealing wax. Mounted upon the upper casing member 5 and exteriorly of the tube 32 and tightly fitted to the latter is an elongated hub 37 to which are secured the inner edges of a plurality of spaced agitator vanes 37'.

The motor 4 is formed with and secured to a cover member 11 and a base member 27, from the center of the latter of which a boss 28 extends upwardly and forms a bearing for a downwardly-extended motor shaft 38. The motor base member 27 is formed with outwardly-extended diametrically-opposed portions 29 having downwardly-extended tubular bosses 29' within which pins 9 and 10 are dependently secured. These pins 9 and 10 are enclosed in bushings 30 which form journals for a pair of elongated hubs 7² and 8² secured respectively to horizontally-spaced gears 7 and 8 which engage at their inner adjacent edge portions with the opposite sides of a pinion 6 secured to the lower end of the motor shaft 38. The bodies of these gears 7 and 8 are formed with a plurality of spaced openings 7' and 8' in order to reduce their weight. The motor base member 27 is also formed with diametrically-opposed ears 45, Figure 2, spaced ninety degrees from the bosses 29' and forming supports for downwardly extending pins 46, Figures 1 and 2, which bear upon the casing member 12 and assist in supporting the motor 4.

The motor and gearing are secured to the casing comprised of the members 12, 5, and 32 by means of pins 20 and 21 secured in and downwardly extended from the pins 9 and 10, respectively, and passing through the casing member 12. These pins 20 and 21 also secured to the lower surface of the casing member 12 an inverted saucer-shaped plate 19. Projecting downwardly from, and secured to, the plate 19 are a pair of diametrically-opposed lugs 41 and 42, Figures 3 and 3a, whose function will be later described.

From the foregoing description and the accompanying drawings, it is evident that the axes of the bearing pins 9 and 10 for the gears 7 and 8 are not fixed but, if means are provided

for swinging them to and fro in arcs having centers concentric with the axis of the motor shaft 38, they are free so to swing, and that such swinging movements will be communicated to the gyrator assembly including the casing 12, 5, and 32, and vanes, the motor, and the plate 19. I shall now describe means for effecting such swinging movements.

Secured to the gears 7 and 8, and adjacent the peripheries thereof, and to symmetrically disposed portions thereof, are weights 15—16—17—18, the weights being in opposed pairs 15—16 and 17—18, respectively, fastened to the top and bottom faces of the gears 7 and 8 by rivets 49. When the gears 7 and 8 are rotated from a starting position such as illustrated, for instance, by the full line showing thereof in Figures 2 and 4, and the motor shaft 38 turns in a counter-clockwise direction, the gears 7 and 8 turn in a clockwise direction, and the weights 15—16—17—18 move toward the positions shown therefor in dot-and-dash lines in Figure 4, the tangentially-directed forces created by the weights tending to move the axes of the bearing pins 9 and 10 in arcs having the axis of the motor shaft 38 as a center and in clockwise direction, Figures 2 and 4. This tendency of the pins 9 and 10 so to be moved continues until the rotation of the gears 7 and 8 has carried the weights through a sufficient arc to reverse the direction in which the tangentially-directed forces created by the weights tend to move the axes of the pins 9 and 10. Then, until the continued rotation of the gears 7 and 8 has again reversed the direction of the throw induced by the inertia of the weights, the weights 15—16—17—18 and the gears 7 and 8 move toward the positions shown therefor in broken lines, Figure 4, and the axes of the pins 9 and 10 move in the arcs in a counter-clockwise direction. These cycles are periodically repeated by the continued rotation of the gears 7 and 8, and the axes of the pins 9 and 10 move back and forth in the paths of the two arcs shown in Figure 4 and, consequently the whole gyrator assembly 36, including the vanes 37', will have to and fro oscillating movements.

I provide means for intensifying the strokes of the vanes 37' in an assembly such as thus far described, and for cushioning or equalizing the energy that would be expended in such an assembly in stopping the pins 9 and 10 and the related elements in one direction of movement and in starting the movement of these pins and elements in the other direction. These means will now be described.

Journaled upon the upwardly-extended bearing 23' of the base plate 23 is an inner spring block 24 between which and outer spring blocks 24', and to which inner and outer spring blocks, are secured by means of rivets 40 two leaf spring assemblies 25 and 26. The lugs 41 and 42 which have been mentioned as extended downwardly from the plate 19 extend downwardly slightly further than the springs 25 and 26 and are disposed between the latter adjacent their ends so that the springs 25 and 26 will intercept these lugs 41 and 42 when the plate 19 is turned incident to the reciprocatory movements of the gyrator assembly. The lugs 41 and 42 are of a horizontal length slightly less than the distance between the opposed inner leaves of the springs 25 and 26, as clearly indicated in Figure 3 by the space "66". There are other lugs 43 and 44, a pair of them and diametrically opposed, projected upwardly from the stationary base member 23, and

lying, normally, adjacently interiorly of the movable lugs 41 and 42. These fixed lugs 43 and 44 are disposed between the opposed springs 25 and 26 so as also to contact with the inner long leaves of the springs 25 and 26, after a slight movement of the latter from their normal positions, the amount of such slight movement being represented by the space 68', Figure 3.

