Jan. 14, 1947. P. E. GELDHOF ET AL 2,414,196

DRAIN MECHANISM

Filed Dec. 6, 1943 4 Sheets-Sheet 1

Fig. 1.

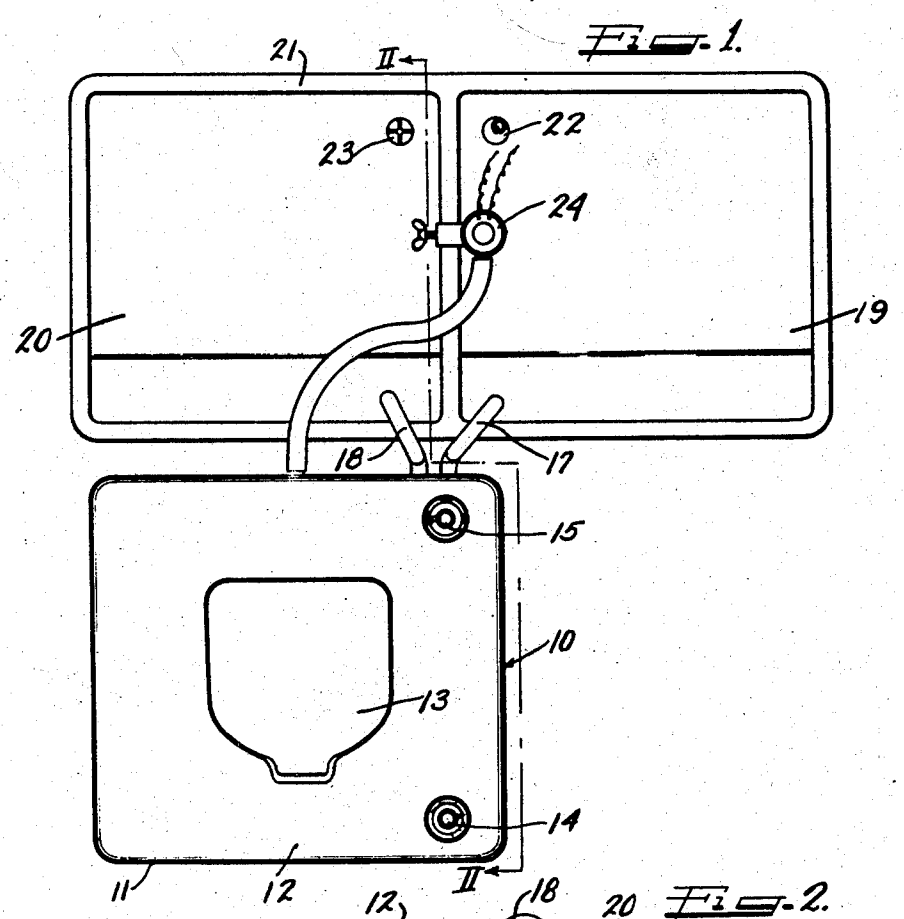
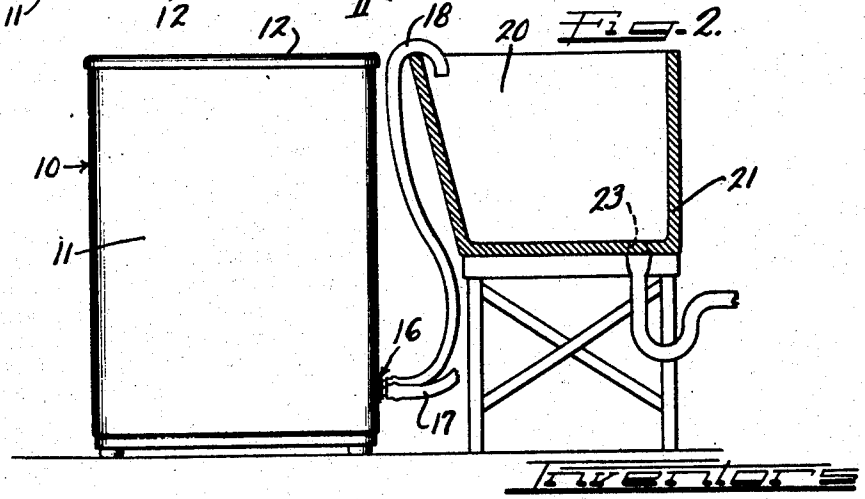


Fig. 2.



