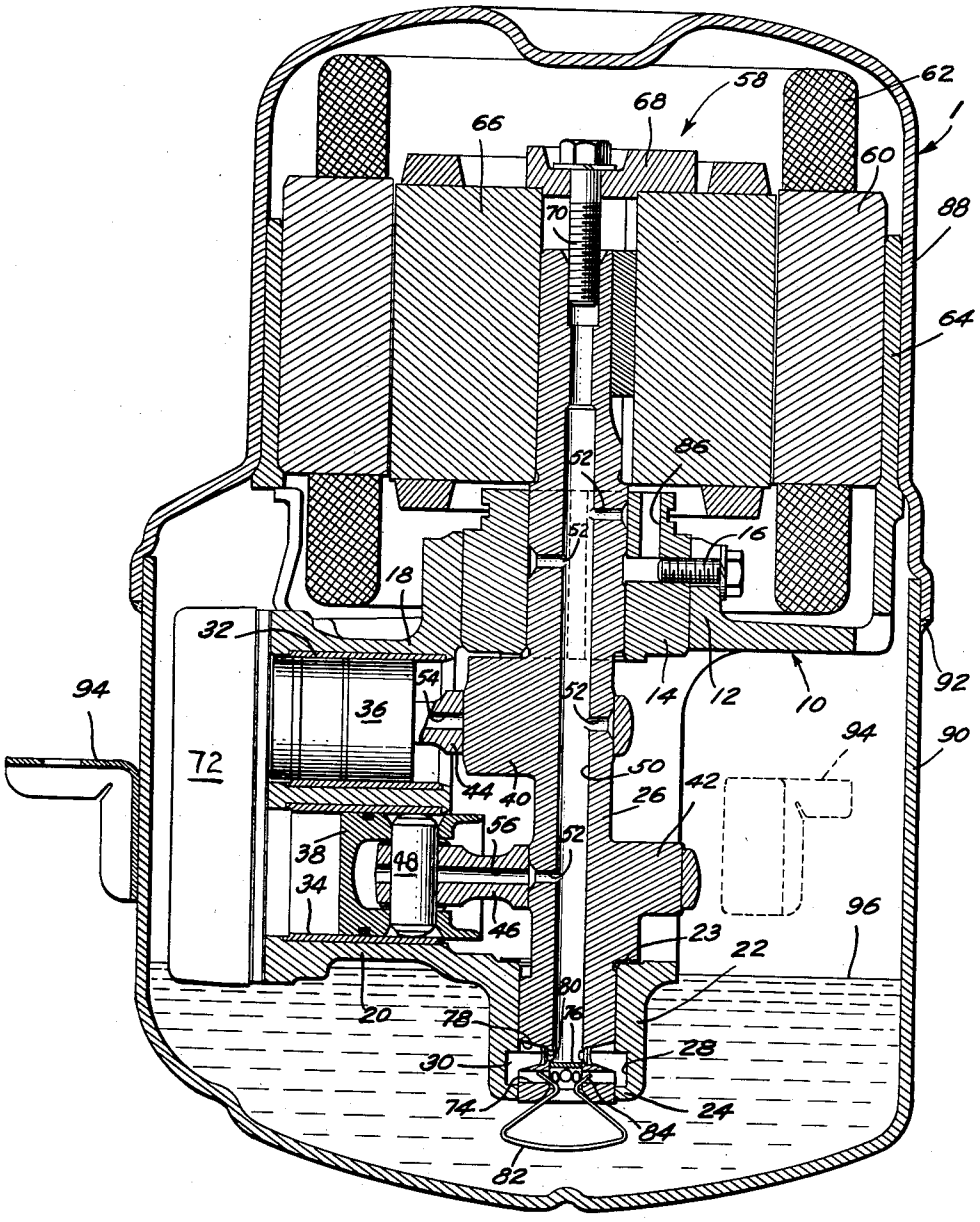
March 29, 1960 E. W. REICHARD 2,930,522

VAPOR LOCK PREVENTING MEANS FOR COMPRESSOR LUBRICATION SYSTEM

Filed June 14, 1956



INVENTOR

Everett W. Reichard

BY Sidney N. Rosenfeld

ATTORNEY

United States Patent Office 2,930,522
Patented Mar. 29, 1960

2,930,522

VAPOR LOCK PREVENTING MEANS FOR COMPRESSOR LUBRICATION SYSTEM

Everett W. Reichard, West York, Pa., assignor, by mesne assignments, to Borg-Warner Corporation, Chicago, Ill., a corporation of Illinois

Application June 14, 1956, Serial No. 591,419

2 Claims. (Cl. 230—206)

This invention relates to refrigerant compressors and more particularly to an improved lubricating system for the same.

