Feb. 24, 1953 C. S. DAYTON 2,629,469

DRIVE MECHANISM FOR WASHING MACHINES AND THE LIKE

Filed March 26, 1949 2 SHEETS—SHEET 1

Fig.1.

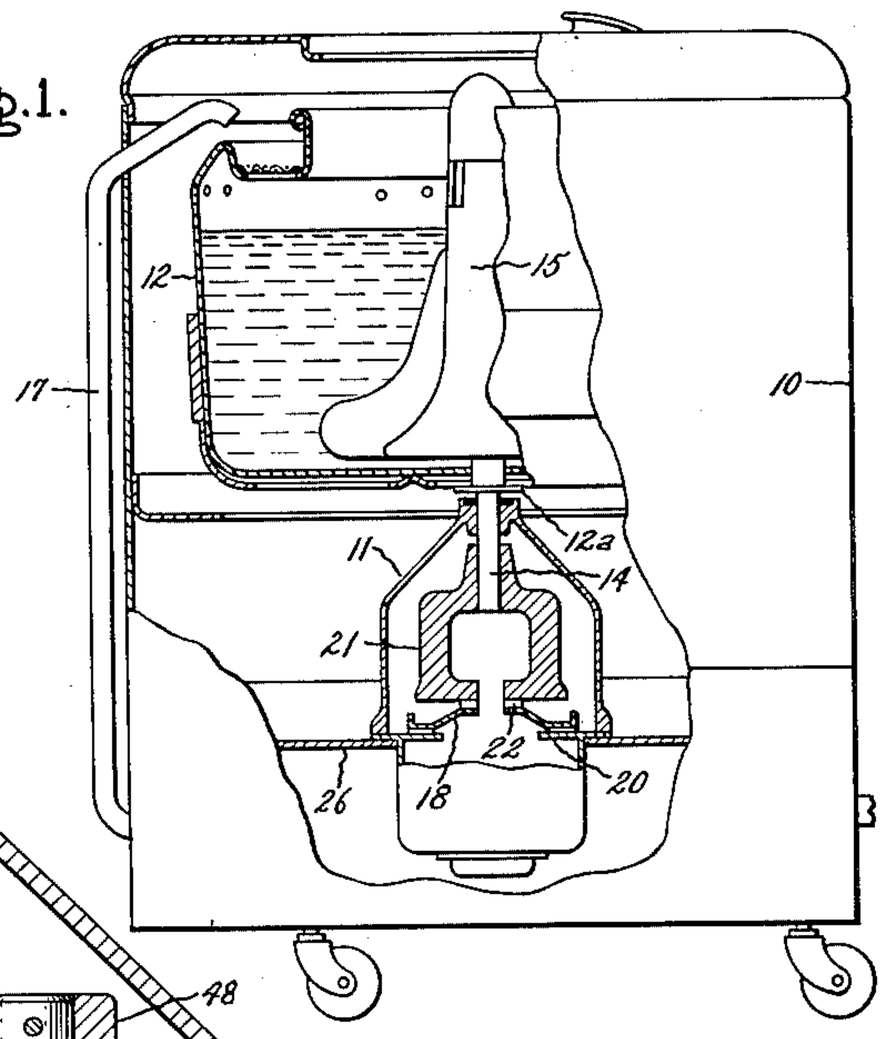

Fig.2.

