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Weatherhead et al.

[11] **3,797,969**

[45] **Mar. 19, 1974**

[54] **REFRIGERANT COMPRESSOR**

[75] Inventors: **Herman R. Weatherhead,** Dayton, Ohio; **William F. Gibson,** Hayward, Wis.

[73] Assignee: **Chrysler Corporation,** Highland Park, Mich.

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[21] Appl. No.: **282,639**

[52] **U.S. Cl.** **417/273**

[51] **Int. Cl.** **F04b 27/04**

[58] **Field of Search** 417/269, 270, 273, 533, 417/539; 74/50; 277/68, 74, 75; 91/493, 495

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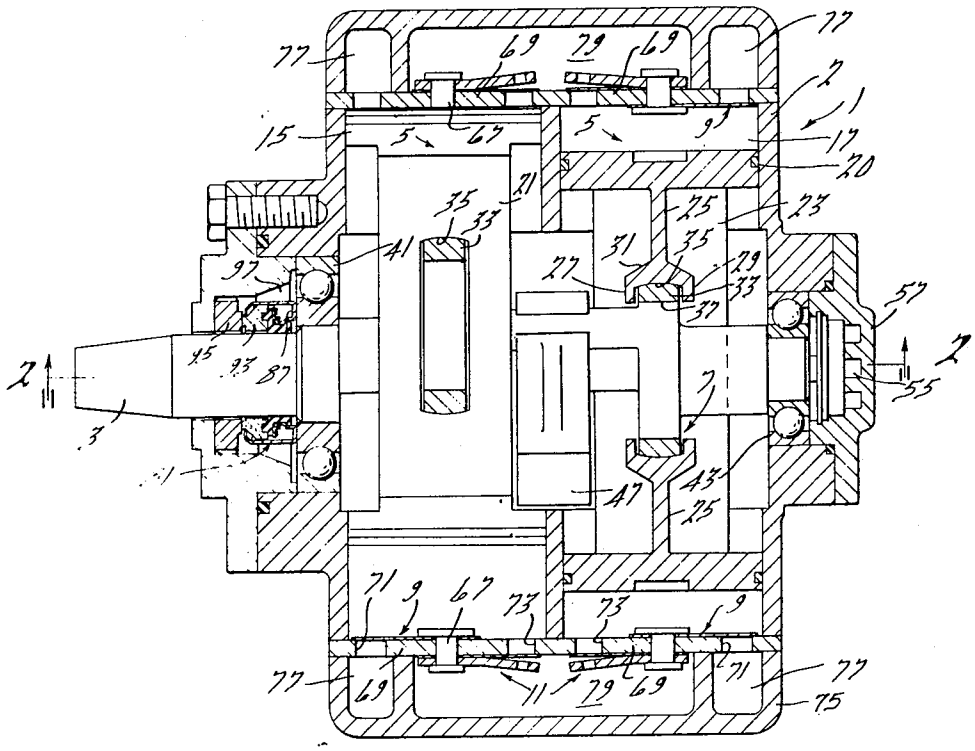
Primary Examiner—William L. Freeh

Assistant Examiner—Gregory P. LaPointe

[57] **ABSTRACT**

A compressor having two pairs of opposed pistons, the pistons of each pair being rigidly connected together for common reciprocable movement and yoke members connecting said pistons to a rotatable crankshaft.

