

Nov. 1, 1949.

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2,486,707

VALVE AND ACTUATING MECHANISM FOR FLUID MOTORS

Filed June 18, 1945

3 Sheets-Sheet 1

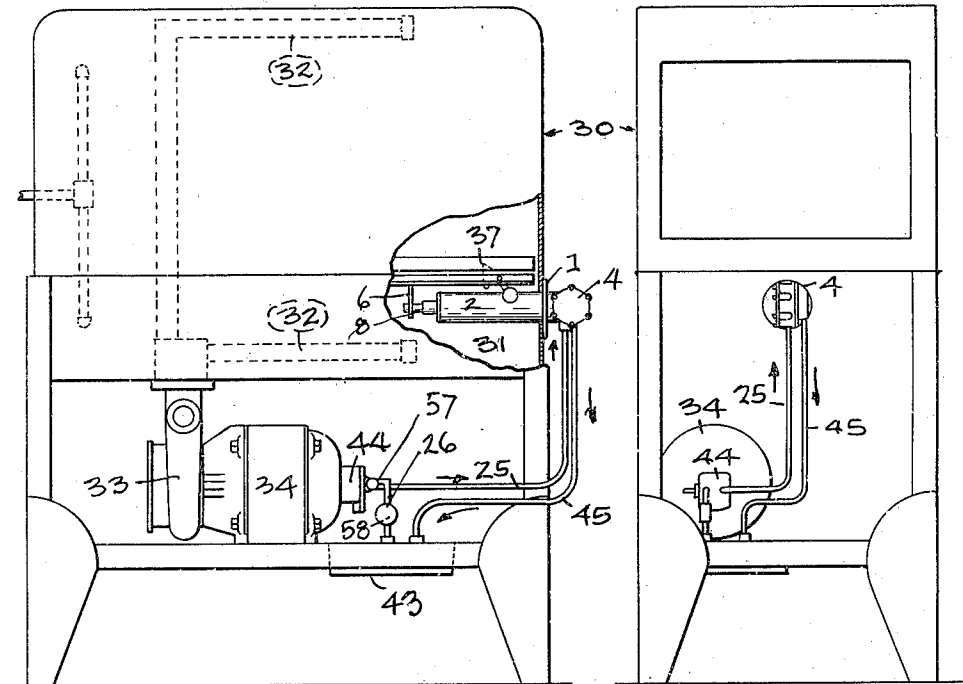


Fig. 1.

Fig. 2.

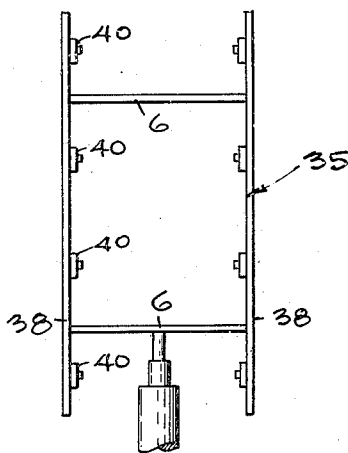


Fig. 3.

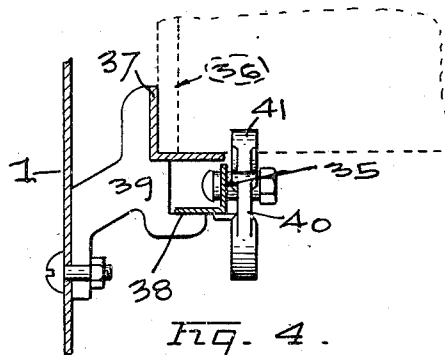


Fig. 4.

