April 8, 1952 O. H. SCHELDORF 2,592,343

COMPRESSOR HEAD ASSEMBLY

Filed March 15, 1950

Fig. 1.

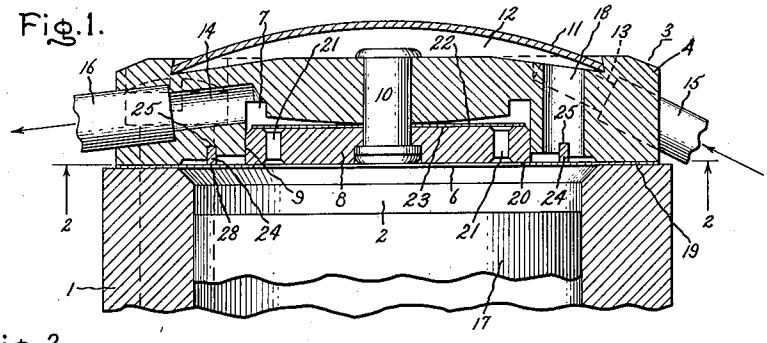


Fig. 2.

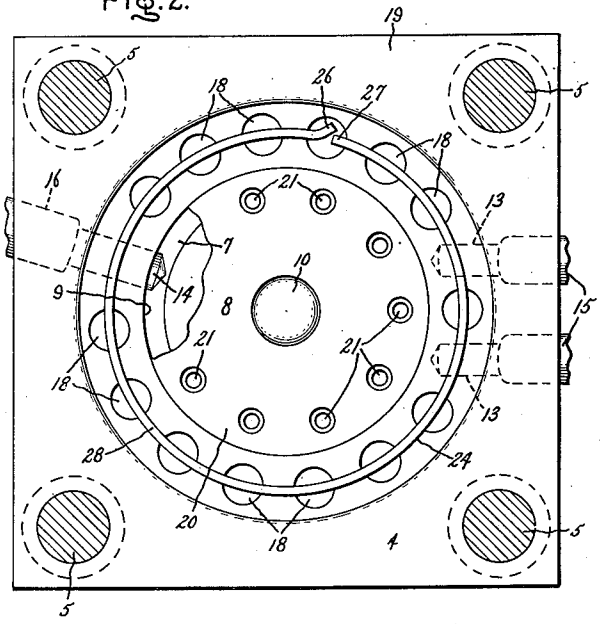


Fig. 3.

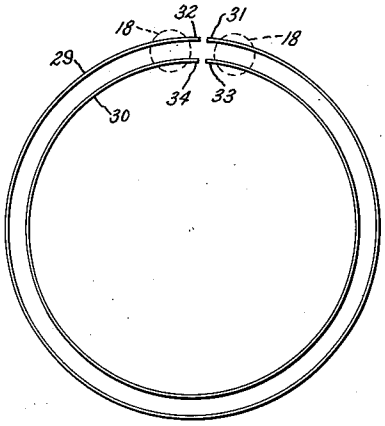


Fig. 4.

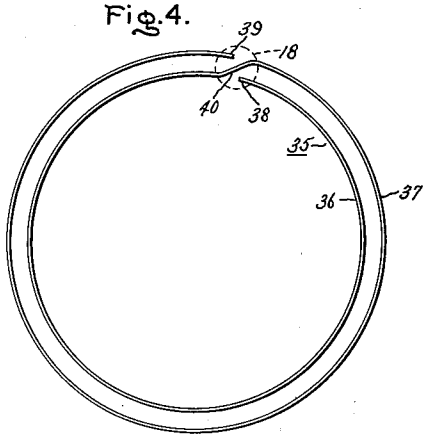
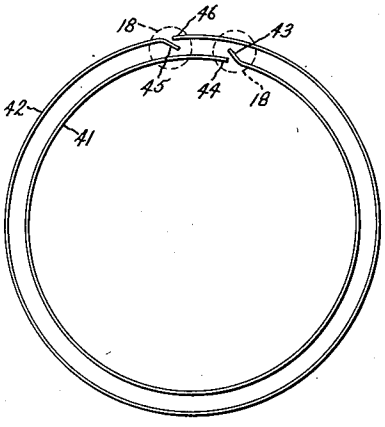


Fig. 5.



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Patented Apr. 8, 1952 2,592,343

UNITED STATES PATENT OFFICE

2,592,343

COMPRESSOR HEAD ASSEMBLY

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Application March 15, 1950, Serial No. 149,745

12 Claims. (Cl. 230—228)

1

My invention relates to compressors and more particularly to compressor head assemblies.

