

Feb. 4, 1958

D. HAYS
WASHING MACHINE

2,821,840

Filed June 17, 1952

4 Sheets-Sheet 1

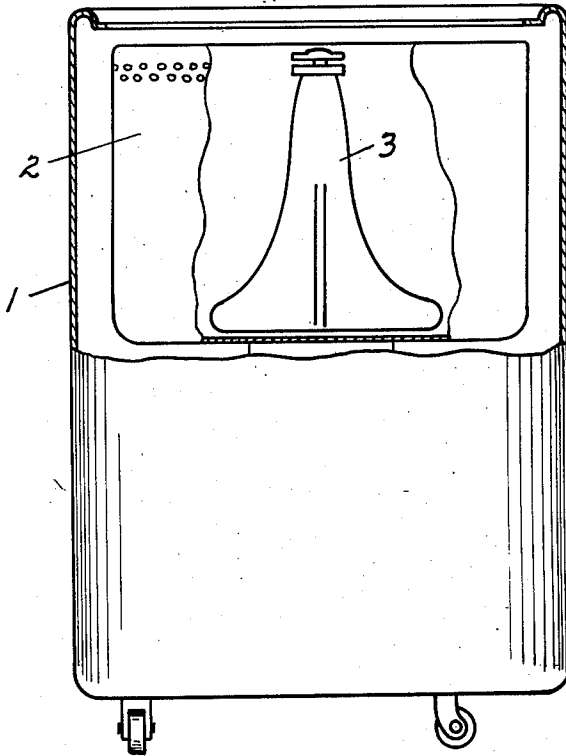


FIG. 1

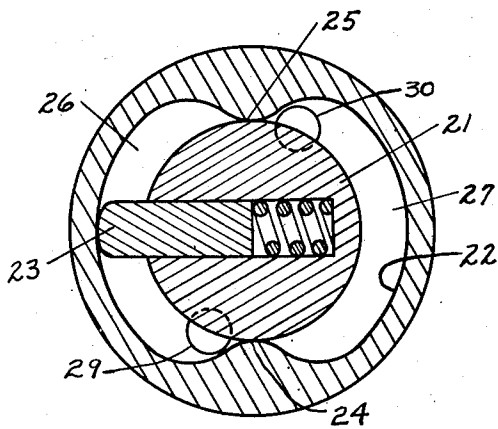


FIG. 3

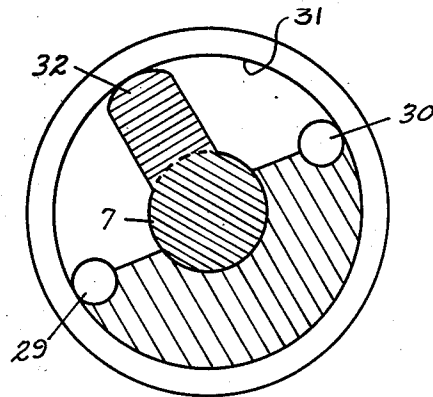


