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DISPENSING VALVE

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Fig. 1.

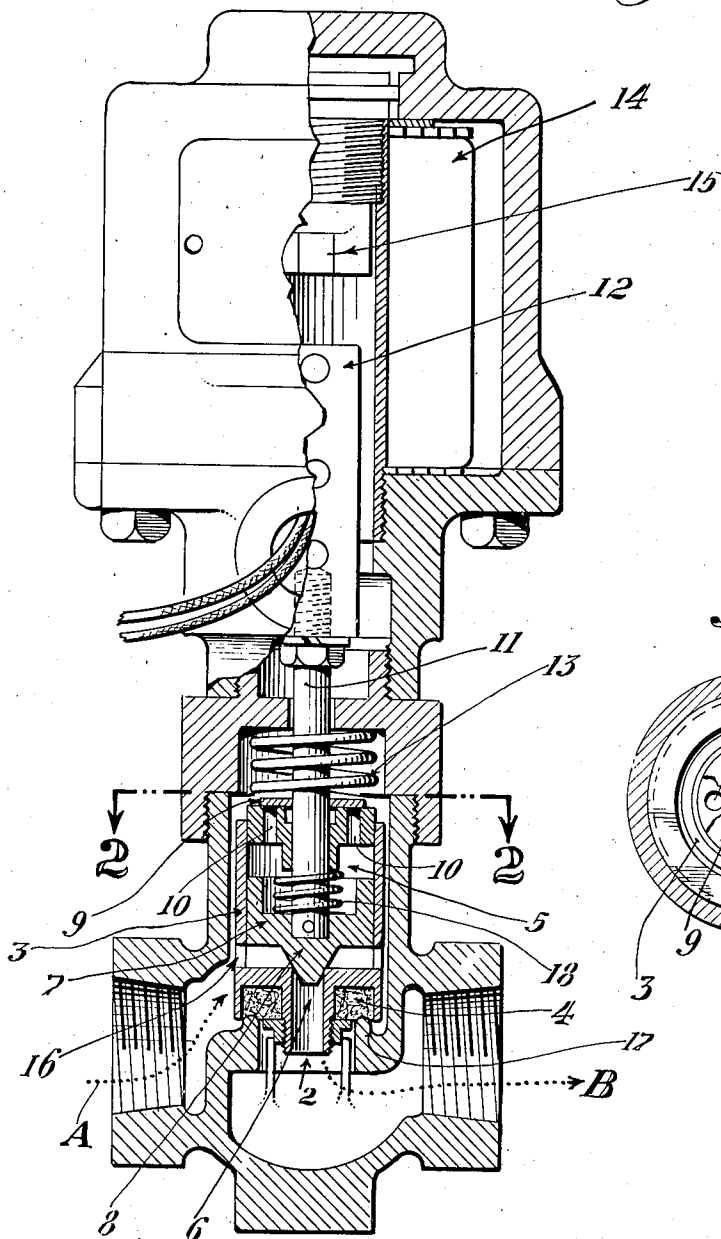
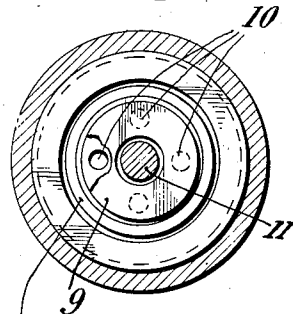


Fig. 2.



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DISPENSING VALVE

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4 Claims. (Cl. 277—36)

My invention relates to a dispensing valve, operated by a solenoid and designed to provide for a diminished flow of material where a diminished flow of a predetermined volume is desired and to avoid the shock incident to a sudden interruption of a flow of liquid or other material.

My valve is particularly adapted for use with automatically operated liquid dispensing and measuring, as well as packaging devices, where speed and accuracy in dispensing or packaging are important factors. A common practice in such devices has been to employ two solenoid operated valves, one of full pipe size for full and rapid delivery of the main bulk of the material to be measured and one of much smaller size for accurately delivering the final amount or increment. This construction involved more complicated and more expensive arrangement of piping than was desirable.

My invention comprises a very desirable combination of two valves contained in one body or casing having an inlet and outlet operated by a single solenoid. I have preferably shown my valve operated by a solenoid of the packless type, but it is apparent that it can readily be adapted for use with the ordinary commercial form of open solenoid if the valve is provided with a sliding stem stuffing box.

Referring to the drawing Figure 1 is a vertical sectional view with parts of the solenoid broken away. Figure 2 is a horizontal section on the lines 2—2 of Figure 1. Like characters of reference indicate like parts throughout the views.

Referring to Figure 1, the valve body is formed with an inlet and outlet so arranged that the flow is from A to B. The body of the valve is provided with a main port 2 and there is mounted within said body a reciprocatory holder 3 (Fig. 2) preferably of cylindrical form, a disk or valve 4 forming a part of or attached to the holder 3. The holder 3 has a chamber 5 of cylinder form. It is provided with an auxiliary port 6 and there is slidably mounted therein a piston 7, having formed thereon or attached thereto auxiliary valve member 8, and is further provided with a valve or disk 9 which is loosely mounted on valve stem 11 and acts normally to close the orifices 10, the operating stem 11 being attached to piston 7 and the solenoid core 12. A spring 13 acts to retract holder 3 and valve 4 to close the main port 2, when the solenoid is de-energized.

