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WASHING MACHINE WITH IMPROVED LIQUID AND ADDITIVE  
DISPENSING MEANS  
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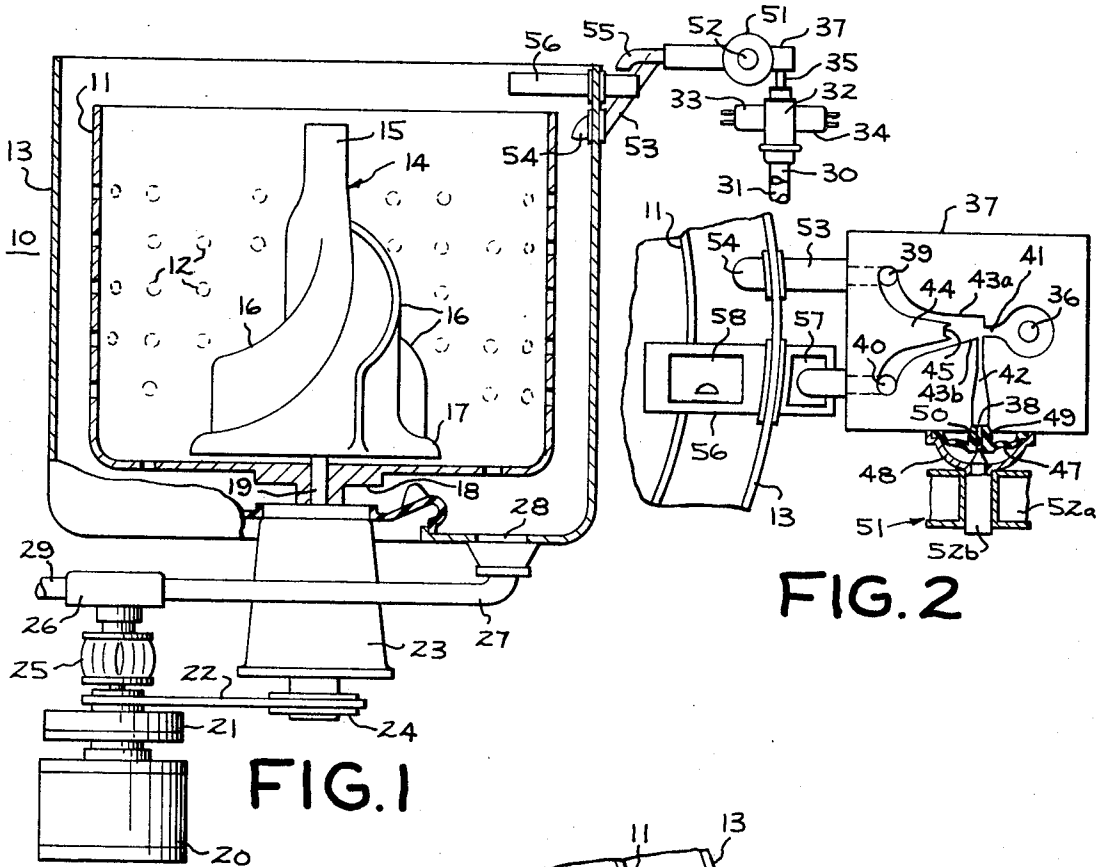


