REFRIGERATING APPARATUS

Filed Oct. 17, 1936 4 Sheets-Sheet 1

Fig. 1.

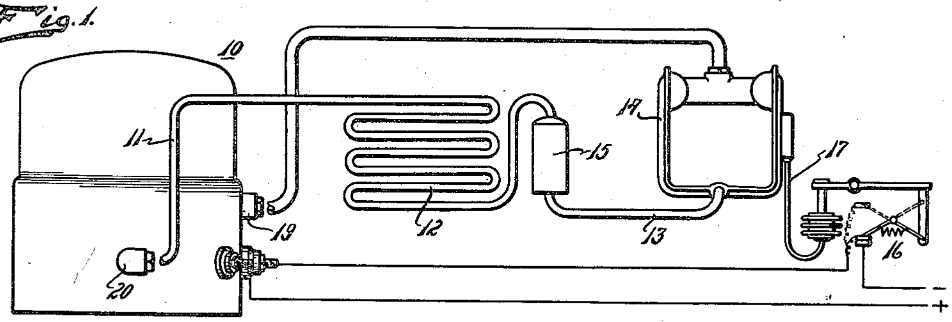


Fig. 2.

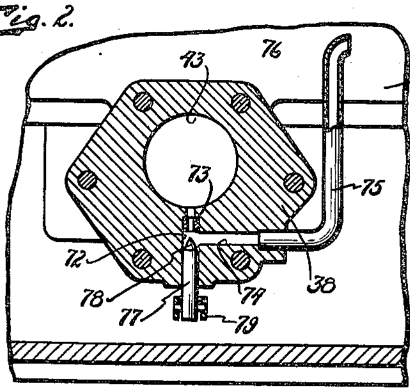


Fig. 3

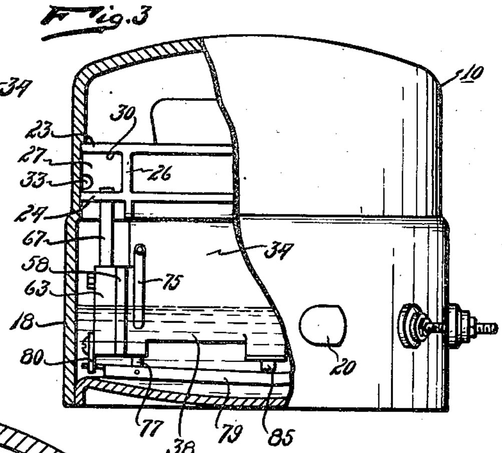
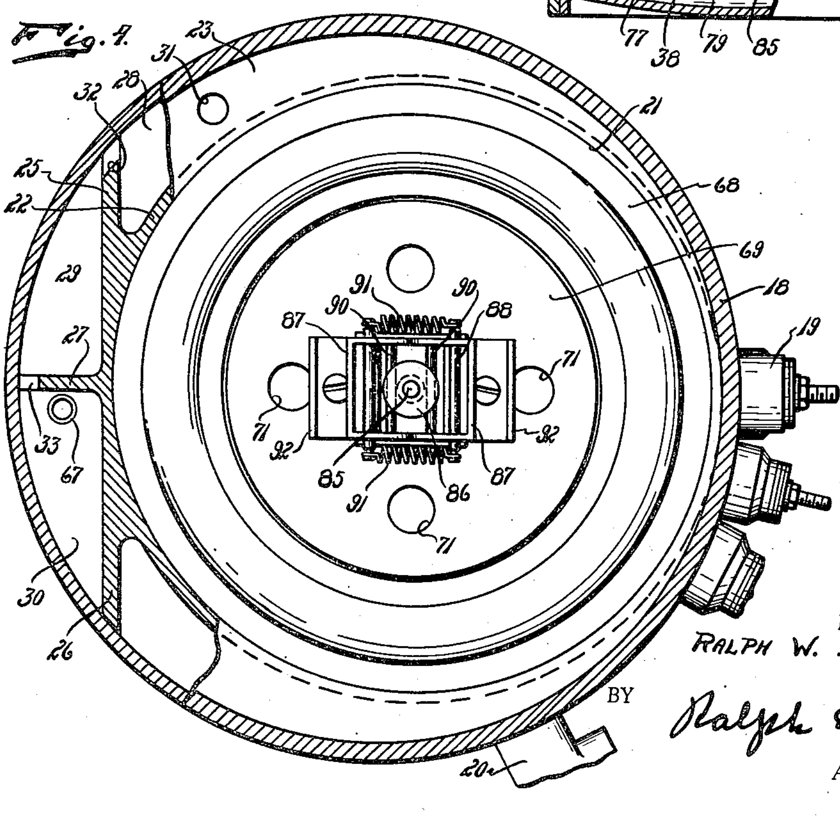


Fig. 4.



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REFRIGERATING APPARATUS

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Fig. 5.