9 Claims, 12 Drawing Figures



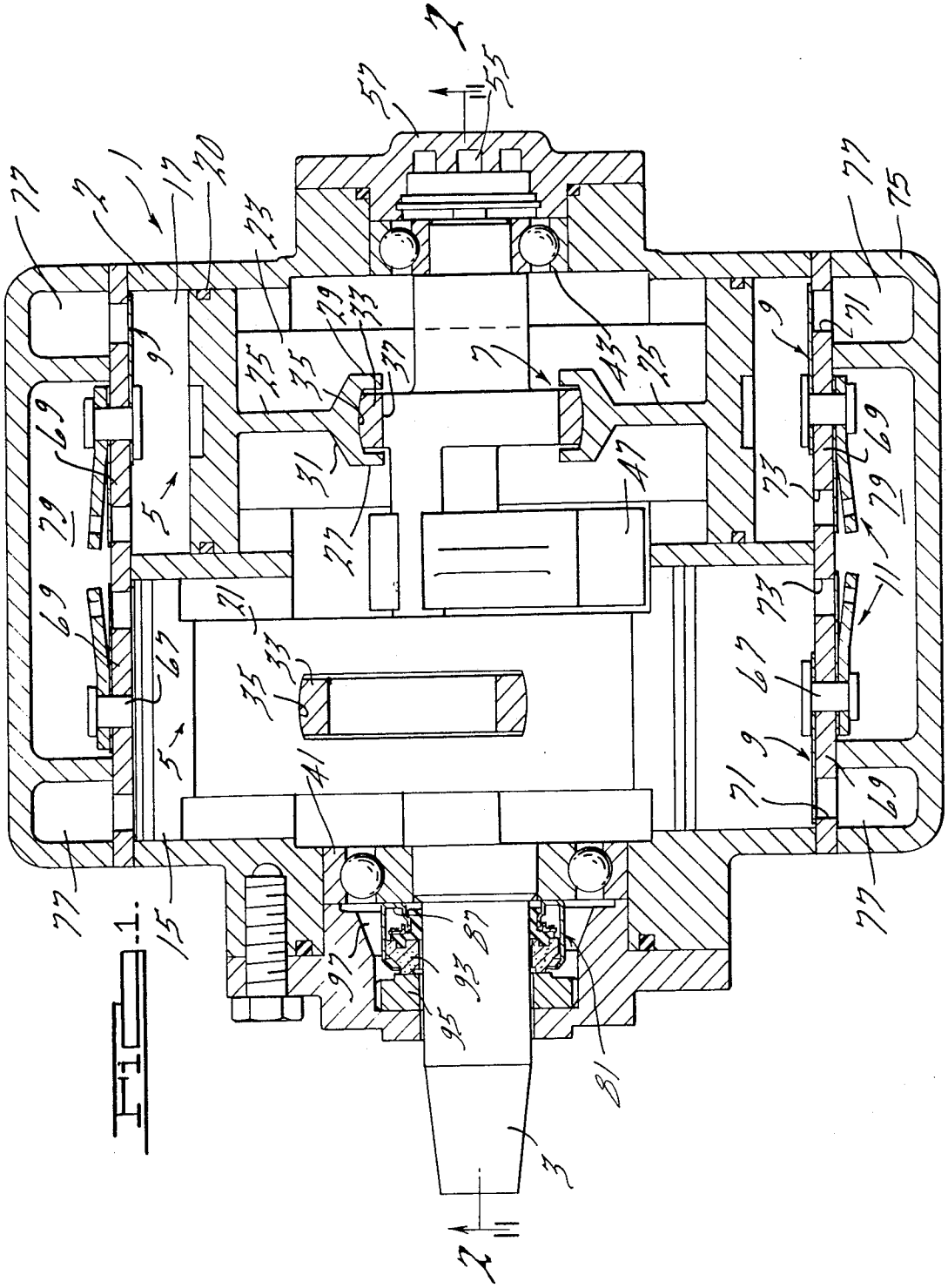


Fig. 1.

