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FLUID PRESSURE REGULATING VALVE

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Fig. 1.

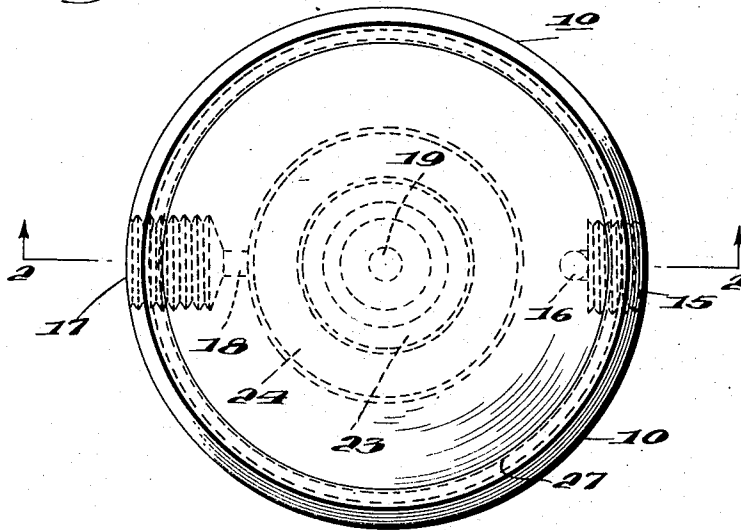
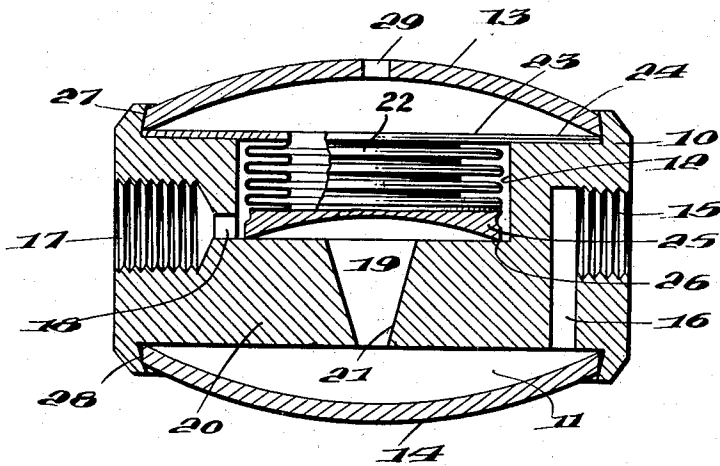


Fig. 2.



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FLUID PRESSURE REGULATING VALVE

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2 Claims. (Cl. 137—543.17)

This invention relates to fluid regulator valves and more particularly to a novel form of low pressure regulator valve and the method of making the same. Valves of this kind are desirable in fluid systems wherein it is necessary to deliver fluid at a constant rate from a supply that is variable such as in an automatic fuel feeding system wherein fluid fuel is fed to a carburetor or fuel injector from a pulsating fuel pump and the like.

One important object of the present invention is to provide a novel construction and arrangement of low pressure fluid flow regulator valve and the method of making the same.

Another object of the invention is to provide a novel low cost valve of simplified construction which shall be more efficient and reliable in operation than similar valves heretofore used for such purposes.

Another object of the invention is to provide a novel construction of flow regulator valve of the character designated which shall include chambers and connecting passages formed out of a block of material to provide the desired flow passages.

A further object of the invention is to provide a novel form of regulator valve operating unit which shall reduce pulsations in fluid flow to a minimum.

A further object of the invention is to provide a simplified form of valve casing block having chambers formed therein and press fit covers for hermetically sealing the chambers and the valve operating unit encased therein.

These and other objects of the invention will be more manifest from the following specification and drawings and more particularly set forth in the claims.

In the drawings:

Figure 1 is an enlarged top plan view of the regulator, and,

Figure 2 is a sectional view in elevation on line 2—2 of Figure 1.

Referring to Figures 1 and 2 of the drawings, there is shown a fluid flow regulator valve embodying the invention. The valve includes primarily a relatively flat cylindrical casing body 10 of cast material such as metal or plastic which may be cored out or machined in any suitable manner to provide the novel simplified construction. The body 10 is so constructed and arranged so that the necessary interior chambers formed in the casing and the connecting channel passages may be formed with a minimum of expense in the machining or casting operation. The opposite sides of the body 10 are cored out to form inlet and discharge chambers 11 and 12 respectively. The open sides or ends of the chambers are each closed by concave metal disk members 13 and 14 hereinafter more fully described. The inlet chamber 11 is connected to a suitable source of pressure such as a fuel pump (not shown) by a threaded port opening 15 and a connecting channel 16 cored out of the body material. In a like manner, a delivery port 17 and a channel 18 commensurate in size with the inlet channel 16 is connected to a suitable conduit (not shown) for supplying

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fluid fuel to a carburetor, for example. The feature of making the channel ports 16 and 18 substantially the same size or cross sectional area is of particular advantage in smoothing out the fluid impulses from the inlet to the discharge side of the valve as hereinafter more fully described.

The chambers 11 and 12 are connected by a central orifice flow passage 19 located in a diametrical partition wall member 20 separating the inlet and outlet chambers and formed as an integral part of the valve body. This opening is throated or tapered as indicated by the numeral 21 so that the opening to the discharge side of chamber 12 is of greater area than the opening from the inlet chamber 11.

