Oct. 25, 1949. J. W. McNAIRY 2,485,621

WASHING MACHINE

Filed Aug. 25, 1944 2 Sheets-Sheet 1

Fig. 1.

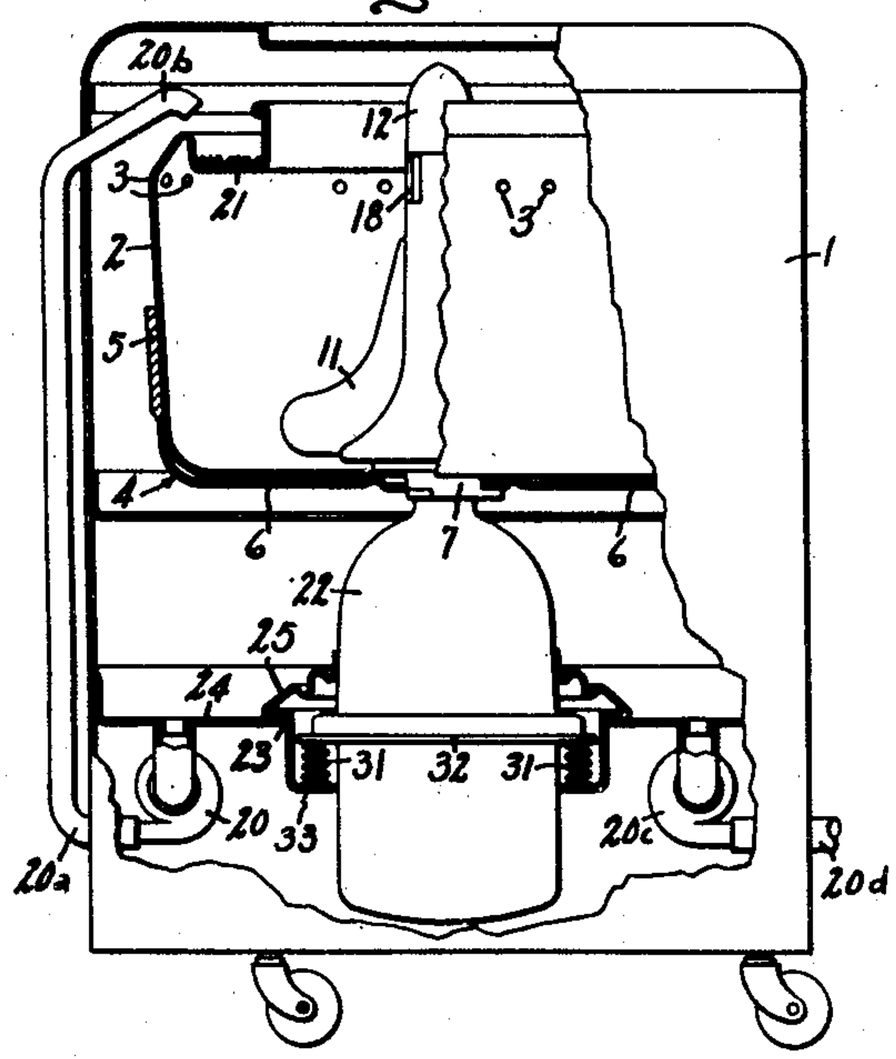


Fig. 3.

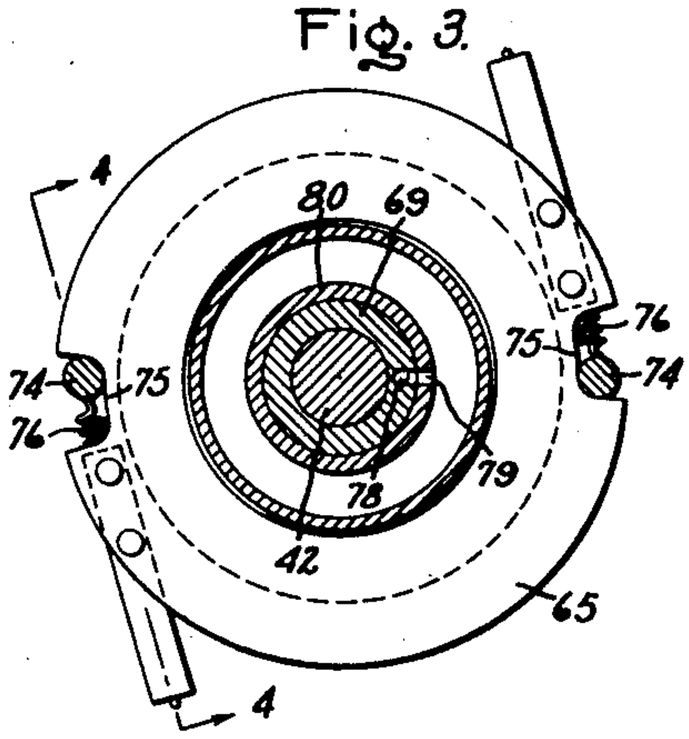


Fig. 4.

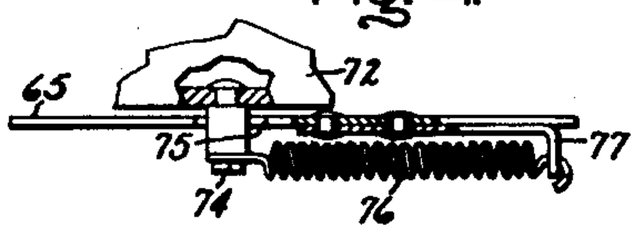


Fig. 7.