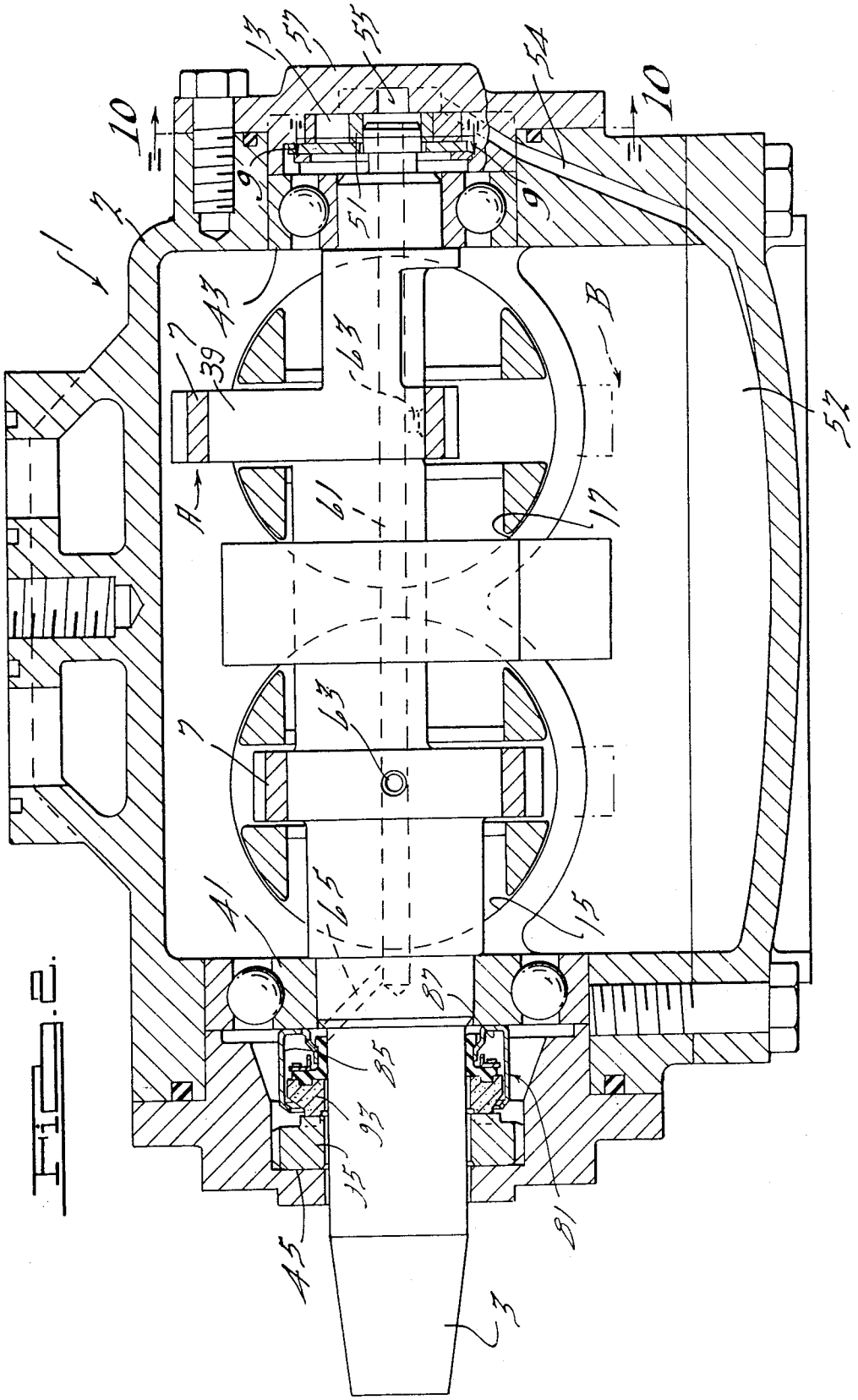


Fig. 2

FIG. 3.

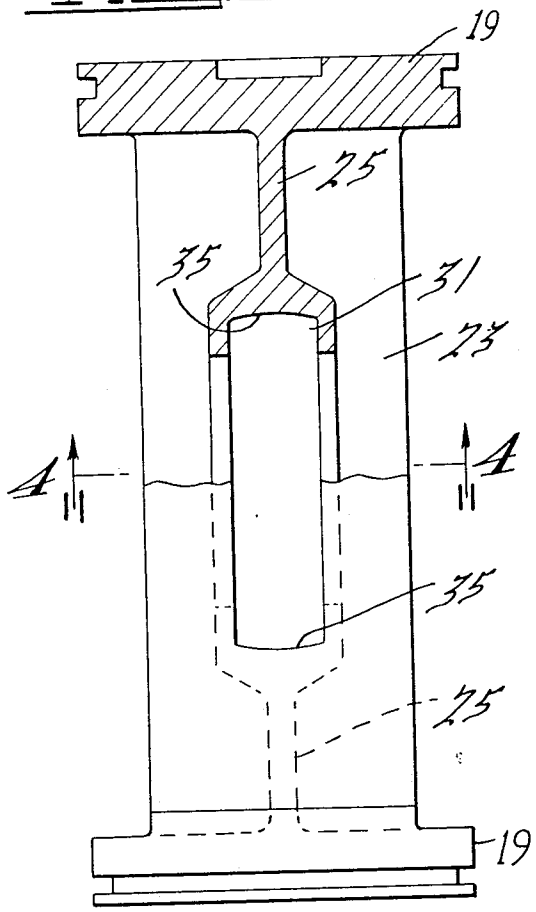


FIG. 5.