FIG. 4

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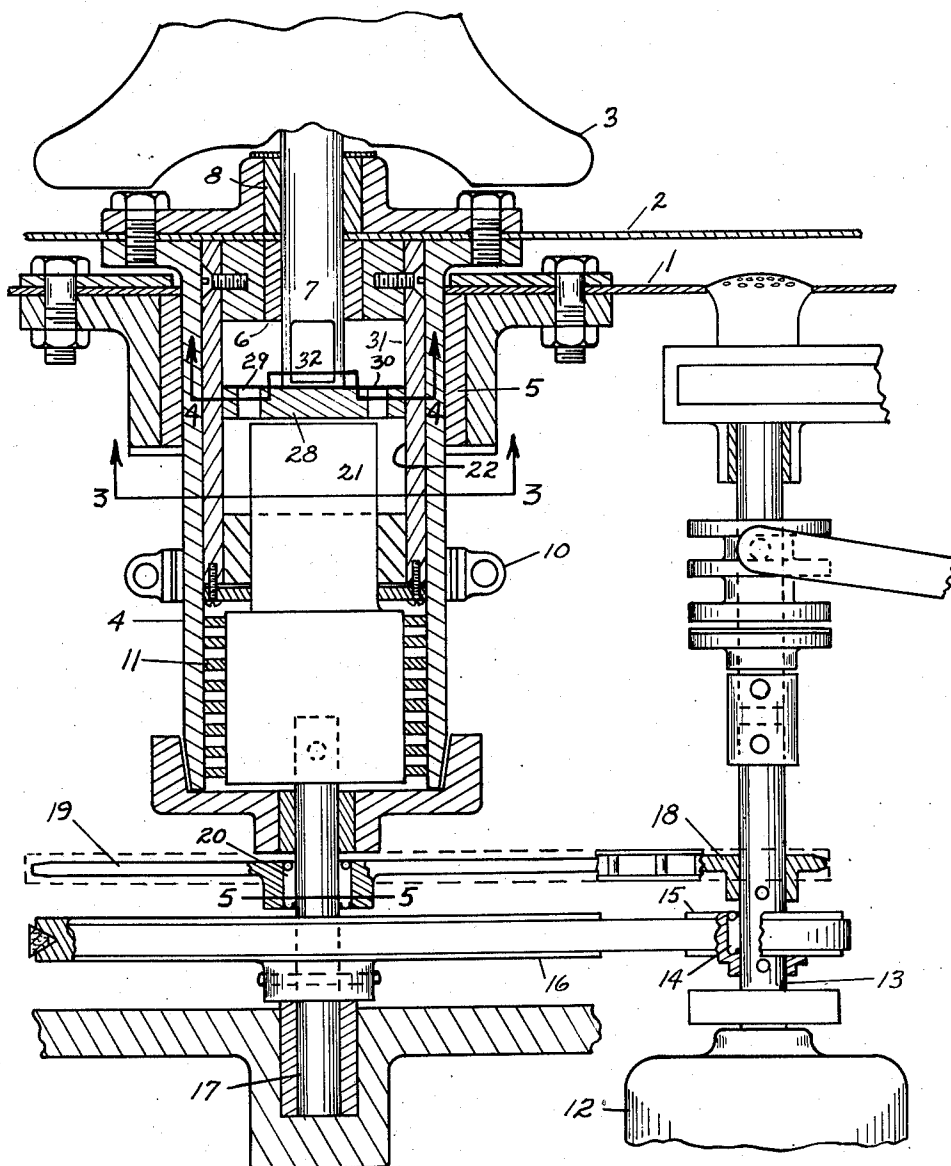


FIG. 2

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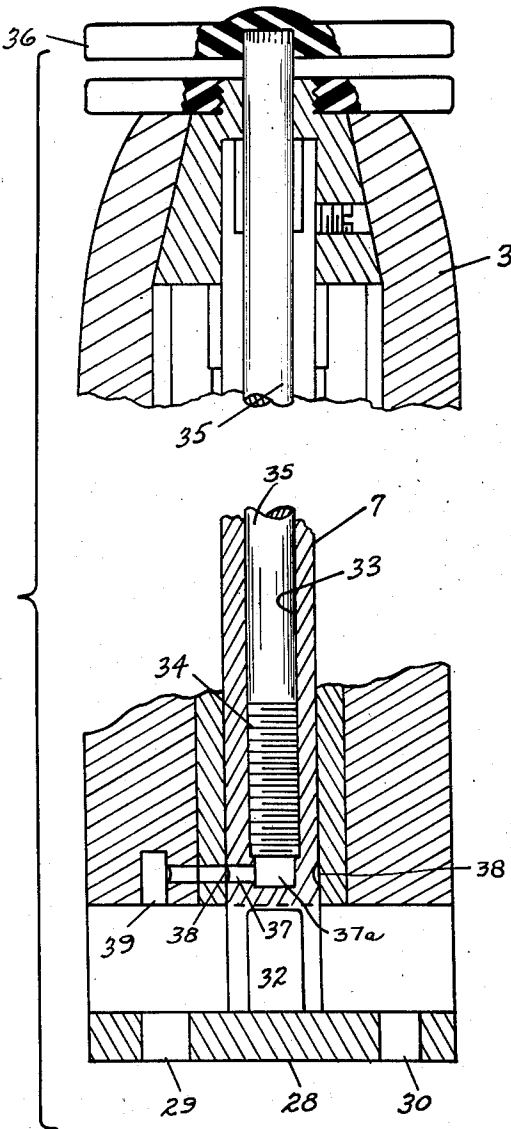