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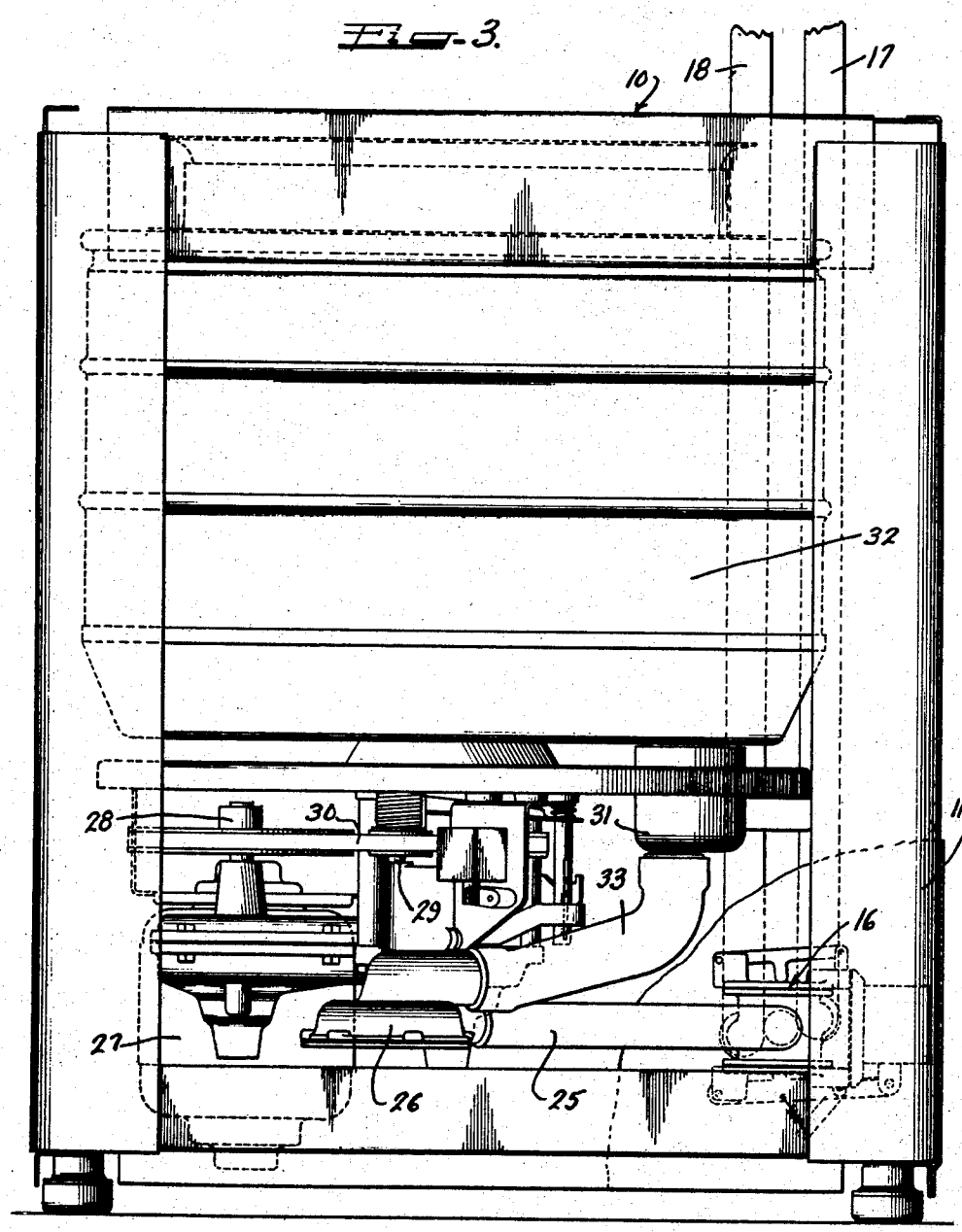
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DRAIN MECHANISM

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Fig. 3.



