May 27, 1941. A. A. KUCHER 2,243,465

REFRIGERATING APPARATUS

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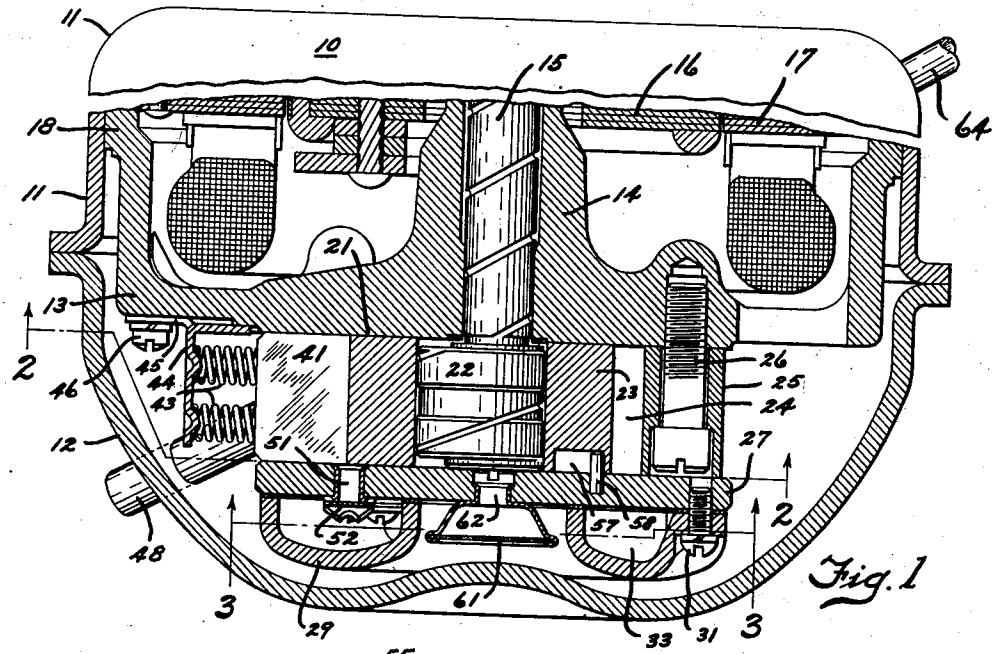


