July 5, 1966 R. W. AYLING 3,259,307

HERMETIC REFRIGERANT COMPRESSORS

Filed May 28, 1964

FIG. 1.

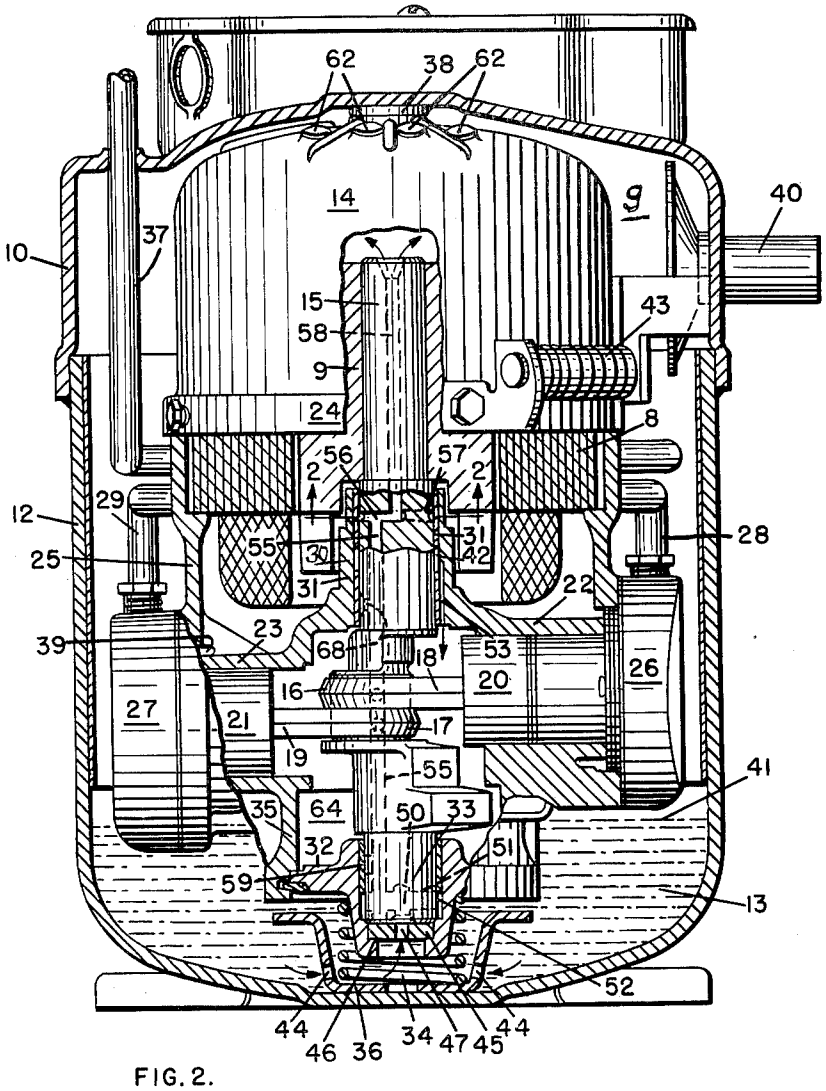
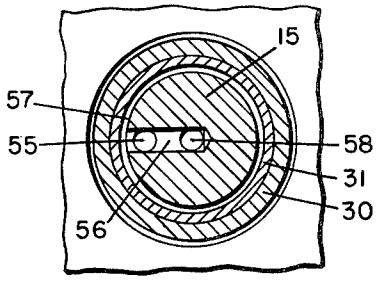


FIG. 2.



INVENTOR:

ROBERT W. AYLING,

BY Robert J. Palmer

ATTORNEY

United States Patent Office

3,259,307

Patented July 5, 1966

3,259,307

HERMETIC REFRIGERANT COMPRESSORS

Robert W. Ayling, Staunton, Va., assignor to Westinghouse Electric Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

Filed May 28, 1964, Ser. No. 370,962
2 Claims. (Cl. 230—206)

This invention relates to lubricating systems of hermetically sealed, refrigerant compressors, and to means for venting refrigerant gas from such systems.

It is common practice to lubricate the bearings of a hermetically sealed, refrigerant compressor having an upper motor compartment, a lower crankcase compartment, and a vertically extending crankshaft, by pumping oil from a reservoir in the bottom of the crankcase compartment, through a vertically extending passage, and radial passages in the crankshaft, to the bearings. In such compressors, refrigerant is mixed with the oil, and during operation, refrigerant gas is supplied with the oil to the bearings, preventing adequate lubrication of the latter. It has been proposed, as disclosed in the U.S. Patent No. 3,098,604, to place the vertically extending oil passage in the crankshaft, off-center so that the heavier oil is moved by centrifugal force through the radial passages to the bearings, and to vent the lighter refrigerant gas through an inclined passage in the crankshaft which crosses the vertical passage, and extends to the periphery of the crankshaft, into the motor compartment. A disadvantage of such a vent system is that when the pressure within the motor compartment is substantially less than the suction pressure of the compressor, oil may flow through the vent passage into the motor compartment. The motor of such a compressor usually has a motor cover with small openings through which suction gas passes on its way to the suction side of the compressor, and the size of these openings determines the pressure drop through them, and the pressure within the motor compartment.

It has also been proposed to arrange such a vent passage that it vents the gas into the crankcase compartment. A disadvantage of this is that crankcase pressure may vary during operation, and may be sufficient to blow gas through the lubrication passages, causing loss of adequate lubrication.

