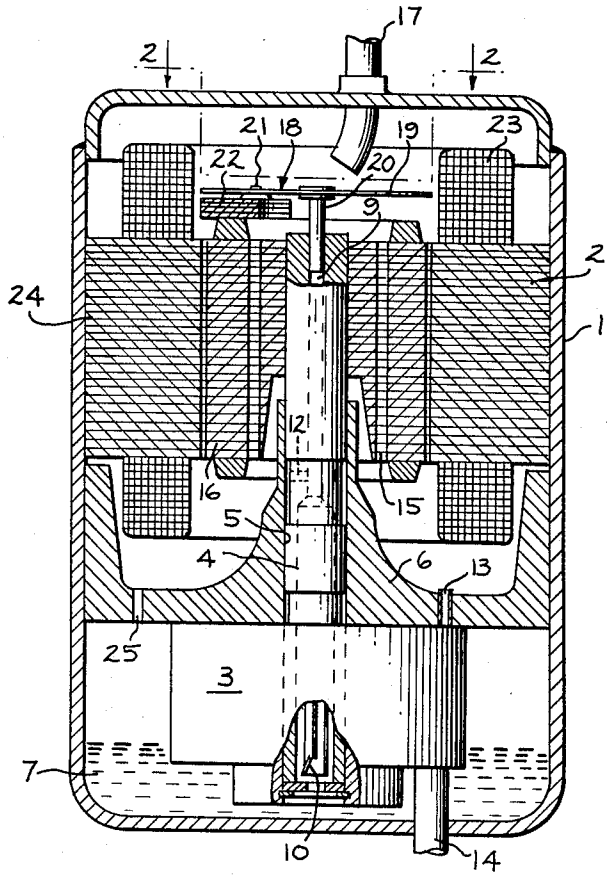
April 6, 1965 D. C. RINEHART 3,176,914

HERMETICALLY SEALED COMPRESSOR UNIT

Filed Aug. 27, 1963

FIG. 1



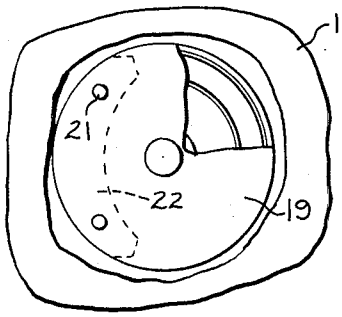




FIG. 2

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3,176,914

# HERMETICALLY SEALED COMPRESSOR UNIT

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2 Claims. (Cl. 230—207)

The present invention relates to hermetically sealed compressor units and is more particularly concerned with a hermetic compressor unit in which the high pressure gas discharged from the compressor is employed to cool the motor.

One form of hermetic compressor of this type includes a hermetic casing housing a compressor unit in the lower portion thereof and a motor for driving the compressor in the upper portion of the case. The two are mounted on a common shaft which is journalled in a bearing structure suitably supported within the casing. The bottom of the hermetic casing contains a reservoir of lubricating oil which is employed to lubricate the bearing surfaces of the unit. In order to convey the lubricating oil from the oil reservoir to the surfaces requiring lubrication, the compressor includes a lubricating system comprising a passage extending axially through the shaft to a point at least level with the uppermost bearing surfaces. For convenience of manufacture, the oil passage is normally drilled the entire length of the shaft and the upper portion of the passage is then plugged to prevent the oil flowing upwardly through the passage from being discharged through the upper end of the shaft into the portion of the case above the motor.

Also in hermetic compressors of the type in which the compressed gas is discharged from the compressor into the interior of the casing and is passed upwardly into cooling contact with the motor, means must be provided for separating entrained oil from the discharge gas before it leaves the casing so that this entrained oil can be returned to the oil reservoir. To this end, centrifugal means are normally provided above the motor for centrifugally separating the entrained oil from the gas which has passed through the motor.

The present invention is concerned specifically with a simple and low cost unitary assembly adapted to be mounted on the upper end of the motor for accomplishing both a plugging of the oil passage and a centrifugal separation of the entrained oil from the discharge gas.

In accordance with the preferred embodiment of the invention, there is provided a hermetically sealed compressor unit including a sealed casing having a body or reservoir of lubricating oil in the bottom thereof, a compressor positioned in the lower portion of the casing and a drive motor including a rotor in the upper portion of the casing. The drive motor and compressor are connected by means of a vertical drive shaft journalled in a bearing suitably supported within the casing and disposed above the oil reservoir. For the purpose of lubricating the bearing and other surfaces requiring lubrication, the shaft includes an axial passage for conducting oil from the oil reservoir to the upper portions of the shaft from where it is supplied through suitable ducts to the bearing and other surfaces. To facilitate the forming of this passage, the passage is drilled the entire length of the shaft so that it opens into the upper end thereof. The unit also includes means for directing the discharge gas from the compressor upwardly through the motor for cooling purposes. In order to seal the open upper end of the oil passage and to provide means for the purpose of centrifugally separating entrained oil from the discharge gas after it has passed through the motor, there is provided a unitary assembly comprising a rod or stem adapted to be snugly received in the upper end of the oil passage, a disc rigidly secured to the rod normal to the axis thereof



and means for securing the disc to the motor rotor so that during operation of the compressor the disc will rotate with the rotor substantially in the path of the gas stream flowing upwardly through the motor for the centrifugal separation of entrained oil from the gas stream.

For a better understanding of the invention, reference may be had to the accompanying drawing in which:

FIGURE 1 is a side elevational view partly in section of a hermetic refrigerant compressor incorporating the present invention; and

FIGURE 2 is a partial plan view taken generally along line 2—2 of FIGURE 1.