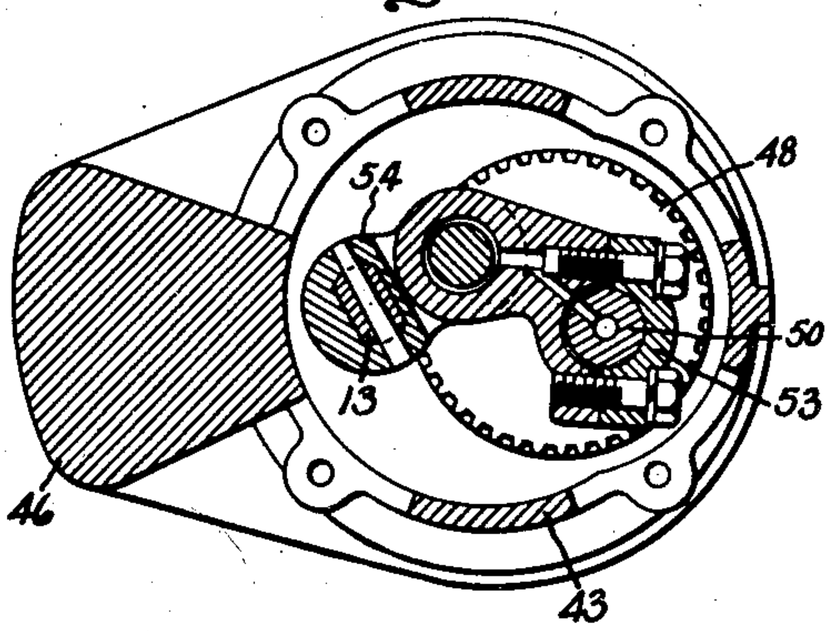


Fig. 6.

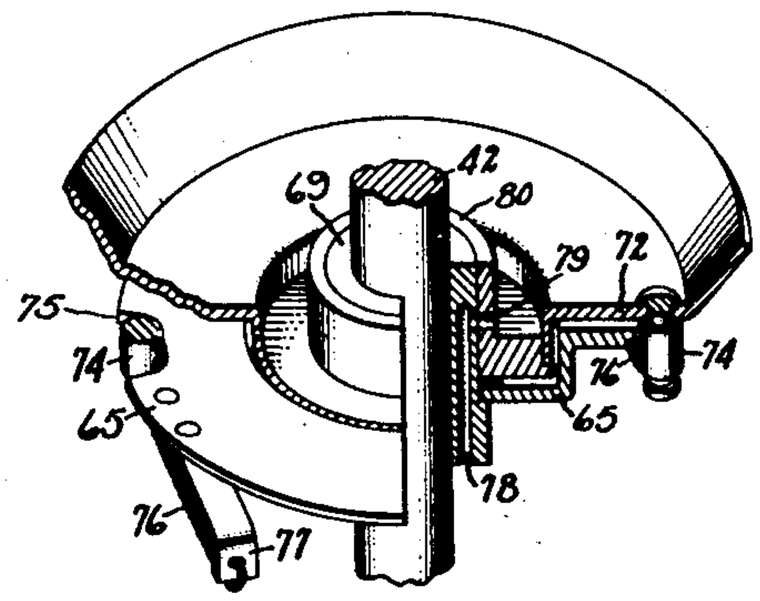
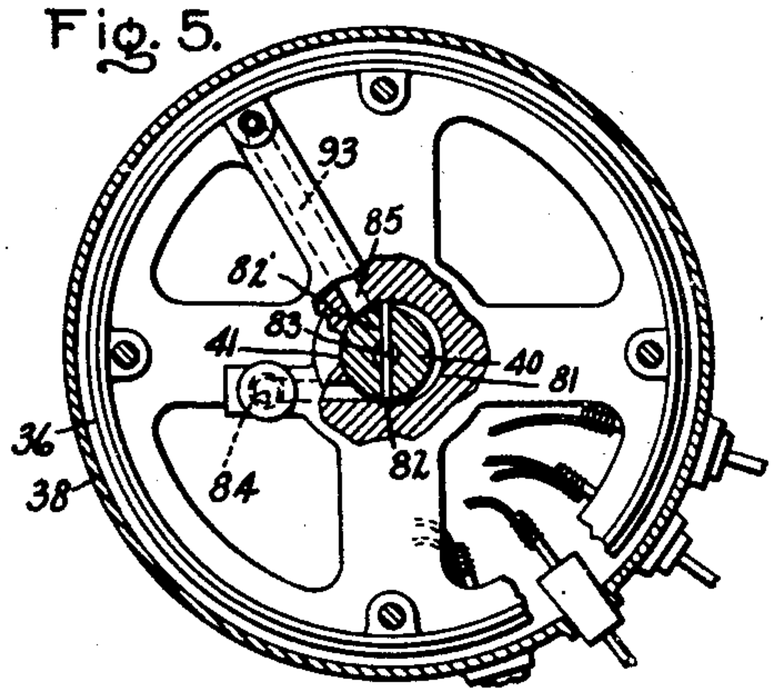


Fig. 5.



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Oct. 25, 1949. J. W. McNAIRY 2,485,621

