July 14, 1942. J. LE VALLEY ET AL 2,289,441

ROTARY COMPRESSOR

Filed March 14, 1940 2 Sheets-Sheet 1

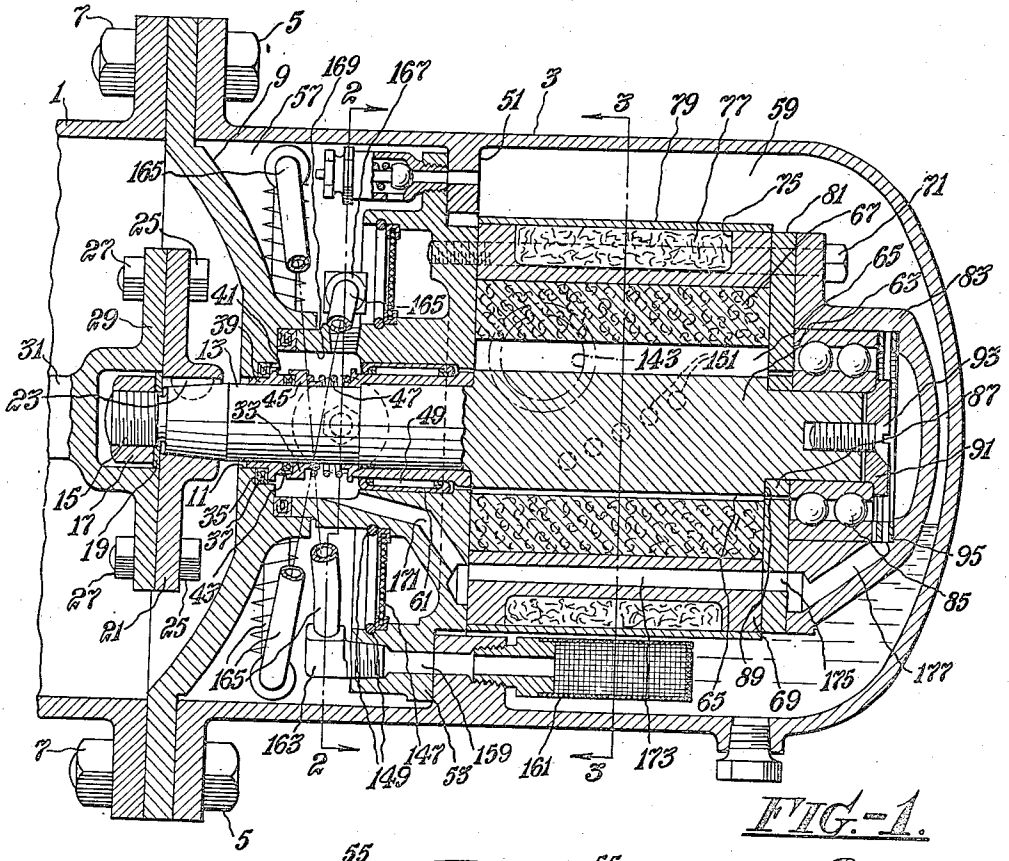


FIG.-1.