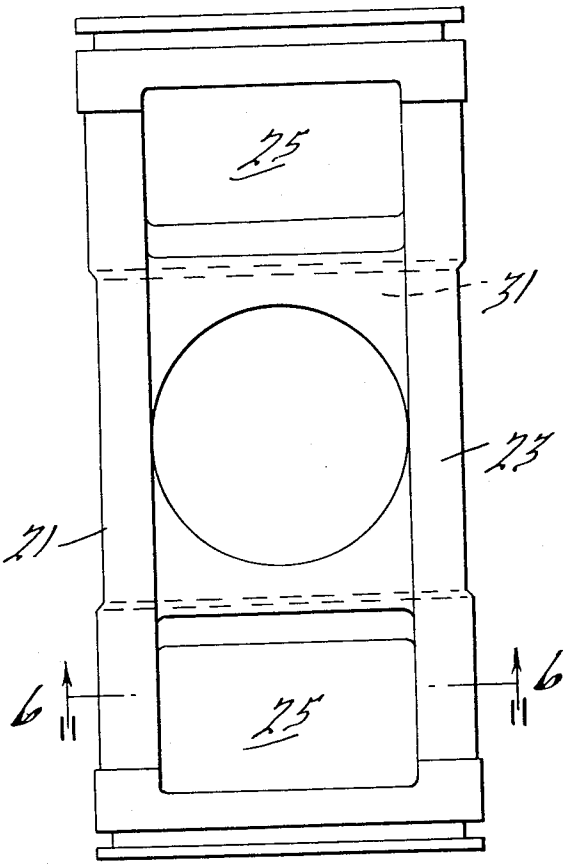
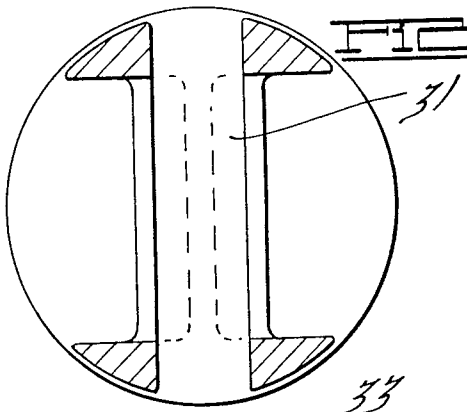


FIG. 4.



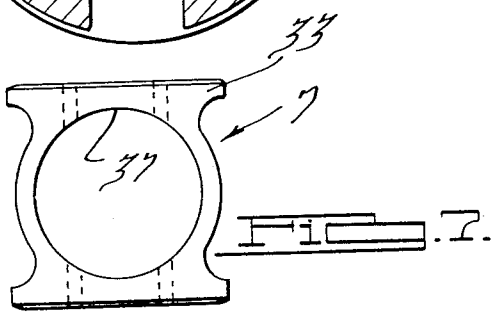
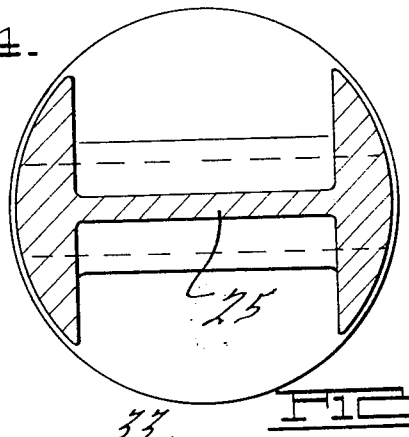


FIG. 7.

FIG. 6.



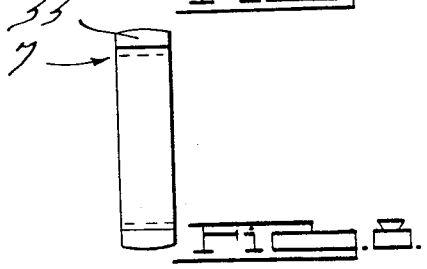


FIG. 8.

FIG. 12.