FIG. 6

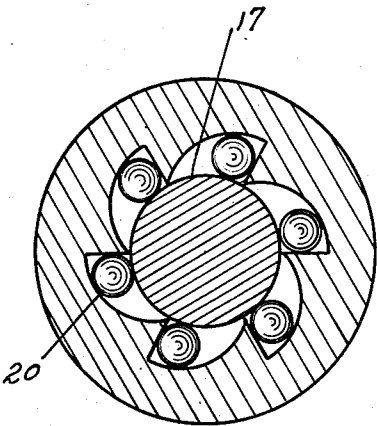


FIG. 5

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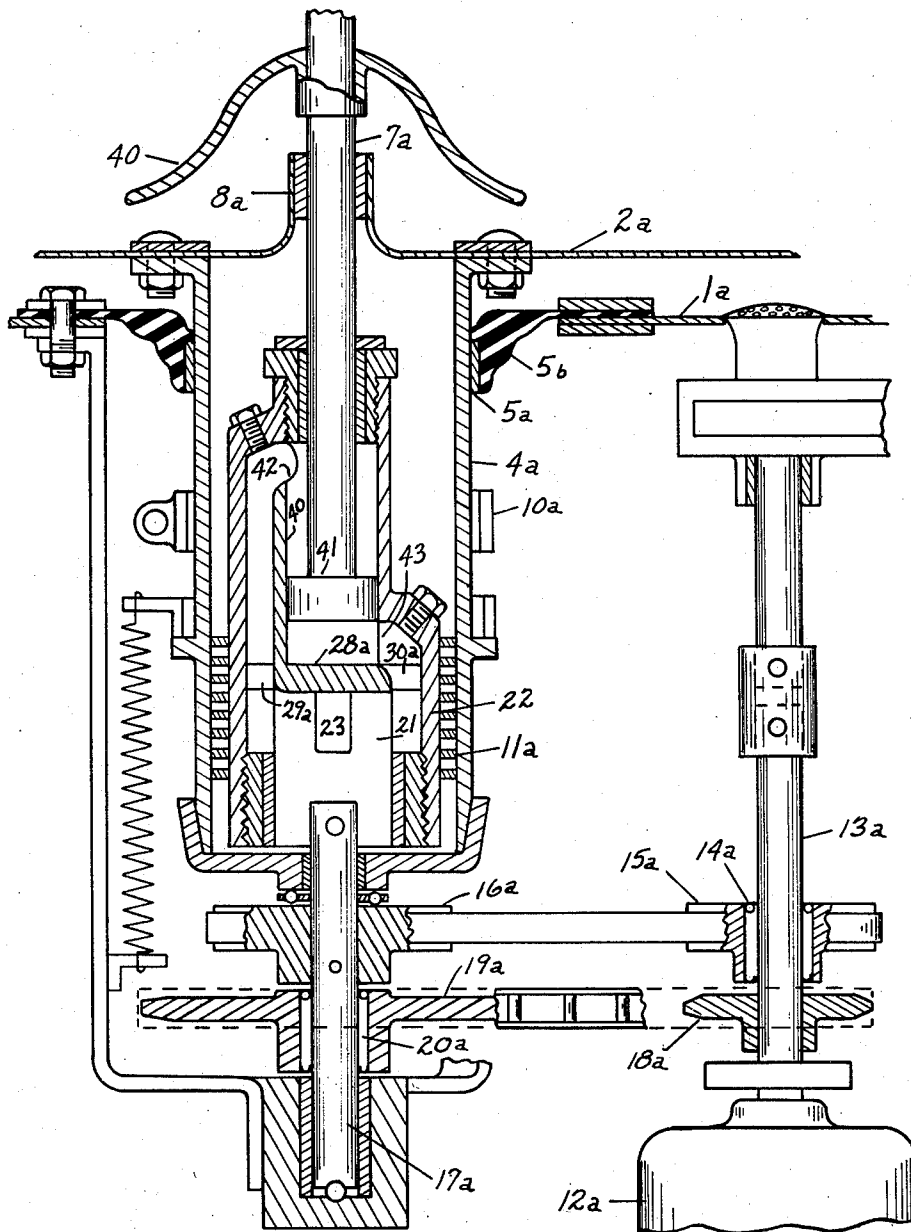


FIG. 7

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2,821,840

WASHING MACHINE

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9 Claims. (Cl. 60—54.5)

This invention is intended to provide a hydraulic drive for an oscillatory washing machine agitator. The drive can be used for linear or angular oscillation and can form part of the transmission of a single tub washer and dryer of the centrifugal extractor type.