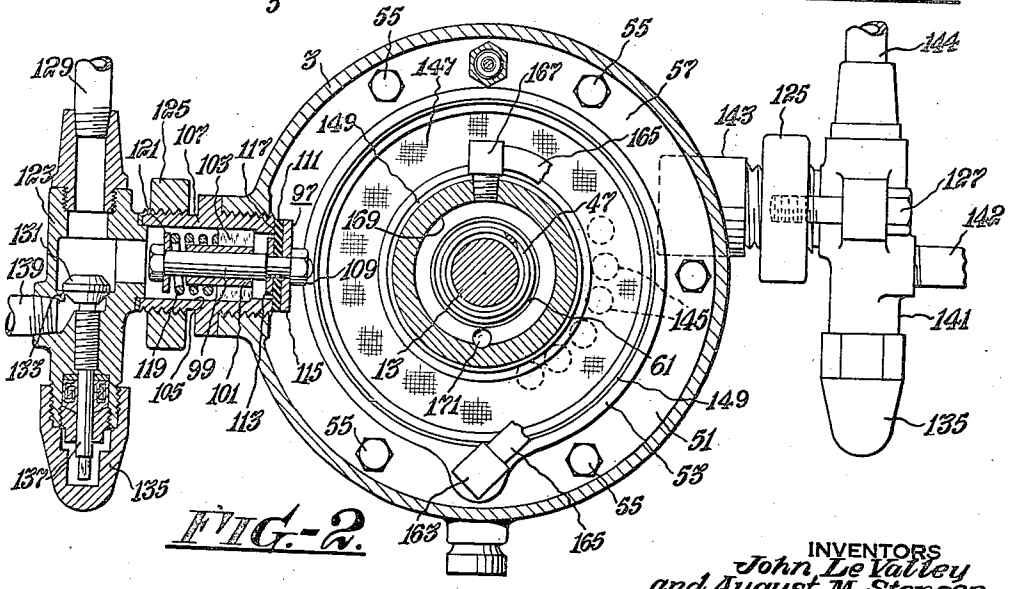


FIG.-2.

INVENTORS
John Le Valley
and August M. Stenger
BY
THEIR ATTORNEY

July 14, 1942. J. LE VALLEY ET AL 2,289,441

ROTARY COMPRESSOR

Filed March 14, 1940 2 Sheets-Sheet 2

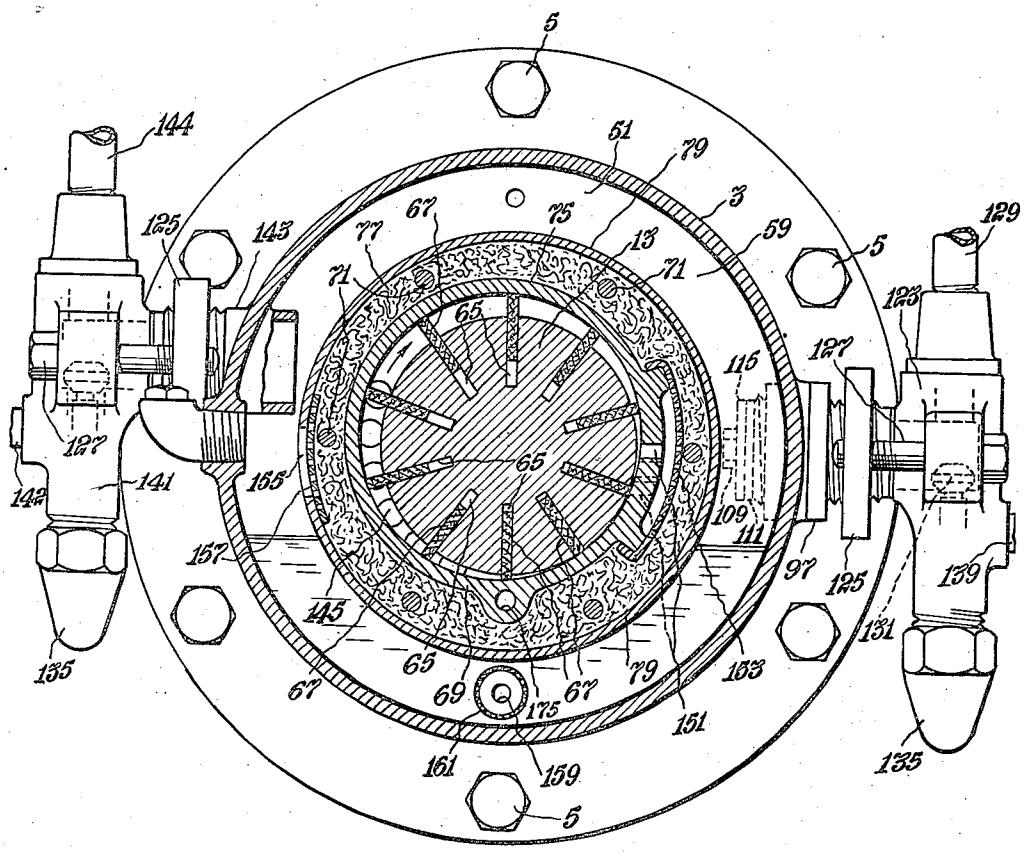


FIG.-3.

