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Endress

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[54] **REFRIGERATOR APPARATUS INCLUDING MOTOR COOLING MEANS**

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[52] **U.S. Cl.** **62/468,** 62/505

[51] **Int. Cl.** **F25b 31/00**

[58] **Field of Search** 62/84, 468, 505

[56] **References Cited**

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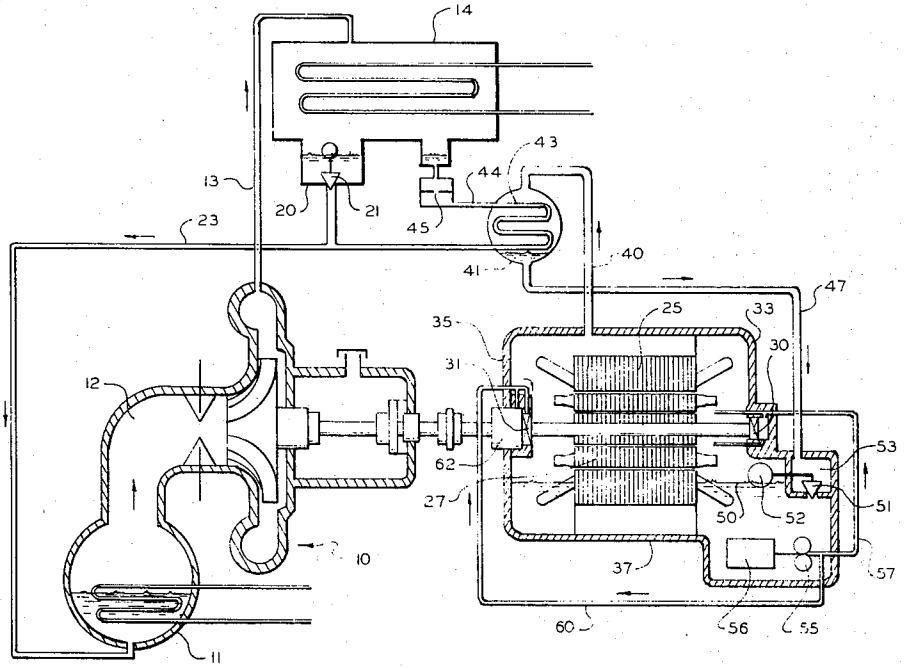
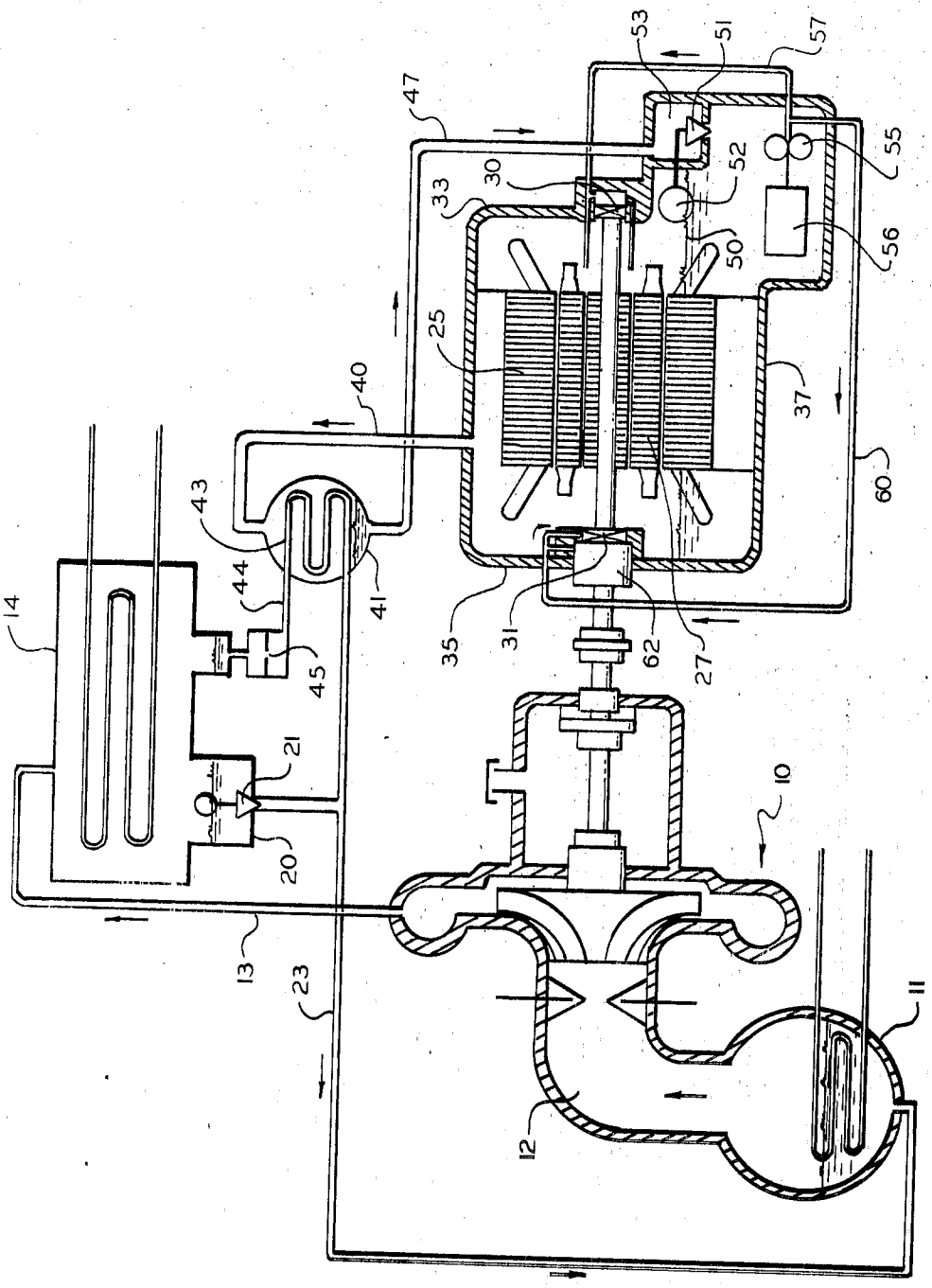
[57] **ABSTRACT**

