Dec. 24, 1957 G. C. F. ASKER 2,817,360

VALVE

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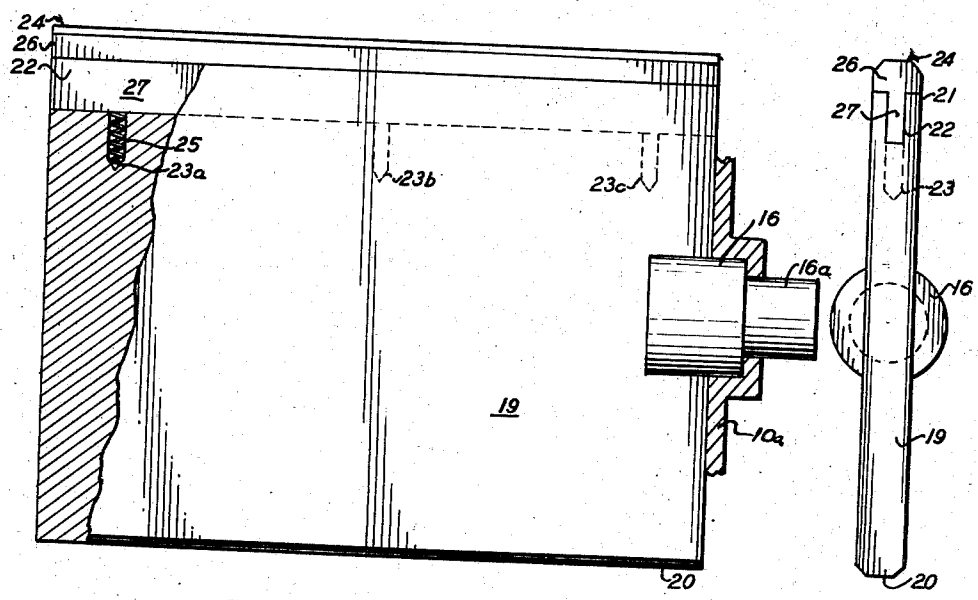


Fig. 2

Fig. 3

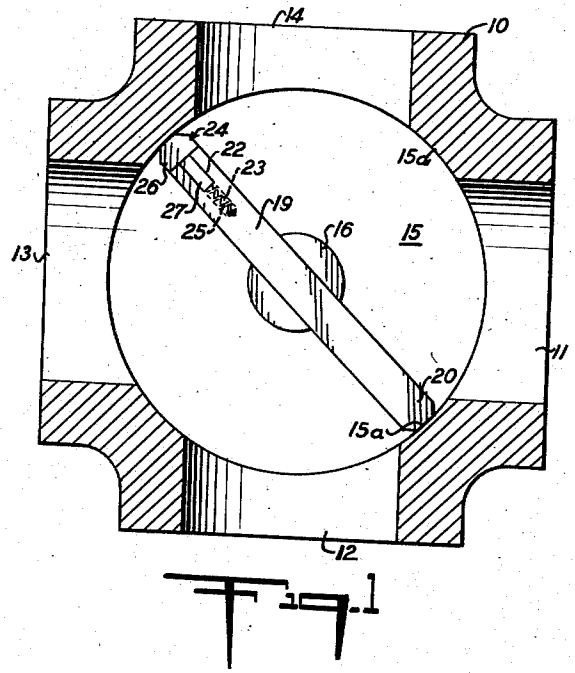


Fig. 1

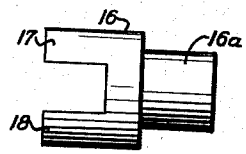


Fig. 4

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VALVE

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5 Claims. (Cl. 137—625.43)

This invention relates to improved seal construction for the rotary vane element of valves of the type which have a vane rotor mounted between valve ports to control the flow of fluid therebetween without leakage and is an improvement over my copending application Ser. No. 312,724 filed October 2, 1952 now Pat. No. 2,703,586 issued March 8, 1955.

As particularly described in my parent application, the invention relates to sealed rotor construction for vane rotor control valves wherein a resilient self-adjusting seal is mounted about a rotary vane to effectively seal the same radially against the valve body walls.

In my parent application a resilient seal was placed at opposite sides of the rotary vane, and the body of the vane was centrally fixed in its pivotal mounting for fixed rotation about its axis. According to the present construction the vane is mounted with sliding clearance to slide radially within retaining arms of its pivots, whereby resilient sealing means are necessary at only one side of the vane type rotor and improved sealing construction is provided with respect to sealing effectiveness against the valve body wall at both sides using only one seal; and greater economy in construction and use of the rotary vane is available in that that construction is simpler and the vane mounting is self-adjustable progressively with wear.

