

July 12, 1927.

1,635,295

E. TYDEN

VALVE DEVICE

Filed Feb. 3, 1926

Fig 1.

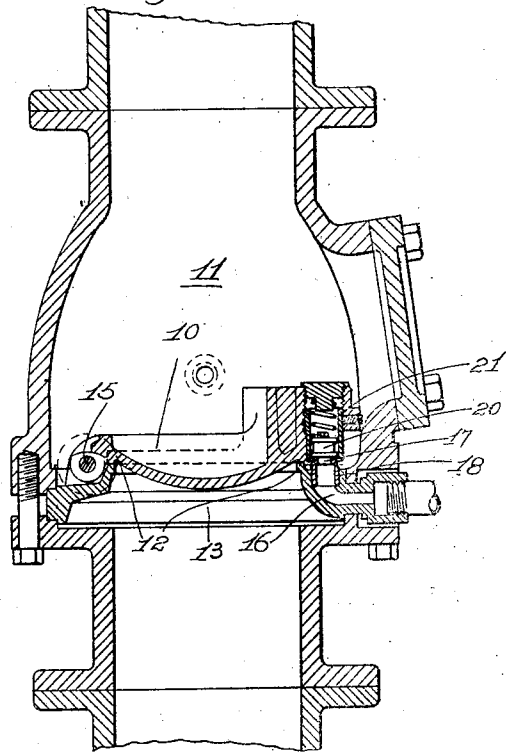
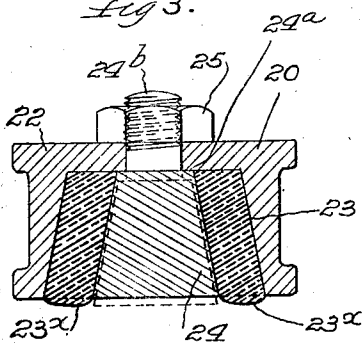
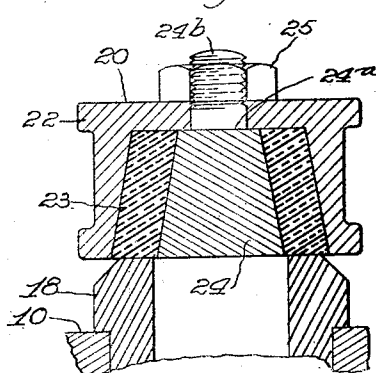


Fig 3.



Witness
W. C. McKnight

Fig 2.



Inventor:
Emil Tyden.
by *Burton Burton*
his Attorneys.

UNITED STATES PATENT OFFICE.

EMIL TYDEN, OF EVANSTON, ILLINOIS.

VALVE DEVICE.

Application filed February 3, 1926. Serial No. 85,655.

The purpose of this invention is to provide an improved form and construction of valve and seat having soft—as distinguished from metallic—seating surface, without liability to any substantial elastic reaction from seating pressure tending to delay the actual opening of the valve, and without liability to be deformed by indentation or protrusion from remaining a long time seated without relief from the seating pressure. The immediate occasion for the invention is the difficulty experienced in providing a suitable valve device for co-operation with the seat at the port of an auxiliary duct which is necessary to provide in certain forms of dry pipe valve construction, for admitting water to operate an alarm when the main valve is initially, and to the slightest extent, opened, the valve for this auxiliary purpose being carried by the main valve which controls the water access to the system, and moved for opening in the opening movement of said main valve. If there is any appreciable delay in the actual opening of the auxiliary port when the main valve begins to open, such as results from the reaction of an elastically yielding seat or yielding valve face tending to react from the seating pressure, the alarm is not sounded as promptly as it should be. In this situation it is equally important, however, that the valve at the auxiliary port should be absolutely unseating, and for this reason a metallic valve co-operating with the metallic seat is not feasible, because the auxiliary valve being carried by many times larger main valve, the degree of accuracy in the pivoting of the main valve which would be necessary for the perfect accuracy of co-operation of the metallic valve and seat at the small auxiliary port, is impracticable; and by the two imperative necessities arising in this particular type of construction, viz., a sure seating and a quick unseating of the auxiliary valve, there is created an urgent necessity for the present invention which is therefore illustrated in the drawings in the particular construction referred to, viz, the dry pipe valve carrying a valve for controlling an auxiliary port.

