

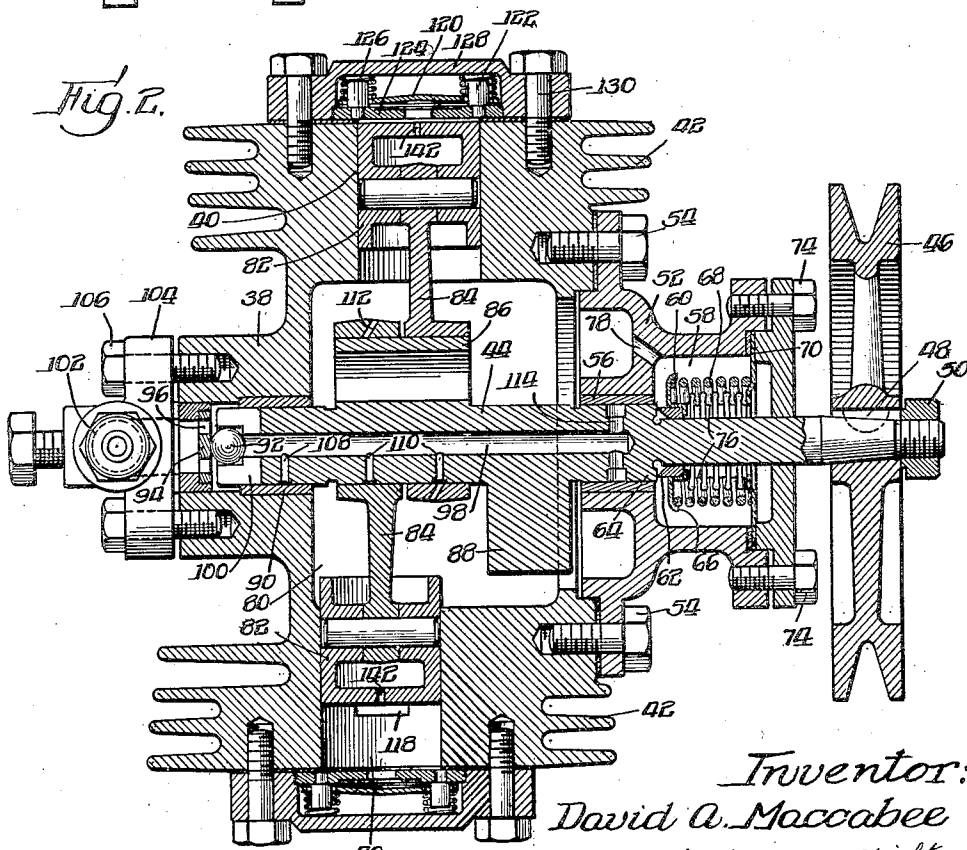
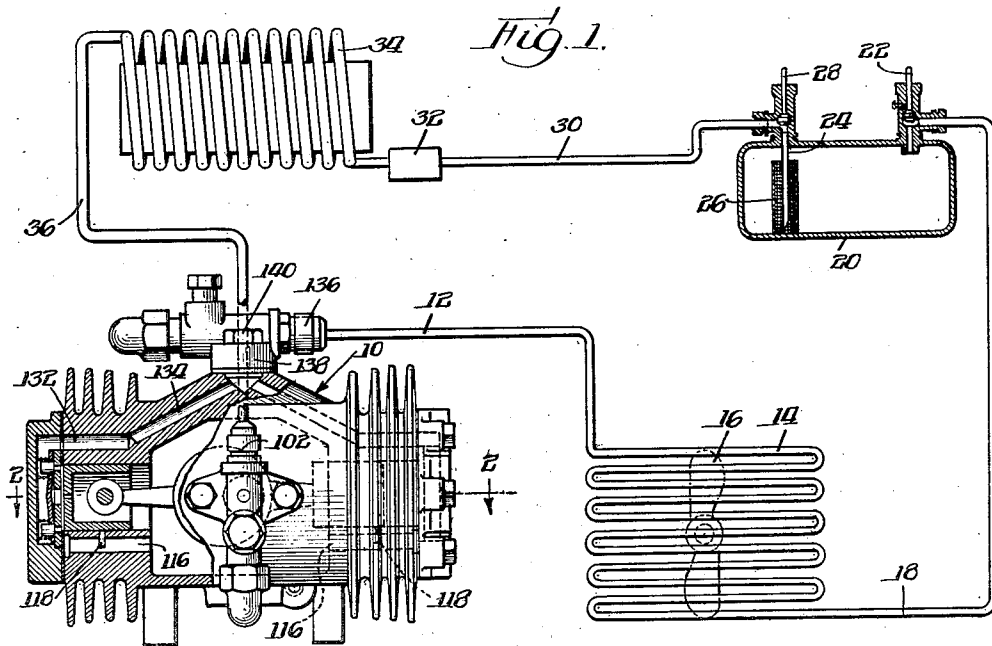
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COMPRESSOR LUBRICATING SYSTEM

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COMPRESSOR LUBRICATING SYSTEM

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This invention relates to improvements in refrigerant compressors and lubricating systems therefor.

