May 29, 1934. J. H. DENNEDY 1,960,576

REFRIGERATING SYSTEM

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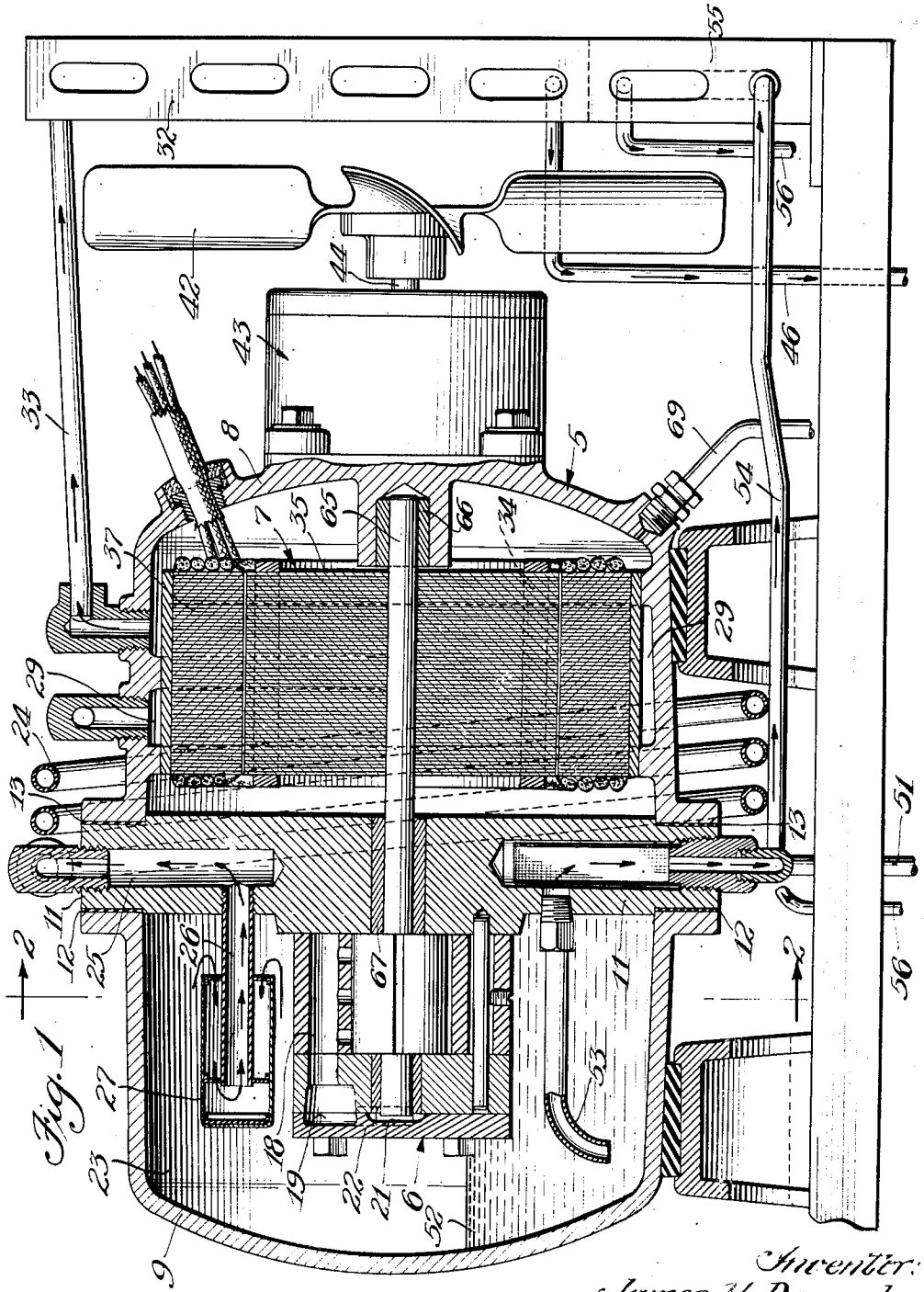