The operation is as follows:

When the coil 14 of the solenoid, which is preferably of the packless type, but can be of the open type, is deenergized, the parts of the device

are in the position shown in Figure 1 and the main port 2 and the auxiliary port 6 are closed. When the solenoid coil is energized, the movable core 12 is drawn upwardly towards the fixed core 15, carrying with it the stem 11 and piston 7 attached thereto, thereby opening auxiliary port 6. During this first or initial movement of the piston within the disk or valve holder, said holder 3 (Fig. 2) remains momentarily in its original or initial position maintaining the closure of main port 2. Any fluid in chamber 5, which entered through ports 16 and between the piston 7 and chamber wall, and is present in chamber 5, will be forced by piston 7 through orifices 10 arranged about the top wall of the cylindrical holder, the disk 9 being raised sufficiently to permit such a flow of the liquid through orifices 10 to the outside of holder 3, thereby causing the liquid thereafter to assist in normally holding the main valve 2 on its seat. The continued movement of piston 7 brings it into contact with the inside wall of the top of the disk holder and causes disk holder with its attached valve 4 to open up the main port 2 and thereafter the holder picks up disk or washer 9, thereby preventing the return flow of said liquid into the chamber 5. The final movement of piston and disk holder against tension of main spring 13 lifts main valve 4 from port 2 permitting a full discharge of liquid through main and auxiliary port. The initial and final movement upward of piston 7 follow in quick succession. The guides shown on Fig. 1 are to insure a concentric sealing of disk 4.

When coil 14 is de-energized, the core 12, stem 11, disk holder 3 and main valve or disk 4 are retracted by gravity and spring 13, as a unit, to the initial position of holder, the valve 4 closing main port 2, but the piston 7 retains its relative position to disk holder, remaining in the extreme upper position within the holder due to the absence of liquid in chamber 5 and during this interval of time the auxiliary port 6 remains open permitting a reduced or dribble flow of liquid from the inlet through port 6. Soon thereafter sufficient fluid enters said chamber so that the piston 7 is retracted by gravity and small spring 18, said piston dropping to its initial position closing the auxiliary port 6 and stopping the dribble flow of liquid, ending the discharge of liquid. The fluid above said disk holder assists in holding port 2 closed. The exact sequence of movement of piston and disk holder and timing thereof can be predetermined by the dimensions of port 6, clearance around stem 11 and that around disk holder and in this way the interval

of time between the closing of the main port and the closing of the auxiliary port can be fixed and thereby the volumes of liquid discharged through port 2 and that through port 6 can be established. It is to be understood from the foregoing that the adjustment in the clearances and the dimensions of parts is for regulating the amount of leakage of the liquid into chamber 5, which leakage assists the spring 18 and in that way the timing of relative movement of chamber and piston is accomplished. With a valve provided with a $\frac{3}{4}$ " body used with a liquid, such as water, having a pressure of 6 lbs. per sq. in. the water being discharged to atmosphere, the ports, passages and chambers were so proportioned that the main port or valve passed eleven and one-half ($11\frac{1}{2}$) gallons per minute, while the solenoid was energized. After the solenoid was de-energized the valves and ports passed .115 gallon in $3\frac{1}{2}$ seconds before the auxiliary port was completely closed. The maximum variation of the dribble flow or trickle will not be more than .0022 gallon or 1.9%, and for accurate dispensing of liquids this variation of 1.9% is well within the requirements.

Without further analysis, the foregoing will so fully reveal the gist of this invention that others can, by applying current knowledge readily adapt it for other types of dispensing valves by retaining substantially the various characteristics of parts of the generic or specific aspects of the invention and therefore such adaptations should be and are to be comprehended within the meaning and range of equivalents.

I claim as follows:

1. A dispensing valve for fluids having main and auxiliary actuating members, a main port and an auxiliary port formed in the main actuating member, valves for said ports in combination with an extensible chamber formed by the walls of said actuating members, said fluid entering said chamber during movement in one direction of the actuating member for said auxiliary valve and exhausted therefrom during its reverse

movement, the flow of said fluid to said chamber being predetermined in order to vary the relative volumes discharged through said main and auxiliary ports.

2. A dispensing valve for fluids having main and auxiliary actuating members, a main port, an auxiliary port formed in the main actuating member, valves for said ports, in combination with an extensible fluid chamber formed by the walls of said actuating members, the said fluid passing into said chamber to assist in closing the auxiliary port a predetermined period of time after the closing of the main port, the fluid being exhausted from said chamber during the reverse movement of said auxiliary actuating member.

3. In a dispensing valve for predetermining the amount of a major and minor flow of fluid consisting of a casing, a main port and an auxiliary port, valves for said ports, in combination with a reciprocatory member forming a chamber connected to one of said valves, a piston movable within said chamber forming a closure for same, said piston being connected to the other valve and being initially elevated to lift said valve and thereafter held in elevated position after the main port has been closed until a predetermined amount of leakage of said fluid has entered said chamber.

4. A fluid dispensing valve comprising two reciprocatory members, one member having a hollow part and the other member movable therein, a main valve and an auxiliary valve, means connecting one member to the main valve and the other member to the auxiliary valve, a fluid passage into said hollow part, in combination with a relief port means for automatically opening and closing said relief port by the movement of one of said reciprocatory members for regulating the fluid leakage into said hollow part, one of said reciprocatory members being positioned to permit a predetermined amount of fluid leakage without materially affecting the force required to open said auxiliary valve.

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