In the drawings:

Fig. 1 is an elevation, partly broken away, of a washing machine of the single tub washer and dryer type.

Fig. 2 is a section through the agitator and spinner basket drive.

Fig. 3 is a section on line 3—3 of Fig. 2.

Fig. 4 is a section on line 4—4 of Fig. 2.

Fig. 5 is a section on line 5—5 of Fig. 2.

Fig. 6 is a section through an arrangement for varying the agitator stroke.

Fig. 7 is a section through a modification in which the oscillation of the agitator is linear instead of angular.

In Fig. 1 is diagrammatically shown a single tub washer and dryer having an external tub 1 within which is mounted a perforate spinner basket 2 and an angularly oscillating agitator 3. During washing, the spinner basket remains stationary and the agitator 3 is oscillated. At the end of washing, the water is drained from the tub 1 and the spinner basket 2 is rotated to centrifugally dry the clothes. The construction so far described is or may be of common construction.

As shown in Fig. 2 the spinner basket is fixed to a sleeve 4, which depends through and is journaled in a bearing 5 fixed on the bottom wall of the tub 1. At the upper end of the sleeve is fixed a bearing 6 for an agitator shaft 7. On the inside of the basket there is also another bearing 8 for the agitator shaft. During washing, the spinner basket is held stationary by a brake 10 which grips the outer surface of the sleeve 4. During centrifugal drying, the brake 10 is released and the spinner basket 2 is driven through a coil spring clutch 11 inside the sleeve 4. The power for driving the washing machine is obtained from a reversible motor 12 having a shaft 13 connected by an over-running clutch 14 to a drive pulley 15, which drives a pulley 16 pinned to a vertical shaft 17 when the motor rotates in the direction to cause driving engagement of the clutch 14 with the pulley 15. When the motor runs in the reverse direction the pulley 15 is free on the shaft 13 and there is a direct chain drive from a sprocket 18 pinned to the shaft 13 to a sprocket 19 connected to the shaft 17 through an over-running clutch 20. The over-running clutches 14 and 20 are oppositely arranged so that when the clutch 14 is in driving engagement with the pulley 15, the clutch 20 is loose with respect to the shaft 17. The clutches 14 and 20 permit high speed rotation of the shaft 17 for centrifugal drying and low speed rotation of the shaft 17 for operation of the agitator by the expedient of changing the direction of rotation of the driving motor 12.

The oscillating drive for the agitator 3 is effected by means of a pump rotor 21 fixed to the shaft 17 and rotating in a pump chamber 22 (Fig. 3). The pump rotor has a spring pressed vane 23 which sweeps the inside walls

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of the pump chamber and forces the oil ahead of the vane. The main body of the pump rotor has a running clearance with inwardly extending projections 24 and 25 at opposite sides of the pump chamber, which divide the pump chamber into two compartments or chambers 26 and 27. Above the pump chamber is a plate 28 having diametrically opposite ports 29 and 30 located respectively at the ends of the chambers 26 and 27 as regards the direction of rotation of the pump rotor 21. The ports 29 and 30 communicate with a cylinder 31 having therein a vane piston 32 fixed to the lower end of the agitator shaft 7. As the vane 23 on the pump rotor approaches the port 29 in the plate 28, the oil is forced up through the plate and causes the vane piston 32 to be moved toward the port 30. This movement of the vane piston 32 toward the port 30 forces oil back down into the compartment 27 so that when the vane 23 passes the projection 24 the compartment 27 is full and in condition to force oil back up through the port 30 and thereby cause reverse movement of the vane piston 32. With this arrangement there is accordingly one complete oscillation of the vane piston 32 at each revolution of the pump rotor 21. The amplitude of the oscillation depends upon the ratio of the volume of the compartments 26 and 27 to the volume of the cylinder 31. By adjusting the volume of the cylinder 31, the stroke or amplitude of oscillation of the agitator can be set within wide limits. The stroke can also be varied by the volume of oil, the stroke being shorter if the oil is partly drained.

