April 2, 1963 K. J. HEINICKE 3,083,718

WASHING MACHINE

Filed Aug. 21, 1961 2 Sheets-Sheet 1

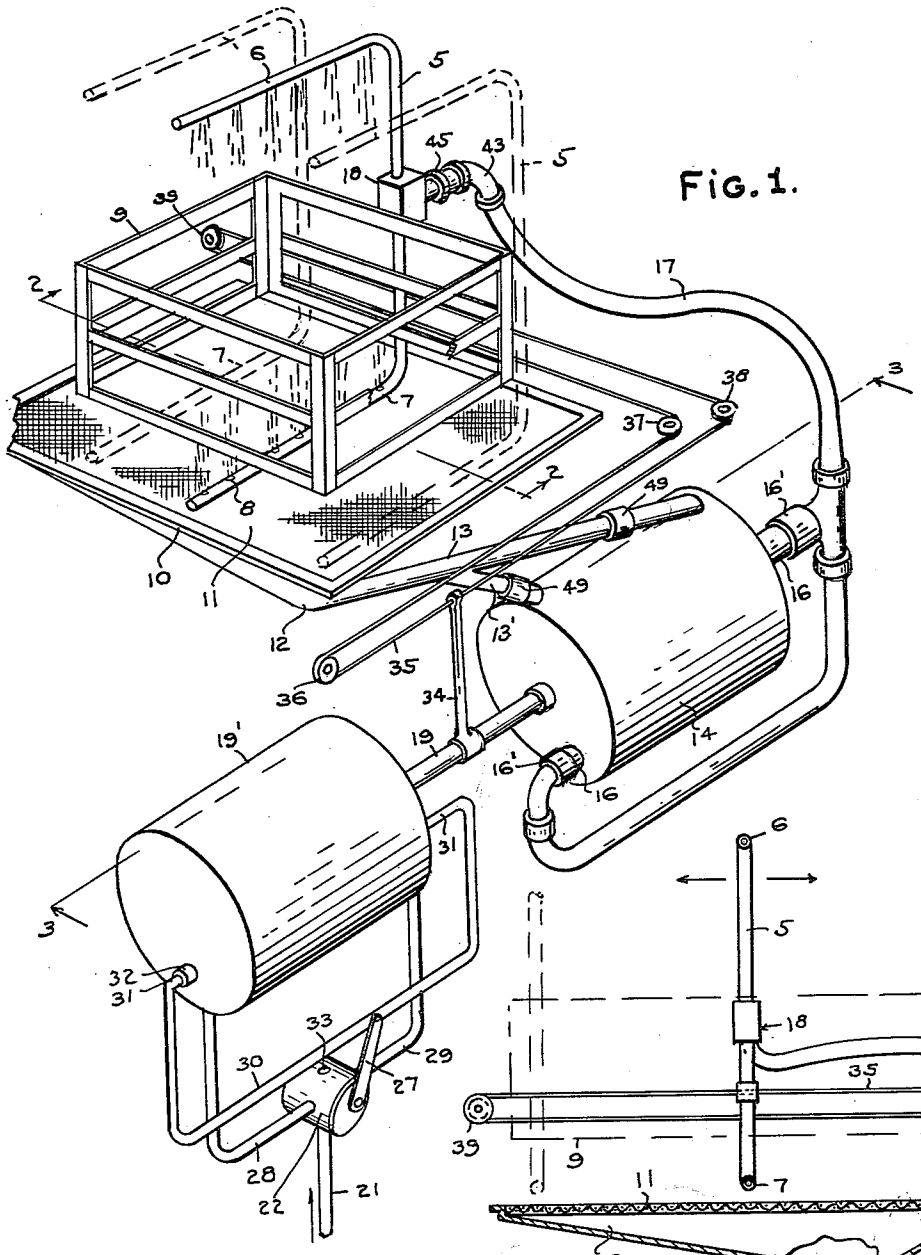


Fig. 1.

Fig. 2.