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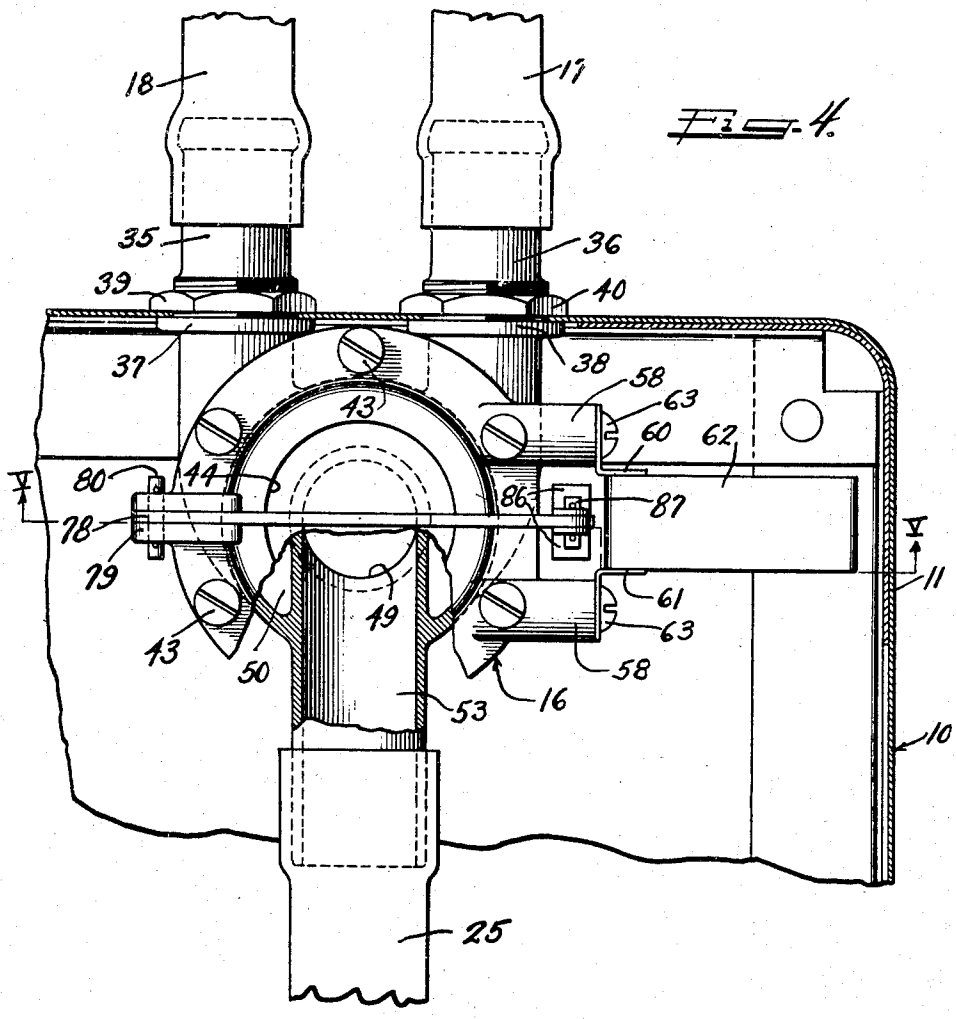
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DRAIN MECHANISM

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Fig. 4.



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DRAIN MECHANISM

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Fig. 5.