INVENTORS
John LeValley.
And August M. Stenger.
BY
THEIR ATTORNEY.

Patented July 14, 1942 2,289,441

UNITED STATES PATENT OFFICE

2,289,441

ROTARY COMPRESSOR

John Le Valley and August M. Stenger, Painted Post, N. Y., assignors to Ingersoll-Rand Company, New York, N. Y., a corporation of New Jersey

Application March 14, 1940, Serial No. 323,868

1 Claim. (Cl. 230—207)

The present invention relates to a compressor and, more particularly, it relates to a compressor adapted for compressing refrigerating fluid and the like.

A refrigerant compressor adapted for use with small refrigeration units may be operated by either an electric motor or an internal combustion engine, and it must, under most circumstances, be relatively small and compact. In accordance with the practice of this invention therefore, the compressor is enclosed in a shell which is divided into an intake or suction chamber and an outlet or discharge chamber. The latter chamber not only serves as a lubricant reservoir, but it also houses the compressor itself.

Accordingly, it is an object of the present invention to provide a compressor which is housed in the discharge chamber of the compressor shell.

Another object is to provide a compressor which is lubricated by lubricant under compressor fluid discharge pressure.

Still another object is to provide a compressor wherein the exhaust ports open into a lubricant filter.

A further object is to provide a compressor wherein a cooling tube for the compressor lubricant is located in the suction chamber of the shell.

A still further object is to provide a rotary compressor wherein the exhaust ports in the compressor casing are arranged in such a manner as to obviate the noise of escaping fluid.

An additional object is to provide a motor driven compressor wherein the lubricant supplied to the compressor is discharged therefrom through the exhaust ports.

Another object is to provide a motor driven rotary compressor wherein the clearance between the rotor and the ends of the compressor cylinder may be regulated.

A still further object is to provide a more compact and simple refrigeration compressor.

These and further objects will be apparent from the following specification of which the drawings form a part and in which

Figure 1 is a view in section of a compressor constructed in accordance with the principles of the present invention.

Figure 2 is a sectional view taken along line 2—2 of Fig. 1.

Figure 3 is a sectional view taken along line 3—3 of Fig. 1.

Referring to Fig. 1, the casing 1 of the driving motor has secured thereto the compressor shell 3 by means of the bolts 5 and nuts 7. Between the casing 1 and the shell 3 is a cover 9 which fits into the bore of casing 1 of the compressor assembly and is employed in the alignment of the compressor. This cover extends inwardly and is provided with a bore 11 through which passes the rotor 13. The end of the rotor 13 is threaded, as at 15, to receive the nut 17 bearing against the washer 19 which, in turn, lies on the flange 21. The flange is keyed to the rotor 13 by a suitable means such as the "Woodruff" key 23. Flange 21 is secured by the bolts 25 and nuts 27 to the other flange 29 formed on the end of the motor driving shaft 31. Thus, the two flanges form an ordinary flange coupling although any form of coupling will be suitable. With this arrangement, it is obvious that, upon rotation of the shaft 31, the rotor 13 will also be rotated.

In order to seal the space between the bore 11 and the rotor 13 to prevent the escape of fluid from within the compressor shell 3, a seal, generally indicated at 33, is provided, which comprises rotating the seal element or ring 35 of some material such as "Corprene" resting in a recess 37, formed in the bore 11. A stationary seal element or sleeve 39 fits in the bore 11 of the cover 9 and is spaced from the rotor 13. An annular shoulder 41 provided on sleeve 39 bears against the ring 35. Adjacent the inner end of this sleeve is a second ring 43 against which the bushing 45 is held by the spring 47. The opposite end of the spring rests against one end of the needle bearing 49. The function of the spring is to constantly urge the rotating seal element 35 against the stationary seal element 39, thus effecting the sealing between rotor 13 and cover 9.