At the end of the washing operation, the brake 10 which held the spinner basket 2 stationary during washing is released and the motor 12 is reversed thereby establishing a drive through the pulleys 15 and 16 which causes a higher speed rotation of the shaft 17 in the opposite direction from the direction of rotation during oscillation of the agitator. Under these conditions, the spinner basket is driven through the coil spring clutch 11 which acts in the same manner as the over-running clutches 14 and 20 in that it drives only in one direction and runs free in the reverse direction. The coil spring clutches are well understood and need not be further illustrated. The pump rotor 21 which provides the fluid drive for the agitator rotates with the pump chamber 22 during centrifugal drying so that there is no relative movement between the pump rotor and the pump chamber and accordingly no oscillation of the agitator.

In Fig. 6 is shown an arrangement for varying the agitator stroke. As was pointed out in connection with the description of Figs. 2 to 5, inclusive, the stroke of the agitator depends upon the relative volume of the compartments 26 and 27 and of the cylinder 31. That is for a given volume of oil discharged upwardly through the port 29 the vane piston moves an angular distance sufficient to accommodate that volume of oil. With the arrangement shown in Fig. 6, an auxiliary reservoir 37a is provided for receiving part of the oil forced upward through the port 29. Accordingly, the vane piston 32 moves an angular distance such that the volume of oil between it and the port 29 plus the volume of oil in the auxiliary reservoir is equal to the volume of oil forced up through the port 29. By having the auxiliary reservoir of variable volume the stroke of the agitator can be varied.

In order to provide the variable volume reservoir which can vary the stroke or amplitude of oscillation of the agitator 3, the agitator shaft 7 is bored at 33 and is threaded at 34 to receive a shaft 35, which extends out the upper end of the agitator and is provided with a handle 36 by means of which it can be threaded into and out of the bore 33. The lower end of the shaft 35 communicates through a way 37 in the agitator shaft 7 with an annular groove 38 which is connected by a way 39

directly above the port 29. When the shaft 35 is threaded clear to the bottom, the agitator oscillates through its full stroke. As the shaft 35 is threaded out of the agitator shaft 7, the stroke is decreased and can easily be cut to half of the full stroke.

In the washing machine so far described the agitators 3 have been angularly oscillated. There are washing machine agitators which are linearly oscillated or reciprocated vertically up and down toward the bottom of the tub. In Fig. 6 the invention is shown applied to a washing machine having such a linearly oscillating agitator. This agitator comprises a cup shape disc 40 adjacent the bottom of the spinner basket 2a and fixed to the vertically reciprocable agitator shaft 7a.

Except for the drive for the vertically reciprocating agitator, the construction in Fig. 7 is very similar to the construction in Fig. 2. The spinner basket 2a has a depending sleeve 4a which is journaled in a bearing 5a yieldably supported from the bottom of the tub 1a by a rubber grommet 5b. The vertical reciprocation of the agitator shaft 7a is guided by a bearing 8a. During washing, the spinner basket is held stationary by a brake 10a. The drive for the washing machine is obtained from a reversible motor 12a having a belt drive 15a, 16a, to a drive shaft 17a, there being an over-running clutch 14a between the pulley 15a and the motor shaft 13a, which makes the pulley 15a loose on the shaft 13a when the motor 12a runs in one direction. There also is a chain and sprocket drive 18a, 19a to the power shaft 17a through an over-running clutch 20a, which is oppositely arranged to the over-running clutch 14a so that one of the clutches is engaged and the other is loose.

The drive to the spinner basket 2a for centrifugal extracting is through the pulleys 15a, 16a and a coil spring clutch 11a to a sleeve 4a. The coil spring clutch 11a, like the over-running clutches 14a, 20a runs free in one direction of rotation and engages in the other. When the drive is in the centrifugal extracting position, there is direct drive from the motor shaft 13a through the pulleys 15a, 16a and the clutch 11a to the spinner basket 2a.

