

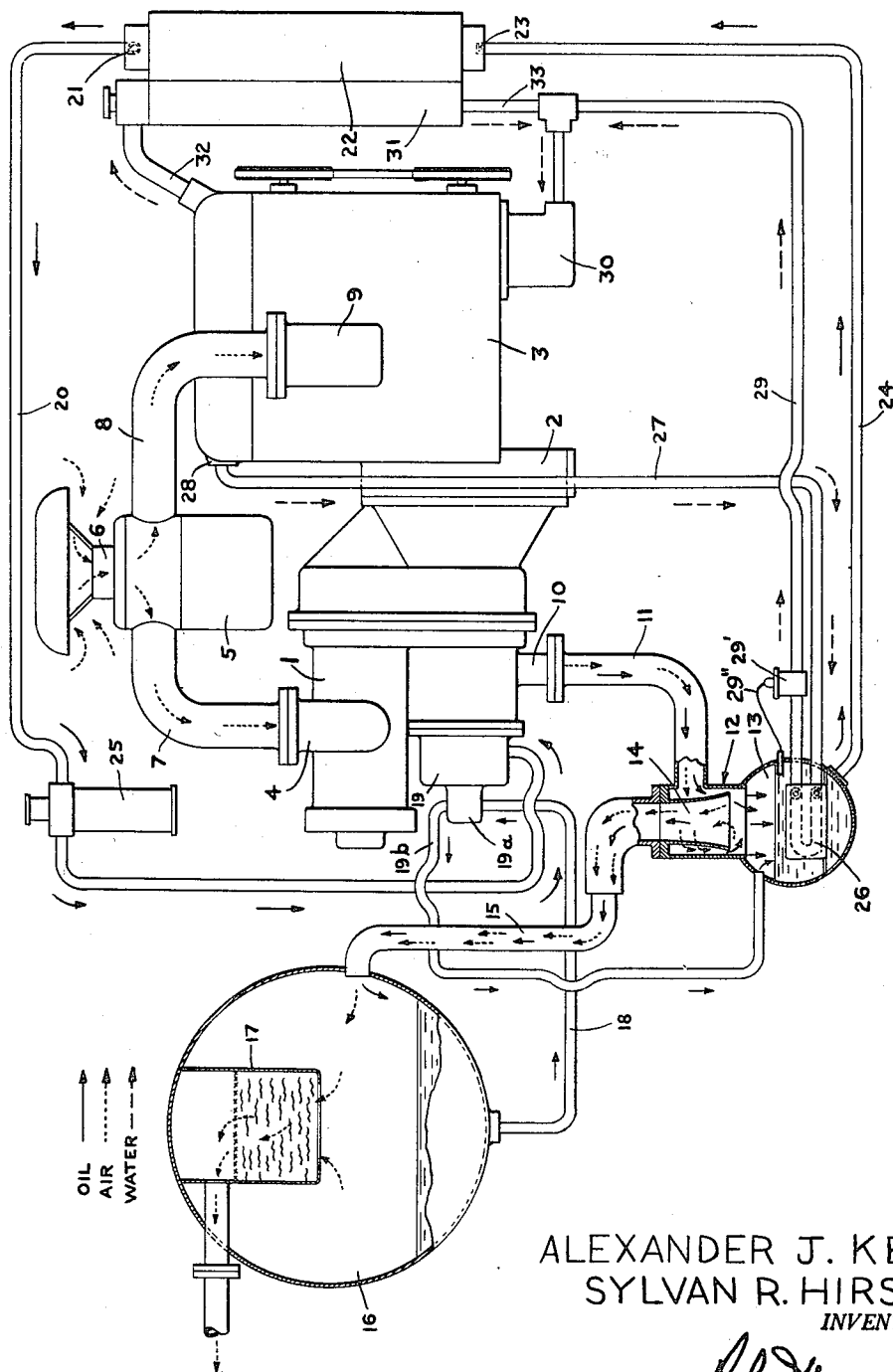
Jan. 6, 1959

A. J. KEIR ET AL

2,867,376

OIL HEATING ARRANGEMENT FOR ROTARY FLUID COMPRESSOR

Filed March 25, 1954



ALEXANDER J. KEIR
SYLVAN R. HIRSCH
INVENTORS

BY *Rolund Meyer*
att'y

1

2,867,376

OIL HEATING ARRANGEMENT FOR ROTARY FLUID COMPRESSOR

Alexander J. Keir, Springfield, and Sylvan R. Hirsch, Longmeadow, Mass., assignors to Worthington Corporation, Harrison, N. J., a corporation of Delaware

