June 13, 1939. W. G. PONTIS ET AL 2,162,639

COMPRESSOR OR PUMP

Original Filed Jan. 18, 1933 2 Sheets-Sheet 1

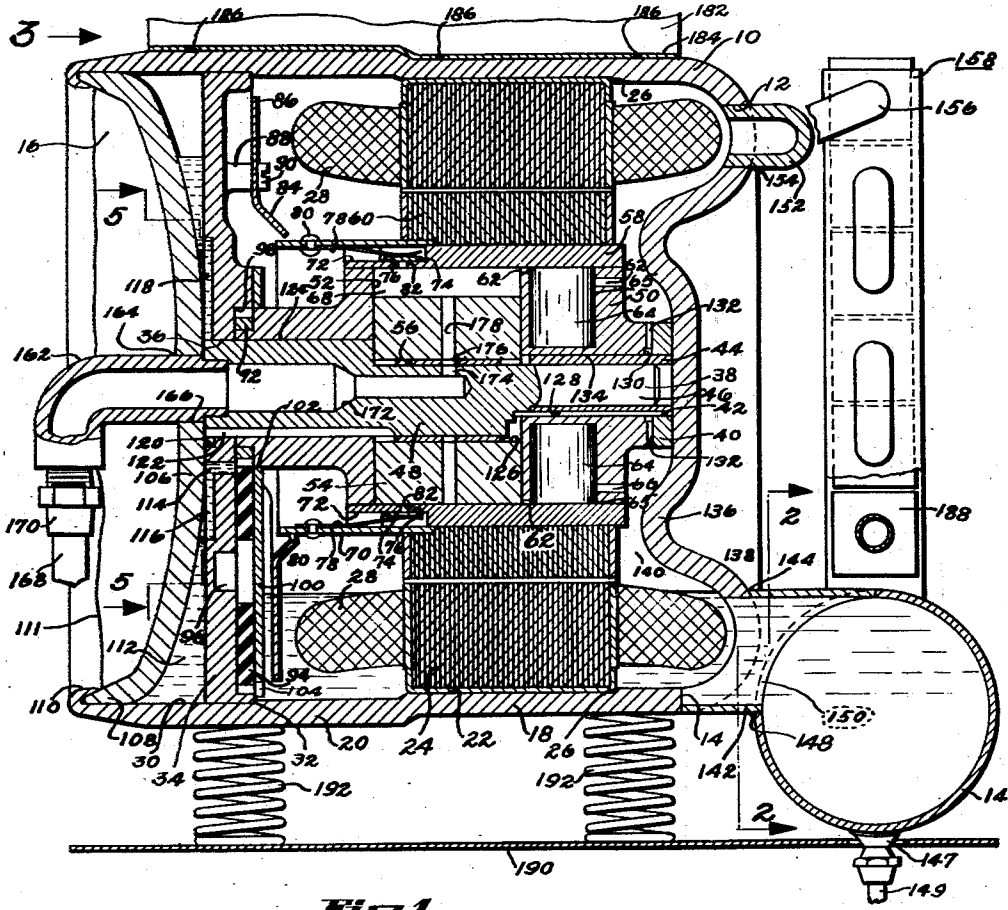

Fig. 1

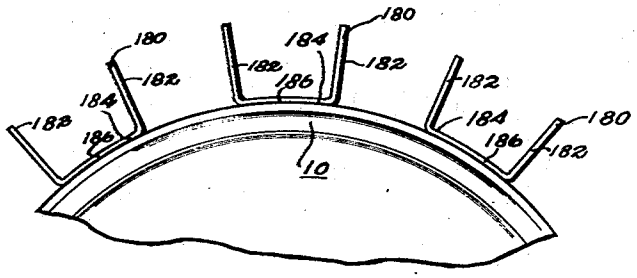

Fig. 3

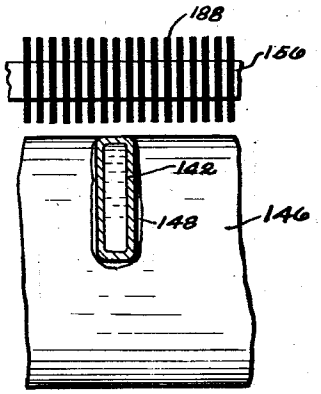

Fig. 2

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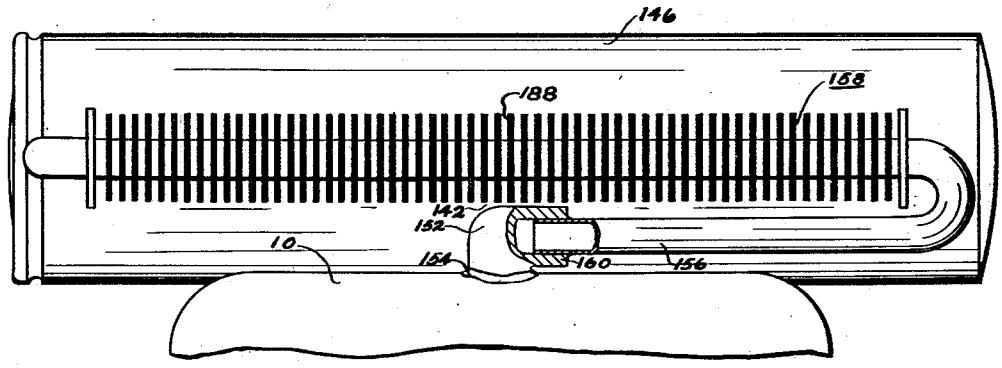

Fig. 4

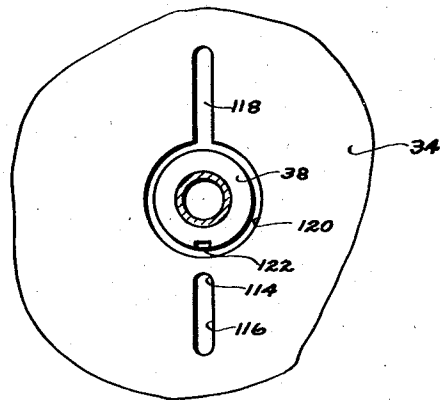

Fig. 5

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COMPRESSOR OR PUMP

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Application January 18, 1933, Serial No. 652,264
Renewed March 5, 1936

5 Claims. (Cl. 230—139)

This invention relates to a structure applicable to a compressor or pump, and more particularly to an enclosure therefor, and the heat dissipating means associated therewith.

It is understood that the structures of compressors and pumps are quite similar, especially with respect to parts such as the enclosure or housing members and the cooling means utilized therewith. Hence, it may be clearly seen that the structure disclosed and claimed for the present invention is applicable to either, although the structure shown, is that of a compressor.

It may also be here understood that the term formable hard metal used in the specification and claims of this application refers particularly to metal formed after it has reached, or is in, a congealed, set or hardened state.

An object of the present invention is to provide an enclosure or housing for a compressor that may be made of formable hard metal at a reasonable production cost.

Another object of the present invention is to provide an enclosure or housing structure for a compressor having an auxiliary end member as well as an end cover, which end member and end cover cooperate to facilitate assembly and improve the housing.

