

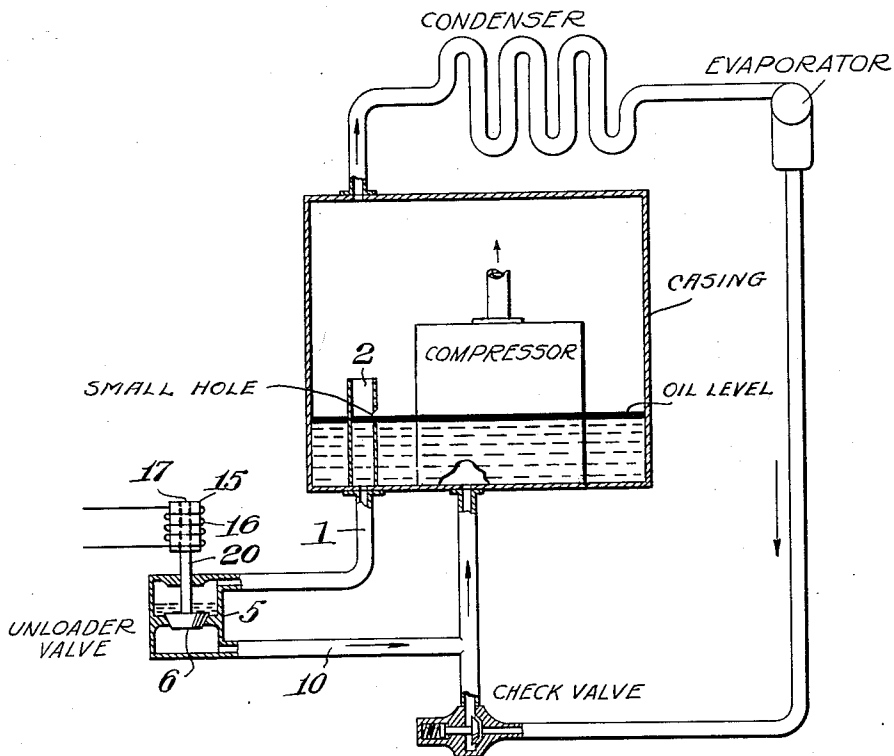
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REFRIGERATION APPARATUS

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REFRIGERATION APPARATUS

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This invention relates to refrigeration apparatus and particularly to unloaders for compressors of such apparatus. In the operation of a refrigerator compressor, it is highly advisable in certain cases to have some means for permitting the driving motor to acquire its running speed before being fully loaded.

The usual unloading system involves a gas line connecting the exhaust and intake of the compressor. Disposed in this line is a valve which may be suitably controlled so that substantially unobstructed passage to the refrigerator is offered while the motor is starting up. It is evident that after the motor has attained its running speed, complete closure of the gas line is necessary if leakage is to be avoided. As is well known, the pressures reached in a refrigerating system of the household type are frequently in the neighborhood of 100 pounds to the square inch. With refrigerants such as sulphur dioxide, and other substances in common use, it is a difficult problem to avoid leakage at valves under such conditions.

An object of this invention is to devise an unloader system in which no leakage is possible during the closed position of the valve.

In general, this invention contemplates the introduction of a sealing liquid, preferably lubricating oil, at the unloader valve, resulting in the effectual closing of the valve to the medium being compressed during the operation of the compressor. In order to introduce the sealing liquid, provision is made whereby the exhaust of the compressor exerts pressure on a body of lubricating oil and forces a small quantity of such oil into the unloading system.

The single figure in the drawing shows a refrigerating system embodying this invention. In the preferred embodiment of the invention the compressor, which may be of any type whatsoever, exhausts directly into the interior of a chamber from which a suitable conduit leads to a condenser for the liquefaction of the refrigerant. The condenser supplies the liquefied refrigerant to an evaporator from whence the gasified refrigerant finds its way back through a check valve into the intake of the compressor. In the bottom of the chamber there is preferably a body of lubricating oil which is adapted to be forced through the compressor for lubricating the bearings.