From the foregoing, it is evident that the reciprocatory movements of the gyrator assembly will cause the lug 41 to engage and move an end of one spring 25, and the lug 42 to engage and move an end of the other spring 26, both spring movements being clockwise, if the direction of movement of the gearing is such as indicated by the dot-and-dash showing in Figure 4. However, the opposite ends of the respective springs cannot move clockwise, as is true of the ends first-mentioned, but are stopped and bent into symmetrically opposite positions, to those assumed by the first-mentioned spring ends, by the fixed lugs 44 and 43. The result is indicated in the dot-and-dash showing of Figure 3. If the gyrator assembly had been moved in the opposite direction to that just described, i. e., to the positions shown in broken lines in Figures 2 and 4, then the effect upon the springs 25 and 26 and the positions assumed by the latter would be those indicated in the broken line showings of Figure 3.

The operation of the aforementioned elements, and the effect upon the reversing of directions of movement of the vanes 37', are as follows:

When the gyrator assembly tends to move in counter-clockwise direction, for instance, Figure 4, the springs 25 and 26 are increasingly tensioned toward the position illustrated by the broken line showing of Figure 3, this tensioning of the springs continuing until the reactive forces of the springs 25 and 26 are equal to the tangentially-directed forces of the weights 15—16—17—18, by which time the rotation of the gears 7 and 8 has carried the weights to approximately the broken line positions shown in Figures 2 and 4. Then there is a dwell or rest period in the movement of the gyrator assembly in its reciprocatory path until the tangentially-directed forces of the weights tends to reverse the direction of movement of the gyrator assembly. During this dwell period the gears 7 and 8 continue to rotate and the tangentially-directed forces of the weights 15—16—17—18 are reversed in direction. As soon as these tangentially-directed forces tend to move the gyrator assembly in a direction the same as that in which the reactive forces of the tensioned springs 25 and 26 tend to move the gyrator assembly, then the weights and springs aggregate their impulses and snap the gyrator assembly toward the opposite end of its reciprocatory path of movement, or tend to so snap it. This induced snap action of the gyrator assembly is through an arc of about 90°, when the cycle has been repeated often enough to have built up the full accumulative effect of the springs 25 and 26. Thus, the action of the springs 25 and 26 not only gives the gyrator assembly a snap action and increases its speed of reciprocatory movement at the beginning of its stroke in one direction, but also slows up its movement at the end of the stroke in each direction and thus cushions or equalizes the energy which is expended in stopping the movement of the gyrator assembly in one direction and in starting its movement in the opposite direction, when the weights rotate by the centers

which define the changes of direction in which the tangentially-directed forces are exerted. This cushioning and smoothing out of energy application is occasioned, of course, by the resistance of the springs 25 and 26 to compression and by the reactive stresses exerted by the springs when they are freed from the forces tending to compress them.

I provide means for lubricating moving parts and enclose the same so that there is no contamination by dust and injurious liquids and gases. These means comprise open bottom cups or shells 13 and 14 downwardly extended from the main bodies of the gears 7 and 8 and spaced somewhat from the bottom ends of the bushings 30 so as to form oil cups from which by means of openings 47 in the bushings 30 and hubs 72 and 82 therefor the lubricant finds entrance to the moving surfaces, there being provided a felt and wick arrangement 48 for effecting the transfer of the lubricant. The lubricant is splashed up into the cups 13 and 14 by their movement with the gears 7 and 8 from an oil well 39 which is formed in the bottom of the casing member 12 and is filled to about the height of the bottom of the cups 13 and 14. The lubricant also travels upwardly and outwardly along the conical sides of the cups 13 and 14 due to the rotation of the gears 7 and 8.

In Figure 5, I disclose a form of washing apparatus embodying my improved mechanical movement in which the motor gearing, and related mechanism are disposed in the space 55 located exteriorly of and beneath the washing chamber of the tub 54 and between the legs 56 upon which the tub is supported. A casing 67 for the operating mechanism is formed with an elongated standard 63 which extends upwardly into the washing chamber of the tub 54 and is connected to an agitator of any desired style provided with vanes 69. The standard 63 is supported by and turns in an elongated bearing 70 mounted upon the inside face of the bottom of the washing chamber of the tub 54.