Another object of the present invention is to provide an enclosure structure for a compressor, which enclosure has improved fluid and lubricant cooling means.

Another object of the present invention is to provide an enclosure structure for a compressor which permits hermetically sealing the enclosure by welding, soldering or some similar process without warping or otherwise injuring the machined or other parts by the heat applied.

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

In the drawings:

Fig. 1 is a sectional view of a compressor embodying a preferred form of the present invention.

Fig. 2 is a fragmentary view showing a portion of the receiver or interchange tank and condenser, with the fluid conducting connector shown in section.

Fig. 3 is a fragmentary view of a portion of the housing with cooling fins secured thereto.

Fig. 4 is a fragmentary top view of the compressor unit showing the received or interchange tank and condenser.

Fig. 5 is a fragmentary view showing the lubricating passage provided by the auxiliary end member.

With particular reference to the drawings, a housing **10**, preferably made of formable hard metal, has apertures **12** and **14** in one end thereof, and an open end **16**. The wall of the housing **10** has a portion **18** near the closed end thereof that has a smaller internal diameter than the portion **20** of the wall near the open end **16**. The portion **18** has an internal surface **22**, preferably machined to make a press fit with a motor stator **24**, and a shoulder portion **26** is preferably provided at one end of the surface **22** to serve as a stop to locate the stator **24**. The stator has windings such as **28** thereon. The portion **20** of the wall has an inner surface **30** that is also preferably machined, and provided with a shoulder **32** that serves as a stop for an auxiliary end member **34** that is also preferably machined and fit the surface **30**.