It is an object of my invention to provide a system in which lubricant is continuously circulated with the refrigerant.

It is further an object of my invention to construct the refrigerant compressor in such a manner that the incoming cold vapor is conducted through the driving member for the compressor for the purpose of cooling the bearings therefor.

Another object of my invention is to provide similar refrigerant compressors in which the crank shaft is formed with an axial intake passage into which the incoming cold refrigerant vapor, containing some refrigerant, is delivered and to further provide ducts in the crank shaft for delivering the cold refrigerant and lubricant to the bearings for the crank shaft whereby the refrigerant and lubricant is finally drawn by suction into the crank case cavity from which it is drawn into the cylinders for compression and delivery from the compressor casing.

Further objects and advantages of my improvements will be more readily apparent from the following description taken in connection with the attached drawing, in which

Figure 1 is a somewhat diagrammatic view of the refrigerating system showing the reservoir in vertical section and the compressor in partial vertical section, and

Figure 2 is a horizontal section on an enlarged scale of the refrigerant compressor.

The refrigerating system includes a two-cylinder compressor from which the high pressure refrigerant vapor containing lubricant is delivered through the pipe 12 to the condenser coil 14, to be cooled by the fan 16. The condensed refrigerant containing lubricant is then delivered through the pipe 18 to a reservoir 20 past a shut-off valve 22. Within the reservoir 20 the refrigerant liquid containing some lubricant collects at the bottom while the excess lubricant containing a small percentage of refrigerant collects as a floating layer within the reservoir. The outlet tube 24 surrounded by the screen 26 draws off the refrigerant liquid containing a small percentage of lubricant from the bottom of the reservoir. The fluid is delivered past the outlet shut-off valve 28 through a pipe 30 to an expansion valve 32. The low pressure refrigerant vapor containing lubricant flows through the evaporator 34 and is finally delivered through the pipe 36 to the inlet of the compressor.

I have found that it is highly desirable to cir-

culate some lubricant with the refrigerant through the entire system. It seems that a much more uniform cooling action is obtained throughout the length of the evaporator coil due to the fact that the lubricant appears to carry through some of the refrigerant so that the refrigerant does not become completely vaporized at the inlet only of the evaporator and the cooling action is continuous throughout a considerable portion of the length of the evaporator.

Referring now to the construction of the refrigerant compressor as shown in Figure 2, the compressor casing 38 includes a pair of oppositely disposed cylinders 40 having annular cooling ribs 42. The crank shaft 44 is driven by the pulley 46 held by key 48 and nut 50 to the outer end of the crank shaft. The bearing housing 52 is secured to the compressor casing by bolts 54 and has mounted therein a bearing sleeve 56 for support of one end of the crank shaft.

The cavity 58 in the housing 52 will provide space for the provision of sealing means comprising a ring 60 having a knife-edge contact at 62 with a shoulder 64 of the crank shaft. Bearing 60 has secured thereto a flanged disk 66 which forms a seat for the inner end of a coil spring 68 reacting at its outer end against a disk 70 held in seated position by the cap 72 fastened by bolts 74. A metallic sealing bellows 76 is welded at its inner end to the flanged ring 66 and at its outer end to the disk 70. It will be understood that the spring ring 68 maintains a sealing contact between the ring 60 and the crank shaft 44. Passage 78 is provided through the housing 52 to permit free flow of the refrigerant vapor from the cavity 58 and into the crank case cavity 80.

The pistons 82 are mounted in the cylinders 40 and are operated by connecting rods 84 from an eccentric 86 on the crank shaft. The crank shaft may have a counter-balance 88. The inner end of the crank shaft is supported by bearing sleeve 90 and a ball thrust bearing 92 is also provided. The ball bearing 92 seats upon a disk 94 formed with perforations 96. It will be noted that the crank shaft 44 has a longitudinal passageway 98 and its inner end is notched as at 100 to provide a seat for the ball bearing 92 but still permit free passage of the refrigerant vapor and lubricant through the perforated disk 94 and into the passage 100 of the crank shaft.

The refrigerant vapor and lubricant from the evaporator is introduced into the compressor through the inlet connection 102 provided on the cap member 104, which is secured to the casing 38 by bolts 106, and the cold refrigerant and lu-

bricant flows longitudinally through the crank shaft. The crank shaft has a radial passageway 108 leading to the bearing sleeve 90. Radial passages 110 lead to the bearings for the connecting rods 84 which, in turn, are provided with diagonally disposed ducts 112. Finally the outer end of the crank shaft is formed with a plurality of radial passages 114 whereby the refrigerant vapor and lubricant which has not been delivered through the first-mentioned radial passage will escape adjacent the outer bearing sleeve 56 for the crank shaft. It will be understood that the refrigerant vapor and lubricant will perform the dual function of cooling and lubricating the crank shaft and its bearings and finally reaches the crank case cavity 80.