WASHING MACHINE

Filed Aug. 25, 1944 2 Sheets-Sheet 2

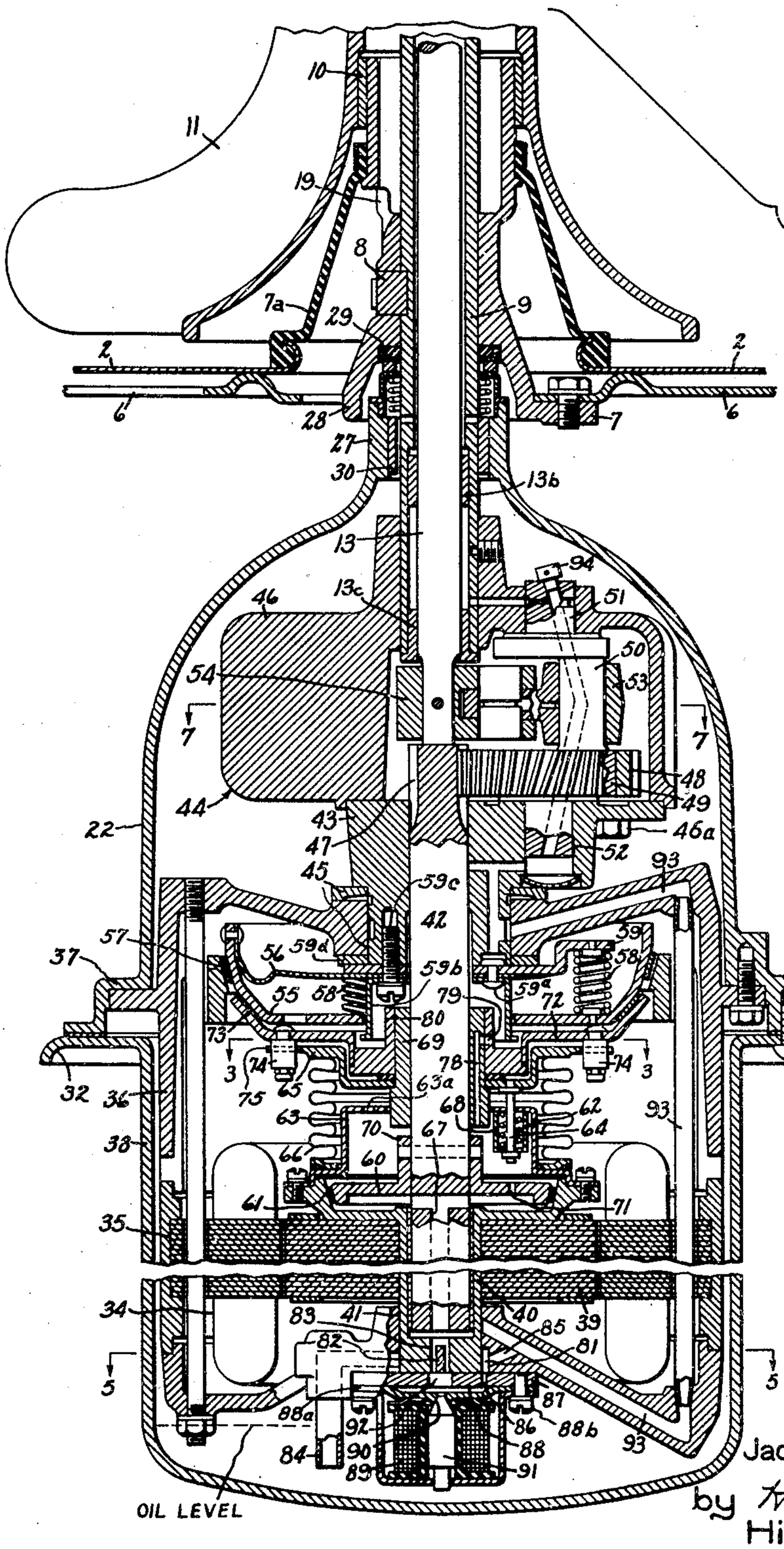
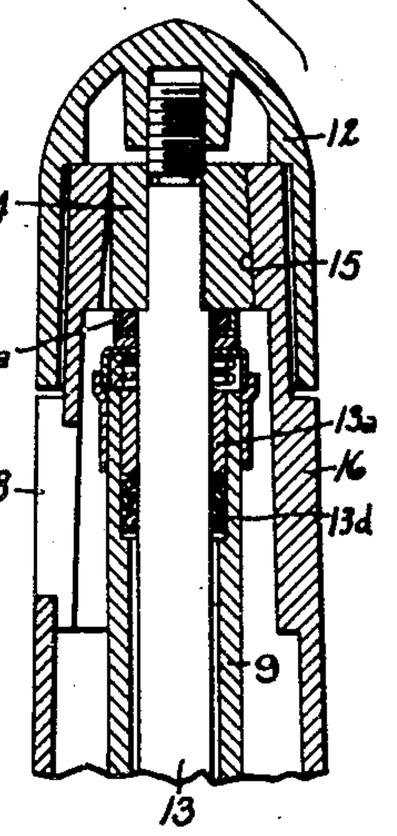


Fig. 2.



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UNITED STATES PATENT OFFICE

2,485,621

WASHING MACHINE

Jacob W. McNairy, Bridgeport, Conn., assignor to General Electric Company, a corporation of New York

Application August 25, 1944, Serial No. 551,105

23 Claims. (Cl. 192—3.5)

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The present invention relates to clothes washing and drying machines of the type comprising a basket in which the clothes are washed and which is rotated at high speed for extracting the liquid from the clothes by centrifugal force, and particularly to such machines wherein the driving motor is connected to the mechanisms to be operated through the intermediary of fluid actuated friction clutches.

In this type of machine, there are a number of factors such as the temperature and age of the fluid which actuates the clutches and the polishing or wearing of the clutch surfaces, for example, which effect changes in the friction characteristics of the clutch mechanism and this in turn may cause objectionable variations in the load on the driving motor.

One object of my invention is to provide an improved construction and arrangement in a machine of this type whereby the aforementioned difficulty is overcome, my improved construction functioning to compensate automatically for variations in friction characteristics of the clutch members so as to insure a constant load on the driving motor while the speed of rotation of the spin basket is being accelerated.

Another object of my invention is to provide in a washing machine of the type to which the invention relates an improved construction and arrangement of fluid actuated clutches whereby I obtain a small, compact structure which is very reliable in operation.

Other objects of my invention and the advantages thereof will be pointed out hereinafter.

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

In the accompanying drawings, Fig. 1 is an elevation of a washing machine embodying my invention; Fig. 2 is an enlarged section through the driving mechanism with the discharge from the oil pump (shown in its correct relative position in Fig. 5) brought around into the plane of the view for purposes of illustration; Fig. 3 is a section on line 3—3, Fig. 2; Fig. 4 is a section on line 4—4, Fig. 3; Fig. 5 is a section on line 5—5, Fig. 2 except that the discharge conduit for the oil pump is shown in correct relative position with respect to the inlet to the pump; Fig. 6 is a perspective view of certain of the clutch parts, and Fig. 7 is a sectional view taken on line 7—7, Fig. 2.