Located in the outlet chamber 12 is a valve unit 22 comprising an elongated cylindrical corrugated hollow spring type metal bellows 23 having its top body portion open and flanged outwardly to form an annular disk as indicated by the numeral 24. This construction provides a flat peripheral edge support for the valve unit and a hermetic seal for the chamber 12. The bellows 23 substantially fills the cylindrical chamber 12 and the lower end portion of the bellows extends in relatively close proximity to the opening 19 and carries a circular dish shaped or concave valve element member 25. This element may be formed integral with the bellows in any suitable manner as by soldering, brazing or welding and the like. This valve unit is located within the discharge chamber 12 so that in its normal unstressed position the peripheral edges 26 of the concave valve element engage the partition wall surface as a valve seat or surface remote from the opening 19 and near the bottom edge wall of the chamber. It will be noted that the sharp edge contact of the concave valve element 25 with the partition wall 20 provides a free acting contact valve which not only forms a fluid pressure compensating chamber, but is self-cleaning should any foreign matter accidentally enter the valve because all contact surfaces are reduced to a minimum. The sharp peripheral edge 26 of the circular concave valve element 25 also serves to distribute the fluid flow radially to the walls of the circular chamber 12 and thus tends to wash the seat and clear it during normal operation when pressure fluid is flowing through the valve and around the bellows folds. The sharp edge of the valve eliminates the conventional valve seat and thus effectively prevents any danger of the sticking owing to its contact with a flat surface.

The concave dish shaped valve element 25 also forms with the inlet chamber 11 a connected chamber area between the under side of the valve 25 and the partition 20 so that as the fluid flows from the main inlet chamber 11 through the tapered passage 19, this chamber further cushions the pressure pulses from the pump or other irregular pressure source and provides a steady and uniform fluid flow to the point of use. The pulsations are further cushioned in the outlet chamber 12 by the corrugated bellows folds.

The body 10 forming the valve chambers is closed at top and bottom by the press fitting disk closure members 13 and 14 respectively. The fitting of the closure discs is provided by undercutting the open outer peripheral edge end portions of the body 10 as indicated by the numerals 27 and 28 respectively, so that in one machine operation, the top and bottom covers 13 and 14 may be press formed and fitted into position so as to hermetically seal the valve body. As in the case of the top cover 14, the sharp inside peripheral edge contacts 27 of the cover 14 engage the edge of the annular bellows flange 24 to provide a flexing hinge point as well as a tight pressed knife edge hermetic seal for the discharge chamber 12 and retain the valve 25 in position. In order to permit the

free and unrestricted operation of the bellows valve unit 22 in responding to pump pulse pressures, a vent to atmosphere opening 29 is provided in the top cover 13.

One of the important features of the novel regulator construction is the arrangement of the valve interior to include the central throated passage 19 acting in conjunction with the concave valve surface to obtain peripheral distribution of the fluid being forced into the discharge chamber 12. The bellows 23 and the passages 16 and 18 are all designed to cooperate and give a predetermined performance within a certain required pressure operating range. On any operation, the bellows with its valve 25 moves in predetermined response to pulsations or ordinary fluid pressure variations to deliver a steady flow of fluid in response to whatever pressure fluid may be desired. For example, if the valve 25 opens to supply fluid at one pound pressure the valve may raise or open an eighth of an inch and if the pressure service should increase to two pounds, the valve will open a quarter of an inch etc. Thus the volume of the secondary inlet chamber increases accordingly and further absorbs the fluid pulsations and effects a steady flow of fuel to a carburetor or other designated points of use.

Another important feature of the present regulator is that the unit is a sealed construction and the integral bellows valve 25 is the only moving part, therefore no adjustments are required and any danger of malfunctioning is entirely eliminated or reduced to a minimum.

While there is shown a preferred embodiment of my invention, it is obvious that various changes may be made therein without departing from the scope of the invention as defined in the claims.

What I claim is:

1. In a low pressure fluid pulsation regulator valve, the combination of a cylindrical valve casing member having a central block body portion of a diameter greater than the thickness thereof, a diametral partition wall formed integral with the body portion to divide the casing into an inlet chamber on one side of the partition wall and an outlet chamber on the opposite side of said partition wall, disc-shaped casing members secured to the opposite side peripheral end portions of the casing block body portion to complete the inlet and outlet chamber casing walls, an inlet passage formed in the casing block wall for conducting fluid to the inlet chamber, an outlet passage formed in the casing block wall for conducting fluid from the outlet chamber, a throated fluid flow passage formed in said partition wall for conducting fluid between the two chambers to effect a fluid pressure differential be-

tween the two chambers for initially dampening the fluid pulses, a valve unit located in the outlet chamber for controlling the flow of fluid through the throated passage, said unit comprising a corrugated spring metal bellows mounted in the outlet chamber to effect a variable capacity of said outlet chamber, the upper peripheral edge of said bellows being secured between said end portion of said block and the disc-shaped casing member, and a valve member mounted at the lower extremity of the bellows to control the flow of fluid through the throated passage and finally dampen the pulses, said valve member having a larger surface area than the discharge end of said throated passage and including a concave surface formed therein adjacent said throated passage to provide a supplemental inlet pressure chamber on a portion of the partition wall.

2. A pulsation regulator valve of the character described in claim 1 in which the inside top and bottom peripheral edges of the central valve body portion are undercut adjacent said partition wall, said disc-shaped metal cover members secured in the undercut edges to hermetically seal the casing chambers and one of said undercut edges and disc-shaped casing members securing the upper peripheral edge of said bellows to said body member.

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