Oct. 31, 1939. W. E. JOHNSON 2,178,425

REFRIGERATING MACHINE

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Fig. 1.

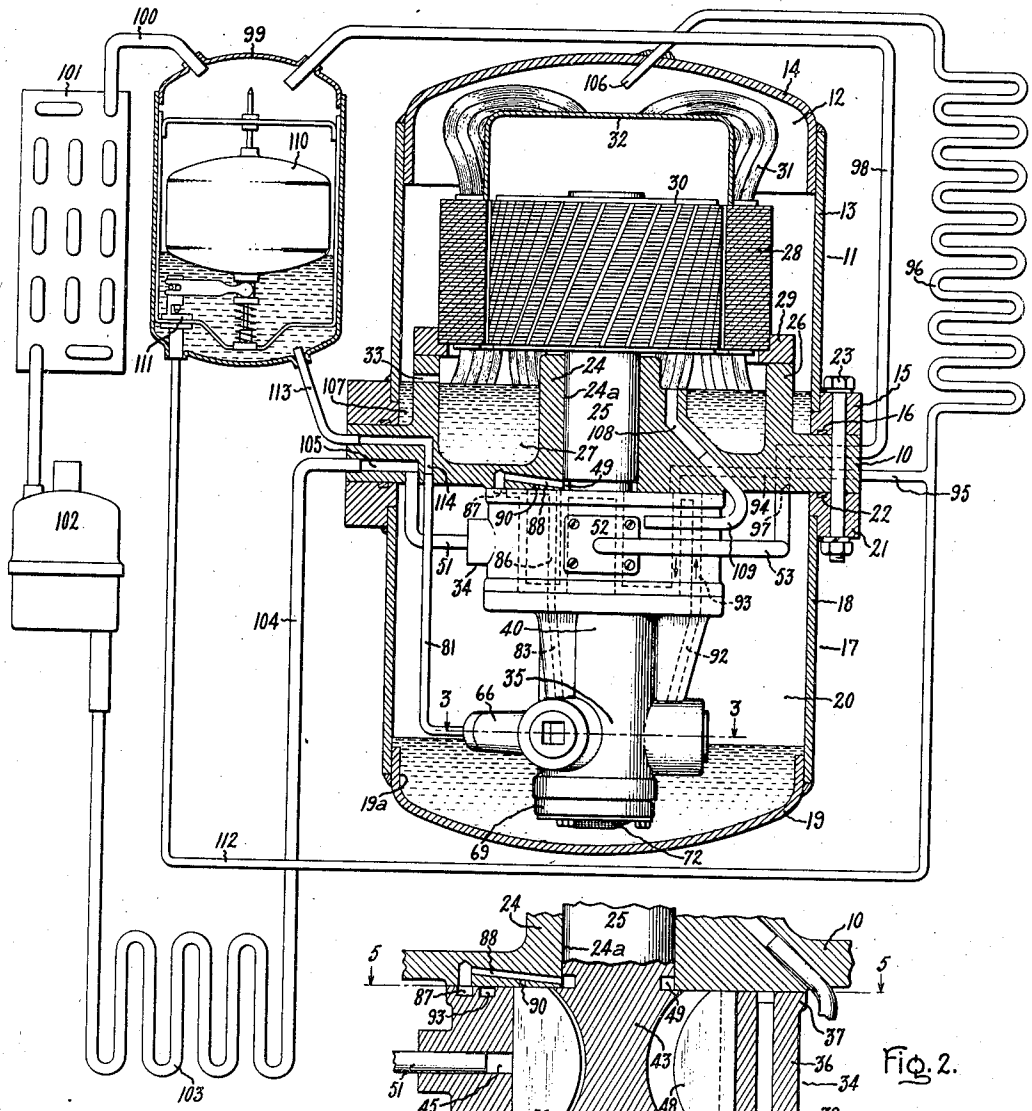


Fig. 2.

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Fig. 3.

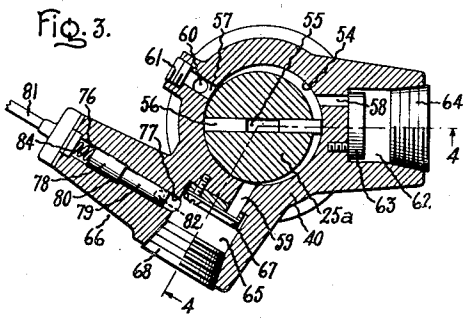


Fig. 4.

