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GANG VALVE ARRANGEMENT

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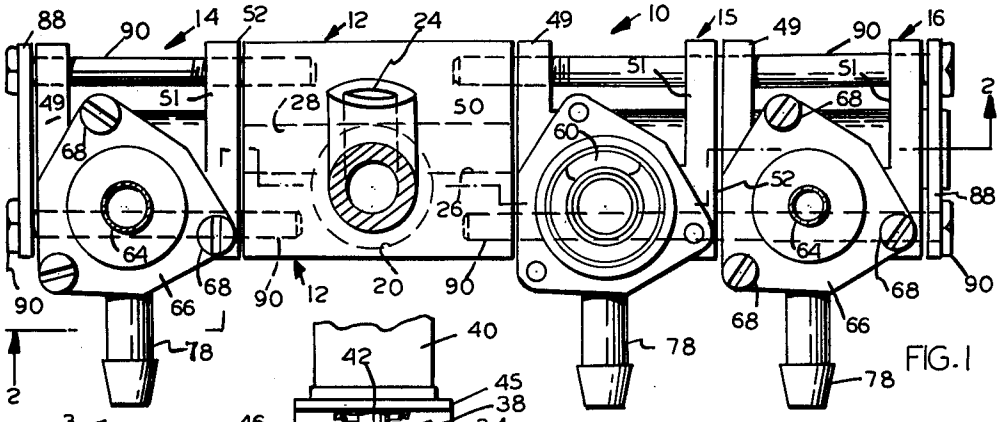


FIG. 1

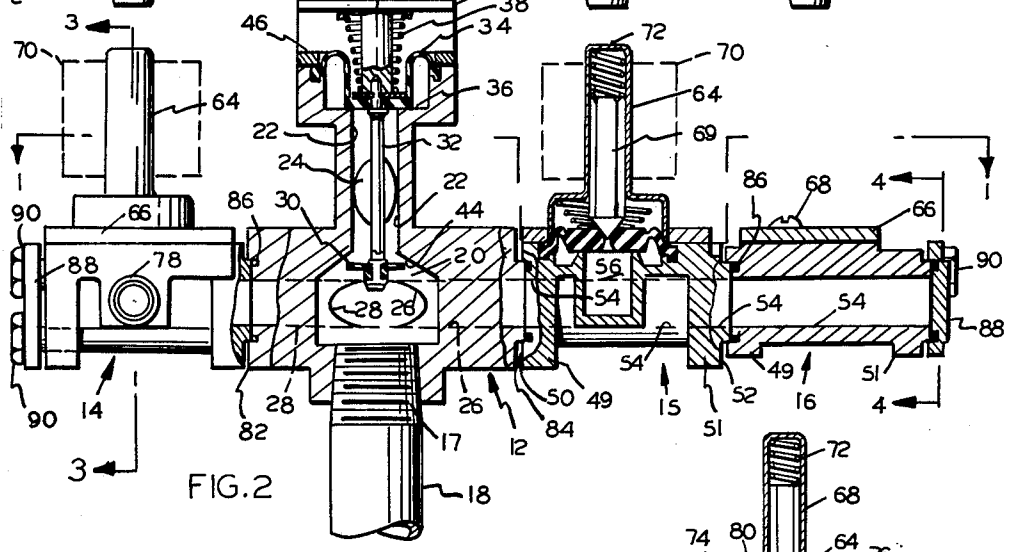


FIG. 2

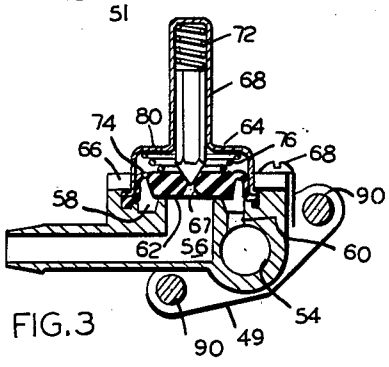


FIG. 3

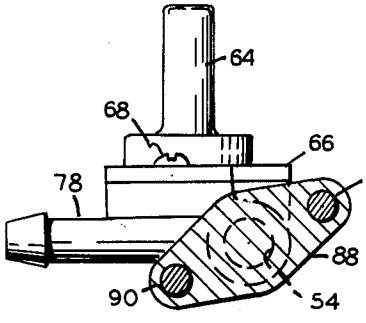


FIG. 4

INVENTOR.
PHILLIP GEORGE HONSINGER
BY
WILSON, SETTLE, McRAE & CRAIG
ATTORNEYS

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GANG VALVE ARRANGEMENT

Philip George Honsinger, Southfield, Mich., assignor to American Radiator & Standard Sanitary Corporation, New York, N.Y., a corporation of Delaware

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This invention relates to fluid valve systems and particularly to a system wherein a series of gang valve bodies are stacked together so as to receive fluid from a common source and discharge same to various selected points of use. The invention has particular application in machines for dispensing hot liquids such as cocoa, coffee, tea, etc.