An opening **36** is provided in the auxiliary end member **34** into which one end of the shaft **38** is press fitted. The auxiliary end member **34** thus forms a support for one end of the shaft **38**, while the other end of that shaft is supported by a block **40** having an aperture **42** therein, into which aperture a sleeve **44** fits. The sleeve **44** fits over an end portion **46** of the shaft **38**. The end portions of the shaft **38** are concentric, or axially aligned, while a mid portion **48** of the shaft **38** is eccentric thereto. The cylinder block **50** is rotatably mounted upon the concentric portions of the shaft **38**, and a cylinder **52** provided in the block **50** has a double acting piston **54** therein that is actuated by the eccentric portion **48** of the shaft through a cross-head **56**. The cylinder block **50** has a sleeve **58** fitted thereover which forms a cylinder head. A conventional type of motor rotor **60**, such as a squirrel cage rotor having a laminated iron core, is press fitted upon the sleeve **58**, and electromagnetically associated with the stator **24** so that the rotary motion imparted to the rotor **60** is directly transmitted to the rotary cylinder block **50**. The motion thus imparted to the cylinder block **50** causes effective oscillatory movement of the piston within the cylinder **52**, by virtue of the action of the eccentric portion **48** of the shaft and cross-head **56**.

Unloading valves **64** are mounted in recesses **65** in the cylinder block **50** so as to control fluid flow through the ducts **62** and **66** communicating

therewith and with the compression chambers such as 68 and the interior of the housing, respectively. These valves serve to relieve the load on the motor when it is starting. The sleeve 58 has recesses 72 at one end thereof which are covered by a ring 70, which ring is secured to the sleeve 58. The recesses 72 provide spaces for the mounting of pressure release valves comprising discs 74 resiliently urged against seats 76 by normally biased leaf springs 78. The discs 74 cover ports 82 and are provided for the passage of compressed fluid from the compression chambers such as 68 to the interior of the housing. The normally biased leaf springs 78 are secured at one end to the ring 70 by rivets 80. The ring 70 also serves as a baffle and one end thereof projects into a projecting portion 84 of a baffle 86. The baffle 86 is mounted on and spaced from the auxiliary end member 34 through posts 88 that are formed on the inner surface of the auxiliary end member 34, said baffle being secured thereto by screws 90 or other suitable fastening means.

The cylinder block 50 has a gear 92 on the end thereof that is adjacent the auxiliary end member 34, which gear meshes with a lubricant conveying gear 94 that is rotatably mounted on the auxiliary end member 34 through a stud 96. The gears 92 and 94 are mounted within a recess 98 in the auxiliary end member 34, which recess is preferably machined and conforms to the peripheral form of the meshing gears. A plate 100 is secured to the auxiliary end member 34, so as to cover the gears, said plate having an aperture 102 therein through which the end of the cylinder block 50 passes. A groove 104 in the lower end of the plate 100 permits the passage of lubricant from the interior of the housing to the lubricant conveying gear 94.

An end cover 106, curved or concaved inwardly toward the interior of the housing 10, is located from the auxiliary end member 34 and has a rim portion 108 formed thereon that is substantially tangent to the inner surface of the housing 10. The portion 110 of the housing 10 at the open end thereof is deformed by rolling or other suitable means so as to overlap the end of the rim portion 108 of the end cover 106. The end cover 106 is then preferably hermetically sealed with the housing 10 by welding the adjacent portions 108 and 110 to form a welded seam therebetween such as at 111. The curvature of the end cover 106 serves to form a lubricant cooling space 112 intermediate the end cover and the auxiliary end member 34. This space also tends to serve as a trap for sediment or foreign substance that settles out of the lubricant when the lubricant is trapped therein.

An opening 114 through the end member 34 serves as a lubricant conducting passage to carry lubricant from the lubricant conveying gear 94, and communicates with a lubricant conveying groove 116 in the auxiliary end member, from which groove lubricant passes into the space 112. Preferably above the level of the shaft 38, a lubricant conveying groove 118 in the auxiliary end member 34 is provided to permit the passage of lubricant therethrough to an annular lubricant conveying passage 120 also in the auxiliary end member, which passage communicates with the lubricant conveying groove 122 in the shaft 38. Lubricant that passes through the groove 122 lubricates bearing surfaces 124 between the shaft 38 and the cylinder block 50, and conveys lubricant to an opening 126 in the piston 54 within which the cross-head 56 is mounted, which opening communicates with the lubricant conveying groove 128 in the sleeve 44. Lubricant from the groove 128 lubricates bearing surfaces 134 between the sleeve 44, and the cylinder block 50, and communicates with an annular groove 130 in the end of the block 50 and thence to the passages 132, also in the end of the block 50, which convey the lubricant back into the housing.