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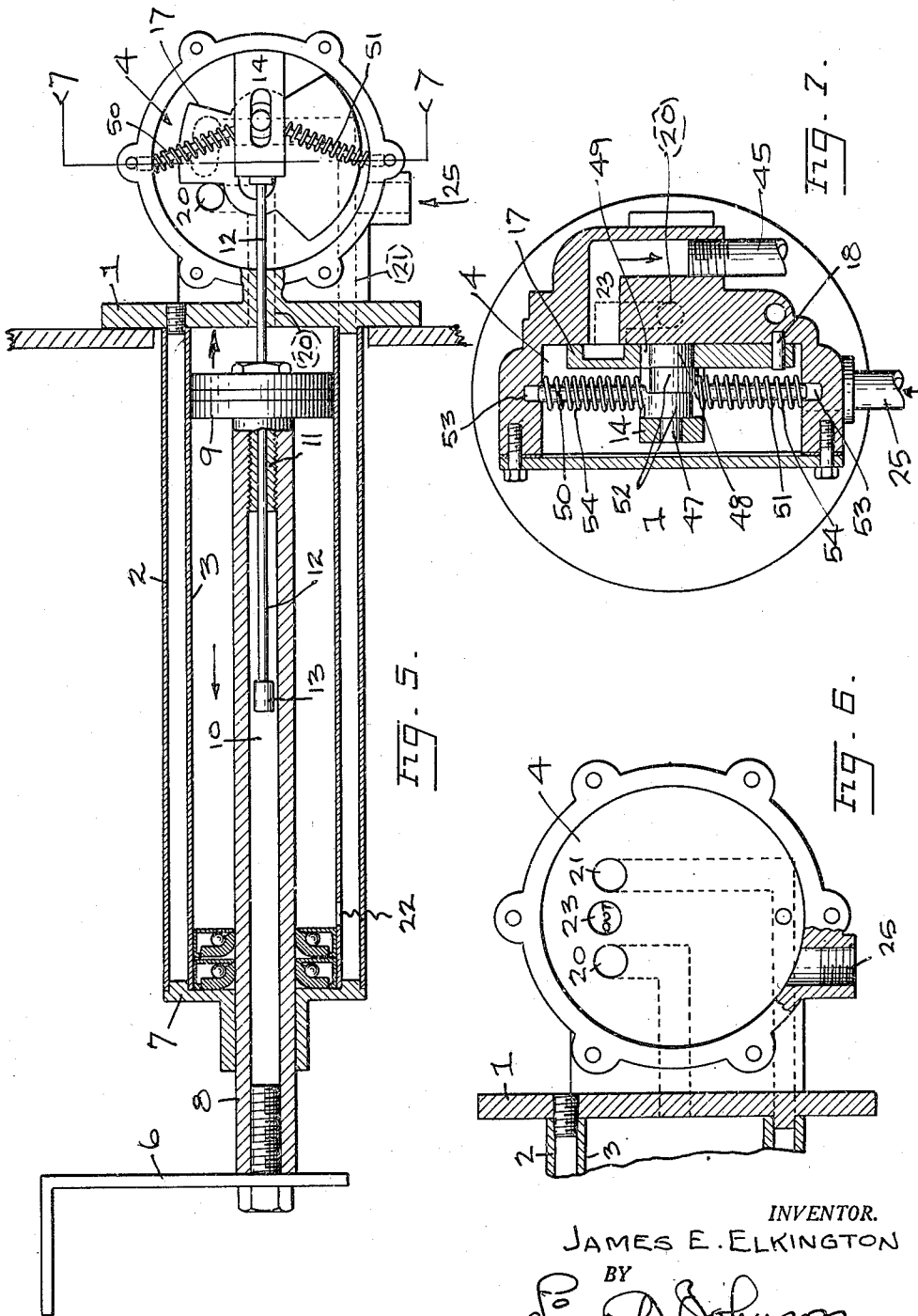
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3 Sheets-Sheet 2



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VALVE AND ACTUATING MECHANISM FOR FLUID MOTORS

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3 Sheets-Sheet 3

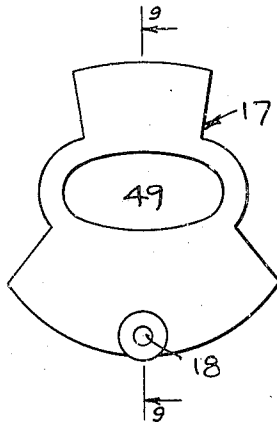


Fig. 8.

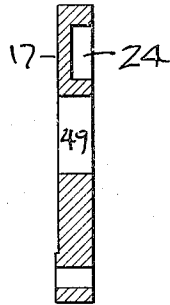


Fig. 9.

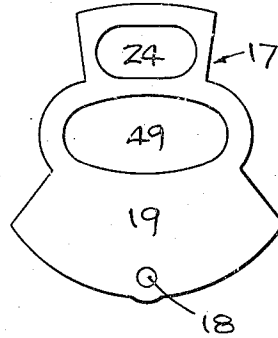


Fig. 10.