The open drive motor for a refrigeration apparatus is mounted in a hermetic casing containing a quantity of a mixture consisting of a refrigerant and a lubricating oil. A passage extends from the upper portion of the casing to an auxiliary condenser, and a second passage returns condensed mixture to the motor casing. The auxiliary condenser is cooled by a metered flow of refrigerant from the condenser of the apparatus. The flow is metered to supply the condensed mixture in sufficient quantity to effectively cool the motor during continuous operation of the motor at full load.

2 Claims, 1 Drawing Figure

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REFRIGERATOR APPARATUS INCLUDING MOTOR COOLING MEANS

BACKGROUND OF THE INVENTION

In certain refrigeration systems the compressor is operated by an open drive motor. The open drive motor is mounted externally of, and separate from, the compressor, as distinguished from an enclosed drive wherein the motor is mounted in the compressor housing. The advantages of an open drive motor are well known, especially in that the motor can be quickly and conveniently serviced and replaced if necessary. Also, if desired, the motor can be replaced by a turbine or other primer mover. The advantage of a refrigerant cooled motor is also well known. The main advantage being in that the rating of the motor may be reduced 25 percent or more. This effects a saving of several thousand dollars in motor costs for a motor drive on large tonnage refrigeration apparatus.

Various arrangements have been proposed to cool open drive motors by refrigeration. In one arrangement, there is provided an auxiliary compressor and condenser. The refrigerant vapor is passed from the motor casing to the inlet of the compressor and the liquid refrigerant is conveyed from the auxiliary condenser to the motor casing. In that arrangement, a separate lubricating system is necessary to provide oil to the motor bearings. The motor bearings are sealed off to prevent the leakage of oil from the bearings into the refrigerant in the motor casing. It is necessary to periodically inspect the seals to make certain that the oil is not leaking into the refrigerant, especially where the compressor is of the reciprocating piston type. Also, a separate compressor has to be operated and maintained. In another arrangement, the refrigerant is passed directly from the main refrigerating apparatus to the motor casing. That arrangement has the same disadvantage in regard to supplying the lubricant to the motor bearings.

SUMMARY OF THE INVENTION

In this invention, the hermetically sealed motor casing is provided with the supply of mixture containing refrigerant and lubricating oil. A passage extends from the upper portion of the motor casing to the auxiliary condenser, and a passage from the condenser to the motor casing for the return of liquid refrigerant. Means is provided for maintaining the refrigerant oil mixture in the motor casing at a selected level. There is a flow metering means in a line extending from the main condenser to the cooling coil in the auxiliary condenser and is arranged to meter the refrigerant through the coil so as to maintain a flow of liquid refrigerant and oil mixtures from the auxiliary condenser to the motor casing sufficient to properly cool the motor when operated consistently under full load.