During washing, the motor 12a runs in the reverse direction and the over-running clutch 14a is loose while the over-running clutch 20a is engaged. This causes rotation of a pump rotor 21 in a chamber 22 which has the identical construction shown in Fig. 3. Directly above the pump rotor is a plate 28a having diametrically opposite ports 29a, 30a. The plate 28a is integral with a vertical cylinder 40 containing a piston 41 fixed to the lower end of the agitator shaft 7a. As the pump rotor 21 rotates the vane 23 sweeps around and alternately forces liquid up through the ports 29a, 30a. That is during one-half revolution of the pump rotor 21 oil is forced up through the port 29a and during the other half revolution of the rotor 21 oil is forced up through the port 30a. Since the ports 29a and 30a are always connected to the pumping chamber while oil is being forced up through one of the ports it is free to drain down through the other. Since the port 29a is connected through a way 42 with the upper side of the piston 41 and the port 30a is connected by a way 43 with the lower side of the piston 41 it can be seen that the piston 41 will alternately be moved up and down thereby imparting a vertical reciprocation to the agitator. The speed of reciprocation of the piston 41 is determined by the speed of rotation of the shaft 17a. During one complete revolution of the shaft 17a the piston 41 goes through one complete up and down oscillation. The stroke through which the piston 41 is reciprocated is determined by the volume of the pumping chamber as compared to the volume of the cylinder 40.

In the use of the machine, during washing the brake 10a is held engaged holding the spinner basket 2a stationary, and the shaft 17a is driven through the sprockets 18a, 19a causing a vertical reciprocation of the agitator at the speed equal to the speed of rotation of the shaft

17a. At the end of the washing, the brake 10a is released and the motor 12a reversed to complete a direct drive to the spinner basket through the pulleys 15a, 16a and the clutch 11a, which grips the sleeve 4a connected to the spinner basket.

What I claim as new is:

1. In an oscillatory drive, a rotatable power shaft, means for rotating the power shaft, a pair of liquid filled chambers on opposite sides of the power shaft, a liquid delivery port leading from each chamber, piston means for the chambers, a drive from the power shaft to the piston means actuating the piston means toward one of the delivery ports during part of the revolution of the power shaft and then toward the other of the delivery ports during the balance of the revolution of the power shaft to force liquid out first through said one of the liquid delivery ports and then through the other of the delivery ports, a driven shaft, a piston on the driven shaft, a cylinder surrounding the driven shaft piston, a passage connecting one of the port to one side of the driven shaft piston, and a passage connecting the other of the ports to the other side of the driven shaft piston.

2. In an oscillatory drive, a rotatable power shaft, means for rotating the power shaft, a pair of liquid filled chambers on opposite sides of the power shaft, each chamber having a port, a pump rotor on the power shaft sweeping into first one and then the other of the chambers to force liquid out through first one and then the other of the ports during each revolution of the power shaft, a driven shaft, a piston on the driven shaft, a cylinder surrounding the driven shaft piston, a passage connecting one of the ports to one side of the driven shaft piston, and a passage connecting the other of the ports to the other side of the driven shaft piston.

3. In an oscillatory drive, a rotatable power shaft, means for rotating the power shaft, a pair of liquid filled chambers on opposite sides of the power shaft, each chamber having a port, a pump rotor on the power shaft sweeping into first one and then the other of the chambers to force liquid out through first one and then the other of the ports during each revolution of the power shaft, a driven shaft, a piston on the driven shaft, a cylinder surrounding the driven shaft piston, a passage connecting one of the ports to one side of the driven shaft piston, a cavity in the driven shaft, a passage leading from said one side of the driven shaft piston to the cavity, an adjustable member extending out through the top of the driven shaft and extending into the cavity to an adjustable extent for varying the volume of the cavity and thereby varying the stroke of the driven shaft, and a passage connecting the other of the ports to the other side of the driven shaft piston.