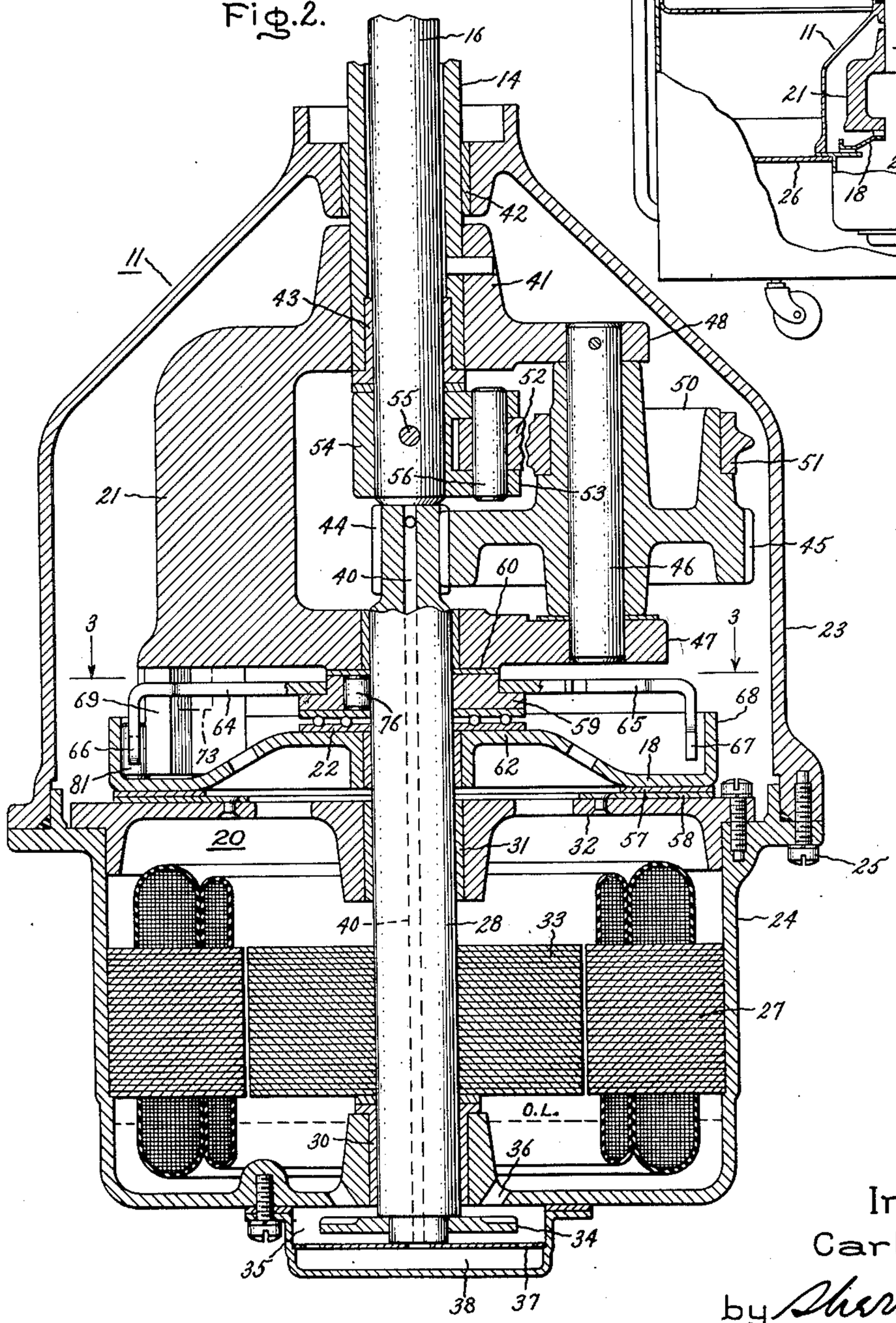

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Fig.3.

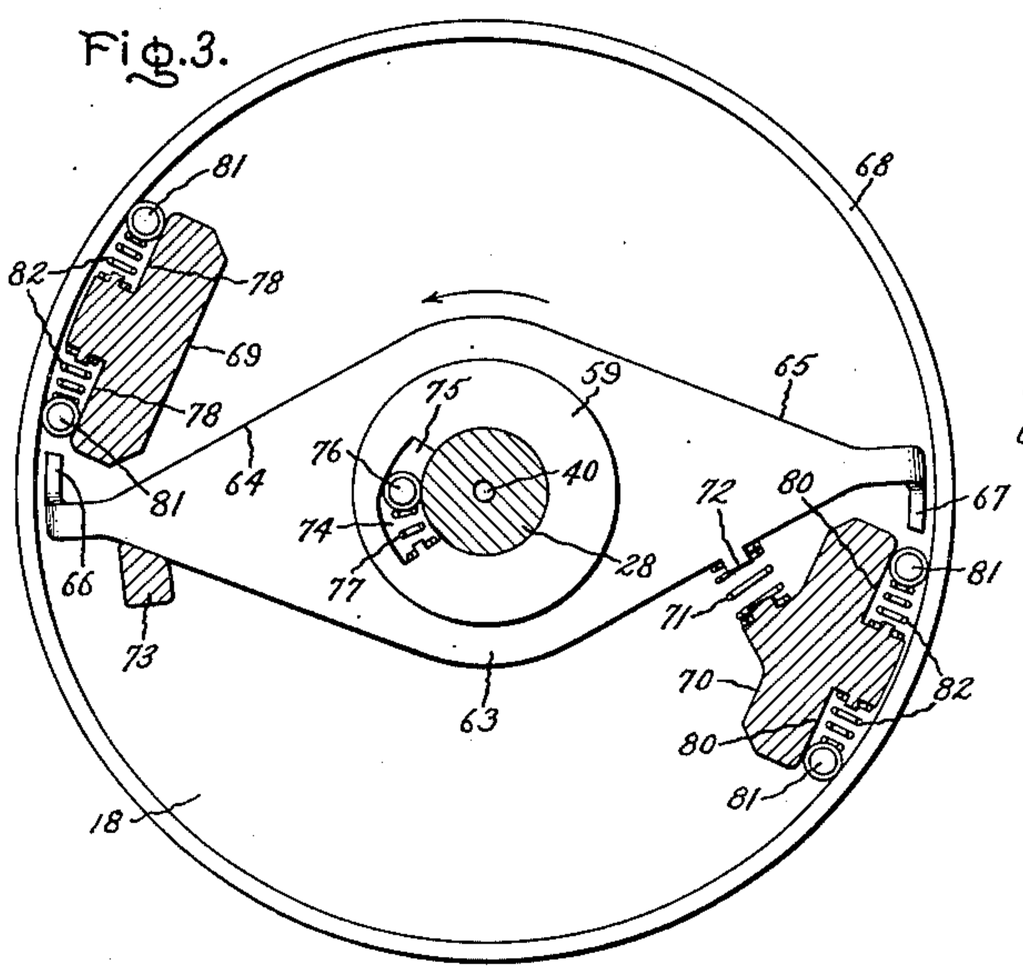


Fig.4.