Fig. 1

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Fig. 2

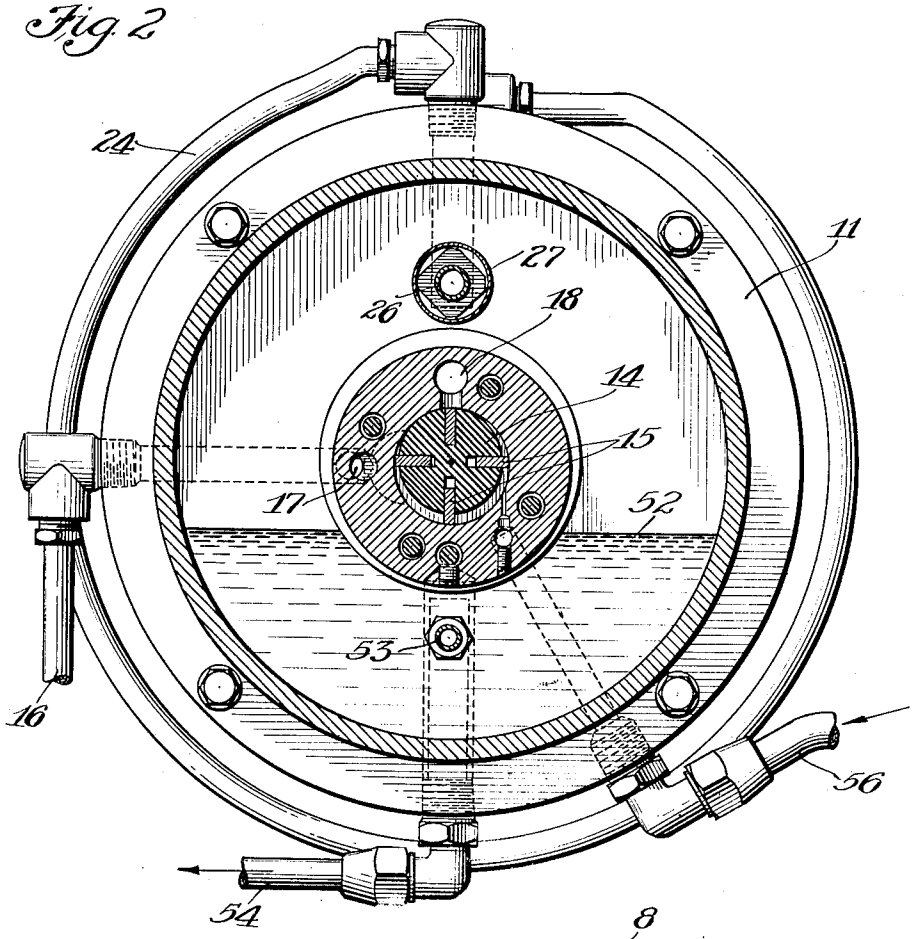
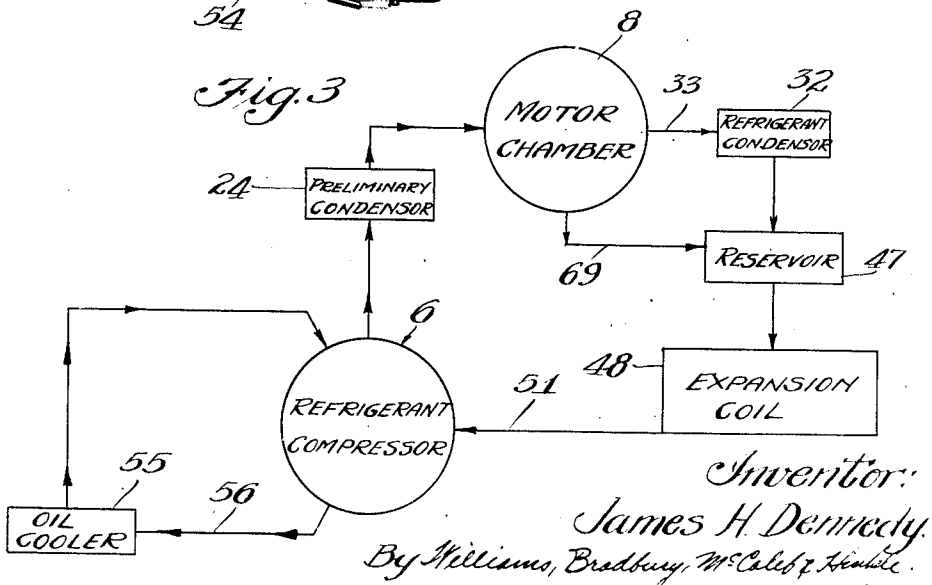


Fig. 3



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REFRIGERATING SYSTEM

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12 Claims. (Cl. 62—115)

This invention relates to a refrigerating system and more particularly to a system in which the motor and compressor are hermetically sealed within the system in such a manner that loss of refrigerant through a packing about the motor shaft leading to the compressor is impossible since the motor casing comprises a portion of the refrigerant circulating system.