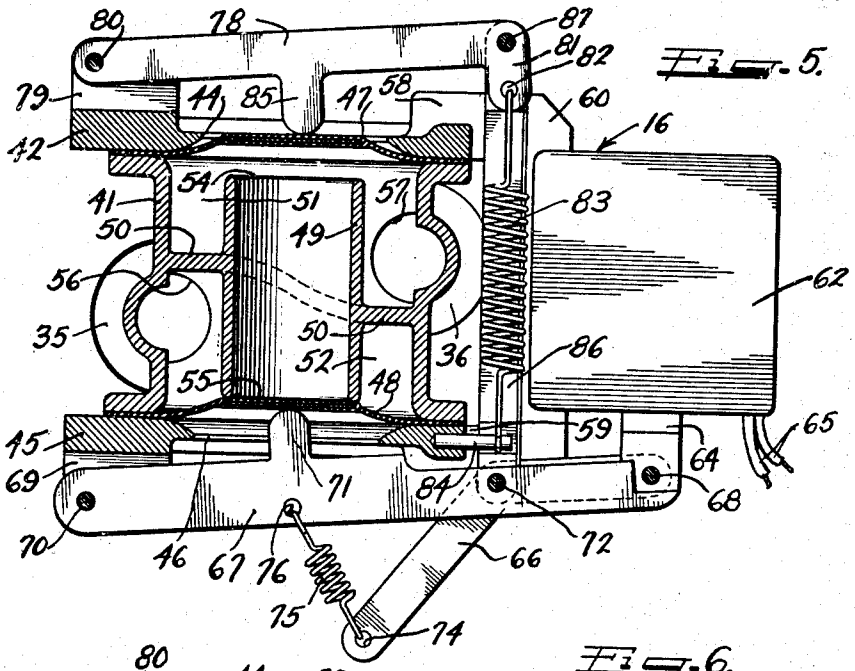
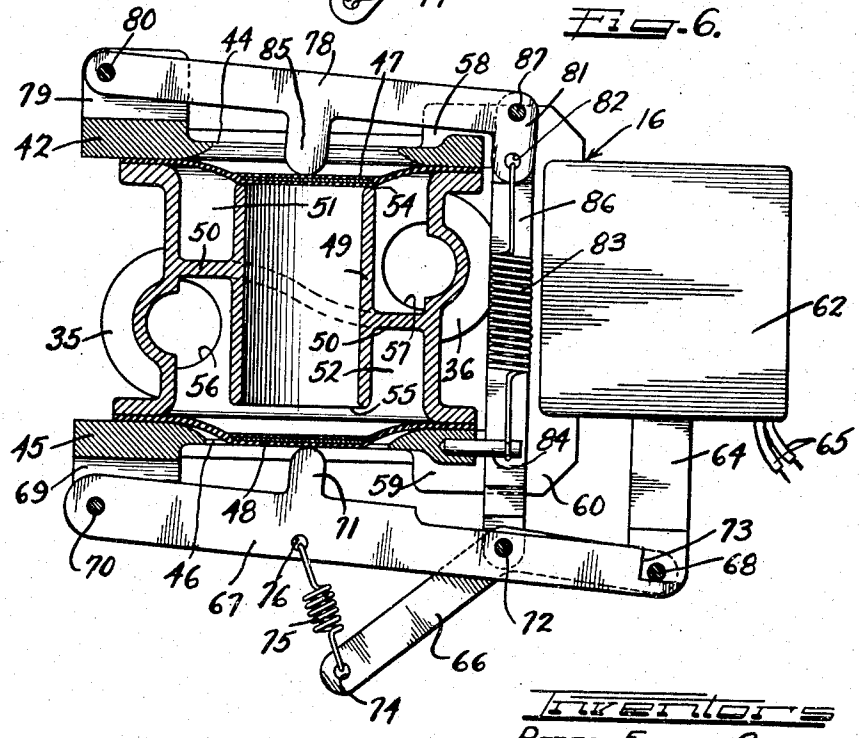


Fig. 6.



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UNITED STATES PATENT OFFICE

2,414,196

DRAIN MECHANISM

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Application December 6, 1943, Serial No. 513,138

3 Claims. (Cl. 277—21)

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The present invention relates to improvements in home laundry apparatus. More particularly, the instant invention is concerned with a means for discharging the cleansing fluid from the container of such a machine for temporary storage pending the use of the container for the performance of other allied steps in the complete cycle of a laundering operation.

The means of the present invention are particularly advantageously adapted to use in connection with an automatic washing, rinsing and drying apparatus. As is customary in the use of such equipment, a complete cycle of operations is performed which normally includes washing, rinsing and drying of the clothes or other fabrics to be laundered in the container. The rinsing operations, of which there are ordinarily several, usually employ only clear water of relatively low or medium temperature and, therefore, no great loss is experienced by the discharge of such water to the drain and the use of a fresh water supply for each of these operations.

In the case of the washing step, however, an abundance of water at a relatively high temperature in which large quantities of soap or other suitable cleansing agents are dissolved is required for carrying out the laundering operation. For this reason, it is particularly advantageous to remove the soapy water from the container of the automatic washing, rinsing and drying machine following the completion of the washing step to some suitable storage means for temporary retention pending the completion of the subsequent stages in the complete cycle of operations all of which are performed in or with the aid of the container. Then on the completion of the rinsing and drying operations, the soapy water employed in the previous washing step may again be introduced to the container for reuse.

Such a procedure as that outlined above makes possible a considerable saving in the hot water supply and also in the quantity of detergent required to complete the laundering operation. This is indeed an important factor since the hot water supply in the average home is limited and most systems are incapable of producing a continuous supply of water of a temperature sufficiently high to perform the several washing steps for numerous batches of clothing or other articles to be laundered with the greatest facility.