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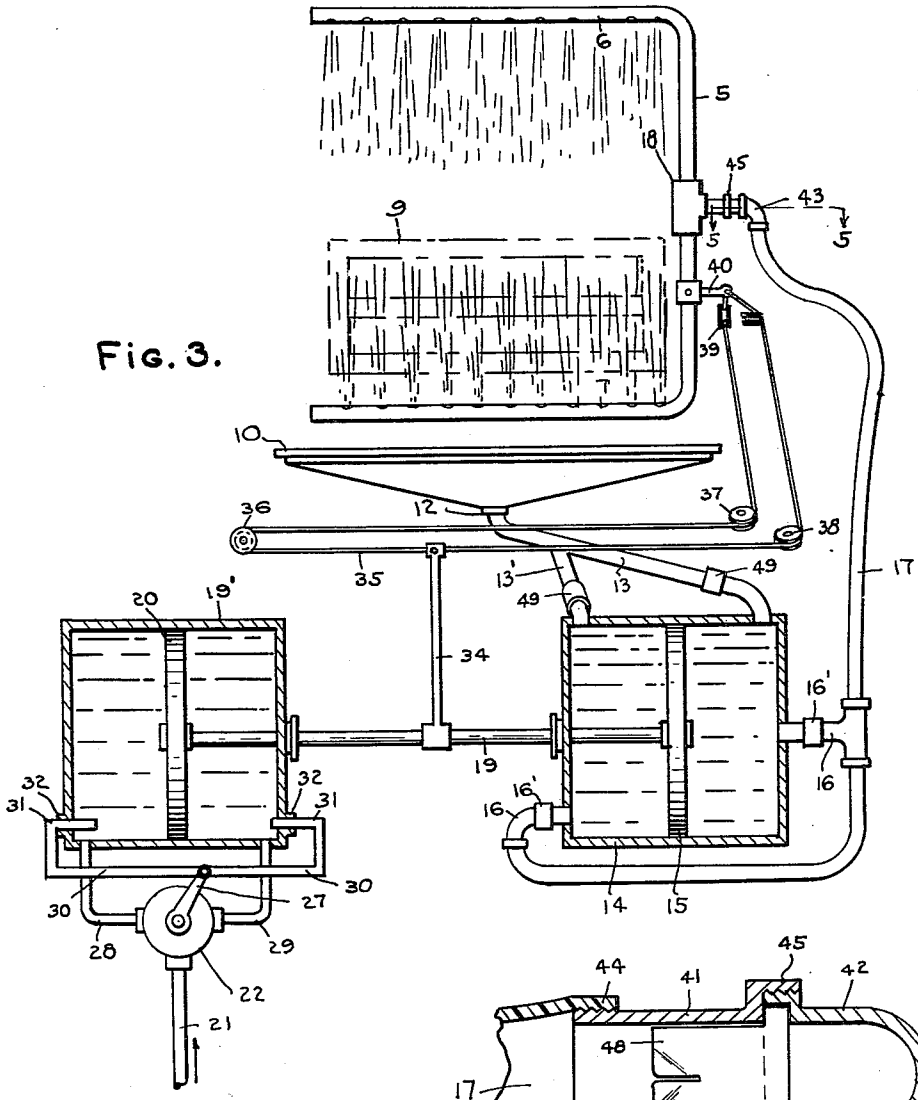


Fig. 3.

Fig. 5.

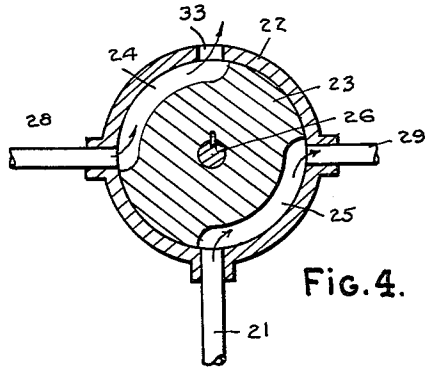


Fig. 4.

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WASHING MACHINE

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2 Claims. (Cl. 134—111)

This invention relates to an improved washing machine of the type primarily to wash laboratory glassware and whereby a supporting basket is disposed in the line of movement of a spray device such as that illustrated basically in my United States Patent No. 2,827,064 and wherein a spray head is reciprocated back and forth over the glassware supporting basket to project streams of water both upwardly and downwardly and also wherein the spray head is reciprocated by a reversible cable that is driven from a prime mover such as an electric motor.

The apparatus of this invention comprises a similar spray head that is actuated under the influence of a hydraulic cylinder and with the entire device functioning to propel the spray head while at the same time injecting water and a detergent through the spray head for subsequent collection into a spray pressure cylinder where it is again forced outwardly under the influence of the hydraulic cylinder to force the water and the detergent in continuous cycles through the washing apparatus.