The sealing means hereof may be used upon vane type rotors mounted within a valve body having any number of valve ports for purposes of sealing the rotor sides against fluid leakage between valve ports. For rotary type valves controlling gas flow between ports, the rotor is a relatively thin vane mounted diametrically as a planar wall extending diametrically from side to side through the axis of a generally cylindrical chamber. Such rotatable vane is desirably sealed radially at each opposite side against the cylindrical walls of the valve chamber with which the valve ports communicate. As pointed out in my parent application, it is sometimes also desirable to seal such vane axially against the closed ends of the cylindrical chamber and such axial sealing as shown in my parent application may also be provided herein as desired. The present construction, however, deals primarily with the radial seals against the cylindrical valve chamber wall applied to such vane.

A typical valve construction using such vane is a four way valve, such as the common "reversing" valve, wherein four valve ports are interconnected in pairs by proper positioning of the vane. The present sealing construction is outstanding for use in such valve.

As an outstanding feature of the present construction, the vane itself is mounted diametrically from side to side of the cylindrical chamber in which it rotates, slidable diametrically in its pivot arms to allow radial movement with respect to its rotary axis for continuous self-adjustment as wear upon the edges of the vane progresses. Only one resilient seal is necessarily provided thereby on only one edge of said vane. The vane thus supported, having its sealing means resiliently thrust against a cylindrical

valve chamber wall, by reaction thrusts the entire vane body slidably against the valve wall at a diametrically opposite point, whereby sealing pressure is evenly maintained at both opposite planar sides of the vane; but a resiliently mounted and replaceable seal becomes necessary at only one side thereof. It is accordingly a primary object to provide a simplified and improved seal construction for a vane type rotor of a multiway rotary vane type valve. Other objects will be inherent in the description taken in conjunction with the drawings in which:

Fig. 1 shows the valve assembly in section perpendicular to the axis of the valve through the approximate center thereof;

Fig. 2 illustrates an assembly detail of the rotor with the radial seal thereon and its position within a pivotal mounting for rotation thereof with parts in section to illustrate seal construction;

Fig. 3 is an end view of the vane of Fig. 2;

Fig. 4 is a detail illustrating the pivotal mounting of the vane.

As illustrated, the valve comprises a body **10** having four valve port openings **11**, **12**, **13** and **14** radially disposed thereabout as in typical four way valve construction shown in somewhat greater detail in my parent application whose description is incorporated herein by reference and made a part hereof. The valve body **10** has a cylindrical rotor chamber **15** centrally bored through the valve, of which Fig. 1 is a section perpendicular to the axis thereof.

The valve body **10** has end walls **10***a* each bored concentric with the axis of the valve chamber **15**, each end wall to receive a rotary pivotal support **16** one of which is shown in detail in Fig. 4. This support is cylindrical in outer contour as shown in Figs. 2 and 3 and is journaled in an end wall of the valve **10***a*, Fig. 2 for rotation by any conventional rotating means. The rotary vane supports **16** have a shank portion **16***a* which extends out of the end wall of the valve end to which any conventional valve rotor rotating means such as a wheel or lever may be attached for rotation of the support and vane; the detailed extension of that shank from the end wall being the same as shown in my parent application. As shown in Fig. 4, the rotary vane support is diametrically cut at its inner end **16** through its center from side to side to convert the same to a forked construction, the prongs of which **17** and **18** are sufficiently widely separated to receive in sliding fit therebetween the rotor vane **19**.

The rotor vane **19** is a rectangular plate, as shown in Fig. 2, having a length usually corresponding to the axial length of the valve chamber to seal the same from end to end, but at least substantially beyond the axial position of each valve port. In some constructions it may be desirable to seal the entire cylindrical valve chamber, both sides and ends, as described in my parent application, and accordingly the ends may be sealed by the construction of my parent application. The width of the vane **19**, as shown, is less than the diameter of the cylindrical valve chamber. One side edge **20** of the vane **19** is slightly rounded to bear against a cylindrical valve chamber wall **15***a* for sealing rotation thereagainst.

The opposite side edge **21** of said vane **19** has a deep groove **22** cut therein parallel to the vane axis from end to end. The bottom of the groove **22** has several vertical borings **23***a*, **23***b* and **23***c* into the plane of the vane centrally thereof inward from the bottom of said groove **22**, preferably equidistantly spaced along the length of said groove. Several sealing springs **25** are mounted each within one of the borings **23** to extend resiliently upward into the space of the groove **22**, each from within one of said borings **23**.