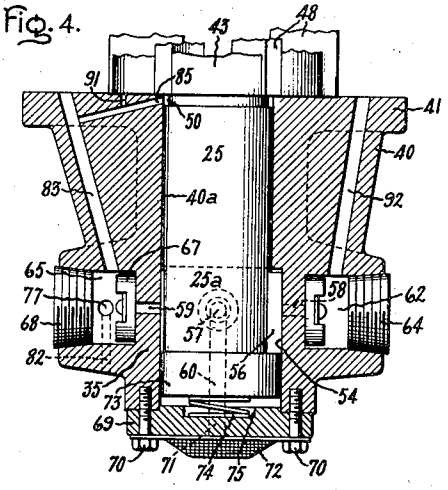
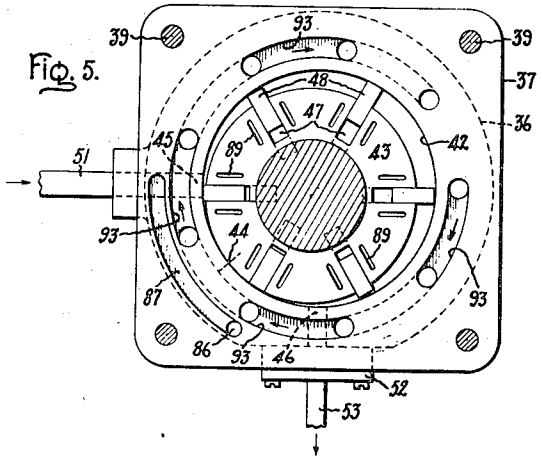


Fig. 5.



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UNITED STATES PATENT OFFICE

2,178,425

REFRIGERATING MACHINE

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Application February 18, 1937, Serial No. 126,370

4 Claims. (Cl. 230—210)

My invention relates to refrigerating machines.

Refrigerating machines of the compression type are provided with a compressor having a compression chamber, and a displacement member in the chamber which cooperates therewith to withdraw vaporized refrigerant from an evaporator associated with the machine and discharge the compressed refrigerant into a high pressure refrigerant circuit including a refrigerant condenser. It has been proposed to seal such a compressor against leakage of compressed refrigerant therefrom by maintaining a body of lubricant under pressure in a recess associated with the sealing surfaces of the compression chamber. Difficulty has been encountered, however, in the operation of such sealing arrangement as that described due to the wide variation in the pressure of the compressed refrigerant in the high pressure circuit, over the operating range of the machine. This pressure depends at any particular time upon the amount of refrigeration supplied by the machine, the rate of heat dissipation of the condenser of the machine, and other factors. When the pressure in the high pressure circuit of the machine is relatively high, the pressure of the compressed refrigerant in the compression chamber often exceeds the pressure of the body of sealing lubricant, thus permitting leakage of the compressed refrigerant from the compressor. When the pressure in the high pressure circuit of the machine is relatively low, the pressure of the body of sealing lubricant often greatly exceeds the pressure of the compressed refrigerant in the compression chamber, thus allowing a considerable amount of lubricant to flow from the body of sealing lubricant into the compressor. Under these conditions, not only is the volumetric efficiency of the compressor diminished by the leakage of sealing lubricant into the compression chamber, which reduces the amount of useful work done by the compressor upon the refrigerant, but the sealing lubricant leaking into the compressor chamber also absorbs compressed refrigerant, thus diminishing the quantity of compressed refrigerant which is discharged into the condenser of the machine.

It is an object of my invention to provide a refrigerating machine having a motor and a compressor arranged within a closed casing and having an improved lubricating system, and an improved arrangement for dissipating heat from the motor and the compressor.

Another object of my invention is to provide a refrigerating machine having a refrigerant compressor and a pressure lubricating system utilizing low pressure for cooling the compressor and utilizing high pressure for sealing the compressor against leakage of compressed refrigerant therefrom.