In order to unload the driving motor, I preferably provide a pipe 1 extending into a casing and having an open end 2 well above the level of the oil exposed to the exhaust pressure from the compressor. Pipe 1 terminates in an unloader valve comprising a seat 5 and valve 6. A pipe 10 connects the valve with the intake of the compressor. Any of the well-known means for operating valve 6 at the proper time may be used. In this instance, there is shown an electro-magnet 15 having a coil 16 provided with a cylindrical aperture 17, into which is adapted to be drawn an armature 20 attached to valve 6. Through suitable connections (not shown) coil 16 may be energized during the period when the driving motor is started until it attains its running speed. The energization of this coil serves to pull up armature 20 within aperture 17 of electro-magnet 15 and thus opens valve 5. At the same time, the check valve remains closed because of the abnormal pressure in line 10. The exhaust and inlet of the compressor are therefore directly connected and permit the free operation of the compressor. Upon the attainment of full speed, electro-magnet 15 is de-energized and releases valve 6, permitting it to drop on seat 5. The suction of the compressor on the intake opens the check valve. Pressure is then built up within the casing and the load on the compressor established.

While the high pressure within the casing tends to force valve 6 tightly against seat 5, it is found in actual practice that it is difficult to avoid some leakage with ordinary valves. In order to remove any such possibility, there is preferably provided a minute opening in pipe 1 at approximately the level of the oil. It is clear that during the time the check valve is closed and unloader valve is open, the discharge from the compressor rushing through pipe 1 will serve to draw a minute quantity of oil into pipe 1. This oil will naturally be

drawn along by the current of gas and be deposited along various portions of the inside of the unloader valve. Upon the closure of valve 6 on its seat, any slight leakage of gas in the seat will serve to collect oil at the leak and form a seal.

Of course, the relative positions of the various parts may have some influence on the amount of oil flowing into pipe 1. Thus, for example, if the parts are in the relative position shown in the drawing, gravity will tend to aid in the introduction of the oil to the valve. This, however, is not essential since the rush of gas through pipes 1 and 10 when the unloader valve is open and check valve is closed, will be amply sufficient for introducing a small amount of oil into the valve, irrespective of the relative positions of the parts.

Inasmuch as the surface of the oil during the operation of the compressor is agitated, it is evident that the precise location of the small hole in pipe 1 is immaterial so long as some oil will get to it. Any excess oil within the unloader system will be blown back into the compressor when the unloader valve is open and check valve closed, so that there is no harm in having more oil in the unloader system than is necessary for sealing. The static pressure built up within pipe 1 when the unloader valve is closed will prevent the filling up of the unloader system with oil to the exclusion of gas. In practice, the size of the hole in pipe 1 and the relative position with respect to the oil level will depend upon conditions of the entire system and may easily be determined by experiment.

While I have described this invention in connection with a refrigeration system, it is to be clearly understood that this invention may be generally applied to any system whatsoever in which a compressor and an unloader are associated.

What I claim is:

1. A system of the character described comprising a compressor, a gas conduit having a check valve connected to the intake thereof, a shunt path from the exhaust to the intake of the compressor including a valve for unloading, said compressor during the starting thereof, and means associated with said shunt path for the introduction of a sealing liquid on said valve.

2. A system of the character described comprising a compressor, a gas conduit having a check valve connected to the intake thereof, a shunt path from the exhaust to the intake of said compressor, said shunt path including a valve adapted to be opened only during the starting period of said compressor and to be maintained in closed position directly by gas pressure from the compressor discharge, a body of oil for lubricating said compressor, and means for introducing a portion of said

oil into said shunt line for sealing said valve in its closed position.

3. A system of the character described comprising a compressor, a body of lubricating oil associated therewith, a gas conduit having a check valve connected to the intake of said compressor, a shunt path from the exhaust to the intake of said compressor including a valve, means for opening said valve during the starting period of said compressor only, means connecting the high pressure side of said valve with the gas discharge from the compressor and said oil, and means for introducing a portion of said oil in said valve body for sealing the same in its closed position.

4. A system of the character described, comprising a compressor, an unloading shunt line including a valve connecting the exhaust and intake of said compressor, means for opening said valve during the starting period of said compressor, means for applying the compressor discharge pressure to said valve to close it, and means connecting said shunt line and said body of oil whereby a portion of said oil may flow into said line and seal said valve in its closed position.