Referring particularly to Figures 6, 7, and 8, I therein disclose an adaptation of washing apparatus embodying my improved mechanical movement to a compartment of a standard laundry tray, in which "50" represents such compartment of a standard tub assembly which is supplied with hot and cold water through the pipes 51. For supporting my improved gyrator assembly 36' in such a tray compartment 50, I provide an upper cross bar 52 adapted to be tightly secured to the top of the compartment 50 by means of clamps 53. This bar 52 has an elongated downwardly-extended boss 54 interiorly of which and adjacent the bottom of which is mounted a cylindrical journal member 55 forming the top of the gyrator assembly 36'. Secured to the top of the journal member 55 is a tube 56 which extends upwardly through the bar 52 and forms a conduit for conductors 57 leading to the motor 4. Extending upwardly from the casing member 5 is a central vane support 61 to which are attached a plurality of outwardly extended spaced vanes 372. The journal member 55 projects upwardly from this vane support 61. Surrounding the conductor tube 56 is a coiled spring 59 secured at its upper end in the stationary member 52 and at its lower end in the journal member 55. The upper end of the tube 56 is exteriorly threaded and engaged by a nut 58 whereby the whole assembly can be locked in position, the nut 58 being adapted to turn freely

and smoothly upon the portion of the upper surface of the bar 52 with which it contacts. Such turning is caused by the turning of the tube 56 and the journal member 55 in the boss 54, and the turning of the vanes 37², and the motor 4, and the entire gyrator assembly, by means within the casing members 5 and 12 substantially identical with those described with reference to Figures 1, 2, 3, and 3a, except that the fixed base 23, the leaf springs 25 and 26, the cup-shaped member 19, and the related mechanism beneath the member 19, which are described and shown with reference to the form of washing apparatus shown in Figures 1, 2, 3, and 3a, are dispensed with in the form of washing apparatus shown in Figures 6, 7, and 8, and the effect of the springs 25 and 26 upon the swinging movements of the bearings 9 and 10 described with reference to Figures 1, 2, 3, and 3a, is accomplished in the form of washing apparatus shown in Figures 5, 6, and 7, by the spring 59. Also, in this form of the washing apparatus, the casing members 5 and 12 are secured together by countersunk screws 62, Figure 7. It is evident that the arcuate movement of the axes of the pins 9 and 10, under the action of the weights 15—16—17—18, will put the spring 59 under tension which will effect alternately a cushioning for, and a snapping of, the strokes of the vanes 36'.

The form of washing apparatus shown in Figures 6, 7, and 8, differs in one particular, in effect, from that shown in Figures 1, 2, 3, 3a, and 4, in that the spring 59 commences immediately to be put under tension, upon any movement of the gyrator assembly; whereas, there is some slight movement of the gyrator assembly, before the springs 25 and 26 are so acted upon, in the construction shown in Figures 1, 2, 3, 3a, and 4, because of the provision of the slight spaces 60 and 60', Figure 3, between the lugs 41, 42, 43, and 44, and the adjacent leaves of the springs 25 and 26.

What I claim is:

1. A mechanical movement comprising a fixed support and a movable support, a spring secured to the fixed support and also connected to the movable support so as to be tensioned or released by a movement of the latter, a motor and a gear driven thereby, said gear being centrally mounted relative to the movable support, bearing pins connected to the movable support so as to effect a movement of the latter when the bearing pins move, the bearing pins being symmetrically arranged relative to the gear, members respectively rotatable about the bearing pins and driven by the gear, and means moving the bearing pins alternately in opposite directions, said means being energized by the momentum of the rotating members.

2. A mechanical movement comprising a fixed support and a movable support, a spring secured to the fixed support and also connected to the movable support so as to be tensioned or released by a movement of the latter, a motor and a gear driven thereby, said gear being centrally mounted relative to the movable support, bearing pins connected to the movable support so as to effect a movement of the latter when the bearing pins move, the bearing pins being symmetrically arranged relative to the gear, and members respectively rotatable about the bearing pins and driven by the gear, said members being relatively symmetrically unbalanced so as to cause the centrifugal force created by the rotation of the

members to pull said bearing pins alternately in opposite directions in arcs of a circle having its center in the axis of said gear.

3. A mechanical movement comprising a prime mover establishing an axis of oscillation, a floating member rotatable on its own axis by said prime mover in a plane transverse to the planes containing said axis of oscillation, a weight secured to and eccentrically mounted on the rotatable member, means maintaining the axis of oscillation fixed, and means maintaining the axis of the rotatable member in a circle of which the axis of oscillation is a center.

4. A mechanical movement comprising a prime mover establishing an axis of oscillation, a plurality of floating members each rotatable on its own axis by said prime mover in a plane transverse to the planes containing said axis of oscillation, said members being symmetrically arranged around said axis of oscillation, and per se relatively symmetrically unbalanced, and means maintaining said rotatable members in fixed relative positions.

