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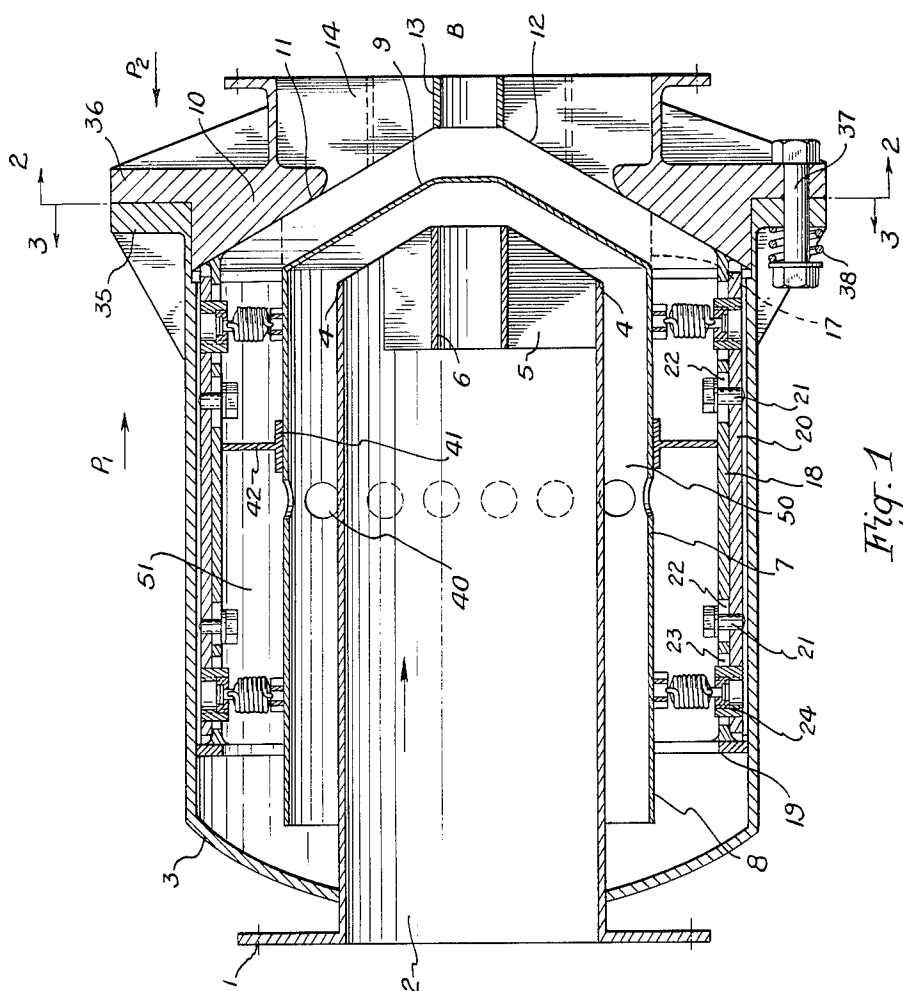
H. MAASSEN

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VALVE FOR AIR RAID SHELTER

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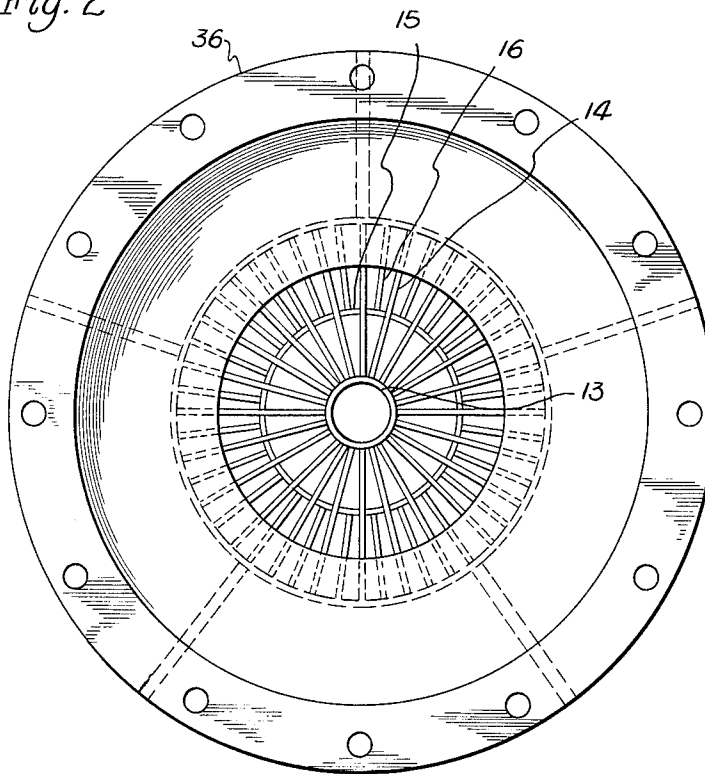
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VALVE FOR AIR RAID SHELTER

