



US 20070028653A1

(19) **United States**(12) **Patent Application Publication****Thies et al.**(10) **Pub. No.: US 2007/0028653 A1**(43) **Pub. Date: Feb. 8, 2007**(54) **FLUID DISTRIBUTION SYSTEM****Publication Classification**(76) Inventors: **Edward L. Thies**, Creola, OH (US);  
**Matthew C. Parsons**, Dowagiac, MI (US)(51) **Int. Cl.**  
**D06F 39/02** (2007.01)(52) **U.S. Cl.** ..... **68/17 R; 68/207**

Correspondence Address:

**WHIRLPOOL PATENTS COMPANY - MD**  
**0750****500 RENAISSANCE DRIVE - SUITE 102**  
**ST. JOSEPH, MI 49085 (US)**(57) **ABSTRACT**(21) Appl. No.: **11/199,002**(22) Filed: **Aug. 8, 2005**

A dispensing system is disclosed herein and includes a valve, a rotatable disc within the valve, and a motor for selectively rotating the disc to certain positions. Positioning of the disc, via the motor, establishes communication between the inlet of the valve and one of at least two outlets.

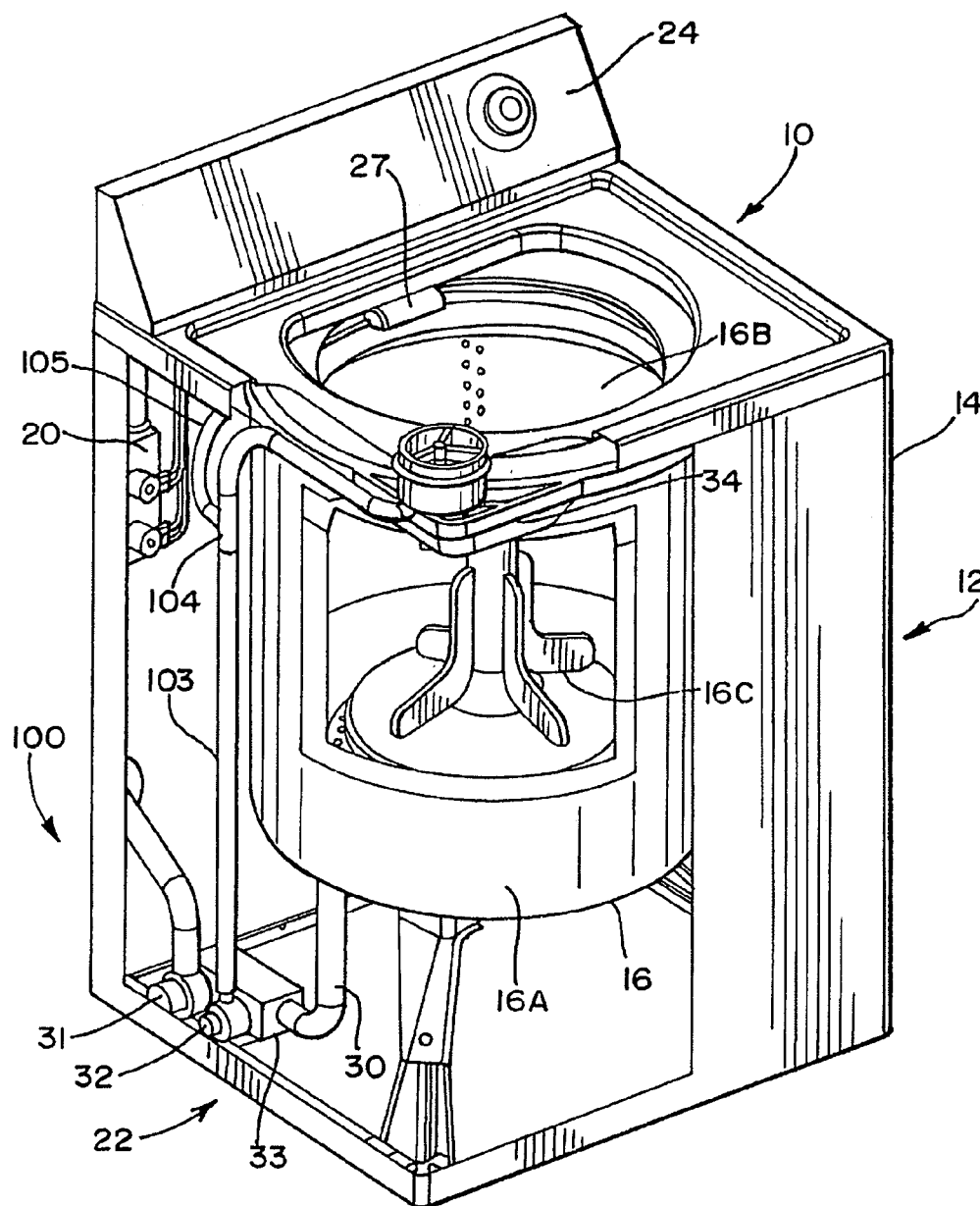
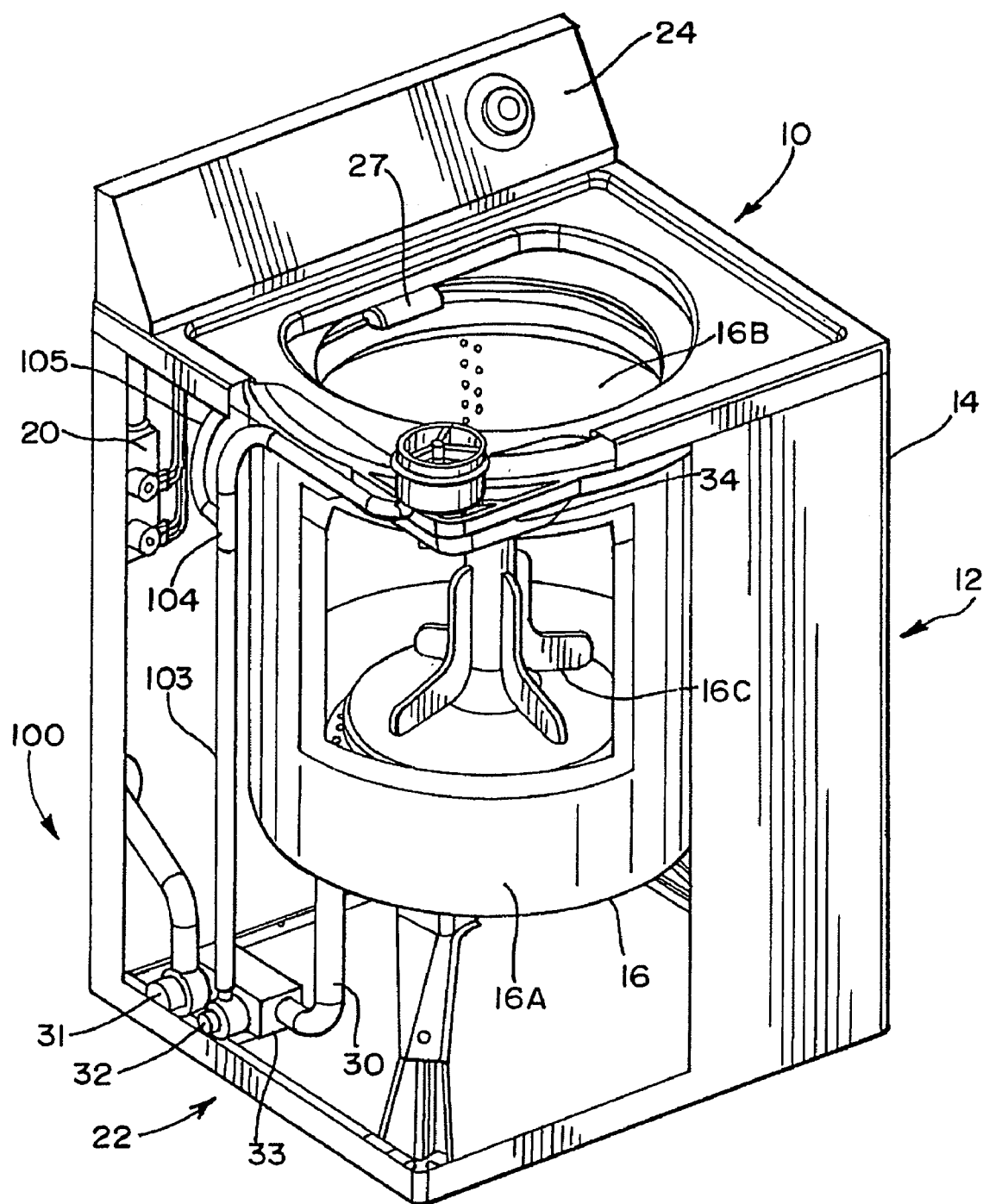
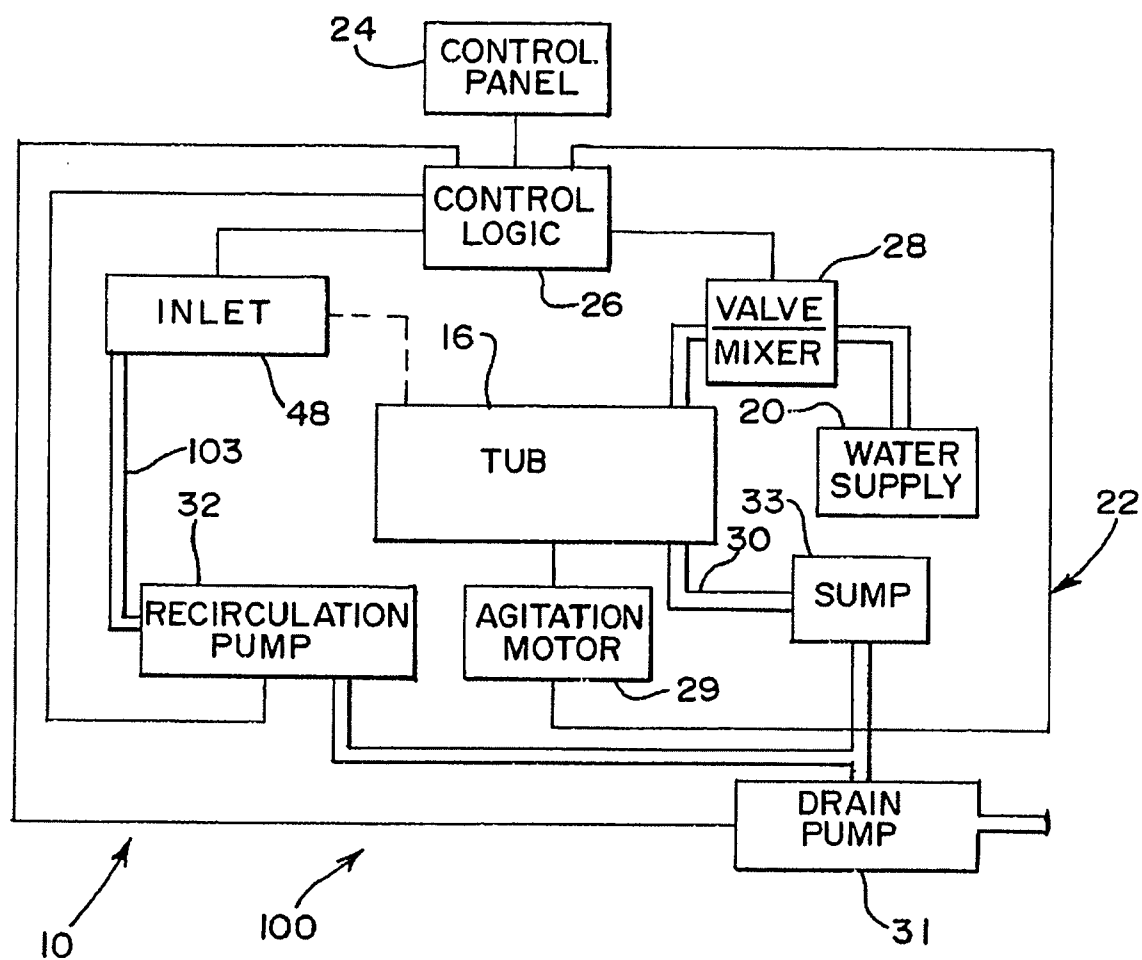


