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(56) Documents cited  
None

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Selected US specifications from IPC sub-class F16K

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(54) Switch valve

(57) A switch valve for switching the flow of a fluid comprises a hollow valve body (3) having at least one inlet (4) and at least a first and a second outlet (5, 6). The hollow valve body (3) contains a preferably spherical closure member (7) normally disposed adjacent the inlet (4) in the absence of a fluid flow entering the valve therethrough, and a switch body (8) formed with guide surfaces (9, 10) for guiding the closure member (7) to a position obturating a selected one of the outlets in the presence of a fluid flow entering through the inlet. The switch body is magnetically coupled to an actuator device (11) outside of the valve body for displacement between two operative positions causing the closure member (7) to close a selected one of the outlets.

Fig. 1.

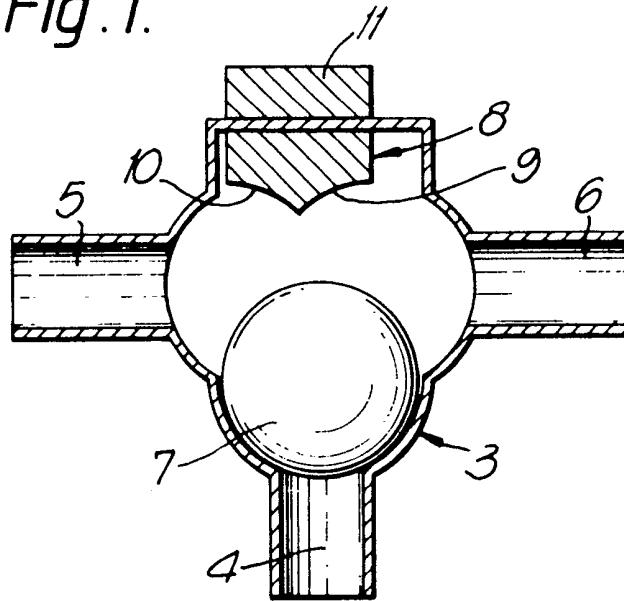


Fig. 1.

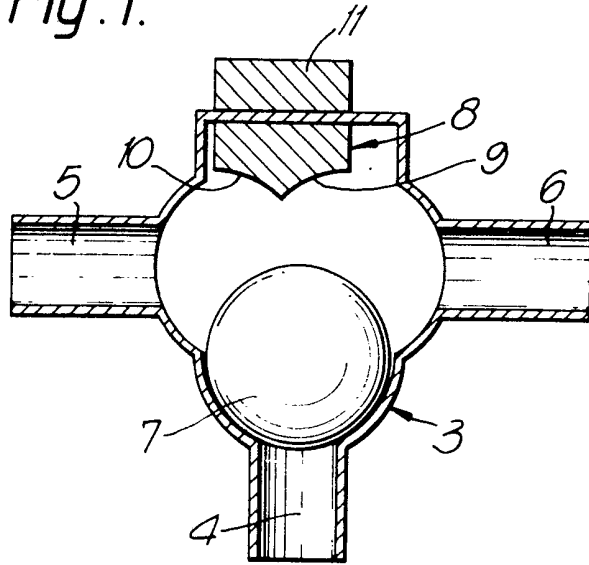
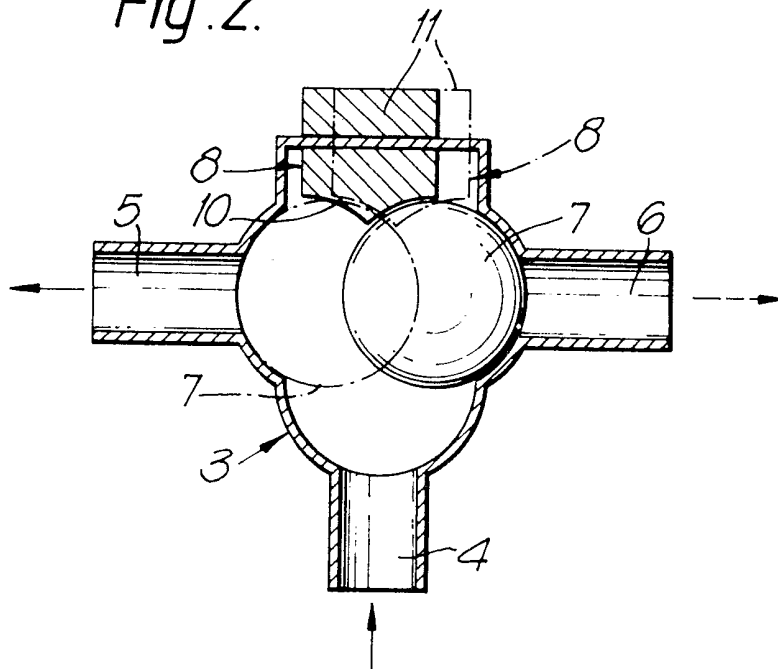