Referring to Fig. 1 of the drawing, there is

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shown a washing machine of the type disclosed in the application of Thomas T. Woodson, Serial No. 551,096, filed Aug. 25, 1944, having an outer casing or tub 1 in the upper part of which is located a spinner basket 2 having centrifugal discharge openings 3 at the region of greatest diameter which during washing are at or slightly above the liquid level. The spinner basket is non-rotatably seated in a carrier 4 having annular walls 5 surrounding the basket and serving as a balance ring and having radial arms 6 bolted to a hub 7 fixed by a clamp 8 to a tubular shaft 9 for driving the spinner basket. The space between the basket and the hub is sealed by a rubber sleeve 7a having its upper end fixed to the hub and its lower end fixed to the basket. At the upper end of the hub is a bearing 10 for the lower end of a bladed agitator 11 fastened by a nut 12 to the upper end of a drive shaft 13 journaled in bearings 13a, 13b and 13c in the spinner shaft 9. An oil retaining felt ring 13d is associated with the bearing 13a. The shaft 13 has fixed thereto an agitator drive nut 14 fitting in a complementary socket 15 in the agitator hub 16. A shaft seal 14a is provided between the upper ends of the spinner and agitator shafts 9 and 13.

In the agitator hub 16 at or slightly below the wash water level in the spinner basket are drain passages 18 leading to the space between the spinner shaft 9 and the agitator hub 16. The water draining through these passages flows through the space between the shaft 9 and the agitator hub and through passages 19 in the carrier hub 7 to the bottom of the outer casing 1 whence it is pumped onto an annular filter 21 on the rim of the spinner basket by a circulating pump 20. The pump has its inlet connected to the bottom wall 24 of the outer casing and its discharge connected to a conduit 20a having a nozzle 20b directed onto the filter. The pump is operated during washing so the wash water is continually withdrawn from the spinner basket through the passages 18 and 19 (and possibly openings 3) and returned to the basket through the filter 21. The continuous circulation and filtering of the water removes lint and other particles and keeps the wash water clean. The amount of wash water flowing through the passages 18 and 19 automatically adjusts itself to the capacity of the pump 20 by slight variation of the wash water level. If the pump operation is impaired, the wash water level would fall only slightly below the lower edges of the openings 18 which is only slightly less than the desired wa-

ter level for washing. There is also provided a drain pump 20c having its inlet connected to the bottom wall 24 of the outer casing 1 and its discharge connected to a conduit 20d leading to a drain.

The concentric spinner and agitator drive shafts 9 and 13 are driven by mechanism enclosed within a sealed casing 22 having its upper end projecting through opening 23 in the bottom wall 24 of the outer casing. The space between the casing 22 and the wall 24 is sealed by a flexible annular rubber ring 25 having its inner edge clamped to the casing 22 and its outer edge clamped to the wall 24. The ring 25 serves not only as a seal but as a flexible connection preventing the transmission of vibrations to the outer casing. The upper end of the casing 22, which is above the maximum water level in the outer casing 1, is provided with a reduced diameter hub 27 which projects within a skirt 28 at the lower end of the hub 7 and is provided with a seal 29 and a sleeve bearing 30 for the spinner shaft 9.

During both washing and centrifugal drying the upper part of the gear casing 22 is cooled by the wash water. During washing, the wash water falls onto the upper end of the gear casing from the passages 19. During centrifugal drying, the wash water discharged through the centrifugal discharge openings 3 falls into the bottom of the outer casing and partially submerges the upper end of the gear casing.

The spinner basket and the associated driving mechanism contained within the casing 22 are resiliently supported by springs 31 arranged between a flange 32 on the casing 22 and a supporting flange 33 depending from the bottom wall 24 of the tub. The springs permit gyratory movement of the spinner basket during centrifugal drying so that the spinner basket rotates substantially about its center of mass, and also permit lateral movement of the casing 22 which lowers the node of vibration. The stiffness of the springs is such that the critical speed is of the order of 100 R. P. M., which is substantially below the centrifugal drying speed of 1200 R. P. M.

The machine is driven by a motor 34 having a stator 35 fixed in a frame 36 fixed to the under side of a flange 37 on the upper part of the casing 22. The motor is enclosed by a shell 38 also fixed to the flange 37. The motor has a rotor 39 fixed to a sleeve 40 having its closed lower end journaled in a bearing 41 in the motor frame. Sleeve 40 forms the motor rotor shaft. Slidably and rotatably journaled in the sleeve 40 is a shaft 42 journaled at its upper end in the lower portion 43 of a frame 44 carrying the agitator drive gearing mechanism. The frame as a whole is journaled in a sleeve and thrust bearing 45 in the motor frame. The upper portion 46 of the frame 44 is fixed to the spinner shaft 9 so that the spinner basket is rotated for centrifugal extracting by an arrangement hereinafter described for rotating the frame 44. The two frame portions 43 and 46 are fastened together by a suitable number of studs 46a. The agitator driving mechanism, which is operated by rotation of the shaft 42 relative to the frame 44, consists of a pinion 47 in the upper end of the shaft 42 meshing with a gear 48 shrunk on a collar 49 on a crank shaft 50 journaled in bearings 51 and 52 in the upper and lower parts of the frame. The crank shaft is connected by a connecting rod 53 with a crank arm 54 pinned to the lower end of the agitator shaft 13. Upon rotation of the crank shaft the agitator is oscillated through an angle determined by the connecting rod 53 and the crank arm 54 and at a speed determined by the rotation of the crank shaft. In the present construction the agitator is oscillated through an angle of approximately 60° and at a rate of 350 complete oscillations per minute.