Filed Dec. 20, 1963

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Fig. 2



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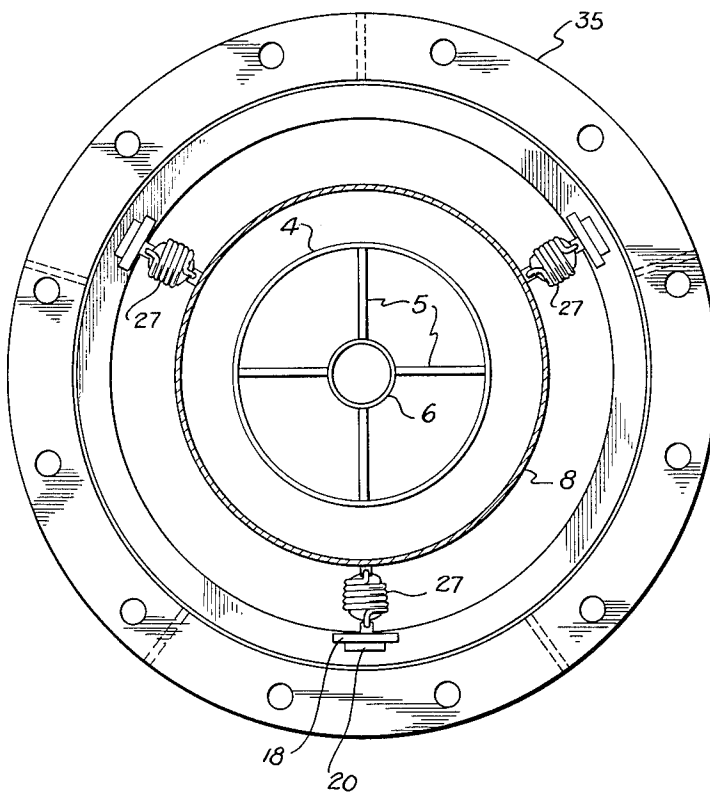
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4 Sheets-Sheet 3

Fig. 3



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4 Sheets-Sheet 4

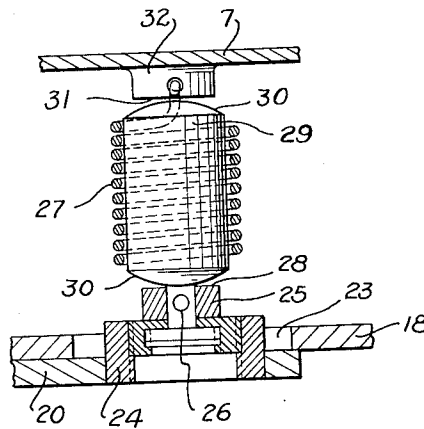


Fig. 4

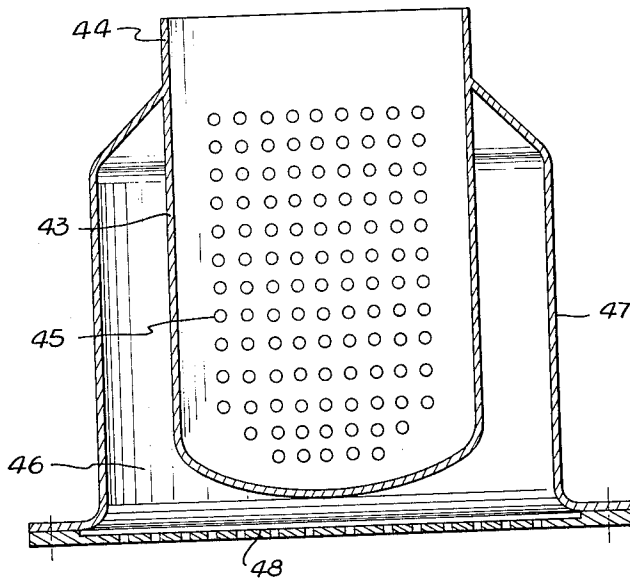


Fig. 5

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3,232,208

VALVE FOR AIR RAID SHELTER

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11 Claims. (Cl. 98—119)

This invention relates to a valve for either the air intake or air exhaust duct of an air raid shelter.

Air raid shelter valves for the intake or exhaust ducts usually have a valve head in the form of a plate, cone, dish, or the like. The movable valve head can be guided by rods or rails, or it can be movably suspended. In the latter case, the valve head is hung so that the valve is normally open for permitting the free passage of air. When there is an increase in the outside air pressure, such as caused by a bomb explosion, the valve then closes down against the valve seat to shut off the passage of air. However, all of these valves have the disadvantage in that the shock wave produced by the bomb explosion passes through the valve before the valve can close due to its inertia.

