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L. J. CLAPP

1,998,444

VALVE MECHANISM

Filed Dec. 29, 1927

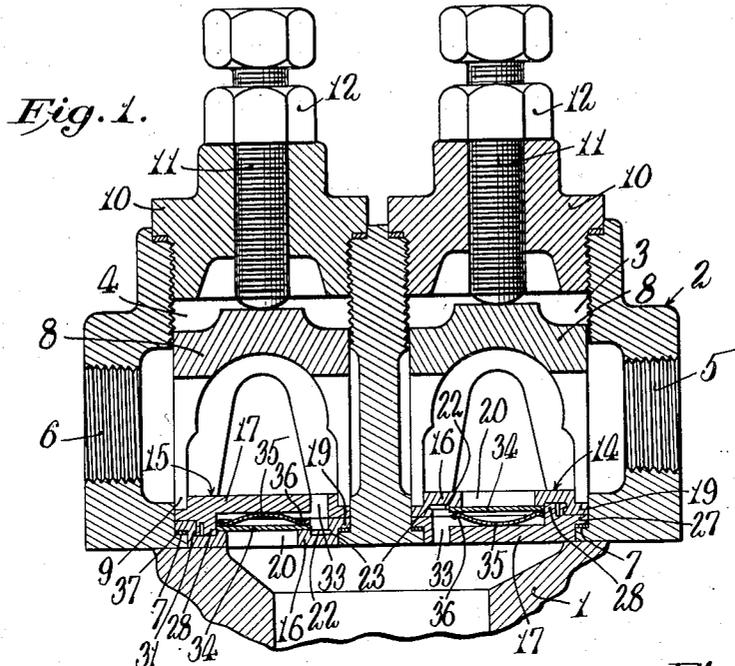


Fig. 2.

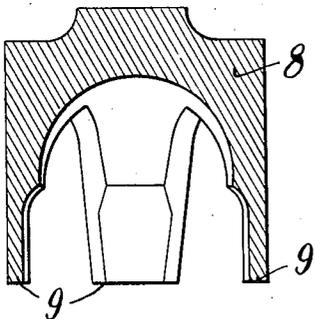


Fig. 8.

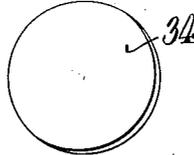


Fig. 9.

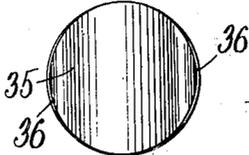


Fig. 3.

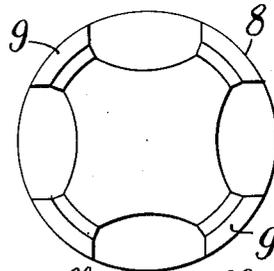


Fig. 7.

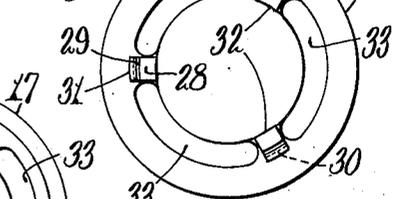


Fig. 6.

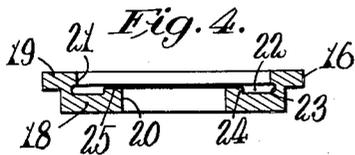
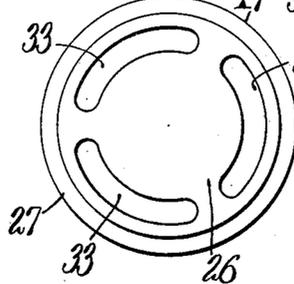
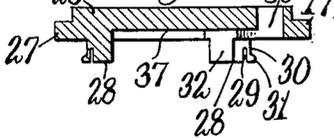


Fig. 5.



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UNITED STATES PATENT OFFICE

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VALVE MECHANISM

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9 Claims. (Cl. 251—119)

My invention relates to valve mechanisms.