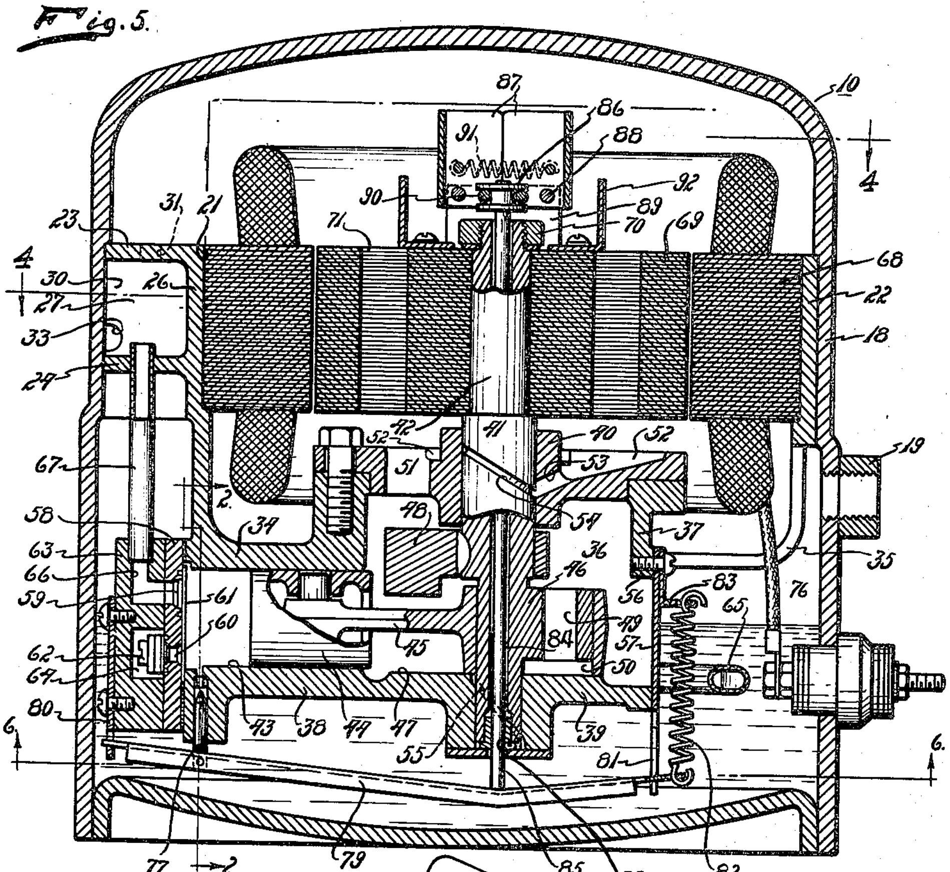
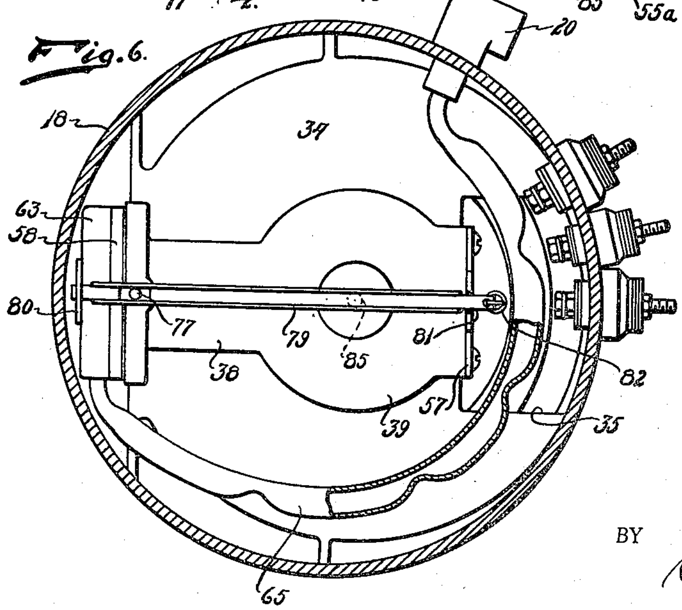


Fig. 6.



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REFRIGERATING APPARATUS

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Fig. 7.

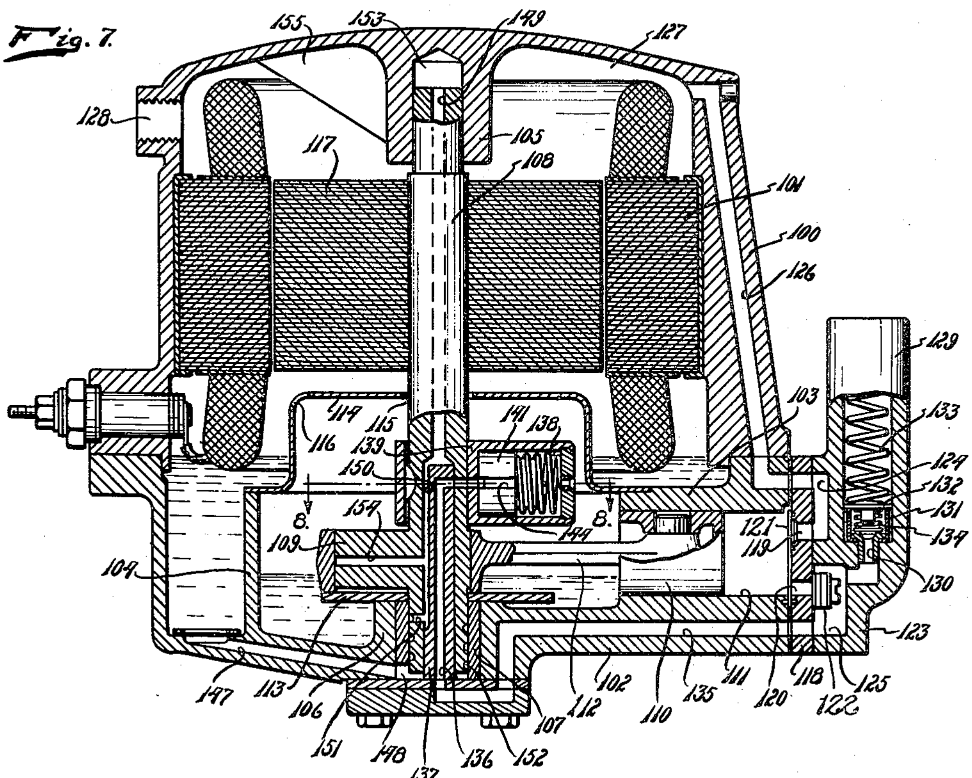
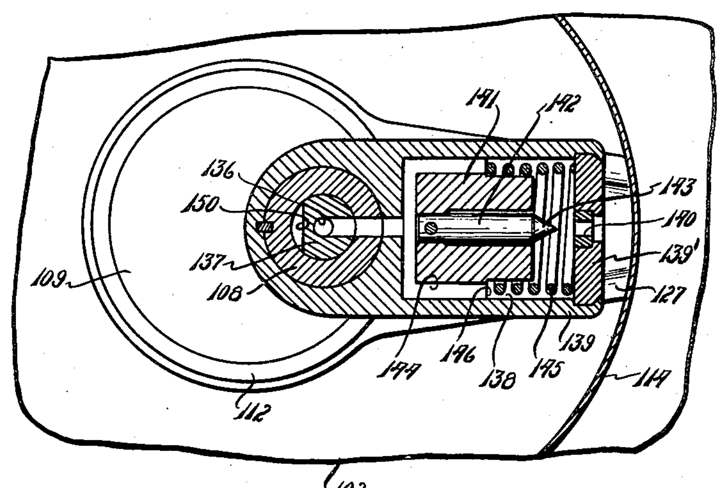