Fig. 1

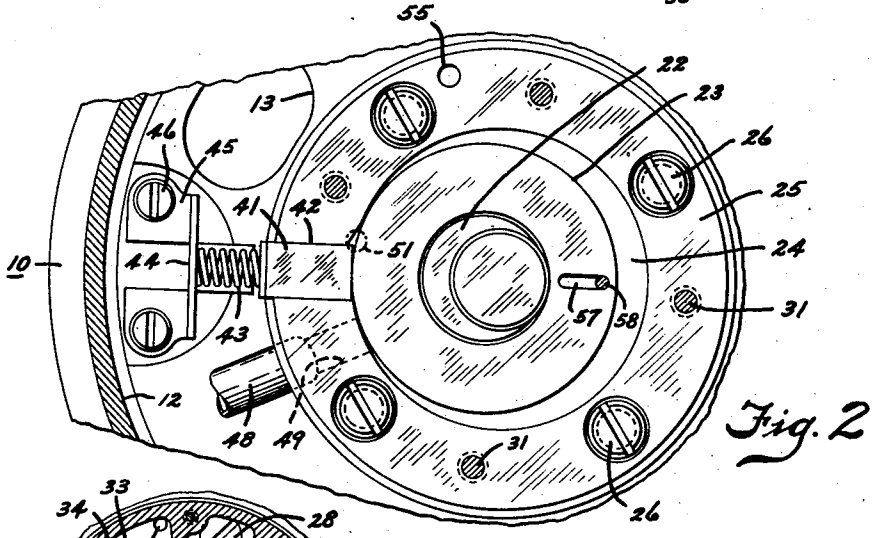


Fig. 2

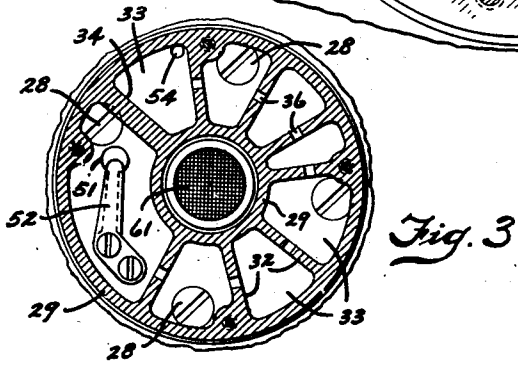


Fig. 3

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REFRIGERATING APPARATUS

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4 Claims. (Cl. 230—145)

This invention relates to compressors and particularly compressors for refrigerating systems.

An object of my invention is to provide an improved rotary compressor for refrigerating systems.

Another object of my invention is to provide a rotary compressor employing an eccentric to gyrate or oscillate a rotor ring within a cylinder with means for preventing rotation of the rotor ring relative to and within the cylinder during its gyration therein.

A further and more specific object of my invention is to provide a so-called loose or free ring of a rotary compressor with an elongated groove that receives a stationary pin secured to an end plate of the compressor cylinder which groove permits the ring to gyrate within the cylinder and which pin prevents rotation of the ring relative to the cylinder during the gyratory movement of the ring within the cylinder.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a vertical sectional view through a sealed motor-compressor unit having my invention embodied therein;

Fig. 2 is a transverse sectional view of the compressor part of the unit shown in Fig. 1 and is taken on the line 2—2 thereof; and

Fig. 3 is a transverse sectional view of a portion of the unit taken on the line 3—3 of Fig. 1.

Referring to the drawing, for illustrating my invention, I have shown in Fig. 1 thereof a sealed motor-compressor unit, generally represented by the reference character 10, adapted to circulate a refrigerating medium to and from an evaporator of a refrigerating system. The sealed unit 10 comprises an upper dome-shaped housing 11 and a lower housing 12 bolted or otherwise suitably secured to housing 11 to form a sealed enclosure. A metal spider-like member 13 has a central vertically elongated portion 14 forming a bearing for a shaft 15. The upper end of shaft 15 carries a motor rotor 16 which rotates within a motor stator 17 secured to the upstanding walls 18 of member 13. The bottom horizontal surface of member 13 is finished and provides one flat wall 21 of a compressor cylinder. Shaft 15 extends through the wall 21 at the bearing portion 14 of metal member 13 and has an eccentric 22 integrally formed thereon. A rotor ring 23 having a continuous or unbroken outer cylindrical surface surrounds the eccentric 22 and is located in a cylinder chamber 24 provided in an annular metal member 25 which is secured to member 13 by a plurality of bolts 26. The ring 23 is relatively thick and is of smaller allover diameter than the diameter of the cylindrical wall of the cylinder chamber 24 to thereby permit the ring to be gyrated within the chamber. A plate 27, which cooperates with the flat bottom wall 21 of member 13, provides another flat wall of the cylinder chamber 24 and is secured to the annular metal member 25 by a plurality of bolts 28 (see Fig. 3). A housing 29 is secured to plate 27 by a plurality of screws 31 and is provided with a plurality of webs 32 (see Fig. 3) which form in conjunction with plate 27 a plurality of chambers 33. All webs 32 of housing 29 except the one web 34 have an opening 36 therein to permit communication therebetween for a purpose to be hereinafter described. A divider block 41 extends through an opening 42 cut in member 25 (see Fig. 2) and is pressed against the rotor ring 23 by a pair of springs 43 which springs are supported by a backing plate 44 having ears 45 secured to member 13 by the bolts 46. The divider block 41 is separate from and independent of ring 23 and is adapted to abuttingly engage the continuous outer surface of the ring. Refrigerant or other medium to be compressed by the compressor portion of unit 10 may flow into the cylinder 24 through a pipe 48, which is sealed to the wall of the lower housing 12, and through an inlet passage 49, cut in the annular member 25, leading to the interior of the cylinder chamber 24. It will be noted that the passage 49 communicates with cylinder 24 adjacent the divider block 41 and that I have provided an outlet passage 51 upon the opposite side of the divider block 41. The passage 51 is provided with a discharge check valve device 52 of any suitable or conventional construction and which is located within one of the chambers 33 of housing 29 and which is attached to the under side of plate 27 (see Fig. 3). It will also be noted that I have provided a hole 54 (see Fig. 3) which extends through the plate 27 and registers with a hole 55 (see Fig. 2) extending through the annular member 25. These registering holes 54 and 55 are arranged in registration with a bore (not shown) provided in a web portion of spider casing or member 13.