A T-shaped sealing member **24** comprising a cap portion **26** rounded at its outer edges, similar to the opposite

vane edge **20**, and cooperative therewith for sliding sealing movement against the cylindrical valve chamber wall **15***a*, and having its outer cap portion **26** of a width corresponding to that of the rotor vane **19**, has symmetrically centrally extending therefrom a narrow sliding plate support portion **27** of a thickness substantially corresponding to the groove **22** for mounting therein in sliding fit. The sealing member **24** accordingly has its narrow sliding plate mounted in the side of the rotary vane to slide in the groove **22** thereof and is resiliently pressed outwardly therefrom by the springs **23** against the cylindrical valve chamber wall **15***a* for seal thereof during rotation of the vane **19**. That spring pressure against the sealing member **24** in contact with the wall **15***a* reactively presses the body of the rotary vane **19** simultaneously against its opposite edge **20** in sealing contact with the valve chamber wall **15***a* at a diametrically opposite portion. Thus the rotary vane **19** is sealed at both opposite sides of the cylindrical valve chamber resiliently.

As the vane **19** is slidingly supported within the forked rotor support **16** for rotation thereof, as wear occurs, regularly or irregularly at opposite sides thereof in contact with the chamber wall **15***a*, the vane is equalized in pressure by springs **25** thereagainst to accommodate the resiliently sliding side seal. As wear progresses the vane may slide within its forked rotor support diametrically toward either side.

While the vane **19** as shown is usually rectangular, the same seal construction is useful where the vane is shaped to taper somewhat from one end of the valve chamber to the other to accommodate a valve chamber which is correspondingly tapered to frusto-conical shape.

As thus described a substantially improved seal is provided for both diametrically opposite sides of a rotary vane type valve which is highly economical in construction to effectively seal the vane. The single sealing element which may be of metal or plastic may become worn in use and is readily replaceable but the wear takes place not only upon the seal but upon the opposite end of the vane. However, while the vane body may progressively wear, the seal itself is simply replaceable from time to time as needed.

I claim:

1. A valve comprising a valve body having an annular chamber, a plurality of valve ports in said body communicating with said chamber, a vane type rotor element mounted radially slidable for rotation in said chamber with its edges extending diametrically towards opposite annular sides thereof as a partitioning element controlling the flow of fluid between valve ports, said vane rotor having a groove in one edge thereof parallel to the annular wall of said chamber, a sealing member having a thin body portion corresponding substantially to the length and width of said groove slidably mounted therein and means for resiliently biasing said vane and sealing member each against a diametrically opposite portion of said annular wall.

2. Valve structure as defined in claim 1 wherein the sealing member is substantially T-shaped in section, the cap portion of which is substantially the same width as said vane, and the stem portion corresponds in sliding fit to said groove.

3. Valve structure as defined in claim 1 wherein the vane is supported for rotation between a pair of forked rotor elements at opposite ends of said vane with sliding clearance between prongs of said forks, whereby said vane is self-adjustable radially under resilient sealing pressure between opposite radial portions of said annular wall.

4. A valve comprising a valve body having an annular wall enclosing a substantially cylindrical chamber, a plurality of valve ports in said body communicating with said chamber, a pair of vane support and rotation elements mounted about the axis of said cylindrical chamber at opposite ends thereof for rotation, a vane slidably mounted for rotation and self-adjustment diametrically from side to side of said cylindrical chamber in said vane support elements for rotation thereby, said vane having a groove cut in one edge thereof from end to end, a sealing member slidably mounted within said groove and means between said vane and sealing member resiliently biasing said sealing member and vane each against opposite diametric portions of the cylindrical chamber wall for sealing engagement therewith.

5. A valve comprising a valve body having an annular chamber, a plurality of valve ports in said body communicating with said chamber, a vane type rotor element in said chamber extending diametrically from side to side for contact with the annular walls of said chamber, means for rotating said vane, said rotating means supporting said vane in sliding fit for radial movement for adjustable seal of the edges of said vane against the annular sides as a fluid-tight partitioning element controlling the flow of fluid between valve ports, a sealing member carried by said vane parallel to and between one edge of said vane and the annular wall of said chamber, resilient biasing means between said sealing member and said vane biasing the sealing member against said annular wall in sealing contact therewith and reactively against said vane to seal the opposite edge against an opposite portion of said annular wall.

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