Fig. 8.



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REFRIGERATING APPARATUS

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Fig. 9.

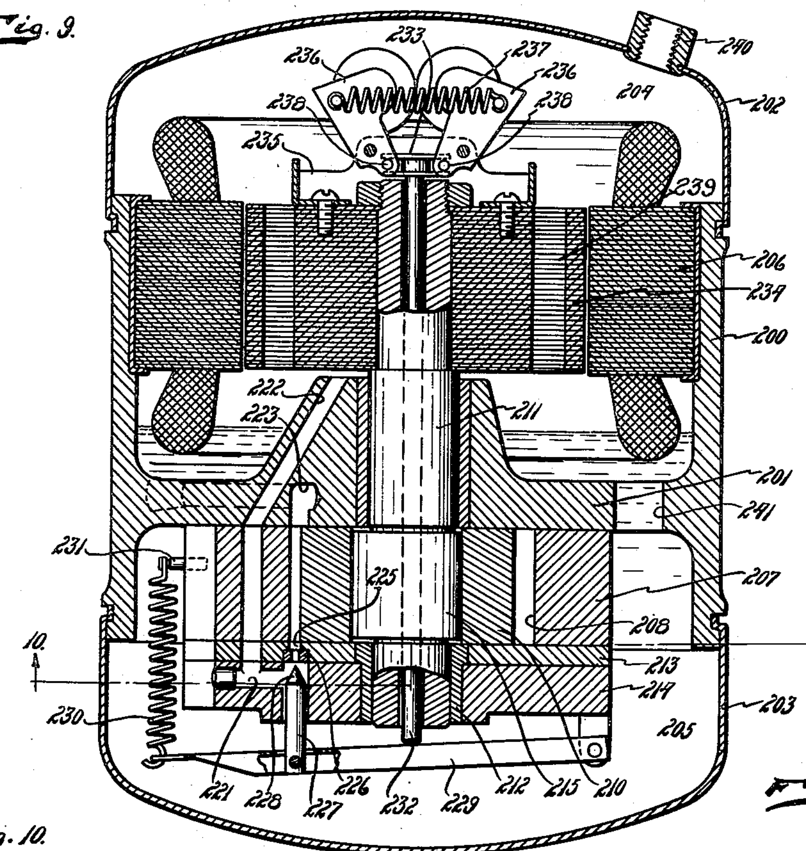


Fig. 10.

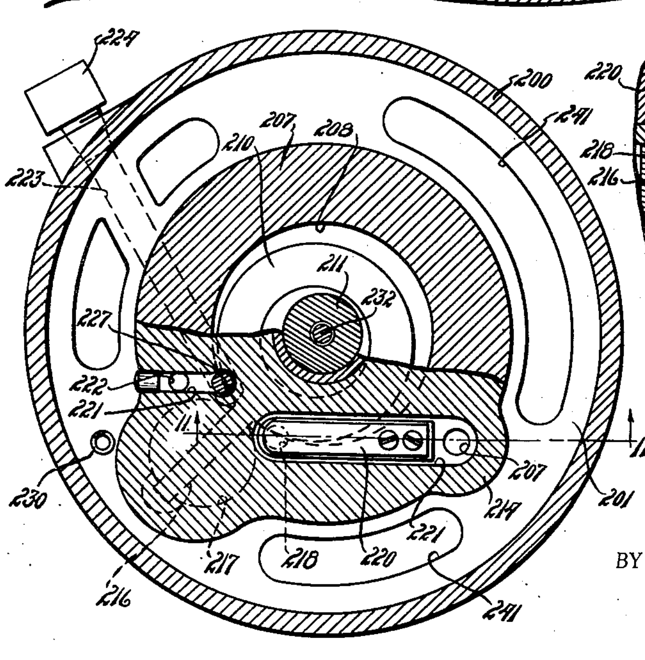
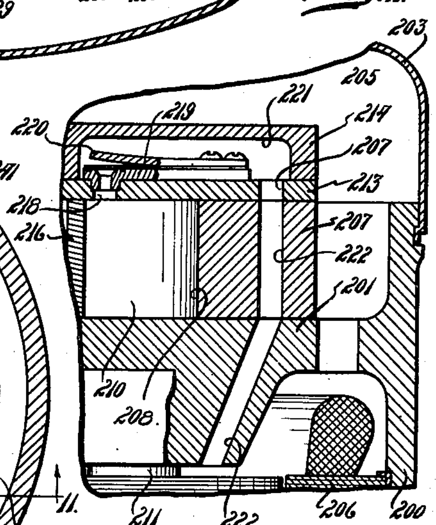


Fig. 11.