A further object of my invention is to provide a refrigerating machine having a refrigerant compressor and a pressure lubricant system for sealing the compressor against leakage of compressed refrigerant, the pressure of the sealing lubricant being regulated and maintained in reponse to the pressure of the compressed refrigerant above the pressure of the compressed refrigerant.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawings in which Fig. 1 is a side elevation, partly in section, of a refrigerating machine embodying my invention; Fig. 2 is an enlarged side elevation of the rotary compressor of the refrigerating machine; Fig. 3 is an enlarged sectional view on the line 3—3 of Fig. 1 of the lubricant pump of the refrigerating machine; Fig. 4 is a sectional view on the line 4—4 of Fig. 3 of the lubricant pump; and Fig. 5 is an enlarged plan view on the line 5—5 of Fig. 2 of the rotary compressor of the refrigerating machine.

Referring to the drawings, I have shown in Fig. 1 a refrigerating machine including a supporting plate or frame 10 and an upper casing section 11 cooperating with the supporting frame 10 to define an upper chamber 12. The upper casing section 11 comprises a cylindrical body 13 and a cup-shaped end 14 sealed thereto by welding. A ring 15 is welded to the open end of the cylindrical body 13 and is provided with an annular recess thereabout which receives a suitable sealing gasket 16 therein. A similarly constructed lower casing section 17, comprising a cylindrical body 18 and a cup-shaped end 19, cooperates with the supporting frame 10 to define a lower chamber 20. About the open end of the cylindrical body 18 there is secured a ring 21 provided with an annular recess thereabout which receives a suitable sealing gasket 22 therein. The rings 15 and 21 are tightly secured to cooperating sealing surfaces formed on the supporting frame 10 by a series of bolts 23 passed through holes formed in the sealing rings and the supporting frame. The upper and lower casing

sections 11 and 17 may be individually removed from the supporting frame 10 for purpose of inspection in the upper and lower chambers 12 and 20, respectively. When these casing sections are secured in place upon the supporting frame 10, a hermetically sealed casing is provided for housing the refrigerant circulating elements of the refrigerating machine as will be hereinafter described.

The supporting frame 10 is provided with a centrally disposed boss 24 having a bearing 24a in which a drive shaft 25 is journaled and which extends into the upper and lower chambers 12 and 20, respectively. An annular flange 26 is provided about the supporting frame 10 in spaced relation to the centrally disposed boss 24, and cooperates therewith to define an annular recess 27 extending about the supporting frame 10 and constituting a lubricant reservoir. An electric motor is arranged in the upper chamber 12, and comprises a stator 28 which is supported by an annular ring 29 secured to the flange 26, and a rotor 30 secured to the upper end of the drive shaft 25. The rotor 30 of the electric motor is preferably of the squirrel-cage type, and the stator 28 is provided with a winding 31 connected to a suitable source of supply. A deflecting baffle 32 of cup-shaped configuration is secured to the upper end of the stator 28 in order to prevent lubricant discharged into the upper chamber 12 from flowing into the air gap between the rotor and the stator of the electric motor. The end turns of the stator windings 31 at the lower end of the electric motor are arranged to extend into the annular recess 27 formed in the supporting frame 10. An opening 33 formed in the flange 26 affords a communication between the lower portion of the interior of the chamber 12 and the interior of the annular recess 27.

A rotary type refrigerant compressor 34 and a lubricant pump 35 are arranged in the lower chamber 20 and are operated by the lower portion of the drive shaft 25 extending through the opening 24a in the centrally disposed boss 24 on the supporting frame 10. As best shown in Figs. 2 and 5 the compressor 34 is provided with a cylindrical body 36 having flanges 37 and 38 about its upper and lower ends, respectively. The upper end of the block 36 is secured to the lower surface of the supporting frame 10 about the drive shaft 25 by a series of bolts 39 extending through holes formed in the upper flange 37 and threaded into holes provided in the supporting frame 10. The lubricant pump 35 is provided with a casing 40 having a flange 41 about its upper end, the flange 41 being secured to the flange 38 on the lower end of the compressor body. A cylindrical bore or compression chamber 42 is formed in the compressor body 36 and extends therethrough between the lower surface of the supporting frame 10 and the upper surface of the lubricant pump casing 40, which surfaces constitute cylinder heads for the bore 42. These cylinder heads and the body 36 thus comprise a casing for the compressor 34. A rotor or displacement member 43 is provided on the lower end of the drive shaft 25, preferably being formed integral therewith, and arranged in the bore 42. The bore 42 is disposed eccentric with respect to the center line of the drive shaft 25 and the rotor 43 is disposed concentric with respect to the center line of the drive shaft 25. The rotor 43 contacts the cylindrical wall of the bore 42 along a line indicated at 44 in Fig. 5, thus defining a crescent-shaped chamber within the bore 42 in which gaseous refrigerant is compressed. Intake and exhaust ports 45 and 46, respectively, are arranged in the block 36 on opposite sides of the line 44 and in communication with the ends of the crescent-shaped chamber in the bore 42. A plurality of radially disposed slots 47 are formed in the rotor 43 which receive a plurality of slidable blades 48 therein, the outer ends of the blades being in contact with the cylindrical wall of the bore 42.