Extending from the inner surface of the shell 3 is a flange 51 to which is secured a partition, or transverse wall, 53 by bolts 55 (shown in Fig. 2). The flange 51 and the partition 53 thus serve to divide the interior of the shell into an intake, or suction, chamber 57 and an outlet, or discharge, chamber 59. The rotor 13 extends through a bore 61 in the partition 53 in which is located the needle bearing 49 and on which the rotor rests. Within the discharge chamber 59 the rotor 13 is provided with a portion 63 of larger diameter than the portion of the rotor in the suction chamber 57. The portion 63 is provided with slots 65, as shown in Fig. 3, which receive the vanes 67.

Surrounding the rotor section 63 and the vanes 67 is a cylinder 69 which is eccentrically bored with respect to the rotor and is secured to the partition 53 by the cap screws 71 and 73. The cap screws 71 serve to hold the cylinder 69 in

position and the cap screws 73 hold the cover plate 81 and the bearing cover 83 in position. An annular recess 75 is provided in the outer wall of the cylinder 69 to receive a lubricant filter material 77, such as steel or copper wool, and, in order to maintain the filter material in the recess, the cover 79 is provided around the cylinder 69.

It will be noted from the drawing that the end of the rotor 13, within the discharge chamber 59, is reduced in diameter and journalled on a bearing 85 abutting against the cover plate 81 and held in position by the bearing plate 83. The inner race of the bearing 85 abuts against a spacer 87 which, in turn, rests against the shoulder 89, formed adjacent the rotor section 63. The width of the spacer 87 is several thousandths of an inch greater than the width of the plate 81 in order that the position of the rotor 63 and the vanes 67, with respect to the plate 81, may be controlled in the manner about to be described.

The inner race of the bearing 85 is held in position with respect to the rotor portion 63 by the washer 91 which is, in turn, located by the position of the screw 93 threadedly engaging the end of the rotor. The outer race of the bearing is maintained in position relative to the rotor portion 63 by the spring 95 lying between the bearing 85 and the bearing plate 83. The end clearance between the rotor section 63 and the end plate 81 is thus established by the initial difference and thickness between end plate 81 and the spacer ring 87.

Fluid is admitted to the suction chamber 57 through the check valve 97 located in the wall of the compressor shell 3. The check valve 97 is of ordinary construction and comprises a spindle 99 reciprocatingly mounted in a sleeve 101, supported by the extensions 103, formed on the bore 105, of the valve body 107 which is secured on the compressor shell. Secured to one end of the spindle 99 by the nut 109 is a valve proper 111, resting between two metal washers 113 and 115. The valve normally rests on its seat 117, being held there by the spring 119, surrounding the spindle 99, the sleeve 101 and bearing against extensions 103 and the washer 121.

In addition to the check valve 97, a manually operated valve 123 is secured to the valve body 107 by means of the ring 125 and the bolts 127. The valve 123 is of conventional design and need not be described here except to point out that fluid to be compressed is supplied through the conduit 129 and, so long as the valve disk 131 rests on its seat 133, shown in the Fig. 2, all fluid entering through the conduit 129 must escape from the valve through the check valve 97 to the suction chamber 57. If, however, it be desired to by-pass the suction chamber and render the compressor inoperative, it is only necessary to remove the cap 135 and turn the spindle 137 so that the valve disk 131 moves away from its seat and fluid may then escape through the conduit 139. Normally, however, the valve disk 131 is maintained on its seat and all fluid entering through conduit 129 passes into the suction chamber when the difference in pressure between the pressure in suction chamber 57 and the pressure in the conduit 129 is sufficient to permit the check valve 97 to open.

A valve 141, similar in all respects to the valve 123, is placed at the discharge port 143 of the outlet chamber 59 and, since the valves are identical, valve 141 need not be further described. The valve 141 is connected to the discharge conduit 144 and also to a by-pass conduit 142.