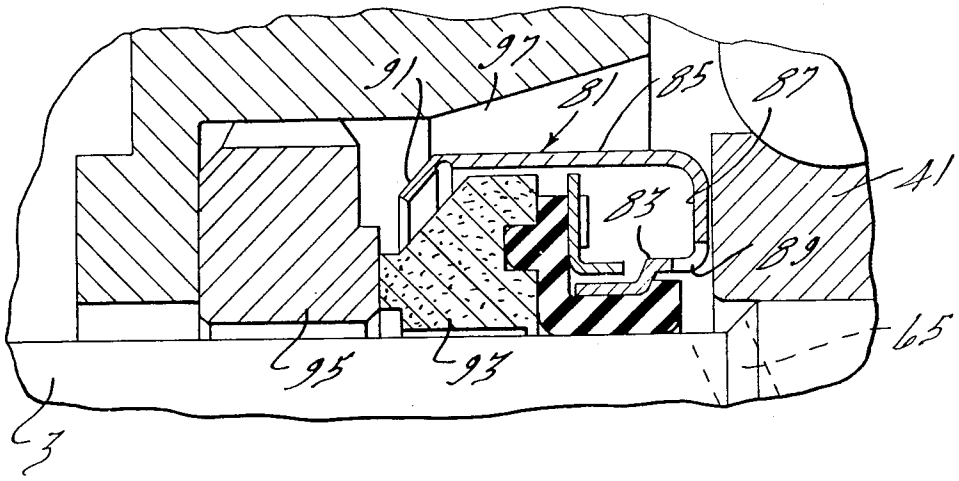
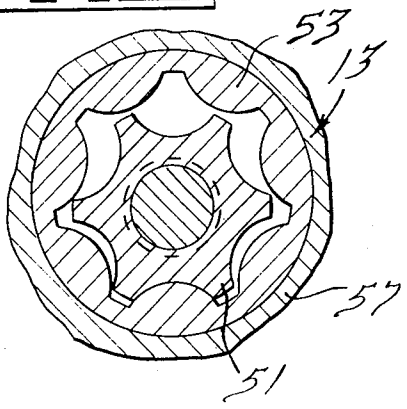


FIG. 9.



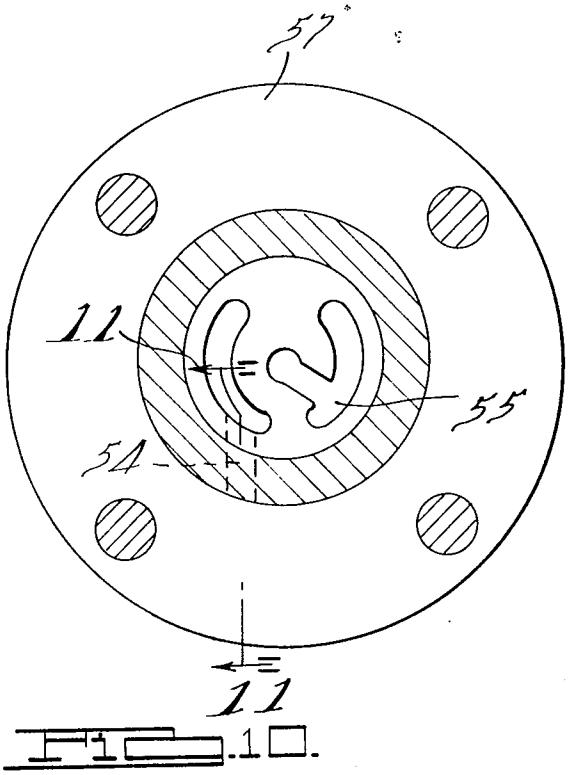


FIG. 10.

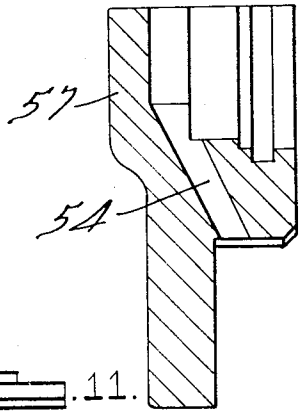


FIG. 11.

REFRIGERANT COMPRESSOR

BACKGROUND OF THE INVENTION

This invention relates to a refrigerant compressor for an air conditioning system, and more particularly to a refrigerant compressor for an automotive air conditioning assembly.

Automotive air conditioning systems include a refrigerant compressor driven by the automotive vehicle engine. The drive from the engine to the compressor is normally accomplished by a belt driven by the engine and a magnetic clutch connected between the belt and the compressor. The compressors normally include a plurality of pistons driven in one of several different manners. For example, the pistons could be driven by piston rods mounted on a driven crankshaft or they could be driven by drive rods actuated on a rotating swash plate. The present invention is directed to a compressor utilizing a scotch yoke to effect movement of the pistons.

BRIEF SUMMARY OF THE INVENTION

Briefly, this invention relates to a compressor for a refrigeration system, the compressor having two pairs of opposed reciprocable pistons connected to a rotatable crankshaft.