The drive shaft 25 extends below the rotor 43 and is journaled in an opening 40a formed in the casing 40 of the lubricant pump 35. Adjacent the upper end of the rotor 43 and the lower surface of the supporting frame 10 an annular recess 49 is formed in the drive shaft 25. A similar annular recess 50 is formed in the drive shaft 25 adjacent the lower end of the rotor 43 and the upper surface of the casing 40 of the lubricant pump. Each of these annular recesses contains a body of lubricant under relatively high pressure for sealing the bore 42 against leakage of compressed refrigerant. Also, the lubricant in the recess 49 lubricates the portion of the drive shaft 25 above the rotor 43 which is journaled in the opening 24a in the boss 24 on the supporting frame 10, while the lubricant in the recess 50 lubricates the portion of the drive shaft 25 below the rotor 43 which is journaled in the opening 40a in the casing 40 of the lubricant pump 35.

During the operation of the compressor, vaporized gaseous refrigerant is drawn into the compressor through an inlet conduit 51 connected to the intake port 45 and compressed in the crescent-shaped chamber extending between the intake port 45 and the exhaust port 46 by the blades 48 slidably carried by the slots 47 in the rotor 43. The compressed refrigerant is then discharged from the compressor through the exhaust port 46 into a muffler 52 secured to the compressor, from which it flows through an outlet conduit 53.

As best shown in Figs. 3 and 4, a cylindrical bore 54 is arranged in the lower end of the casing 40 of the lubricant pump 35. The bore 54 is somewhat larger than the bearing 40a and is disposed eccentric with respect thereto and the center line of the drive shaft 25. The extreme lower end 25a of the drive shaft 25 is arranged in the bore 54 and constitutes a rotor for the lubricant pump. A slot 55 is formed in the rotor 25a which receives a pair of diametrically disposed slidable blades 56. The casing 40 is provided with an inlet port 57 communicating with the bore 54, a low pressure discharge port 58 and a high pressure discharge port 59. A lubricant inlet passage 60 is formed in the casing 40 and communicates with the inlet port 57. Access may be had to the inlet port 57 through an opening formed in the casing 40 which is closed by a plug 61 threaded into the casing. The discharge port 58 communicates with a chamber 62 formed in the casing 40 into which compressed lubricant from the bore 54 is discharged through a suitable valve 63. Access may be had to the interior of the chamber 62 to facilitate inspection of the valve 63 through an opening formed in the casing 40 which is closed by a plug 64 threaded into the casing. The discharge port 59 communicates with a chamber 65 formed in a lubricant pressure regulator 66 into which compressed lubricant from the bore 54 is discharged through a suitable valve 67. Access may be had to the interior of the cham-

ber 65 to facilitate inspection of the valve 67 through an opening formed in the lubricant pressure regulator 66 which is closed by a plug 68 threaded into the lubricant pressure regulator. The valves 63 and 67 are preferably of the flapper type comprising a base having a discharge aperture and a recess formed therein for guiding a valve element arranged to open and close the discharge aperture formed in the base.

An end cap 69 is secured to the lower end of the casing 40 by a series of bolts 70 and constitutes a cover plate for the bore 54. The end cap 69 is provided with an opening 71 therethrough which is in registry with the lubricant inlet passage 60 formed in the casing 40. The end cap 69 is also provided with a reticulated screen 72 on the lower end thereof and secured thereto, so as to prevent foreign matter from entering the opening 71 formed therein. The extreme lower end of the rotor 25a is provided with a polished surface normal to the center line of the drive shaft 25 which supports the drive shaft 25 upon a thrust bearing block 73 positioned within the bore 54. The thrust bearing block 73 is resiliently supported by the end cap 69 upon a compression spring 74 positioned in a recess 75 formed in the end cap 69.