The housing 10 is provided with a curved portion 136 which projects inwardly and intermediate the passages 132 and windings 28 so as to prevent the lubricant that is thrown from the passages 132 from continually spraying against the winding, and to effect additional cooling of the lubricant by the passage thereover. The normal level of the lubricant in the housing remains somewhat below the space 140 between the rotor 60 and stator 24, as indicated at 138. The normal level of the lubricant in the space 112 may vary, but to provide lubrication for the moving parts, must be sufficiently high to enter the passage 118 in the auxiliary end member.

A fluid conveying conductor 142 is hermetically sealed to the housing 10 preferably by welding such as at 144, and also to a receiver or interchange tank 146 such as at 148, so as to provide a fluid communicating means therebetween through the opening 14 in the housing 10 and an opening 150 in the receiver or interchange tank 146. A fluid conveying connector 152, preferably having a sectional thickness thinner than that of the housing, is hermetically sealed to the housing preferably by welding such as at 154, and also preferably fitted into the aperture 12 in the housing 10 to provide a connecting means between the interior of the housing and the tube 156 of a condenser 158. The tube 156 is preferably brazed or soldered into the connector 152, such as at 160. The other end of the tube 156 is connected and hermetically sealed to the receiver or interchange tank 146 to provide fluid communication between the condenser 158 and the receiver or interchange tank, the connection between the condenser and the receiver or interchange tank not being shown. The fluid conveying connector 162 projects through an aperture 166 in the end cover 106 and is hermetically sealed therewith, preferably by welding such as at 164. The connector 162 provides for fluid communication from the fluid supply therefor, not shown, through a tube such as 168 and coupling 170 to the compression chambers such as 68 through the fluid conducting passages 172 and 174 in the shaft 38, 176 in the cross head 56 and 178 in the piston 54. Relative movement of the cross head 56 and shaft 38 interrupts the fluid flow between the passages 174 and 176 to accomplish a valve action to control the flow.

Heat dissipation from the housing is aided through the use of substantially channel shaped cooling members 180 having substantially radially extending fins 182 and a connecting portion 184 that conforms to the curvature of the housing. Cooling members 180 preferably extend longitudinally along the surface of the housing, and are preferably secured thereto by spot welding at points along the connecting portions 184 such as at 186. The condenser is preferably cooled by fins 188 secured to the tube 156. Both the fins 182 and 188 are primarily for cooling the fluid compressed by the compressor, as in the case of a refrigerator compressor, for causing condensation of the compressed fluid. A suitable connector 147 is hermetically sealed to the

receiver or interchange tank **146** for providing fluid communication with a utilization device, not shown, through any suitable means such as a tube **149**.

The present form of compressor has been designed for use with a refrigerant which, when liquefied, is more dense than the lubricant used for the compressor parts. Hence, the fluid condensed in the condenser flows downwardly and through the lubricant in the receiver or interchange tank **146**, and that condensed within the compressor housing flows downwardly through the lubricant therein and through the connector **142** into the receiver or interchange tank. The condensed fluid thus flowing into the interchange tank displaces lubricant therein to raise the level of the lubricant within the housing. Hence, in this form of a refrigerating unit it is preferable that the junction between the connector **142** and the lower wall of the compressor is even with or below the inner surface of the housing so that condensed fluid may not become trapped in the housing. It is also preferable that the connector **142** is of sufficient heighth to permit simultaneous circulation in two directions therein; namely, that of the liquefied fluid toward the receiver, and that of the lubricant from the receiver to the housing. The lubricant is cooled through contact with the housing and end cover.

The compressor is supported from a base **190** by springs **192** intermediate that base and the housing **10**.

Although the mechanical features of the movable parts of the compressor shown are not a part of the present invention, they are necessarily shown and described to facilitate an understanding of the advantages derived through the features of the enclosure structure. Since the auxiliary end member **34** is used as a support for one end of the shaft **38**, as well as the support for other parts of the unit such as the lubricant conveying gear **94**, it is preferable that that member be machined to provide an accurate mounting for the parts. Then, since the welded seams are preferable both from the standpoint of cost and hermetic sealing, and heat applied directly to the auxiliary end member **34** such as would be necessary to weld that member in place would cause production troubles due to the warping of the auxiliary end member after it had been machined.

