June 22, 1954

A. CONORD

WASHING MACHINE WITH ROTATABLE AND HELICALLY-MOVABLE BASKET

2,681,557

Filed Dec. 26, 1951

4 Sheets-Sheet 1

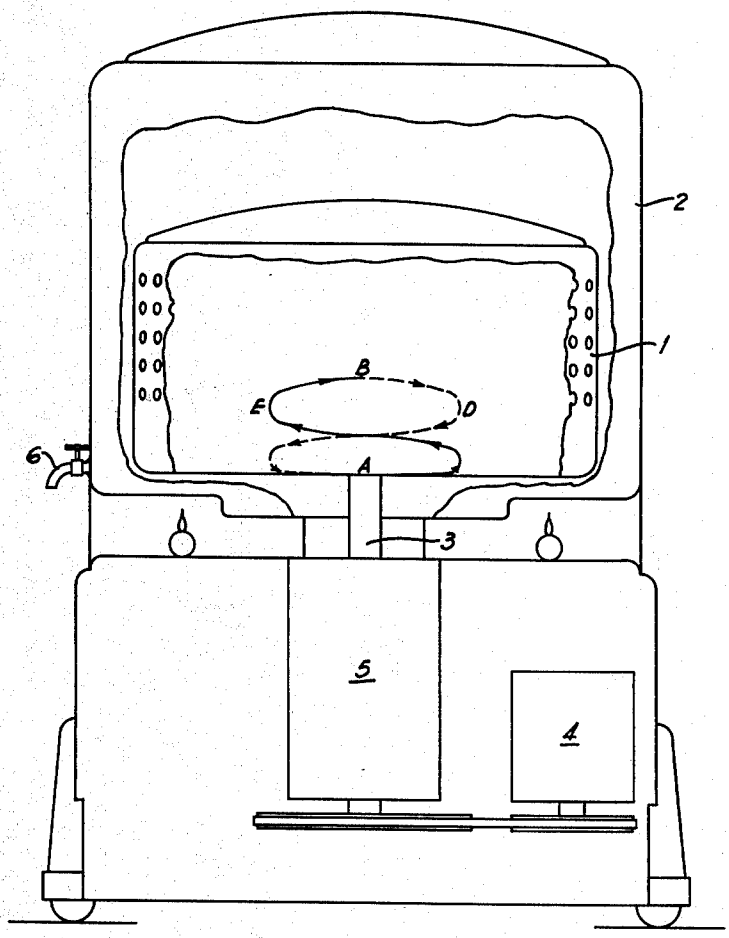


Fig. 1