One object of the invention is to provide a fluid valve system wherein a series of identical gang valve bodies may be utilized to build up a manifold type valve structure which receives fluid from a single source and discharges it to various different selected points of use, the number of such points of use being easily varied or predetermined by an easily accomplished change in the number of gang valve bodies employed in the system.

A further object is to provide a manifold type valve structure wherein flow of fluid to the individual discharge points may be controlled electrically, as by solenoid means, thereby permitting automatic push-button or coin-actuated switch operation of the system in any area having a source of electric power.

Another object is to provide a gang valve manifold arrangement wherein the gang valve bodies can be connected together in a compact relation without necessity for any adapters or other similar mounting devices.

A further object is to provide a gang valve assembly which does not leak at the joints, is easily assembled together, is sturdy after assembly, and is easily mounted in place on a supply duct without extraneous mounting brackets.

A still further object is to provide an electrically-controlled gang valve assembly wherein the electrical components all face in one direction for convenient connection with electrical leads and wherein the fluid discharge spouts all face in another direction for convenient connection with points-of-use tubing.

A still further object is to provide a gang valve assembly having the desired features of low cost, usability in confined spaces, and satisfactory service life.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

In the drawings:

FIG. 1 is a sectional view of one embodiment of the invention taken on line 1—1 in FIG. 2.

FIG. 2 is a sectional view taken on line 2—2 in FIG. 1.

FIG. 3 is a sectional view on line 3—3 in FIG. 2.

FIG. 4 is a sectional view taken on line 4—4 in FIG. 2.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also, it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Referring to the drawings, there is shown a gang valve assembly 10 comprising an inlet valve body 12 and a series of identical gang valve bodies 14, 15 and 16. Body 12 defines a threaded inlet opening 17 which in the illustrated embodiment is adapted to connect with the vertical

pipe 18 of a small boiler (not shown) of the type utilized in dispensing machines for hot drinks such as coffee, cocoa and tea. The vertical pipe may serve as the mounting means for the gang valve assembly since the assembly is designed to be relatively light in weight and to be disposed substantially centrally with respect to the supporting pipe.

In the illustrated embodiment fluid flows from pipe 18 upwardly into chamber 20, from where it has three possible paths of flow, namely upwardly through passage 22 to a vent opening 24, to the right via a passage 26, or to the left via a passage 28. Flow into passage 22 is controlled by a rubber valve element 30 carried on an operating rod 32. Flow into passages 26 and 28 is controlled by the condition of energization of certain solenoids carried atop each of the gang valve bodies 14, 15 and 16.

Normally valve element 30 will be opened (as shown) only when it is desired to vent the boiler of excess steam. At other times element 30 will be raised to a position closing passage 22, and hot liquid from the boiler will be directed to flow into one or the other of the passages 26 and 28.

Referring in greater detail to the construction of the vent valve, it will be seen that valve rod 32 extends upwardly from rubber element 30 to connection with a rubber diaphragm 34 which serves as a seal for the upper end of passage 22. Said passage is configured to provide a shoulder 36 which functions as a stop for limiting downward movement of the diaphragm against a shoulder 36.

Elevation of diaphragm 34 is accomplished by a solenoid-armature assembly 40, 42. As shown, the armature 42 is connected with rod 32 so that when the solenoid is energized the entire diaphragm-rod assembly is elevated to thereby draw rubber element 30 into sealing engagement with frustro-conical seating surface 44 formed internally of body 12. Preferably element 30 is formed of relatively thin, soft flexible material so as to permit it to seat tightly on frustro-conical surface 44 even when the fluid pressure in chamber 20 is relatively low. The operating solenoid for element 30 may be mounted in any appropriate manner, as on a bracket 45 formed as part of the clamping plate 46 for diaphragm 34. Vent opening 24 exhausts pressure from below diaphragm 34 when the diaphragm is raised; consequently little force is required to return the diaphragm to its illustrated lowered position when the solenoid is de-energized. The weight or armature 42, together with the force of light spring 38 breaks any residual magnetism and lowers the diaphragm.

