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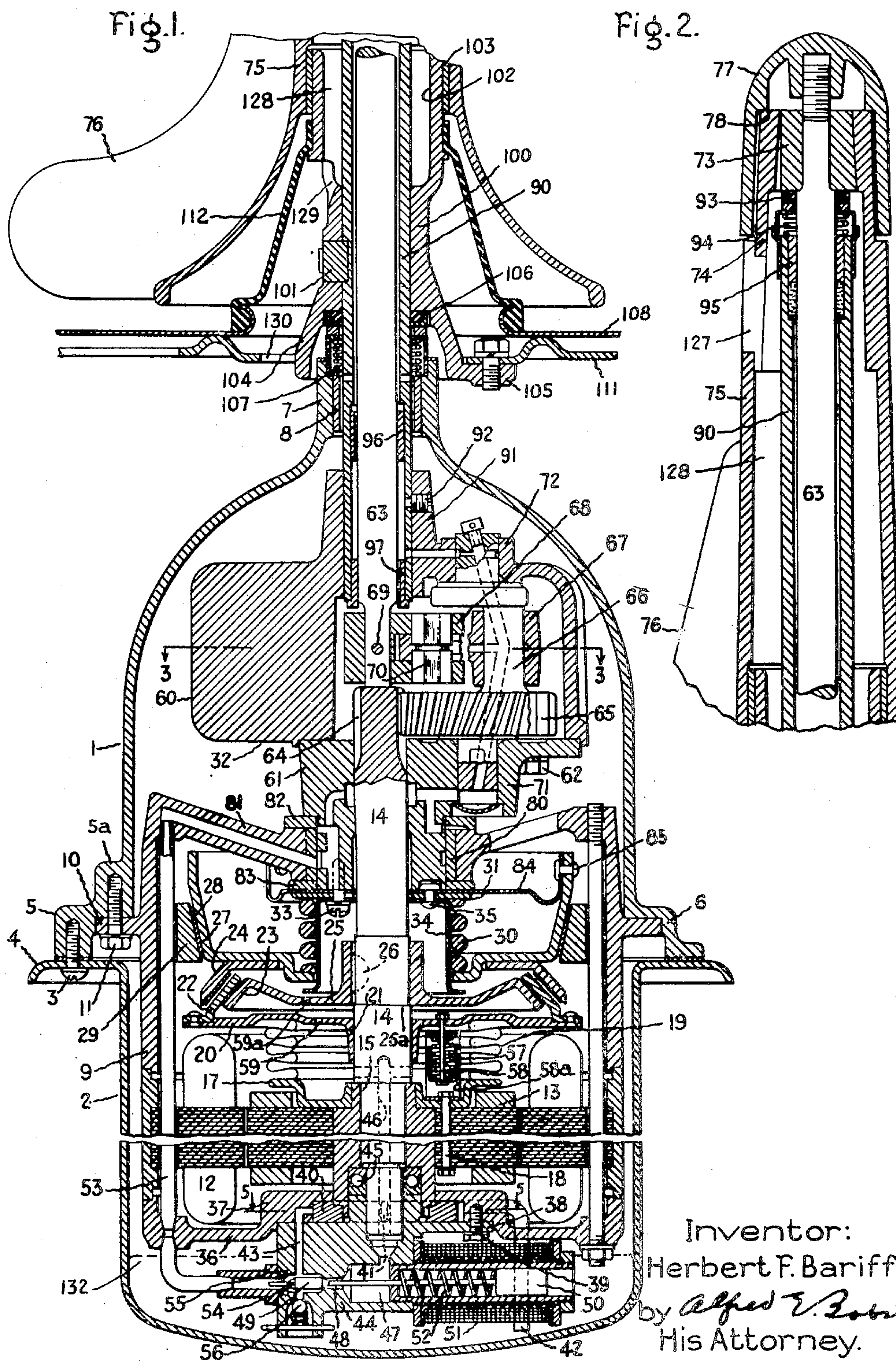
H. F. BARIFFI