Application March 25, 1954, Serial No. 418,567

1 Claim. (Cl. 230—207)

This invention relates generally to rotary fluid compressors of the type wherein lubricant is delivered to the compressing chambers to lubricate the moving parts of the compressor and to cool the fluid being compressed, and more particularly to means for preheating the lubricant furnished to the rotary fluid compressor by means of the cooling water from the cooling jacket of the prime mover driving the compressor.

In rotary fluid compressors wherein the lubricant is delivered to the compressing chamber to lubricate the moving parts as well as to cool the fluid being compressed, it has been found that when starting up particularly when the ambient atmospheric temperature is relatively low that the lubricant will remain viscous for a considerable length of time during which period the compressor will not be properly lubricated.

The present invention overcomes this problem by providing in the lubricant system a heat exchanger connected to the cooling fluid jacket of the prime mover to receive the cooling fluid therein for preheating the lubricant fluid simultaneously with the warming up and during the operation of the prime mover so that the rotary fluid compressor will be properly lubricated when it is placed in operation.

With this and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawing which shows diagrammatically the preferred form of the improved oil heating arrangement for rotary fluid compressors and the features forming the invention will be specifically pointed out in the claim.

Referring more particularly to the drawing which shows diagrammatically a rotary fluid compressor 1 driven through a clutch generally designated 2 by a prime mover 3 of the type which includes a jacket for cooling water of which there are several well known in the art and easily purchasable on the open market such as a two or four-cycle internal combustion engine.

The rotary fluid compressor 1 shown in the present invention is illustrated in copending application, Serial No. 350,091 filed April 21, 1953, now Patent No. 2,780,406 and accordingly includes rotating impellers operating to compress air or other fluid and embodies a lubricating system wherein the lubricant fluid is delivered not only to the bearing elements but directly into the compression chamber or chambers where the lubricant is mixed with the fluid being compressed.

The clutch 2 may be any type of manual or automatic clutch such clutches being easily purchasable on the open market and hence not more fully described herein.

In the present illustrative form of the invention air is delivered to the suction inlet 4 from an air filter 5 having its inlet 6 open to atmosphere by means of a conduit 7 connected therebetween. The air filter 5 is also connected

2

by a conduit 8 to the carburetor generally designated 9 of the prime mover 3.

The discharge outlet 10 of the rotary fluid compressor is connected by connecting conduit 11 to a compressed fluid-lubricant separator generally designated 12.

The compressed fluid-lubricant separator 12 is shown as connected to and communicating with a lubricant reservoir 13 in the lubrication system for the rotary fluid compressor hereinafter more fully described. It will be understood, however, that these units may be separated and connected by other suitable means than that shown without departing from the spirit of the present invention. However, with this preferred arrangement the lubricant which is separated by action of centrifugal force will drop by gravity flow into the lubricant reservoir, allowing the compressed fluid to pass through an outlet passage 14 formed in the compressed fluid-lubricant separator 12.

The compressed fluid thence passes by connecting conduit 15 to a compressed fluid receiver 16 having an air filter 17 therein for removing the last residuum of lubricant from the compressed fluid. The compressed fluid can then be passed to any desired use from the receiver 16 in the manner which is well known in the art.

The separated lubricant which falls to the bottom of the receiver 16 will be returned thru return line 18 connected to the suction of an auxiliary pump 19a of the positive displacement type, which discharges the separated lubricant into the oil storage reservoir 13 thru the conduit 19b connected between the discharge of the pump 19a and the reservoir 13. It is believed clear that the lubricant could be returned directly to the lubrication system by differential pressure without departing from the spirit of the present invention.

Lubrication system

The lubrication system is shown as including a main lubricant pump 19 which may be of the gear type easily purchasable on the open market, which pump is connected to the rotary compressor 1 so that it discharges into the compression chamber thereof as described and shown in the abovementioned copending application.