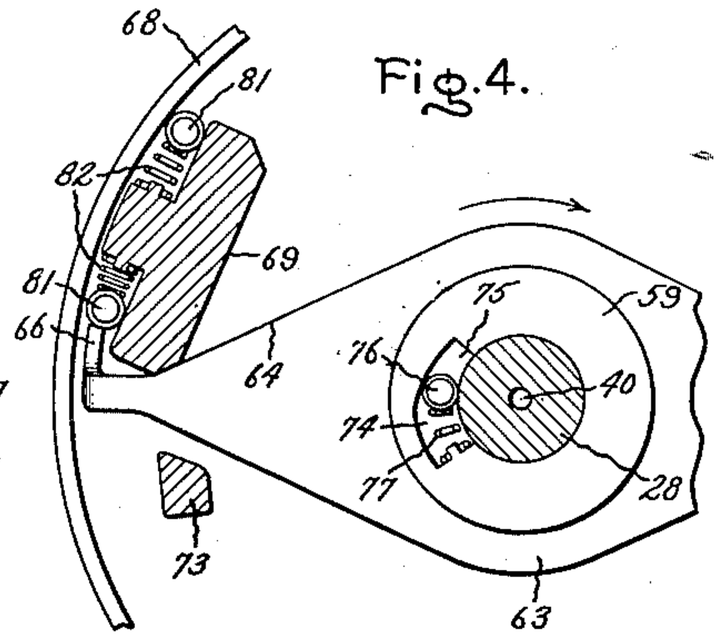


Fig.5.