2,485,622

CLOTHES WASHING MACHINE MECHANISM

Filed July 13, 1945

2 Sheets-Sheet 1





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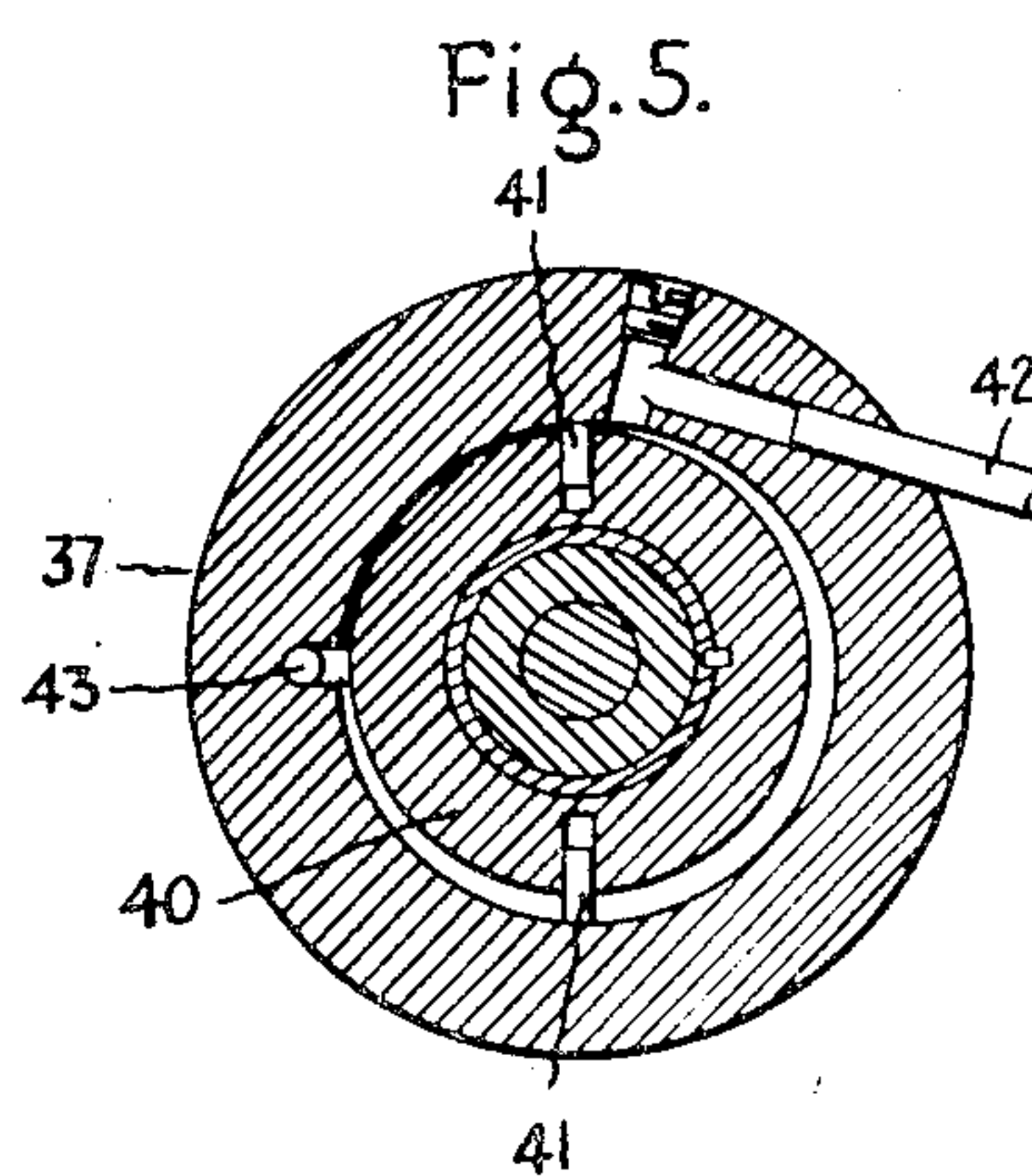