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Patented May 7, 1940

2,199,486

UNITED STATES PATENT OFFICE

2,199,486

REFRIGERATING APPARATUS

Ralph W. Doeg, Detroit, Mich., assignor, by mesne assignments, to Nash-Kelvinator Corporation, Detroit, Mich., a corporation of Maryland

Application October 17, 1936, Serial No. 106,172

8 Claims. (Cl. 230—58)

This invention relates to refrigerating apparatus and more particularly to refrigerating apparatus of the compression type in which the motor and compressor are enclosed within an hermetically sealed casing.

One of the objects of the present invention is to provide a compact and efficient compression mechanism which may be readily assembled in a relatively small space.

Another object is to provide a durable and simplified type of fluid compressor of the reciprocating type having a minimum number of working parts which may be easily assembled.

Another object is to provide a motor driven fluid compressor with new and improved means of such arrangement that the motor is permitted to gain momentum before assuming the working load of the compressor, whereby to prevent possible destruction of the motor due to heavy starting load.

With the above and other objects in view, the present invention consists in certain features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawings, and then claimed.

Referring to the accompanying drawings which illustrate suitable embodiments of the present invention;

Figure 1 is a diagrammatic showing of a refrigeration system, employing a compressor of the present invention;

Figure 2 is a section taken approximately on line 2—2 of Figure 5;

Figure 3 is a side elevation of the compressor unit, a portion of the casing being broken away;

Figure 4 is an enlarged transverse section taken approximately on line 4—4 of Figure 5;

Figure 5 is an enlarged vertical section taken through the compressor unit;

Figure 6 is a section taken approximately on line 6—6 of Figure 5;

Figure 7 is a vertical section taken through a compressor unit of modified construction;

Figure 8 is an enlarged section taken approximately on line 8—8 of Figure 7;

Figure 9 is a vertical section through a rotary type compressor unit embodying the unloading device of the present invention;

Figure 10 is a section taken on line 10—10 of Figure 9; and

Figure 11 is a section taken on line 11—11 of Figure 10.

Referring to the accompanying drawings in which like numerals refer to like parts throughout the several views, I have shown diagrammatically in Figure 1, for the purpose of illustration, a refrigeration system in which the numeral 10 represents the compressor unit. The refrigerant compressed by the compressor flows through conduit 11 to the condenser 12 where it condenses into liquid form and flows through conduit 13 to the evaporator 14 under the control of a device, such as a float controlled chamber 15. The refrigerant is evaporated in the evaporator 14 and is withdrawn therefrom by the compressor and compressed. The circuit for the compressor motor is controlled by a suitable switch mechanism 16 which is under the control of a suitable thermostatic device 17 associated with the evaporator 14, or any other suitable control device.

In the form of the invention shown in Figures 2 to 6, the motor-compressor unit is housed within a hermetically sealed casing 18 having a suction connection 19 and an outlet connection 20 extending therethrough.

Arranged within the casing 18 is a compressor of the reciprocating type and an electric motor for driving the same. These are supported from a casting 21 having an annular wall 22 and outwardly extending, spaced, upper and lower flanges 23 and 24, respectively, eccentrically arranged with respect to the wall 22 and merging into the wall 22 as shown in Fig. 5. Extending between the flanges 23 and 24 opposite the region where they merge into the wall 22 are opposed vertical walls 25 and 26 substantially tangential to the wall 22 and a radial vertical wall 27.

The edges of flanges 23 and 24, the edge faces of the walls 25, 26 and 27 and a portion of the wall 22 have a tight fitting engagement with the inner surface of the casing 18 and support the casting 21 within the casing adjacent the upper and closed end thereof but spaced therefrom. The flanges 23 and 24 and the walls 22 and 25 form with the wall of the casing a chamber 28. The flanges 23 and 24 and walls 25 and 27 form with the wall of the casing a chamber 29, and similarly, the flanges 23 and 24 and walls 26 and 27 form with the wall of the casing a chamber 30. The space within the casing above the member 21 is in communication with the chamber 28 through an aperture 31 formed in the upper flange 23. The chambers 28 and 29 are in communication with each other through an opening 32 formed in the wall 25 and the chambers 29 and 30 are in communication with each other through an opening 33 formed in the wall 27.

As shown in Figs. 5 and 6, the annular wall 22 extends downwardly and is provided with an integral radial portion 34 which closes in the annular wall 22, except for an opening 35 therethrough adjacent the inlet or suction connection 19, and except for an opening 36 provided by an upwardly extending annular flange 37, coaxial with the wall 22.

Formed integrally with the under side of the portion 34 is a cylinder 38 and crankcase portion 39, and journalled in the wall of the crankcase portion 39 and in a closure plate 40 for the opening 36 is a vertically extending shaft 41 which has a portion 42 extending upwardly beyond the closure plate 40.