An object of this invention is the provision of an improved method and means whereby the motor may be cooled.

In systems of this type it has heretofore been proposed to pass high pressure refrigerant from the compressor directly through the motor housing on its way to the condenser and thereby cool the motor, but this method has not been successful on account of the fact that the compressed refrigerant as it leaves the compressor is relatively hot and will not absorb sufficient heat from the motor to adequately cool the same.

Another object of my invention is to provide means for cooling the motor with refrigerant in a manner to obviate the above objection, and more specifically to provide a cooling element through which the refrigerant must pass while moving from the compressor to the motor compartment.

In general, my invention comprises a compound housing consisting of a motor casing and a compressor casing, which casings are sealed to a partition which separates them and forms two compartments both of which are in the refrigerant circulating system. The compressor is adapted to receive refrigerant from the low pressure side of the system and compress it, discharging the same into the casing about the compressor, from which it passes through an oil separator and thence to a preliminary cooling element which condenses a portion of the refrigerant, in practice about twenty-five per cent thereof, which condensed refrigerant together with the uncondensed is led into the motor compartment where it extracts heat from the motor, causing it to again vaporize. The refrigerant gas discharged from the motor casing passes through the main condenser and from there to the receiver and expansion coils.

In the accompanying drawings, in which a specific embodiment of my invention is illustrated,

Figure 1 is a vertical longitudinal section of the compressor and motor unit constructed in accordance with my invention;

Figure 2 is a vertical cross section taken on the line 2—2 of Figure 1; and

Figure 3 is a diagrammatic illustration of a typical circulating system incorporating my invention.

Referring to Figures 1 and 2, the compound housing 5 for the compressor 6 and the motor 7 comprises a motor casing 8 and a compressor casing 9, which casings are suitably secured in firm engagement with opposite sides of the partition element 11 and have suitable gaskets 12 and 13 interposed between the partition and the casings for making a hermetic seal therewith so that none of the refrigerant can escape into the surrounding atmosphere.

The compressor may be of any conventional type comprising a rotating element 14 having vanes 15 which draw refrigerant into the compressor through the pipe line 16 and port 17, after which it is compressed and discharged through the passageway 18 and through the passageway 19 and port 21 through the head 22 into the space 23 within the compressor housing.

A preliminary cooling coil 24 has communication with the interior of the compressor compartment 23 through the medium of a vertical passageway 25 in the upper edge of the partition 11, and through the conduit 26 and oil separator 27. The coil 24 passes around the motor housing a sufficient number of times to provide ample radiating surface through which heat may pass for the purpose of allowing part of the refrigerant therein to become condensed. The opposite end of the coil 24 has communication with a passageway 29 in the motor casing, which passageway communicates with all parts of the interior of the motor compartment. The condensed refrigerant coming into contact with the motor 7 extracts heat therefrom to cool the motor and becomes again fully vaporized and passes out of the motor casing and to the main condenser unit 32 through the medium of a conduit 33.

A motor 7 is preferably of the squirrel cage induction type as illustrated, having the conducting bars 34 and end rings 35 permanently fixed thereto. The stator 37 may have any suitable type of winding thereon for producing the necessary rotating field and the electrical conductors leading to the winding must be suitably sealed where they pass through the motor casing.

The fan 42 which cools the condenser 32 is driven by an independent motor 43 through the motor shaft 44. The condensed refrigerant passes from the condenser through the conduit 46 and to the receiving chamber 47, from which it is controllably admitted to the expansion coils 48 illustrated diagrammatically only in Fig. 3.

From the expansion coils it is again drawn to the compressor through the conduit 51 and the refrigerant cycle is repeated.

The compressor compartment is at all times partially filled with oil 52 which is drawn through the conduits 53 and 54, through which it is conducted to the oil cooler 55, which is preferably a portion of the main condenser as shown in Figure 1. The cooled oil passes from the cooler 55 through the conduit 56 and back to the compressor as shown in Figure 2.

The motor shaft 65 is journalled in suitable sleeve lubricating bearings 66 and 67 for simplifying the lubricating system and insuring long and continuous operation of the refrigerating unit without the necessity of repair or replacement. In case oil should be entrained into the motor compartment along with the refrigerant, suitable means may be provided such as a conduit 69 for conducting the oil therefrom to the receiver 47, from which it is carried through the expansion coils and back to the compressor.

It will be understood by those skilled in the art that various modifications may be devised for accomplishing the objects of this invention and I therefore desire to avail myself of such modifications as come within the scope of the appended claims.