It will be understood that during the storage of the water for the temporary period preceding its reintroduction to the container of the washing apparatus, it may, if desired, be heated to maintain a temperature somewhat nearer that required for its use in the subsequent washing operation.

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It is, therefore, an object of the present invention to provide novel drain mechanism which is particularly useful in apparatus capable of producing the aforementioned advantageous results and, in so doing, to facilitate the use of home laundry apparatus.

It is a still further object of the present invention to provide a drain mechanism for discharging the cleansing fluid from the container of a laundry machine into temporary storage pending the conclusion of intermediate steps in the cycle of operations employed in connection with such apparatus so that the cleansing fluid may be returned to the machine for any desired number of subsequent washing operations.

Other objects and novel features of the present invention will be apparent from the following detailed description of one embodiment of the present invention as illustrated in the accompanying drawings.

On the drawings:

Figure 1 is a plan of a typical form of automatic washing, rinsing and drying machine with which the device of the present invention is particularly advantageously adapted to be employed associated with a suitable storage means and a drain outlet;

Figure 2 is an elevation of the apparatus as seen from the line II—II in Figure 1 with parts in section;

Figure 3 is an elevation of the machine of Figure 1 with parts removed for the sake of clearness and to aid in illustrating the application of the device of the present invention to the structure of an automatic washing, rinsing and drying machine;

Figure 4 is an enlarged view of a portion of the machine with parts broken away to illustrate the drain mechanism in plan;

Figure 5 represents a vertical section along the line V—V through the drain mechanism illustrated in Figure 4 in one stage of its operation; and

Figure 6 corresponds generally to Figure 5 but illustrates the drain mechanism with the parts thereof disposed in their relationship in another stage of its operation.

As shown on the drawings:

In Figures 1 and 2 of the drawings, the typical automatic washing, rinsing and drying machine 10 with which the apparatus of the present invention is advantageously employed is provided with a cabinet 11 housing the operating elements

of the apparatus. The cabinet 11 is provided with a top panel 12 in which is disposed a cover 13 for the introduction of articles to be laundered to the interior parts of the machine. A control knob 14 is provided for the purpose of setting or adjusting the timing mechanism which directs the operation of the machine in the performance of the complete cycle of its operations and is mounted on the top panel 12 adjacent one corner thereof. A second control knob 15 by means of which the operator selects the desired temperature for the cleansing fluid, in this case, water, which is supplied by a suitable mixer type valve (not shown) to be employed in the various steps of the laundering operations is located adjacent another corner of the top panel 12.

The drain mechanism to which the present invention relates is indicated generally in Figure 3 of the drawings by the reference character 16. The drain mechanism 16 is advantageously positioned near the base of the cabinet 11 and substantially directly below the control knob 15 in the top panel 12 of said cabinet.

The drain mechanism 16 of the invention takes the form of a two-way valve having a pair of outlets 17 and 18 which advantageously take the form of flexible rubber hose connections having molded gooseneck ends which are adapted to be hung over the edge of the laundry tray 21. The outlet connection 17 is advantageously adapted to be associated with the section 19 of the laundry tray 21 while the connection 18 may be associated with section 20 thereof. Section 19 of the laundry tray 21 is thus employed as a storage means for the temporary storing of the soapy water following the washing operation performed in the automatic washing machine 10 pending the completion of the subsequent operations in the operating cycle thereof by plugging the drain outlet 22 therefor. The drain 23 of the section 20 may be left open so as to permit the fluid discharged by the hose connection 18 to pass to the drain.

Any suitable form of pumping means such, for example, as the portable pump unit 24, detachably mounted upon the laundry tray 21, may be employed for withdrawing the stored water from the section 19 of said tray for reintroduction to the automatic washing machine 10.

It will be readily understood that any suitable storage means and drainage outlet may be employed in lieu of the laundry tray 21. Inasmuch as a laundry tray of the type illustrated is usually standard equipment in many homes, it is advantageous to employ one of the sections thereof for the storage of the hot soapy water removed from the machine 10 following the washing operation, while another of the sections may be used to receive the water employed in the other operations, all of which is to be discharged to the drain outlet.

As illustrated in Figure 3 of the drawings, the drain mechanism 16 of the invention is connected as by means of the hose connection 25 to the discharge side of the pump unit 26 mounted in and forming a part of the washing machine 10. The pump 26, which is driven by the main motor 27 through pulleys 28, 29 on said motor and pump, respectively, together with the belt 30, is connected to the sump 31 of the tub 32 by means of a suitable hose connection 33 through which the water is removed from said tub and discharged through the drain mechanism 16.