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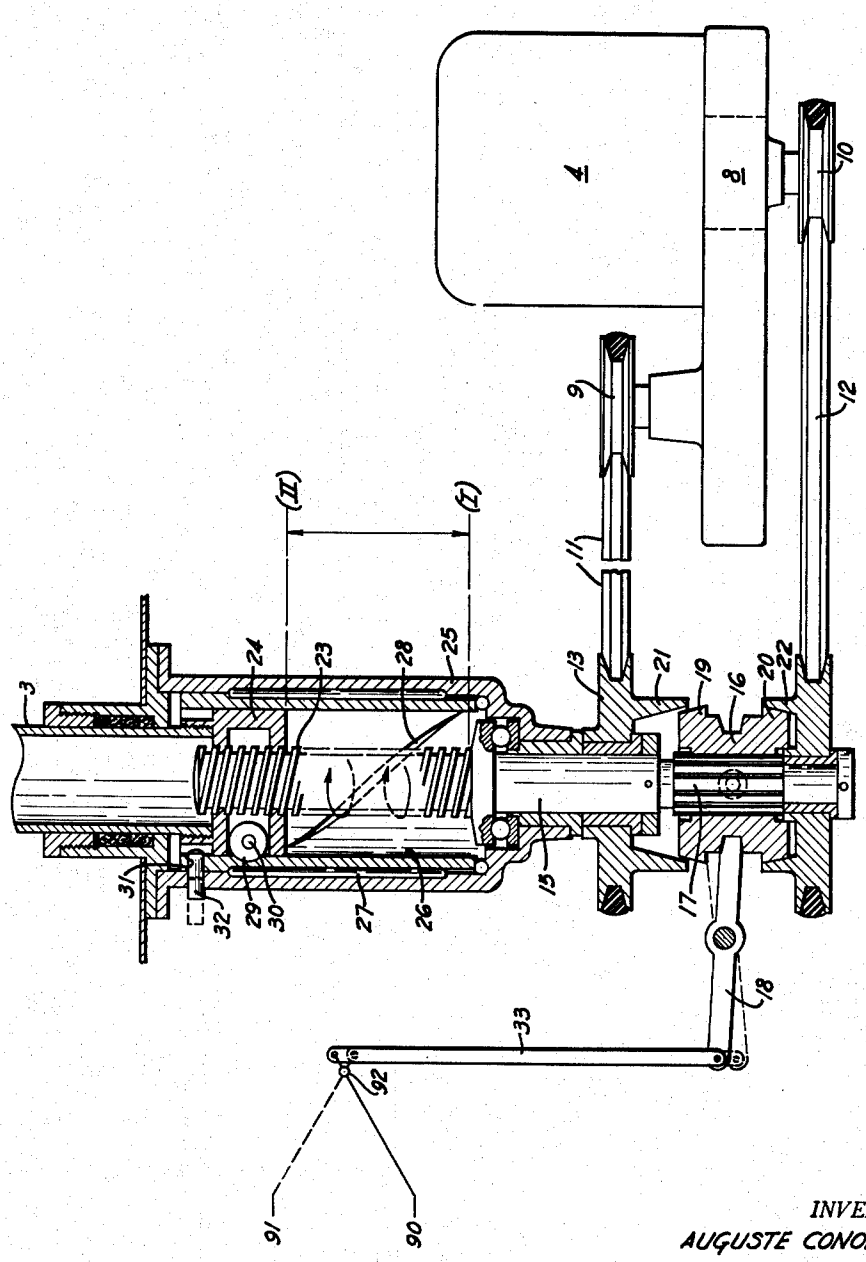


Fig. 2

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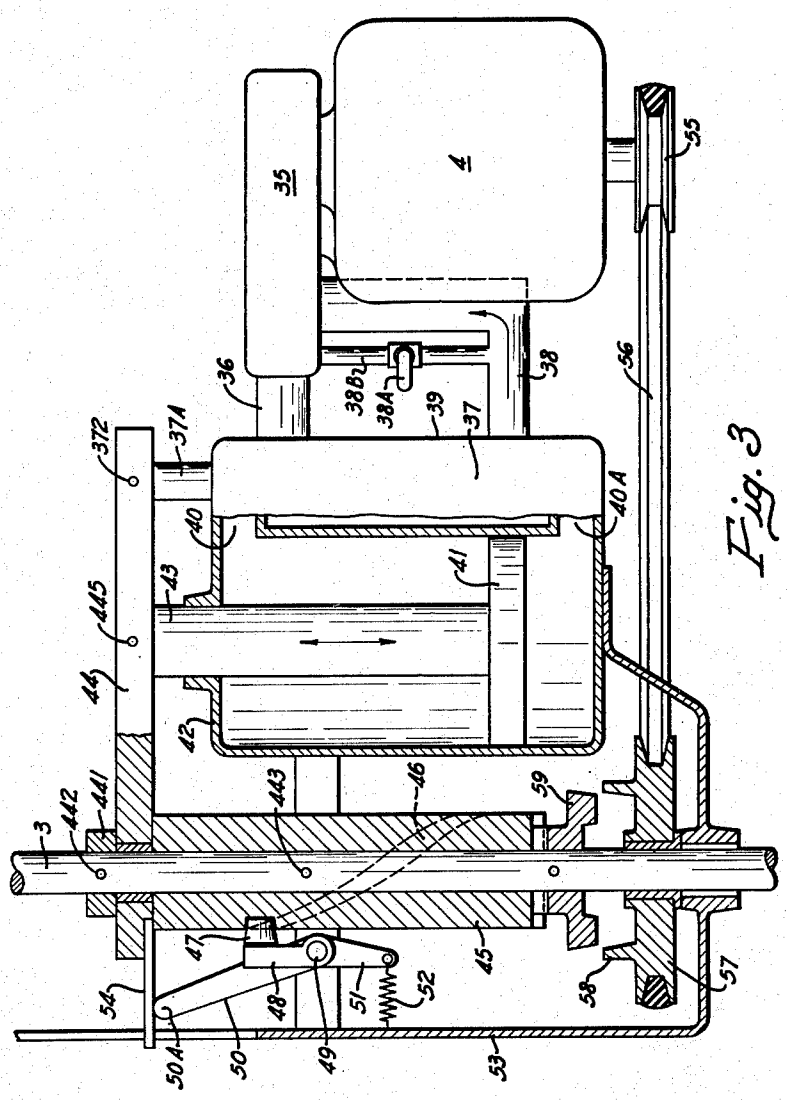