Mounted within the bore 43 of the cylinder 38 is a reciprocable piston 44 to which one end of a connecting rod 45 is pivoted. The opposite end of the rod 45 is mounted on an eccentric 46 formed on the shaft 41, the lower face of the large or eccentric end of the rod has bearing engagement with a finished surface 47 provided on the wall of the crankcase portion 39. Also mounted on the shaft 41, within the crankcase portion 39, is a counter balance 48 opposed to the eccentric 46.

The eccentric 46 is provided with an opening 49 therethrough and an enlarged recess 50 at its lower side for a purpose which will be later described.

The closure plate 40 is formed with an opening 51 therethrough, and a recess or pocket 52 which communicates with opening 51. The closure plate 40 also has a passageway 53 leading to the upper bearing surface for the shaft 41, the shaft having a spiral oil groove 54 adjacent the passageway 53. The lower end of shaft 41 is journalled in crankcase portion 39 which has a spiral oil groove 55 extending around shaft 41. The lower end of spiral 55 is in open communication with the lubricating oil in the crankcase through slot 55*a* and the upper end extends to the surface 47 for conducting lubricant to the moving parts of the compressor. Rotation of shaft 41 will cause lubricant in slot 55*a* to be flung outwardly into spiral groove 55 by centrifugal force. Thus the lubricant is delivered to the moving parts of the compressor under pressure. Should too much lubricant enter the space 36 the surplus is free to overflow through opening 51 back to the crankcase reservoir and some to the groove 52 for supplying groove 54.

The crankcase portion 39 is provided with an opening 56 for the insertion of the connecting rod 45 and piston 44, which opening is closed by a plate 57.

The outer end of the cylinder bore 43 is closed by a plate 58 having a suction port 59 and a discharge port 60. Associated with the suction port 59 is a suitable valve 61, such as a reed valve, and associated with the discharge port 60 is a valve 62 of any suitable construction. Associated with the plate 58 is a head member 63 having a discharge passage 64 which communicates with the discharge port 60, and which communicates through a discharge conduit 65 with the outlet connection 20. The head member 63 also has an inlet passage 66 which communicates with the suction port 59, and is provided with a suction conduit 67 which extends through the flange 24 into the chamber 30 as shown in Fig. 5.

The motor for driving the compressor comprises a stator or winding 68 mounted within the annular wall 22 of casting 21, and a rotor 69 securely mounted upon the extending portion 42 of the shaft 41 by means of a nut 70 threaded on the end of the shaft portion 42.

The rotating element 69 is provided with a plurality of openings 71 extending therethrough, the purpose of which will be described later.

In order to relieve the motor of the starting load of the compressor, I have provided an unloading device of novel construction. Referring to Figures 2, 4 and 6, the cylinder 38 is provided with a vertical passageway 72 extending from the lower side thereof to the cylinder bore 43. Arranged within this passageway is an annular element 73 which forms a valve seat. Connecting into the passageway 72 below the valve seat 73 is a passageway 74 which is provided with a conduit 75 that terminates and opens above the level of liquid in the chamber 76 and below the member 21 so as to by-pass refrigerant discharged from the compressor into the chamber 76 during the starting period when the valve seat 73 is uncovered.

Slidably positioned in the passageway 72, is a slide valve rod 77 having a tapered end 78 which is cooperable with the valve seat to close the by-pass. The lower end of the valve rod 77 projects below the cylinder 38, and is pivoted to a bar 79 adjacent one end which is pivotally supported on a plate 80 secured to the head portion 63.

The bar 79 extends directly below the axis of the shaft 41, and the other end thereof is guided in a slot 81 formed in the plate 57 and connected by means of a tension spring 82 to a bracket 83 secured to the crankcase portion 39.

The shaft 41 has a coaxial passage 84 within which a rod 85 is positioned, the lower end of the rod extending below the crankcase portion and seating on bar 79, and the upper end of the rod extending above the shaft extension 42. This end of the rod is provided with a spool-like member 86 with which a centrifugal device is associated.

The centrifugal device comprises a pair of vertically arranged U-shaped members 87 having their leg portions normally abutting each other, and which are pivoted upon pins 88 carried by brackets 89 secured to the upper side of the rotating element 69. The members 87 carry pins 90 which are located within the groove of the spool-like member, but at opposite sides of the bottom thereof. Tension springs 91 normally hold the members 87 in abutting engagement.

With the parts of the centrifugal device in the position shown in Figure 5, the rod 85, against the tension of spring 82, holds the valve rod 77 away from the seat 73 to permit refrigerant to by-pass to the chamber 76.

As the motor gains speed, the members 87 pivot outwardly away from each other, gradually, until they engage stops 92 secured to the rotating element 69, at which time the spring 82 moves the bar 79 upwardly and causes the valve rod 77 to close the by-pass. The compressor, then, compresses the refrigerant and circulates the refrigerant through the system.

Since the member 21 has sealed engagement with the wall of the casing, the vaporized refrigerant drawn by the compressor into the chamber 76 from the evaporator, is caused to flow through the opening 35 and, thence, upwardly through the apertures 71 in the rotating element 69, whereby, as a result of which, centrifugal force separates lubricant particles from the vaporized refrigerant. Some of the separated lubricant drains down the outer surfaces of the apertures and into the recess 52 for lubricating the upper bearing of the compressor. The separated lubricant which discharges above the rotating element 69 impinges against the motor winding 68 and drains back through the space between the rotating element 69 and motor winding 68 to the bottom of the chamber 76.

