

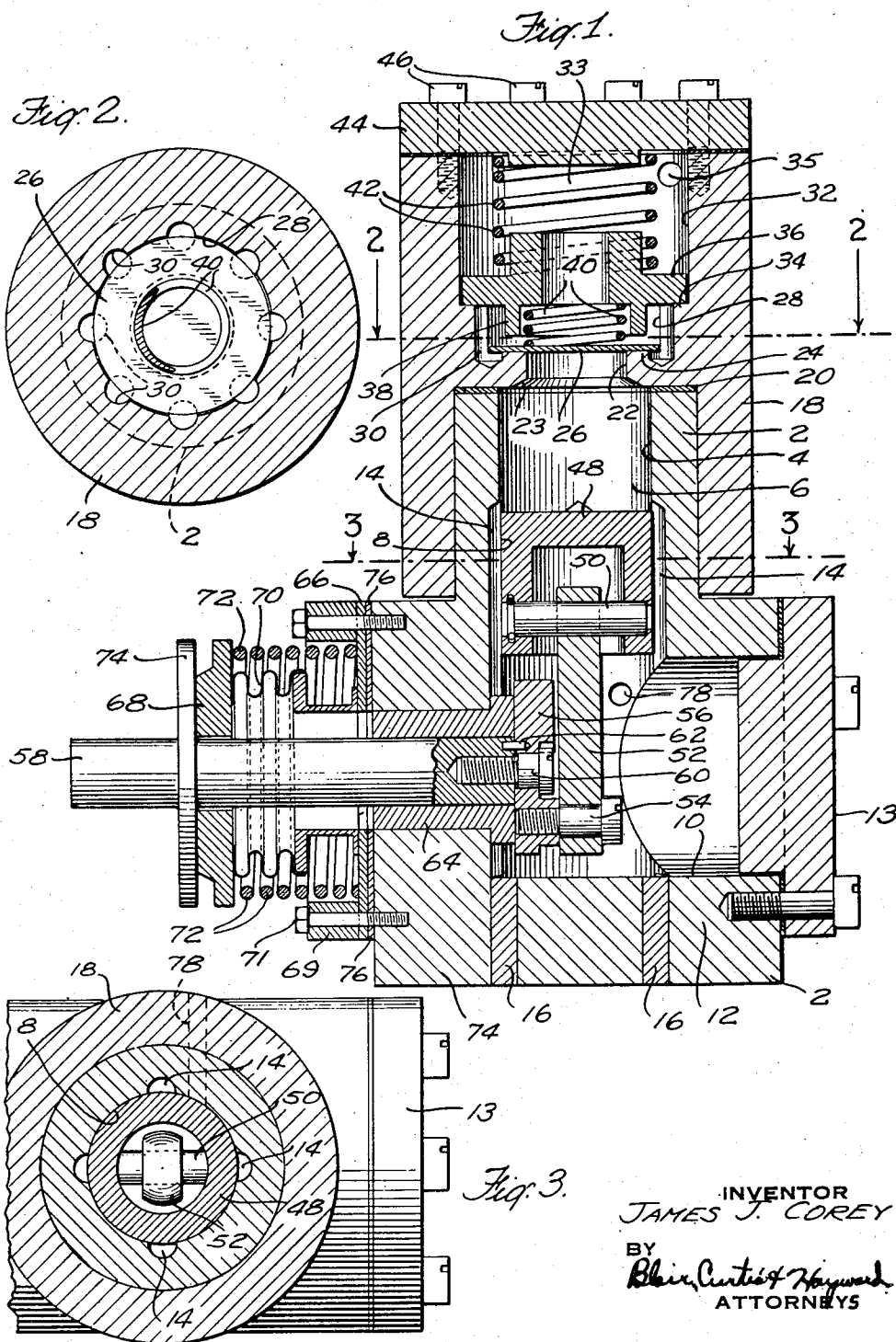
March 2, 1948.

J. J. COREY

2,436,854

COMPRESSOR

Filed May 30, 1945



INVENTOR
JAMES J. COREY
BY
Blair, Curtis & Hayward
ATTORNEYS

UNITED STATES PATENT OFFICE

2,436,854

COMPRESSOR

James J. Corey, Jackson Heights, N. Y.

Application May 30, 1945, Serial No. 596,619

5 Claims. (Cl. 230-172)

1

This invention relates to refrigeration, and more in particular to a high-speed, reciprocating compressor of small size and relatively high capacity.

An object of this invention is to provide a dependable and sturdy refrigerator compressor which is adaptable for high-speed operation and yet which has relatively high capacity. A further object is to provide a compressor which is easy and inexpensive to manufacture, simple and sturdy in construction and efficient and dependable in use. These and other objects will be in part obvious and in part pointed out below.

This invention accordingly consists in the features of construction, combinations of elements, arrangement of parts, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the drawings:

Figure 1 is a sectional view of a compressor which constitutes one embodiment of the invention; and,

Figures 2 and 3 are sectional views respectively on the lines 2-2 and 3-3 of Figure 1.