Fig. 3

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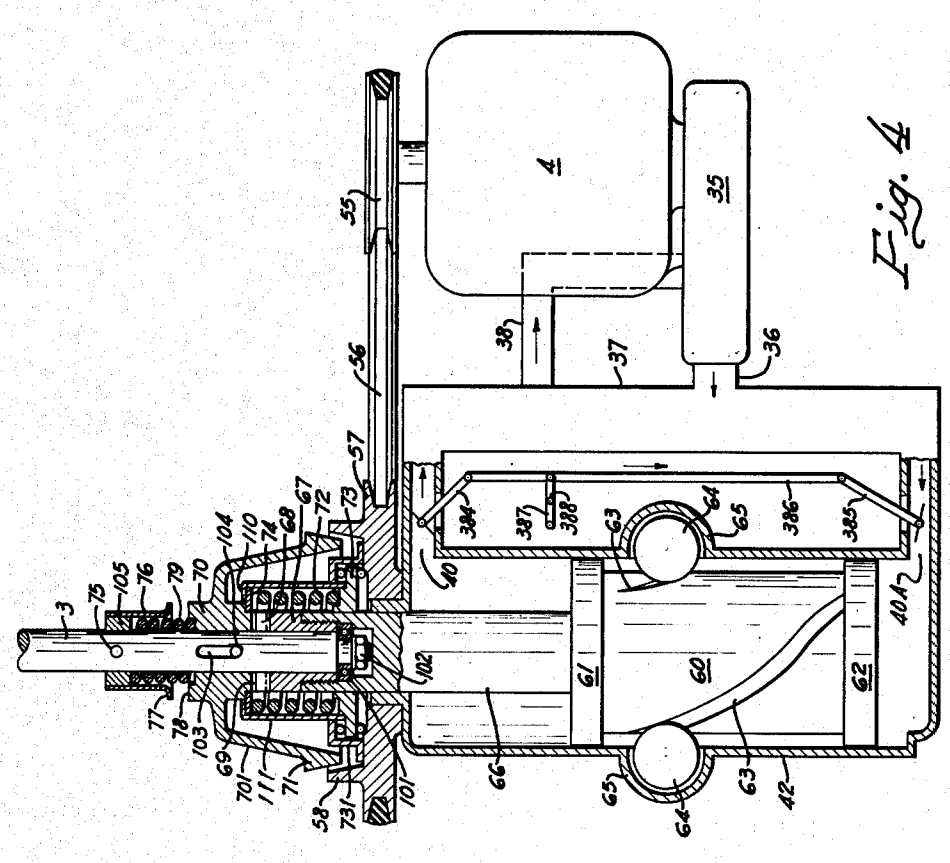


Fig. 4

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UNITED STATES PATENT OFFICE

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WASHING MACHINE WITH ROTATABLE AND HELICALLY-MOVABLE BASKET

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5 Claims. (Cl. 68—23)

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This invention relates to a washing machine which is essentially characterised by the nature of the movement imparted to the receptacle or basket which contains the linen during the washing operation and preferably also the rinsing operation. This receptacle is displaced with an alternately rising and falling helical movement within a container filled with the washing liquid.

When the washing operation is completed, the basket is lowered to its bottom position and is there set in rotation without on this occasion, at the same time, participating in the rising and falling motion, after having drained away the washing liquid contained in the container.

