

March 1, 1960

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2,926,840

ENCLOSED MOTOR-COMPRESSOR UNIT

Filed July 9, 1958

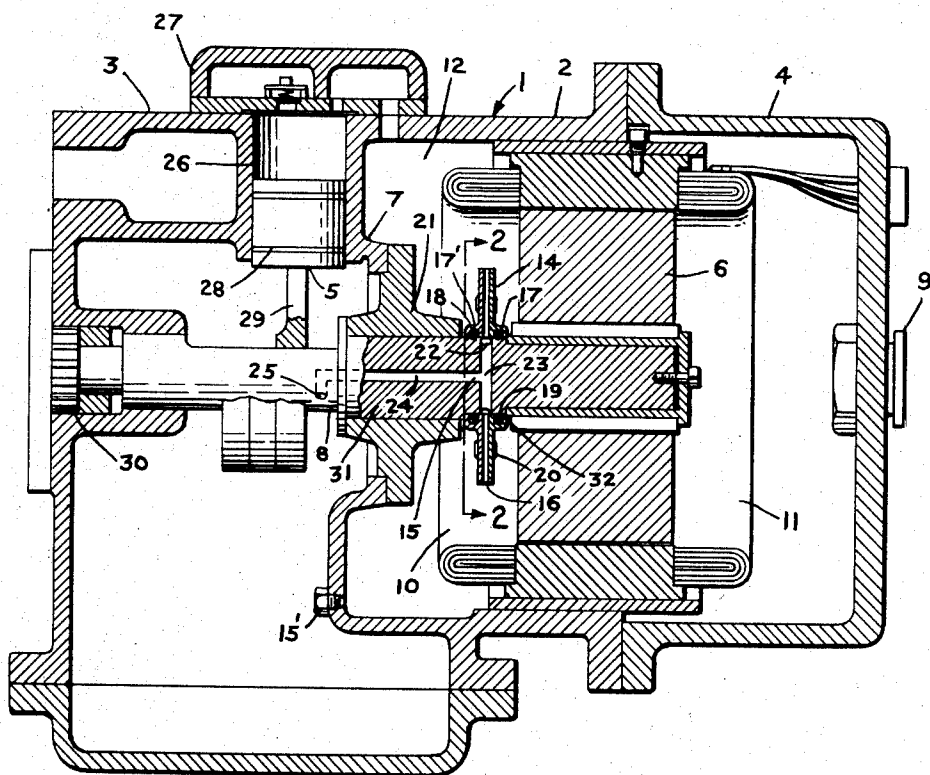


FIG. 1

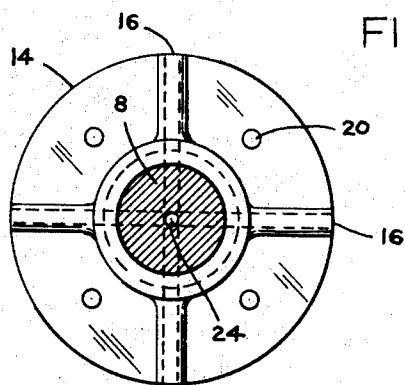


FIG. 2

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ENCLOSED MOTOR-COMPRESSOR UNIT

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Application July 9, 1958, Serial No. 747,525

5 Claims. (Cl. 230—206)

This invention relates to an enclosed motor-compressor unit, commonly called a hermetic compressor, and more particularly to a unit wherein the motor is cooled by the working fluid of the system in which the unit is operating.

The application of enclosed motor-compressor units as the circulating implement in a refrigeration system has distinct advantages, both from the standpoint of manufacture and operational effectiveness, over prior type units. However, inherent defects in the construction of hermetic refrigeration compressors has created serious operational difficulties and particularly in hermetic units of the horizontal type.

First, the return of lubricant from the motor compartment to the compressor compartment is arrested because operational characteristics of the unit tend to build up a higher pressure in the compressor compartment than existing in the motor compartment—the compartments being substantially sealed from each other.

Coincident with the foregoing pressure build-up, in the compression compartment, is the increase in oil level in the motor compartment. As a consequence the motor becomes oil flooded and if the condition is allowed to prevail the compressor becomes oil starved.

Various systems have been incorporated into the construction of hermetic motor-compressors to relieve the arresting influence that the higher gas pressure, in the compression compartment, has on the lubricant collected in the motor compartment.

One such system is disclosed in United States Patent 2,673,026 and provides a hermetic motor compressor with means for reducing the pressure in the compression compartment below the pressure in the motor compartment whereby lubricant then returns from the motor compartment to the compression compartment.