4. In an oscillatory drive, a rotatable power shaft, means for rotating the power shaft, a pair of liquid filled chambers on opposite sides of the power shaft, each chamber having a port, a pump piston, driving means between the power shaft and the pump piston for moving the piston during each revolution of the power shaft toward first one and then the other of the ports to force liquid alternately out first through said one of the ports and then through said other of the ports, a driven shaft, a piston on the driven shaft, a cylinder surrounding the driven shaft piston, a passage connecting one of the ports to one side of the driven shaft piston, and a passage connecting the other of the ports to the other side of the driven shaft piston.

5. In an oscillatory drive, a rotatable power shaft, means for rotating the power shaft, a pair of liquid filled chambers on opposite sides of the power shaft, each chamber having a port, a pump piston, driving means between the power shaft and the pump piston for moving the piston during each revolution of the power shaft toward first one end then the other of the ports to force liquid alternately out first through said one of the ports and then through said other of the ports, a vertically

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reciprocable driven shaft, a piston on the driven shaft, a cylinder surrounding the driven shaft piston, a passage connecting one of the ports to one side of the driven shaft piston, and a passage connecting the other of the ports to the other side of the driven shaft piston.

6. In a drive, oscillatory driven shaft means, rotatable driven shaft means, a rotatable power shaft, means for alternatively rotating the power shaft at the speed of oscillation of the oscillatory driven shaft means and at the speed of rotation of the rotatable driven shaft means, a pump chamber having a pair of liquid filled chambers on opposite sides of the power shaft, each liquid filled chamber having a port, means rotatably supporting the pump chamber, a brake for holding the pump chamber stationary, a rotary pump piston, a drive between the rotary pump piston and the power shaft for sweeping the pump piston into first one and then the other of the liquid filled chambers to force liquid out through first one and then the other of the ports during each revolution of the power shaft, a drive for the oscillatory driven shaft means comprising a cylinder, a driven shaft piston in the cylinder, a passage connecting one of the ports to one side of the driven shaft piston and a passage connecting the other of the ports to the other side of the driven shaft piston, and a drive for the rotatable shaft means comprising a clutch from the power shaft to the rotatable shaft means.

7. In a drive, oscillatory driven shaft means, rotatable driven shaft means, a rotatable power shaft, the shaft means and the power shaft being concentric and the power shaft being below the oscillatory driven shaft means, means for alternatively rotating the power shaft at the speed of oscillation of the oscillatory driven shaft means and at the speed of rotation of the rotatable driven shaft means, a pump chamber having a pair of liquid filled chambers on opposite sides of the power shaft, each liquid filled chamber having an upwardly directed port, means rotatably supporting the pump chamber, a brake for holding the pump chamber stationary, a rotary pump piston, a drive between the rotary pump piston and the power shaft for sweeping the pump piston into first one and then the other of the liquid filled chambers to force liquid out through first one and then the other

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of the ports during each revolution of the power shaft, a drive for the oscillatory driven shaft means comprising a cylinder above the pump chamber, a driven shaft piston in the cylinder, a passage connecting one of the ports to one side of the driven shaft piston and a passage connecting the other of the ports to the other side of the driven shaft piston, and a drive for the rotatable shaft means comprising a clutch from the power shaft to the rotatable shaft means.

8. In an oscillatory drive, a rotatable power shaft, means for rotating the power shaft, a pair of liquid filled chambers on opposite sides of the power shaft, each chamber having an upwardly directed port, a pump piston, driving means between the power shaft and the pump piston for moving the piston during each revolution of the power shaft toward first one and then the other of the ports to force liquid alternately out first through said one of the ports and then through said other of the ports, a vertically reciprocable driven shaft above and concentric with the power shaft, a piston on the driven shaft, a cylinder surrounding the driven shaft piston, a passage connecting one of the ports to one side of the driven shaft piston, and a passage connecting the other of the ports to the other side of the driven shaft piston.

9. In an oscillatory drive, a rotatable power shaft, means for rotating the power shaft, a pair of liquid filled chambers on opposite sides of the power shaft, each chamber having an upwardly directed port, a pump rotor on the power shaft sweeping into first one and then the other of the chambers to force liquid out through first one and then the other of the ports during each revolution of the power shaft, a driven shaft above and concentric with the power shaft, a piston on the driven shaft, a cylinder surrounding the driven shaft piston, a passage connecting one of the ports to one side of the driven shaft piston, and a passage connecting the other of the ports to the other side of the driven shaft piston.

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