In addition, the invention includes by way of example various arrangements by which it is possible to impart this alternating helical movement to the basket in the container filled with liquid, and then this continuous rotational movement for centrifugal drying in the lower part of the container from which the washing liquid has previously been emptied.

The accompanying drawings show the general means which is the basis of the invention and also, by way of example, various arrangements for carrying out this general means.

Figure 1 is a purely diagrammatic figure intended to show the general assembly of the machine.

This figure shows a washing machine comprising a perforated basket 1 disposed axially in a container 2 and mounted on a shaft 3. By means of any suitable transmission means 5, actuated by means of an electric motor 4, a motion is imparted to the shaft 3 such as indicated diagrammatically by the curves A—E—B and B—D—A. Along the branch A—E—B, the shaft assumes a rising helical movement on a vertical axis comprising a rotation directed, for example, in a counter-clockwise direction. Succeeding this rising movement at the point B, there is a helical descending movement B—D—A about the same axis but with a rotation in the opposite direction (for example in a clockwise direction). This alternating helical movement is continued throughout the washing period. For rinsing purposes, the liquid in the container 2 is emptied by means of tap 6. The container is refilled with water and the basket 1 continues to have imparted to it the same alternating helical movement. When the washing operation has been completed, the basket is lowered to its bottom position corresponding to the point A of the path previously described. The container 2 is

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emptied and the basket 1 has imparted to it a rapid circular rotational movement for the purpose of causing the drying of the linen.

Figure 2 shows diagrammatically and in section an arrangement by which it is possible to impart to the shaft 3 either an alternating helical movement or the continuous rotational movement in the lowered position of the basket 1. In this embodiment, the movement is transmitted from the electric motor 4 to a reversing means 8 comprising two pulleys 9, 10 constantly turning in opposite directions. By means of belts 11 and 12 each of these pulleys drives another pulley 13 and 14 respectively loosely mounted on a shaft 15. A clutch sleeve 16 is engaged on a spline 17 on the shaft 15 so that it may slide on said shaft without turning relatively thereto. A control lever 18 permits the member 16 to be displaced. This member carries two clutch cones 19, 20 capable of engaging with corresponding cones 21, 22 carried by the pulleys 13, 14. This arrangement, which is known per se, will not be described in greater detail. It will immediately be seen that if the lever 18 is reciprocated, the shaft turns alternately in one direction and then in the other. Keyed to the upper end of the shaft 15 is an endless screw 23 on which is mounted a nut 24 fast with the shaft 3 of the basket.

The screw 23 forms the axis of a cylindrical casing 25 within which may rotate a sleeve 26 on antifriction roller or needle bearings 27. Formed inside the sleeve 26 is a helical groove 28 in which is guided a member 29, for example a roller connected to the nut 24, in which it turns about a pin 30 secured to the nut.

The sleeve 26 may at will be made fast with the casing 25 or made independent of such casing so as to turn freely within the latter on the rollers 27.

In the embodiment illustrated, the sleeve 26 is apertured for this purpose at its upper end at 31 and a pin 32 movable parallel to its axis may extend into the said hole 31. The pin may occupy two positions: the position in full lines in which the sleeve 26 is fast with the casing 25 and the position in dotted lines in which these members are made independent.

In order to cause the operation of the machine, the motor 4 is started, the pin 32 being in the position shown in full lines, and the lever 18 is caused to oscillate in such a manner as to bring the pulleys 13 and 14 alternately into engagement with the shaft 15. The result is that the screw 23 turns first in one direction and then in the other. The nut 24 guided by the groove

28 of the sleeve 26, which is fixed, thus carries out a vertical reciprocating movement which the groove 28 converts into a helical reciprocating movement between the positions (I) and (II). This movement is transmitted to the basket 1 by means of the shaft 3.

In order to obtain the continuous rotation necessary for the drying, the lever 18 is secured in one or other of its extreme positions at the same time as the pin 32 is brought to the position shown in dotted lines. As the screw 23 turns, it drives the sleeve 26 by means of the nut 24, the roller 29, and the groove 28, which sleeve then turns inside the casing 25 so that the shaft 3 is given a continuous rotational movement without rising or falling.