During washing the frame 44 is held stationary by a clutch and brake member 55 connected to the lower end of portion 43 of the frame by flat radial spring arms 56 and urged into engagement with a cooperating brake surface 57 on the motor frame by compression springs 58 arranged between the upper side of the clutch and brake member and arms 59 fixed to the frame. The spring arms 56 and the arms 59 are fastened together at their central portions by a suitable number of rivets 59a which serve also to attach to arms 56 and 59 a depending cup 59b having an outturned flange at its lower end which forms a stop to limit the movement of the clutch member 55 by spring 58 prior to the time the assembly comprising parts 55, 56, 58 and 59 is assembled in the machine. The riveted together parts form a unitary assembly which is fastened to the lower surface of frame portion 43 by screws 59c. At 59d is a thrust washer positioned between the upper surface of the riveted together parts and the lower surface of the adjacent sleeve bearing to take any vertical thrusts. During washing, the shaft 42 is connected to the motor rotor 39 by a cone clutch member 60 pinned to the shaft which is urged into engagement with a cooperating clutch surface 61 on the rotor by compression springs 62 arranged between a cup 63 fixed to the rotor and the lower ends of pins 64 fixed at their upper ends to a plate 65 closing the upper end of a corrugated bellows 66 the lower end of which is also fixed to the rotor. The springs 62 are shown in the compressed position in which the bellows is expanded by oil pressure admitted through a passage 67 in the shaft 42 compressing the springs an amount limited by sleeves 68 arranged between the lower ends of the pins 64 and the under side of the cup 63. When the oil pressure in the passage 67 is cut off, the bellows is collapsed by the compression springs 62 moving a sleeve bearing 69 fixed to the plate 65 against a sleeve 70 integral with the clutch member 60 and forcing the clutch member into engagement with the clutch surface 61 of the rotor to connect the shaft 42 to the motor. While the shaft 42 is connected to the motor by clutch member 60 and the motor is running, the agitator is oscillated through the intermediary of pinion 47, gear 48, crank shaft 50, connecting rod 53, crank arm 54 and shaft 13. The operation of the agitator is stopped and centrifugal extracting is started by admitting oil under pressure through the passage 67, the upper end of which communicates with the space between the rotor 39 and the lower side of the clutch member 60 and, through a restricted passage 71 in the clutch member and openings 63a in cup 63, with the interior of the bellows 66. When oil is first admitted through the passage 67 there is no oil pressure in the bellows on the upper side of the clutch member 60 and the full oil pressure acting on the lower face of clutch member 60 is effective to move the clutch member 60 clear of the cooperating clutch surface 61. This results in a slight upward movement of the shaft 42 relative to the rotor 39 which provides a slight

clearance between the lower end of the shaft and the sleeve 40 into which oil flows from the passage 67, exerting an upward force on the shaft sufficient to retain the clutch member 60 in the disengaged position. Upward movement of clutch member 42 is limited by the upper end of shaft 42 engaging the lower end of shaft 13. Passage 71 is to permit certain collapse of the bellows 66 when the oil supply is cut off and the clutch members 60 and 61 reengage. Passage 71 serves also to insure complete seating of the clutch member 60, it serving to permit oil to escape from beneath clutch member 60 at the instant clutch member 60 makes contact with its seat thus preventing any trapping of oil which would prevent proper seating from taking place. Passage 71 is small enough that escape of oil through it will not prevent building up of pressure beneath clutch member 60 when the clutch is to be released. Following the disengagement of the clutch member 60, the bellows is filled with oil through said clearance between clutch 60 and cooperating member 61 and through openings 63*a* and is expanded against the force of the compression springs 62, moving a clutch member 72 which is fixed to and carried by a bearing sleeve 80 positioned on sleeve bearing 69 on the upper side of the plate 65 into engagement with a clutch surface 73 on the clutch and brake member 55. Upon engagement of the clutch member 72, the axial motion is continued until the clutch and brake member 55 is lifted clear of the brake surface 57, the arms 56 flexing upward and the springs 58 being compressed to permit of such movement. The clutch member 72 is connected torsionally to the bellows 66 by pins 74 on the clutch member which project through notches 75 in the edge of plate 65 and are connected to the plate by tension springs 76 arranged between the pins and tabs 77 fastened on the plate 65. Thus the motor drives the clutch plate 55 through the intermediary of bellows 66, plate 65, springs 76, and clutch member 72, and in turn clutch plate 55 drives the spin basket 2 through spring arms 56, frame 44 (the frame and the gearing carried by it rotating as a unit) and tubular shaft 9. Plate 65 forms a driving member for clutch member 72 connected to it by the circumferentially yieldable spring members 76. Since clutch member 60 is now disengaged from clutch surface 61, agitator 11 is held from oscillating by the clothes in the spin basket and the agitator shaft 13 and shaft 42 turn as a unit with frame 44. Since the drive from disk 65 to clutch member 72 is through springs 76, there is a tendency for disk 65 to move circumferentially relatively to clutch member 72 due to the extension of springs 76 in transmitting torque from disk 65 to the clutch member. The relative angular position of the clutch member 72 and the plate 65 is accordingly determined by the torque exerted by the friction surface 73 and the deflection of the springs 76. The friction torque at the surface 73 is determined by the pressure exerted on the clutch member 72 by the bellows 66. According to one feature of my invention, this pressure is controlled by a bleeder valve consisting of a port 78 in the bearing 69 fixed to the plate 65 and a port 79 in the sleeve bearing 80 to which the clutch member 72 is fixed. When the bellows 66 is collapsed, the tension springs 76 hold the pins 74 against the opposite end of the notches 75 from that shown in Fig. 3, and in this portion the port 79 is out of register with the port 78 and the bleeder valve from the bellows is closed. Upon admission of oil to the interior of the bellows, the full oil pressure is available to force the clutch member 72 into engagement with the clutch surface 73 and the maximum friction torque is exerted. This torque depends not only upon the oil pressure but also upon the viscosity of the oil which is affected by temperature, the character of the friction surfaces and other factors. The equipment is designed so that this maximum friction torque is more than is desired for the motor. The friction torque accordingly results in relative rotation between the clutch member 72 and the plate 65, bringing the ports 78 and 79 into register to a certain extent and bleeding oil from the interior of the bellows to reduce the bellows pressure and thereby reduce the pressure between the clutch member 72 and the friction surface 73. The final position of the ports 78 and 79 (something short of the in register condition shown in Fig. 3) is such that the effective pressure in the bellows is sufficient to cause the desired friction torque. The desired friction torque is determined by the springs 76 which control the relative position of the ports. With this arrangement a substantially constant torque is obtained independent of the viscosity of the oil and the condition of the clutch surfaces. Upon engagement of the clutch member 72 with the friction surface 73, the spinner basket is therefore accelerated at the desired rate and the motor is neither over nor under loaded.