In a refrigerant compressor of the vertical type it is necessary to provide a lubricant pump to deliver lubricant to the vertically spaced bearing surfaces surrounding the compressor crankshaft or eccentric shaft, whichever may be used. It has been a common practice to provide the shaft with an internal bore extending beyond the uppermost bearing and a number of radial ports leading to each bearing surface. The pump delivers the lubricant to the internal bore whence it is delivered by way of the radial ports to the various bearing surfaces.

In such a vertical type of compressor it has been found desirable, from the standpoint of simplicity and economy, to use a centrifugal type of lubricant pump formed either integrally with the compressor shaft or separable therefrom. Such prior art pumps perform satisfactorily when pumping ordinary liquids. However when such a pump was incorporated by applicant in a refrigerant compressor, it failed to pump. In a relatively short period of time the bearings were damaged and the entire compressor rendered useless. An experimental compressor utilizing the centrifugal type lubricant pump was then built by applicant and enclosed in a transparent casing. Visual observation then showed that large globules of gas formed in the oil passages and particularly over the pump inlet preventing the passage of oil through the pump. As is well known in the refrigerating art, many refrigerants are miscible with the lubricants commonly used. The lubricant therefore is apt to contain globules of gaseous refrigerant. When one of these globules surrounds the intake of the pump stopping the pumping action, the result is commonly known as a vapor lock.

Prior to my invention it was uniformly believed necessary to prevent any agitating or churning of the body of lubricant within the compressor so that these globules would not be formed in the lubricant with the consequent danger of vapor lock in the oil pump. Stated another way, it was believed necessary to maintain the body of lubricant in as quiescent a state as possible, to prevent vaporization of the refrigerant with the attendant formation of the gaseous globules.

I have discovered that, contrary to prior beliefs and practices, vapor lock can be completely eliminated and improved pumping performance be secured by providing a beater member to churn the lubricant adjacent the pump intake. While this procedure does release globules of refrigerant gas within the lubricant, these globules are broken into such small size that the lubricant and entrained globules can freely pass through the pump. The pump will therefore perform satisfactorily with no danger whatsoever of vapor lock.

Further, the beater member performs yet another function. I provide a beater member secured to the shaft for rotation therewith, which when performing its primary function of breaking down the globules of gas,

serves also to direct the lubricant to the pump intake. The advantages of this procedures are believed to be obvious.

It is an object of this invention to provide a lubricating system for a vertical refrigerant compressor wherein a centrifugal pump is formed adjacent the lower end of the compressor drive shaft for forcing lubricant to the shaft bearings and beater means are provided for churning the lubricant in the vicinity of the pump inlet for breaking down any globules of refrigerant vapor formed in the lubricant.

It is a further object of this invention to provide a lubricating system for a vertical refrigerant compressor wherein a centrifugal pump is formed adjacent the lower end of the compressor drive shaft for forcing lubricant to the shaft bearings and beater means are provided for churning the lubricant in the vicinity of the pump inlet for breaking down any globules of refrigerant vapor formed in the lubricant and for directing the lubricant to the inlet of said pump.

The drawing is a vertical sectional view, with parts thereof in elevation, of a compressor embodying the invention.

As can be readily seen, the invention is shown applied to a vertical hermetic compressor, however it will be appreciated that the invention is equally applicable to any type of vertical compressor utilizing a centrifugal type lubricant delivery pump.

Compressor 1 comprises a supporting member 10 having an internally upstanding portion 12 which serves to support upper bearing 14 by way of bolt 16.

Compressor cylinders such as are shown at 18 and 20 are formed integrally with supporting member 10 and form the working space for the pistons.

At its lower end member 10 is formed with a downwardly extending portion which serves as lower bearing 22. Bearing 22 has a shoulder 23 formed therein which serves as a thrust surface.

Supporting member 10 terminates at its lower end in an integrally inturned flange 24 which surrounds the lower end of eccentric shaft 26 with a running fit. Flange 24 in connection with cut-away portion 28 serves to form a pumping chamber 30.

Cylinders 18 and 20 are provided with suitable liners 32 and 34 respectively in which pistons 36 and 38 reciprocate. The pistons receive the reciprocating force from eccentrics 40 and 42, formed integrally with shaft 26, and connected to the pistons by way of connecting rods 44 and 46 and wrist pins such as 48. The pistons could, of course, be reciprocated by a conventional crankshaft instead of the eccentric shaft.