An object of my invention is to provide an improved valve mechanism. A more specific object of my invention is to provide an improved and simplified valve mechanism particularly adapted for use in small air compressors, though of general application. A further object of my invention is to provide an improved valve mechanism comprising a minimum number of parts and constituting a self-contained unit which may be used interchangeably as an inlet or as a discharge valve. Other objects and advantages of the invention will hereinafter appear.

In the accompanying drawing, in which for purposes of illustration I have shown one embodiment which my invention may assume in practice:

Fig. 1 is a central vertical section through the upper end of a compressor cylinder and the valve mechanism therefor, the latter being constructed in accordance with the illustrative embodiment of this invention.

Fig. 2 is a central vertical section through a follower member.

Fig. 3 is a bottom view of the follower member.

Fig. 4 is a central vertical section through a valve seat member.

Fig. 5 is a central vertical section through a cover member.

Fig. 6 is a top view of the structure shown in Fig. 5, while

Fig. 7 is a bottom view of the same structure.

Fig. 8 is a perspective view of a valve element, and

Fig. 9 is a plan view of a spring element.

Referring to the drawing, 1 represents a compressor cylinder member upon which a valve mechanism generally designated 2 is mounted. Herein the valve mechanism comprises a pair of chambers 3 and 4, the chamber 3 being an inlet chamber and communicating with an inlet passage 5, and the chamber 4 being a discharge chamber and communicating with a discharge passage 6. In each of these chambers a shoulder 7 is formed upon which a valve mechanism, hereinafter described, may be seated. To hold the valve mechanism in position upon the shoulders, follower members 8 are employed, the follower members having a series of depending feet 9 adapted to engage the valve units and hold them in position. To maintain the follower members 8 in place and to close the end of the chambers 3, the latter have threadedly secured therein closure members 10 through which screw members 11 extend. The screw members 11 engage the upper ends of the follower members, and may be

locked in position by lock nuts 12. The valve units for inlet and discharge purposes are the same, structurally, in the illustrative embodiment of the invention; and these are designated, in the case of the inlet valve, 14 and in the case of the discharge valve 15. Each valve unit comprises a seat member 16 and a cover or guard member 17. The seat member comprises a relatively shallow cylindrical body portion 18 from whose upper end (Fig. 4) a peripheral flange 19 projects. The seat member is traversed by a bore 20 opening at the end of the body member from which the flange 19 projects into a larger bore 21. The bore 21 at its innermost end is provided with an undercut recess 22 providing a shoulder 23. An upstanding rim 24 surrounding the inner end of the bore 20 provides a valve seat 25. The guard or cover member is also generally cylindrical in outline and comprises a thin body portion 26 having a peripheral flange 27 of substantially the same diameter as the flange 19. From the lower end surface of the member 17, as viewed in Fig. 5, a series of feet 28 project, these being spaced 120° apart, and having their outer sides spaced from the center of the cover member a distance approximately equal to the radius of the recess 21, the outer side of each foot being a curved surface coaxial with the cover member, and the inner side 32 being likewise a curved surface coaxial therewith. Each of these feet is split, as at 29, to provide a resilient outer portion 30 having a locking boss 31 at its lower extremity which is adapted to engage in the recess 22 to hold the parts of the cage mechanism together. The inner surfaces 32 of the depending feet 28 constitute valve guiding surfaces; and are struck on substantially the same radius as the radius of the outer surface of the valve seat projecting rim 24. Arcuate passages 33 traverse the cover member 17 and are disposed between the depending feet 28, these passages constituting the discharge passages for the fluid passing beneath the valve and flowing outwardly between the feet 28 when the valve is raised. A flat, preferably resilient, preferably metallic, valve element 34 is adapted to cooperate with the valve seat 25; and to yieldingly maintain it in seated position, a transversely flexed resilient spring member 35 having upturned ends 36 is provided. The cover is recessed centrally as at 37.