The system and process of lubricant separation shown and described herein forms no part of the present invention, but is described and claimed in a co-pending application Serial No. 106,118, filed October 16, 1936, by Lawrence A. Philipp, for Compressor.

Particular attention has been paid in the present invention to compactness, ease of assembly and simpleness of the parts of the compressor unit to the end of obtaining quietness and efficiency of operation.

In the construction shown in Figure 7, the casing is comprised of two parts, namely, an upper portion 100 which houses and supports the stator or motor winding 101, and a lower portion 102 which is shaped to provide a horizontally arranged cylinder 103 and crankcase portion 104 which is open at the upper side. The upper and lower portions are provided with hub-like portions 105 and 106, respectively, the portion 106 being provided with a bushing 107. Having its ends journalled in the portion 105 and bushing 107 is a shaft 108 having an eccentric 109 thereon.

A piston 110 is reciprocably mounted in the bore 111 of the cylinder 103 and is connected by means of a connecting rod 112 with the eccentric 109, the lower side face of the rod 112 being slidably engaged with a bearing plate 113 supported on the end face of the portion 106.

The open side of the crankcase portion 104 is closed by means of an inverted cup-shaped portion 114 of sheet metal having an opening 115 through which the shaft 108 extends, and an opening 116 through the upper side thereof. The shaft 108 above the portion 114 carries the rotor or motor winding 117.

The bore 111 of the cylinder 103 opens through the lower casing portion 102 and is closed by a valve plate 118 having intake and discharge ports 119 and 120 respectively. Associated with the ports 119 and 120 are valves 121 and 122, respectively, of any suitable construction and a head portion 123 having an inlet passageway 124 and an outlet passageway 125. The inlet passageway communicates with the port 119 and with a passageway 126 provided in the casing portions 102 and 100 which leads to the space 127 above the motor winding. The inlet 128 for the hermetically sealed chamber formed by the casings 100 and 102 is provided in the upper casing 100.

The head 123 is provided with an outlet connection 129 within which is positioned a valve seat 130 communicating with the discharge passageway 125. Surrounding the valve seat 130 is an annular sleeve 131 against which a valve plate 132 is normally urged into engagement by a compression spring 133. Interposed between the valve plate 132 and the valve seat 130 is a spring 134 of less weight than the spring 133.

The discharge passage 125 also communicates with a passageway 135 which in turn communicates with a passageway 136 provided in a member 137 mounted within the lower end of the shaft 108 to rotate therewith.

The passageway 136 communicates through the shaft 108 with a chamber 138 formed in a member 139 secured to rotate with the shaft 108 and which also acts as a counterbalance. The outer end of the chamber 138 is provided with an apertured plate 139' having a valve seat 140, and mounted within the chamber 138 is a cylindrical weight 141 which carries a valve member 142 having a tapered end 143. The weight 141 is formed with side passages 144 and is normally urged away from the valve seat 140 by a compression spring 145 interposed between a shoulder 146 thereon and the plate 139'.

Lubrication of the shaft 108 is provided for by means of a passageway 147 formed in the lower casing portion 102 which communicates with the bottom of that portion of the chamber surrounding the crankcase portion 104 and forming a lubricant reservoir. The passageway 147 leads to a recess 148 formed in the bushing 107. The shaft 108 is also formed with a passageway 149 opening through its upper end and communicating with a passageway or groove 150 formed in the member 137, the groove 150 in turn opening into an aperture 151 provided through the lower end of the shaft 108, which end is formed with a spiral thread 152 that extends to the bottom of the shaft 108 and to the aperture 151. Also, the eccentric 109 is formed with a passageway 154 leading to the groove 150 and to its bearing surface so that lubricant flowing through the groove 150 will flow outwardly by centrifugal force to lubricate such passageway.

During rotation of the shaft 108, the spiral thread 152 causes lubricant to be drawn through passageway 147 for lubricating the bearing surface at the lower end of the shaft and to also flow upwardly through the passageway 149 to the space 153 above the end of the shaft 108 to lubricate the upper bearing surface thereof.

In the operation of the compressor shown in Figures 7 and 8, the motor is relieved of the starting load of the compressor, during the starting period, by reason of the fact that the spring 145 holds the valve portion 143 away from the seat 140 with the result that the refrigerant, which, during normal operation, would be compressed, by-passes through passageways 125, 135, 136, 144, and 140 into the crankcase and thence through opening 116 into the refrigerant chamber. As the motor gains speed, the weight 141 gradually moves outwardly by centrifugal force and closes the valve seat 140. During the starting period the valve plate 132 closes the discharge passage 130, but when the motor attains its normal speed, and when the valve seat 140 is closed by member 142, the compressed refrigerant flows through the opening in the valve seat 130 and thence to the condenser or evaporator.

The suction created by the compressor draws vaporized refrigerant and lubricant through the inlet 128 and due to the baffling effect provided by the upper portion of the motor winding 101 and a vane 155 formed in the upper end of the casing portion 100, entrained lubricant particles are separated from the vaporized refrigerant and drain to the reservoir through the annular space between the rotating element 117 and motor winding 101, the refrigerant flowing through passageway 126 to the compressor.

In the construction shown in Figures 9, 10 and 11, I have shown a rotary type compressor, employing an unloader device of the general character shown in Figures 2, 4, and 5. In this construction, an annular casting 200 having a wall 201 extending across the same, intermediate its ends, is provided, the open ends thereof being closed in by upper and lower closure caps 202 and 203, respectively, and the wall 201 forming an upper or motor compartment 204, and a lower or compressor compartment 205. The stator or motor winding 206 is supported by the casting 200 in the upper compartment 204.