In some types of compressors such as those used in refrigerating apparatus a thin flexible metal disk is employed for controlling flow of fluid through the intake passages to the compressor. A relatively high pressure is exerted against this disk during the compression stroke tending to distort or break the disk. In the past a plurality of very small intake passages have been employed so that the remainder of the member containing the intake passages provides adequate support. In my arrangement, I have employed much larger holes for the intake passages, thereby decreasing the pressure drop and increasing the volumetric efficiency, while at the same time providing for sufficient support to minimize distortion or breakage of the disk.

Accordingly, it is an object of my invention to provide an improved compressor head assembly including an improved arrangement for minimizing pressure drop.

It is another object of my invention to provide an improved compressor head assembly including an improved arrangement for supporting a flexible valve element and for minimizing breakage thereof.

It is a further object of my invention to provide an improved compressor head assembly which is simple to manufacture.

Further objects and advantages of my invention will become apparent as the following description proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawing in which Fig. 1 is a sectional elevation view of a portion of a compressor incorporating an embodiment of my invention; Fig. 2 is a view taken along the line 2—2 in Fig. 1; and Figs. 3, 4 and 5 show modified forms of my invention.

In carrying out the objects of my invention an elongated member is formed into annular shape and is positioned so as to extend across the intake passages with one face of the member being adjacent the flexible valve element. In this way the elongated member acts to brace the flexible valve element against the force exerted on this element during the compression stroke of the compressor.

Referring to Figs. 1 and 2 there is shown a portion of the frame 1 of a compressor having

2

a cylindrical bore 2 formed therein. The top of the cylindrical bore 2 is closed by a head assembly 3. This assembly includes the head member 4 which is held against the top of the compressor frame 1 by a plurality of bolts 5 extending through the head member 4 and into the body of the compressor frame 1. A flat resilient flexible valve element or valve 6 is held in position between the head member 4 and the frame 1 and serves as a gasket at the engaging surfaces of the head member 4 and the frame 1. The head member 4 is shaped to provide a recess 7 within which is received a circular member 8. The member 8 has a press fit with the wall 9 of the recess 7 and is additionally held in assembled positive position with the head member 4 by a fastening device or rivet 10.

A concave resilient disk 11 is mounted at the top of the head member 4 to provide a muffle chamber 12. The head member 4 is bored to provide two passages 13 communicating with the muffle chamber 12, and the head member is further bored to provide a passage 14 communicating with the recess 7. Tubes 15 are brazed to the head member 4 in communication with the passages 13 to conduct vaporized refrigerant from the refrigerating system (not shown) to the muffle chamber 12. Similarly a tube 16 is brazed to the head member 4 in communication with the passage 14 to conduct compressed refrigerant form the compressor to the refrigerating system. In order to provide for the passage of vaporized refrigerant from the muffle chamber 12 to the bore or cylinder 2 where it may be compressed by a reciprocating piston 17 a plurality of ports 18 are annularly disposed about the head member 4. These ports 18 are in the form of passages or holes of substantial diameter extending through the head member 4. The flexible element 6 is arranged to engage the surface 19 of the head member 4 and the surface 20 of the member 8 so as to cover and close the ports 18. During the downward or suction stroke of the reciprocating piston 17 the flexible valve element 6 is forced downwardly out of engagement with the surface 20 by the differential pressure exerted thereon so as to permit passage of vaporized refrigerant through the ports 18 to the bore or cylinder 2. Similarly the member 8 is provided with a plurality of annularly disposed exhaust ports or passages 21 extending through the member 8 so as to provide for the discharge of compressed refrigerant from the cylinder 2 into the recess 7 and thence through the discharge passage 14 and the tube 16. A

resilient metal disk 22 is disposed between the member 8 and the head member 4 and is urged by its natural resilience into engagement with the surface 23 of the member 8 in order to cover the exhaust ports 21. During the upward or compression stroke of the piston 17 the flexible disk 22 is forced away from the surface 23 to open the ports 21 and permit passage of compressed refrigerant from the cylinder 2.

The general arrangement of the compressor head assembly described above has been used previously. However, it has been the previous practice to use a much larger number of much smaller openings for the intake ports. This was rendered necessary in order to minimize the distortion and breakage of the valve element 6 under the high pressure exerted thereagainst during the upward or compression stroke of the piston 17. The use of a plurality of very small openings for the intake passages results in an undesirably high pressure drop through the intake portion with a resultant lower volumetric efficiency. Also these small holes and the large number of them required makes the problem of drilling in mass production more difficult. I have overcome these difficulties by utilizing instead a smaller number of intake openings 18 of a substantially greater diameter.