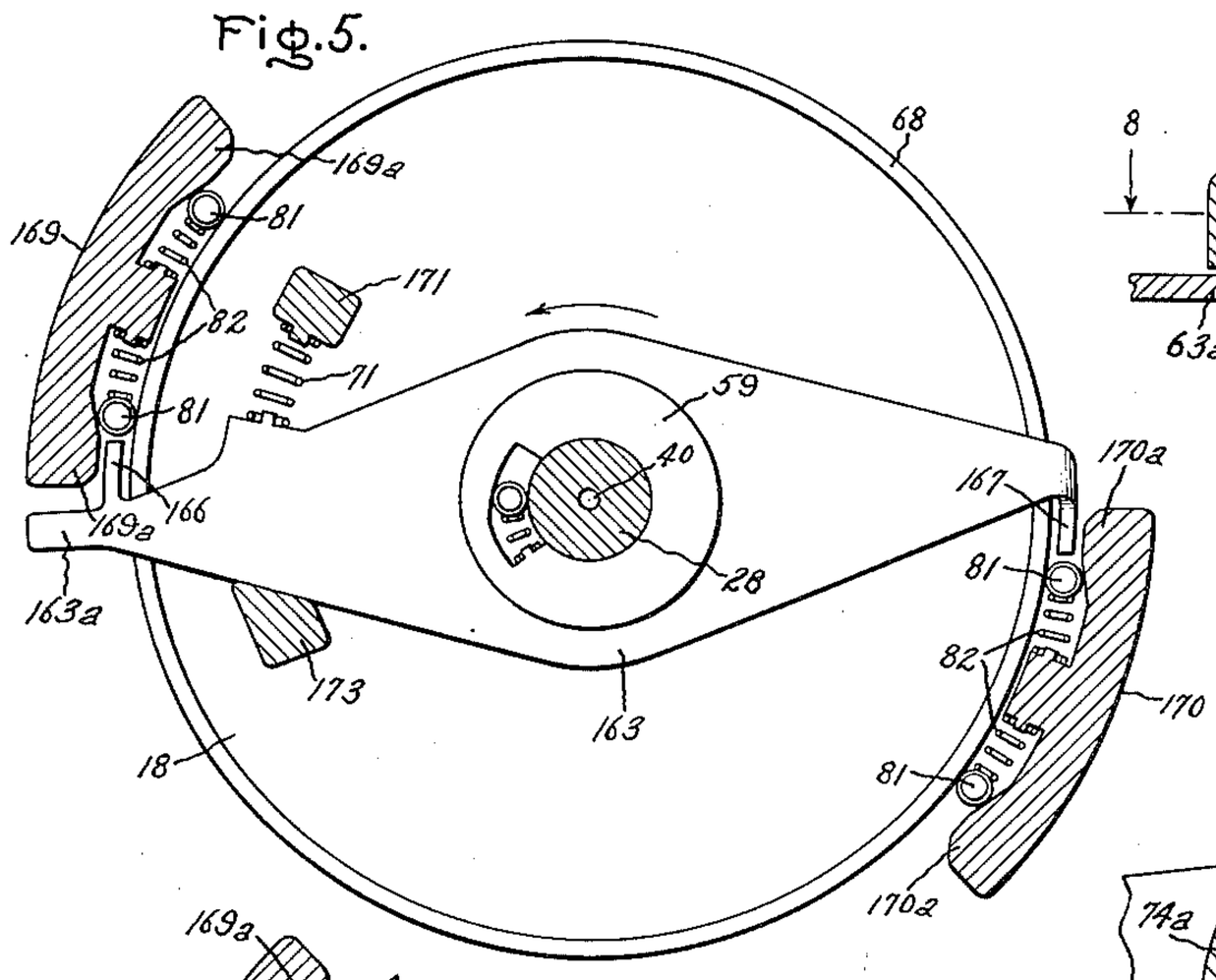


Fig.6.

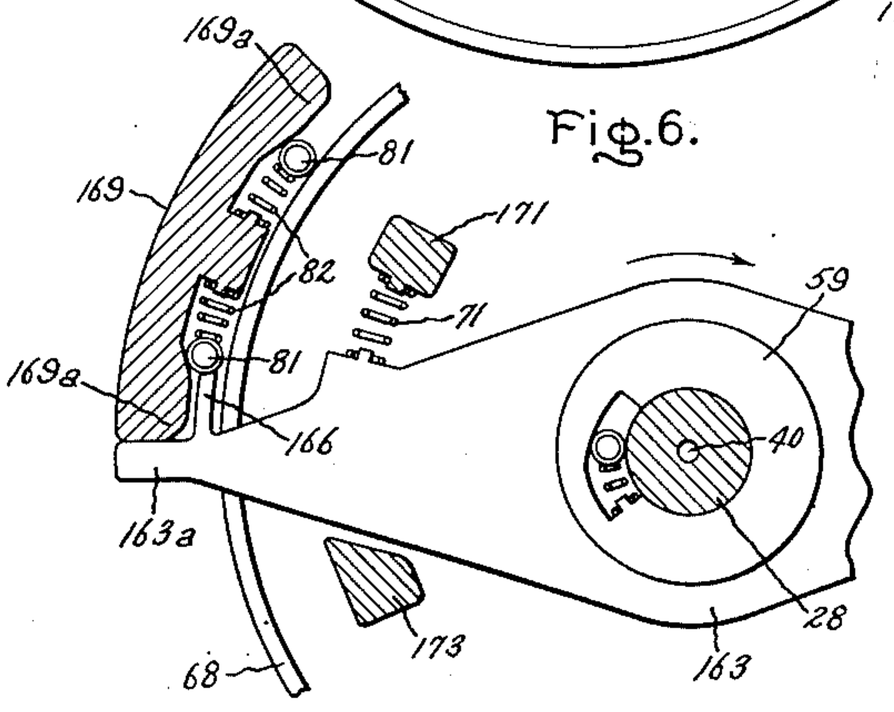


Fig.7.

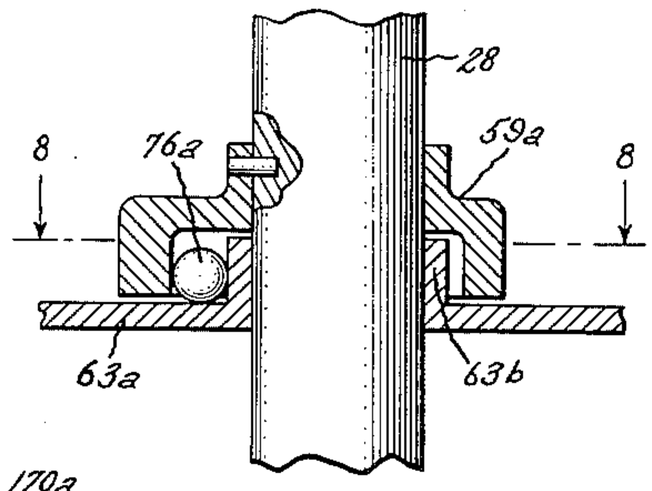
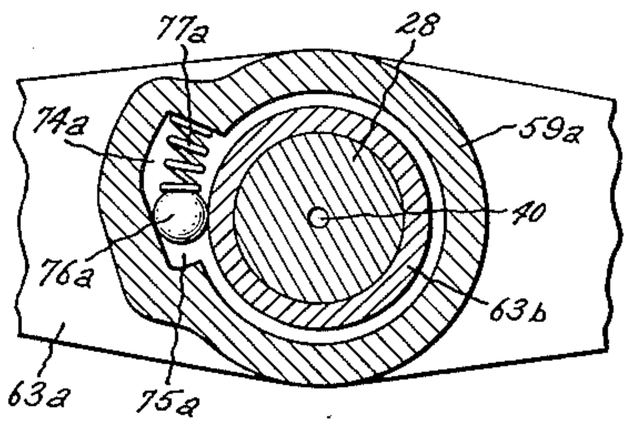


Fig.8.