The propulsion means and the water ejecting means embody a pair of cylinders each having pistons therein and with the pistons being connected by a common piston rod whereby to move in unison under the influence of novel hydraulic power means that preferably is connected to a source of pressurized water such as the usual service supply furnished by municipalities.

The invention further proposes a receptacle having a filter disposed therein for receiving any objectionable particles that might be washed from the glassware and with the water and the detergent passing through the filter to enter the opposite ends of the spray pressure cylinder where they are again forced outwardly through a flexible conduit to enter the spray head for discharge upwardly and downwardly to the articles disposed within the basket.

The invention further contemplates means connected with the common piston rod for the two cylinders that is coupled to an endless cable and with the cable being trained over suitable pulleys and connected intermediate its length with a vertical leg of the spray head so that as the piston rod is shiftable back and forth under the influence of the hydraulic cylinder the spray head will be reciprocated back and forth over the basket and its underlying filter receptacle.

Novel features of construction and operation of the device will be more clearly apparent during the course of the following description, reference being had to the accompanying drawings wherein has been illustrated a preferred form of the mechanism and wherein like characters of reference are employed to denote like parts throughout the several figures.

In the drawings:

FIGURE 1 is a perspective view of a washing machine constructed in accordance with the invention, supporting structure being omitted for sake of clearness,

FIGURE 2 is a fragmentary longitudinal section taken substantially on line 2—2 of FIGURE 1,

FIGURE 3 is a transverse section taken substantially on line 3—3 of FIGURE 1,

FIGURE 4 is an enlarged section taken through a control valve for the hydraulic cylinder, and

FIGURE 5 is a fragmentary section taken on line 5—5 of FIGURE 3.

Referring specifically to the drawings, there has been illustrated in FIGURES 1 and 2 a spray head embodying a vertical pipe 5 having right angled end portions 6 and 7. The portions 6 and 7 are apertured at 8 so that jets of water and detergent are ejected in opposed relation. Disposed within the line of movement of the spray head is a basket device 9, in which is supported the usual foraminous basket that is adapted to hold the articles of laboratory glassware. The spray head is adapted to be reciprocated back and forth as indicated in dotted lines in FIGURE 1 and the means for reciprocating the spray head will be hereinafter described.

Disposed beneath the lower leg portion 7 of the spray head is a generally rectangular receptacle or pan 10 having a removable filter sheet 11. The pan 10 has its bottom inclined downwardly to a common discharge point 12 where it is connected with a discharge pipe 13. The pipe 13 is inclined downwardly and is connected to a forward end of a cylinder 14 and whereby the water and detergent may be strained through the filter sheet 11 and drained downwardly for collection into the forward end of the cylinder 14. Branch pipe 13' leads to the opposite end of cylinder 14.

Referring now to FIGURE 3, it will be seen that the cylinder 14 is provided with a slidable piston 15, forming variable chambers for the alternate collection and discharge of the drain water when the piston is moved back and forth to alternately collect and discharge the water from the chambers upon opposite sides of the piston when the piston is moved in either direction where it is discharged through coupling devices 16 embodying outwardly opening check valves 16'. In the event that air might possibly accumulate in the cylinder 14, being drawn therein with the water from the receptacle 10, it will be entirely obvious that any suitable air relief ports may be employed to prevent the backing up of an air pressure that might interfere with the proper operation of the device. However, it is not believed that such air relief will be necessary in view of the fact that the piston 15 is constantly discharging fluid from the cylinder 14 and it is natural that any air would be discharged at the same time. The water and detergent is then forced through a flexible hose 17 for discharge through a coupling 18, carried by the vertical leg 5 of the spray head, where it is directed in opposite directions for discharge downwardly and upwardly through the leg portions 6 and 7. The coupling 18 embodies a vibratory mechanism such as that illustrated in my Patent No. 2,947,312. The piston 15 is slidable under the influence of a piston rod 19 that is extended outwardly through the left end of the cylinder 14 and is continued into a cylinder 19' where it has connection with a slidable piston 20. The piston 20 constitutes the power means for the washing mechanism and is actuated by a source of water supply from a pipe 21. The pipe 21 has connection with a casing 22 of a valve 23. The valve 23 is provided with circumferential ports 24 and 25 and the valve is rotatable under the influence of a shaft 26 that extends axially of the valve 23 and outwardly thereof for connection to a crank arm 27. Lateral pipes 28 and 29 have communication with the cylinder 19' adjacent its opposite ends whereby water flowing from the pipe 21 may pass through either the pipes 28 or 29 through the ports 24 or 25, depending upon the position of the crank arm 27. The crank arm 27 is reciprocated by a valve rod 30 having its opposite ends upturned and bent upon itself to extend into the cylinder 20, as shown at 31. The ends 31 are slidable in bearings 32 formed in the ends of the cylinder 19 and the inner free ends of the portions 31 are disposed in the line of movement of the piston 20 so that, when the piston 20 is moved longitudinally of the cylinder, it will bump or engage the free ends of the rods