The lower end of the lubricant pump 35 is submerged in lubricant contained in a lubricant reservoir 19a formed by the cup-shaped end 19 of the lower casing section 17. During the operation of the lubricant pump, lubricant is drawn into the bore 54 from the lubricant reservoir 19a through the lubricant inlet passage 60 and the inlet port 57. The lubricant drawn into the chamber 54 is pumped by the blades 56 carried by the rotor 25a. A portion of this lubricant is discharged at a relatively low pressure through the discharge port 58 and valve 63 into the chamber 62, while the remainder of this lubricant is further pumped into the chamber 54 and discharged at a relatively high pressure through the discharge port 59 and valve 67 into the chamber 65 formed in the lubricant pressure regulator 66.

As shown in Figs. 3 and 4, the lubricant pressure regulator 66 is formed integral with the lubricant pump casing 40 and includes a body in which the chamber 65 is formed and in which communicating large area and small area bores 76 and 77, respectively, are formed. The communicating bores 76 and 77 slidably receive a large area piston 78 and a small area piston 79, respectively, constituting an integral plunger 80. The small area bore 77 communicates with the chamber 65 and the large area bore 76 communicates with a conduit 81, which conduit communicates with the high pressure refrigerant circuit of the machine. A lubricant diverting passage 82 is formed in the body of the lubricant pressure regulator 66 and communicates between the small area bore 77 and the lubricant reservoir 19a formed in the cup-shaped end 19 of the lower casing section 17. An outlet passage 83 is formed in the lubricant pump casing 40 and communicates between the chamber 65 and the sealing surfaces of the compressor 34 and the bearings of the drive shaft 25. The small area piston 79 is slidably arranged in the small area bore 77 to open and to close the lubricant diverting passage 82, the small area piston 79 being biased to close the lubricant diverting passage 82 by a small spring 84 acting on the plunger 80.

When the refrigerating machine is started lubricant is discharged from the lubricant pump 35 through the high pressure discharge port 59 and the valve 67 into the chamber 65 in the lubricant pressure regulator 66. The small area piston 79 being biased to close the lubricant diverting passage 82 allows the pressure in the chamber to become quickly built up to set the lubricant pressure regulator into operation. Under normal operation of the machine the lubricant discharged into the chamber 65 is under a pressure higher than is required by the sealing and bearing surfaces of the machine supplied by the outlet passage 83, thus the small area piston 79 is slid in the small area bore 77 to partially open the lubricant diverting passage 82 in order to control the pressure of the lubricant in the chamber 65 and the outlet passage 83. The small area piston 79 is subjected to the pressure of the lubricant in the chamber 65 and tends to slide the plunger 80 in one direction, while the large area piston 78 is subjected to the pressure of the compressed refrigerant in the high pressure refrigerant circuit of the machine and tends to slide the plunger 80 in the opposite direction. The degree of opening of the lubricant diverting passage 82 being controlled by the sliding movement of the small area piston 79 of the plunger 80 is thus regulated in accordance with the difference in pressures of the lubricant in the chamber 65 and the compressed refrigerant in the high pressure refrigerant circuit of the machine. As the degree of opening of the lubricant diverting passage 82 establishes the pressure of the lubricant in the chamber 65, the pressure of lubricant in the chamber is regulated in accordance with the pressure of the compressed refrigerant in the high pressure refrigerant circuit of the machine. In view of the fact that the area of the piston 78 is larger than the area of the piston 79 the lubricant in the chamber 65 will be maintained at a pressure greater than the pressure of the compressed refrigerant in the high pressure refrigerant circuit of the machine, and as these areas are fixed a substantially constant ratio greater than unity between the pressure of the lubricant in the chamber 65 and the pressure of the compressed refrigerant in the high pressure refrigerant circuit of the machine will be maintained.

