

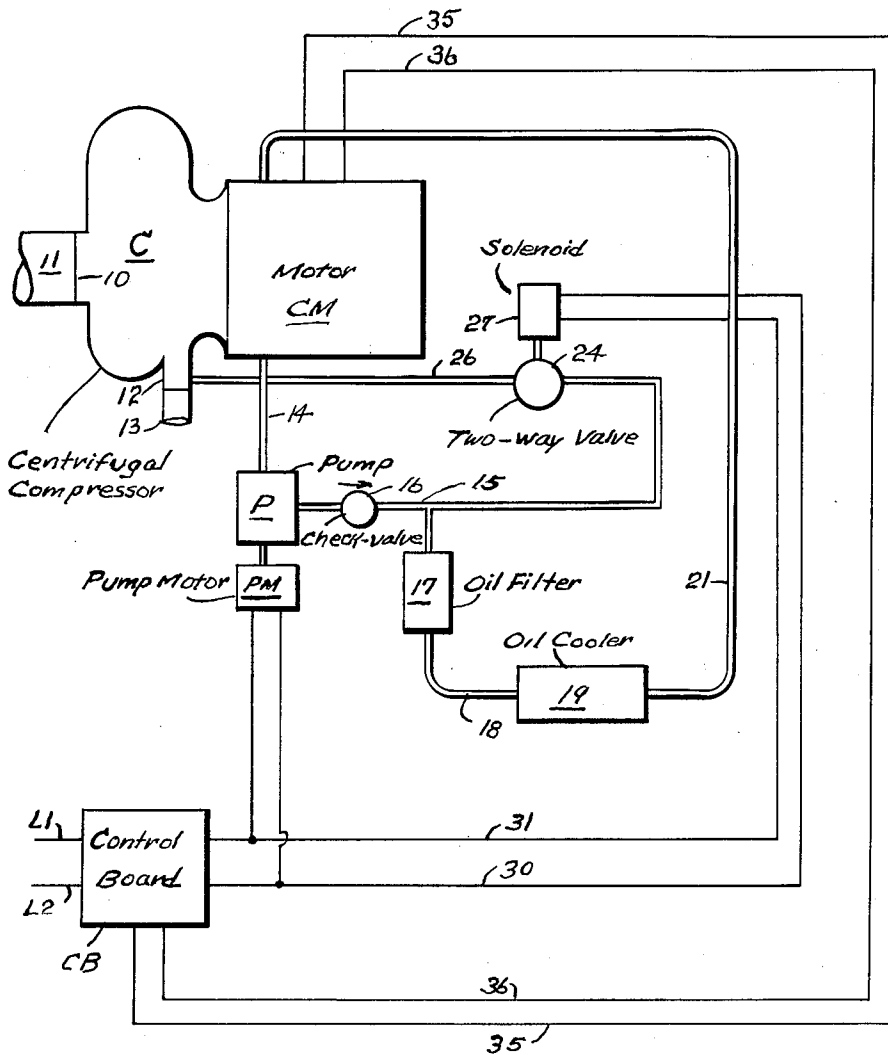
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OIL SUPPLY SYSTEMS FOR REFRIGERANT COMPRESSORS

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OIL SUPPLY SYSTEMS FOR REFRIGERANT COMPRESSORS

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8 Claims. (Cl. 230-207)

This invention relates to oil supply systems for motor-driven, refrigerant compressors having external motor-driven, oil pumps.

In one refrigeration system having a motor-driven centrifugal compressor, and having an external, motor-driven, oil pump for supplying oil to the bearings of the compressor-motor unit, it is the practice to energize the pump motor for a short period of time before the compressor motor is started, and the deenergize the pump motor shortly after the compressor motor is deenergized. This provides oil to the bearings while the compressor and its motor are starting, and while they are coming to a stop. A disadvantage of such an oil supply system is that in case of a power failure, the oil pump motor will stop when the compressor motor stops.

The copending application of J. L. Ditzler, Ser. No. 360,410, filed Apr. 16, 1964, discloses and claims a system for supplying oil to the bearings of a compressor-motor unit while the latter is coming to a stop after a power failure, by providing a pressure tank in the oil circuit, and by providing a solenoid-operated, three-way valve which connects the top of the tank to the suction side of the compressor for applying suction to fill the tank with oil while the compressor is operating, and which connects the bottom of the tank to the discharge side of the compressor when the compressor and pump motors are deenergized, to supply discharge gas into the tank to force the oil therein to the bearings of the compressor-motor unit.

This invention is an improvement on that of the Ditzler application, in that the pressure tank is eliminated, and a two-way valve instead of a three-way valve is used. The two-way valve supplies discharge gas into the oil filter and oil cooler of the system to force oil in the filter and cooler to the bearings of the compressor-motor unit, when the compressor and pump motors are deenergized.

Objects of this invention are to simplify and reduce the costs of systems for supplying oil to the bearings of a compressor-motor unit while the latter is coming to a stop.