In order to prevent rotation of the ring 23 relative to the cylindrical wall of the chamber 24 during gyration or oscillation thereof within the cylinder, I cut an elongated notch 57 in the lower

flat surface of ring 23 which notch receives a peg or pin 58 staked or otherwise suitably secured to the flat chamber wall or plate 27. It is to be understood that the compressor portion of sealed unit 10 is submerged in a body of oil contained in the reservoir formed by the lower housing 12. Thus the eccentric 22 formed on shaft 15 and the shaft itself may be provided with spiral grooves for directing oil into contact with the outer surface of eccentric 22 and into contact with the shaft bearing surfaces. The lubricant from the oil reservoir may flow through a screen 61 and a passage 62, provided in the central part of plate 27, into the inner cylindrical chamber of ring 23 which contains the eccentric 22. A pipe 64 sealed to the upper part of the dome housing 11 communicates with the interior of unit 10 and is adapted to convey refrigerant compressed by the compressor portion of unit 10 therefrom and into a condenser.

During operation of unit 10 the motor thereof causes rotation of shaft 15 about the axis of the cylindrical wall of chamber 24 and consequently the eccentric 22 formed on the shaft is rotated within the cylindrical inner surface of ring 23. Since the axis of eccentric 23 is offset relative to the axis of shaft 15 and the cylinder chamber wall, its rotation within the ring 23 causes this ring to gyrate or oscillate within the cylinder 24. The gyration or oscillation of ring 23 permits gaseous refrigerant to be drawn into the cylinder 24 from the passage 49 and this refrigerant is compressed in the cylinder by the gyratory movement of ring 23. The compressed refrigerant is forced from the cylinder 24 through the passage 51 and discharge valve device 52 from where it flows into the one chamber 33 adjacent the imperforate web 34 and thence through the openings 36, provided in the webs 32 of housing 29, and through the plurality of chambers 33 to the hole 54. The compressed refrigerant flows through the registering holes 54 and 55 and through the hole in the web portion of spider member 13 to a point above the level of oil in unit 10 and thence outwardly of the unit through the pipe 64. During gyration of ring 23 within cylinder 24 the elongated notch or groove 57 therein is moved from one side to the other side of peg or pin 58 and this pin prevents rotation of the ring 23 relative to and within cylinder 24 to thus limit movement of the ring 23, by rotation of eccentric 22, to a gyrating motion. Also, during gyration of ring 23 within the cylinder chamber 24 the divider block 41 is reciprocated due to its abutting engagement with the continuous outer surface of ring 23. The lower housing 29 and the series of chambers 33 provided thereby form a silencing device to muffle the noise created by refrigerant being discharged from the compressor and serves to dissipate the latent heat of compression of the refrigerant to oil surrounding this chamber forming housing.