During the operation of the machine lubricant under relatively high pressure is supplied from the chamber 65 in the lubricant pressure regulator 66 to the annular recess 50 formed in the drive shaft 25 below the compressor rotor 43 through the outlet passage 83 and a passage 85 formed in the casing 40 of the lubricant pump 35. Also, lubricant under relatively high pressure is supplied from the chamber 65 in the lubricant pressure regulator 66 to the annular recess 49 formed in the drive shaft 25 above the compressor rotor 43 through the outlet passage 83, a vertically disposed passage 86 formed in the compressor block 36, an arcuately disposed passage 87 formed in the upper end of the compressor body 36 and a passage 88 formed in the supporting frame 10. The body of lubricant retained in the recess 49 forms a seal between adjacent surfaces of the rotor 43 and the supporting frame 10 to prevent the escape of compressed refrigerant from the upper end of the compression chamber 42, and the body of lubricant retained in the recess 50 forms a seal between adjacent surfaces of the rotor 43 and the casing 40 of the lubricant pump 35 to prevent the escape of compressed refrigerant from the lower end of the compression chamber 42. Lubricant also flows from the recesses 49 and 50 along the drive shaft 25 into the bearings 24a and 40a, respectively, in which the drive shaft is journalled to lubricate these bearings.

As best shown in Figs. 2 and 5, a shallow radially disposed depression 89 is formed in the upper end of the rotor 43 on each side of each of the blades 48. A small passage 90 is formed in the lower surface of the supporting frame 10 adjacent the cylindrical wall of the bore 42 and communicating with the passage 88 formed in the supporting frame 10 in order to supply lubricant under relatively high pressure from the lubricant pressure regulator 66 to the depressions 89 formed in the upper end of the rotor 43. The lubricant supplied these depressions 89 further seals the upper ends of the rotor 43 and the blades 48 against leakage of compressed refrigerant. In a similar manner a small passage 91 is formed in the upper end of the lubricant pump casing 40 adjacent the cylindrical wall of the bore 42 and communicating with the passage 85 formed in the casing 40 in order to supply lubricant under relatively high pressure from the lubricant pressure regulator 66 to like depressions formed in the lower end of the rotor 43. The lubricant supplied these depressions further seals the lower ends of the rotor 43 and the blades 48 against leakage of compressed refrigerant.

Lubricant discharged under relatively low pressure from the lubricant pump 35 into the chamber 62 flows through a passage 92 formed in the lubricant pump casing 40 into a circulating passage or conduit 93 forming the compressor block 36 and extending thereabout in heat exchange relation therewith. The circulating passage 93 is of serpentine configuration and extends from a position adjacent the lower flange 38, up and down through the block a number of times, and thereabout to a position adjacent the upper flange 37. The lubricant flows through the circulating passage 93 into a passage 94 formed in the supporting frame 10 which is connected by a conduit 95 to a lubricant cooler 96 arranged exteriorly of the enclosing casing formed by the casing sections 11 and 17, the lubricant cooler being air cooled or cooled in any other suitable manner.

During the operation of the refrigerating machine, vaporized gaseous refrigerant is drawn into the compressor 34 through the inlet conduit 51. The gaseous refrigerant is then compressed in the compression chamber 42 and discharged into the muffler 52 from which it is conducted by the outlet conduit 53 to a passage 97 formed in the supporting frame 10. The compressed refrigerant is conducted through the passage 97 to the exterior of the enclosing casing by a conduit 98 to a lubricant separating device 99. The compressed refrigerant passes from the upper portion of the lubricant separating device 99 through a conduit 100 into a forced air cooled refrigerant condenser 101 where it is liquefied and delivered to a flow controlling float valve 102. The liquefied refrigerant passes from the float valve 102 into an evaporator 103 wherein the liquid refrigerant is vaporized by the absorption of heat. The vaporized gaseous refrigerant is withdrawn from the evaporator 103 through a conduit 104 and flows back into the enclosing casing through a passage 105 formed in the supporting frame 10. The gaseous refrigerant reenters the compressor 34 through the inlet conduit 51.