I claim as my invention.

1. In a refrigerating system in combination, a sealed casing including a compressor compartment and a motor compartment, a compressor and a motor in their respective compartments operably connected together, said compressor being adapted to receive low pressure gas from outside said casing and compress it, discharging it under high pressure into said compressor compartment, a preliminary cooler communicating with said compressor compartment and adapted to discharge commingled, compressed gaseous and condensed refrigerant into the motor compartment for cooling the motor, and a condenser communicating with said motor compartment for fully liquefying gas discharged therefrom.

2. In a refrigerating system in combination, a sealed casing including a motor compartment and a compressor compartment, a motor and a compressor operably connected together and positioned in their respective compartments, said compressor being adapted to compress refrigerant and discharge it into the compressor compartment, cooling means communicating with said compartments for conducting refrigerant from one to the other while condensing a portion of the same, and a refrigerant condenser communicating with said motor compartment to condense refrigerant discharged therefrom.

3. In a refrigerating system in combination, a refrigerant compressor, a motor operably connected with said compressor, cooling means for said motor comprising a casing, and a cooling coil for conducting compressed refrigerant from the compressor to the interior of the motor casing and condensing a portion thereof, and means for condensing refrigerant discharged from said motor casing.

4. In a refrigerating system in combination, a refrigerant compressor, and a motor for operating the same, a casing about said compressor for receiving oil and refrigerant discharged therefrom under high pressure, a sealed motor casing, a cooler communicating with and adapted to conduct refrigerant from the compressor casing to the motor casing and condense a portion of the same, and means for condensing the refrigerant discharged from the motor casing.

5. In a device of the class described, a motor, a sealed casing about said motor, means for partially condensing gaseous refrigerant and delivering commingled gaseous and condensed refrigerant under pressure to said motor casing for cooling said motor, and means for condensing the refrigerant discharged from the motor casing.

6. In a hermetically sealed refrigerating system, a compressor and motor unit hermetically sealed within the system, a casing for the motor, a preliminary cooling element adapted to receive gaseous refrigerant under pressure from said compressor, partially condense the refrigerant and deliver it to the interior of the motor casing, and means for condensing the refrigerant discharged from the motor casing.

7. The method of cooling a motor which is sealed in a refrigerating system including a compressor and refrigerant, which consists of passing compressed refrigerant gas from the compressor through a cooler for partially condensing the same, then passing the commingled gaseous and condensed refrigerant through the motor.

8. In a hermetically sealed refrigerating system comprising a compressor and a motor for operating the same, a casing for said motor, means for cooling and partially condensing the compressed refrigerant and delivering it in a commingled state to the motor casing, and a condenser for liquefying the refrigerant discharged from the motor casing.

9. In a refrigerating system comprising a hermetically sealed refrigerating circuit including a compressor, a casing about the compressor forming a compartment for containing gaseous refrigerant under pressure, a motor operably connected with said compressor, a casing for said motor forming a compartment therefor, a partition between the compartments having its edge fixed to said casings, an auxiliary condenser communicating with the compressor compartment for receiving refrigerant therefrom and partially condensing the same, and discharging the refrigerant into the motor casing, and a main condenser having communication with the discharge of the motor casing.

10. In a refrigerating system comprising a hermetically sealed refrigerating circuit including a compressor, a casing about the compressor forming a compartment for containing gaseous refrigerant under pressure, a motor operably connected with said compressor, an auxiliary condenser communicating with the condenser compartment for receiving refrigerant therefrom and partially condensing the same, means communicating with said auxiliary condenser adapted to conduct refrigerant therefrom into heat exchange relation with said motor, and a main condenser for receiving and fully liquefying refrigerant discharged from the last said means.

11. The method of cooling the compressor motor of a refrigerating apparatus which consists in passing substantially all of the circulating refrigerant in series through a circuit, in the course of which circuit the compressed gaseous refrigerant is first partially condensed, then passed into heat exchange relation with the motor to revaporize some of the condensed refrigerant and then passing the refrigerant into a condenser, the refrigerant at the region of the first and second mentioned condensings and at the region of the heat exchange relation being at substantially the same pressure.

12. A refrigerating system having a motor for the compressor and comprising a circuit for a refrigerant consisting, in order, of a low pressure expansion chamber, said compressor, a first condenser, a chamber in heat absorbing relation to the motor, a second condenser (the first condenser, chamber and second condenser being under high pressure) and a valve leading from the second condenser to the expansion chamber, substantially all of the circulating refrigerant passing through said circuit in series.

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