It is desirable therefore, to use an end cover for accomplishing the sealing of the end of the housing, and that end cover is preferably curved so that the edges at which the welding is done are separate from the auxiliary end member to prevent excessive transfer of heat to that member. By having curvature such that the mid-portion of the end cover rests against the end of the shaft or the auxiliary end member, that serves as a means of properly and consistently locating the end covers in the units thus constructed. After the end cover is thus located, it is preferable and desirable to secure that cover in place while the welding operation is being accomplished. As indicated, this may preferably be done by deforming a portion of the housing such as by rolling the edge of the housing over the edge of the curved end cover. The end cover thus formed also serves to aid in holding the auxiliary end member in place against the shoulder **32**. By making the curvature concave inwardly toward the inside of the housing, the cover is made stronger in resisting pressure from within. The space **112** between the auxiliary end member **34** and the end cover **106** may then be used as a lubricant cooling chamber. Since the lubricant is carried from the reservoir formed by the housing into the moving parts of the compressor, it is preferable to cool the lubricant before it enters the moving parts to lubricate the surfaces therebetween. The lubricant is therefore forced into the space **112** which provides a relatively large cooling surface for a relatively small volume of lubricant and thus accomplishes efficient cooling, and any sediment or foreign substance that settles out of the lubricant while it is in the space **112** is there trapped so that it cannot cause damage to the moving parts.

It is also desirable to cool the compressed fluid as much as possible within the compressor housing so as to thereby reduce the necessary size of the condenser **158**. Hence, the cooling fins **180** are secured thereto to increase the heat dissipating surface of the housing. The fluid that is not condensed within the housing passes through the connector **152** into the condenser **158**. Hence, that connector is necessarily hermetically sealed with the housing and the tube **156**. The sealing between the tube **156** and the connector **152** is preferably accomplished by brazing or soldering, and hence in order to facilitate the concentration of heat necessary to accomplish that operation, it is preferable that the sectional thickness of the connector **152** should be thinner than that of the housing **10**, or at least thin enough to prevent excessive dissipation of heat therefrom.

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

What is claimed is as follows:

1. In a compressor, a housing having an open end and an internal shoulder adjacent said open end; an auxiliary end cover in said housing and in engagement with said shoulder; and a dished end cover in the housing and engaging with its central portion the auxiliary end cover and so as to form together with the latter a compartment within the closed housing, and the rim portion of the dished end cover extending toward the open end of the housing and being secured thereto by an overlapping end portion of the housing and a compressor unit within the housing.

2. In a compressor, a housing having an open tapered end and an internal shoulder adjacent said open end; an auxiliary end cover in said housing and in engagement with the shoulder thereof; and a dished end cover in the housing and engaging with its central portion the auxiliary end cover so as to form together with the latter a compartment within the closed housing, the rim portion of the dished end cover being tapered and extending toward the tapered open end of the housing and being secured thereto by an overlapping end portion of the housing; and a compressor unit within the housing.

3. In a compressor, a housing having an open end and an internal shoulder adjacent said open end, an auxiliary end cover in said housing and in engagement with said shoulder, and a dished end cover in the housing and engaging with its central portion the auxiliary end cover so as to form together with the latter a compartment within the closed housing, and the rim portion of the dished end cover extending toward the open end of the housing and being secured thereto by an overlapping end portion of the housing, and a

compressor unit within the housing having a discharge jet directed toward the wall opposite said open end.

4. A motor-compressor unit comprising a cylindrical casing having an open end and an internal shoulder adjacent said open end, an auxiliary cover in said housing and in engagement with said shoulder, and a dished end cover in said housing and forming together with said auxiliary end cover an oil zone, a motor in said casing, a compressor in said casing, means whereby said motor drives said compressor, said motor and said compressor being axially displaced from said oil zone, means for forcing lubricant from said oil zone into a passage leading to the bearing surfaces of said motor and compressor, and a jet through which excess oil may leave said passage, said jet being directed against a portion of the end wall opposite said oil zone.

5. A motor-compressor unit comprising a casing, a motor in said casing having stator windings adjacent the upper end of said casing, a compressor in said casing driven by said motor, an oil passage through which oil is conveyed to the bearing surfaces of said motor and said compressor, jet means through which a portion of said oil discharges, said jet being directed toward said stator windings, means for forcing oil through said passage, and a reentrant portion on said casing projecting between said jet and said stator windings whereby oil discharged from said jet is prevented from striking said windings.

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