FIG. 1



# FIG.2



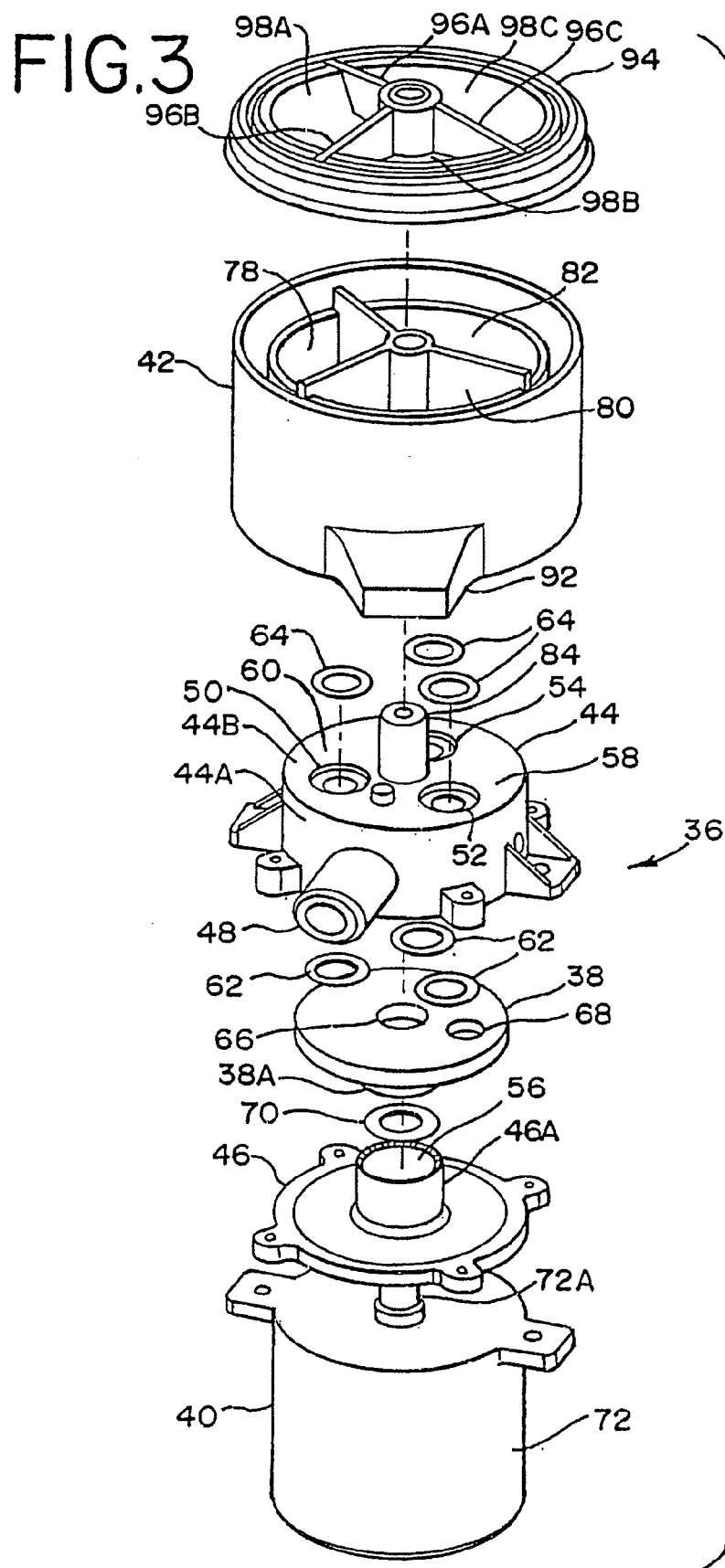


FIG. 4

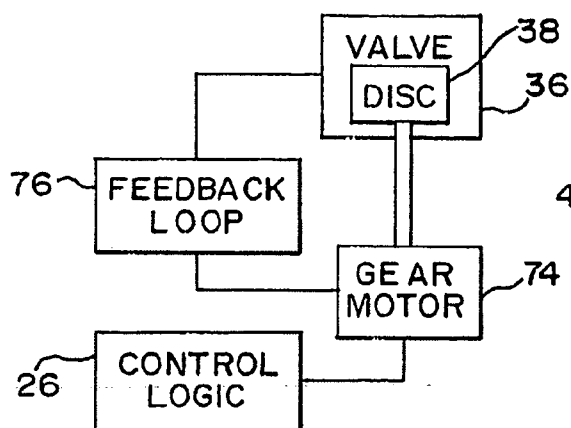


FIG. 5

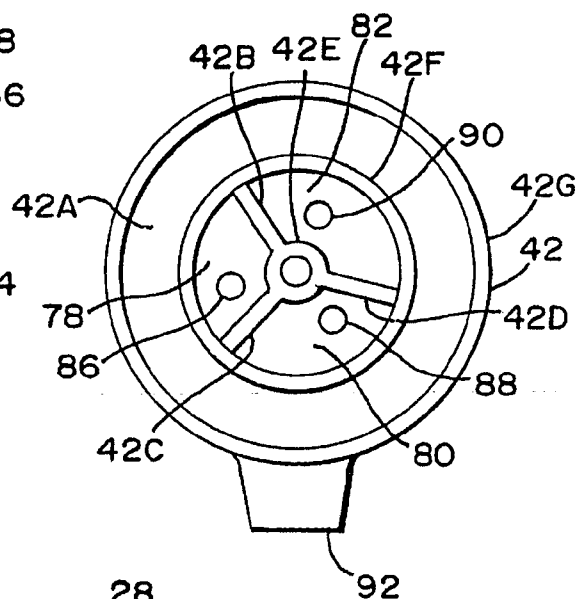


FIG. 6

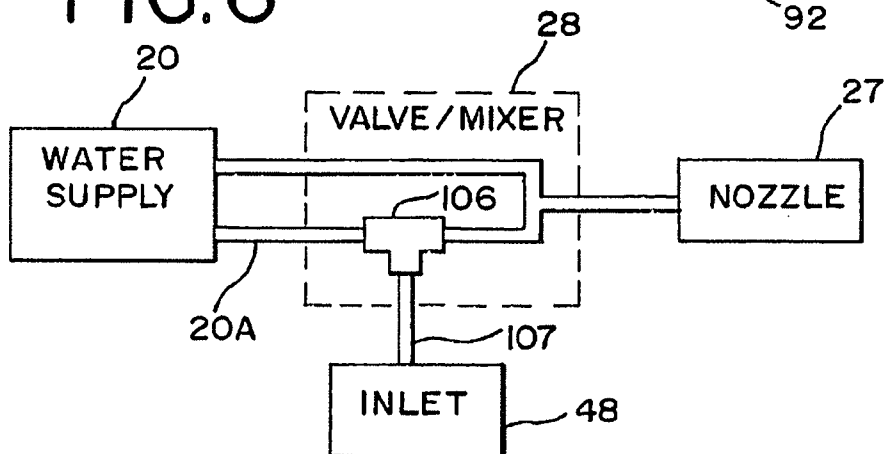


FIG. 7

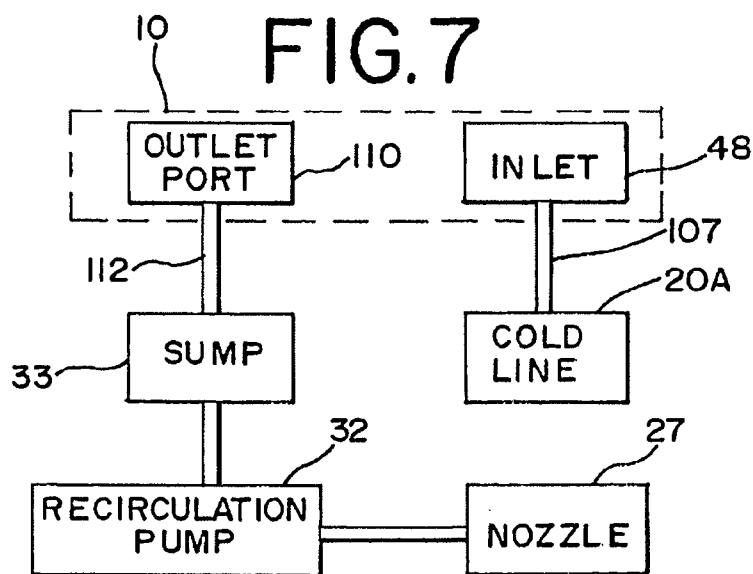


FIG. 8

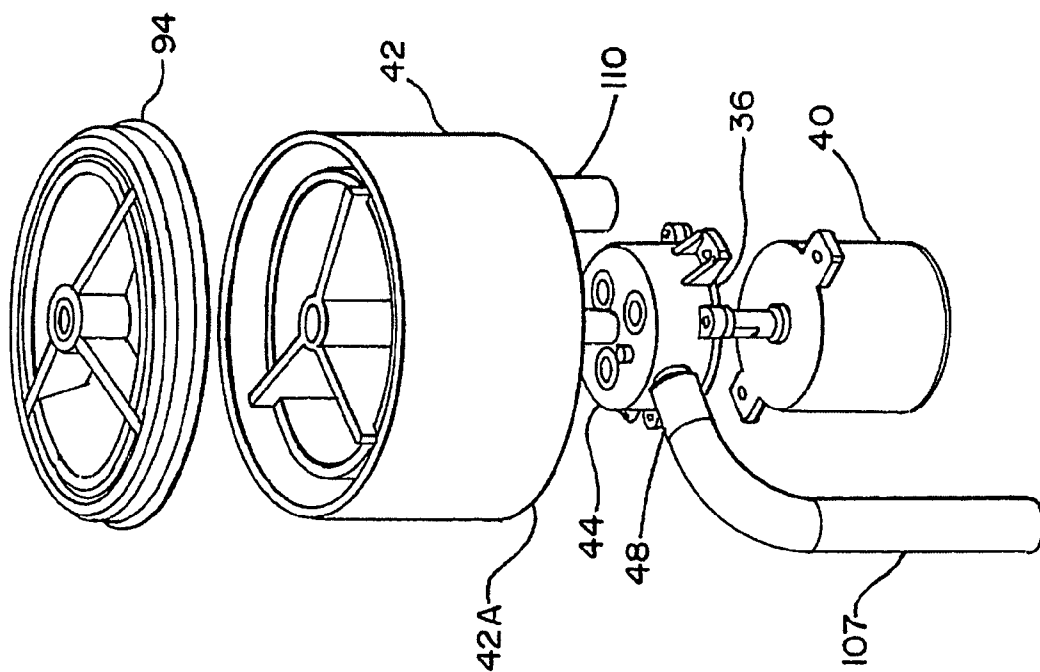
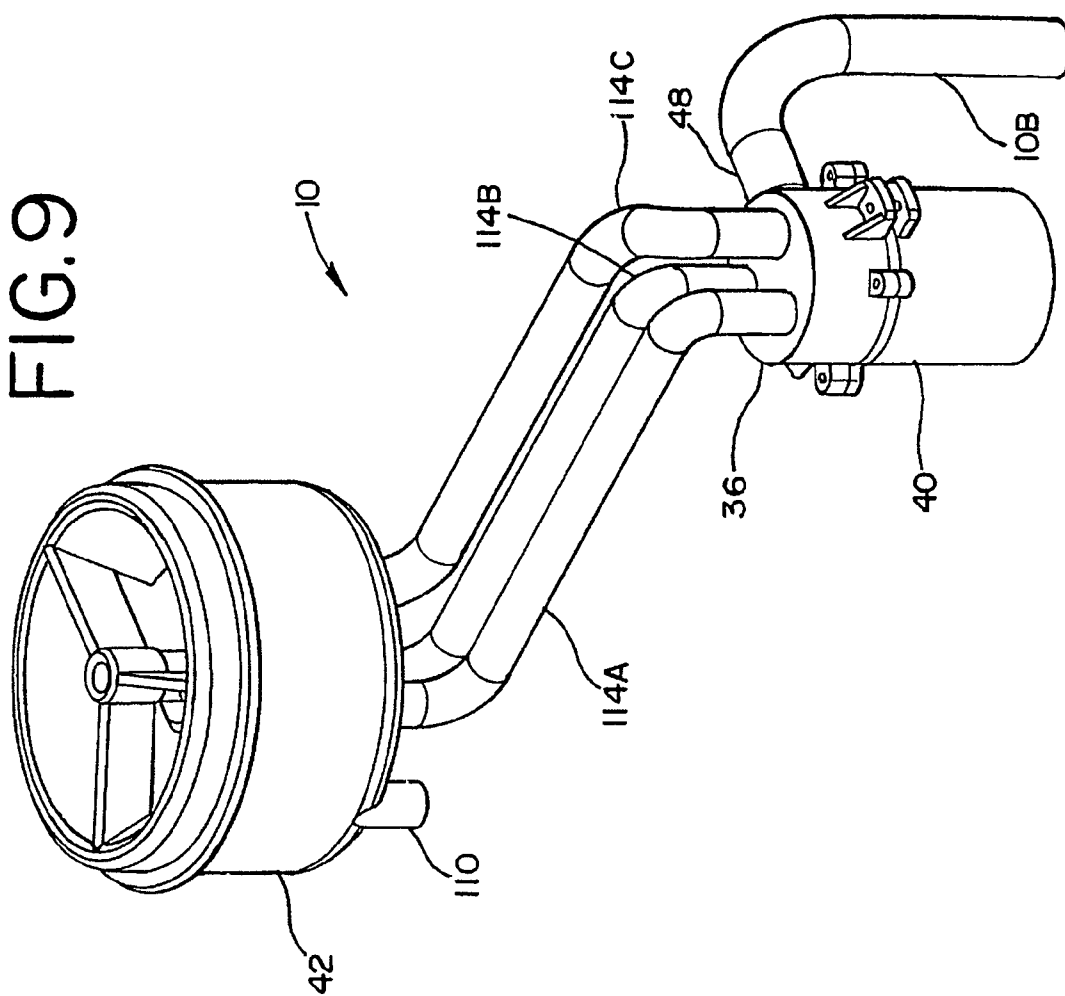


FIG. 9



## FLUID DISTRIBUTION SYSTEM

### BACKGROUND OF THE INVENTION

[0001] The present invention relates generally to a fluid distribution system and, more particularly, to a distribution system for a clothes washing machine.

[0002] As is well known in the art, a washing machine has an operating cycle, including the following general steps: (1) filling the tub; (2) washing; (3) spinning and draining the tub; (4) re-filling; (5) rinsing; and (6) final draining. At appropriate times, cleaning products are added to the tub. For example, detergent is added during the initial filling; bleach is added prior to or during washing; and softener is added during re-filling or rinsing.