One of the primary objects of this invention is to provide a refrigerant compressor in which opposed pistons are connected together, thus reducing the number of separate piston components necessary.

Another object of this invention is to provide a compressor such as described which utilizes a scotch yoke to effect movement of the pistons.

A further object of the invention is to provide a compressor of the type described which is effective in operation and efficient in operation.

Other objects and advantages of this invention will be made apparent as the description progresses.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings in which one of various possible embodiments is illustrated,

FIG. 1 is a horizontal section through a compressor constructed in accordance with this invention;

FIG. 2 is a slightly enlarged section taken along line 2—2 of FIG. 1;

FIG. 3 is an enlarged horizontal section, certain portions being broken away and shown in section, of a double piston component used in this invention;

FIG. 4 is a section taken along line 4—4 of FIG. 3;

FIG. 5 is a side view of the piston shown in FIG. 3;

FIG. 6 is a section taken along line 6—6 of FIG. 5;

FIG. 7 is an elevation of the yoke used in the compressor;

FIG. 8 is a side view of the yoke shown in FIG. 7;

FIGS. 9 and 10 are sections taken along line 9—9 and 10—10 of FIG. 2;

FIG. 11 is a section taken along line 11—11 of FIG. 10; and

FIG. 12 is an enlarged fragmentary view of FIG. 2.

Corresponding parts are shown by corresponding reference characters throughout the several views of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, a compressor of this invention is generally indicated at 1. Basically, the compressor 1 includes a housing 2, a crankshaft 3, piston member 5, yokes 7, suction valves 9, discharge valves 11, and an oil pump 13.

More specifically, the housing 1 is formed to have two elongated cylinders 15 and 17 therein. The piston members 5 are located in the cylinder 15 and 17. Each piston member 5 comprises piston heads 19 located at opposite ends thereof. Rings 20 are provided in heads 19. Side columns or struts 21 and 23 are joined adjacent piston heads 19 by their sectional webs 25. Between webs 25 the piston member is formed into two spaced apart web portions 27 and 29 which constitute part of a track or guide 31. This track or guide is generally rectangular and extends into and through each side column 21 and 23.

Each track 31 provides a path and guideway for a yoke 7. The track 31 extends perpendicularly to the longitudinal axis and movement of the piston member 5. Inside each track 31 is a yoke 7. Each yoke includes an elongated contact portion 33 having a slightly curved surface when viewed in the direction of the track 31 which mates with a curved surface on the portions 35 of the track. Between the contact portions 33 is an annular bearing 37 in which a crank 39 of crankshaft 3 is positioned.

The crankshaft 3 is mounted at opposite ends thereof in the housing 1 by bearings 41 and 43 and a seal 45. The crankshaft 3 has two cranks 39, one for each piston member 5, and offset arcuately by 90°. As will be made apparent, this 90° offset permits the four compression strokes to be spaced 90° apart. Inasmuch as the two cranks are not opposite one another a counterweight 47 is connected to the crankshaft between the cranks.

The left hand end of the crankshaft 3, as viewed in FIGS. 1 and 2, is adapted to be connected to a driver mechanism (not shown) and the right hand end is provided with oil pump 13. Pump 13 includes a driving inner member 51 on the end of the crankshaft and a driven outer member 53 driven by inner member 51. Oil is drawn from the sump area 52 through passage 54 to the pump and is forced from the decreasing volume between the driving and driven members through passages 55 in an end plate 57.

The passages 55 provide a path for lubricant to a passage 61 extending axially through crankshaft 3. Radially extending outlet passages 63 from axial passages 61 permit the delivery of oil to the bearings 37. A port 65 extends from the left end of the passage 61 to the seal 45 for lubricating the latter and the bearing 41.

As shown, seal 45 includes an annular retainer 81 having an inner ring portion 83 connected to an outer ring portion 85 by a radially extending wall 87. Openings 89 are provided at the juncture of wall 87 and portion 83 to permit the ingress of lubricating oil into the retainer 81. The oil flows along ring 85 to an inwardly angled flange 91 which directs the oil inwardly onto the interface between rotating seal member 93 and fixed abutment member 95. The oil then flows outwardly through space 97 to the bearing 41.

Each end of the cylinders 15 and 17 is provided with a suction valve 9 and a discharge valve 11. A single fastener 67 extends through the valve seat 69 and secures the valves 9 and 11 so that they normally close suction and discharge ports 71 and 73. A manifold 75 includes

cavities 77 and 79 for delivering refrigerant gas to and from the suction and discharge ports.