FIG. 2

FIG. 4

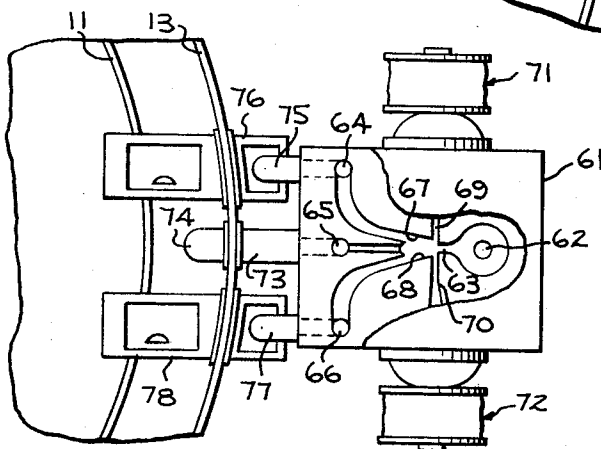
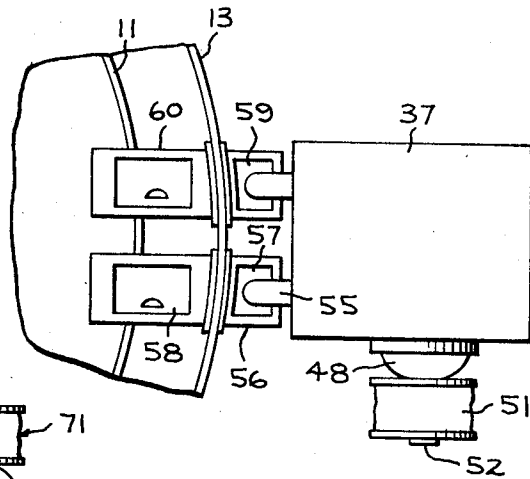


FIG. 3

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## WASHING MACHINE WITH IMPROVED LIQUID AND ADDITIVE DISPENSING MEANS

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5 Claims

### ABSTRACT OF THE DISCLOSURE

A washing machine provided with a liquid supply mechanism having a fluid amplifier for controlling the liquid supply mechanism outlets to the washing container. An additive dispenser is connected to at least one outlet and the amplifier is controllable to selectively cause dispensing of the additive.

### SUMMARY OF THE INVENTION

An object of the invention is to provide an improved liquid supply mechanism and additive dispenser for washing machines.

Another object of the invention is to provide such an improved mechanism by which clear liquid and additives selectively may be dispensed into the washing machine.

In accordance with one embodiment of this invention there is provided a liquid supply mechanism for a washing machine, including a fluid amplifier having a main inlet for the washing liquid, control inlet means and at least two outlets for the washing liquid. The main inlet communicates with a source of washing liquid under pressure. Each of the outlets communicates with the container of the washing machine in fluid dispensing relation thereto. Additive receptacle means communicate with at least one of the outlets to dispense additive to the container in response to liquid flow from that outlet. The amplifier is configured to discharge through one outlet any liquid entering the main inlet when the control inlet means is provided with a first connection to ambient and to discharge the liquid through other of the outlets in response to a variation of the control inlet means connection to ambient. Means are included to selectively vary the connection of the control inlet means to ambient to determine through which of the outlets liquid will be discharged from the fluid amplifier to the container and thus selectively dispense additive to the machine.

### BRIEF DESCRIPTION OF THE DRAWING

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed the invention will be better understood from the following description taken in connection with the accompanying drawing, in which:

FIG. 1 is a schematic, front elevational view of a clothes washing machine including one embodiment of the invention, the view being partly in section to illustrate details;

FIG. 2 is an enlarged, fragmentary plan view of a portion of FIG. 1, partly broken away and partly in section for illustration;

FIG. 3 is an enlarged, fragmentary plan view similar to FIG. 2 but showing another embodiment of the invention; and

FIG. 4 is an enlarged, fragmentary plan view similar to FIG. 2 but showing still another embodiment of the invention.

### DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to FIG. 1 of the drawing, there is shown therein, in schematic form, an agitator-type washing machine generally indicated by the numeral 10. Machine 10 includes a clothes basket 11 having perforations 12 over its side and bottom walls and disposed within an outer, imperforate tub or casing 13. Basket 11 and tub 13 form together a container to receive liquid and material to be washed in the liquid. This entire structure may be mounted within a suitable appearance and protective cabinet, which has been omitted for the sake of simplicity.