[0003] Various mechanisms have been developed to facilitate the automatic dispensing of these cleaning products. None, however, has offered the capability to distribute or dispense up to three cleaning products, in an automated fashion, and in an effective manner.

### SUMMARY OF THE INVENTION

[0004] In a principal aspect, the present invention is a fluid distribution system, having a particular application in washing machines. The present invention is not, however, limited to such washing machines, except as otherwise noted.

[0005] The system includes a valve, a rotatable disc within the valve, and a motor mechanism for selectively rotating the disc to certain positions. The valve has at least one inlet and at least one outlet. The rotatable disc defines a channel and, depending upon the selected position of the disc, the channel provides communication between the inlet and outlet.

[0006] It is thus an object of the present invention to provide a novel and unique fluid distribution system. Another object is to provide a novel and unique dispensing system for washing machine. It is also an object of the present invention to provide an automated control capable of receiving fluid from one or more sources and for delivering fluid to one or more outlet ports.

[0007] It is a further object to provide fluid, from an inlet, to a selected outlet, so as to produce a liquid flow or pressure at the selected outlet. It is yet another object of the present invention to provide an automated distribution system for selectively delivering at least three cleaning products to the tub of a washing machine.

[0008] These and other features, objects and advantages of the present invention are described or apparent in the following detailed description.

### BRIEF DESCRIPTION OF THE DRAWING

[0009] Preferred embodiments of the present invention are described herein with reference to the drawing wherein:

[0010] FIG. 1 is a partial perspective, partial exploded, partial cut-away view of a washing machine, incorporating an integrated preferred embodiment of the present invention;

[0011] FIG. 2 is a partial schematic diagram of the washing machine shown in FIG. 1;

[0012] FIG. 3 is an exploded perspective view of the preferred embodiment shown in FIG. 1;

[0013] FIG. 4 is a partial schematic diagram of an alternative embodiment to that shown in FIG. 1;

[0014] FIG. 5 is a top view of the dispenser shown in FIG. 1;

[0015] FIG. 6 is a partial schematic diagram illustrating an alternative water supply for the preferred embodiment of FIG. 1;

[0016] FIGS. 7 and 8, a partial schematic diagram and an exploded partial perspective view, respectively, illustrate yet another preferred embodiment; and

[0017] FIG. 9 is a partial perspective view of a non-integrated embodiment of the present invention.

### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] Preferred embodiments of the present invention are shown in FIGS. 1-8 as an integrated distribution system, generally designated 10, for use in a conventional washing machine, generally designated 12. As is well known in the art, the washing machine 12 includes a cabinet 14, a tub 16 (having an outer plastic casing 16A in communication with an inner metal basket 16B and a rotatable agitator 16C), a water supply 20, a water drain, generally designated 22, a control panel 24 for selection of the various operational modes, and control logic 26 for overall operational control. (As used herein, the terms "communicate" and "communication" refer to fluid communication.) Preferably the control logic 26 is a microprocessor. In a conventional manner, the control logic 26 receives the operational parameters selected by the user (not shown) via the control panel 24. Such parameters include, without limitation, load size and water temperature.

[0019] Upon user initiation, the control logic 26 effectively connects the water supply 20 (hot and cold supplies) to the tub 16, such that filling thereof begins through a fresh water nozzle 27. This connection is via a valve and mixer combination 28, well known in the art. When the water level for the selected load size is reached, washing begins with activation of an agitation motor 29, coupled to the agitator 16C, by the control logic 26. Upon completion, rinsing is effected. The tub 16, or more particularly the outer casing 16A, is drained via a drain hose 30 and drain pump 31. Water in the tub 16 is also periodically re-circulated via a recirculation pump 32, in communication with the drain hose 30 and under control of the logic 26, to facilitate washing and rinsing. In this preferred embodiment, the drain hose 30 and pumps 31, 32 are coupled through a remote sump 33, as described in U.S. Pat. No. 6,820,447 (the teachings of which are incorporated herein by reference).

[0020] As best shown in FIG. 1, the system 10 is secured in a front left corner 34 of the cabinet 14, adjacent the tub 16. Referring now primarily to FIG. 3, the system 10 is generally cylindrical and includes four major components: a valve, generally designated 36, a rotatable disc 38, motor means 40, and a dispenser 42. The valve 36 vertically interposes the motor means 40 and the dispenser 42. In this preferred embodiment, the dispenser 42 communicates

directly with the tub 16, i.e., water exiting the dispenser 42 flows directly into the tub 16.

[0021] The valve 36 includes a housing 44, having a substantially cylindrical side wall 44A, an upper end wall 44B, and a substantially circular spool 46, conventionally secured to and closing the housing 44 opposite the end wall 44B. The housing 44 includes a substantially cylindrical fluid inlet or intake 48, extending radially from the side wall 44A.

[0022] The housing 44 provides first, second and third substantially circular outlets 50, 52, 54 in the upper end wall 44B. While three outlets are shown in this particular preferred embodiment (i.e., in the washing machine 12 that utilizes three cleaning products), it is to be understood that any number of outlets may be fed from the single inlet 48. The spool 46 includes a central, upwardly extending, substantially annular flange 46A, defining a motor aperture 56.

[0023] As best shown in FIG. 3, the outlets 50, 52, 54 reside within a first segment 58 of the end wall 44B. The remaining segment 60 is solid. Each of the outlets 50, 52, 54 is flared, on both sides of the end wall 44B, to accommodate interior and exterior sealing O-rings 62, 64.