The oil pressure for expanding the bellows is obtained from a vane type oil pump at the closed lower end of the sleeve 40 fixed to the rotor 39 of the motor. The pump comprises an eccentric bore 81 which forms a pump cavity at the lower end of the bearing 41 and a vane 82 received in the slotted lower end of the sleeve 40. At the center of the sleeve is a passage 83 in line with the passage 67 in the shaft 42 and of slightly greater diameter than the width of the vane 82 and the slot 82′ receiving the vane. During rotation of the motor, oil is drawn into the pump through an intake 84 from a sump in the bottom of the shell 38 and is discharged through a pump cavity 81. Leading from the passage 85 is a restricted passage 86 in a plate 87 forming the bottom wall of the pump housing leading to a chamber 88 on the under side of the plate formed between the underside of the plate and dished cap 88*a* attached to plate 88 by screws 88*b*. The oil pressure within the chamber 88 is controlled by a solenoid valve 89, the frame of which is fixed to plate 87 and cup 88*a* by screws 88*b* and having a plunger 91 provided with a tapered upper end adapted to seat against and close a normally open port 90 in cup 88*a*. Port 90 is of greater area than the passage 86 so that when port 90 is open, the oil flow from the discharge side of the pump through passage 86 flows out through port 90, thus preventing the building up of any substantial oil pressure in the chamber 88. When the solenoid valve 89 is energized, plunger 91 is raised to close the port 90 so that full oil pressure builds up within the chamber 88 and is conducted through a passage 92 in the plate 87 and passage 83 to the passage 67 in the shaft to expand the bellows. The operation of the washing machine is accordingly controllable by opening and closing the circuit to the solenoid valve. When the circuit to the solenoid valve is open, the bellows 66 is collapsed by spring 62. When this takes place, clutch

member 72, bearing sleeve 89, plate 65 and sleeve bearing 69 move downward, clutch member 72 moving away from clutch member 55, permitting clutch member 55 to be moved by springs 58 into engagement with brake surface 57, the spring arms 56 flexing downward to permit this movement of the clutch member to take place. The engagement of clutch member 55 with brake surface 57 serves to hold against turning movement in its bearings, the structure comprising clutch member 55, arms 56, frame 44, tubular shaft 9 to which frame 44 is fixed, hub 7 and basket 2. During the downward movement, sleeve bearing 69 engages the top surface of sleeve 70 to move shaft 42 downward to bring clutch member 60 into engagement with clutch surface 61, thus connecting shaft 42 to the motor rotor. At this time, the upper end of shaft 42 moves away from the lower end of shaft 13. Now, when the motor operates, the agitator is oscillated through agitator clutch 60 in the manner already explained. When the solenoid valve is energized, the bellows 66 is expanded to move the clutch member 72 into engagement with the clutch surface 73 and establish a direct drive from the motor through the frame 44 to the spinner basket and the clutch member 60 is moved away from the clutch surface 61 to disconnect the shaft 42 and thereby prevent oscillation of the agitator.

In addition to supplying the oil pressure for controlling the driving mechanism, the oil pump also supplies oil to pressure lubricate the bearings through passages 93, and the oil sprayed from the bearings and from fitting 94 at the upper end of the crank shaft is sprayed over the interior of the casing 22 for cooling purposes. In connection with the operation of the mechanism, it will be noted that agitator clutch member 60 forms in substance a valve which is opened by the fluid pressure and which controls flow of fluid pressure to corrugated bellows 66, the fluid pressure being first applied to the agitator clutch member 60 to disconnect the agitator drive from the motor before substantial fluid pressure is supplied to the corrugated bellows to effect closing of the spin basket clutch to connect the spin basket to the motor. This arrangement has substantial advantage since it insures the release of the agitator clutch prior to the closing of the spin basket clutch so that the one load is taken off the motor before the other load is applied thus avoiding double loading of the motor. This enables a smaller motor to be used than would otherwise be required. The arrangement of the solenoid operated valve 89 so that it is normally open to permit the fluid pressure supplied to chamber 88 to be dissipated through port 90 and is closed to effect flow of fluid to build up pressure to operate the clutches to change from washing to drying is advantageous since by this arrangement the fluid in the bellows when valve 89 is opened can flow out of the bellows through passage 67, the same passage by which it entered, thus avoiding the necessity of a separate discharge port for the bellows 66.

By connecting the lower end of the bellows directly to the rotor, arranging the movable spin basket clutch directly above the rotor at the other end of the bellows, and positioning the agitator clutch directly adjacent to the motor rotor, I am enabled to provide a compact structure which requires a minimum axial movement of the bellows in order to effect the opening of

the agitator clutch, the closing of the spin basket clutch and the release of the brake for the spin basket.

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

1. In combination, a driven member, a rotatable frame connected to said member, a motor, an oil pump driven by said motor, a friction clutch between the motor and the frame, a bellows supplied from said oil pump for engaging the clutch, and means controlled by the clutch torque for varying the oil pressure in the bellows to control the clutch torque.

2. In combination, a driven member, a rotatable frame connected to said member, a motor, an oil pump driven by the motor, a friction clutch between the motor and the frame, a bellows supplied from said oil pump for engaging the clutch, a bleeder valve from the bellows, and means responsive to clutch torque for adjusting the valve to control the clutch torque.

3. In combination, a spinner basket shaft, a washing means shaft, a rotatable frame connected to the spinner basket shaft, mechanism carried by the frame for operating the washing means shaft, a motor for driving said mechanism, an oil pump driven by the motor, friction clutch and brake means for the frame arranged alternatively to clutch the frame to the motor or to hold the frame stationary, a bellows supplied from said oil pump for controlling the engagement of the clutch and brake means, a torque responsive connection between the bellows and the clutch means, and a valve controlled by said connection for controlling the oil pressure in the bellows.