In order to brace the valve element 6 and to minimize distortion and breakage thereof I provide a ring or annular element 24 which extends across the ports 18 generally at the center of the cross section of these ports. The ring or ring-shaped element 24, which is preferably in the split form illustrated, rather than a continuous ring, is formed from an elongated element which is bent into the shape shown. An annular recess or groove 25 is provided in the face of the head member 4 on the side adjacent the flexible valve element 6 for receiving and supporting the split ring 24. The groove or recess 25 intersects each of the ports 18 along a line generally extending through the center of the cross section of these ports. The ring 24 is preferably made of a material similar to that of the head member 4, such as steel, and it is copper brazed into engagement with the head member 4. This copper brazing may conveniently be accomplished at the same time that the tubes 15 and 16 are copper brazed into engagement with the head member 4. In the form shown in Fig. 2, the ends 26 and 27 of the ring 24 are disposed within one of the ports 18. In order to allow for variations which may occur during mass production manufacture, one of the ends 26 is bent outwardly out of the line of the ring 24. It can be seen that this deflection of a portion of the end 26 allows for some variation in the length of the elongated element of which the split ring 24 is formed and also for some variation in the diameter of the circular recess 25.

In the arrangement described above intake ports 18 of substantial diameter are employed with a resultant decrease in pressure drop through the intake portion below that present where the smaller openings previously used are employed and a resultant increase in volumetric efficiency. At the same time any tendency toward breakage of the valve element 6 because of the use of these larger openings is minimized by the addition of the generally centrally disposed split ring 24. It can be seen that, during the compression stroke of the piston, the valve element 6 is forced against the surface or face 28 of the ring 24, which surface 28 is in the plane

of the surfaces 19 and 20, thereby bracing the valve. Thus an increase in volumetric efficiency over that available in the constructions previously employed is achieved with no increase in the tendency toward distortion or breakage of the flexible element 6. Although the ring 24 has been shown extending generally through the center of the cross section of the ports 18, it may be disposed closer to the surface 20 of the circular member 8 than to the surface 19 of the head member 4, since the stress on the valve element 6 is greater in the area generally adjacent the surface 20 than in the region generally adjacent the surface 19.

In the form shown in Fig. 2 a split ring is employed in which the ends 26 and 27 are disposed within one of the ports 18. In the modified form shown in Fig. 3, two concentric split rings 29 and 30 are employed. In lieu of extending generally across the center of the cross sectional area of the ports 18, as in the form disclosed in Fig. 2, the split rings or annular elements 29 and 30 are disposed on each side of the line extending through this center point, so as to provide two elements extending across each of the ports spaced so as to impart a maximum of bracing to the flexible valve element 6. In utilizing the split ring form shown in Fig. 3 as part of the compressor head assembly, two concentric grooves or recesses would obviously be formed within the head member 4, each of the grooves receiving a corresponding one of the split rings 29 and 30.

The form shown in Fig. 3 also differs from that illustrated in Fig. 2 in that the ends 31 and 32 of the split ring 29 and the ends 33 and 34 of the split ring 30 are disposed within the area or space between adjacent ports 18 rather than within a particular one of the ports 18. The ends 31 and 32 and the ends 33 and 34 are, as shown, spaced slightly from each other so as to allow for slight variations in the length of the elongated elements from which the rings 29 and 30 are formed and slight variations in the diameter of the recesses in which these rings are received. It will be apparent that the ends 26 and 27 of the ring 24 in the form shown in Fig. 2 could, if desired, be disposed in the space or area between adjacent ports 18 in lieu of being arranged within one of the ports as shown. Conversely, the form shown in Fig. 3 could be arranged using only one split ring in lieu of the two shown, this one ring being positioned so as to extend through a line running generally through the center of the ports 18.

Another modified form of my invention is shown in Fig. 4. In this form a single elongated element or a strip 35 is formed so as to provide two concentric annular portions or rings 36, 37. The elongated element 35 is positioned so that the ends 38, 39 thereof are disposed within one of the intake ports 18. The element 35 is further shaped to provide a portion 40 extending diagonally across the center of the port 18 between the ends 38 and 39 and connecting the two concentric rings 36, 37. The form shown in Fig. 4 provides two bracing portions extending across each of the ports 18, as in the form shown in Fig. 3.