[0024] The rotatable disc 38 resides within the housing 44, substantially adjacent and parallel to the end wall 44B, interposing the inlet 48 and the outlets 50, 52, 54. The disc 38 sealingly engages the sidewall 44A in a manner permitting rotation thereof with respect to the housing 44. The disc 38 further engages the O-rings 62 into compression with the end wall 44B.

[0025] The disc 38 includes a central, substantially annular sleeve 38A, extending downwardly away from the upper end wall 44B, which provides a central mounting aperture 66, substantially aligned with the motor aperture 56. The disc 38 further defines a channel or passageway 68, radially displaced from the mounting aperture 66.

[0026] In this preferred embodiment, the disc 38 has four operational positions. In the first or rest position, the channel 68 is within or aligns with the solid segment 60 of the end wall 44B. In the three other positions, the channel 68 substantially vertically aligns with the outlets 50, 52, 54, respectively. Appropriate positioning or rotation of the disc 38 provides communication, through the channel 68, between the inlet 48 and any one of the outlets 50, 52, 54.

[0027] A spring washer 70 interposes the sleeve 38A and flange 46A. The spring washer 70 biases the disc 38 against the O-rings 62 to substantially avoid leakage, while providing sufficient "play" to allow rotation of the disc 38.

[0028] The motor means 40, under control of the logic 26, selectively rotates the disc 38 to one of its four operational positions, as the washing machine 12 is advanced through its operational cycle. In this preferred embodiment, the motor means 40 is a conventional stepper motor 72, having a shaft 72A. The motor 72 is below the valve 36, and the shaft 72A extends substantially vertically through the motor aperture 56 of the spool 46 to engage the mounting aperture 66 of the disc 38. The shaft 72A is conventionally attached to the sleeve 38A, and both apertures 56, 66 are conventionally sealed to avoid leakage around the shaft 72A. Preferably, the mounting aperture 66 and shaft 72A define a keyed arrangement to facilitate attachment and rotation.

[0029] A less expensive gear motor 74 could be used as an alternative to the stepper motor 72. In this alternative embodiment shown in FIG. 4, accurate positioning of the channel 68 with respect to the outlets 50, 52, 54 is achieved by a conventional feedback loop 76.

[0030] Referring now to FIGS. 3 and 5, the substantially cylindrical dispenser 42 sits above and is secured to the valve 36 in a conventional manner. The dispenser 42 provides first, second and third upwardly opening, sector-shaped receptacles 78, 80, 82, for receipt of a detergent, bleach and clothes softener, respectively. The dispenser 42 includes a substantially circular base wall 42A, radially extending divider walls 42B, 42C, 42D, and substantially concentric, substantially cylindrical boundary walls 42E, 42F, 42G. In this preferred embodiment, the housing 44 further includes a centrally located, substantially cylindrical mount 84, extending from the end wall 44B opposite the spool 46. The mount 84 is received by the innermost boundary wall 42E to facilitate assembly.

[0031] The dispenser 42 or, more particularly, the base wall 42A provides first, second and third ports 86, 88, 90 within the receptacles 78, 80, 82, respectively. The outlets 50, 52, 54 substantially vertically align with the ports 86, 88, 90, respectively, such that the receptacles 78, 80, 82 selectively communicate with the inlet 48. The ports 86, 88, 90 are flared to accommodate the O-rings 64, substantially avoiding leakage between the valve 36 and dispenser 42.

[0032] The dispenser 42 further includes a spout 92, extending radially from the outer boundary wall 42G, substantially towards the agitator 16C. The spout 92 opens over the outer casing 16A or an extension thereof, such that water exiting the spout 92 is delivered to the tub 16. As best shown in FIG. 3, the height of the intermediate boundary wall 42F is less than that of the divider walls 42B, 42C, 42D and the innermost and outermost boundary walls 42E, 42G, such that liquid flowing into any one of the receptacles 78, 80, 82 eventually overflows the intermediate boundary wall 42F, discharging into the tub 16 via the spout 92.

[0033] The distribution system 10 further includes a substantially cylindrical, generally concave cover 94, detachably secured to the dispenser 42. The cover 94 has three radially extending walls 96A, 96B, 96C, corresponding to and substantially vertically aligned with the divider walls 42B, 42C, 42D of the dispenser 42, to provide three dispensing chambers 98A, 98B, 98C. Each chamber 98A, 98B, 98C has an open bottom, such that the cleaning products pass into the receptacles 78, 80, 82, respectively. Each chamber 98A, 98B, 98C bears a label (not shown) indicating proper placement for each of the three cleaning products (i.e., detergent, bleach and rinsing agent, respectively). Alternatively, a single chamber 98A has an open bottom and the cover 94 is rotated to achieve proper loading of the cleaning agents.

[0034] As best shown in FIGS. 1 and 2, the system 10 further includes supply means, generally designated 100, for supplying fluid to the inlet 48 of the valve 36. In this preferred embodiment, the supply means 100 includes the recirculation pump 32, interconnecting the tub 16 and inlet 48 via the drain hose 30, the remote sump 33 and a first supply hose 103. A first inlet T-connector 104, coupled into the supply hose 103, and a first inlet hose 105, connected to the nozzle 27, splits water flow from the recirculation pump

**32** between the nozzle **27** and the inlet **48**. The pump **32** is activated by the control logic **26**.

[0035] Referring now to FIG. 6, another preferred embodiment of the system **10** is shown, wherein the supply means **102** includes a second inlet T-connector **106**, coupled to a cold line **20A** of the water supply **20**, downstream of the valve but prior to mixing in the valve/mixer **28**, and a second supply hose **107**, connected between the inlet **48** and the T-connector **106**. The T-connector **106** allows water flow to both the nozzle **27** and inlet **48**. In this preferred embodiment, the recirculation pump **32**, sump **33**, first inlet T-connector **104** and first inlet hose **105** may be eliminated.

