April 5, 1960 R. E. BOEHLER 2,931,386

FLUID-OPERATED DIAPHRAGM VALVE

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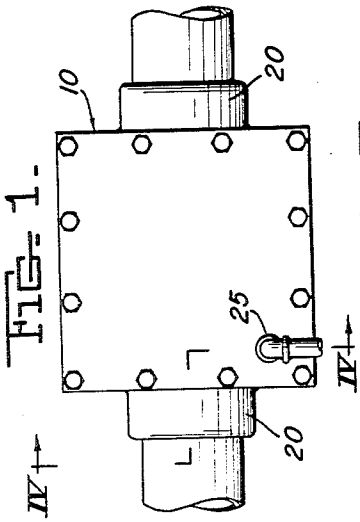


FIG. 1.

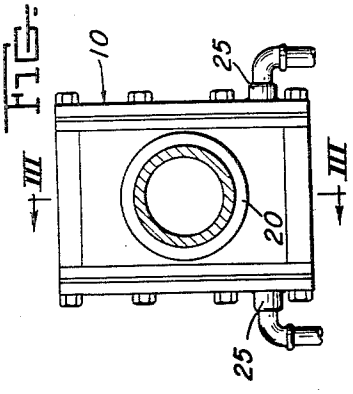


FIG. 2.

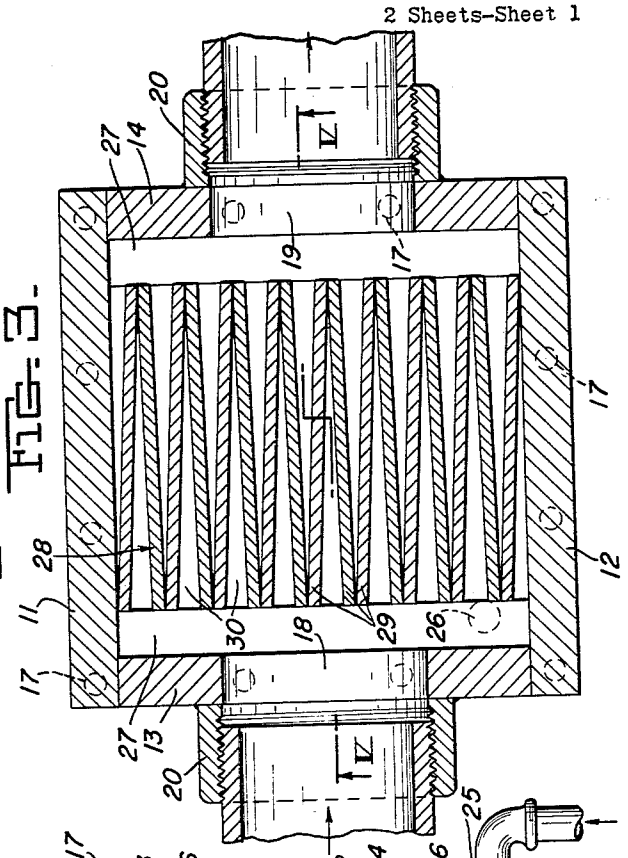


FIG. 3.

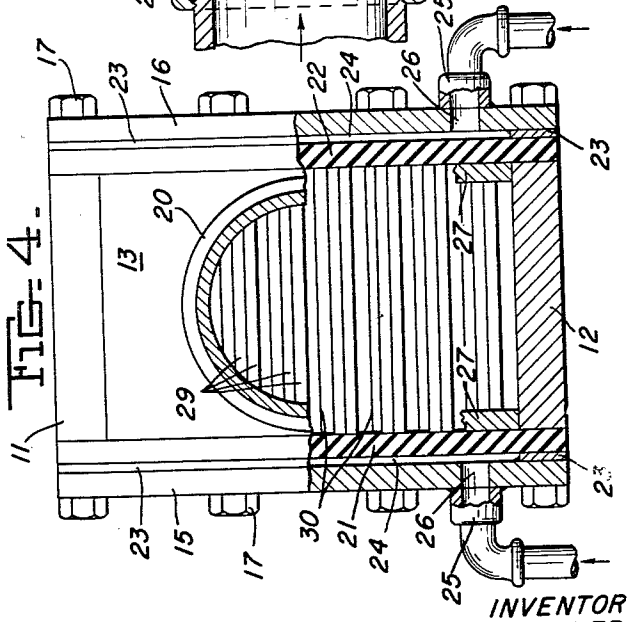


FIG. 4.

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FIG. 5.