This invention improves such lubrication and gas venting systems by placing an annular groove in the crankshaft at the upper bearing of a compressor, by providing a radial passage which connects with this groove and with the off-center oil passage, and providing a vent passage on the axis of the crankshaft which connects at its lower end with the radial passage, and which has an open upper end at the upper end of the crankshaft. Venting occurs when trapped gas is forced by oil pressure towards the center of rotation, escaping through the central vent passage. This system is less critical to motor cover pressure drops than in systems having vent passages that cross the shaft axis, and is not affected by crankcase pressure variations.

An object of this invention is to improve systems for venting gas from lubricating systems of hermetically-sealed, refrigerant compressors.

This invention will now be described with reference to the annexed drawings, of which:

FIG. 1 is a side view, partially in section, and with the lower portion of the motor cover removed, of a refrigerant compressor embodying this invention, and

FIG. 2 is a section through the crankshaft of the compressor, along the lines 2—2 of FIG. 1.

An upper shell 10 around a motor compartment 9, is attached to a lower shell 12, the lower portion of the

latter extending around a crankcase compartment 64 which has an oil sump 13 in its bottom. An electric motor 8, having a cover 14, has a rotor attached to the upper end portion of a vertically extending crankshaft 15 which has throws 16 and 17 attached to piston rods 18 and 19 respectively, of pistons 20 and 21 respectively, in compressor cylinders 22 and 23 respectively. The cover 14 is attached by a strap 24, a coiled spring 43, and another similar spring which is not seen, to the shell 10. The springs oppose the rotational torque of the motor. The cylinders 22 and 23 are cast integral with an inner shell 25, and have heads 26 and 27 respectively, which contain the usual suction and discharge valves which are not shown, and have suction ports 39. Discharge gas tubes 28 and 29 are connected to the cylinder heads 26 and 27 respectively, and to outlet tube 37. Formed to the cylinders above the latter is a bearing housing 30 around spaced-apart bearings 31 around the shaft 15 between the motor 8 and the cylinders 22 and 23. The bearings 31 have a passage 42 therebetween which opens into a vent passage 53 connecting with the crankcase compartment 64. Joined to the cylinders 22 and 23 below the latter is a sleeve 35, to the lower portion of which is attached another bearing housing 32 around bearings 33 for the lower end portion of the crankshaft 15.

The lower end of the housing 32 is cylindrical, and has therearound the upper portion of a coiled spring 34, the lower end of which rests on the bottom of a pan 36 on the bottom of the shell 12. Between the centers of the tops of the motor cover 14 and shell 10, there is a rubber grommet 38. The spring 34 and the grommet 38 resiliently support the motor-compressor unit within the hermetic casing consisting of the shells 10 and 12. Suction gas tube 40 extends through the shell 10 for supplying suction gas to cool the motor 8 as is usual in hermetic units. The motor cover 14 has small openings 62 in its top for passing suction gas into the motor cover.

The numeral 41 shows the normal oil level of the sump 13. The pan 36 immersed in the oil in the sump has oil inlet openings 44. The lower end of the shaft 15 rests on a thrust washer 45 which is seated on a shoulder 46 of the housing 32 near its bottom, and which has a central oil passage 47 therein. The bottom of the crankshaft 15 has a central bore 50 connecting with the oil passage 47, and connecting with a radial bore 51 which opens into a clearance opening 52 in the housing 32 below the lower end of the bearing 33. A vertically-extending, off-center bore 55 in the crankshaft 15 has its lower end opening into the bore 51, and at its top opens into a radial bore 56, the outer end of which opens into an annular groove 57 in the crankshaft 15, located at about the center of the upper bearing 31. A central bore 58 in the crankshaft 15 on the axis of the latter, connects at its lower end with the inner end of the radial bore 56, and has an open, upper end at the top of the crankshaft 15. The radial bore 56 extends from the annular groove 57 across the top of the off-center bore 55, and ends at the bottom of the central bore 58.

The radial bore 51 acts as a centrifugal pump, supplying oil through the bore 55 to the bearings 33 and 31, the oil passing to the upper bearing 31 through the radial bore 56 and annular groove 57, and passing to the lower bearing 31 through a radial bore 68. Oil passes to the lowermost bearing 33 through a radial bore 59. Oil also passes to bearings which are not shown, around the throws of the crankshaft 15.

Trapped gas in the bore 55 at the level of the radial bore 56 is forced by oil pressure to the center of rotation, and escapes through the central vent bore 58 into the motor compartment. Centrifugal force prevents the

heavier oil from passing out the central bore 58. Some gas and oil enter the annular space 42 between the bearings 31, and are vented to the crankcase compartment through the vent passage 53.

What is claimed is:

1. In a hermetically sealed, refrigerant compressor having a casing containing a motor compartment in its upper portion and a crankcase compartment in its lower portion, having an oil sump in said crankcase compartment, having a crankshaft with its bottom in said crankcase compartment and its top in said motor compartment, having a bearing around said crankshaft in said motor compartment, said crankshaft having a vertically extending, off-center oil passage, and said compressor having means for pumping oil from said sump through said passage, the improvement comprising the provision in said crankshaft of a radial passage extending from said bearing beyond the axis of said crankshaft and crossing the top of said off-center passage, and the provision in said crankshaft of a central, gas vent passage having its bottom end opening into said radial passage and having an open upper end at said top of said crankshaft.

2. The improvement claimed in claim 1 in which the outer end of said radial passage connects with said bearing, and its inner end terminates at said bottom end of said central passage.

References Cited by the Examiner

UNITED STATES PATENTS

2,504,528	4/1950	Hume	230—206
3,098,604	7/1963	Dubberley	230—206

FOREIGN PATENTS

181,197	10/1962	Sweden.

ROBERT M. WALKER, *Primary Examiner.*