In the drawings:—

Figure 1 is an axial section of a portion of the dry pipe valve casing and connections

equipped with a valve embodying this invention at the auxiliary port.

Figure 2 is a detail axial section of the auxiliary valve and its seat on an enlarged scale.

Figure 3 is a detail of the valve in the same plane as Figure 2, but showing the parts in full line as before the seating member is trimmed to remove the end bulged out by the compression produced by drawing the central member from the dotted line to the full line position shown in said figure.

The drawings show the main water-controlling valve, 10, in a dry pipe valve casing, 11, having its seat at 12 encompassing the water inlet port, 13, the valve being hinged at one side of said port as indicated at 15. An auxiliary duct, 16, leads in from outside the casing for opening through a port, 17, situated just outside the annular seat, 12, of the main valve, the valve seat about said auxiliary port being provided by a drive fitted bushing, 18, and a valve co-operating with said seat being shown at 20, carried by the main valve at a point directly opposite the hinge pivot of said main valve. The construction in general of this valve constitutes no part of the present invention and will not be described beyond indicating that said valve, 20, is spring-pressed for seating, being carried in a sleeve, 21, which is mounted upon the side of the main valve, 10. The bushing seat member, 18, may be metallic for affording an exactly positioned seating surface for the valve. The valve indicated as to its totality by the numeral, 20, comprises a metallic cup member, 22, whose cavity is frusto-conical, narrowing from mouth to bottom. The seating area of the valve is afforded by a frusto-conical annulus, 23, made of elastically compressible material, as rubber, which is exteriorly dimensioned for fitting in the frusto-conical cavity of the cup, 22, and is contained and held compressed therein by a central frust-conical metal member, 24, exteriorly dimensioned for fitting the interior frusto-conical dimensions of the compressible member, 23. The central frusto-conical member, 24, has a threaded stem 24^b, which extends through the apertured center of the bottom of the cup, a nut, 25, being provided engaging the protruding end of the stem for securing said

central member, 24, properly positioned centrally within the outer member, 22. The frusto-conical rubber annulus, 23, is dimensioned originally for fitting quite accurately within the outer metal member, 22, but having its central aperture slightly less in diameter than the central metal member, 24. That is to say, so dimensioned that the central frusto-conical member inserted in the frusto-conical aperture of the rubber member will not reach the bottom of the cup without strong pressure for spreading the rubber member for enlarging the central aperture. The initial position of the central member, 24, is indicated in dotted line in Figure 3, and it may be understood that for completing the construction the nut, 25, is tightened on the threaded stem to draw the central cavity of the rubber member and seat its shoulder, 24^a, at the bottom of the cup with the nut tightened on the outer side. In this process it will be understood that the rubber member, 23, is sensibly compressed in both directions; that is, axially and transversely, and that there will result a bulging of the rubber at the open end as indicated at 23^x in full line in Figure 3. This bulge will be ground off so that the rubber is substantially flush with the two metallic members, 22 and 24, as seen in Figure 2, and the valve is then in condition for service. The thickness of the annular member, 23, that is, the breadth of its seating face, is desirably slightly more than the corresponding dimension of the seat member, 18, so that in the operation of the valve there is no touch of the metallic parts of the valve with the metallic seat, but on the contrary the metallic seat makes contact only with the soft seating face of the valve formed by the compressed rubber, which, being compressed nearly to its limit of elastic reaction, does not yield to the seating pressure so as to be indented by the valve seat to any sensible extent. In practice the limit of reaction of the valve upon relief from the seating pressure which will not undesirably delay the actual opening of the valve should not exceed $3/1000''$. The ordinary reaction of an ordinarily constructed valve having a rubber face of sufficient thickness to serve the purpose is about $12/1000''$. The compression, therefore, to which the member, 23, is subjected in the initial construction of this valve is designed to take up three-fourths or more of the range of its elastic reaction, that is $9/1000''$ out of the $12/1000''$. And the maximum seating pressure which the valve would experience in the construction indicated will not cause the reaction upon release of pressure to exceed $3/1000''$. This result, it will be recognized, is dependent upon and obtained by cutting off the protruding rubber as described: because, how-

evermuch the rubber might be compressed between the metal elements as described, if any substantial portion were left protruding free to expand laterally upon compression in the direction of the seating pressure, the reaction from such lateral expansion would cause the delay in the unseating of the valve which it is the purpose of the construction to prevent.