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UNITED STATES PATENT OFFICE

2,629,469

DRIVE MECHANISM FOR WASHING MACHINES AND THE LIKE

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Application March 26, 1949, Serial No. 83,686

11 Claims. (Cl. 192—12)

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This invention relates to driving mechanisms for washing machines of the single basket type in which the clothes are washed and then spin dried, and has particular reference to an improved mechanism for effecting the transfer from the washing to the spin operations.

Well-known types of such washing machines have a clothes receptacle or basket suitably supported in a main framework for rotation on a vertical axis. A bladed agitator carried on a shaft concentric with the basket spin shaft projects into the basket, and by suitable mechanism, the basket is held stationary by application of a brake while the agitator rotates or oscillates to effect flexing and movement of the clothes within the washing fluid. When it is later desired to damp dry the clothes the agitator drive idles, the basket brake is released, and the basket is caused to spin. In one domestic washing machine, hydraulically actuated friction clutches are employed in the agitation and spin transmissions and hydraulic pressure is also used to release the brake when the basket is to be spun.

A principal object of the present invention is to reduce the manufacturing costs of the drive mechanisms for such washing machines while improving performance and reducing servicing problems, by simplification of the mechanism and reduction of the number of parts therein; by elimination of hydraulic pressure as a means for operating the clutch and brake systems; and by improving the braking system which holds the basket stationary during washing and stops it after its spin cycle. These and other features and objectives are accomplished herein by utilizing a reversible drive shaft in combination with over-running clutch mechanisms, in lieu of the conventional one-direction shaft and hydraulically energized clutch actuators. In addition to parts reduction, a practical advantage resulting from the invention, as compared to the hydraulic mechanism, is the reduction of oil pumping requirements merely to the generation of oil pressure sufficient to secure adequate circulation of lubricant, thereby correspondingly reducing the motor load. Additionally, the brake system may be simplified by utilizing the weight of the basket and its contents for application of the necessary braking pressure.

The advantages of the invention will be better understood from the following detailed description of a presently preferred embodiment thereof, taken in connection with the drawings in which:

Fig. 1 is a somewhat schematic illustration of a washing machine of the type with which the present invention is useful, said drawing schematically indicating the use of the weight of the spin basket and its contents in applying braking pressures;

Fig. 2 is a vertical sectional elevation of a

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drive mechanism embodying the present invention;

Fig. 3 is a plan view of a brake element and its therein housed drive mechanism, taken in section on lines 3—3 of Fig. 2;

Fig. 4 is a fragmentary view similar to Fig. 3 but showing the operation of the drive mechanism during the spin stage of operation;

Figs. 5 and 6 are views respectively similar to Figs. 3 and 4 but showing a slightly different mechanical arrangement of the drive mechanism;

Fig. 7 is a sectional elevation of a second form of clutch at the main drive shaft; and

Fig. 8 is a plan section taken on lines 8—8 of Fig. 7.

Referring now to Fig. 1, a washing machine comprises an external casing 10 within which is secured a housing 11 for the motor and drive unit. A basket 12 is supported by collar 12a on shaft 14 for rotation, and an agitator 15 is supported for rotation within the basket, on a shaft 16. A practical arrangement of the respective shafts 14 and 16 is to make the latter concentric within the tubular basket shaft 14 as shown in Fig. 2. In the operation of such machines, after the clothes have been placed in the basket 12 and the basket filled with water through means such as the conduit 17 connected to any suitable water supply, the drive mechanism is conditioned, usually through conventional automatic controls (not shown), to operate the agitator 15 to cause a flexing and rubbing of the clothes within wash liquid in the basket. In the present illustration, the agitator drive means effects an oscillation rather than rotation, of the agitator, as later appears. During the agitation phase of operation, the basket is held stationary. In the present invention this is effectively accomplished by releasably coupling the basket spin means to a brake shoe 18, and supporting the weight of the basket and its contents directly thereon. Said brake shoe rests directly on a stationary brake element 20 suitably affixed in the mechanism, as presently described. When it is desired to extract water from the clothes to damp dry the same, the brake is released and the basket is spun on its shaft 14. The actual support for the basket on brake shoe 18 includes the gear frame 21 which is affixed to shaft 14 as by being pinned thereto, and a thrust bearing 22.

As detailed in Fig. 2, the housing 11 includes an upper casing member 23 and a motor housing member 24 suitably joined by co-operating flange structures and any desired plurality of screws or bolts 25. It will be understood that spring mountings or other conventional means (not shown) are employed to mount the housing 11 resiliently on a panel or frame structure

26 which is a fixed part of the main framework of the washing machine. A drive motor field system 27 is press-fit into the housing 24. The main drive shaft 28 is journaled in suitable bearings 30, 31, the latter advantageously being accommodated within a neck extending from the rigid web 32 affixed to the casing part 24, and forming a main load-supporting structure of the fixed brake member 20. As has been indicated, the operation of the device is associated with reversal of the drive shaft direction. Accordingly, I prefer to use a reversing motor rather than equivalent gearing, and shaft 28 takes the direction of rotation of rotor 33, to which it is affixed. The motor shaft mounts a centrifugal impeller 34 suitable for reversible oil pumping, disposed within a pump housing 35. Oil at a normal level O. L. flows into the pump chamber through orifices 36 and then through the orifices 37 and chamber 38 into the axial shaft passage 40. As will be readily understood, oil flows upwardly through the passage 40 and then through suitable outflow ports or equivalent to splash lubricate the various mechanical components of the device.