4. In combination, a spinner basket shaft, an agitator shaft, driving mechanism having a rotatable frame for driving the spinner basket shaft, a motor having a rotor, mechanism carried by the frame operated by rotation of the motor rotor for driving the agitator shaft, a bellows fixed to the motor rotor, a fluid pump driven by the motor rotor, means defining a passage which connects the pump to the bellows, a valve for the passage, a clutch and brake member having a torque transmitting connection to the frame and axially movable to clutching and braking positions, means biasing said member to the braking position, a cooperating clutch member fixed to said bellows and moved by expansion of the bellows into engagement with said clutch and brake member, and a control for said valve.

5. In combination, a spinner basket shaft, an agitator shaft, driving mechanism having a rotatable frame for driving the spinner basket shaft, a motor having a shaft, mechanism operated by rotation of the motor shaft relative to the frame for driving the agitator shaft, a clutch and brake member connected to said frame by a torque transmitting spring means, permitting axial movement of such member relatively to the frame, means biasing said member to the braking position, a bellows connected to the motor shaft, means defining a passage for supplying actuating fluid to the bellows, a clutch on said bellows cooperating with said member to move it axially away from said braking position, and a valve controlling said passage.

6. In combination, a spinner basket, a rotatable frame, a driving connection between said frame and the basket, a motor, a bellows connected to and carried by the motor rotor, a clutch member carried by the bellows for connecting

the motor rotor to said frame, and means for supplying fluid pressure to the bellows to move the bellows and clutch member to connect the motor rotor to the frame.

7. In combination, a spinner basket shaft, an agitator shaft, driving mechanism having a rotatable frame for driving the spinner basket shaft, a motor having a driving shaft, mechanism operated by rotation of said motor shaft relative to said frame for driving the agitator shaft, clutch and brake means for clutching the frame to the shaft and for braking the rotation of the frame, said clutch means including a bellows which at its one end is connected to and rotated by the motor drive shaft and at its other end is provided with a clutch member, and means for supplying fluid to the interior of said bellows for controlling said clutch means.

8. In combination, an agitator shaft, a spinner basket shaft, an electric motor, a clutch for connecting the motor to the spinner basket shaft, a clutch for connecting the motor to the agitator shaft, fluid actuated means for effecting opening and closing movements of said clutches, means for supplying actuating fluid to said fluid actuated means, and means whereby the second-named clutch controls flow of actuating fluid whereby said spinner basket clutch can be closed only after the second-named clutch has been opened.

9. In combination, an agitator shaft, a spinner basket shaft, an electric motor, a clutch for connecting the motor to the agitator shaft, a clutch for connecting the motor to the spinner basket shaft, fluid actuated means for opening the agitator clutch and closing the spinner basket clutch, and means for supplying fluid pressure to said fluid actuated means, said agitator clutch standing in the path of flow of fluid to the fluid actuated means for closing the spinner basket clutch whereby the agitator clutch must be opened before fluid is applied to the fluid actuated means for closing the spinner basket clutch.

10. In combination, a spinner basket shaft, an agitator shaft, shaft means through which the spinner basket shaft is rotated and through which the agitator shaft is actuated, an electric motor, a first clutch for connecting the motor to said shaft means for effecting rotation of the spinner basket shaft, a second clutch for connecting the motor to said shaft means for effecting operation of the agitator shaft, fluid actuated means for actuating said clutches, and means whereby the second-named clutch controls operation of the first-named clutch to prevent closing of the first-named clutch except when the second-named clutch is open.

11. In combination, a spinner basket, a rotatable frame connected to the spinner basket, a drive shaft, a mechanism operated by relative rotation of the drive shaft with respect to the frame, an electric motor having a rotor, a bellows connected to the rotor, a clutch carried by the bellows which is moved to clutch the rotor to the frame by expansion of the bellows, a clutch member on said shaft within the bellows moved into engagement with the rotor by contraction of the bellows, means for contracting the bellows, a brake for holding the frame stationary while said second clutch is engaged to effect operation of said mechanism, and means for supplying fluid under pressure between the rotor and the second clutch to move the second clutch to the declutching position and expand the bellows to clutch the rotor to said frame.

12. In combination, a spinner basket, a shaft for the basket, means defining a stationary brake surface, a brake member connected to said shaft for engagement with the brake surface, a clutch member connected to said shaft, a motor having a rotor, a bellows connected to the rotor to be rotated thereby, a second clutch member, means including a torque responsive member connecting the bellows to said second clutch member, means for supplying fluid under pressure to said bellows to move the second-named clutch member into engagement with the first-named clutch member to connect the motor rotor to said shaft and release said brake member, and means controlled by movement of said torque responsive member for varying the oil pressure in the bellows to control the clutch torque.

13. In combination, a spinner basket, a shaft for the basket, a clutch member connected to the shaft, a second clutch member adapted to be moved into engagement with the first clutch member, a drive member, circumferentially yieldable spring means through which the drive member is connected to the second clutch member, a fluid pressure actuated member for moving said clutch members into engagement with each other, a motor having a rotor connected to said drive member, means for supplying fluid under pressure to said fluid actuated member, and valve means controlled by circumferential movement of said drive member relatively to said second clutch member for controlling the fluid pressure within said fluid pressure actuated member.

14. In combination, an agitator shaft, a spinner basket shaft, a motor having a rotor, a clutch member for connecting the rotor to said agitator shaft, a second clutch member connected to the spinner basket shaft, a third clutch member, a drive member, circumferentially yieldable spring means through which the drive member is connected to the third clutch member, means connecting the motor rotor to said drive member, fluid pressure actuated means for moving said second and third clutch members into engagement with each other, means for supplying fluid under pressure to said fluid actuated means, and valve means controlled by circumferential movement of said drive member relatively to said third clutch member for controlling the fluid pressure within said fluid pressure actuated member.

15. In combination, an agitator shaft, a spinner basket shaft, a motor having a rotor, a clutch member for connecting the rotor to said agitator shaft, a second clutch member connected to the spinner basket shaft, a third clutch member, a drive member, circumferentially yieldable spring means through which the drive member is connected to the third clutch member, means connecting the motor rotor to said drive member, fluid pressure actuated means for moving said second and third clutch members into engagement with each other, means for supplying fluid under pressure to said fluid actuated means, valve means controlled by circumferential movement of said drive member relatively to said third clutch member for controlling the fluid pressure within said fluid pressure actuated member, and means controlled by said first-named clutch member for controlling flow of actuating fluid to said fluid actuated means.