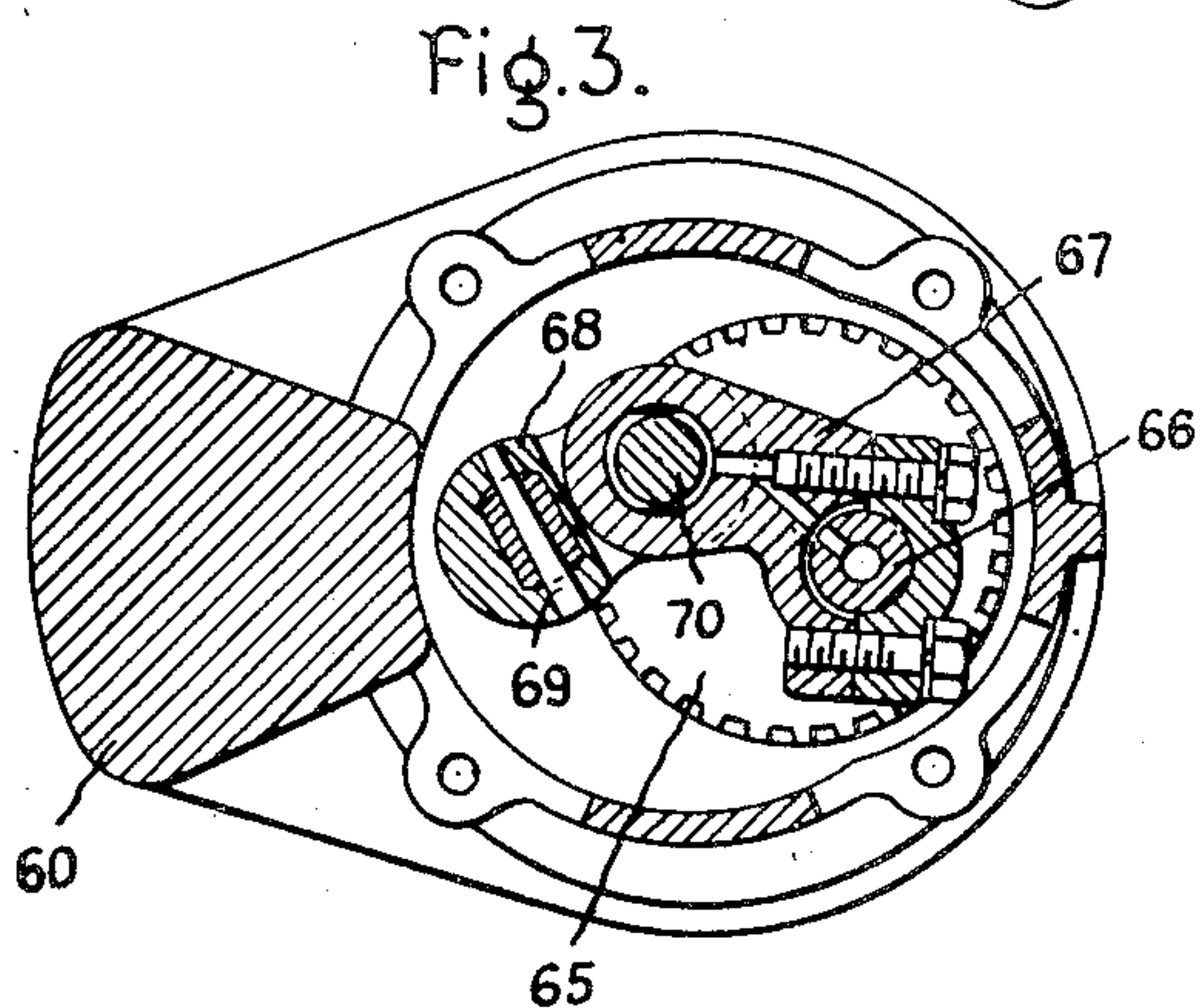
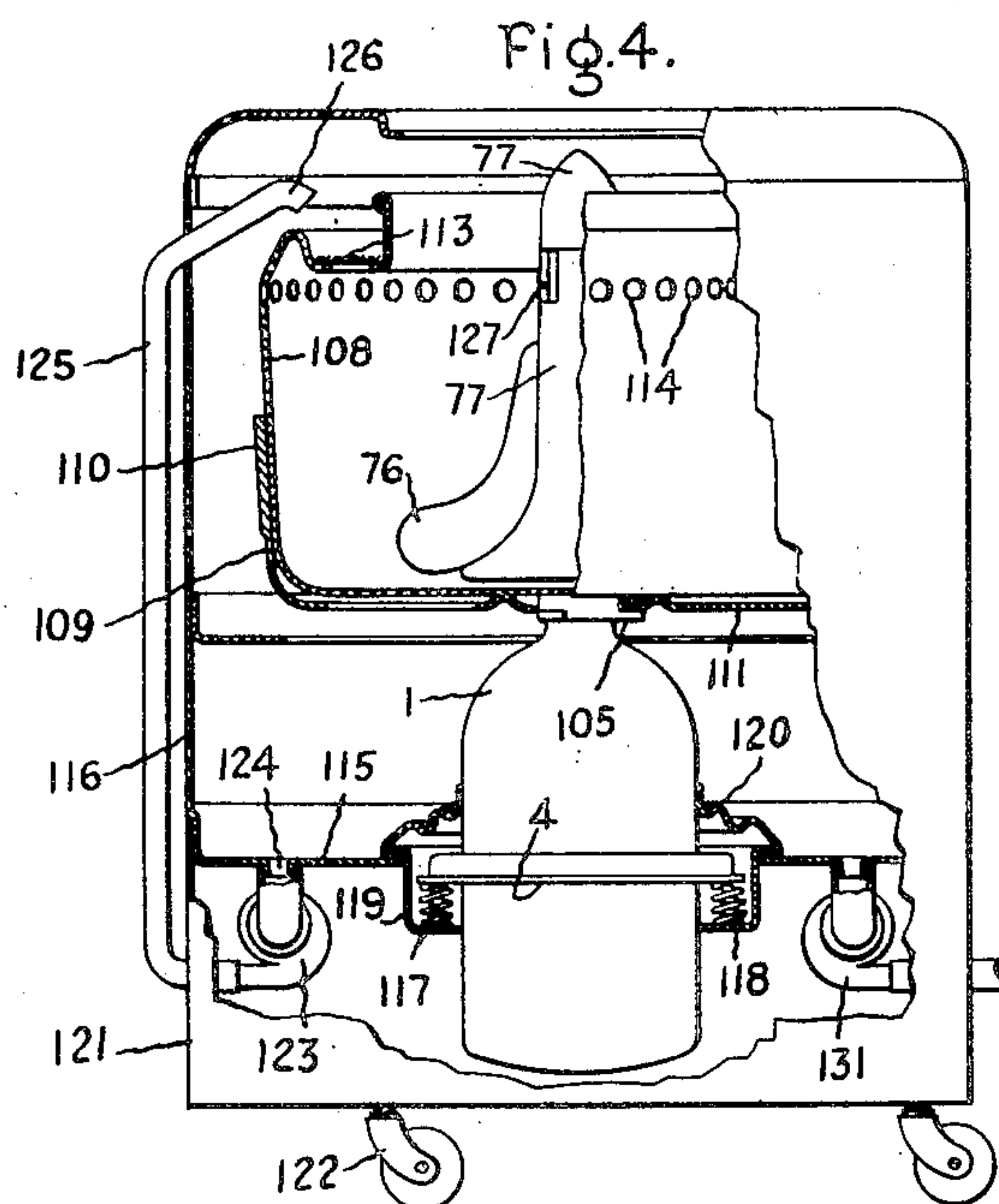
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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