Secured to the under side of the wall 201 is a pump or compressor housing 207 having a cylindrical opening 208 forming the compression chamber within which the rotary element 210 is mounted. The shaft 211 is hollow and is journalled above the housing 207 in the wall 201 and below the housing in a bushing 212 carried by a pair of abutting members 213 and 214 secured to the housing 207. The shaft 211 is formed with an eccentric portion 215 extending within the rotary element 210 for operating the same, the rotary element 210 having a vane-like portion 216 slidably mounted in an oscillatable element 217 carried by the housing 207.

Opening into the chamber 208, at one side of the vane-like member 216, through the member 213 is an outlet 218 provided with a valve seat 219 with which a valve 220 is associated, the member 214 having a passageway 221, surrounding the valve 220, which opens into a passageway 222 formed in the member 213, housing 207 and wall 201, and opening into the motor chamber 204.

Opening into the chamber 208 at the opposite side of the vane-like member 216 through the wall 201 is an inlet passage 223 which opens through the casting 200 and is provided with an inlet connection 224.

Arranged at this same side of the vane-like member 216 and in the member 213 is an aperture 225 having a valve seat 226, the aperture opening into the discharge passageway 221, and slidably mounted in the member 214 coaxial with the valve seat 226 is a valve rod 227 having a tapered end 228 arranged to cooperate with the valve seat 226 to close the passage therethrough. The valve rod 227 is pivoted to a bar 229 extending directly below the opening in the shaft 211, the bar 229 being pivoted at one end to the under side of member 214, and provided at its opposite end with a tension spring 230 which is attached to a pin 231 extending outwardly from the housing 207.

A rod 232 is loosely arranged within the shaft 211 and its lower end engages the bar 229. The upper end of the rod 232 extends above the end of the shaft 211 and is provided with a spool-like member 233 securely fixed thereto.

The upper end of the shaft 211 carries the rotor or rotating element 234 of the motor and secured to the rotor are brackets 235 to which a pair of weighted elements 236 are pivoted. The weighted elements 236 are urged into abutting engagement by means of a spring 237. The elements 236 carry pins 238 which seat in the groove of the spool-like member 233.

With the weighted members 236 in the position shown in Figure 9, the rod 232, through the medium of the bar 229 holds the valve rod 227 away from the seat 226, so that during the starting period the refrigerant entering the suction side of the compressor by-passes through the aperture in the seat 226 and through passages 221 and 222. As the motor gains speed, the weighted members 236 pivot away from each other, allowing spring 230 to move the valve rod 227 to close the seat 226, whereby the incoming refrigerant is compressed and discharged into the motor chamber 204 where it passes through apertures 239 provided through the rotor 234. Due to centrifugal force, lubricant particles are expelled from the compressed refrigerant and drain back through the space between the rotating element 234 and motor winding 206, the refrigerant passing through a connection 240 arranged in the upper closure 202.

The wall 201 is provided with apertures 241 which place the motor and compressor chambers 204 and 205 in communication with each other.

In each of the constructions shown and described, the compressor-motor units are hermetically sealed, compact and easy to assemble.

While I have shown and described several forms of my invention, many changes may be effected therein, without departing from the spirit and scope thereof, as set forth in the appended claims.

What I claim is:

1. In a refrigeration apparatus, a sealed casing, a horizontally positioned compressor cylinder within said casing, a piston reciprocably mounted in said cylinder, a vertical journalled shaft in said casing having an eccentric portion, a connecting rod having one end connected with said piston and its opposite end connected with said eccentric, and a stationary supporting element having bearing and sole supporting engagement with the under side of said last mentioned end of said connecting rod throughout the area of said under side and on which element said end slides.

2. In a refrigeration apparatus, a sealed casing, a horizontally positioned compressor cylinder within said casing, a piston reciprocably mounted in said cylinder, a vertical journalled shaft in said casing having an eccentric portion, a connecting rod having one end connected with said piston and its opposite end connected with said eccentric, and a stationary supporting element having bearing and sole supporting engagement with the under side of said last mentioned end of said connecting rod throughout the area of said under side and on which element said end slides, said apparatus having means for lubricating the bearing surface of said supporting element.

3. In a refrigeration apparatus, a sealed annular casing having a vertical axis and forming a low pressure chamber having an opening for receiving low pressure refrigerant, the lower portion of said chamber forming a lubricant reservoir, an annular element having a vertical axis and having an outwardly extending eccentric flange, said flange having a tight fitting engagement with the inner wall of said casing for supporting the element within the casing with the axis of said element offset with respect to the axis of said casing, said element having an integral radial portion at one end thereof to provide a closure therefor and having integral cylinder and crankcase portions in said radial portion, a motor winding carried by said annular element, a vertical shaft journaled in said crankcase portion of said radial portion and having an eccentric thereon, a piston reciprocably mounted in said cylinder, a connecting rod connected to said piston and having an apertured end surrounding said eccentric, said apertured end having slidable bearing engagement with and being supported solely by the bottom wall of said crankcase portion, said shaft extending upwardly through said crankcase portion and axially within said winding, a rotatable motor element within said winding and fixed to said shaft, a head for said cylinder portion disposed beneath said eccentric flange, said head having an inlet open-

ing, and conduit means connected with said inlet opening and communicating with the space above said eccentric flange.