Fig. 2.



## SPECIFICATION

**Switch valve for switching a fluid flow**

5 The present invention relates to a switch valve for switching the flow of a fluid such as water or air and adapted to be supplied with such fluid via controlled circulation means such as a pump or a blower.

10 Italian Patent Application No. 21702/a/81, filed on May 14, 1981 discloses a switch valve operable for alternately connecting the outlet of a circulation pump to the sprinkler rotors of a dishwashing machine. The valve is  
 15 actuated by the program control unit of the machine with the aid of electromechanic actuator means; these necessarily penetrate the structure of the valve resulting in a complicated construction and sealing problems impairing the reliability of the valve in operation.  
 20 Italian Patent No. 952,781 discloses a dishwashing machine, the circulation pump of which is connected to two sprinkler rotors through a switch valve containing a closure element in the form of a bistable ball adapted  
 25 in the inoperative state of the pump to seat on a first or a second valve seat by the action of gravity. The pump is operated in an intermittent manner, and the valve seats, being  
 30 substantially -shaped, are disclosed closely below two associated outlets of the valve. During the alternating operating cycles of the pump, the ball is actuated by the entering fluid flow to close one or the other of the outlets  
 35 of the valve alternately, while in the inoperative state of the pump the ball drops by gravity onto the first or second seat in an alternating manner.

40 The operation of this valve is rather critical and sensitive to the presence of dirt particles in the fluid flow. Even very small deposits of such dirt particles on or adjacent the valve seats may interfere with the proper switching operation of the closure member between its  
 45 two stable positions. In any case, as outlined above, the switching operation of the closure member is alternating, so that it is not possible to arbitrarily control the flow of the fluid through one or the other outlets of the valve.

50 The problems discussed above are minimized by the solution proposed in Italian Patent Application No. 45711/A/86, filed March 19, 1986 in the name of the present Applicant. This Patent Application relates in particular to a dishwashing machine the circulation  
 55 pump of which is connected to two sprinkler rotors through a switch valve of the monostable type responsive to the back-pressure in the conduits connected to the valve for selectively connecting one or the other sprinkler  
 60 rotor to the pump when the intervals between operating phases of the pump are shorter or longer than a predetermined interval.

65 Although this solution gives satisfactory results when employed in a machine having a

fluid circuit of determined characteristics, such as dishwashing machines and the like, it is not readily applicable to other appliances.

70 It is therefore an object of the present invention to provide a switch valve for switching the flow of a fluid, which is simple and reliable, applicable to various uses, and selectively operable as desired.

75 According to the present invention there is provided a switch valve for switching the flow of a fluid, the valve having an inlet opening, at least a first and second outlet adapted to be  
 80 selectively closed by at least one closure element normally disposed at a stable position adjacent said inlet opening, control means adapted to be selectively displaced between a first and a second position to act as a guide for said closure element for directing it to an  
 85 unstable closing position for closing said first or second outlet respectively, when fluid is being delivered into the inlet opening.

The invention will be further described by way of non-limitative example, with reference to the accompanying drawings, wherein:

90 Figs 1 and 2 show diagrammatical cross-sectional views of a switch valve in different operative positions according to a preferred embodiment of the invention.

95 As shown in the drawings, the valve substantially comprises a hollow body 3 having at least one inlet opening 4 at its lower portion, and at least a first and at least a second outlet opening 5 and 6, respectively, at opposite sides.