Any fluid entering the suction chamber 57 through the check valve 97 is admitted to the compressor cylinder through the intake ports 145, indicated by dotted lines in Fig. 2, provided in the partition 53. In order that any foreign matter in the incoming fluid shall be prevented from entering the cylinder, a screen 147 held in place by the rings 149 on the partition 53 is provided.

As will be seen from Fig. 3, any fluid entering through intake ports 145 is compressed as the rotor moves the vanes around the cylinder wall in a counterclockwise direction to the outlet ports 151. A guard 153 is placed over the outlet ports in order to prevent any filtering material 77 from entering and clogging the ports 151. Any fluid discharged must pass completely through the filtering material and escape through the outlet 155 provided in the cover 79. Within the cover 79 a grate 157 is placed so as to prevent any of the filtering material from escaping through the outlet 155. The compressed fluid entering the discharge chamber 59 escapes therefrom through the discharge port 143, valve 141 and the discharge pipe 144.

The lower portion of the discharge chamber 59 serves as an oil or lubricant reservoir which is normally subjected, when the compressor is operating, to the discharge pressure of the compressor. A passage 159, formed in the flange 51 and partition 53, serves to remove lubricant from the reservoir. To prevent foreign matter in the lubricant from entering this passage, the screen filter, generally indicated at 161, is provided. A coupling 163, acts to connect the passage 159 with a finned cooling tube 165 which is located in the suction chamber 57. The cooling tube terminates in a coupling 167, secured in the partition 53, and communicates with the recess 169, formed in the partition 53 to surround the sealing means 33, previously described.

The lower portion of the recess 169 opens into the bore 171 extending through the partition 53 and communicating with the conduit 173 provided in the cylinder 69. In order that oil or lubricant which is forced through the conduit 173 may be employed to lubricate the bearing 85, appropriate passages 175 and 177 are provided in the cover plate 81 and the bearing plate 83 respectively.

With this arrangement it is apparent that, when the compressor is operating, the fluid discharged from the compressor, being under pressure, will force lubricant through the screen 161, the passage 159, through the coupling 163, to the cooling tube 165, wherein the temperature of the lubricant is lowered, and thence to the recess 169. Lubricant in the recess will not only lubricate the seal but also the needle bearing 49 and some lubricant will enter between the rotor section 63, the vanes 67 and the partition 53 to lubricate the compressor. At the same time, oil will flow through the bore 171, conduit 173 and the passages 175 and 177 to lubricate the bearing 85 and also provide lubricant between the cover plate 81 and the rotor section 63 and vanes 67.

Since some of the lubricant enters the compressor, it is to be expected that the fluid escaping through the outlet ports 151 will carry some of this lubricant and it is to remove such lubricant that the filtering material 77 is provided. The lubricant removed from the fluid by

the filter will drain back into the outlet chamber through the grate 157 and the outlet 155 so that a constant circulation of lubricant is provided.

Although the invention has been described with reference to one specific embodiment the invention is not to be limited save as defined in the appended claim.

We claim:

In a refrigerant compressor, the combination of a shell, a transverse wall in the shell, an intake chamber defined by the shell and wall, a discharge and oil chamber defined by the shell and wall, a rotor in the discharge chamber, vanes carried by the rotor, a cylinder cooperating with the vanes eccentric with respect to the rotor on the transverse wall, ports in the transverse wall through which refrigerating fluid may flow from the suction chamber into the cylinder for compression by the vanes and rotor, discharge ports in the cylinder to remove the compressed refrigerating fluid, an oil filter surrounding the cylinder, a plate surrounding the cylinder and retaining the filter thereon, a screened port in the plate to enable refrigerating fluid to escape from the filter, a screen in the discharge and oil chamber, a conduit in the suction chamber associated with the last named screen, a cooling coil communicating with the last conduit in said suction chamber, bearings for the rotor on the shaft, and conduits to convey oil from the cooling coil to the bearings and said rotor, said discharge pressure maintaining the oil under pressure and forcing it to the bearings and rotor.

JOHN LE VALLEY.
AUGUST M. STENGER.