In the center of basket 11 there is provided a vertical axis agitator 14 which includes a center post 15 and a plurality of curved vanes 16 extending out from the center post and connected together at their base by a flared skirt 17. Both the basket 11 and agitator 14 are movably mounted. Conventionally, the basket is mounted for rotation and the agitator is mounted for some type of oscillatory motion which will effect a washing action on fabrics in the basket. In one conventional structure, the basket 11 may be secured to a hollow shaft member 18, and the agitator may be secured to a shaft 19 which extends up within shaft 18 in rotatable relation thereto. Basket 11 and agitator 14 are driven from a reversible motor 20 by a drive mechanism including a clutch 21 mounted on the motor shaft. Clutch 21 allows the motor to start without load and then pick up the load as it comes up to speed. A suitable belt 22 transmits power from the clutch to a transmission assembly 23 through a pulley 24. Thus, depending upon the direction of motor rotation, pulley 24 of transmission 23 is driven in opposite directions.

Transmission 23 is so arranged that it supports and drives both shafts 18 and 19. When motor 20 is rotated in one direction the transmission causes agitator 14 to be oscillated through shaft 19 while basket 11 is held stationary. Conversely, when the motor is driven in the opposite direction, the transmission rotates basket 11 and agitator 14 together at high speed through shafts 18 and 19 for centrifugal extraction of liquid from the clothes. While the particular form of drive means does not form part of the present invention, reference is made to Pat. 2,844,225 issued on July 22, 1958 to James R. Hubbard et al. and owned by the General Electric Company, assignee of the present invention. That patent discloses in detail the structural characteristics of a transmission suitable for use in the illustrated machine.

In addition to operating the transmission as described, motor 20 also provides a direct drive through a flexible coupling 25, to a pump structure 26. Pump 26 has an inlet connected by conduit 27 to an opening 28 formed at the lowermost point of tub 13. Pump 26 also has an outlet connected to a conduit 29 which leads to a suitable drain (not shown). Pump 26 is so formed that it is directive sensitive. It drains liquid from the opening 28 and discharges it through conduit 29 to drain during centrifugal extraction operations; but it is inoperative, during washing operations, merely tending to pump air into the tub.

Referring now to FIGS. 1 and 2, there is shown an improved liquid supply mechanism for introducing washing and rinsing liquid as well as additives such as detergents and rinse agents to the container formed by basket 11 and tub 13. The liquid supply mechanism includes suitable conduits 30 and 31 which are connected to sources of hot and cold water (not shown). Conduits 30 and 31 extend into a conventional mixing valve 32 having solenoids 33 and 34. Energization of solenoid 33 permits passage of hot water through the valve to a hose 35; energization of solenoid 34 permits passage of cold water through the valve to hose 35; and energization of both solenoids

permits mixing of hot and cold water in the valve and passage of warm water into hose 35.

The hose 35 is connected to the main inlet 36 of a fluid amplifier device 37, which also includes a control inlet 38 and two outlets 39 and 40. A passage 41 is formed in the fluid amplifier connecting the main inlet 36 to the outlets 39 and 40. A second passage 42 connects control inlet 38 to the main passage 41. The main passage 41 is offset at 43a opposite the control passage 42, and is essentially continuous at 43b, adjacent the control passage 42. The wall 44, separating outlets 39 and 40 is provided with a notch 45 facing the main inlet 36. With this configuration, when control inlet 38 is open to ambient such as the outside atmosphere, liquid entering through the main inlet 36 will exit through the outlet 39. This is so because the entrainment of fluid (such as air) from control passage 42 spoils any suction between the stream of liquid and wall 43b. On the other hand, when control inlet 38 is closed, liquid entering main inlet 36 will exit through outlet 40. This is because there are offsetting suction effects between the stream and each of the walls 43a and 43b. Therefore, the Coanda effect causes the stream to prefer to adhere to wall 43b, which is closer than wall 43a.