The oscillations of the lever 18 necessary for the washing and the rinsing are produced by any suitable arrangement, for example, by a small motor which a timing device causes to turn first in one direction and then in the other. They may also be produced by buttons 90, 91 operated by the shaft 3 near the two ends of its vertical travel A, B (Figure 1) and acting on a rod 33 pivoted to the lever 18.

Figure 3 represents a modification in which the control of the basket is effected by a hydraulic device, for example, by means of oil under pressure. The motor 4 in this case drives an oil pump 35 which is connected by a supply conduit 36 and a return conduit 38 to a distributor of the slide valve type which is known per se. Two apertures 40, 40A send the oil coming from the distributor, and according to the slide valve of this distributor, to one or other of the faces of a piston 41 movable in a cylinder 42, which imparts an alternating vertical movement to the piston. The rod 43 of the piston 41 is coupled by means of a pin 445 and a cross member 44, at the one end, by a pin 372 to a rod 37A which controls the valve of the distributor 37 and, at the other end, by a collar 441 and a pin 442 to the shaft 3 which carries the basket 1, so that the shaft may turn in the member 44.

Fixed to the shaft 3 by a pin 443 is a sleeve 45 on which is formed a helical groove 46. The upper part of this sleeve bears against the cross member 44. Rolling in the groove is a roller 47 turning on a member 48. The member 48 may itself oscillate about a pin 49 on which are keyed, on the one hand, a lever 50 and, on the other hand, a lever 51 subjected to the action of a spring 52 secured to the mechanism casing 53. The member 44 carries an extension 54 which is adapted to bear against the end 50A of the lever 50.

The motor 4 causes rotation of a pulley 55 which, by a belt 56, drives a pulley 57 which is loose on the shaft 3 and in which this shaft may slide vertically. The pulley 57 carries a clutch cone 58 and a corresponding cone 59 is keyed to the shaft 3.

The machine functions in the following manner:

The motor 4 is started and this supplies oil under pressure to the distributor 37. Assuming, as illustrated in the figure, that the piston 41 is near the bottom of its downward movement, the oil arrives through the aperture 40 and leaves through the aperture 40A. On reaching the bottom of its travel, the displacement of the distributor 37 caused by the rod 37A has the effect of causing the oil to arrive at 40A and leave at 40. Consequently, the piston 41 moves upwardly again. Conversely, when the piston reaches the top of its travel, the distributor again reverses the inlet and the outlet of the oil so that the piston 41 travels downwardly again. This movement is transmitted by the member 44 to the shaft 3, but as the latter is fast with the sleeve 45 guided by the groove 46 and the roller 47, the vertical reciprocating movement is changed into helical reciprocating movement of the shaft 3. This movement is continued until the distributor 37 is rendered inoperative, for example, by opening the valve 38A of a by-pass 38B. Under these conditions, the shaft 3 descends beyond the position at which the distributor produces the reversal of travel and to a sufficient extent to render the clutch 58, 59 operative. However, at the same time, the extension 54 bearing on the end of the lever 50 causes the roller 47 to leave the groove 46. The sleeve 45 and consequently the shaft 3 are free to carry out the continuous rotational movement which is imparted to them by the pulley 57 and the clutch 58, 59.

The embodiment shown in Fig. 4 shows a modification of the previous arrangement. The motor 4, the pump 35, the apertures 40, 40A and also the oil conduits 36, 38 are similar to the arrangement described in Figure 3. In addition, the motor 4 drives a pulley 55 controlling, through a belt 56, a pulley 57 provided with a clutch device 58. Sliding in the cylinder 42 is a piston 60 provided at its two ends with sealing packings 61, 62, said piston being formed with two helical grooves 63 engaged by balls or rollers 64 housed, for example, in cavities or housings 65 in the cylinder 42. The distributor 37 is constituted by any suitable device, known per se, for example, a Corliss type distributing system shown very diagrammatically by vanes 384, 385 coupled by a rod 386 and controlled by a lever 387 in such manner that one is opened when the other is closed. This distributing system may or may not depend automatically on the basket reaching one or other of its extreme positions. Coupled to the piston 60 is a rod 66 into which is screwed a member 67 carrying dog-clutch teeth 68 at its end. These teeth may engage with corresponding teeth 69 formed on the lower part of a sliding sleeve 70 which may slide without turning on the shaft 3 between two positions limited by a slot 103 and a pin 104 or any other means, and to which is secured, by means of a bell-shaped member 701, a clutch crown 71 capable of being brought into mesh with the crown 58 of the pulley 57.