BRIEF DESCRIPTION OF THE DRAWING

The drawing discloses a schematic view of a refrigeration system, the compressor of which is driven by a motor embodying my invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The refrigeration system disclosed in the drawing includes a centrifugal type compressor **10** operable to draw refrigerant vapor from the cooler **11** through a passageway **12.** The compressed vapor is discharged from the compressor through a line **13** to a condenser **14.**

The condenser is provided with a refrigerant sump **20** containing a flow control metering valve **21** for the discharge of liquid refrigerant through line **23** to the lower portion of the cooler **11.**

The motor for driving the compressor **10** includes a stator **25** and a rotor **27.** The rotor **27** is journaled for rotation in bearigs **30, 31** mounted in the end walls **33, 35** of the hermetically sealed casing **37.**

A first passageway **40** extends from the upper portion of the casing **37** to an auxiliary condenser **41.** A heat exchanging coil **43** is mounted in the condenser **41** and is supplied with liquid refrigerant from the main condenser **14** through a line **44** which includes a flow control device **45.** Refrigerant is returned from the heat exchanger **43** to the cooler. As shown in the drawing, the return line from the heat exchanger **43** is connected in line **23.**

Liquid refrigerant is conveyed from the auxiliary condenser **41** to the motor casing **37** by line **47.** A supply of a mixture containing a refrigerant and a lubricating oil is maintained in the lower portion of the motor casing **37.** The refrigerant vapor passing through the passage **40** to the auxiliary condenser contains a quantity of the lubricating oil entrained therein. The refrigerant vapor is condensed in the condenser **41** and returned through the passage **47,** together with the oil entrained in the vapor. The mixture is maintained at a predetermined level indicated at **50** by a metering valve **51** operated by a float **52.** The valve **51** is mounted in a chamber **53.**

A pump **55** driven by a motor **56** operates to pump the mixture from the motor casing **37** through a line **57** for discharge onto the bearing **30** and against the confronting end of the rotor **27.** The mixture is also pumped through line **60** to the bearing **31** and to the shaft seal **62.**

Inasmuch as the auxiliary condenser **41** is cooled with refrigerant from the main condenser **14,** the mixture flowing through the return passage **47** to the motor casing is at an exceptionally low temperature. The motor is cooled to a temperature substantially equal to the temperature in the cooler **11.** This results in maintaining the oil in the mixture at high viscosity to provide good lubrication. This arrangement has the advantage of permitting the use of a refrigerant in the mixture different from the refrigerant in the refrigeration apparatus.

The meter device **45** may be in the form of a fixed orifice or an adjustable valve. In any event, the flow through the return passage **47** is such as to provide proper cooling of the motor when operated consistently at full load. Employing refrigerants conventionally used and conventional types of lubricating oils, the mixture may consist of 40 — 50 percent oil and 50 — 60 percent refrigerant.

While I have described the preferred embodiments of my invention, it is to be understood that the invention is not limited thereto, but may be otherwise embodied within the scope of the following claims.

I claim:

1. A refrigeration system including a compressor, a condenser and a cooler, a motor operatively connected to the compressor for operating the same, said motor being mounted in a hermetically sealed casing, a quan-

tity of mixture of a refrigerant and a lubricating oil in the motor casing, a passage extending from the upper portion of the motor casing to an auxiliary condenser and a second passage extending from the auxiliary condenser to the motor casing, means for maintaining said mixture at a selected level in the motor casing, a heat exchanging coil mounted in said auxiliary condenser, a refrigerant line extending from the apparatus condenser to said heat exchanger and a return line extending from the heat exchanger to the cooler of the apparatus, a flow metering device in said line from said apparatus condenser to said heat exchanger and operable to meter a flow of refrigerant from the apparatus condenser to said heat exchanger, said flow being sufficient to effectively cool the motor operating under maximum load, a pump operable to circulate the mixture in said motor casing and discharging the same to the bearings of said motor and against said motor components.

2. Apparatus as set forth in claim **1** wherein the mixture in said motor casing consists of 50 percent refrigerant and 50 percent lubricating oil.

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