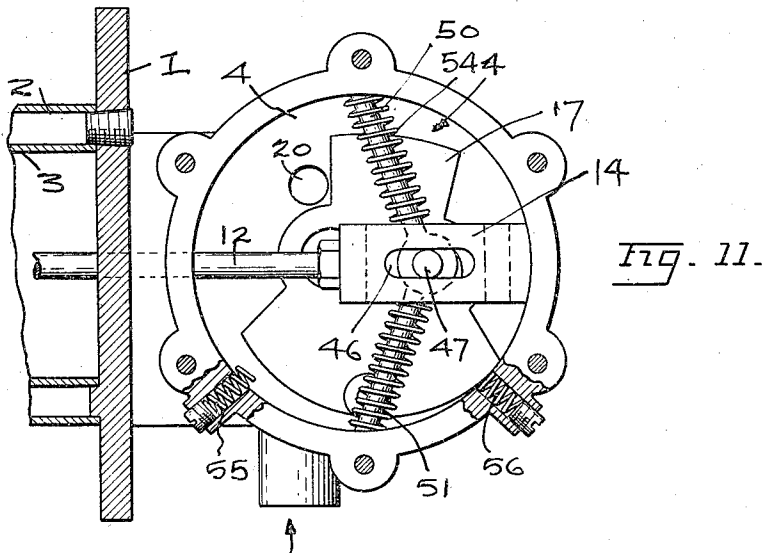


Fig. 11.

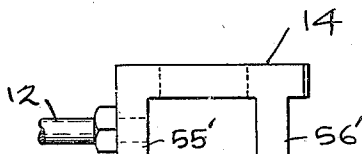


Fig. 12.

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UNITED STATES PATENT OFFICE

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VALVE AND ACTUATING MECHANISM FOR FLUID MOTORS

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3 Claims. (Cl. 121-164)

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This invention relates to a dishwashing machine and particularly to a hydraulic actuator or prime mover for reciprocating a dish tray moving rack in and through the washing zone of said machine; said actuator being made to reciprocate by hydraulic pressure in alternating cycles.

An object of the invention is to provide a hydraulic actuator which includes a plunger made to reciprocate by applying hydraulic pressure in alternating cycles to opposite faces of the plunger thru the instrumentality of a valve timer synchronized to operate with the plunger and to control its operation.

In the accompanying three sheets of drawings:

Fig. 1 is a side elevation of a dish washing machine constructed in accordance with my invention, showing my hydraulic reciprocator operatively applied thereto.

Fig. 2 is an end elevation of Fig. 1.

Fig. 3 is a plan view of the rack (for reciprocating the dish trays) having my reciprocator applied thereto.

Fig. 4 is a cross-section taken thru one side of the dish washing machine showing the relationship of the slide rack, trays and tray guides.

Fig. 5 is a longitudinal section of a hydraulic actuator or prime mover constructed in accordance with my invention, illustrated in its application to a slide rack on a dishwashing machine, the plunger of the actuator being secured to the rack while the actuator mechanism is fixed on one end of the washing machine structure.

Fig. 6 is a front view of the valve chamber with the operative mechanism removed.

Fig. 7 is an enlarged cross-section taken thru the valve chamber on the line 7-7 of Fig. 5.

Fig. 8 is a view of the rear face of the actuator valve.

Fig. 9 is a cross-section taken through Fig. 8 on the line 9-9.

Fig. 10 is a view of the front face of the actuator valve.

Fig. 11 is a front elevation of the valve chamber showing the operative mechanism mounted therein.

Fig. 12 is a side elevation of the yoke for actuating the valve.

In detail the construction illustrated in the drawings comprises in Figs. 1 and 2 a dish washing machine which in its entirety is designated by the numeral 30. This dish washing machine includes, in addition to the necessary structural frame work, a water tank 31, fluid spray pipes

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32, a fluid pump 33 and a motor 34, a reciprocating rack 35 mounted over the tank 31 and between the spray pipes 32 for moving trays 36 of dishes and the like thru the washing zone on the parallel guides 37 which extend longitudinally thru the machine.