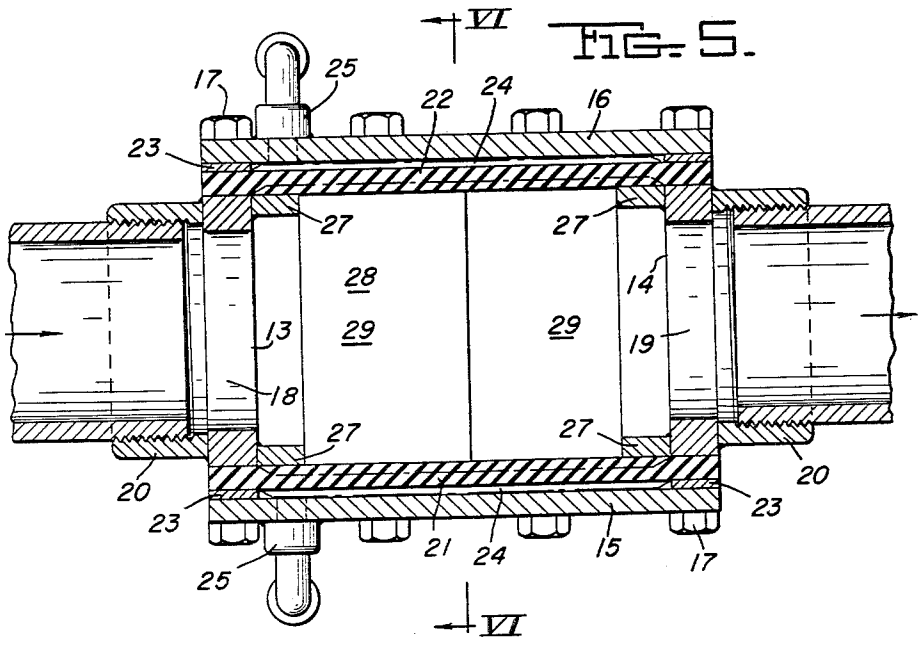
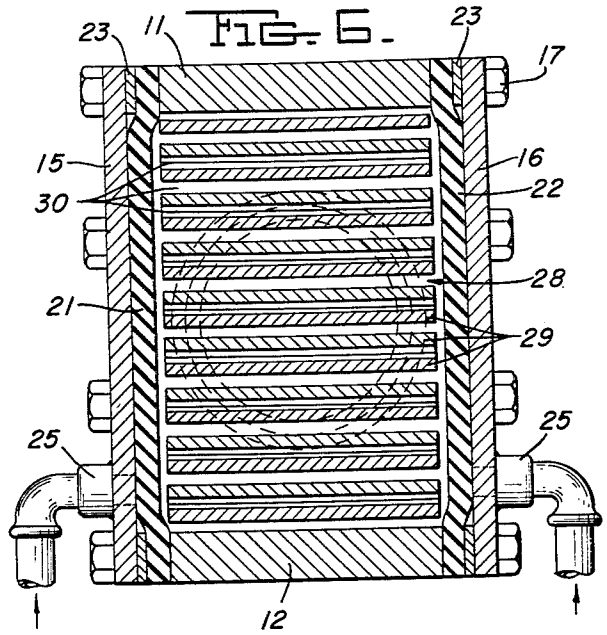


FIG. 6.



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FLUID-OPERATED DIAPHRAGM VALVE

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Application October 9, 1957, Serial No. 689,148

4 Claims. (Cl. 137—599)

This invention relates to valves and, in particular, to a diaphragm valve adapted to be held closed by fluid pressure and to open under the pressure in the line in which the valve is installed, when the closing pressure is released.

The object of the invention is to provide a valve of the type described which is simple in construction, fast and trouble-free in operation, and capable of making a tight closure even against heavy line pressure.

In a present preferred embodiment, the valve of my invention comprises a box-like housing having inlet and outlet openings at opposite ends and accordion-like transverse partition means blocking direct flow between said openings but terminating short of the side walls of the housing. Flexible diaphragms carried by said side walls are adapted to be forced by fluid pressure behind them, into sealing engagement with the side edges of said partition means. When the edges are not thus engaged, flow through the valve occurs by spilling over them. The partition means is preferably an assembly or stack of plates joined in zig-zag or accordion fashion, forming interfitting chambers or passages, closed at one end, adjacent passages communicating with the openings in the opposite ends of the housing, respectively.

A complete understanding of the invention may be obtained from the following detailed description and explanation which refer to the accompanying drawings illustrating the present preferred embodiment. In the drawings:

Figure 1 is a side elevation;

Figure 2 is an end elevation;

Figure 3 is a central section taken along the plane of line III—III of Figure 2;

Figures 4 and 5 are further sections taken along the planes of lines IV—IV and V—V, respectively, of Figures 1 and 3; and

Figure 6 is a transverse section taken along the plane of line VI—VI of Figure 5.