16. In combination, an agitator shaft, a spin-

ner basket shaft, a motor having a rotor, a clutch member for connecting the rotor to said agitator shaft, a second clutch member connected to the spinner basket shaft, a third clutch member, a drive member, circumferentially yieldable spring means through which the drive member is connected to the third clutch member, a bellows connecting the motor rotor to said drive member, means for supplying fluid under pressure to the bellows to move the third clutch member into engagement with the second clutch member, and valve means controlled by circumferential movement of said drive member relatively to said third clutch member for controlling the fluid pressure in said bellows.

17. Mechanism for driving outer and inner coaxial shafts comprising a frame connected to the outer shaft, gearing in the frame connected to the inner shaft, means defining a stationary brake surface, a member having a surface for engagement with said brake surface and a clutch surface, axially yieldable torque transmitting means connecting said member to the frame, an axially movable clutch member adapted to engage said clutch surface, a drive member movable axially with the clutch member, circumferentially yieldable means connecting the drive member to the clutch member, a driving motor having a rotor, a bellows connecting said drive member to the rotor, means for supplying fluid under pressure to the bellows to move the clutch member into engagement with said clutch surface and separate the brake surfaces, valve means controlled by relative circumferential movement between said first-named member and the drive member for regulating the fluid pressure in the bellows, and clutch means for connecting the motor rotor to said gearing.

18. Mechanism for driving outer and inner coaxial shafts comprising a frame connected to the outer shaft, gearing in the frame connected to the inner shaft, means defining a stationary brake surface, a member having a surface for engagement with said brake surface and a clutch surface, axially yieldable torque transmitting means connecting said member to the frame, an axially movable clutch member adapted to engage said clutch surface, a drive member movable axially with the clutch member, circumferentially yieldable means connecting the drive member to the clutch member, a driving motor having a rotor, a bellows connecting said drive member to the rotor, means for supplying fluid under pressure to the bellows to bring the clutch member into engagement with said clutch surface and separate the brake surfaces, valve means controlled by relative circumferential movement between said first-named member and the drive member for regulating the fluid pressure in the bellows, and a clutch member positioned in the path of flow of the fluid supplied to the bellows for connecting the motor rotor to said gearing which is disconnected by the pressure of the fluid supplied to the bellows.

19. Mechanism for driving outer and inner coaxial shafts comprising a frame connected to the outer shaft, gearing in the frame connected to the inner shaft, means defining a stationary brake surface, a member having a surface for engagement with said brake surface and a clutch surface, axially yieldable torque transmitting means connecting said member to the frame, an axially movable clutch member adapted to engage said clutch surface, a drive member, circumferentially yieldable means connecting the drive member to the clutch member, a driving motor having a rotor, a bellows connecting said drive member to the rotor, a pump driven by said rotor for supplying fluid under pressure to the bellows to bring the clutch member into engagement with said clutch surface and separate the brake surfaces, valve means controlled by relative circumferential movement between said first-named member and the drive member for regulating the fluid pressure in the bellows, and a clutch member positioned in the bellows in the path of flow of the fluid supplied to the bellows for connecting the motor rotor to said gearing which is disconnected by the pressure of the fluid supplied to the bellows.

20. Mechanism for driving outer and inner coaxial shafts comprising an electric motor having a rotor, a bellows connected to and rotated by the said rotor, walls defining a clutch surface on the rotor within the bellows, a clutch member in the bellows for connecting said rotor to one of said shafts, means biasing said clutch member into engagement with said clutch surface, clutch means including a clutch member moved by expansion of the bellows for connecting the motor rotor to the other of said shafts, and means for supplying fluid pressure to the bellows beneath said first-named clutch member whereby the fluid pressure disconnects said first-named clutch member prior to expansion of the bellows to effect engagement of said clutch means.

21. Mechanism for driving outer and inner coaxial shafts comprising an electric motor having a rotor, a bellows connected to and rotated by the said rotor, walls defining a clutch surface on the rotor within the bellows, a clutch member in the bellows for connecting said rotor to one of said shafts, means biasing said clutch member into engagement with said clutch surface, clutch means including a clutch member moved by expansion of the bellows for connecting the motor rotor to the other of said shafts, walls defining a conduit connected to the bellows beneath said first-named clutch member for supplying fluid under pressure to the bellows, a normally open discharge passage in said walls, and means for closing said passage to effect flow of fluid under pressure into the bellows to move the clutch members.

22. Mechanism for driving outer and inner coaxial shafts comprising an electric motor having a rotor, a bellows connected to and rotated by the said rotor, walls defining a clutch surface on the rotor within the bellows, a clutch member in the bellows for connecting said rotor to one of said shafts, means biasing said clutch member into engagement with said clutch surface, clutch means including a clutch member moved by expansion of the bellows for connecting the motor rotor to the other of said shafts, a pump driven by the motor rotor, walls defining a conduit connecting the discharge side of the pump to the bellows beneath said first-named clutch member, a discharge opening in said walls, and means for closing said discharge opening to effect flow of fluid under pressure into the bellows to move the clutch members.

23. Mechanism for driving a washing machine shaft comprising a clutch member connected to the shaft, means defining a brake surface on which the clutch member normally rests, an electric motor having a rotor, a bellows connected to the motor rotor for rotation, a clutch mem-

ber connected to the bellows, a fluid pump driven by the motor rotor, a conduit connecting the discharge side of the pump to the bellows, to supply fluid under pressure to the bellows to effect movement of the second clutch member with respect to the first clutch member and to lift it from engagement with the brake surface, a normally open discharge passage in said conduit, and means for closing said discharge passage to effect flow of fluid under pressure to the bellows.

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Certificate of Correction

Patent No. 2,485,621 **October 25, 1949**

JACOB W. McNAIRY

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, line 59, for the numeral "14" read *13*;

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 25th day of April, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.