Shaft 26 is provided with an internal lubricant receiving bore 50 and a plurality of radial ports 52 to direct the lubricant received within the bore to the various bearing surfaces. As can be seen, the connecting rods are provided with suitable passages 54 and 56 to direct lubricant to the wrist pins.

It will be appreciated that for purposes of illustration a two cylinder machine has been shown. However, the invention is applicable to all types of vertical compressors whatever the number of cylinders.

An electric motor, indicated generally at 58, is provided for rotating shaft 26. Motor 58 comprises the customary stator 60 and stator windings 62. Stator 60 is press-fitted within upstanding sleeve 64 formed integrally with supporting member 10. A rotor 66 is provided and is connected to eccentric shaft 26 by way of lug 68 and bolt 70.

Customary inlet and discharge valves (not shown) are provided in top head 72. Refrigerant gas is received from a refrigerant evaporator (not shown), compressed and

delivered to a refrigerant condenser (not shown) as is well known in the refrigerating art.

The novel pumping arrangement will now be described:

Shaft **26** is provided adjacent the lower end thereof, with a plurality of lubricant pumping passages **74**. A disc **76** is press-fitted within bore **50** above the passages **74**. Shaft **26** is also provided with a cut-away portion **78**, forming a continuation of chamber **30**, and passages **80** leading therefrom into bore **50**. Passages **74** are of sufficiently greater length than passages **80** to insure that lubricant will flow through passages **80** into bore **50** against the centrifugal force created in passages **80**.

A beater member **82** is provided having two hook like portions **84** which are fitted into any two opposed passages **74** so that member **82** rotates with shaft **26** for churning the lubricant to break down any globules of gas therein. Beater member **82** is also shaped to perform a second desirable function of directing the lubricant to the intake of the pump. While the lubricant directing feature of the beater member is not necessary to practice the basic invention, the same is believed to be desirable in directing lubricant flow to the pump.

As a precautionary measure, a reversed "L" shaped passage **86** is provided in bearing **14** communicating with bore **50** to vent any gas that might, under unusual operating conditions, become trapped therein.

The entire assembly is press-fitted into upper housing member **88**. Lower housing member **90** is then telescoped therein and welded thereto, as shown at **92**, to complete the assemblage.

Bracket members **94** may be provided for suitably mounting the compressor in its vertically operating position.

The lower portion of housing member **90** forms a lubricant containing sump containing lubricant to a level **96** therein.

It is to 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 scope of the appended claims.

What is claimed is:

1. Apparatus of the class described comprising a casing; a refrigerant compressor mounted within said casing, said compressor including a rotatable vertical shaft and spaced bearing members surrounding said shaft; a centrifugal pump formed adjacent the lower end of said shaft and having a lubricant intake; a lubricant containing sump formed in the lower end of said casing containing a body of lubricant to submerge said pump intake; said pump serving to deliver oil from said body of lubricant to said bearings; and beater means attached to said shaft proximate to said pump lubricant intake for rotation therewith to churn the body of lubricant in the vicinity of said pump intake, whereby any globules of refrigerant which may be present in the said lubricant will be broken into a size sufficiently small to pass through the inlet of said centrifugal oil pump.

2. Apparatus of the class described comprising a casing; a refrigerant compressor mounted within said casing, said compressor including a rotatable vertical shaft having a bore therein and radial ports through a wall thereof, and spaced bearings surrounding said shaft and ports; a centrifugal pump formed adjacent the lower end of said shaft and having a lubricant intake; a lubricant containing sump formed in the lower end of said casing and containing a lubricant submerging said pump intake; said pump serving to force lubricant through said bore and ports to said bearings when said shaft is rotating; and beater means attached to said shaft and dependent therefrom into the lubricant proximate to said pump intake for breaking down any large globules of refrigerant which may be present in the lubricant into globules sufficiently small to pass through the intake of said centrifugal pump.

References Cited in the file of this patent

UNITED STATES PATENTS

2,199,415	Philipp	May 7, 1940
2,287,203	Smith	June 23, 1942
2,312,596	Smith	Mar. 2, 1943
2,370,778	Compton	Mar. 6, 1945
2,379,133	Curtis	June 26, 1945
2,419,676	Curtis	Apr. 29, 1947
2,500,751	Halfvarson	Mar. 14, 1950
2,555,619	Vincent	June 5, 1951