Referring now in detail to the drawings, the valve of my invention comprises a box-like housing 10 including top and bottom walls 11 and 12, end walls 13 and 14 and side plates 15 and 16 removably secured to the top, bottom and end walls by screws 17. The end walls are welded to the top and bottom walls, and have inlet and outlet openings 18 and 19 therein, respectively. Coupling halves 20 are welded to the end walls in axial alinement with these openings for convenience in installing the valve in a pipe line.

Flexible diaphragms 21 and 22 of rubber or the like are clamped by the side plates to the edges of the top, bottom and end walls. The side plates have marginal ribs 23 on their inner faces providing clearance spaces 24 to permit outward flexing of the portion of the diaphragms inwardly of their edges. Coupling halves 25 are welded to the side plates in alinement with holes 26 therein whereby pipe connections may be made to supply fluid under pressure to spaces 24. Vertical spacer

bars 27 are welded to the end walls of the housing of the diaphragms.

Partition means 28 is positioned between the pairs of bars 27 adjacent the end walls, and is welded thereto. The partition means has the form of an assembly or stack of plates 29 welded together at their ends, in zig-zag or accordion fashion, adjacent plates making small dihedral angles with each other and forming interfitting chambers or passages 30. These passages are closed at one end but communicate alternately with opposite ends of the housing.

As shown in Figure 5, the diaphragms 21 and 22 are adapted to make sealing engagement with the edges of plates 29 under fluid pressure in spaces 24, thereby blocking flow from one end of the valve to the other. When the pressure in said spaces is relieved, fluid flow from one end of the valve to the other may occur, if the pressure differential between the ends of the valve is sufficient to flex the diaphragms outwardly, permitting flow over the edges of plates 29 from the passages 30 communicating with the high-pressure end of the housing, into the passages communicating with the low-pressure end. Thus, either end of the valve may be connected to the high-pressure line, since the valve is symmetrical about a central transverse plane. The admission of pressure fluid to spaces 24 from a control source may be governed by any suitable valve, operable manually or by power means.

It will be apparent that the valve of my invention is characterized by many advantages. It is simple and inexpensive to manufacture. The diaphragms are the only moving parts and their movement is very limited so that opening or closing is almost instantaneous. The total sectional area available for flow through the valve may be made equal to or in excess of the sectional area of the pipe, with a compact design. A tight seal may be obtained because of the extended area of the diaphragms subject to control pressure. The pressure drop through the valve is low. The frictional wear is taken mostly by the diaphragms which are well adapted to resist it and may be easily replaced if necessary. Operation of the diaphragms by fluid pressure makes for simplicity and ease of control.

Although I have disclosed herein the preferred embodiment of my invention, I intend to cover as well any change or modification therein which may be made without departing from the spirit and scope of the invention.

I claim:

1. A valve comprising a box-like housing having inlet and outlet openings and side walls, partition means disposed in said housing extending normal to the line of direct flow from one of said openings to the other, said partition means being a stack of assembled plates having alined side edges, adjacent plates making a small dihedral angle with each other and defining adjacent passages, alternate passages communicating with said openings, respectively, and the vertices of said angle being generally normal to said line of flow, at least one of the side edges of said plates being spaced from a side wall of the housing permitting fluid flow therebetween from one of said openings to the other around said edge, a flexible diaphragm mounted on said wall adapted to make sealing engagement with said plate edges, and a connection in said side-wall for admitting pressure fluid between the wall and diaphragm.

2. A valve comprising a box-like housing having opposed side walls and ends, a top and a bottom, inlet and outlet openings at opposite ends of the housing, partition means between said openings including an accordion-like assembly of plates defining interleaved passages communicating alternately with said openings, and having side edges, a flexible diaphragm generally parallel to the side walls of the housing and held between the side edges of

said plates and said side walls, one side of each diaphragm being adapted to make sealing engagement with the plates, and connections to the side walls for the admission of pressure fluid to the other sides of the diaphragms.

3. A valve comprising a box-like housing having opposed side walls, ends, a top and a bottom, inlet and outlet openings at opposite ends of the housing, an accordion-like partition means disposed normal to the line of flow between said openings and terminating short of the side walls of the housing, said partition means defining interleaved passages alternately communicating with said openings respectively, and a flexible diaphragm between the partition and each side wall of the housing adapted to make sealing engagement with said partition,

said diaphragms being at least the size of the side walls whereby said diaphragms may be secured by their edges to said housing.

4. The combination defined in claim 3, characterized by said partition means being a stack of assembled plates, with adjacent plates making a small dihedral angle with each other.

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