I do not limit myself to the particular or detail means of producing the condition of compression of the compressible and elastically reacting element of the valve which is herein shown, but, on the contrary, the specific construction for thus compressing this element will be varied according to the character of the valve and it is formed in totality for this particular purpose. And particularly I do not limit myself to the circular form of the valve parts by reason of which they are describable as conical in the term frusto-conical. On the contrary, any tapered form which will cause the application of pressure in one direction to produce compression also in a transverse direction will be within the scope of the specific feature of the invention which is exemplified by the frusto-conical form.

I claim:—

1. A valve device comprising a valve and a co-operating valve seat, one of said co-operating elements being a rigid annulus with a central port to be closed by the seating of one of said elements on the other, and the other co-operating element comprising an annular member of yieldingly compressible elastically reacting substance as rubber, and two rigid members respectively within and encompassing said annular member, and means for compressing the compressible member between the inner and the encompassing rigid members for rendering it substantially incompressible further by the seating pressure, the compressible member being approximately flush with the rigid members at the end exposed between them for seating after being compressed between them; whereby the extent of said compressed element which is susceptible to compression and capable of elastic reaction in the direction of impact of valve and seat is negligible and such yielding and reaction is prevented.

2. A valve element comprising an annular element of compressible elastically reacting material, as rubber and the like, and two rigid elements fitted respectively within and encompassing said annular elements, the latter being exposed at one end between the rigid elements for seating, and means for compressing the yielding element radially between the rigid elements, said yielding element, when thus compressed, having a negligible protrusion at the seating end beyond the other elements; whereby the portion of said compressed element which is

free to expand transversely to the direction of seating impact is negligible, and thereby the elastic yielding and reaction of said element in said direction of impact is negligible.

3. A valve device comprising a compressible and elastically reacting part and two rigid parts between which the compressible part is held, and means for stressing the rigid parts toward each other to compress the other part between them, said compressible and elastic part being exposed at the end between said rigid parts for forming at said end a seating face in a plane transverse to the faces of the rigid parts between which it is compressed, said seating face being approximately flush with the ends of the rigid parts.

4. In the construction defined in claim 3 the rigid parts being respectively adapted to encompass and to be encompassed by the yieldingly compressible part.

5. In the construction defined in claim 3 the rigid parts being tapered and respectively adapted to encompass and to be encompassed by the compressible part, and means for stressing one of the rigid parts longitudinally with respect to the other for compressing the yielding part between them in two directions transverse to each other.

6. A valve device comprising an outer rigid cup member having its cavity frusto-conical, narrowing from open end to bottom; an inner rigid frusto-conical member correspondingly tapered; a compressible yieldingly reacting relatively soft member of frusto-conical annular form fitted between

the two rigid members, and means for stressing the inner rigid member toward the cup bottom for contracting the annular space between the two rigid members and compressing therein the compressible elastically reacting member, the latter, when thus compressed, having negligible protrusion from the open end of the cup member or beyond the greater base of the central rigid member.

7. In the construction defined in claim 3 the rigid parts being respectively a cup having its cavity tapered narrowing from open mouth to bottom, and a similarly tapered central plug, the means for stressing said two parts toward each other being a threaded stem projecting from the lesser base of the central plug through the bottom of the cup member, and a nut on said stem outside the cup bottom.

8. In the construction defined in claim 3 the rigid parts being respectively adapted to encompass and be encompassed by the yieldingly compressible part, the inner encompassed rigid part being exteriorly tapered, and the compressible part being correspondingly tapered interiorly, and the means for stressing the rigid parts toward each other for compressing the compressible part comprising co-operating screw-threaded elements for thrusting the inner tapered part longitudinally with respect to the outer rigid part by screwing said threaded elements together.

In testimony whereof I have hereunto set my hand at Los Angeles, California, this 28 day of January, 1926.

EMIL TYDEN.