4. In a refrigeration apparatus, a sealed annular casing having a vertical axis and forming a low pressure chamber having an opening for receiving low pressure refrigerant, the lower portion of said chamber forming a lubricant reservoir, said casing opening communicating with said reservoir, an annular element having a vertical axis and provided with an outwardly extending eccentric flange, said flange having a tight fitting engagement with the inner wall of said casing for supporting the element within the casing with the axis of said element offset with respect to the axis of said casing, said element having an integral radial portion at one end thereof to provide a closure therefor, and having integral cylinder and crankcase portions in said radial portion, said annular element having an opening therein to provide open communication between the lubricant reservoir and the space above said eccentric flange containing the low pressure refrigerant, a motor winding carried by said annular element, a shaft journaled in said crankcase portion of said radial portion and having an eccentric thereon, a piston reciprocably mounted in said cylinder, a connecting rod connected to said piston and having an apertured end surrounding said eccentric, said apertured end having slidable bearing engagement with and being supported solely by the bottom wall of said crankcase portion, said shaft extending upwardly through said crankcase portion and axially within said winding, a rotatable motor element within said winding and having driving connection with said shaft, a head for said cylinder portion disposed beneath said eccentric flange, and conduit means connected with said head and communicating with the space above said eccentric flange for supplying refrigerant to the cylinder.

5. In a refrigeration apparatus, a sealed annular casing having a vertical axis and forming a low pressure chamber having an opening for receiving low pressure refrigerant, the lower portion of said chamber forming a lubricant reservoir, an annular element having a vertical axis and provided with an outwardly extending eccentric flange, said flange having a tight fitting engagement with the inner wall of said casing for supporting the element within the casing with the axis of said element offset with respect to the axis of said casing, said element having an integral radial portion at one end thereof to provide a closure therefor and having integral cylinder and crankcase portions in said radial portion, a motor winding carried by said annular element, a shaft journaled in said crankcase portion of said radial portion and having an eccentric thereon, a piston mounted in said cylinder operatively connected to said eccentric, said shaft extending upwardly through said crankcase portion and axially within said winding, a rotatable motor element within said winding and having driving connection with said shaft, a head for said cylinder portion disposed beneath said eccentric flange, said head having an inlet opening, and conduit means connected with said inlet opening and communicating with the space above said eccentric flange.

6. In a refrigeration apparatus, a sealed annular casing having a vertical axis and forming a low pressure chamber and having an opening for receiving low pressure refrigerant, the lower portion of said chamber forming a lubricant reservoir, said casing opening communicating with said reservoir, an annular element having a vertical axis and provided with an outwardly extending eccentric flange, said flange having a tight fitting engagement with the inner wall of said casing for supporting the element within the casing with the axis of said element offset with respect to the axis of said casing, said element having an integral radial portion at one end thereof to provide a closure therefor and having integral cylinder and crankcase portions in said radial portion, said annular element having an opening therein to provide open communication between the lubricant reservoir and the space above said eccentric flange, a motor winding carried by said annular element, a shaft journaled in said crankcase portion of said radial portion and having an eccentric thereon, a piston mounted in said cylinder operatively connected to said eccentric, said shaft extending upwardly through said crankcase portion and axially within said winding, a rotatable motor element within said winding and having driving connection with said shaft, a head for said cylinder portion disposed beneath said eccentric flange, said head having an inlet opening, and conduit means connected with said inlet opening and communicating with the space above said eccentric flange.

7. In a refrigeration apparatus, a sealed annular casing having a vertical axis and forming a low pressure chamber having an opening for receiving low pressure refrigerant, the lower portion of said chamber forming a lubricant reservoir, an annular element having a vertical axis and provided with an outwardly extending eccentric flange, said flange having a tight fitting engagement with the inner wall of said casing for supporting the element within the casing with the axis of said element offset with respect to the axis of said casing, said element having an integral radial portion at one end thereof to provide a closure therefor and having integral cylinder and crankcase portions in said radial portion, a motor winding carried by said annular element, a vertical shaft journaled in said crankcase portion of said radial portion and having an eccentric thereon, a piston reciprocably mounted in said cylinder, a connecting rod connected to said piston and said eccentric, said shaft extending upwardly through said crankcase portion and axially within said winding, a rotatable motor element within said winding and fixed to said shaft, a head for said cylinder portion disposed beneath said eccentric flange, said head having an inlet opening, and conduit means connected with said inlet opening and communicating with the space above said eccentric flange.

8. In a refrigeration apparatus, a sealed annular casing having a vertical axis and forming a low pressure chamber and having an opening for receiving low pressure refrigerant, the lower portion of said chamber forming a lubricant reservoir, said casing opening communicating with said reservoir, an annular element having a vertical axis and provided with an outwardly extending eccentric flange, said flange having a tight fitting engagement with the inner wall of said casing for supporting the element within the casing with the axis of said element offset with respect to the axis of said casing, said element having an integral radial portion at one end thereof to provide a closure therefor and having integral

cylinder and crankcase portions in said radial portion, said annular element having an opening therein to provide open communication between the lubricant reservoir and the space above said eccentric flange, a motor winding carried by said annular element, a vertical shaft journaled in said crankcase portion of said radial portion and having an eccentric thereon, a piston reciprocably mounted in said cylinder, a connecting rod connected to said piston and said eccentric, said shaft extending upwardly through said crankcase portion and axially within said winding, a rotatable motor element within said winding and fixed to said shaft, a head for said cylinder portion disposed beneath said eccentric flange, said head having an inlet opening, and conduit means connected with said inlet opening and communicating with the space above said eccentric flange.

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