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## CLOTHES-WASHING MACHINE MECHANISM

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9 Claims. (Cl. 192—3.5)

1

The present invention relates to clothes washing machines of the type comprising a basket for containing the clothes to be washed, an agitator in the basket for effecting the washing operation, and means for spinning the basket and agitator as a unit to effect drying.

The object of my invention is to provide an improved motor driven mechanism for effecting oscillation of the agitator for washing and spinning of the basket for drying, and particularly an improved clutch arrangement for connecting the motor to the agitator and to the basket, and 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 drawing, Fig. 1 is a vertical sectional view of a mechanism embodying my invention, a part being broken out at the lower end of the figure and a part being omitted at the upper end; Fig. 2 is a vertical sectional view of the upper end of the mechanism, it forming with Fig. 1 the complete mechanism; Fig. 3 is a sectional view taken on line 3—3, Fig. 1; Fig. 4 shows an outline of a complete washing machine incorporating my improved mechanism, and Fig. 5 is a detail sectional view taken on line 5—5, Fig. 1.

The mechanism is enclosed in a sealed casing comprising an upper section 1 and a lower section 2, the two sections being connected together by a ring of bolts 3 which extend through an outwardly extending flange 4 on casing section 2 and thread into bosses 5 formed on a flange 6 on the upper casing section 1. Casing section 1 tapers inwardly at its upper end and terminates in a neck 7 provided with a bearing sleeve 8. Casing section 2 is closed at its lower end. In the lower portion of the casing is an electric motor comprising a frame 9 having a flange 10 which is fastened to flange 6 by a ring of circumferentially spaced studs 11 which thread into openings in bosses 5a. In the motor frame is a field structure 12 and an armature structure 13.

The armature structure comprises a tubular armature bushing 15 which forms the rotor shaft and on which the armature laminations are stacked and in which is journaled the lower end of a drive shaft 14. On the upper side of the armature is a collar 17 fastened to the armature by a ring of circumferentially spaced bolts 18. Fixed at its lower end to collar 17 is a corrugated bellows 19, the upper end of which is fixed to a movable clutch member 20. Clutch member 20 has a hub 21 which has a sliding fit on shaft 14 and at its periphery it is provided with a clutch ring 22 positioned between two clutch rings 23 and 24. Clutch ring 23 forms a part of a clutch member 25 which is fixed to shaft 14 by being keyed thereto as is indicated at 26 and is utilized to effect oscillations of the agitator for

2

washing. Clutch member 25 rests against a shoulder 26a on shaft 26 which serves to absorb the clutch engaging force. Clutch member 25 may be termed the agitator clutch member. Clutch ring 24 is fixed to the underside of and forms a part of a clutch member 27 which is utilized for spinning the spin basket and also as a brake for the spin basket. Clutch member 27 may be termed the brake and spin clutch member. It is provided with a brake surface 28 adapted to seat against a stationary brake ring 29 which forms a part of the motor frame 9. It is biased to a position against brake ring 29 by a spring 30 positioned between a disk 31 which is attached to the lower end of a gear frame 32 by a ring of circumferentially spaced studs 33 and the central portion of brake and clutch member 27. Spring 30 surrounds a guide cup 34 which is attached to disk 31 by a ring of rivets 35 and is provided with an outturned flange at its lower end. It serves to hold spring 30 and clutch member 27 prior to assembly of these parts in the machine.