This invention will now be described with reference to the annexed drawing which is a diagrammatic view of one embodiment of this invention.

A centrifugal, refrigerant compressor C is driven by an electric motor CM, the two being combined as a unit. The compressor C has an axial, gas inlet 10 connected by a refrigerant line 11 to an evaporator which is not shown, and has a discharge gas outlet 12 connected by a refrigerant line 13 to a condenser which is not shown. Lubricating oil is drawn from the bearings of the unit, through a tube 14 by an external oil pump P driven by an electric motor PM. The discharge side of the pump P is connected by a tube 15 containing a check-valve 16, to the inlet of an oil filter 17. The outlet of the filter 17 is connected by a tube 18 to the inlet of an oil cooler 19, the outlet of which is connected by a tube 21 to the internal lubricating system of the compressor-motor unit. The inlet of the filter 17 is also connected by a tube 22 to a two-way valve 24 which is connected by a tube 26 to the outlet 12 of the compressor C. The valve 24 is adjusted by a solenoid 27.

The solenoid 27 is connected by wires 30 and 31 to wires 32 and 33 respectively, which connect the pump

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motor PM to a conventional control board CB. The compressor motor CM is connected by wires 35 and 36 to the control board CB. The control board is connected to power lines L1 and L2.

OPERATION

In operation, just before the compressor motor CM is energized by the control board CB, the pump motor PM is energized by the control board to drive the pump P. While the compressor is starting up, the pump P circulates oil through the tube 14, the check-valve 16, the tube 15, the oil filter 17, the tube 18, the oil cooler 19, the tube 21 and the bearings of the compressor-motor unit, and continues this circulation while the pump motor PM is energized. The solenoid 27 is energized at this time, and the valve 24 is adjusted to prevent discharge gas in the tube 26 from passing into the tube 22. When the compressor motor CM is deenergized by the control board CB, the pump motor PM remains energized by the control board for a short time after the compressor motor CM is deenergized by the control board, so that oil is supplied by the pump P to the compressor-motor unit while the latter is coasting to a stop. So far, the described operation is conventional except that the usual oil circuit does not include the tube 26, the two-way valve 24 and its solenoid 27, the tube 22, and the check-valve 16.

In the conventional system, when there is a power failure, the pump motor cannot operate after the compressor motor is deenergized, so that there is inadequate lubrication during the time the compressor-motor unit is coasting to a stop. The coasting to a stop period may be twenty seconds or more due to the high speed of normal operation, and the fly wheel effect.

Using this invention, when the pump motor PM and the solenoid 27 are deenergized, the solenoid adjusts the valve 24 to supply discharge gas from the compressor C and the condenser to which it is connected, through the tube 26 into the tube 22, and from the latter into the filter 17, the check-valve 16 preventing the passage of discharge gas into the pump P. The high pressure discharge gas applied to the inlet of the filter 17, forces the oil in the filter 17 and the oil cooler 18, through the tube 21 to the bearings of the compressor-motor unit. The oil so supplied from the filter 17 and the cooler 19 provides lubrication for about thirty seconds, a period of time sufficient for adequate lubrication while the compressor-motor unit is coasting to a stop.

When the pump motor PM is again started, the pump P supplies oil under pressure into the previously described circuit to force the discharge gas therefrom, and to supply oil to the compressor-motor unit before the compressor motor CM is started.

The oil filter 17 and the oil cooler 19 are seen to serve as oil storage means in addition to their usual functions.

What is claimed is:

1. An oil supply system for a compressor-motor unit, comprising an oil pump, oil storage means having its inlet connected to the outlet of said pump, an oil return tube connecting the inlet of said pump to said unit, an oil supply tube connected to the outlet of said storage means, a two-way valve, a third tube connecting said valve to said inlet of said storage means, a fourth tube connecting said valve to the outlet of said compressor, and means for adjusting said valve to connect said fourth tube to said third tube for supplying discharge gas from said compressor into said inlet of said storage means to force oil from said storage means through said oil supply tube to said unit.

2. An oil supply system as claimed in claim 1 in which said oil storage means comprises an oil filter.

3. An oil supply system as claimed in claim 2 in which said oil storage means comprises an oil cooler connected in series with said filter.

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4. An oil supply system as claimed in claim 1 in which said oil storage means comprises an oil cooler.

5. An oil supply system as claimed in claim 1 in which an electric motor is provided for driving said pump, in which a solenoid is provided for adjusting said valve, in which common means is provided for concurrently energizing and deenergizing said pump motor and said solenoid, said solenoid, when energized, adjusting said valve to disconnect said fourth tube from said third tube, and, when deenergized, adjusting said valve to connect said fourth tube to said third tube.

6. An oil supply system as claimed in claim 5 in which said oil storage means comprises an oil filter.

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7. An oil supply system as claimed in claim 6 in which said oil storage means comprises an oil cooler connected in series with said filter.

8. An oil supply system as claimed in claim 5 in which said oil storage means comprises an oil cooler.

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