Lubricant is drawn from the lubricant reservoir 19a formed in the cup-shaped end of the lower casing section 17 through the screen 72 and into the bore 54 of the lubricant pump 35. The lubricant is pumped through the chambers 54 and a portion thereof is discharged through the low pressure discharge port 58 into the chamber 62 formed in the casing 40. The lubricant contained in the chamber 62 passes upwardly through the passage 92 into the circulating passage or conduit 93, formed in the compressor block 36, and thereabout into the passage 94, formed in the supporting frame 10, through the conduit 95 and into the lubricant cooler 96. It will be observed that the flow of the lubricant in the circulating passage 93 is in a direction from the exhaust port 46 towards the intake port 45 as indicated by the arrows in Figs. 1 and 5. Thus, the coolest lubricant first contacts the compressor body 36 adjacent the exhaust port 46. This direction of flow of the cooling lubricant tends to equalize the temperatures existing in the compressor block 40, thus minimizing localized distortion of the compressor block. From the lubricant cooler 96 the lubricant is conducted through a conduit 106 into the upper chamber 12 formed by the upper casing section 11 and discharged upon the baffle 32. The lubricant then flows across the baffle 32 into contact with the winding 31 of the stator 28 of the electric motor and across the stator laminations into an outer annular recess 107 formed between the cylindrical body 13 of the upper casing section 11 and the flange 26 provided about the supporting frame 10. The lubricant flows from the annular recess 107 through the passage 33 formed in the flange 26 into the recess 27 formed in the supporting frame 10. The annular recess 27 constitutes a lubricant reservoir in which the end turns of the winding 31 of the stator 28 are submerged. The lubricant in the recess 27 then passes through a passage 108 formed in the centrally disposed boss 24 and is discharged through a conduit 109 into contact with the muffler 52 and the compressor block 36 from which the lubricant drains back into the lubricant reservoir 19a formed in the casing section 17. The lubricant passing from the lubricant cooler 96 cools the stator 28 and the winding 31 of the electric motor, the muffler 52 and the block 36 of the compressor.

A portion of the lubricant drawn into the chamber 54 formed in the lubricant pump casing 40 is pumped to a relatively high pressure and is discharged through the high pressure discharge port 59 into the chamber 65 formed in the lubricant pressure regulator 66. The pressure of the lubricant in the chamber 65 is regulated in accordance with the pressure of the compressed refrigerant in the high pressure refrigerant circuit of the machine, and this lubricant under relatively high pressure passes upwardly through the passage 83 formed in the lubricant pump casing 40. A portion of the lubricant in the passage 83 flows through the passage 85 into the passage 91 and the annular recess 50 to seal the lower ends of the blades 48 and the compression chamber or bore 42 against leakage of compressed refrigerant and to lubricate the lower ends of the rotor 43 and the drive shaft 25. The remainder of the lubricant in the passage 83 flows through the passages 86 and 87 formed in the compressor block 36 into the passage 88 formed in the supporting frame 10. From the passage 88 the lubricant flows into the passage 90 and the annular recess 49 to seal the upper ends of the blades 48 and the compression chamber or bore 42 against leakage of compressed refrigerant and to lubricate the upper ends of the rotor 43 and the drive shaft 25.

Some of the lubricant supplied the compressor 34 for purposes of sealing and lubricating the same finds its way into the bore 42 and becomes trapped in the refrigerant compressed therein.

This trapped lubricant is discharged from the compressor through the conduits 53 and 98 into the lubricant separating device 99 along with the compressed refrigerant. As before mentioned, the compressed refrigerant passes from the lubricant separating device 99 through the conduit 100 to the refrigerant condenser 101, while the lubricant is separated therefrom and collected in the lower portion of the lubricant separating device.

A float mechanism 110 is arranged within the lubricant separating device 99 and operates a valve 111 in response to the quantity of lubricant contained in the lower portion of the lubricant separating device. When a predetermined quantity of lubricant has been collected in the lower portion of the lubricant separating device 99, the float mechanism 110 operates the valve 111 to an open position and permits a portion of the lubricant to flow from the lower portion of the lubricant separating device through a conduit 112 into the lubricant cooler 96.

In the lower portion of the lubricant separating device 99 there is provided a conduit 113 which communicates with a passage 114 formed in the supporting frame 10. This passage 114 is connected by the conduit 81 to the large area bore 76 formed in the body of the lubricant pressure regulator 66, thus subjecting the large area piston 78 slidably arranged in the large area bore 76 to the pressure of the high pressure refrigerant circuit, as previously explained.

While I have shown a particular embodiment of my invention, I do not desire my invention to be limited to the construction shown and described, and I intend in the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. A refrigerating machine including an enclosing casing, a supporting frame in said enclosing casing forming upper and lower chambers therein, a drive shaft journaled in said frame and extending into said chambers, an electric motor supported by said frame in said upper chamber, said electric motor including a stator provided with a winding and a rotor secured to said drive shaft, a refrigerant compressor supported by said lower chamber and driven by said drive shaft, a lubricant pump in said lower chamber and driven by said drive shaft, lubricant reservoirs formed in said upper and lower chambers, a conduit extending from said reservoir in said upper chamber into proximity with said compressor, and means including said lubricant pump for circulating lubricant from said lubricant reservoir in said lower chamber in heat exchange relation with the winding of said electric motor into said upper reservoir, through said conduit, over the surface of said compressor and back into said lubricant reservoir.