Figure 1 illustrates the manner in which the refrigerant vapor and lubricant is drawn into the cylinders 40 through the horizontal passageways 116 and the notched inlets 118 opening into the cylinder cavities. The compressed refrigerant vapor and lubricant is delivered through outlet check valves 120. Each check valve 120 is positioned by studs 122 on a supporting ring 124 and coil springs 126 are provided positioned by the studs and reacting upon the valve 120 to normally hold the valve in seated position. The check valve and spring assembly is retained in place by a cap member 128 secured to the cylinder by bolts 130. The compressed refrigerant and lubricant is finally delivered through the passageways 132-134 to the outlet connection 136 of the cap member 138 secured by bolts 140.

As another feature I may employ small bleed openings 142 in the heads of the pistons. This will provide for easy starting of the compressor by permitting a small portion of the refrigerant vapor to flow back into the crank case cavity.

In operation the cold refrigerant vapor and lubricant is drawn into the compressor casing due to the high suction maintained in the crank case cavity. The cold refrigerant vapor will keep the bearings of the rotatable crank shafts cool and the lubricant will pass through all of the bearings. Although some of the lubricant may collect in the crank case cavity, I do not provide a large lubricant reservoir, as is customary practice, but, instead, intend to circulate the lubricant with the refrigerant. The cold low pressure refrigerant together with entrained lubricant is therefore drawn into the cylinders and compressed by the action of the pistons and is then conducted to the high pressure side of the system. The refrigerant vapor is condensed and finally flows together with the lubricant into the reservoir where the lubricant saturated refrigerant settles out. The excess lubricant containing some refrigerant collects above or below the surface of the lubricant saturated liquid, dependent upon the specific gravities of the liquids used. As the refrigerant vapor is drawn from the evaporator, refrigerant liquid and lubricant are supplied through the expansion valve.

I claim:

1. In a refrigerant compressor, a casing, a crank shaft rotatably supported in said casing, a thrust bearing for the inner end of said crank shaft, said crank shaft having a passage extending therein from the inner end thereof and means for circulating low pressure refrigerant vapor and lubricant around said thrust bearing and into the passage of said crank shaft.

2. In a refrigerator compressor, a casing including a crank casing cavity, a rotatable crank

shaft extending through said crank case cavity, spaced bearings for supporting said crank shaft in said casing, a thrust bearing for the inner end of said crank shaft, sealing means between the outer end of said crank shaft and said casing, said crank shaft having a longitudinal passage open at the inner end thereof, means for delivering low pressure cold refrigerant vapor into said casing and around said thrust bearing into the crank shaft passage, means for conducting the refrigerant vapor from said crank shaft passage to said bearings and means operated by said crank shaft for compressing the refrigerant vapor drawn from said crank case cavity and delivering the refrigerant from the casing.

3. In a refrigerant compressor, a casing including a cylinder and a crank case cavity, a piston in said cylinder, a crank shaft rotatably supported in said casing and connected to said piston, an axial passage in said crank shaft, an inlet through said casing into communication with said passage in said crank shaft, a communication between the crank shaft passage and the crank case cavity for the passage of the refrigerant vapor, an inlet passage from said crank case cavity into said cylinder and an outlet passage from the cylinder for the delivery of the compressed refrigerant vapor.

4. In a refrigerant compressor, a casing including a pair of cylinder chambers and a crank case cavity, pistons reciprocable in said cylinders, a crank shaft rotatably mounted in said casing and extending outwardly thereof, sealing means between said crank shaft and said casing at one end of said crank case cavity, connecting rods between said crank shaft and said pistons, said crank shaft having a longitudinal passage formed therein, a refrigerant inlet through said casing into communication with one end of said crank shaft passage, communicating ducts between portions of said crank shaft passage and said crank case cavity, inlet passages leading from said crank case cavity to said cylinders and outlet passages for the delivery of the compressed refrigerant from said cylinders.

5. In a refrigerant compressor, a casing including cylinder chambers and a crank case cavity, pistons reciprocable in said cylinders, a rotatable crank shaft extending into said casing, sealing means between said rotatable crank shaft and said casing, spaced bearings for said crank shaft within said casing beyond said sealing means, inlet means for delivering the refrigerant vapor and lubricant through said crank shaft to said bearings whereby said refrigerant vapor and lubricant finally reaches the crank case cavity, inlet passages from said cavity to said cylinders and outlet passages from said cylinders for the delivery of the compressed refrigerant.

6. In a refrigerant compressor, a casing, a cylinder in said casing, a piston reciprocable in said cylinder, a crank shaft rotatably supported in said casing, sealing means between said crank shaft and said piston, said casing having a crank case cavity surrounding the crank shaft, an inlet for the refrigerant vapor into said crank case cavity, an inlet passage from said cavity to said cylinder, an outlet passage for the delivery of compressed refrigerant from said cylinder and metering means in said piston for bleeding back into the crank case cavity a portion of the refrigerant being compressed in said cylinder.

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