5. A mechanical movement comprising a prime mover establishing an axis of oscillation, a plurality of floating gears each rotatable on its own axis by said prime mover in a plane transverse to the planes containing said axis of oscillation, said gears being symmetrically arranged around said axis of oscillation, weights secured to and mounted on the several gears in such a manner that the latter are relatively symmetrically unbalanced, and means maintaining said gears in fixed relative positions.

6. A mechanical movement comprising a motor having a motor shaft establishing an axis of oscillation, a gear secured to the motor shaft, a pair of gears engaged by said first-mentioned gear, weights secured to and mounted on the respective gears, said weights being such as to render the gears symmetrically unbalanced, said weights, due to the rotation of the gears, traveling in circular paths transversely to planes containing the axis of oscillation, whereby the gears oscillate in arcs of circles having a center in said axis of oscillation, and means maintaining said gears in fixed relative positions.

7. A mechanical movement comprising a source of power establishing an axis of oscillation, a member rotatable by the source of power, said member being mounted to float around said axis of oscillation, means energized by the rotation of said member and imparting to the latter an orbital arcuate movement, means maintaining the axis of oscillation fixed, and means maintaining the axis of the rotatable member in a circle of which the axis of oscillation is a center.

8. A mechanical movement comprising a motor and motor shaft, a gear secured to the motor shaft, gears arranged in a common plane transverse to and about the motor shaft and driven by the first-mentioned gear, weights eccentrically mounted on the several last-mentioned gears, said gears and weights being of such several effective masses that the resultant of their combined centrifugal forces exerts no torque on the axis of the motor shaft, and means maintaining said gears in fixed relative positions.

9. A mechanical movement comprising a motor and motor shaft, a gear secured to the motor shaft, a pair of gears symmetrically arranged around the motor shaft and engaged by the first-mentioned gear, said pair of gears having axes of rotation that are parallel to the axis of the motor shaft, weights eccentrically mounted on

said pair of gears, and means maintaining said gears in fixed relative positions.

10. A mechanical movement comprising a motor and motor shaft, a gear secured to the motor shaft, opposed eccentrically-weighted gears rotatable by the first-mentioned gear, said opposed gears being mounted so as to cause their weights, when the gears are rotated, each to swing in circles lying in planes perpendicular to the motor shaft, and means maintaining said gears in fixed relative positions.

11. A mechanical movement comprising a prime mover establishing an axis of oscillation, a plurality of floating members each rotatable on its own axis by said prime mover in a plane transverse to the planes containing said axis of oscillation, said members being symmetrically arranged around said axis of oscillation, and per se relatively symmetrically unbalanced, means maintaining said rotatable members in fixed relative positions, and means for controlling the amplitude of the oscillatory strokes imparted to said floating members by the aforementioned elements.

12. A mechanical movement comprising a prime mover establishing an axis of oscillation, a plurality of floating members each rotatable on its own axis by said prime mover in a plane transverse to the planes containing said axis of oscillation, said members being symmetrically arranged around said axis of oscillation, and per se relatively symmetrically unbalanced, means maintaining said rotatable members in fixed relative positions, and springs intersecting the paths of the oscillatory movements imparted to said maintaining means by the aforementioned elements.

13. A mechanical movement comprising a prime mover establishing an axis of oscillation, a plurality of floating members each rotatable on its own axis by said prime mover in a plane transverse to the planes containing said axis of oscillation,

said members being symmetrically arranged around said axis of oscillation, and per se relatively symmetrically unbalanced, means maintaining said rotatable members in fixed relative positions, and means for periodically storing part of the energy induced by the aforementioned elements to slow down the resultant oscillatory movements of the floating members, said means alternately releasing the stored energy to speed up said oscillatory movements.

14. A mechanical movement comprising a prime mover establishing an axis of oscillation, a plurality of floating members each rotatable on its own axis by said prime mover in a plane transverse to the planes containing said axis of oscillation, said members being symmetrically arranged around said axis of oscillation, and per se relatively symmetrically unbalanced, means maintaining said rotatable members in fixed relative positions, and means for alternately accumulating and releasing the kinetic energy induced by the aforementioned elements periodically to vary the oscillatory movements of the floating members.

15. A mechanical movement comprising a prime mover establishing an axis of oscillation, a plurality of floating members each rotatable on its own axis by said prime mover in a plane transverse to the planes containing said axis of oscillation, said members being symmetrically arranged around said axis of oscillation, and per se relatively symmetrically unbalanced, means maintaining said rotatable members in fixed relative positions, and means for periodically storing part of the energy induced by the aforementioned elements to slow down the end of the resultant oscillatory movements of the floating members, said means alternately releasing the stored energy to speed up the beginning of said oscillatory movements.

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