[0036] FIGS. 7 and 8 illustrate yet another preferred embodiment of the present invention. The inlet **48** is coupled to the water supply **20**, as shown in FIG. 6. The spout **92** of the dispenser **42** is replaced by a substantially cylindrical outlet port **110**, extending downwardly from the base wall **42A**. A third supply hose **112** connects the port **110** and the remote sump **33**, and water, containing the various cleaning products, is directed via the recirculation pump **32** to the nozzle **27**.

[0037] In FIG. 9, a non-integrated version of the present invention is shown. The dispenser **42** (regardless of configuration) is remote from the valve **36**, connected thereto via three interconnection hoses **114A**, **114B**, **114C**.

[0038] In terms of operation, and again with reference primarily to FIGS. 1-5, the control logic **26** rotates the disc **38** from the rest position as the tub **16** fills with water, such that the channel **68** aligns with the outlet **50** and port **86**. The logic **26** then activates the pump **32**, such that water flows into the receptacle **78**. Continued filling overflows the intermediate boundary wall **42F** of the dispenser **42**, such that the mixture of water and detergent enters the tub **16**. After a predetermined period of time, the logic **26** halts operation of the pump **33** and rotates the disc **38** back to the rest position, effectively closing the valve **36**.

[0039] Prior to the end of this filling step, or alternatively at the beginning of the washing step, the disc **38** is again advanced from the rest position and water is pumped into the receptacle **80**. This adds bleach to tub **16**. A similar sequence is followed to provide softener, from the receptacle **82**, during the rinsing step.

[0040] Preferably the disc **38** is in place prior to initiation of water flow. This allows rotation thereof in the absence of any water pressure. Introduction of water into the bottom of the receptacles **78**, **80**, **82** enhances mixing and delivery of the cleaning materials.

[0041] While a preferred embodiment has been described herein, it is to be understood that modifications and changes can be made without departing from the true scope and spirit of the present invention, as defined by the following claims, which are to be interpreted in view of the foregoing detailed description. For example, a feature from any one of the preferred embodiments may be incorporated to any of the other embodiments.

What is claimed is:

1. A fluid distribution system comprising, in combination:
  - a valve having an end wall and an inlet, said end wall having a first segment and a second segment defining at least a first outlet;

a rotatable disc within said valve and defining a channel; and

motor means for rotating said rotatable disc to at least a first position wherein said channel substantially aligns with said first segment and a second position wherein said channel substantially aligns with said first outlet, whereby said inlet of said valve selectively communicates with said first outlet.

2. A fluid distribution system as claimed in claim 1 wherein said rotatable disc residing substantially adjacent said end wall.

3. A fluid distribution system as claimed in claim 2 further comprising at least a first seal engagingly interposed said rotatable disc and said end wall, said first seal substantially encompassing said first outlet.

4. A fluid distribution system as claimed in claim 3 wherein said valve has a side wall defining said inlet.

5. A fluid distribution system as claimed in claim 1 further comprising a dispenser having an outlet port and at least a first receptacle in communication with said first outlet.

6. A fluid distribution system as claimed in claim 5 further comprising supply means for delivering a liquid to said inlet of said valve, said liquid selectively flowing into said first receptacle of said dispenser and thereafter exiting said outlet port.

7. A fluid distribution system for use in a washing machine, having a tub, comprising, in combination:

- a valve having an inlet and at least a first outlet and a second outlet;

- a rotatable disc within said valve and defining a channel;

- motor means for rotating said rotatable disc to at least a first position wherein said channel substantially aligns with said first outlet and a second position wherein said channel substantially aligns with said second outlet, whereby said inlet of said valve selectively communicates with said first outlet and said second outlet; and

- a dispenser having at least a first receptacle, in communication with said first outlet, and a second receptacle, in communication with said second outlet, said dispenser including an outlet port in communication with said tub, whereby said first and second receptacles selectively communicate with said inlet.

8. A fluid distribution system as claimed in claim 7 further comprising supply means for delivering a liquid to said inlet of said valve, said liquid selectively flowing through said first and second receptacles to said outlet port and into said tub.

9. A fluid distribution system as claimed in claim 8 wherein said supply means draws said liquid from said tub.

10. A fluid distribution system as claimed in claim 7 wherein said valve includes an end wall defining a rest position, said first outlet and said second outlet, said rotatable disc residing substantially adjacent said end wall.

11. A fluid distribution system as claimed in claim 10 wherein motor means rotates said rotatable disc to at least a third position wherein said channel substantially aligns with said rest position.

12. A fluid distribution system as claimed in claim 11 further comprising supply means for delivering a liquid to

said inlet of said valve, said liquid selectively flowing through said first and second receptacles to said outlet port and into said tub.

**13.** A fluid distribution system as claimed in claim 12 wherein said supply means draws said liquid from said tub

**14.** A fluid distribution system as claimed in claim 13 further comprising a first seal and a second seal engagingly

interposed said rotatable disc and said end wall, said first seal substantially encompassing said first outlet and said second seal substantially encompassing said second outlet.

**15.** A fluid distribution system as claimed in claim 14 wherein said valve has a side wall defining said inlet.

\* \* \* \* \*