From the foregoing, it will be seen that I have provided an improved rotary compressor unit and that by limiting movement of the rotor ring within the cylinder to a gyratory motion as described, I prevent unnecessary wear of operating parts of the compressor. My improvement permits maintenance of all the desirable characteristics of a rotary compressor structure of the type disclosed while at the same time prolongs the life of operating parts thereof. The simplified and inexpensive arrangement disclosed is particularly applicable to the so-called free ring type rotary compressors, and in this respect I wish to distinguish my invention from those types of rotary compressors wherein the divider block is carried by or mounted in the rotor ring.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In combination, a compressor having a plurality of walls forming a chamber provided with an inlet and an outlet, a ring disposed within said chamber and having an outer surface of smaller diameter than said chamber, means disposed within said ring and located eccentrically with respect to the axis of said chamber, means for rotating said eccentrically located means about the axis of said chamber to gyrate said ring therein, a divider block separate from and independent of said ring located in a wall of said chamber intermediate said inlet and said outlet thereof on one side of said eccentric, means forcing said divider block into abutting engagement with the outer surface of said ring whereby the block is reciprocated by the gyratory movement of said ring, and means preventing rotation of said ring relative to said chamber during gyration thereof within the chamber, said last named means being offset relative to the axis of said chamber and disposed entirely on the side of said eccentric opposite said block.

2. In combination, a compressor having a plurality of walls forming a cylinder provided with an inlet and an outlet, a ring disposed within said cylinder and having an outer surface of smaller diameter than said cylinder, means disposed within said ring and located eccentrically with respect to the axis of said cylinder, means for rotating said eccentrically located means about the axis of said cylinder to gyrate said ring therein, a divider block separate from and independent of said ring located in a wall of said cylinder intermediate said inlet and said outlet thereof on one side of said eccentric, means forcing said divider block into abutting engagement with the outer surface of said ring whereby the block is reciprocated by the gyratory movement of said ring, said ring having an elongated groove therein disposed on the side of said eccentric opposite said block, the center line of elongation of said groove being in alignment with the center of said block and with the axis of said cylinder when the point of greatest eccentricity of said ring is in contact with the center point of the inner surface of said block, and stationary means located within the groove in said ring for preventing rotation of said ring relative to said cylinder during gyration thereof within the cylinder.

3. In combination, a compressor having two spaced apart flat walls and a cylindrical wall extending therebetween to form a chamber, said chamber having an inlet and an outlet in certain of its walls, a relatively thick ring disposed within said chamber and having an outer surface of smaller diameter than said cylindrical chamber wall, means disposed within said ring and located eccentrically with respect to the axis of said cylindrical chamber wall, means for rotating said eccentrically located means about the axis of said cylindrical chamber wall to gyrate said ring within said chamber, a divider block separate from and independent of said ring located in said chamber cylindrical wall intermediate said chamber inlet and outlet on one side of said eccentric,

spring means forcing said divider block into abutting engagement with the outer surface of said ring whereby the block is reciprocated by the gyratory movement of said ring, a side of said ring adjacent one chamber flat wall having an elongated groove therein disposed on the side of said eccentric opposite said block, the center line of elongation of said groove being in alignment with the center of said block and with the axis of said cylinder when the point of greatest eccentricity of said ring is in contact with the center point of the inner surface of said block, and stationary means projecting into said chamber from its said one flat wall and located within the groove in said ring for preventing rotation of said ring relative to said cylindrical chamber wall during gyration thereof within the chamber.

4. In combination, a rotary compressor having a compressor chamber, said compressor chamber comprising spaced apart side walls and a circumferential wall, a movable compressor ring of smaller diameter than said compressor chamber and disposed between and in contact with the side walls of said compressor chamber and adapted to gyrate therein, inlet and outlet ports for said compression chamber, a divider block yieldingly held against the circumference of said movable compressor ring and adapted to maintain contact with the ring during movements thereof, eccentric means for gyrating said compressor ring within said compressor chamber whereby to cause compression of a fluid thereby, and means traversing one edge surface of the ring and the side wall contacting therewith for limiting circumferential movement of said ring within said chamber, said last named means being located entirely on one side of the axis of said chamber about which said piston gyrates and said ring being freely rotatable with regard to said divider block except for said last named means.

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