The object of this invention is to produce an air raid shelter valve which avoids the above disadvantages.

In this invention, the valve is essentially a hollow piston valve having a piston head and a piston skirt. This skirt is open in the direction of the outside atmosphere and forms an air blast pressure shock wave deflection chamber.

By reason of this valve construction, the piston valve is moved and closed against its valve seat before the pressure wave has a chance to flow around the piston valve and into the air raid shelter.

According to another feature of this invention, an air inlet pipe extends through the valve housing into and spaced from the piston skirt. This has the additional advantage in that the air pressure wave is first positively directed to the inside of the valve head.

The means by which the objects of the invention are obtained are described more fully with reference to the accompanying drawings in which:

FIGURE 1 is a longitudinal cross-sectional view through the valve;

FIGURE 2 is a cross-sectional view taken on the line 2—2 of FIGURE 1;

FIGURE 3 is a cross-sectional view taken on the line 3—3 of FIGURE 1;

FIGURE 4 is an enlarged detailed cross-sectional view of the piston valve holding means; and

FIGURE 5 is a cross-sectional view of a pressure wave muffler insertable into the mouth of the air intake duct leading to the valve.

As shown in FIGURE 1, the flange 1 of an air intake pipe 2 is adapted to be joined to the air intake duct leading to the atmosphere, and which pipe extends into valve housing 3.

The outlet end 4 of pipe 2 is reinforced by radially extending plates 5 which are fastened at one end to the inner wall of pipe 2 and at the other end to a cylinder 6 which is concentric with the longitudinal axis of pipe 2.

The piston valve 7 has a cylindrical skirt 8 and a conical piston head 9. Pipe 2 projects into and is spaced from skirt 8. Piston head 9 can be slightly curved or given an elliptical, circular, or compound curve cross-section, as preferred, in any individual valve. Valve seat 10 conforms and is complementary to the shape of piston head 9. This valve seat is composed of an annular seat portion 11 and an open work portion 12. As

2

shown, note FIGURE 2, portion 12 is composed of a cylinder 13 concentric with the valve seat and from which flat plates 14 extend radially to the annular portion 11. A second concentric cylinder 15 can be added and from which plates 16 extend to the annular portion 11. The ends of the cylinders and plates form an extension of the valve seat 10 and a bearing surface for the piston head 9 when in closed position. Thus a very large reinforced surface is formed for the piston valve 7 when it is closed by a shock wave.

The valve opening distance or the path that the valve travels from open to closed position is indicated by the dashed line 17.

The piston valve 7 is held by spring means, including three fixed beams 18 fastened at one end to valve seat 10. In the cross-sectional view of FIGURE 1, only two beams 18 are shown. The opposite ends of the beams 18 are joined to a ring 19 which is secured to the inner wall of housing 3. Beams 18 are spaced from the inner wall of housing 3. Between these beams and the wall are longitudinally slidably mounted bars 20. These bars are held in place by set screws 21 which project through slots 22 in beams 18. Beams 18, note FIGURE 4, also have elongated slots 23 through which project sockets 24 joined to bars 20. These sockets contain a fitting 25 having an opening for receiving the looped end 26 of a coil spring 27. The upper surface 28 of fitting 25 is a bearing surface for the cylindrical strut 29 held within the coils of spring 27. Each end 30 of strut 29 is conically or spherically shaped so that it can tilt on the upper bearing surface 28 of the fitting 25 and on the surface 31 of the lug 32 which is attached to piston valve 7. A looped end of the spring 27 also extends through a hole in the lug 32 to hold the spring in place. When piston valve 7 moves longitudinally, the strut ends 30 first tilt on the bearing surfaces 28 and 31, respectively, so that it is moved satisfactorily. Strut ends 30 and bearing surfaces 28 and 31 have approximately the same breadth. Also, piston valve 7 is held in the position shown in FIGURE 1 by the springs 27 as long as no forces are exerted against piston head 9.

The valve opening represented by line 17 can be fixed to any length by means of set screws 21.

Altogether six springs 27 are positioned around the piston valve 7 so that the piston valve is kept centered with respect to the valve seat. For valves of greater size, more springs can be used.

Housing 3 has a flange 35 which is secured to the flange portion 36 of valve seat 10 by means of bolts 37 and compression springs 38. The nuts are tightened on the springs 38 to give a pressure at which flanges 35 and 36 will separate in the direction of arrow P₂ at a pre-given pressure.