The tub 32 of the typical automatic washing, rinsing and drying machine surrounds a suitable

perforated rotatably mounted basket in which the articles of clothing or other fabrics to be laundered are adapted to be centrifugally dried and a concentrically mounted agitator member for circulating the water in the tub 32 as well as imparting a constant motion and bending action to the articles being laundered during the washing and rinsing operations. The washing machine 10 is adapted to perform, in succession, each of the laundering operations without attendance after the operator has once adjusted the control knob 14 for the automatic timing device to set the apparatus in motion. At the same time, the operator selects, by setting the control knob 15, the desired temperature for the supply of water to be introduced to the tub 32 of the machine at its proper interval in accordance with the cycle of operations which is controlled by the timing device.

The drain mechanism of the present invention is advantageously mounted in the cabinet 11 of the washing machine 10 in the manner shown in Figure 4. The mounting of the drain mechanism 16 is accomplished by inserting the outlets 35 and 36 in the apertures in the wall of the cabinet 11 so that they extend therethrough with the flanged portions 37 and 38 formed on said outlets flush against the inner surface of the wall. Jam nuts 39 and 40 are threaded on the external periphery of the outlets 35 and 36, respectively, and serve to draw the flanged portions 37 and 38 thereon tightly against the wall of the cabinet 11 thereby providing a rigid mounting for the drain mechanism 16.

The drain mechanism 16 embodies a generally cylindrical casing 41 which is open at both ends thereof. An annular cover member 42 having a central opening 44 extending therethrough is secured to one of the open ends of the casing 41 as by means of the screws 43. A similar cover member 45 having a centrally disposed opening 46 therein is mounted on the other end of the casing 41. The cover members 42 and 45 serve to secure in place against the ends of casing 41 the flexible diaphragms 47 and 48, respectively, which operate in the manner hereinafter described to control the direction of flow of the water discharged from the tub 32 of the automatic washing machine 10 through the drain mechanism 16.

The casing 41 is provided with an internal, open ended generally cylindrical tube 49 which is disposed concentrically with respect to said casing and advantageously formed integrally therewith, being held in place therein as by means of the integral wall 50. The wall 50 also serves to divide the interior of the casing 41 into separated upper and lower generally annularly shaped chambers 51 and 52, respectively. An inlet 53 to which the hose connection 25 from the pump 26 is connected is advantageously cast integrally with the casing 41 so as to extend therethrough and connect directly to the tube 49. It will be understood that any other suitable arrangement of the parts or manner of their fabrication may be employed in the structure of the casing 41, that illustrated being only by way of preferred example.

The tube 49 is preferably formed slightly shorter in its axial dimension than the overall axial length of the casing 41. Thus, the ends of the tube 49 which serve as seats 54 and 55 for the flexible diaphragms 47 and 48, respectively, are disposed inwardly from the open ends of the casing 41 and directly below the central openings 44 and 46 in the cover members 42 and 45, respec-

tively. This arrangement of the seats 54 and 55 of the tube 49 provides a substantial space for the movement of the flexible diaphragms 47 and 48 in the casing 41 without interference. The innermost edges of the openings 44 and 46 in cover members 42 and 45, respectively, are also advantageously tapered outwardly to facilitate the free movement of the diaphragms 47 and 48.

The outer wall of casing 41 adjacent the point where the outlets 35 and 36 join is bulged slightly as indicated in Figures 5 and 6 to enable said outlets to join the cylindrically formed casing in substantially tangential relation thereby minimizing the resistance to the passage of the fluid therethrough. The outlet 35 interconnects with the lower chamber 52 through the port 56 while the outlet 36 communicates with the upper chamber 51 as by means of the port 57. It will be seen that, depending upon which end of the tube 49 is opened to permit the fluid introduced thereto by the inlet 53 to emerge therefrom, said inlet 53 may be connected with either chamber 51 or chamber 52 and will, therefore, deliver fluid to outlet 36 or outlet 35, respectively, as the case may be.

The cover member 42 is provided with a pair of raised bosses 58 while the cover member 45 has corresponding bosses 59 to which are secured the angles 60, 61 as by means of screws 63 threaded into said bosses for supporting the solenoid 62. The solenoid 62 has an axially movable magnetic core 64 which is adapted to be shifted from an extended position such as that illustrated in Figure 6 of the drawings to a retracted position illustrated in Figure 5. The retracted position of the core 64 is achieved by energizing the coil of the solenoid 62 by supplying an electrical current thereto by connecting the connections 65 into a suitable electrical circuit.