The dirty dishes or other articles to be washed are placed by hand in trays 36 and the loaded trays are placed on the entrant end of guides 37. The guides 37 are formed of spaced complementary angle bars and beneath said guides the reciprocating rack 35, see Fig. 3, is slidably mounted. The rack 35 is formed of parallel bars 38 connected by transverse members 6. The bars 38 rest and slide upon brackets 39 mounted on opposite sides of the machine as shown in Fig. 4. The inside face of each of the bars 38 is provided, at spaced intervals between the ends thereof, with counterweighted pawls 40 pivotally mounted thereon. The upper end 41 of each pawl 40 is adapted to engage ribs or serrations (not shown) on the under side of the dish trays 36 for the purpose of intermittently advancing said dish trays thru the washing process from the entrant end of the tray guides 37 to the discharge end thereof. The rack 35 is reciprocated on a horizontal plane in the manner to be hereinafter described. When the rack 35 is reciprocated forwardly toward the discharge end of the washing machine the upper end 41 of each pawl engages the dish trays 36 and advances them, with an intermittent movement, along the tray guides 37. On the return stroke of the rack 35 the pivoted pawls 40 disengage from the dish trays but automatically swing upwardly into contact with the dish trays upon the start of the forward stroke of the rack 35.

The type of rack 35 hereinabove described for advancing the dish trays thru the wash zone is only one of many types of similar racks which might be utilized to be actuated by my reciprocating mechanism. For example, a rack swingingly supported, pendulum style, might also be activated by my hydraulic actuator or a pair of parallel endless belts could be actuated intermittently by my prime mover for moving the dish trays thru the machine. It is to be understood that while I have developed the prime mover particularly for its use on a dish washing machine, that the reciprocative impulses developed by it could be applied to or utilized on many other machines of a type and kind needing a reciprocative movement in some phase of their operations.

Spaced nested cylinders 2 and 3 are mounted on the base 1 and are closed at the end opposite

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to the base 1 by a cap 7. The cap 7 is secured to the base 1 by rods, welding or otherwise.

The cap 7 is drilled centrally with the axis of the cylinders 2 and 3 to provide a bore in which a shaft 8 is slidably confined. The outer end of the shaft 8 is fixed to the cross member 6 of the rack, while the inner end of the shaft 8, within the inner cylinder 3, has a plunger or piston 9 mounted thereon.

The end of the shaft 8 where it is secured to plunger 9 is drilled axially at 10. This open bore 10 is closed by a hollow plug 11. A stem 12 is slidably confined in the plug 11 and the end of the stem within the bore 10 has an annular shoulder 13 there around to limit the movement of the stem in one direction. The opposite end of the stem 12 extends through a hole in the base 1 into the reservoir 4 where it has attached thereto a yoke 14 which is related mechanically to the valve structure to be hereinafter described. The valve structure consists of the valve plate 17, see Figs. 8, 9 and 10. The valve 17 is pivotally mounted at its bottom end on a pin 18 fixed in the chamber 4. The valve 17 has a flat face 19 which is operatively mounted in relation to three ports 20, 21 and 23, on one wall of the chamber 4. The port 20 communicates directly with the inner cylinder 3, Figs. 5 and 6, while the port 21 communicates with the space between the inner and outer cylinders 2 and 3 and through the port 22 with the interior of the inner cylinder at a point near the outer end thereof, see Fig. 5. Midway between the ports 20 and 21 is the port 23 which latter port is an exhaust or relief port, through which spent fluid pressure from cylinder 3 flows to a collection tank 43 on the base of the machine 30. In order to communicate the exhaust port 23, alternately, with the ports 20 and 21, the flat face 19 of the valve 17 is recessed at 24, the length of said groove being sufficient to connect the ports 20 and 23 or 21 and 23, depending upon the position of the valve 17.

Fluid under pressure is developed by a rotary pump 44 connected to the motor 34. The fluid pressure is delivered thru a line 25 to the valve chamber 4, while the spent fluid is returned from said chamber through a line 45 to the tank 43. A pipe 26 supplies fluid from the tank 43 to the pump 44.

The valve is mechanically swung back and forth by the yoke 14. The yoke 14 has a slot 46 therein. A pin 47 has one end slidably confined in the slot 46 while the head 48 of the pin is confined in an oval slot 49 in the valve 17. A pair of radially disposed pins 50 and 51 are arranged on diametrically opposite sides of the center pin 47, each of pins 50 and 51 having an eyelet 52 confined on the center pin 47. The outer end of each of the pins 50 and 51 is confined in a recess 53 in the inner wall of the chamber 4. An expansion spring 54 is mounted around each of the pins 50 and 51. The yoke 14 is provided with ears 55' and 56' on one face thereof, said ears lying on opposite sides of the eyelets 52 on the center pin 47.