The dog clutches 68, 69 are kept engaged by the spring 79 bearing on a ring 105 pinned at 75 to the shaft 3 and tending to cause the shaft 3 to lift with the shaft 66. Secured to the ring 105 is a cup 76, the purpose of which will be hereinafter described. In addition, the member 67 encloses, between it and the end of the shaft 66, an abutment or roller 101 fixed to the shaft 3 by a nut 102, so that the shaft 3 may turn without sliding with respect to the shaft 66.

A strong spring 72 surrounds the end of the shaft 66 and the member 67. It is enclosed by a sleeve 111 and held compressed between a washer 73 turning in a casing 731 rigidly fixed to the pulley 57, the said washer closing the lower part of the sleeve 111, and a washer 74 bearing on the upper edge 116 of the sleeve 111.

For washing and rinsing, the motor 4 is started and the distributor 37 is actuated at each end of the vertical travel of the basket 1. Under the action of the alternating oil pressure, the piston 60 oscillates in the cylinder 62 but, as a result of the guiding action due to the grooves 63 and the

rollers 64, this vertical reciprocating movement is converted into a helical reciprocating movement transmitted to the shaft 3 by the member 67 and the teeth 68, 69. The assembly formed by the shaft 3, the rod 66, the clutch 68, 69 and the ring 70 rises and falls as a unit, while sliding relatively to the washers 73 and 74 which remain stationary, because 74 is held by the flange 110 of the cover 111.

When it is desired to dry the linen, the piston 60 is caused to descend, for example, by acting on the distributor 37 which may, for example, be of the Corliss type, beyond the point where the rollers 64 reach the uppermost part of the grooves 63.

The piston 60 therefore moves further downwards, driving the rod 66, the member 67, and the shaft 3 downwardly. The spring 79 is compressed by the ring 105, allowing the edge 77 of the cup 76 to bear on the shoulder 78 of the ring 70. The travel provided between the surfaces 77 and 78 is greater than the height of the clutch teeth 68 and 69. As the ring 70 is not being displaced, because the spring 72 is substantially stronger than the spring 79, the clutch members 68, 69 are no longer in engagement. With continuation of the downward movement of the piston 60, the ring 70 is pushed downwardly by the member 76, the spring 72 is compressed and the clutch cones 71 and 58 come into contact so that the shaft 3 is driven by the pulley 57. It is obvious that the hydraulic pressure exerted on the piston 60 must be greater than the force of the spring 72 and must be maintained throughout the whole of the drying period.

It is to be understood that the invention is not limited to the embodiments which have been described and shown. In particular, the necessary reciprocating movements for the washing and the rinsing, instead of being obtained from a motor 4 always turning in the same direction, and by reversing devices constituted either by a clutch reversing means such as a member 16 (Figure 2) or by a distributor such as 37 (Figures 3 and 4), could be obtained by giving the motor 4 itself a rotational movement first in one direction and then in the other by means of an electrical reversing switch.

In the various embodiments which have just been described it is to be understood that the container holding the basket will preferably be equipped with a heating system of a type known per se.

It will also be possible for the machine to include any useful accessories such as a pump for emptying the water in the container and also a thermometer. Finally, a timing mechanism may make it possible to change automatically from washing to rinsing and from rinsing to drying in a manner which is also known per se.

I claim:

1. Washing machine, comprising in combination, a container holding the washing liquid, a basket containing the linen to be washed movably mounted in said container, driving means for imparting a reciprocating helical movement to the basket about a vertical axis while washing linen means for imparting a continuous rotational movement to the basket about the vertical axis, while drying the washed linen a motor, a disengageable coupling between said motor and said driving means, and a disengageable coupling between said motor and said rotary means.