The bottom wall 36 of the motor frame is shaped to provide a pump housing 37, the lower side of which is closed by a cover plate 38 fastened in place by a ring of circumferentially spaced bolts 39. The lower end of sleeve 15 projects into the pump housing and is provided with a rotor head 40 which forms the rotating member of an eccentric type fluid pump. The blade means for the pump is indicated at 41. The inlet pipe for the pump is indicated at 42 and the discharge conduit for the pump is indicated at 43, the discharge conduit being formed in an enlarged head 44 which is integral with cover plate 38. The fluid pressure pump may be of any suitable type. In the present instance, a known type of eccentric positive displacement fluid pump is indicated. The pump casing is eccentric with respect to pump head 40 and as the bushing 15 rotates, the blade means 41, which can move radially with respect to head 40, serves to pump fluid in through inlet pipe 42 and discharge it through conduit 43. At 45 is a ball thrust bearing for the motor rotor bushing 15, the lower race being supported on a projection on cover plate 38 and the upper race being connected to bushing 15. At its lower end shaft 14 is provided with an extension of a diameter less than that of the rest of the shaft which is journaled in an opening in cover plate 38 to provide a guide bearing for the lower end of shaft 14.

In the lower end of shaft 14 is an axial passage 46, the lower end of which communicates with a chamber 47 formed in head 44 and the upper end of which communicates with the interior of bellows 19. Chamber 47 is connected to discharge conduit 43 by a passage 48 controlled by a normally closed valve 49. The stem of valve 49 is connected to the plunger 50 of a solenoid



3

51. Plunger 50 is biased to a position wherein valve 49 is closed by a spring 52. When the solenoid is deenergized, spring 52 holds valve 49 against its seat. When the solenoid is energized, plunger 50 is moved to open valve 49 and admit fluid pressure from discharge conduit 43 to chamber 47 from whence it may flow through passage 46 to the interior of bellows 19. Discharge conduit 43 is connected with a pipe line 53 which supplies oil for lubricating the various bearings of the washing machine. The lubricating system is not described in detail as its specific arrangement forms no part of the present invention. The passages for flow of lubricant to the several parts are indicated clearly in the drawing. At its left hand end, valve head 49 is provided with wings 54 which seat against a wall 55 surrounding the inlet to pipe line 53. This serves to cut off partially the flow of oil to pipe line 53 when valve 49 is opened but does not entirely shut it off due to the passages between the wings. It permits the flow of sufficient oil to lubricate the parts while at the same time it impedes the flow to the extent needed to build up the pressure it is desired to supply to bellows 19. At 56 is a spring-pressed relief valve which may be set to limit the pressure supplied by the eccentric pump so that it cannot exceed a desired value.

For collapsing bellows 19 and thereby holding movable clutch ring 22 in engagement with clutch ring 23, there are provided a plurality of compression springs 57 which at their lower ends rest in cups carried by the lower ends of bolts 58 depending from clutch member 20 and at their upper ends engage the top walls of rectangular yokes 58<sup>a</sup> fastened to collar 17 by the bolts 18. In clutch member 20 is a leakage port 59 which connects the interior of bellows 19 with the space beneath clutch member 25 and in clutch member 25 is a leakage port 59<sup>a</sup>. Axial expansion of bellows 19 is limited by the upper ends, the cups engaging the under surfaces of the adjacent portions of yokes 58<sup>a</sup>.

Gear frame 32 comprises an upper portion 60 and a lower portion 61 connected together by a ring of circumferentially spaced bolts 62. It carries gearing through which shaft 14 actuates an agitator shaft 63, the upper end of shaft 14 being journaled in portion 61 so it may turn therein relatively to the gear frame. In the present instance, this gearing is shown as comprising a pinion 64 formed directly on the upper end of shaft 14 which meshes with a gear wheel 65 on which is a crank 66 connected by a crank arm 67 to a crank arm 68 which in turn is fastened by a pin to the lower end of agitator shaft 63, as is indicated at 69. Crank arms 67 and 68 are connected together by a pivot pin 70. Gear 65 and crank 66 are supported in bearings 71 and 72 in the lower and upper walls of gear frame 32. Agitator shaft 63 has a hexagonal shaped driving head 73 fixed on its upper end over which fits the hollow post 74 of agitator 75. The blades of the agitator are indicated at 76. The agitator is fastened to the upper end of agitator shaft 63 by a sleeve nut 77 which threads onto the upper end of shaft 63 and has a shoulder 78 which engages with the upper end of the agitator sleeve.