One end of the crank arm 66 is secured to the free end of the core 64 of the solenoid 62 as by means of the pin 68. The crank arm 66 is adapted to pivot about a pin 72 which extends through an operating lever 67 arranged in contiguous relation to the crank arm 66 at a point adjacent one end of said lever. The other end of lever 67 is pivotally mounted in a bifurcated boss 69 formed on the cover member 45 and secured therein by means of the pin 70. At a point intermediate its ends the lever 67 is provided with a finger portion 71 extending substantially at right angles to the longitudinal axis of said lever to contact the flexible diaphragm 48.

The end of the lever 67 adjacent the core 64 of the solenoid 62 is provided with a cut away portion 73 which is so formed that a portion of the lever 67 which remains is adapted to contact the pin 68 in the core 64 when said core is in its extended position as indicated in Figure 6 of the drawings. The free end of crank arm 66 has an aperture 74 therein which accommodates an end of a tension coil spring 75 the other end of which is hooked into an aperture 76 in lever 67 disposed adjacent the finger portion 71 thereon.

A second operating lever 78 is pivotally mounted in a bifurcated boss 79 formed on the cover member 42 as by means of a pin 80. The lever 78 is provided at the end opposite that mounted in the boss 79 with a depending portion 81 having an aperture 82 in the lowermost end thereof into which an end of a tension coil spring 83 is hooked. The opposite end of the spring 83 is anchored to a post 84 secured in any suitable fashion to the cover member 45.

Like the lever arm 67, lever 78 is provided with

a finger portion 85 projecting substantially at right angles to the longitudinal axis of said lever for contacting the flexible diaphragm 47. The lever arm 78 is connected to the crank arm 66 and the lever 67 with pin 72 by means of a pair of link members 86 which are pivotally secured to the lever 78 as by means of a pin 87 extending through said lever adjacent the depending portion 81 thereof. The link members 86 may advantageously be bent outwardly in that portion of their overall length extending between the pins 72 and 87 at the extremities thereof so as to clear the coil spring 83 which is disposed therebetween.

The flexible diaphragms 47 and 48 may be formed of any suitable flexible material such, for example, as rubber, artificial rubber, Neoprene or the like. To facilitate the manipulation of the diaphragms 47 and 48 by the lever arms 67 and 78 with respect to the seats 54 and 55, the center portion of said diaphragms may advantageously be stiffened or reinforced as by means of a disk inserted or imbedded in the diaphragm in the manner illustrated. The disk may be made of metal or any other suitable stiffening material.

The drain mechanism 16 of the present invention may be operated by any suitable electrical circuit through conductors 62.

When the solenoid 62 is energized, the core 64 thereof is shifted axially so as to approach the position shown in Figure 5. The recession of the core 64 moves the end of the crank arm 66 attached thereto by the pin 68 upward pivoting the arm slightly but principally raising its pivot point about the pin 72 by which it is connected to lever 67 and at the same time raising the lowermost ends of the link members 86 which are also connected to the pin 72. The shifting of the pin 72 causes the lever 67 to pivot about its mounting on the pin 70 in the boss 69 so as to bring the finger portion 71 on said lever into contact with the stiffened central portion of the flexible diaphragm 48 urging it against the seat 55 on the tube 49 and thereby closing off the lowermost end of said tube. The spring 75 is extended slightly to cause the finger portion 71 with the core 64 of solenoid 62 in retarded position to apply sealing pressure of the diaphragm 48 against the seat 55 and permits the core 64 to seat itself properly to prevent chattering.

As the pin 72 on which the crank arm 66 is pivoted moves upwardly, the link members 86 are shifted in the direction of their longitudinal axes. This movement of the link members 86 shifts the pin 87 and the depending portion 81 of the lever 78 upwardly (as seen in Figures 5 and 6) thereby extending the coil spring 83 against the anchor post 84. The lever 78 is simultaneously pivoted about the pin 80 in the boss 79 so as to raise the finger portion 85 thereof with respect to the flexible diaphragm 47. The pressure of the water introduced through the hose connection 25 and the inlet 53 to the tube 49 by the pump 26, which is started simultaneously with the energization of the solenoid 62, raises the flexible diaphragm 47 off the seat 54 of the tube 49 causing the water withdrawn from the tub 32 of the washing machine 10 to pass into chamber 51, through the port 57 therein, outlet 36 and hose connection 17 into the storage section 19 of the laundry tray 21.