The gear frame 21 is formed with a neck 41 pinned or otherwise mechanically affixed to the tubular shaft 14. A bearing 42 journals shaft 14 relative to the housing 11. A bearing 43 within the shaft 14 journals the agitator shaft 16 in suitable spaced relationship with the inner wall of the spin shaft. Shaft 16 is arranged to be oscillated by a gear train and crank assembly which includes a main drive pinion 44 fixed to or formed on the end of shaft 28 and in continual mesh with a gear 45 rotatable on a shaft 46 supported between the gear frame brackets 47, 48. An eccentric collar 50, desirably integral with gear 45 carries the eye 51 of a crank arm 52 which extends between spaced arm structures 53 of a collar 54 suitably secured as by the pin 55 to shaft 16. A shaft 56 pivots the crank arm with respect to collar 54. It will be seen that the gear frame and gear train are components of a planetary system in which when frame 21 is held stationary so as to permit relative rotation of the drive shaft with respect to the frame, rotation of shaft 28 will oscillate shaft 16; but when frame 21 rotates with the shaft 28, the agitator shaft drive means becomes ineffective, in the sense of operating idly. This gear train is not my invention, but is substantially as described in the Herbert F. Bariffi application S. N. 604,888 filed July 13, 1945, now Patent No. 2,485,622, dated October 25, 1949, for "Clothes Washing Machine Mechanism" and assigned to the assignee of the present invention.

Brake shoe 18, on which the gear frame 21 and the basket structure carried thereby are supported, has a layer 57 of suitable braking or friction material, cooperating with a plate 58 of steel or the like, surfacing the fixed brake 20.

Releasable driving means between shaft 28 and gear frame 21 include a clutch collar 59 through which shaft 28 rotatably extends, said collar accommodating a clutch element, as later described. The collar is interposed between a clutch roller retainer washer 60 on which the gear frame actually rests and the thrust bearing 22 supported on the central web 62 of the brake member 18.

Non-rotatably secured to said clutch collar is a driver 63 having two radially extending arm portions 64, 65 terminating in diametrically opposed fingers 66, 67 which extend downwardly

within the outer wall 68 of the brake member 18, and suitably above the surface of said brake member. It will be noted from Fig. 3 that the respective fingers face in the same direction of rotation. Extending downwardly from the gear frame 21 adjacent the wall 68 are the diametrically opposed members 69, 70. As presently explained, the fingers 66, 67 are clutch-release devices, and to hold them normally in operative position, drive member 63 is rotated counterclockwise of Fig. 3 by means such as the coil spring 71 which extends from member 70 and seats about an ear 72 projecting from the drive arm 65. A stop 73, projecting downwardly from the gear frame, limits the rotation of the driver 63 under the urging of spring 71.

It has been explained that during the agitating cycle the spin basket is held stationary, and is thereafter released for spin drying at a subsequent operational step. In the present invention this is accomplished by a combination of directionally selective clutches, one group of which locks the gear frame to the brake member 18 upon rotation of shaft 28 in a predetermined direction and a co-operating clutch couples the frame driving means to the shaft upon rotation of the shaft in the opposite direction. The then-resulting rotation of driver 63 effects the release of the brake clutches and transmits shaft torque to the frame 21. In one form of drive clutch, collar 59, rotatably carried on the shaft 28, has a pocket 74 formed in its inner wall, said pocket terminating in a gradually narrowing extension 75 reaching opposite to the direction of rotation of shaft 28 during agitation; in the present instance, said rotation is counterclockwise of Fig. 3. A roller 76 has a diameter less than the width of pocket 74, but greater than the constricted end 75 thereof, and is normally urged by means of a spring 77 toward said constricted end. Thus shaft 28 may rotate counterclockwise without transmitting substantial torque to the clutch collar but will transmit torque thereto during clockwise, or "spin" rotation. Any momentary counterclockwise rotation of driver 63 as the shaft begins rotation is limited by post 73.

A modified clutch collar, shown in Fig. 7 has somewhat better wear resistance. The collar, 59*a*, is pinned to shaft 28, and has an extension, see Fig. 8, which provides the pockets 74*a*, 75*a*, within which the ball or roller 76*a* is placed. Driver 63*a* has a neck 63*b* rotatably engaging the shaft 28. It will be noted that driver 63*a* is coupled to the shaft 28 by clockwise rotation of shaft 28, as in the previous embodiment.