With the above described arrangement, when the motor is running and movable clutch ring 22 is in engagement with the agitator clutch 23, as shown in the drawing, shaft 14 is rotated and through pinion 64, gear 65 and crank arms 67 and 68 effects oscillating movement of the agitator shaft 63 and the agitator 75.

4

Gear frame 32 is supported in a bearing 80 in the top wall 81 of the motor frame and its weight is carried by a thrust collar 82 arranged between the top surface of wall 81 and a shoulder on frame 32. At 83 is a second thrust collar located between the under surface of wall 81 and disk 31.

Clutch member 27 is connected to disk 31 by a plurality of circumferentially spaced spring arms 84 which at their outer ends are attached to clutch member 27 by suitable rivets 85 and at their inner ends are attached to disk 31 by rivets 35. In the present instance, the structure is indicated as being a spider comprising a central disk attached to disk 31 from the peripheral edge of which project the several spring arms 84 and it is this central disk which directly engages the thrust collar 83. With the foregoing arrangement, it will be seen that clutch ring 24 and clutch member 27 are connected to gear frame 32 through the intermediary of the spring arms 84. The spring arms are rigid in a circumferential direction but are adapted to yield axially to permit clutch member 27 to move relatively to gear frame 32.

Surrounding agitator shaft 63 is a tubular shaft 90, the lower end of which is fixed in a collar 91 on the upper side of gear frame 32 by a set screw 92. Shaft 90 projects into casing 1 through neck 7 and is journaled in the bearing sleeve 8. The upper end of tubular shaft 90 terminates just short of the underside of head 73 (Fig. 2) and between it and the head there is arranged a suitable seal 93 biased to sealing position by a spring 94. In tubular shaft 90 are spaced bearings 95, 96 and 97 for agitator shaft 63.

Attached to tubular shaft 90 is a collar 100, the collar being fixed to the tubular shaft by a suitable fastening member 101. At its upper end, collar 100 is provided with a flared portion 102, the outer surface of which serves as a journal for a bearing sleeve 103 pressed into the lower end of the agitator post 74. At its lower end, collar 100 is provided with a flared end 104 which projects down around the neck 7 of casing 1 and is provided with a bolting flange 105. Between the upper end of neck 7 and the lower end of collar 100 is a suitable sealing ring 106 biased into sealing position by a spring 107.

The spin basket 108 of the washing machine is attached to tubular shaft 90. It is non-rotatably seated in a carrier frame 109. Carrier frame 109 comprises an annular wall 110 which surrounds basket 108 and serves as a balance ring, and radially extending arms 111 which at their inner ends are bolted to flange 105. The space between basket 108 and collar 100 is sealed by a rubber ring 112 having its upper end fixed to collar 100 and its lower end fixed to the basket as is shown clearly in Fig. 1. Basket 108 is provided at its upper end with an annular filter 113 and with discharge openings 114.

Casing 1 with its contained mechanism, spin basket 108 and agitator 75 form a unitary washing and drying unit which may be mounted in a washing machine tub as shown in Fig. 4, for example. Here the unit is mounted on the bottom wall 115 of an outer tub or casing 116, it being supported on spaced springs 117 positioned between flange 4 on casing 1 and a flange 118 on the lower end of a sleeve 119 which at its upper end is fixed in an opening in bottom wall 115. The space between bottom wall 115 and casing 1 is sealed by a rubber sleeve 120 which at its upper end is fixed to casing 1 and at its lower end is



fixed to bottom wall 115. Tub 116 may be supported in a skirt 121 which in turn is supported on casters 122.

At 123 is a pump which may be suitably driven and is used to circulate the water while washing. Its inlet 124 is connected to the bottom 115 of the tub and its discharge is connected to a conduit 125 having a nozzle 126 at its upper end which discharges the wash water onto filter 113 through which the water flows to basket 108. The level of the water in basket 108 is fixed by a drain opening 127 adjacent the upper end of agitator post 74 (Fig. 2) through which water flows to a vertical passage 128 between agitator post 74 and tubular shaft 90. Passage 128 at its lower end (Fig. 1) connects through an opening 129 in collar 100 with the space between collar 100 and sealing ring 112 which space in turn is connected to tub 116 by an opening 130 in flange 105. The pump is operated during washing so the wash water is continuously withdrawn from the spin basket through passages 127, 128, 129 and 130 (and also openings 114 should the water level reach such openings) and returned to the basket through filter 113. At 131 is a suitable pump for emptying the water from the washing machine. Water may be supplied to the machine initially in any suitable manner. As stated, the washing machine unit comprising casing 1 and its contained mechanism, spin basket 108 and agitator 75 may form a part of any suitable type of washing machine and it is to be understood that the setting shown is only by way of example.