Operation of the apparatus is as follows:

As the crankshaft 3 is rotated, the cranks move in a circular path. However, the cylinders 15 and 17 confine the movement of the piston members 5 to a straight line reciprocal movement. The yoke members 7 transfer the vertical component of the rotary movement of the cranks to the pistons. The horizontal component of the crank movement is utilized to slide the yokes 7 in the tracks 31 in the pistons. Thus, as the cranks move from a 3 o'clock or 90° position to a 9 o'clock or 270° position the yokes move from the position shown at A in FIG. 2 to a position shown by dotted lines at B in such Figure. When the cranks are in the 90° and 270° positions, the pistons are located at the midpoint of their stroke. At the 180° and 0° positions the pistons are at their fully retracted and maximum compression positions.

In view of the foregoing it will be seen that the several objects of this invention are achieved.

Although only one embodiment of the invention has been disclosed and described, it is apparent that other embodiments and modifications of the invention are possible.

We claim:

1. A compressor for a refrigeration system comprising a housing, two pairs of opposed cylinders, a reciprocable member having pistons on opposite ends thereof mounted for reciprocable movement in each pair of opposed cylinders, each cylinder having a suction valve for admitting refrigerant gas to be compressed and a discharge valve for permitting the discharge of compressed refrigerant, a crankshaft, means mounting said crankshaft in said housing for rotational movement and means connecting said crankshaft to said reciprocable members for imparting reciprocating movement to said members upon rotation of said crankshaft, said means mounting said crankshaft for rotational movement including at one end of said shaft, a bearing and a seal, said seal including an annular retainer having an inner ring and an outer ring extending generally axially of said shaft, a radially extending wall portion joining said rings, a plurality of openings in said retainer at the juncture of said radially extending wall and said inner ring, and means for delivering lubricant to said retainer at said openings, said openings being adapted to permit the flow of lubricant therethrough to said outer ring.

2. A compressor as set forth in claim 1 wherein said pistons of each reciprocable member are joined by side columns, webs extending between said side columns, guide means on said webs extending normal to the direction of movement of said pistons.

3. A compressor as set forth in claim 2 wherein said means connecting said crankshaft to said reciprocable members comprise a pair of yokes, one for each member, slidably mounted on said guide means.

4. A compressor as set forth in claim 1 wherein said outer ring of said retainer has an inwardly angle lip for directing lubricant flowing along said outer ring inwardly, said seal including a rotatable bearing member having an interface with a fixed member, said lubricant being directed to said interface.

5. A compressor as set forth in claim 4 wherein said means mounting said crankshaft for rotation includes, at the other end of said shaft, a bearing, a pump being attached to said other end of said shaft, said housing including a lubricant sump, a passage in said housing connecting said sump to said pump, a passage extending through said shaft from said pump to a point adjacent said openings in said retainer.

6. A compressor as set forth in claim 5 wherein said pistons of each reciprocable member are joined by side columns, webs extending between said side columns, guide means on said webs extending normal to the direction of movement of said pistons.

7. A compressor as set forth in claim 6 wherein said means connecting said crankshaft to said reciprocable members comprise a pair of yokes, one for each member, slidably mounted on said guide means.

8. A compressor as set forth in claim 7, further including a counter weight connected to said crankshaft, one crank of said crankshaft preceding the other crank by 90° in location.

9. A compressor for a refrigeration system comprising a housing, two pairs of opposed cylinders, a reciprocable member having pistons on opposite ends thereof mounted for reciprocable movement in each pair of opposed cylinders, each cylinder having a suction valve for admitting refrigerant gas to be compressed and a discharge valve for permitting the discharge of compressed refrigerant, a crankshaft, means mounting said crankshaft in said housing for rotational movement and means connecting said crankshaft to said reciprocable members for imparting reciprocating movement to said members upon rotation of said crankshaft, said pistons of each reciprocal member being joined by side columns, webs extending between said side columns, guide means on said webs extending normal to the direction of movement of said pistons, said means connecting said crankshaft to said reciprocal members comprising a pair of yokes, one for each member, slideably mounted on said guide means, each said guide means having a slightly curved surface when viewed in a direction normal to direction of movement of said pistons, each yoke including elongated contact portions having slightly curved surfaces when viewed in said direction normal to the direction of movement of said pistons, said curved portions of said yokes engaging and mating with said curved surfaces of said guide means.

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