In the refrigeration art, difficulty has been encountered in providing a compressor which will operate with a very high speed and in a dependable manner for long periods of time. This is particularly true where it is desirable to provide a compressor of small size. One of the difficulties has been that the valve arrangements have been unsatisfactory; that is, valves which operate efficiently at very high speeds often are fragile or are quite complicated. Furthermore, even with some types of relatively simple valve arrangements, the cost of manufacturing is high. It is an object of the present invention to avoid the disadvantages of the prior art structures and to provide a compressor which will meet the demands for a compressor of the type referred to above.

Referring particularly to Figure 1 of the drawing, a cylinder block 2 is provided with a cylinder bore 4 having at the top a gas compression chamber 6 and below this a piston-guide portion 8. This cylinder bore is provided by boring from the head end of the cylinder block down through to near the bottom of the block. The cylinder block is also provided with a cross-bore 10 which intersects the cylinder bore and forms at the base of the cylinder bore a crankcase generally indicated at 12. Crankcase 12 is closed at the right by a cover plate 13. Extending from the crank case up along the sides of the cylinder

2

bore and evenly spaced thereabout are four refrigerant passageways 14 (see also Figure 3). Each of these passageways is formed prior to the boring of cylinder bore 4 by drilling a hole from the bottom of the cylinder block (Figure 1) upwardly through the block with the drill axis along a line which is later at the surface of the cylinder bore 4. After being drilled, the lower end of each bore 14 is plugged as at 16.

Enclosing the upper end of the cylinder block is a cylinder head 18 which is press-fitted onto the cylindrical upper end of the cylinder block and is held in place by a pair of sunken set screws (not shown). The upper end of the cylinder block is sealed by a sealing ring 20 which is tightly pressed between the annular mating surfaces of the two blocks. The cylinder head is bored from its upper end to provide adjacent the upper end of the compression chamber 16 a gas outlet passageway 22 which is concentric with the compression chamber and which has its lower end enlarged at the beveled edge 23. Surrounding the upper end of passageway 22, is an annular valve seat 24 upon which rests a thin metal valve disc 26.

As shown best in Figure 2, valve disc 26 is snugly received in a valve bore 28 which is larger than passageway 22. Equally spaced around the periphery of bore 28 are eight small bores 30 the lower ends of which (see Figure 1) extend below the level of valve seat 24. These bores are drilled prior to the forming of bore 28 and they have their axes along lines which are later at the outer surface of bore 28. Thus the forming of bore 28 cuts away the upper ends of these bores 30 to form semi-cylindrical channels which provide the gas outlet from valve seat 24 up and around the periphery of valve disc 26.

In the top of the cylinder head is a concentric bore 32 which forms a refrigerant outlet chamber 33 with a compressed gas outlet opening 35, and at the bottom of this bore 32 is an annular ledge 34 which forms the seat for a valve retainer 36. Valve retainer 36 has a central opening, and around this opening on the under side is a collar 38 which encloses a valve retaining compression spring 40. Normally valve retainer 36 is resiliently held against seat 34 by a relatively heavy compression spring 42, the upper end of which rests against a sealing cover plate 44. Cover plate 44 seals the upper end of bore 32 and is held in place by a plurality of stud bolts 46. Valve disc 26 is relatively light in weight as compared with valve retainer 36, and spring 40 is relatively light as compared with spring 42; thus,

the valve disc lifts easily and the valve retainer normally remains stationary, but under emergency conditions, the valve retainer is lifted.

Slidable in the cylinder bore 4 is a piston 48 which is connected through a pin 50 and a piston rod 52 to a crank pin 54 carried by a weighted crank member 56. Crank member 56 is attached to the end of crankshaft 58 by a stud bolt 60 and is held against turning by a dowel pin 62. Drive shaft 58 is snugly received and rotatable in a sleeve bearing 64 extending through the wall of the cylinder block. On the outside of the cylinder block, shaft 58 is sealed by a sealing assembly formed by a pair of rings 66 and 68 connected by expansible sleeve 70. Ring 66 and a packing gasket 67 are clamped against the cylinder block by a clamping ring 69 held in place by a plurality of stud bolts 71. A compression spring 72 is positioned between rings 66 and 68, and presses ring 68 against a flange 74 on shaft 58.

During use, refrigerant to be compressed enters the crank case 12 through an inlet 78, and at the end of each down-stroke of the piston, the gas flows up passageways 14 into compression chamber 6. Then, upon each up-stroke the gas is compressed; and at the extreme upper end of the stroke, the pressure is sufficient to unseat valve disc 26 so that the compressed gas flows through passageway 22 and thence radially under the edges of the disc into the lower ends of bores 30. The gas then passes upwardly past the edges of the valve disc and thence over the top of the valve disc past spring 40 and up the center of the valve retainer 36 into the refrigerant chamber 33. The compressed gas leaves chamber 33 through the refrigerant outlet 35.