The gear pump has its suction connected to a conduit 20 leading from the outlet 21 of a lubricant cooler 22 in turn having its inlet 23 connected by a conduit 24 to the lubricant reservoir 13. A lubricant filter 25 of any standard type of which there are many easily purchasable on the open market is also provided in the connecting conduit 20 to remove impurities from the lubricant utilized for lubricating the rotary fluid compressor 1.

Lubricant heating means

In order to preheat the lubricant for the rotary compressor before it is placed into operation, a heat exchanger 26 of any suitable type and size is provided in the lubricant reservoir 13. The heating medium in the heat exchanger 26 will be the coolant from the prime mover 3 which is conveyed thereto by a conduit 27 having its inlet connected to a cooling fluid outlet 28 provided on the prime mover 3. The coolant is returned to the cooling system by means of a return conduit 29 connected to the suction of the cooling fluid circulating pump 30 which serves to circulate the cooling fluid in the prime mover 3 thru the conventional radiator 31 connected by inlet conduit 32 to the prime mover and by outlet conduit 33 to the circulating cooling fluid pump in a manner well known in the art and hence not more fully described herein.

The return conduit 29, is provided with an automatic thermally controlled valve 29' which operates reversely of the conventional automotive type thermostat that is,

3

it is open when the temperature is below a predetermined temperature (in the present invention one above the condensation temperature of water vapor entrained and entrapped in the lubricant) and closed when it is above this temperature. Thus, when starting up initially, the valve 29' will normally be open to allow coolant to pass to the heat exchanger and thereby preheat the lubricant. However, when the predetermined temperature is reached, the effect of this temperature on the temperature sensing element 29'' disposed in the reservoir 13 and connected to the valve 29' is to cause the said valve to close. However, if at any time thereafter during operation the temperature of the lubricant drops below the predetermined minimum then the valve 29' will open once again.

Operation

When the prime mover 3 is placed into operation, the clutch 2 is initially in the disengaged position. The cooling fluid circulating pump 30 will assuming the thermostat is open, in addition to the normal circulation thru the prime mover circulate the cooling fluid thru the heat exchanger 26 thereby raising the temperature of the lubricant in the lubricant reservoir 13 to the desired operating temperature.

After the lubricant reaches operating temperature the clutch is engaged placing the rotary fluid compressor 1 into operation. Lubricant then passes from the lubricant reservoir 13 thru the conduit 24, lubricant cooler 22 and conduit 20 to the suction of the pump 19 and is discharged thereby into the rotary fluid compressor 1 joining the air drawn into the suction inlet 4 thereof as above described. The air is discharged thru the discharge outlet 10 and then is passed to the separator 12 where the lubricant is returned to the lubricant reservoir 13 and the compressed air passed to the receiver 16, also as above described.

During operation, the lubricant is normally above the

4

predetermined temperature above mentioned and is primarily maintained within the desired operational temperatures by the lubricant cooler 22. Where however, the lubricant tends to drop below the predetermined temperature, the heat exchanger 26 will be brought into operation by the action of the thermally controlled valve 29' controlling the flow of the coolant to the heat exchanger.

While one form of the invention has been illustrated and described it is obvious that those skilled in the art may vary the details of construction and it will be understood accordingly that the invention is therefore not to be limited to this specific construction or arrangement of parts shown but that they may be widely modified within the invention defined by the claim.

What is claimed is:

In combination, a compressor, a prime mover for driving said compressor, a fluid cooling system for the prime mover, a lubrication system for the compressor including a pump and a lubricant reservoir, a heat exchange means in said lubricant reservoir, a conduit means connecting said heat exchange means to the fluid cooling system for the prime mover, and a normally open valve disposed in said conduit means and adapted to close when the temperature of the lubricant in said lubricant reservoir reaches a predetermined maximum value.

References Cited in the file of this patent

UNITED STATES PATENTS

1,651,156	Rushmore	Nov. 29, 1927
1,867,519	Miller	July 12, 1932
1,989,585	Bigelow	Jan. 29, 1935
2,260,538	Parker	Oct. 28, 1951

FOREIGN PATENTS

879,736	France	Nov. 30, 1942
1,040,203	France	May 20, 1953