31 to shift the valve rod 30 in an opposite direction and rocking the crank arm 27 so as to reverse the flow of water from one side of the piston 20 to the other, such action causing a reciprocation of the piston rod 19. In each reverse position of the valve 23 pressurized water will flow to one side of the piston 20 and is drained to either one of the pipes 28 or 29 and passes through either of the ports 24 or 25 for discharge through a port 33. While the valve mechanism employed in connection with the hydraulic motor that includes the cylinder 19' has been merely indicated as one means for actuating the valve 23, of course there would be some possible objection to this means of actuation since it is relatively slow and would not complete its cycle until the piston 20 had made its complete stroke. It is contemplated that a suitable snap action means be provided, well known in the art, whereby the piston at the end of its stroke will actuate the valve to a full opening or closing position.

As clearly illustrated in FIGURES 1 and 3, the piston rod 19 is provided with an upstanding rigid arm 34 fixed to the piston rod 19 rigidly and intermediate its length. The upper end of the arm 34 is clamped or otherwise connected to a cable 35 that traverses groove pulleys 36, 37, 38 and 39 and with the ends of the cable 35 being fixedly connected to a bracket 40 fixed upon the vertical tube 5 of the spray head. It will be observed that as the pistons 15 and 20 are movable under the influence of water being injected upon alternate sides of the piston 20, such action causes the arm 34 to move the cable 35 back and forth, resulting in an oscillatory movement of the spray head over and below a rack for supporting the glassware to be washed. One means has been provided to alternately inject and release water from the cylinder 19 although it will be understood that various means may be employed to cause the piston 20 to traverse the cylinder 19 in a back and forth movement or a prime mover may form the source of power.

With respect to FIGURE 5, wherein has been illustrated a component element of the combination and embodying certain structural features contained in my U.S. Patent No. 2,947,312, such construction embodies a two-part coupling 18 having sections 41 and 42. This coupling 18, as illustrated in FIGURE 3, embodies an L-fitting 43 that is connected to the pipe 17. The fitting section 41 has communication with the end of the pipe 17, as shown at 44. Seated within the union 45 of the coupling 18 is a flat reed-like member 46 that is split at a free end 47 to form tongues 48. The plate 46 is axially arranged with respect to the section 41 of the coupling and the tongues 48 are disposed in a transverse manner with respect to the flow of water and detergent being forced from the cylinder 14 and whereby to impart a pulsation to the water being discharged and returned to the spray head, such action being fully recited in the above noted patent.