In order to control through which of the outlets the fluid will exit there is provided means for selectively opening and closing to atmosphere the control inlet 38. A flexible diaphragm member 47 is mounted over the inlet 38 and held in place by an open web support structure 48. The diaphragm includes a nib portion 49 which substantially fills the inlet 38. A central aperture or opening 50 extends through the nib 49 so that, when the aperture is open, the control inlet 38 is open to atmosphere and, when the aperture 50 is closed, the control inlet 38 is effectively closed to atmosphere. The support 48 also serves as the mount for a solenoid structure 51 including a coil 52a and a plunger 52b. The solenoid is so constructed and mounted that, when the coil 52a is energized, the inner end of the plunger 52b closes the aperture 50 and, when the coil is de-energized, the plunger moves away from the aperture 50. Thus, by selectively energizing the coil 52a, the control inlet 38 may be opened or closed to atmosphere to determine through which of the outlets 39 and 40 fluid will exit from the fluid amplifier.

Normally, washing machines include some suitable sequence control mechanism for determining the sequence of steps performed by the machine as well as their duration. The coil 51 may be connected in such a sequence control arrangement to provide switching of the fluid from one outlet to the other at the appropriate times in the sequence of operation of the machine. Since the particular sequence of switching as well as the particular sequence of other steps in washing machine cycle of operation is not part of this invention a particular sequence control arrangement has not been shown, there being many in the art.

The outlet 39 communicates with the container through a conduit 53 which terminates in a suitable fitting 54 mounted in the wall of tub 13. Thus, fluid existing from the fluid amplifier through outlet 39 flows through the conduit 53 and fitting 54 into the tub 13 and basket 11. The outlet 40 communicates with the container by means of a conduit 55 which is connected at one end to the outlet 40 and disposed at its other end to discharge fluid into a suitable flow-through type additive storage receptacle 56, mounted in the wall of tub 13.

The receptacle 56 is provided at one end with an opening 57 to receive fluid from the conduit 55 and at the other end with an opening (not shown) to discharge the fluid into the container formed by the basket 11 and tub 13. The flow of fluid through the storage receptacle 56 from conduit 55 to the container will flush out any additive in the receptacle and dispense it into the container. In order to place a suitable additive in the receptacle 56, it is provided with a manually operable cover member 58 which may be opened to insert a suitable additive and

then closed to prevent liquid from splashing out of the receptacle during operation.

With this construction, when it is desired to provide clear liquid to the container, the solenoid 51 is de-energized so that the water or other liquid entering amplifier inlet 36 will exit through outlet 39, conduit 53 and fitting 54 into the container formed by basket 11 in the tub 13. When it is desired to dispense a suitable additive to the container, such as a detergent, for a washing operation, or a fabric softener, for a rinsing operation, the solenoid coil 52a is energized so that the plunger 52b closes aperture 50. With this configuration the liquid entering the amplifier at main inlet 36 during the next liquid fill operation of the machine will exit through outlet 40 and flow through conduit 55 and storage receptacle 56 into the container formed by basket 11 and tub 13. This operation will carry the additive, which had previously been placed in the receptacle 56, into the container.

FIG. 3 shows a modification of the invention wherein two separate additives may be dispensed into the container, and, in the description of FIG. 3, the same numerals will be used to describe parts which are the same as FIG. 2. The amplifier 37 is the same as that shown in FIG. 2 and the outlet 40 communicates with the container formed by basket 11 and tub 13 through the same conduit 55 and additive storage receptacle 56. The outlet 39, however, communicates with the container through a conduit 59 and a second additive storage receptacle 60, similar to the conduit 55 and storage receptacle 56 utilized in conjunction with outlet 40.

With this arrangement of parts, regardless through which outlet the liquid exits from the fluid amplifier, it will pass through a storage receptacle on its way to the container. With this arrangement two separate additives may be dispensed into the container during a single cycle of operation of the machine without the operator having to return to the machine once the cycle of operation has begun. For instance, a suitable detergent could be placed in the receptacle 56 and a suitable fabric softener in receptacle 60. During the filling operation prior to washing the fabrics, coil 51 would be energized so that the liquid would exit from the amplifier through outlet 40 and thereby flow through a storage receptacle 56 to dispense the detergent into the container. By the same token, during the fill for the final rinse operation the solenoid 51 would be de-energized so that fluid would exit from the amplifier through outlet 39 and thus dispense a fabric softener into the container.