In the operation of the device hydraulic pressure is delivered to the chamber 4 from the pump 44. The valve 17 being positioned as shown in Figs. 5 and 11, fluid pressure passes from the chamber 4, thru port 20 and into the inboard end of the cylinder 3, causing the plunger to move outwardly in the direction of the arrows, thereby forcing the inert oil on the outboard side of the plunger to be moved into and thru the port 22 and discharge port 23 to the collection sump 43.

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When the plunger reaches the extreme limit of its outboard movement, the stem 12 exerts a pull on the yoke 14, the ears of which engage the eyelets 52 on the center pin 47 forcing the pins 50 and 51 from the off-center position shown in Figs. 5 and 11 to an opposite off-center position. The movement of the pins 50 and 51 from one off-center position to the other, causes the springs 54 to be momentarily compressed up to the time said pins 50 and 51 reach an aligned dead center position. Immediately after passing the dead-center position, the pent up pressure of the compressed springs is released causing the pins 50 and 51 to snap rapidly out and in, so doing, causing the valve 17 to move rapidly from one operating position to the other. The spaced compression springs 55 and 56 located in the lower periphery of the chamber 4 are designed to deaden the impact of the valve 17 when snapping from one position to the other. The change of position of the valve closes the port 20 and opens the port 21. Immediately fluid pressure starts feeding out thru the port 21, thru the space between cylinders 2 and 3, and thru the port 22 into the outboard end of the inner cylinder 2 to work against the outboard face of the plunger 9 causing it to move inwardly. Oil on the inboard side of the plunger is discharged out thru the port 20 and discharge port 23. When the plunger 9 reaches the inboard end of its stroke the yoke on the stem 12 exerts a pull on the center pin 47 and causes it to snap the valve over from one position to the other, thus immediately reversing the direction of flow of the fluid pressure and the plunger 9. The alternate reversal of directional movement of the plunger continues automatically as long as there is fluid pressure directed into the apparatus.

The valve 17 is only one form of device for synchronizing the movement of the plunger and timing the delivery of fluid pressure to opposite faces of the plunger and it is to be understood the invention contemplates that other types and kinds of valve timers might be used in place of the specific form of device illustrated and described herein.

Having thus described this invention, what I claim and desire to secure by Letters Patent is:

1. Hydraulic apparatus comprising a cylinder; a piston in said cylinder; a source of liquid under pressure; conduit means extending between said cylinder and source; a valve interposed in said conduit means to control the application of hydraulic pressure from said source to opposite faces of the piston; said valve having an arcuate surface; pivot means for said valve eccentrically disposed with respect to said surface; a link member interconnecting said piston and valve to oscillate said valve about said pivot means in timed relation with the piston stroke and thereby control the application of hydraulic pressure at intermittent intervals to opposite faces of the piston for reciprocating said piston; and a spring substantially radially disposed with respect to said surface stressed by said valve in a terminal position thereof serving to accelerate the movement of the valve at the commencement of its oscillation.

2. Hydraulic apparatus comprising a cylinder; a piston in said cylinder; a source of liquid under pressure; conduit means extending between said cylinder and source; a valve interposed in said conduit means to control the application of hydraulic pressure from said source to opposite faces of the piston; said valve having an arcuate surface; pivot means for said valve eccentrically

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disposed with respect to said surface; a link member interconnecting said piston and valve to oscillate said valve about said pivot means in timed relation with the piston stroke and thereby control the application of hydraulic pressure at intermittent intervals to opposite faces of the piston for reciprocating said piston; an over-center spring imparting a snap action to said valve in its oscillating movements; and a spring substantially radially disposed with respect to said surface stressed by said valve in a terminal position thereof serving to accelerate the movement of the valve at the commencement of its oscillation.

3. Hydraulic apparatus comprising a cylinder; a piston in said cylinder; a source of liquid under pressure; conduit means extending between said cylinder and source; a valve interposed in said conduit means to control the application of hydraulic pressure from said source to opposite faces of the piston; said valve having an arcuate surface; pivot means for said valve eccentrically disposed with respect to said surface; a link member interconnecting said piston and valve to oscillate said valve about said pivot means in timed relation with the piston stroke and thereby control the application of hydraulic pressure at intermittent intervals to opposite

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faces of the piston for reciprocating said piston; and a pair of springs substantially radially disposed with respect to said surface alternately stressed by said valve in the terminal positions thereof serving to accelerate the movement of the valve at the commencement of each stroke of its oscillation.

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