When the solenoid 62 of the drain mechanism 16 is deenergized, the elements thereof will again return to their relative positions illustrated in Figure 6 of the drawings.

In so doing, as the core 64 of the solenoid 62 of the drain mechanism 16 is extended, the pin 72 drops downwardly relieving the tension in the spring 83 as the link members 86 are shifted and the spring causes the finger portion 85 of the lever 78 to urge or snap the flexible diaphragm 47 into contact with the seat 54 on the tube 49. The tension in the coil spring 75 is also relieved with the shifting of the core 64 and the pin 72 pivoting the lever 67 about the pin 70 and withdrawing the finger portion 71 from contact with the flexible diaphragm 47 so as to allow it to drop away from the seat 55 of the tube 49 again opening the lowermost end of the tube. The pin 68 in core 64 of solenoid 62 moves downward until it contacts the cut away portion 73 on the lever 67 which is supported in its lowermost position by the link members 86 and lever 78 the finger portion 85 of which rests upon the stiffened central portion of the flexible diaphragm 47 disposed against its seat 54.

As the pump 26 is operated following the rinsing cycle, the rinse water will be withdrawn from the tub 32, discharged through hose connection 25, inlet 53 and into the chamber 52 in the casing 41 of the drain mechanism 16. The water passes through the port 56 in the chamber 52, outlet 35 and the discharge hose connection 18 into the section 20 of the laundry tray 21 and thence through the drain 23.

When the next cycle of operations is initiated, the tub 32 of the automatic washing machine 10 may be refilled with the soapy water employed in the previous washing operation and stored in section 19 of the laundry tray 21. This operation may be accomplished by the use of a suitable portable motor driven pump unit 24 the flexible hose connection of which is inserted into the upper end of the tub 32 through the cover 13. The soapy water may be again withdrawn for storage, or it may thereafter be discharged to waste depending upon the number of times the operator wishes to reuse the same soapy water supply. It will also be understood that in the period during which the water is stored in section 19 of the laundry tray 21 a suitable heating coil or other satisfactory heating means may be employed to raise the temperature of the water or maintain it substantially that required for the completion of the washing operation.

It will be understood that any suitable storage means may be employed for the temporary storage of the soapy water discharged from the tub 32 and any form of drain may be associated with the outlet connection 18 for the discharging of the water employed in the several laundering operations to the waste outlet. The laundry tray 21 is particularly advantageous for the reason that most homes are equipped with such a fixture and they may be readily adapted to store or discharge water therefrom.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

We claim as our invention:

1. A drain mechanism for a washing machine or the like comprising a generally cylindrical casing, an open-ended substantially tubular member disposed within and in generally concentric relation to said casing, a wall portion disposed substantially perpendicularly with respect to the common axis of the casing supporting the tubular member therein and separating the space between the tubular member and the casing into a pair of outlet chambers so disposed that each communicates with an end of the tubular member, an outlet connection for each outlet chamber, an inlet connected to the tubular member, a pair of valves seated on each end of the tubular member respectively, lever means for opening one of said valves and contemporaneously closing the other, means for actuating the lever means to open one and then the other of said valves in alternate relation.

2. A drain mechanism for a washing machine or the like comprising a generally cylindrical casing, an open-ended substantially tubular member disposed within and in generally concentric relation to said casing, a wall portion supporting the tubular member in the casing and separating the interior of the said casing into a pair of chambers in communication respectively with opposite ends of said tubular member, an inlet connected to the tubular member, an outlet connection for each chamber, a flexible diaphragm positioned to be seated against each end of the tubular member, a lever pivoted on each end of the casing, a link member connecting the two levers together, and means on each lever to actuate the adjacent diaphragm to open and close the respective ends of the tubular member.

3. A two-way valve unit for handling fluid comprising a casing, an inlet in said casing, a pair of chambers in the casing separated from each other but having axially aligned parts communicating with the inlet, an outlet for each chamber, a flexible diaphragm for each chamber positioned to be seated on the respective port to close the same, lever means pivotally mounted on the casing for opening one of said flexible diaphragms and closing the other, and means for actuating the lever means.

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