In Fig. 1, the mechanism in casing 1 is shown as occupying positions for washing, clutch ring 22 being in engagement with the agitator clutch 23 and being held in engagement therewith by springs 57. Brake surface 28 is in engagement with stationary brake ring 29, it being held in engagement therewith by spring 30. This serves to hold gear frame 32, to which clutch member 27 is attached through arms 84, stationary. Now, when the circuit is closed on the electric motor, shaft 14 is rotated and through the gearing carried by frame 32 oscillates shaft 63 and agitator 75 attached thereto in the manner already described, shaft 14 being rotated through the intermediary of bellows 19 and clutch members 22 and 23. In the lower end of casing 1 is a suitable supply of oil for lubricating the various parts and also for use in operating the mechanism to effect drying operation. The oil level is indicated by the dotted line 132. During the washing operation, the eccentric pump pumps oil from the lower end of casing 1 through inlet pipe 42 and discharges it through conduit 43 and pipe line 53 to the various parts requiring lubrication. After the washing operation is completed, an electric circuit is closed on the winding of solenoid 51. This actuates valve 49 moving it toward the left to connect passage 48 with discharge conduit 43. Fluid pressure from the pump flows through passage 48 to chamber 47 and from chamber 47 through passage 46 to the interior of bellows 19. Pressure is thus built up in bellows 19 to expand the same against action of springs 57. As the bellows expands, it first lifts clutch ring 22 from engagement with agitator clutch ring 23 to disconnect the agitator from the motor after which it engages clutch ring 24 to connect the motor to tubular shaft 90, and upon continued movement to lift clutch member 27 free of brake ring 29. Clutch member 27 is lifted against the action of spring 30 which spring is sufficiently strong to effect the needed pressure between clutch rings

22 and 24 for effecting the driving of the spin basket. The arms 84 yield axially to permit of the upward movement of clutch member 27. The agitator is now disconnected from the motor armature and the motor armature is connected to the spin basket, driving the spin basket through corrugated bellows 19, clutch ring 22, clutch member 27, gear frame 32 and tubular shaft 90. During this time, lubricant still can flow past the left hand end of valve 49 to the lubricating system to lubricate the parts. After the spin dry operation is completed, the circuit on the winding of solenoid 51 is opened whereupon spring 52 moves valve 49 to seated position, as shown in Fig. 1. This shuts off the supply of fluid pressure to the interior of bellows 19 whereupon the bellows is collapsed by springs 30 and 57 and the weight of the parts to first seat the clutch member 27 on the brake ring 29 to stop rotation of the spin basket and then to connect clutch ring 22 to the agitator clutch 23. During the collapsing of bellows 19, the oil in the bellows escapes through opening 59 in the clutch member 20. This opening is relatively small compared to passage 46 so that it does not hinder the building up of pressure in the bellows to effect connection of the motor armature to the spin basket. On the other hand, it is sufficiently large to permit of the needed escape of oil for the collapsing of the bellows. Opening 59<sup>a</sup> in clutch member 25 serves to prevent trapping of oil between clutch member 20 and clutch member 23. At the time the circuit on the winding of solenoid 51 is opened, the circuit on the motor will be opened also so that when the basket is brought to rest operation of the agitator will not be started again.

An important feature of my invention is the provision of the two clutch members, one for connecting the motor armature to the agitator operating mechanism and the other for connecting the motor armature to the spin basket for the centrifugal drying operation, the arrangement being such that the two clutches are operated hydraulically from a pump driven by the motor shaft. By reason of this arrangement, the agitator is disconnected from the motor armature prior to the spinning operation so that there is no tendency for the agitator to continue in operation when the spinning is being started.

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

1. In combination, a spinner basket shaft, a washing means shaft, a rotatable frame connected to the spinner basket shaft, a drive shaft, mechanism operated by relative rotation of the drive shaft with respect to the frame for operating said washing means shaft, an electric motor, a clutch between the motor and the drive shaft, a brake for holding the frame stationary while said clutch is engaged to effect operation of the washing means shaft, and means for clutching the motor to the frame and releasing said brake and first clutch to rotate the spinner basket shaft.

2. In combination, a spinner basket shaft, a washing means shaft, planetary driving mechanism for operating the washing means shaft and for rotating the spinner basket shaft having a frame rotatable with the spinner basket shaft, a drive shaft, mechanism operated by a relative rotation of the drive shaft with respect to the frame for operating said washing means shaft, an electric motor, a clutch between the motor and the drive shaft, a brake for holding the frame stationary while said clutch is engaged to effect



operation of the washing means shaft, and means for clutching the motor to the spinner basket shaft and releasing said brake and first clutch to rotate the spinner basket shaft.