Referring to FIGURE 1 of the drawing, there is shown a hermetic compressor adapted to form part of a refrigeration system and comprising a seal casing 1 containing a motor 2 and a rotary compressor 3 connected by means of a vertical drive shaft 4 journalled in a bearing 5 forming part of a main frame 6. A body or reservoir of oil 7 is provided in the bottom of the casing 1 and the lower end of the shaft 4 extends into the oil reservoir 7. For the purpose of providing the necessary lubrication for the bearing 5 and the internal operating components of the compressor 3, the shaft is provided with an axial passage 9 extending the full height or length of the shaft and centrifugal pumping means comprising, for example, a spiral paddle 10 positioned in the lower end of the passage 9 which serves to pump oil from the reservoir 7 upwardly through the passage 9 during rotation of the shaft 4.

During rotation of the shaft 4 oil forced upwardly through the passage 9 is conveyed from the passage by suitable ducts (not shown) into the moving portions of the compressor 3 and by means of a duct 12 to the bearing 5.

During operation of the compressor unit, low pressure gas such as low pressure refrigerant from the evaporator component of a refrigeration system enters the unit through a suction line 14 forming the inlet to the compressor 3 and is discharged from the compressor into the casing above the main frame 4 through a discharge port 13. This high pressure discharge gas stream containing entrained oil from the compressor 3 passes upwardly through a plurality of passages or vents 15 in the motor rotor 16. As the gas stream passes through these passages it absorbs heat from the motor rotor and this heat is ultimately dissipated when the gas is discharged to a condenser (not shown) through a discharge line 17 connected to the casing 1 above the motor 2. In general, means are also provided for precooling the discharge gas as for example by means of liquid refrigerant as described and claimed in my copending application Serial No. 139,447, filed September 20, 1961, now Patent No. 3,109,297, and assigned to the same assignee as the present invention.

In accordance with the present invention there is provided a unitary simple and low cost assembly adapted to close the upper end of the passage 9 and also to centrifugally separate the entrained oil from the discharge gas after it has passed through the rotor 16. This assembly generally indicated by the numeral 18 comprises a disc member 19 of substantially the same diameter as the rotor 16 and a rod or stem 20 extending through the axis of center of the disc and rigidly secured thereto.

The rod or stem 20 is adapted to fit snugly in and substantially seal the upper end of the passage 9 while the entire assembly 18 is secured or anchored to the rotor only by means of one or more pins 21 extending through suitable openings in the periphery of the disc 19 and into the adjacent peripheral portion of the rotor 16. Alternatively as illustrated the disc may be secured to the rotor through a balance pad 22 normally provided on the periphery of the rotor for dynamic bal-

ancing purposes, the pad 22 being in turn riveted to or formed integrally with the rotor.

The disc is of a size such that when it is positioned on the rotor 16 it nests within the cavity defined by the windings 23 on the stator 24. The disc also overlies the upper ends of the passages 15 so that it is directly in the path of the gas stream flowing upwardly through these passages. With the compressor operating, the discharge gas which flows upwardly through the passages 15 impinges on the rotating disc with the result that the gas and its entrained oil is thrown outwardly by centrifugal action against the motor windings 23 and over these windings to the outer side portions of the case. The entrained oil is thereby separated from the gas. The gas passes upwardly and out through the discharge line 17 while the oil returns by gravity flow through the windings and winding slots provided in the stator and an oil return passage 25 in frame 4 to the reservoir 7.

When a balance pad such as the pad 22 is provided between the disc and the rotor, this pad facilitates the oil separation by acting as an impeller causing reduction in pressure between the ends of the rotor and the disc to facilitate the centrifugal action. Alternatively one or more impeller blades may be formed on the upper end of the rotor or integrally cast therewith to provide increased centrifugal action.

From the above description it will be seen that there has been provided a simple unitary structure providing both means for sealing the upper end of the oil passage 9 and also for providing the centrifugal forces or action necessary to separate the entrained oil from the gas passing upwardly through the motor. While a specific embodiment thereof has been shown it is to be understood that the invention is not limited to the particular form shown and described and it is intended by the appended claims to cover all modifications within the spirit and scope of the invention.

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

1. In a hermetically sealed compressor including a sealed casing having an oil reservoir in the bottom thereof, a compressor in the lower portion of said casing, a drive motor including a rotor in the upper portion of said casing, a vertical drive shaft connecting said compressor and said rotor, means including an axial passage in said shaft for conducting oil from said reservoir to the upper portions of said shaft, said passage opening into the upper end of said shaft, and means for conducting discharge gas from said compressor upwardly through said motor; the improvement comprising a unitary assembly for closing the upper end of said passage and for separating entrained oil from the discharge gas passing through the said motor, said assembly comprising a rod adapted to slide into the upper end of said passage, a disc rigidly secured to said rod and means for securing said disc only to said rotor for rotation of said disc with said rotor to centrifugally separate entrained oil from said discharge gas.



2. In a hermetically sealed compressor including a sealed casing having a body of lubricating oil in the bottom thereof, a compressor in the lower portion of said casing, a drive motor including a rotor in the upper portion of said casing, a vertical drive shaft connecting said compressor and said rotor, and having the lower end thereof submerged in said body of lubricating oil, means including an axial passage in said shaft for conducting oil from said body of oil to the upper portions of said shaft, said passage opening into the upper end of said shaft, and means for conducting discharge gas from said compressor upwardly through said motor; the improvement comprising a unitary assembly mounted on said rotor for closing the upper end of said passage and for separating entrained oil from the discharge gas passing through the said motor, said assembly comprising a rod adapted to fit snugly into the upper end of said passage, a flat disc rigidly secured to said rod member and means securing the peripheral portion to a peripheral portion of said rotor and in spaced relation to said rotor for rotation of said disc with said rotor to centrifugally separate entrained oil from said discharge gas.

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