2. A refrigerating machine including an enclosing casing, a supporting frame in said enclosing casing forming upper and lower chambers therein, a drive shaft journaled in said frame and extending into said chambers, an electric motor supported by said frame in said upper chamber, said electric motor including a stator provided with a winding and a rotor secured to said drive shaft, a refrigerant compressor supported by said frame in said lower chamber and driven by said drive shaft, said refrigerant compressor including a casing provided with a compression chamber having intake and exhaust ports, means including a displacement member arranged in said compression chamber for compressing a refrigerant therein, a first circulating conduit formed in said compressor casing and extending thereabout, a lubricant pump in said lower chamber and driven by said drive shaft, lubricant reservoirs formed in said upper and lower chambers, a second circulating conduit formed in said frame and extending from said reservoir in said upper chamber into proximity with said compressor casing, a lubricant cooler arranged exteriorly of said casing, and means including said lubricant pump for circulating lubricant from said lubricant reservoir in said lower chamber through said first circulating conduit into said lubricant cooler and in heat exchange relation with the winding of said electric motor, through said second circulatory conduit, and thence over the surface of said compressor casing and back into said lubricant reservoir.

3. A refrigerating machine including an enclosing casing, a supporting frame in said enclosing casing forming upper and lower chambers therein, a drive shaft journaled in said frame and extending into said chambers, an electric motor supported by said frame in said upper chamber, said electric motor including a stator provided with a winding and a rotor secured to said drive shaft, a lubricant reservoir carried by said frame and submerging the end turns of the stator winding of said electric motor, a refrigerant compressor supported by said frame in said lower chamber and driven by said drive shaft, said refrigerant compressor including a casing provided with a compression chamber having intake and exhaust ports, means including a displacement member arranged in said compression chamber for compressing a refrigerant therein, a lubricant pump in said lower chamber and driven by said drive shaft, a lubricant reservoir formed in said lower chamber, said lubricant pump having an inlet port communicating with said lubricant reservoir formed in said lower chamber and high pressure and low pressure discharge ports, means for supplying lubricant from said high pressure discharge port under relatively high pressure to adjacent surfaces of said compressor casing and said displacement member for sealing said compression chamber against leakage of compressed refrigerant, and means for circulating lubricant under relatively low pressure from said low pressure discharge port in contact with said stator of said electric motor into said lubricant reservoir carried by said frame and thence in contact with said compressor casing and back into said lubricant reservoir formed in said lower chamber.

4. A refrigerating machine including an enclosing casing, a supporting frame in said enclosing casing forming upper and lower chambers therein, a drive shaft journaled in said frame and extending into said chambers, an electric motor supported by said frame in said upper chamber, said electric motor including a stator provided with a winding and a rotor secured to said drive shaft, a recess formed in said frame defining a lubricant reservoir and arranged to submerge the end turns of the stator winding of said electric motor, a refrigerant compressor supported by said frame in said lower chamber and driven by said drive shaft, said refrigerant compressor including a casing provided with a compression chamber having intake and exhaust ports, means including a displacement member arranged in said compression chamber for compressing a refrigerant therein, a lubricant pump in said lower chamber

and driven by said drive shaft, a lubricant reservoir formed in said lower chamber, said lubricant pump including an inlet port communicating with said lubricant reservoir formed in said lower chamber and high pressure and low pressure discharge ports, means for supplying lubricant under relatively high pressure from said high pressure discharge port to adjacent surfaces of said compressor casing and said displacement member for sealing said compression chamber against leakage of compressed refrigerant, means for controlling the pressure of the lubricant supplied for sealing said compressor in accordance with the pressure of the compressed refrigerant to maintain the pressure of the supplied lubricant greater than the pressure of the compressed refrigerant, and means for circulating lubricant under relatively low pressure from said low pressure discharge port in contact with said stator of said electric motor into said lubricant reservoir formed in said frame and thence in contact with said compressor casing and back into said lubricant reservoir formed in said lower chamber.

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