A plurality of ports 40 extend through skirt 8, these ports preferably being closer to the piston head 9 than to the open end of the skirt. In the open position of the valve, these ports lie adjacent a ring 41 held by a plurality of spaced struts 42 secured to the housing 3 by way of the beams 18.

In FIGURE 5, the pressure wave muffler is composed of a tube 43 having an end 44 adapted to be inserted into the mouth of the air duct leading to the valve. The inlet end of tube 43 contains a plurality of openings 45. This inlet end is separated by a space 46 formed between the inlet end and a cover 47 which is adapted to be set in the brickwork forming the wall of the air raid shelter. The cover 47 is closed by a screen 48.

In operation, a fresh air intake suction fan is connected to the side B of the valve for bringing ventilating air into the shelter. The intake air first passes through the muffler of FIGURE 5 and then through air inlet pipe 2 and

against the inner surface of valve head 9. The air is then reversed in its direction of flow into air passageway 50 between pipe 2 and skirt 8 and then through ports 40 into the space 51 between skirt 8 and housing 3. From there the air flows through the valve seat 10 into the shelter. Because of the negative air pressure produced by the fan, the piston valve 7 is initially moved a small distance in the direction of the arrow P₁, while the piston valve is held centered by the struts 29. Any displacement of the piston valve 7 is dependent upon the strength of the springs 27 and the negative pressure produced by the fan.

When a strong explosion occurs in the outside atmosphere, the air pressure shock wave is first partially absorbed in the muffler of FIGURE 5 and then moves through pipe 2 to strike against the inner surface of piston head 9. The wave is then deflected by the piston head. The wave then moves through passageway 50 and finally into space 51.

Passageway 50 and space 51 through which the pressure wave moves are dimensioned so that they together are about twenty times the length of the distance 17. Actually the distance 17 is much less than that shown in the drawing since piston valve 7 has been moved closer to the valve seat by the suction of the fan.

This increase in the distance travelled by the air pressure wave is obtained essentially by reason of the open skirt 8 of piston valve 7. Pipe 2 by projecting into the skirt serves to define the direction of the travel of the pressure wave.

When the pressure wave closes piston head 9 against valve seat 10, ports 40 become covered by the circular ring or head 41 of T-shaped beam 42.

Valve seat 10 is effectively reinforced by the cylinders 13 and 15 and the plates 14 and 16.

In the atmospheric negative pressure or suction phase following the shock wave, the piston valve 7 is moved in the direction of the arrow P₂. In so doing, the inner face of piston head 9 bears against the end 4 of pipe 2 and the reinforcing plates 5 and cylinders 6 which are shaped to conform with the inner face of the piston head.

Having now described the means by which the objects of the invention are obtained, I claim:

1. A valve for either the air intake or air exhaust duct of an air raid shelter comprising a housing having an opening at one end thereof, a valve seat in said opening, a hollow piston valve slidably mounted in and spaced from said housing, said piston valve having an imperforate piston head adapted to be seated upon said seat and a cylindrical skirt forming an air blast pressure shock wave deflection chamber, and an air inlet pipe extending through an opening in the opposite end of said housing and projecting into and spaced from said skirt so that the space between said pipe and skirt communicates with the space between said skirt and said housing, and

means tending to maintain said valve in normally open position.

2. A valve as in claim 1, said skirt having a length of about at least ten times the distance between the valve head, when in open valve position, and the valve seat.

3. A valve as in claim 2, said housing having a longitudinal length of about at least ten times the distance between the valve head, when in open valve position, and the valve seat.

4. A valve as in claim 3, said tending means further comprising spring means, means for joining said spring means to said hollow piston valve, and connecting means for joining said spring means to said housing.

5. A valve as in claim 4, said spring means comprising a coiled spring, a strut within the coil of the spring, said strut having curved ends forming tilting bearing surfaces, and corresponding bearing surfaces in said means for joining said spring means to said hollow piston valve and said connecting means, respectively.

6. A valve as in claim 5, said corresponding surfaces having approximately the same breadth as said curved ends on said struts.

7. A valve as in claim 6, said means for joining said spring means to said hollow piston valve comprising at least one beam secured at one end to said valve seat.

8. A valve as in claim 7, said means for joining said spring means to said hollow piston valve further comprising a plurality of beams, and ring means for securing the other end of each beam, respectively, to said housing.

9. A valve as in claim 8, further comprising a bar movably mounted between said beam and said housing, and sockets attached to said bar and having said corresponding bearing surfaces.

10. A valve as in claim 9, further comprising bolt means for removably securing said housing to said valve seat and including compression spring means for permitting relative movement between said housing and said valve seat.

11. A valve as in claim 10, further comprising a circular ring between the skirt of said piston valve and said housing and attached to said housing, and ports in the skirt of said piston valve, said ports being closable by said ring upon movement of said piston valves to valve closed position.

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