During the "agitate" rotation of shaft 28, gear frame 21 is locked to the brake member 18 by similar clutch devices. It will be seen in Fig. 3 that the inner walls 78, 80 of the respective structures 69 and 70 are chords of the brake member wall 68 and hence provide oppositely facing convergent pockets. Within each of said pockets are disposed rollers 81 which are spring biased toward the constricted mouths thereof. I prefer to use individual springs 82 anchored against a central abutment of the respective members as shown. It will be apparent that with the clutches in the agitate (Fig. 3) position, the gear frame 21 is locked against rotation in either direction with respect to the brake member 18. Thus, the gear frame 21 is held against any reaction torques incident to operation of the agitator.

When it is desired to spin the basket the shaft direction is reversed—in the present instance by reversing the motor—by any suitable control

means (not shown) so as to rotate clockwise of Fig. 3. Then, roller 76 is crowded into the narrow end 75 of the pocket 74 and the driver 63 is constrained to rotate with the shaft. The driver thereupon leaves the stop 73 and the respective fingers 66 and 67 engage with the adjacent rollers 81 driving them inwardly into the enlarged pocket area of the members 69, 70, see Fig. 4, whereupon said members are freed. The engagement of the drive arms 64, 65 with the frame members 69, and 70 will rotate the gear frame 21 and its thereto affixed basket shaft 14. The respective leading rollers 81 of each clutch unit are, of course, impotent to affect the rotation. The thrust bearing 22 provides for maintaining the gravitational load on brake member 18 sufficient to hold said member motionless on the fixed brake surface 58. At the end of the spin cycle, the motor is deenergized, whereupon shaft 28 lags behind the driver 63, and the spring 71 plus the respective springs 82 cause rotation of the driver relative to the gear frame members 69 and 70 sufficient to permit the clutch rollers 81 again to engage wall 68 of the brake member 18. The brake thus becomes effective to bring the basket to a stop.

The embodiments of Figs. 5 and 6 show a structural modification of the brake clutch devices, in which the clutch rollers are positioned on the outside of the brake ring 68, thus allowing the rollers to be thrown outward slightly away from said brake surface during spin. Such construction eliminates the possible formation of flats on the roller, due to wear. In this embodiment, members 169 and 170 are affixed to the gear frame and extend outwardly of the brake member 18 instead of inwardly thereof. Accordingly, since said members are not chordal with relation to the brake shoe wall, it is necessary to shape them suitably to provide constricted passages into which the rollers 81 are normally spring biased by the springs 82. This is simply accomplished by providing the protuberances 169*a*, 170*a* on the respective members. The driver 163 is also suitably modified so that its actuating fingers 166 and 167 extend over the brake member wall 68 and into suitable relationship with the rollers 81. An extension 163*a* is provided on either or both of the driver arms to engage the adjacent edges of the frame members 169, 170 during spin rotation. During the agitate rotation of shaft 28 the driver 163 abuts against the stop post 173 as previously described. The reorganization of the frame drive members 169, 170 requires an obvious change in the disposition of the biasing spring 71, and accordingly there is provided a post 171 projecting downwardly from the gear frame to anchor the spring 71 with respect to the driver 163.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made; and I therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

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

1. A coupling and brake mechanism comprising a rotatable member; a reversible drive shaft journaled in said member; a fixed brake structure; a second brake structure concentric with said rotatable member and interposed between said member and said fixed structure, said second brake structure including a rim extending upwardly adjacent said member; means rotatably supporting said member on said second brake

structure to bias the latter by gravity into engagement with said fixed brake structure; drive means including a collar disposed about said shaft and a direction responsive clutch between said collar and said shaft to mechanically couple said collar to said shaft in only one of the directions of shaft rotation; arm means extending from said collar and engageable with said rotatable member during said rotation of said collar to transmit shaft torque thereto; direction responsive clutch means interposed between said member and said brake structure rim normally coupling said member to said brake structure to restrain rotation of said member relative thereto in either direction, and means extending from at least one of said arms to release said last-named clutch means upon rotation of said collar with the shaft.

2. A coupling and brake mechanism according to claim 1, in which an element of the direction responsive clutch means connecting said rotatable member and said brake is fixed to said member.

3. Drive means according to claim 1, in which said brake connecting clutch means includes rigid elements extending from said rotatable member adjacent the inner rim of said brake structure, a surface of said elements being chordal to said rim to define a plurality of oppositely facing pockets having a gradually lessening width; a roller member within each said pocket, said roller having a diameter less than the maximum width of said pocket and greater than the minimum width thereof; and spring means normally driving said rollers toward the narrow end of their respective pockets to engage with said element and the adjacent brake rim.

4. Drive means according to claim 1, in which said brake connecting clutch means includes rigid elements extending from said rotatable member adjacent the outer rim of said brake structure, said elements in association with said brake rim providing pockets extending oppositely from a shoulder on each of said elements and having mouths narrowing at the extremities remote from said shoulder; a roller within each said pocket, said roller having a diameter less than the maximum width of its adjacent pocket and greater than the minimum width thereof; and spring means extending between said shoulder and each said roller to urge the roller toward the narrow end of the pocket to engage with said element and said adjacent brake rim.

