Nov. 29, 1932. O. J. KENYON 1,889,247

COMPRESSOR VALVE ASSEMBLY

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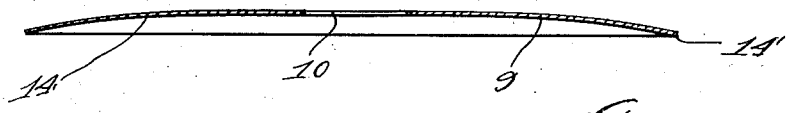



Fig. 3.

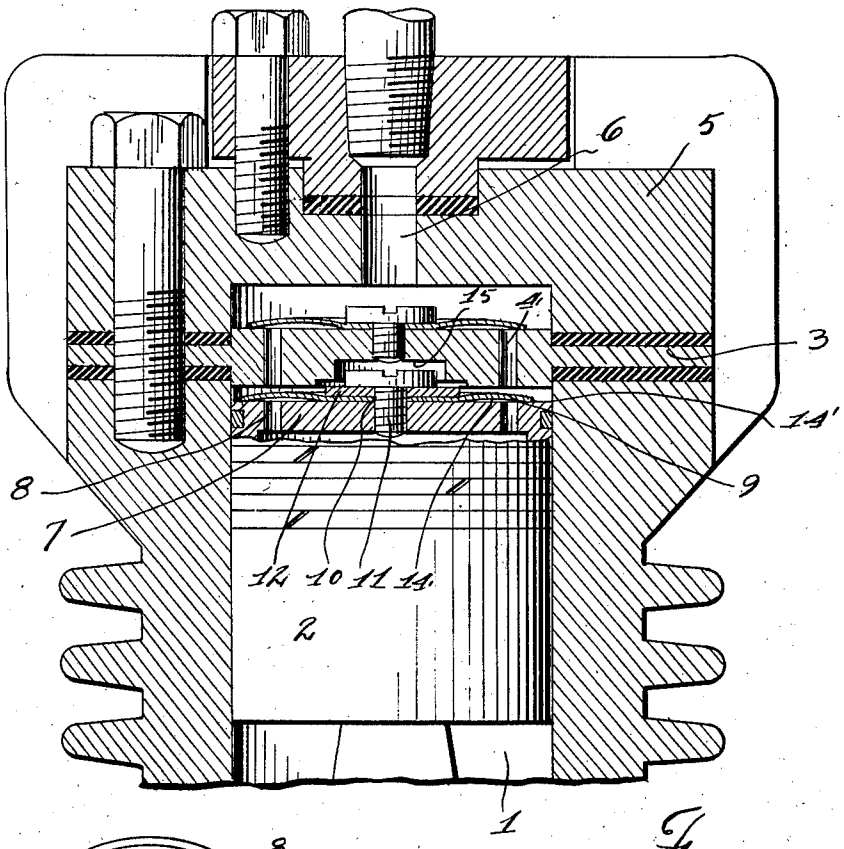



Fig. 1.

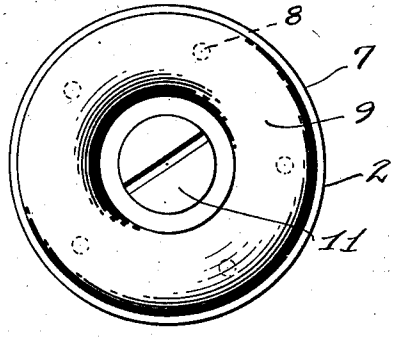



Fig. 2.

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# UNITED STATES PATENT OFFICE

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## COMPRESSOR VALVE ASSEMBLY

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This invention relates to compressors and more particularly to an improved expansion valve for gas or air compressors.

The invention has as one of its primary objects to provide a valve of the above character which may be manufactured economically and is efficient and absolutely noiseless in operation irrespective of whether the compressor is operating at a high or low speed.

It is a further object to obtain a valve which has the combined function of a compressor valve and a safety valve.

The above objects and the novel details of construction of the invention will be made more apparent as this description proceeds especially when considered in connection with the accompanying drawing, wherein,

Figure 1 is a vertical central section through a portion of a compressor embodying my invention;

Figure 2 is a plan view of the piston, and

Figure 3 is a detail view of the valve.

Referring now to the drawing the numeral 1 designates the cylinder of the compressor in which the gas is adapted to be compressed, and 2 the hollow piston reciprocable in said cylinder. 3 is a plate resting on the upper end of the cylinder and having a plurality of circumferentially arranged apertures 4 constituting the outlet ports for the cylinder and 5 is a detachable head for the cylinder having a central passage 6 that constitutes an exhaust for the compressed gas. As shown the head 7 of the piston is formed with a plurality of apertures 8 constituting inlet ports for the gas arranged in axial alignment with the outlet ports 4 which are preferably valve controlled to prevent return of the compressed gas therethrough.

For controlling the passage of the gas through the inlet ports 8 I have provided a light disk valve 9 resting upon the top of the piston and of a sufficient diameter to cover the ports 8. As shown, this valve 9 is preferably formed from a single piece of spring metal and is slightly dished as indicated in Figure 3. The central portion of the valve is formed with an aperture 10 for receiving the headed element 11 which threadedly engages the piston head. In practice a suitable washer 12 is disposed between the head of the element 11 and the valve, so that when the headed element is screwed down, the central portion of the valve will be clamped against the piston head, and due to the fact that the valve is slightly dished as set forth above, the periphery thereof will be held against the piston head by a slight spring pressure, while a portion of the valve intermediate the contacting surfaces aforesaid will be slightly raised cooperating with the piston head to form a circumferentially extending pocket 14.