5. In a system of the character described, a compressor, a chamber into which said compressor discharges, a body of oil associated with said compressor for lubricating purposes, a shunt pipe line including a valve connecting said chamber and the intake of said compressor, said valve being adapted to be opened during the starting period of said compressor and to be closed during the operation thereof by the gas discharge, and means for introducing a portion of said oil into said shunt line and valve for sealing the latter in its closed position.

6. A system of the character described comprising a compressor, a chamber into which the compressor discharges, a shunt line including a valve connecting said chamber and the intake of said compressor, said valve being adapted to open during the starting period of the compressor and be closed during the normal operation thereof by the discharge pressure of said compressor, a body of lubricating oil associated with said compressor and exposed to the pressure within said chamber, and means whereby a quantity of oil may be introduced into said shunt line and said valve for sealing the latter in its closed position.

7. A system of the character described comprising a compressor, a chamber into which said compressor discharges, a body of oil associated with said compressor for lubricating the same, and an unloading system for said compressor, said unloading system comprising a shunt line from said chamber to said compressor intake, said shunt line including a valve adapted to be opened during the starting of said compressor and

be closed during the normal running thereof by the gas pressure from the compressor, said shunt line having a connection to said body of oil whereby a quantity of said oil is admitted to the valve for sealing the same.

8. A system of the character described comprising a compressor, a chamber into which said compressor is adapted to discharge, a body of oil associated with said compressor for lubricating the same and exposed to the pressure in said chamber, and an unloading system for said compressor comprising a shunt line including a valve from said chamber to the intake of said compressor, said valve being adapted to open during the starting period of said compressor and close during the normal operation thereof from the gas discharge, the portion of said shunt line between said chamber and unloading valve having an opening exposed to the body of oil whereby a quantity of said oil is admitted for sealing said valve.

9. A refrigerating system of the type in which oil and refrigerant mingle freely including a compressor, a gas conduit having a check valve connecting an evaporator and compressor intake, a body of lubricating oil operatively associated with said compressor and adapted to be exposed to the exhaust of said compressor, an unloading system comprising a gas line and valve directly connecting the exhaust and intake of said compressor, said valve being adapted to open during the starting of the compressor to permit gaseous refrigerant to pass freely there-through and unload the compressor and to close during the normal operation of the compressor from the gas pressure, and means whereby a quantity of said oil is introduced into said shunt line for sealing said valve in its closed position.

10. A refrigerating system of the type wherein lubricating oil and refrigerant mingle freely including a compressor, a gas conduit having a check valve connecting an evaporator and compressor intake, a chamber into which said compressor discharges, a body of lubricating oil operatively associated with said compressor and exposed to said pressure in the chamber, and an unloading system for said compressor comprising a gas line connecting said chamber and the said compressor intake, said gas line including a valve adapted to open during the starting of said compressor and to close during the normal operation thereof from the gas pressure, said gas line having a connection with said body of oil whereby a quantity of oil is introduced into said line and valve for sealing the latter in its closed position.

11. A refrigerating system of the type wherein lubricating oil and refrigerant mingle freely including a compressor, a gas conduit having a check valve connecting an evaporator and compressor intake, a cham-

ber into which said compressor discharges, a body of lubricating oil for said compressor located in said chamber, and an unloading system for said compressor, said unloading system comprising a gas line and a valve connecting said chamber and said compressor intake, said valve being adapted to be opened during the starting period of said compressor and closed during the normal operation thereof from the gas pressure, said gas line having a restricted opening communicating with said body of oil whereby a portion of said oil is introduced into said gas line to seal said valve in its closed position.

12. A refrigerating system of the type wherein lubricating oil and refrigerant mingle freely including a compressor, a gas conduit having a check valve connecting an evaporator and compressor intake, a chamber into which said compressor discharges, a body of oil in said chamber for lubricating said compressor, a gas line connecting said chamber and said compressor intake, said gas line including a valve adapted to open during the starting period of said compressor and close during the normal operation thereof from the gas pressure, at least a portion of said gas line passing through said oil and having a restricted opening communicating with said oil whereby a quantity of oil is introduced into said valve for sealing in closed position.

In testimony whereof he affixes his signature.

MAHLON W. KENNEY.