100 Adjacent inlet opening 4, and preferably also adjacent outlet openings 5 and 6, hollow valve body 3 is formed with projecting end portions of reduced diameter.

105 Inlet 4 of the valve is adapted to be connected to the outlet of controlled fluid circulation means (not shown), such as a pump or a blower. In the first case outlets 5 and 6 of the valve may be connected for instance to respective sprinkler rotors of a dishwashing  
 110 machine, or to a washing liquid recirculation conduit and a discharge conduit, respectively, of a laundry washing machine of the type described in European Patent Application EP-A-0146719.

115 Loosely contained in hollow valve body 3 is at least one closure element 7, preferably in the form of a ball which may be hollow and is of a non-magnetic material.

120 Normally, that is when the fluid circulation means connected to the valve are inoperative, ball 7 dwells at a position adjacent inlet 4 by the action of gravity (Fig. 1). In this context it is noted that the diameter of ball 7 is suitably greater than the cross-section of openings 4, 5  
 125 and 6.

130 The valve is further provided with control means comprising a body 8 disposed in an upper portion of its interior and horizontally displaceable between positions adjacent respective outlets 5 and 6. The lower side of

body 8 is formed on opposite sides with recesses 9 and 10 adapted to act as respective valve seat portions for ball 7 as will be explained.

- 5 Disposed outside of hollow valve body 3 is an element 11 located adjacent body 8 and magnetically coupled thereto. To this purpose the two elements 8 and 11 are made of a suitable material, at least one of them for instance comprising a permanent magnet.

10 Element 11 may be shifted between its two operative positions by manual operation or by a suitable mechanism to thereby cause body 8 to be displaced accordingly.

- 15 When the control means comprising body 8 and element 11 are in their operative position shown in Fig. 1, and the circulation means is subsequently operated so that the fluid flow entering the valve through inlet 4 tends to lift ball 7, recess 9 of body 8 acts as a guide to direct ball 7 towards outlet opening 6 which is thereby closed. The fluid flow is thus directed towards outlet 5.

- 20 When the fluid flow entering inlet 4 is interrupted, ball 7 drops to the position shown in Fig. 1 by the action of gravity.

- 25 The described action is repeated each time the circulation means is put into operation, as long as control means 8, 11 are not shifted to the position shown in dotted lines in Fig. 2. In this case recess 10 of switch body 8 acts as a guide for directing ball 7 towards outlet opening 5 in response to a fluid flow entering the valve through inlet 4. This fluid flow is then obviously directed towards outlet 6.

- 30 The above description clearly shows the structural and functional simplicity of the valve which is capable of being actuated as desired and does not require any sealing provisions. This is because the magnetic coupling of the control means components 8 and 11 permits the closure member 7 to be suitably shifted without affecting the hermetically sealed construction of the valve body 3.

35 The described valve may of course undergo any modifications within the scope of the invention as defined by the characteristics set forth in the following claims.

- 40 50 The coupling of the components of the control means may thus, for instance, be of an electromagnetic type. In this case the outlet element 11 may comprise a solenoid to the magnetic field of which switch body 8 may be coupled in an elastic manner.

#### CLAIMS

- 60 1. A switch valve for switching the flow of a fluid, the valve having an inlet opening, at least a first and second outlet adapted to be selectively closed by at least one closure element normally disposed at a stable position adjacent said inlet opening, control means adapted to be selectively displaced between a first and a second position to act as a guide

for said closure element for directing it to an unstable closing position for closing said first or second outlet respectively, when fluid is being delivered into the inlet opening.

- 70 2. A switch valve according to claim 1, characterised in that said control means comprises a body formed with respective guide or seat portions for said closure element and adapted to be magnetically coupled to a device located outside said valve by means of which said body is displaceable between said first and second positions.

- 75 3. A switch valve according to claim 2, wherein said external device comprises a permanent magnet.

80 4. A switch valve according to claim 2 or 3, wherein said body comprises a permanent magnet.

- 85 5. A switch valve constructed and arranged to operated substantially as hereinbefore described, with reference to and as illustrated in the accompanying drawings.

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