In practice the valve seat on the piston head indicated at 14′ may be ground in with the usual valve grinding compound. However, this operation is not essential as after successive use, the valve will automatically form an efficient and perfectly air tight seat.

In order to provide an efficient construction and prevent the compressor from heating up, the plate 3 is formed with a recess 15 in the lower face thereof for receiving the headed element 11 and washer 12, thus the clearance in the compression chamber is reduced to the minimum, inasmuch as the valve 9 and its seat are normally substantially flush with the plate 3. The only clearance is the volume of the ports 4 and the thickness of the valve 9 which is not a large factor.

In use the gas to be compressed is introduced into the cylinder below the piston 2 and during each downward stroke of the piston, the suction will cause the periphery of the valve to raise from its seat permitting the gas to pass through the ports 8 into the cylinder above the piston. The upward stroke of the piston will instantaneously seat the valve 9 and will compress the gas against the plate 3 and through the valve controlled ports 4 into the cylinder head, where it is discharged in the usual manner.

With the construction as described, the valve 9 in addition to functioning as a compressor valve, will also act as an efficient safety valve. For example, when using a relatively thin valve on a compressor having a capacity of 150 pounds per square inch, I find that the pressure will not increase with subsequent pumping. This is due to the fact that at that pressure the portions of the valve

opposite the ports 8 are forced down into each port, thereby tending to lift the outer edge of the valve sufficiently to permit the gas between the outer edge of the valve and its seat to escape.

Thus from the foregoing description, it will be apparent that the valve will operate automatically for controlling the passage of the gas through the ports 8. Inasmuch as the valve, as shown in Figure 1, cooperates with the piston head to form the circumferentially extending pocket 14, it will also be apparent that some of the compressed gas will be trapped in this pocket, so that when the valve seats upon the piston head there will be a cushioning effect between the lower surface of the valve and head, consequently the seating of the valve will be quiet, irrespective of whether the compressor is operating at a high or low speed. Moreover by varying the thickness of the valve, the pressure to which it will pump is controlled, thus the valve has the combined function of an expansion valve and safety valve.

While it is believed that from the foregoing description the nature and advantages of my invention will be readily apparent, I desire to have it understood that I do not limit myself to what is herein shown and described and that such changes may be resorted to when desired as fall within the scope of what is claimed.

What I claim as my invention is:

1. The combination with a member having a series of openings therein for the passage of a fluid, of a valve for controlling the flow of refrigerant through said openings, said valve comprising an annular spring metal member having a central portion thereof rigidly secured to the said member and having an annular bowed portion bridging the openings aforesaid and having edge contact with the member beyond the openings.

2. In combination, a member constituting a valve seat having an opening therein for the passage of a fluid, and a valve controlling the passage of fluid through said opening and including a spring metal disc having a portion thereof secured to said member, having a normally bowed portion spanning the opening in said member, and having an edge contact with said member normally maintained by the tension of said bowed portion.

3. In combination, a seat member having a port therein, and a valve controlling said port including a member having a substantially flat portion secured to the first mentioned member and having a resilient normally bowed portion covering said port and having edge contact with the first mentioned member, the said edge contact being normally maintained by the tension of said bowed portion.

4. In combination, a member constituting a valve seat and having a port therein for the passage of a fluid, and a valve controlling the passage of fluid through the port and including a piece of flexible thin sheet metal having spaced portions thereof in substantially the same horizontal plane and an intermediate portion outside of said plane, one of the first mentioned portions being secured to said member, the other said first mentioned portions having edge contact only with said member, and the intermediate portion being constructed and arranged to span the port to be closed and to maintain the edge contact aforesaid.

5. In combination, a valve seat having a port therein, and a valve including a disc having a portion fixed relative to said seat, having another portion movable relative thereto and adapted to have edge contact only with said seat, and having a bowed portion spanning the port in said seat constructed of resilient material and normally maintaining the edge contact aforesaid.

6. A compressor valve comprising a single piece of thin sheet metal having central and peripheral portions disposed at substantially acute angles to each other but located in substantially the same horizontal plane and respectively attachable to and adapted to have edge contact only with a member constituting a valve seat, and having an intermediate arched portion for maintaining said edge contact.

7. An automatically operable compressor valve comprising a disc of light gage spring metal having a flat portion secured at one point against movement relative to its seat, having edge contact only at the periphery, and having an arched intermediate portion spanning the port to be closed and acting as a spring to maintain the edge contact aforesaid, the flat and perimeter portions of said disc being in substantially the same place.

8. In combination, a seat member having a port therein, and a valve controlling the port, including a flexible thin sheet metal disc secured at its center to said member, peened from its center over the port to be closed and having edge contact only with said member beyond said port, the central and edge portions aforesaid being in substantially the same plane whereby the edge portion is held in engagement with said member by the flexibility of the peened portion.

In testimony whereof I affix my signature.

OADES J. KENYON.