In the use of the device, it being assumed that a wire mesh basket has been disposed within the rack 9 and with the basket having a plurality of relatively slender glass laboratory articles upstanding therein. Since the system is basically a closed circuit system, a predetermined quantity of water and detergent or other cleansing medium is poured into the pan 10 where it travels downwardly through the filter 11 to enter the cylinder 14 through either the pipe 13 or the branch pipe 13'. The device is then placed in operation, such operation consisting in directing pressurized water through the pipe 21 to the valve housing 22 and, passing it through either of the ports 24 or 25, depending upon the position of the piston 20 in the cylinder 19. In the position illustrated in FIGURE 4, water will then flow from the pipe 21, through the port 25, pipe 29 and into the cylinder 19 where it will impinge against one side of the piston 20, shifting the piston 20 to the left and also moving the piston 15 through the medium of the connecting rod 19. Water upon the opposite side of the piston 20 will pass through the pipe 28, the port 24 to be discharged through the port 33. When the piston 20 has completed its major stroke to the left, it will contact the stem portion 31 of the valve rod 30, forcing the valve rod to the left and actuating the crank 27 to rotate the valve 23, causing the port 24 to register with the pipe 28 and the pipe 21, while the port 25 registers with the pipe 29 and the exhaust port 33 and the valve rod will remain in such tripped position until the piston 20 has been moved to the right distance capable of moving the stem 31 outwardly for again shifting the valve 23. During the movement of the piston 20, a similar movement will be imparted to the piston 15. As the piston 15 moves to the left, water and detergent that has been collected upon the left side of the piston will be forced outwardly through the coupling 16, past the check valve 16' and through a bypass pipe 17a that has a preferably Y-connection with the pipe 17. Water and detergent will be prevented from backing up through the pipe 13' by a check valve 49. A similar check valve 49 is disposed in the pipe 13 adjacent its point of entry at the opposite end portion of the cylinder 14. As the water is forced outwardly through the pipe 17 and 17a, it will be discharged through the vibratory coupling 43 where it passes through the coupling 18 to enter the spray head 5. Simultaneously with the movement of the pistons 20 and 15, the arm 34, through the medium of the cable 35 causes a spray head to reciprocate from end to end of the pan 10 and, as the washing fluid is being discharged from the spray head in opposed directions, the spray head will be continuously shifted back and forth throughout the movement of the pistons. As the cleansing fluid is discharged from the cylinder 14, it flows through the pipes 17 or 17a to the coupling 18 and during such passage through the coupling, the pressurized fluid impinges against the tongues 48 and creates a vibratory or push-pull action to the water that is maintained throughout its travel from the coupling 43 to the spray head and ejected from the spray head to cause the vibrating fluid to impinge against the glassware and to remove any difficult particles of food or the like and with the fluid subsequently dripping downwardly to the filter 11 where it is drained back into the cylinder 14 for reuse throughout the operative cycle of the machine thus greatly conserving the wash water and the detergent. The use of the check valves 49 prevent the back flow of the cleansing fluid under the influence of the movement of the piston 15 in its double action stroke, where it functions to create a suction in one end of the cylinder 14 while it creates a pressure in the opposite end of the cylinder to force the water to the spray head 5.

The washing action may be continuous over a predetermined length of time and the entire movement of the device is controlled from a suitable valve within the fluid line 21 leading from the source of pressurized fluid supply.

It is to be understood that the invention is not limited to the precise construction shown, but that changes are contemplated as readily fall within the spirit of the invention as shall be determined by the scope of the subjoined claims.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A washing apparatus of the character described for continuously washing relatively slender glass articles, such as laboratory glassware, that comprises a spray head having horizontal and parallel spray arms and a connecting conduit, a rack fixedly supported in relation to the spray head whereby the arms of the spray head are disposed over and below the rack, the spray head being adapted to spray a cleansing medium both downwardly upon the glass ware and upwardly to impinge upon the glassware from below the rack, a drainage receptacle for catching the cleansing medium, the receptacle being downwardly inclined to a common discharge point, a

pump device that includes a cylinder, a piston slidable in the cylinder, a drain conduit leading from the receptacle and that is divided adjacent its end and connected with the cylinder whereby drain medium from the receptacle is directed into opposite ends of the cylinder for subsequent discharge in opposite directions by the piston, outlets in opposite ends of the cylinder, check valves disposed in the outlets and that are outwardly opening, the discharge from the opposite ends of the cylinder being connected to a conduit that has communication with the spray head and whereby the piston on its travel back and forth will continuously discharge any accumulated cleansing medium that has been drained into the cylinder for discharge from the spray head, a hydraulic motor that includes a cylinder, a piston operable in the cylinder, a common piston rod connected with the hydraulic piston and the piston of the pump whereby the pistons are movable in unison, hydraulic means for moving the second named piston in the hydraulic motor, valve means for controlling the flow of a hydraulic fluid to the hydraulic motor and trip mechanism operable under the influence of the movement of the second named piston for tripping the valve and directing the hydraulic medium alternately upon opposite sides of the second named piston whereby to impart a reciprocatory action to the piston and a reciprocatory action to the piston rod and the piston of the pump, a cable device that is trained over grooved pulleys and has connection in its length with the spray head and a rigid connecting device carried by the connecting rod and with a flight of the cable whereby movement of the piston rod functions to shift the cable and the spray head during the continuous operation of the mechanism.

2. The structure according to claim 1 wherein the drain receptacle is coextensive with the maximum travel of the spray head, the said receptacle having an overlying filter whereby to receive particles of food or the like washed from the glassware.

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