Upon the first movement of the piston downwardly, valve disc 26 reseats, and a partial vacuum condition is created so that when the piston uncovers the upper ends of passageway 14, the refrigerant is quickly drawn into the compression chamber. Sufficient oil is provided to lubricate the parts and to maintain the proper seals. If an excessive amount of oil or other liquid enters the compression chamber, the final movement of the compression stroke lifts valve disc 26 and also lifts the valve retainer 36 all without causing damage to the structure and without undue load on the motor drive.

As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinabove set forth, or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a high-speed compressor of the type which may be used in a refrigeration system, the combination of, a cylinder block having a cylinder bore with a gas compression chamber at one end and a piston guide portion at the other end, a cylinder head block surrounding the bore in the cylinder block at the end of the gas compression chamber, said cylinder block having a cross-bore at substantially right angles to said cylinder bore and forming a crankcase, a crankshaft mounted coaxially with said cross-bore, a piston and piston rod assembly including a piston mounted in said cylinder bore and a piston rod connecting said piston to said crankshaft whereby rotation of the crankshaft reciprocates said piston in said cylinder bore between a gas inlet position and a gas outlet position, said cylinder block having a plurality of gas inlet passageways formed by a plu-

rality of bores substantially smaller than and parallel to said cylinder bore with their axes coincident with the wall surface of said cylinder bore, said gas inlet passageways extending from said crankcase to the compression chamber which is beyond said piston when said piston is in its gas inlet position, said cylinder head block having a gas outlet bore which is coaxially positioned with respect to said cylinder bore and is surrounded at its end opposite said compression chamber by an annular valve seat, a disc valve adapted to seat on said valve seat and thereby close the gas outlet bore, and a valve retaining assembly mounted in said cylinder head block and resiliently holding said valve disc in seated position.

2. In a high-speed compressor of the reciprocating piston type, the combination of, a cylinder assembly comprising, a cylinder block having a cylinder bore forming a gas compression chamber adjacent the head end of the bore and a piston guideway at the opposite end thereof, a plurality of gas inlet passageways each formed by a bore substantially less in diameter than said cylinder bore and intersecting the side wall of said cylindrical bore substantially along the piston guideway with each inlet passageway forming a gas inlet to the compression chamber from the opposite end of the cylinder bore, a cylinder head concentric with the cylinder bore and surrounding the head end of the bore in the cylinder block and having a gas outlet bore axially aligned with said cylinder bore thus providing a gas outlet from said gas compression chamber, said cylinder head having an outlet valve bore concentric with and of larger diameter than said gas outlet bore and at the end of said gas outlet bore opposite said compression chamber there being an annular valve seat surrounding said gas outlet bore, said cylinder head having a plurality of evenly spaced gas outlet passageways at the periphery of said outlet valve bore parallel to said outlet valve bore and coextensive axially, said passageways extending toward the compression chamber beyond the valve bore and thus forming recesses open to the outer edge of said valve seat, a valve disc positioned on said valve seat and providing a radial outlet valve at the end of said gas outlet bore, and a valve retainer assembly resiliently holding said disc valve in seated position.

3. Apparatus as described in claim 2 wherein said cylinder block has at the end opposite the compression chamber a cross-bore which is transverse to said cylinder bore and forms a crank chamber, a piston mounted to reciprocate in said cylinder bore, and a crank assembly mounted in said cross-bore to reciprocate said piston.

4. Apparatus as described in claim 2 wherein said valve retainer assembly comprises a coil compression spring resting at one end on said valve disc, a circular valve retainer bearing against the other end of said spring and having a central opening through which the gas passes, and a relatively heavy coil spring holding said valve retainer in position.

5. In a high-speed compressor of the reciprocating piston type, the combination of, a cylinder block having a cylinder bore extending from the cylinder head and forming a gas compression chamber adjacent the head and a piston guideway remote from the head, a cylinder head block having a recess which snugly receives the head end of said cylinder block and which has a gas outlet passageway concentric with the cylinder

5

bore, which passageway is surrounded at the end opposite the bore by an annular valve seat, said head block having a valve bore of larger diameter than said passageway and concentric therewith and providing a guideway for a valve member, a valve member formed by a thin disc seated on said valve seat and adapted to move from and to said valve seat in said valve bore, and a valve retainer assembly including a valve retainer member concentrically positioned with respect to said valve member and with substantially greater weight than said valve member, said valve retainer assembly including spring means resting on said valve retaining member and urging said valve member toward said valve seat, and also including spring means holding said valve retaining member resiliently in its normal position whereby the valve member is

6

raised during each cycle of operation of the compressor and said valve retainer member may be raised when there is excessive pressure against said valve member.

JAMES J. COREY.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
481,143	Hutchinson	Aug. 16, 1892
1,080,322	Brown	Dec. 2, 1913
1,411,054	Marshall	Mar. 28, 1922
1,454,347	Stoms	May 8, 1923
1,528,086	Scovel	Mar. 3, 1925