Many present day washing machines provide a sequence of operation including a pre-wash step, a wash step and one or more rinse steps. With such machines it is desirable for the container first to be filled with clear liquid for the pre-wash step; then, for a detergent to be added when the container is filled for the wash step and, finally, for a rinse agent to be added when the container is filled for the final rinse step.

Referring now particularly to FIG. 4, there is shown an embodiment of the invention which is capable of providing the container with two separate additives and clear liquid before either of the additives is dispensed.

The fluid amplifier device 61 is provided with a main inlet 62, which is connected to the hose 35. A passage 63 is formed in the amplifier connecting the main inlet 62 to outlets 64, 65 and 66. The main passage 63 is offset at 67 and 68, adjacent control passages 69 and 70 respectively. Control passages 69 and 70 selectively may be opened and closed to atmosphere by solenoid 71 and 72 respectively, in the same manner as passage 41 is controlled by solenoid 51 in the embodiment of FIG. 2. With both passages 69 and 70 open to atmosphere there will be no transverse pressure differential across the stream of fluid flowing through passage 63, and the fluid will exit through outlet 65. When only solenoid 71 is actuated to close passage 69, the transverse pressure differential across the stream of fluid will cause it to exit the amplifier

through outlet 64. When only solenoid 72 is actuated to close passage 70, the transverse pressure differential across the stream of fluid will cause it to exit the amplifier through outlet 66.

The outlet 65 communicates with container through a conduit 73 which terminates in a suitable fitting 74 mounted in the wall of tub 13 (in the manner of conduit 53 and fitting 54 of FIG. 2). The outlet 64 communicates with the container by means of a conduit 75. Conduit 75 is connected at one end to the outlet 64 and is disposed at its other end to discharge fluid into a flow-through type additive storage receptacle 76 (like the receptacle 56 of FIG. 2), mounted in the wall of tub 13. Similarly, a conduit 77 connects outlet 66 to the container through an additive storage receptacle 78 (also like receptacle 56 of FIG. 2).

With this last construction, when it is desired to provide clear liquid to the container, even though both storage receptacles 76 and 78 are filled with suitable additives, neither of the solenoids 71 and 72 is energized. Thus the water or other liquid entering amplifier main inlet 62 will exit through outlet 65, conduit 73 and fitting 74 into the container formed by basket 11 and tub 13. When it is desired to dispense a first additive only one of the solenoids is energized, for instance 71, this causes the liquid to exit the amplifier through outlet 64, conduit 75 and receptacle 76. The liquid carries into the container any additive previously stored in receptacle 76. When it is desired to dispense another additive, only the other solenoid is energized, for instance 72. This causes the liquid to exit the amplifier through outlet 67, conduit 77 and storage receptacle 78. The liquid carries into the container any additive previously stored in receptacle 78. Thus, with this last construction, additive can be dispensed to the container on two separate occasions and clear liquid can be introduced to the container, even though both storage receptacles are full.

For purposes of illustration, the additive storage receptacles have been shown as a flow-through type wherein the stream of liquid entering the container flows through the storage receptacle to physically wash out any additive stored therein. Such a dispenser has advantages in that either a liquid or a solid additive may be used and the flow of liquid through the storage receptacle will completely remove the additive during each appropriate operation so that under normal operation no residue of dried additive will build up in the receptacle, as would be the case with a liquid fabric softener and another type of dispenser. However, it will be understood by those skilled in the art that various other dispensers may be used in conjunction with this invention without departing from the spirit thereof. For instance, if only liquid additives are to be used either one or both of the storage receptacles could be of the aspirator type that are connected to the conduit between the appropriate fluid amplifier outlet and the container. With such dispensers, which are well known in the art, the flow of liquid through the conduit would aspirate additive from the storage receptacle and dispense it to the container.