Referring now to the construction of the gang valve bodies 14, 15 and 16, each valve body is similar and a description of body 15 will therefore suffice for a description of the other two valve bodies. As shown in FIG. 2 valve body 15 is provided with two parallel end walls 49 and 51 which form end faces 50 and 52, said end faces defining the termination points of a straight inlet passage 54. The valve body is mounted onto the inlet tee 12 so that passage 54 aligns with flow passage 26.

As shown in FIG. 3, passage 54 extends behind a vertical passage or chamber 56 located within the space defined by an annular chamber 58. A short duct 60 interconnects chamber 58 and passage 54 so that when rubber diaphragm 62 is raised from its FIG. 3 position fluid flows from passage 54 into duct 60 and chamber 58 and thence into chamber 56.

The diaphragm is arranged beneath a metal cover 64 which is held in place by means of a clamping ring 66, suitable screws 68 being provided for securing the clamping ring onto the upper face of the valve body. Formed centrally through the diaphragm is an opening 67 which registers with the armature 69 of a conventional solenoid coil 70. When the solenoid coil is de-energized the

armature is forced downwardly by spring 72 to close the opening 67. In this manner the fluid is bottled up above the diaphragm to move same to the illustrated closed position.

With more particular reference to the closing of diaphragm 62, said diaphragm is provided with a port 74 so that fluid in chamber 58 is enabled to freely flow into space 76 above the diaphragm. The diaphragm area exposed to space 76 is greater than the diaphragm area exposed to chamber 58. Hence when central opening 66 is closed by armature 69 the fluid presure in space 76 moves the diaphragm downwardly to its illustrated position blocking flow of fluid from chamber 58 into chamber 56. When the armature is raised by the action of the solenoid the opening 67 is opened so that the fluid in space 76 is vented to chamber 56, thereby allowing the pressure in chamber 58 to raise the diaphragm to a position allowing main flow of fluid into chamber 56. A light compression spring may be provided at 80 to insure that the diaphragm valve will close under low presure differences.

Each valve body is provided with a discharge spigot 78 which is adapted to receive a flexible tubing (not shown) for directing the fluid to a point of use, as for example a coffee receptable. Preferably the spigot is molded or otherwise formed to be integral with its respective valve body. Also, each valve body is preferably formed with external portions thereof cut away or recessed in order to reduce the amount of raw material required in each body. The basic requirement is merely that enough material be utilized to form the passages and impart sufficient structural strength to the body. Generally speaking the wall structure which defines passage 54 is cylindrical in vertical cross section, and the wall structure which defines the seat for diaphragm 62 is hexagonal in horizontal cross section. The end walls 49 and 51 are made of sufficient thickness to prevent deformation thereof when the mounting bolts 90 are tightened.

Referring now to the gang valve assembly, it will be seen that each valve body 14, 15 or 16 is contoured so that face 52 thereof is provided with an annular boss concentric with passage 54. Also, each face 50 is provided with an annular recess concentric with passage 54. Similarly face 84 of valve body 12 is provided with an annular boss, and face 82 of valve body 12 is provided with an annular recess. The various valve bodies may thereby be stacked on one another with the various bosses fitting within the various recesses as shown in FIG. 2. In each of the recessed areas there is mounted an O-ring seal 86 which seals against escape of fluid at the various joints between the valve bodies.

The various passages 54 in the valve bodies align with one another, and in order to prevent escape of fluid through the ends of the assembly there are provided two similar end caps 88. Each cap is provided with a boss and a recess so that the same cap construction may be utilized to close both ends of the assembly (thereby eliminating some tooling and parts inventory costs). When the cap is used on the right end of the assembly the recessed area of the cap is presented to the boss of the adjacent end valve body. The cap when used on the left end of the assembly is disposed so that its boss surface is presented to the adjacent end valve body.

In order to lock the various valve bodies together there may be provided four ties rods or bolts, numbered 90 in the drawings. Two of these tie rods extend through valve bodies 15 and 16 and into tapped holes in the body 12. The other two tie rods extend through body 14 into two other tapped holes in body 12. The last-mentioned tie rods are of course shorter than the first two rods because of the fact that in the illustrated arrangement only one valve body is disposed on the left side of inlet member 12. It is contemplated that two or more gang valve bodies could be disposed on the left or right side of inlet member 12, in which case the respective tie rods would be chosen accordingly as to length. If desired, all of the gang valve bodies could be disposed on one side of inlet member 12, in which case a cap could be used to close the unused passage 26 or 28; however slightly better operation and weight distribution is achieved when both of passages 26 and 28 are used.

It will be noted from FIG. 3 that tie rods 90 are disposed symmetrically with respect to the centerline of passages 54. By this arrangement the tie rod openings in caps 88 can properly align with the rods without disturbing the cap-boss-recess relationship necessary to permit interchangeable use of the caps on either end of the assembly.