3. In combination, a spinner basket shaft, a washing means shaft, a rotatable frame connected to the spinner basket shaft, a drive shaft, mechanism operated by relative rotation of the drive shaft with respect to the frame for operating said washing means shaft, an electric motor, a bellows connected to the motor having a clutch for driving the frame movable to the driving position by expansion of the bellows, a clutch between the motor and the drive shaft, retracting means for the bellows arranged to move the second clutch to the driving position, a brake for holding the frame stationary while said second clutch is engaged to effect operation of the washing means shaft, and means for expanding the bellows and releasing said brake to clutch the motor to the frame to rotate the spinner basket shaft and to declutch the motor from the drive shaft.

4. In combination, a spinner basket shaft, a washing means shaft, a rotatable frame connected to the spinner basket shaft, a drive shaft, mechanism operated by relative rotation of the drive shaft with respect to the frame for operating said washing means shaft, an electric motor having a rotor connected to a bellows, a clutch carried by the bellows movable to clutch the rotor to the frame by expansion of the bellows, a clutch member on said shaft, means for contracting the bellows to move the first named clutch into engagement with the second named clutch, a brake for holding the frame stationary while said second clutch is engaged to effect operation of the washing means shaft, and means for supplying fluid under pressure to the bellows to expand the bellows to move the first named clutch out of engagement with the second named clutch, release said brake and clutch the rotor to said frame.

5. In combination, a spinner basket shaft, a washing means shaft, a frame connected to the spinner basket shaft, gearing carried by the frame connected to said washing means shaft, a brake for holding the frame from rotating, a drive shaft for the gearing, a motor having a rotor, a clutch member carried by the drive shaft, a clutch member carried by the frame, a clutch member carried by the motor rotor, and means for moving said last-named clutch member to a position wherein it engages the first-named clutch member to effect operation of the washing means shaft through said gearing and to a position wherein it engages the second-named clutch member and releases said brake to effect operation of the spinner basket shaft through the frame.

6. In combination, a spinner basket shaft, a washing means shaft, a frame connected to the spinner basket shaft, gearing carried by the frame connected to said washing means shaft, a brake for holding the frame from rotating, a drive shaft for the gearing, a motor having a rotor, a clutch member carried by the drive shaft, a clutch member carried by the frame, a fluid actuated clutch member carried by the motor rotor, and means for supplying fluid under pressure to the fluid actuated clutch member for effecting its movement between positions where it engages the first-named clutch member for operation of the washing means shaft through said gearing and where it engages said second-named clutch member and releases said brake for operation of the spinner basket shaft through said frame.

7. In combination, a spinner basket shaft, a washing means shaft, a frame connected to the spinner basket shaft, gearing carried by the frame connected to said washing means shaft, a brake for holding the frame from rotating, a drive shaft for the gearing, a motor having a rotor, a clutch member carried by the drive shaft, a clutch member carried by the frame, a fluid actuated clutch member carried by the motor rotor, and a fluid pump driven by the motor rotor for supplying fluid under pressure to the fluid actuated clutch member for effecting its movement between positions where it engages the first-named clutch member for operation of the washing means shaft through said gearing and where it engages said second-named clutch member and releases said brake for operation of the spinner basket shaft through said frame.

8. In combination, a spinner basket shaft, a washing means shaft, a frame connected to the spinner basket shaft, gearing carried by the frame connected to said washing means shaft, means defining a fixed brake surface, a brake member fixed to the frame and movable relatively to the frame into and out of engagement with said brake surface, a clutch member on the brake member, a drive shaft for the gearing, a clutch member carried by the drive shaft, a motor having a rotor, a clutch member carried by the motor rotor, and means for moving said last-named clutch member to positions wherein it engages the first-named clutch member and holds said brake member out of engagement with said brake surface and wherein it engages said second-named clutch member and effects engagement of the brake member with said brake surface.

9. In combination, a spinner basket shaft, a washing means shaft, a frame connected to the spinner basket shaft, gearing carried by the frame connected to said washing means shaft, a drive shaft for the gearing, means defining a fixed brake surface, a brake member fixed to the frame and movable relatively thereto into and out of engagement with said brake surface, a clutch member on the brake member, a motor having a rotor, a movable clutch member carried by the motor rotor, means for moving said movable clutch member between positions where it engages said first-named clutch member and holds the brake member out of engagement with said brake surface and disengages said first-named clutch member and effects engagement of said brake member with said brake surface, a clutch member on said drive shaft, and means for connecting it to the motor rotor for actuating said washing means shaft when said movable clutch member is disengaged from the first-named clutch member and the brake member is in engagement with said brake surface.

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