In Fig. 5 there is shown another modified form of my invention in which two split rings or annular elements 41 and 42, each corresponding to the form shown in Fig. 2, are employed. The split rings 41 and 42 are arranged to extend across the intake ports 18 on opposite sides of a line extending through the center of the cross section of these

intake ports, as in the forms illustrated in Figs. 3 and 4. The ends 43 and 44 of the ring 41 are disposed within one of the intake ports 18, and the ends 45 and 46 of the other of the split rings 42 are disposed within an adjacent intake port 18. Corresponding to the arrangement shown in Fig. 2 one of the ends 43 of the ring 41 and one of the ends 45 of the ring 42 are deflected out of the line of the respective ring. In the specific form shown the end 43 is bent outwardly from the line of the ring 41 and the end 45 is bent inwardly from the line of the ring 42.

While I have shown and described specific embodiments of my invention I do not desire my invention to be limited to the particular constructions shown and described and I intend, by the appended claims, to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to cover said ports, said member having an annular recess therein intersecting said ports, said recess being formed in the face of said member adjacent said valve, and a ring-shaped element secured within said recess for bracing said valve.

2. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to engage one face of said member and to cover said ports, said member having an annular recess therein intersecting said ports, said recess being formed in said one face of said member, and a ring-shaped element secured within said recess, said element having one face disposed in the plane of said one face of said member for engaging said valve to brace said valve.

3. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to cover said ports, said member having an annular recess therein intersecting said ports, said recess being formed in the face of said member adjacent said valve, and a split annular element secured within said recess for bracing said valve.

4. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to cover said ports, said member having an annular recess therein intersecting said ports, said recess being formed in the face of said member adjacent said valve, and an element secured within said recess for bracing said valve, said element being formed into a split ring with the ends of said element spaced from each other.

5. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to cover said ports, said member having an annular recess therein intersecting said ports, said recess being formed in the face of said member adjacent said valve, and an element secured within said recess for bracing said valve, said element being formed into a split ring with the ends of said element spaced from each other, both ends of said split ring being disposed in a space between two adjacent ports.

6. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to cover said ports, said member having an annular recess therein intersecting said ports, said recess being formed in the face of said member adjacent said valve, and an element secured within said recess for bracing said valve, said element being formed into a split ring with the ends of said element spaced from each other, both ends of said split ring being disposed within one of said ports.

7. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to cover said ports, said member having an annular recess therein intersecting said ports, said recess being formed in the face of said member adjacent said valve, and an elongated element formed into a split ring and secured within said recess for bracing said valve, both ends of said elongated element being disposed within one of said ports, one of said ends of said element being bent from the line of said ring.

8. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to cover said ports, said member having two annular recesses therein intersecting said ports, said recesses being formed in the face of said member adjacent said valve, and two split annular elements each secured within a corresponding one of said recesses for bracing said valve.

9. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to cover said ports, said member having two annular recesses therein intersecting said ports, said recesses being formed in the face of said member adjacent said valve, and two elongated elements each formed into a split ring and each secured within a corresponding one of said recesses for bracing said valve, both ends of one of said elements being disposed within one of said ports, both ends of the other of said elements being disposed within another of said ports, one end of each of said elements being bent from the line of the ring formed by the respective element.

10. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to cover said ports, said member having an annular recess therein intersecting said ports along a line extending generally across the center of the cross section of said ports, said recess being formed in the face of said member adjacent said valve, and a ring-shaped element secured within said recess and extending generally across the center of the cross section of said ports for bracing said valve.

11. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to engage one face of said member and to cover said ports, said member having an annular recess therein intersecting said ports along a line extending generally across the center of the cross section of said ports, said recess being formed in said one face of said member, and a ring-shaped

element secured within said recess and extending generally across the center of the cross section of said ports, said element having one face disposed in the plane of said one face of said member for engaging said valve to brace said valve.

12. In a compressor having a cylindrical bore, a member for closing said bore, a plurality of annularly disposed intake ports extending through said member, a flat resilient intake valve arranged to cover said ports, said member having two concentric annular recesses therein intersecting said ports, said recesses being formed in the face of said member adjacent said valve, and means for bracing said valve during the compression stroke, said means including an elongated element formed

into two concentric rings and received within said recesses, each end of said element being disposed within one of said ports, said element including a portion connecting said two rings and extending across said port between said ends.

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The following references are of record in the file of this patent:

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