For purposes of illustration, the present invention has been shown as used in connection with a clothes or fabric washing machine. However, this was done for purposes of illustration only, because it has particular advantage therewith; however, this invention may be used with other washing machines such as automatic dishwashers.

As will be evident from the foregoing description, certain aspects of the invention are not limited to the particular details of construction of the examples illustrated, and it is contemplated that other modifications or applications will occur to those skilled in the art. It is therefore intended that the appended claims will cover such modifications and applications as do not depart from the true spirit and scope of the invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In a washing machine having a container to receive

liquid and material to be washed in the liquid; a liquid supply mechanism including:

- (a) a fluid amplifier having a main inlet for the washing liquid, control inlet means connected to ambient, and multiple outlets for the washing liquid;
- (b) said main inlet being arranged for connection to a source of washing liquid under pressure;
- (c) each of said outlets communicating with the container in liquid dispensing relation thereto;
- (d) additive receptacle means communicating with at least one of said outlets to dispense additive to the container in response to liquid flow from said one of said outlets; and
- (e) means for selectively varying the connection of said control inlet means to ambient to determine through which of said outlets liquid entering said main inlet will exit.

2. In a washing machine having a container to receive liquid and material to be washed in the liquid; a liquid supply mechanism including:

- (a) a fluid amplifier having a main inlet for the washing liquid, a control inlet connected to ambient and two outlets for the washing liquid;
- (b) said main inlet being arranged for connection to a source of washing liquid under pressure;
- (c) each of said outlets communicating with the container in liquid dispensing relation thereto;
- (d) additive receptacle means communicating with at least one of said outlets to dispense additive to the container in response to liquid flow from said one of said outlets; and
- (e) means for selectively closing said control inlet to ambient to determine through which of said outlets liquid entering said main inlet will exit.

3. The mechanism as set forth in claim 2, further including: first means interconnecting one of said outlets with the container so that any liquid exiting from said one outlet will be dispensed into the container; and second means interconnecting the other of said outlets with the container so that any liquid exiting from said other outlet will be dispensed into the container, and including additive receptacle means whereby liquid exiting from said other outlet will cause additive in said receptacle to be dispensed into the container.

4. The mechanism as set forth in claim 2, further including: first means interconnecting one of said outlets with the container so that any liquid exiting from said one outlet will be dispensed into the container, and including first additive receptacle means whereby liquid exiting from said one outlet will cause additive in said first receptacle to be dispensed into the container; and second means interconnecting the other of said outlets with the container so that any liquid exiting from said other outlet will be dispensed into the container, and including second additive receptacle means whereby liquid exiting from said other outlet will cause additive in said second receptacle to be dispensed into the container.

5. In a washing machine having a container to receive liquid and material to be washed in the liquid; a liquid supply mechanism including:

- (a) a fluid amplifier having a main inlet for the washing liquid, two control inlets connected to ambient and three outlets for the washing liquid;
- (b) said main inlet being arranged for connection to a source of washing liquid under pressure;
- (c) said fluid amplifier being configured to discharge through a first of said outlets any liquid entering through said main inlet when both of said control inlets are open to ambient to exit such liquid through a second of said outlets when only the first of said control inlets is closed, and to exit such liquid through the third of said outlets when only the second of said control inlets is closed;

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- (d) each of said outlets communicating with the container in liquid dispensing relation thereto;
- (e) first additive receptacle means communicating with one of said outlets to dispense additive to the container in response to liquid flow from said one of said outlets; 5
- (f) second additive receptacle means communicating with another of said outlets to dispense additive to the container in response to liquid flow from said other of said outlets; and 10
- (g) means for selectively closing each of said control inlets independently of the other of said control inlets to determine through which of said outlets liquid entering said main inlet will exit. 15

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