An analysis of the foregoing patent indicates that the problem relating to oil build-up in the motor compartment is solved with the system disclosed therein. However, another difficulty is presented and particularly in a compressor wherein the motor is cooled by the working fluid of the system in which the unit is operating. Flow of the hot system gases from the compression compartment through the shaft and out the pump located in the shaft at the outboard end of the motor compartment tends to adversely affect the motor temperature, because these hot gases, expelled at the outboard end of the motor compartment, then make a return pass through the motor to further increase the temperature thereof.

The present invention meets the problem of reducing the arresting influence that the higher gas pressure, in the compression compartment, has on the lubricant collected in the motor compartment and in addition in such a manner so as not to interfere with the cooling action that the system fluid has on the motor of the unit.

Said another way, hot gases are ejected from the compression compartment, and as described hereinafter, for passage to the suction manifold in such a fashion that

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they are precluded from interfering with the motor cooling effect that the system fluid has thereon.

Accordingly, it is one object of this invention to provide a hermetic motor-compressor with novel ejector means that remedy the foregoing objections.

It is another object to provide an improved enclosed motor-compressor unit.

With the foregoing objectives in view, and others as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawings, showing an enclosed motor-compressor embodying the novel ejector means, and the features of the invention will be specifically pointed out in the claims.

In the drawings:

Figure 1 is a longitudinal view in section of the enclosed motor-compressor embodying the invention.

Figure 2 is a sectional view taken on line 2—2 of Figure 1 showing the ejector means.

Referring more particularly to the drawings, Figure 1 thereof illustrates an enclosed motor-compressor unit generally designated 1 embodying the present invention. The motor-compressor unit is of the usual type and comprises a casing 2 divided into the usual compression compartment generally designated 3 including the compression means 5 and a driving compartment generally designated 4 including a driving means 6 by a partition means 7 which maintains the respective compartments substantially sealed from one another. Means taking the form of the usual crankshaft 8 is provided for interconnecting the compression means 5 to the driving means 6, the compression means receiving power from the driving means as is customary and in order to circulate the working fluid of the refrigeration system (not shown) with which it is associated.

Referring to Figure 1 in greater detail, a cylinder 26 is formed in the compression portion 3 which is usually integral with the casing 2. The usual cylinder head 27 is secured to the casing 2. Any suitable arrangement of intake and exhaust valves for the working fluid may be employed. In order to compress the working fluid I have provided a piston 28 adapted to reciprocate in the cylinder 26. The driving mechanism for the piston 28 comprises a connecting rod 29 driven from the crankshaft 8 which turns in bearings 30 and 31 suitably retained in the partition 7. Bearing 31 is suitably spaced from the driving means 6 to provide a portion 32 in the low pressure zone of the driving compartment adapted to accommodate the ejector means 14 which is described in detail hereinafter.

In the normal application working fluid from the low side of the refrigeration cycle is received by the compressor through an inlet 9 provided in the driving compartment 4 which is divided into a first zone 10 and a second zone 11 by the driving means 6. This fluid is then passed in heat exchange relationship with the motor 6 to the suction manifold 12, usually formed in the first zone and then to the compression means 5 for passage to the high side of the cycle.

It is evident that passage of the refrigerant through the motor will cause a resultant pressure drop in the gas flowing therethrough. As a consequence the zone receiving the gas that has been passed through the motor will be at a lesser pressure than the zone receiving the gas from the low side of the cycle. In the example shown, the first zone 10 will be at a lesser pressure than the second zone 11. However, it is not intended to limit the scope of the invention to this relationship because the zone receiving the gas from the low side of the cycle will be at a higher pressure than the zone receiving the gas that has passed through the motor.

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In order to alleviate the arresting effect that the high pressure build-up of gas in the compression compartment has on lubricant collected in the driving compartment as discussed above and in such a manner so as not to interfere with the cooling action that the system fluid has on the motor of the unit; ejector means 14 is disposed in the zone of lesser pressure and preferably mounted on the portion 32 of the shaft 8 formed between the bearing 31 and driving means 6 and in communication with a passage means 15 formed therein and to provide operative communication between the compression compartment and the zone of lesser pressure (the first zone) formed in the driving compartment. In addition to providing a pressure differential between the first zone 10 and the compression compartment 3 to permit return of lubricant to the compression compartment through means shown as a check valve 15' in partition 7, which means provides communication between the zone of lesser pressure and the compression compartment 3, disposition of the ejector means 14 in the zone of lesser pressure also provides direct passage of the hot compression gases to the suction inlet 12 to eliminate the heating effect that they had in the past on the motor of the unit.

The ejector 14 is shown as a cast impeller including passage channels 16 and a hub portion 17 provided with a cavity 18 for accommodating a sealing member such as an O-ring 19. However, it is not intended to limit the ejector to this form as it may comprise a hub mounted between the bearing 31 and driving means 6 and include tubes or discs for ejecting gas from the compression compartment 3.