In assembling a valve cage unit, the spring element and valve element are placed between the seat member and the guard member, and the feet of the guard member forced into the seat

member until the yielding locking lips 31 engage in the recess 22. The parts are thus yieldingly held assembled in a manner adequate to permit the ready handling of the parts, but permitting their ready separation by inserting a screw driver or other wedge at the point between the flanges 27 and 19. All additional holding means are thereby avoided and a true two piece cage element is obtained. When in use, the parts are positively forced together between the shoulder 7 and the feet 9 of the follower 8; and a gasket 37 may be used, if desired, between the valve cage flange and the shoulder 7. The same valve unit may obviously be used both as an inlet and as a discharge valve, requiring merely inversion to permit this result. At the right hand side of Fig. 1 a unit of the character described is shown in use as an inlet unit, while at the left, one is shown in use as a discharge unit.

The mode of operation of the mechanism so far described is obvious. Assume the compressor piston (which is not shown) to be upon its suction stroke, air at atmospheric pressure entering through the inlet will unseat the valve 34 of the unit 14 against the pressure of its valve spring 35, and the air will then flow radially between the seat and the upper surface of the valve, and then out of the cage through the passages 33 and into the cylinder bore. On the compression stroke of the compressor piston, the inlet valve will close and the discharge valve will be forced from its seat, and the air will flow radially and then through the passages 33 into the chamber 4 and through the discharge passage 6.

From the foregoing description it will be evident that I have provided a very simple and convenient valve mechanism which comprises the minimum possible number of cage elements, and which is equally adaptable to use as an inlet or as a discharge valve, the parts being securely held together during handling and yet readily detachable, and when detached having no fastening means which must be removed with the possibility of loss.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In combination, a seat element having a port therein surrounded by a valve seat and having an undercut shoulder, a cover element formed with flow slots and having projecting resilient locking portions spaced inwardly from the side of said element and arranged to cooperate with said shoulder, said cover element providing a guard surface, and a valve between said elements.

2. A valve cage assembly comprising a seat element, a cover element formed with projecting valve guiding portions, and resilient means carried by said valve guiding portions and flexible relative thereto for holding said seat and cover elements assembled.

3. A valve cage assembly comprising a seat element, a cover element formed with projecting valve guiding portions, said seat element having portions cooperating with said guiding portions to prevent relative lateral displacement between said elements, and resilient means carried by said valve guiding portions for holding said seat and cover elements assembled.

4. A valve mechanism comprising seat and guard forming elements, one of which provides an undercut shoulder and the other of which provides a plurality of projections each providing relatively inflexible valve guiding portions and, radially spaced from the latter, resilient holding means arranged to cooperate with said undercut shoulder, and a valve disposed between said seat and guard and guided by said guiding portions.

5. A valve cage assembly comprising a seat element and a cover element, one of said elements having a portion receivable within the other and said portion providing a rigid valve guiding portion and yielding holding means.

6. A valve cage assembly comprising a seat element and a cover element, one of said elements having a portion receivable within the other and said portion providing a rigid valve guiding portion and yielding, radially outwardly acting holding means.

7. A valve cage assembly comprising substantially rigid seat and cover members and means for holding the same in assembled relation comprising an undercut shoulder associated with one of said members a plurality of rigid valve guiding portions carried by said other member, and resilient locking devices arranged to cooperate with said undercut shoulder and carried by at least two of said valve guiding portions and movable substantially radially towards and from their supporting guiding portions.

8. A valve cage assembly comprising a seat element and a cover element, one of said elements having a portion receivable within the other and said portion providing a rigid valve guiding portion and, radially spaced from said valve guiding portion, yielding holding means.

9. A valve cage assembly comprising a seat element and a cover element, one of said elements having a portion receivable within the other and said portion providing a rigid valve guiding portion and yielding, radially outwardly acting holding means radially spaced from said rigid valve guiding portion.

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