It will be seen that by using a desired number of the gang valve bodies 14, 15 and 16 (which are identical with one another) fluid from source 18 can be directed to any of several different discharge spigots. Each of the various control solenoids is individually energizable so that the fluid can be suitably controlled by electric switch action. The valve bodies are arranged so that the various solenoids are all positioned atop the valve bodies, thereby facilitating the connection of electrical leads. Also, the various fluid discharge spigots are all located on the same side of the assembly to permit convenient connection with fluid tubings, even when the assembly is disposed in cramped spaces within a machine such as in a drink dispenser.

Various modifications may be resorted to without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. In a fluid flow control and vent valve, an inlet and vent valve body supporting at least one outlet valve, said inlet and vent valve body having an inlet passage, an outlet passage and a vent passage, said outlet valve controlling fluid flow through said outlet passage, said outlet valve having a fluid flow passage aligned with said outlet passage of said inlet and vent valve body, said outlet valve having an annular chamber formed therein in fluid communication with said fluid flow passage, a discharge passage initiating within the space defined by said annular chamber to cooperate therewith in defining an annular valve seat, a fluid flow control diaphragm spanning said annular chamber and seat, an aperture in said diaphragm positioned centrally of said discharge passage, a separate bleed aperture in said diaphragm communicating between said annular chamber and the backside of said diaphragm, a solenoid actuated piston movable to seal said central aperture from the backside of said diaphragm, a spring biasing said diaphragm toward said annular valve seat, said vent passage comprising an elongated bore, said bore having an inlet opening coaxial therewith and an outlet opening peripherally thereof, a valve seat formed on said vent passage inlet opening, a solenoid mounted on said vent passage coaxial to said bore, a valve closable against said seat, a connecting rod extending coaxially of said bore between said solenoid and said valve, a flexible diaphragm positioned transversely of said bore and connected to said rod in fluid-sealing relation to isolate said solenoid from fluid flowing through said vent passage, said diaphragm being spaced from said valve seat on the other side of said outlet opening, and means for locking said inlet and vent valve body and said outlet valve in assembled, operable fluid flow relation as an integral unit.

2. In a fluid flow control and vent valve, an inlet and vent valve body supporting an outlet valve, said inlet and vent valve body having an inlet passage, an outlet passage and a vent passage, an outlet valve controlling flow through said outlet passage, said outlet valve having a fluid flow passage aligned with said outlet passage of said inlet body, said outlet valve having an annular chamber formed therein that is in fluid communication with said fluid flow passage, a discharge passage initiating within the space defined by said annular chamber to cooperate therewith in defining an annular valve seat, a fluid flow control diaphragm spanning said annular chamber and

seat, an aperture in said diaphragm positioned centrally of said discharge passage, a separate bleed aperture in said diaphragm communicating between said annular chamber and the backside of said diaphragm, a solenoid actuated piston movable to seal said central aperture from the backside of the diaphragm, a spring biasing said diaphragm toward said annular valve seat, a valve seat in said vent passage, a valve operable to close said seat, a solenoid mounted on said vent passage, operator means connected between said solenoid and said valve, means isolating said solenoid from fluid flowing through said vent passage, and means for locking said inlet and vent valve body and said outlet valve in assembled, operable fluid flow relation as an integral unit.

3. A fluid flow control and vent valve, characterized by an inlet and vent valve body adapted to support a plurality of separate outlet valves in assembled relation thereto, said inlet and vent valve body having an inlet passage, an outlet passage and a vent passage, said vent passage comprising an elongated bore, said bore having an inlet opening coaxial therewith and an outlet opening peripherally thereof and spaced from said inlet opening, a valve seat formed on said inlet opening, a valve element closable against said seat to control fluid flow through said vent passage, a solenoid to actuate said valve element to open and close the vent passage, said solenoid being mounted on said vent passage coaxial to said bore, a connecting rod extending coaxially of said bore between said solenoid and said valve element, a flexible diaphragm positioned transversely of said bore and connected to said rod in fluid-sealing relation to isolate said solenoid from fluid flowing through said vent passage, said diaphragm being spaced from said valve seat on the other side of said outlet opening, a plurality of on-off outlet valves supported on said inlet and vent valve body in fluid communication with said outlet passage, said outlet valves simultaneously receiving fluid flow through said outlet passage, and means locking said inlet and vent valve body and said outlet valves in assembled, operable flow relation as an integral unit.

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LAVERNE D. GEIGER, *Primary Examiner.*

ISADOR WEIL, *Examiner.*