2. The washing machine defined in claim 1 in which the basket is supported on a vertical axial shaft with the driving means arranged to cause the shaft to turn with a reciprocating helical movement while the rotating means causes the shaft to turn with a continuous rotational movement, said driving means comprising, an endless screw formed on said shaft, a nut fixed on the base of the basket and movable along the endless screw, a sleeve concentric with the screw having a helical groove in its inner surface, a coupling mounted in the container frame movable into one position to hold said sleeve stationary and movable into another position to enable the first sleeve to turn freely about the vertical shaft, and a member on said nut cooperating with the helical groove of the sleeve for turning said basket.

3. The washing machine defined in claim 1 in which the basket is mounted on a vertically journaled shaft and the driving means for imparting a reciprocating helical movement to the basket comprises a double-acting piston on a rod mounted in a cylinder, a motor-driven pump having connections for supplying fluid to either end of the cylinder, valves in the connections for controlling the flow of pressure fluid alternately to opposite ends of the cylinder, a movable connection between the piston rod and the basket shaft by which the basket and the shaft are reciprocated when the piston is reciprocated, a sleeve keyed on said shaft, a helical groove in the sleeve and a roller secured to the container frame and mounted in said groove to impart a helical movement to the basket as it is reciprocated vertically by the piston.

4. The washing machine defined in claim 3 in which the piston is given the rotary motion for drying linen in the basket after the completion of the washing cycle, which comprises a bypass in the fluid connections between the opposite ends of the cylinder, a rotatable mounting for the roller, a tripping member connected with the piston rod arranged to withdraw the roller from the helical groove when the upper end of the helical groove moves down below the roller, a pulley loosely mounted on the basket shaft, a belt connection with the pulley and the said motor to drive the pulley, and a clutch between the pulley and said shaft which is placed into driving connection when the basket is moved down to effect removal of the roller from the helical groove.

5. In a washing machine having a perforated basket and a washing liquid container in which the basket is movably mounted, a vertical shaft fixed axially to the bottom of the basket and extending through a stuffing box mounted in the bottom of the container, a piston on a rod oscillatable in a cylinder connected with said container, a pump for compressing a fluid and supplying it to a distributor, passages leading from the distributor to the cylinder above and below the points of travel of the piston in the cylinder, a valve directing said fluid to one or the other face of said piston through said passages for oscillating the piston rod, said piston rod having a hollow axial opening in its upper end, said basket shaft being mounted coaxially in said piston rod opening so as to be capable of rotating freely therein, spring connections between the rod and the shaft to control axial movement of the shaft in the rising and falling movements of the rod, a sleeve keyed on said piston rod carrying a helical groove, a roller journaled to the container frame and engaging the helical groove so as to cause a helical alternating motion to be imparted to the piston and basket, a loose pulley mounted on said piston

rod, a driving connection of the pulley with the motor which operates the fluid pump, the piston being slidable through said pulley, a clutch element, a ring around the basket shaft, a strong spring mounted between said ring and the body of the pulley acting to normally hold the ring out of engagement with the pulley, said ring having a limited sliding movement on the basket shaft without being able to turn with respect to said shaft, a clutch element on the ring associated with the aforesaid clutch element of the pulley, a disengageable tooth coupling device on said ring mounted for coupling with teeth in the upper end of said piston rod, said ring having an inferior face and a superior face, a cup member fixed on the basket shaft above said ring and adapted to bear on the aforesaid ring when the piston descends beyond the lower limiting position of its helical reciprocating movement in the cylinder, the travel of said cup being in this case greater than the height of the teeth of the disengageable tooth coupling device, a light spring acting between the bottom of the cup and the upper face of the ring to control the limited sliding movement of the basket shaft

relatively to the ring around said shaft, an abutment on the inferior face of the ring against which the strong spring acts to force the ring upwardly, whereby when the piston is lowered beyond the lower position of its helical reciprocating movement the rotational coupling between the rod of the piston and the shaft of the basket is first disengaged and then the clutch between the shaft and the pulley driven by the motor is rendered operative.

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