Two similar impeller members are connected together by fastening means, such rivets 20, with the channels 16 matching to provide flow defining passage means. With O-rings 17 and 17' mounted in each impeller the ejector assembly is pressed onto the portion of the crankshaft 8 in the zone of lesser pressure and up to the bearing housings 21 which serves to sealably position the ejector over the groove 22 formed about the outer periphery of shaft 8 and in communication with a hole 23 also in the crankshaft 8 which communicates with a longitudinal hole 24 in the shaft which is operatively connected to a radial hole 25 formed in the portion of the crankshaft 8 housed in the compression compartment 3.

Accordingly, with this construction and during operation of the compressor the ejector 14 mounted on the shaft 8 and in communication with the compression compartment through passage means 15 creates a differential pressure between the compression compartment 3 and the zone of lesser pressure 10 by ejecting the gases building up in the compression compartment to the zone of lesser pressure 10 and directly to the suction manifold 12. As a consequence, motor cooling is not affected and the pressure in the compression compartment is lowered to permit return of lubricant collected in the driving compartment to the compression compartment through the check valve 15 in the partition 7.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown, but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. In a compressor of the hermetic type including a casing, partition means for dividing the casing into a driving compartment and a compression compartment, compression means in said compression compartment and driving means in the driving compartment, shaft means in the casing operatively interconnecting said compression means to said driving means, said driving means dividing the driving compartment into a first zone adjacent the compression compartment and a second zone, said first zone including a suction compartment for communicating said first zone with said compression means, said shaft including an ejector means in said first zone, said ejector means

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having an inlet and an outlet, and means connecting said inlet with said compression compartment to flow fluid therefrom into said first zone and means in the partition providing operative communication between the driving compartment and the compression compartment whereby lubricant flows from the driving compartment to the compression compartment.

2. In a compressor of the hermetic type including a casing, partition means for dividing the casing into a driving compartment and a compression compartment, compression means in said compression compartment and driving means in the driving compartment, shaft means in the casing operatively interconnecting said compression means to said driving means, said driving means dividing the driving compartment into a first zone adjacent the compression compartment and a second zone, said first zone including a suction compartment for communicating said first zone with said compression means, means for said shaft means to pass fluid from said compression compartment to said suction compartment, said last mentioned means comprising a passageway in said shaft and opening at one end in said compression means and at the other end in said first zone, an ejector in said first zone and mounted on the portion of said passageway opening in said first zone whereby fluid is flowed from the compression compartment to the suction compartment during operation of the compressor, and means in the casing providing operative communication between the driving compartment and the compression compartment whereby lubricant flows from the driving compartment to the compression compartment.

3. In a compressor of the hermetic type including a casing, partition means including a bearing housing and said partition means for dividing the casing into a driving compartment and a compression compartment, compression means in said compression compartment and driving means in said driving compartment, shaft means in said casing and disposed in said bearing housing to operatively interconnect said compression means to said driving means, said driving means dividing the driving compartment into a first zone adjacent the compression compartment and a second zone, the first zone including a suction compartment for communicating said first zone with the compression means, passage means in said shaft means and for communicating the compression compartment with said first zone and said passage means opening at one end into said first zone between said bearing housing and said driving means, ejector means mounted on said shaft and in communication with the end of the passage means opening into said first zone whereby on operation of said compressor fluid is passed from the compression compartment to said suction compartment through said ejector means, and means in the casing providing operative communication between the driving compartment and the compression compartment whereby lubricant flows from the driving compartment to the compression compartment.

4. In a compressor of the hermetic type including a casing, partition means including a bearing housing and said partition means for dividing the casing into a driving compartment and a compression compartment, compression means in said compression compartment and driving means in said driving compartment, a shaft in said casing and disposed in said bearing housing to operatively interconnect said compression means to said driving means, said driving means, dividing the driving compartment into a first zone adjacent said compression compartment and a second zone, the first zone including a suction compartment for communicating said first zone with the compression means, means for said shaft to pass fluid from said compression compartment to said suction compartment, said last mentioned means comprising a longitudinal passageway in said shaft having radial ports at the respective ends thereof, one of said ports opening into the compression compartment, the other port opening into

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said first zone between said bearing housing and said driving means, an ejector mounted on said last mentioned port whereby fluid is flowed from the compression compartment to said suction compartment during operation of said compressor, and vent means in the partition means providing operative communication between the driving compartment and the compression compartment whereby lubricant flows from the driving compartment to the compression compartment.

5. The compressor of claim 4 wherein the ejector com-

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prises separate discs including channels therein and having hub portions including a cavity through the inner periphery of the hub, said separate discs being connected together so that the channels form passageways in communication with the port in said shaft and sealing means in fluid sealing relation with the shaft.

References Cited in the file of this patent

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