5. A coupling and brake mechanism comprising a rotatable member, a reversible drive shaft; a fixed brake structure concentric with said drive shaft; a cooperating brake structure journaled on said drive shaft and interposed between said rotatable member and said fixed brake structure, said brake structures being gravity biased into contact with each other; means mechanically connecting said rotatable member to said cooperating brake structure during rotation of said drive shaft in one direction; a clutch collar rotatably disposed about said drive shaft and having a wall configuration adjacent said shaft to define therewith a pocket having one end narrower than the other; roller means within said pocket and having a diameter greater than the narrow end thereof, said means mechanically connecting said collar to the shaft upon rotation of said shaft opposite to said one direction; and a driving member fixed to said clutch collar and rotatable into engagement with elements of said rotatable member to thereupon drive the same from said drive shaft, said driv-

ing member also releasing the connections between the rotatable member and brake structure to free the rotatable member for rotation.

6. A coupling and brake mechanism comprising a rotatable member, a reversible drive shaft; a fixed brake structure concentric with said drive shaft; a cooperating brake structure journaled on said drive shaft and interposed between said rotatable member and said fixed brake structure, said brake structures being gravity biased into normal contact with each other; means mechanically connecting said rotatable member to said cooperating brake structure during rotation of said drive shaft in one direction; a direction responsive coupling means interposed between said drive shaft and said rotatable member operated in response to rotation of said drive shaft in said other direction including arm members positioned to engage said rotatable member thereby to transmit shaft torque to said rotatable member; and means associated with said arm members to release the connections between the rotatable member and brake structure to free the rotatable member for rotation.

7. A coupling and brake mechanism comprising a rotatable member; a reversible drive shaft journaled in said rotatable member; a fixed brake structure concentric with said member; a second concentric brake structure interposed between said member and said fixed brake structure; means rotatably supporting said member on said second brake structure to bias the latter by gravity into engagement with said fixed brake structure; means releasably connecting said member and said second brake structure; drive means including a collar disposed about said drive shaft and a direction responsive clutch element between said collar and said drive shaft to couple the collar thereto upon rotation of said shaft in a predetermined direction; arm means extending from said collar and engageable with said rotatable member during said predetermined shaft rotation to transmit shaft torque thereto; and means associated with said arm means to release said rotatable member from said second brake structure for rotation relative thereto.

8. A coupling and braking device comprising a reversible drive shaft; a rotatable member; directionally selective clutch means between said drive shaft and said rotatable member effective upon rotation of said drive shaft in a predetermined direction to couple said rotatable member to said drive shaft for rotation therewith; cooperating brake members gravity biased into continuous engagement; and means associated with said clutch to connect one of said brake members to said rotatable member whenever the latter speed falls below the drive shaft speed, and whenever said shaft is rotating opposite to the permitted rotational direction of said rotatable member.

9. A coupling and brake comprising a rotatable member, a reversible drive shaft, a fixed brake structure concentric with said member, a second brake structure concentric therewith and interposed between said member and said fixed brake; means rotatably supporting said member on said second brake structure, whereby the latter is gravity biased into engagement with said fixed structure; means releasably connecting said rotatable member and said second brake structure; drive means including a drive collar and a direction responsive clutch for connecting said drive collar to said drive shaft only during rotation of said shaft in a predetermined direction; arm members extending from said drive collar and engageable with said rotatable member to transmit drive shaft torque thereto; and means carried by said arm members to release said member from said brake structure to permit rotation of said member with said shaft.

10. In combination, a tubular shaft, a rotatable frame affixed thereto, a second shaft disposed within said tubular shaft and rotatable with respect thereto, a reversible drive shaft, means permanently connecting said drive shaft to said second shaft to drive the same, brake means holding the rotatable frame stationary during rotation of said drive shaft in one direction, said brake means including a fixed first brake element and a second brake element interposed between said rotatable frame and said first brake element, means releasably connecting said rotatable frame to said second brake element, and clutch means responsive to rotation of said drive shaft in the opposite direction to mechanically connect said rotatable frame to said drive shaft and to release the rotatable frame from said second brake element.

11. In combination, a shaft, a frame affixed thereto, a second shaft coaxial with said first shaft, a reversible drive shaft, means connecting the drive shaft and said second shaft, brake means engageable with said frame to hold the frame stationary during rotation of the drive shaft in one direction, clutch means responsive to rotation of the drive shaft in the opposite direction to mechanically connect said frame to the drive shaft to be driven thereby and to release the frame from said brake means, said brake means including a fixed first brake element and a second brake element interposed between said frame and said first brake element, said second brake element having an upwardly extending peripheral rim, means releasably connecting said frame to said second brake element including an element depending from said frame adjacent said rim, a surface of said depending element being chordal to said rim to define therewith a plurality of pockets of decreasing width, a roller member within each of said pockets, said roller having a diameter less than the maximum width of said pockets and greater than the minimum width thereof; and spring means normally driving said rollers toward the narrow end of their respective pockets to engage with said depending element and the adjacent brake rim.

CARL S. DAYTON.

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