April 3, 1934. H. OGILVIE 1,953,253

ROTARY COMPRESSOR OR PUMP

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Fig.1.

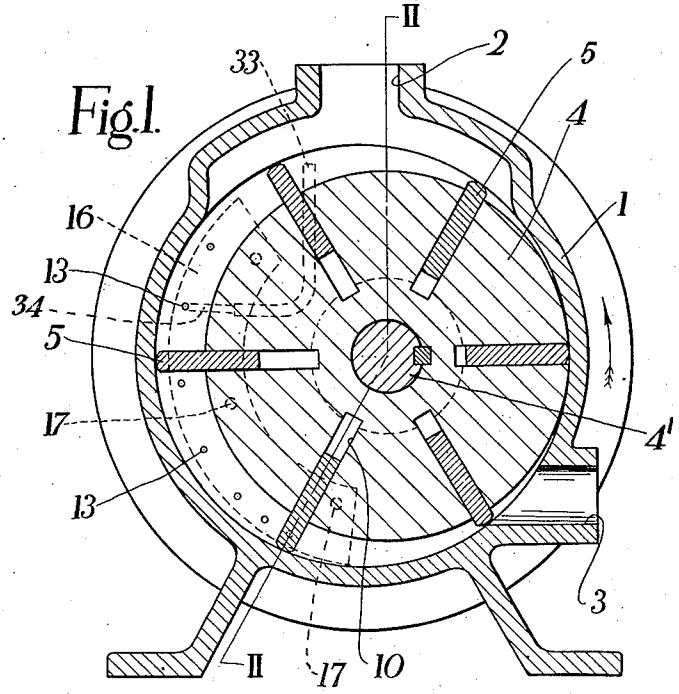
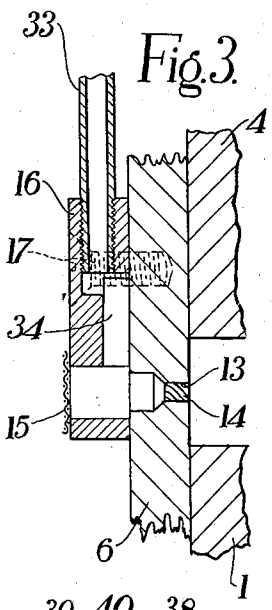


Fig.3.



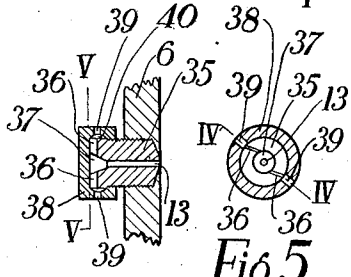


Fig.5.

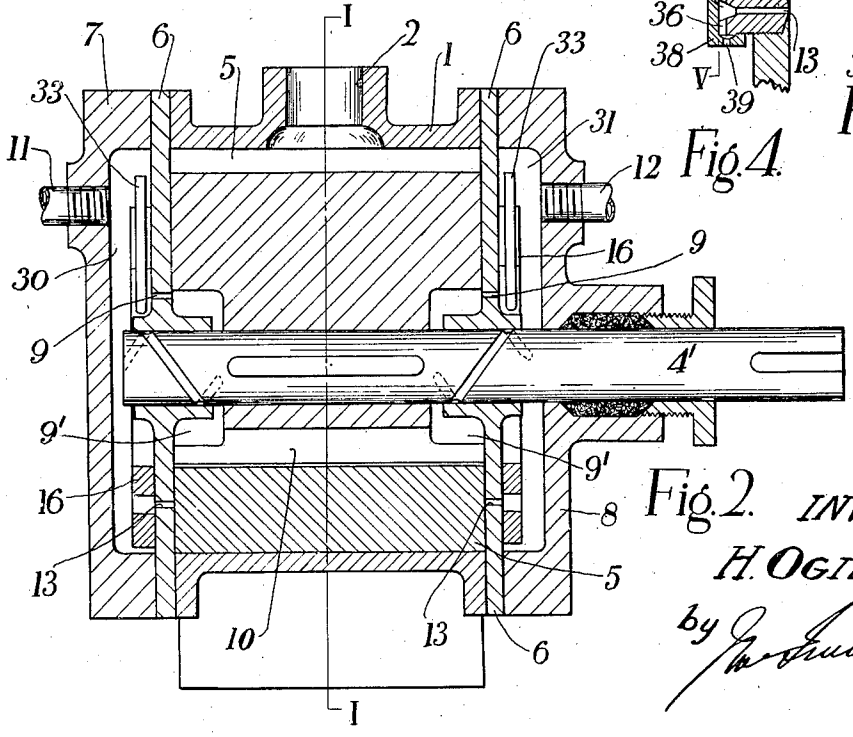


Fig.4.

Fig.2.

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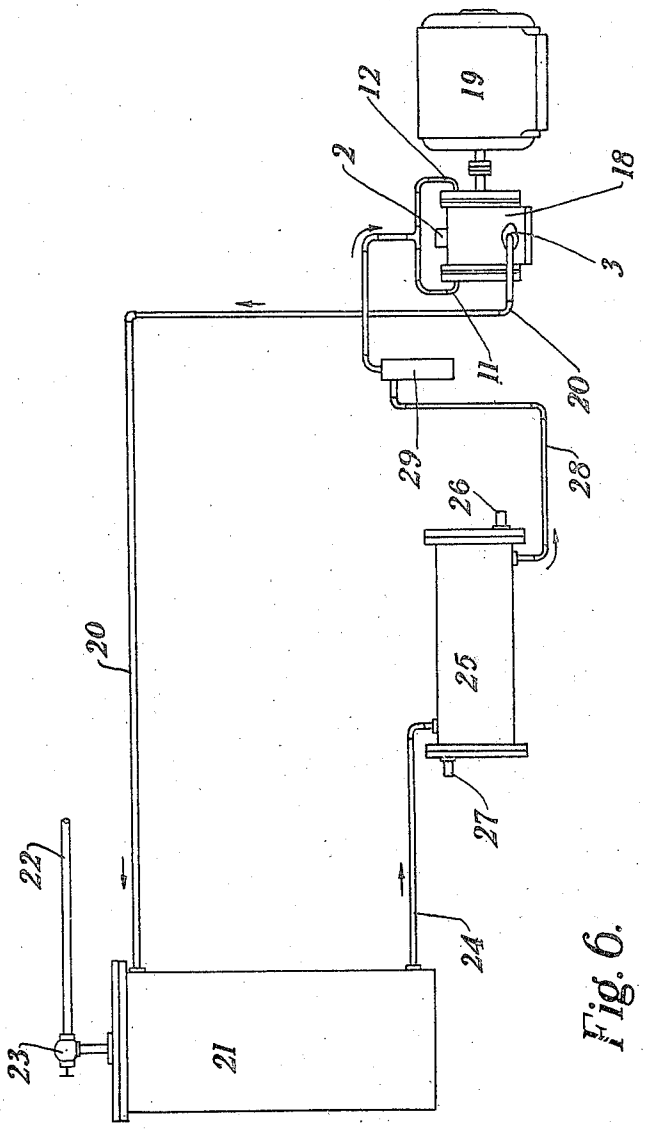


Fig. 6.

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1,953,253

ROTARY COMPRESSOR OR PUMP

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Application March 4, 1932, Serial No. 596,838
In Great Britain March 4, 1931

1 Claim. (Cl. 230—207)

This invention relates to rotary compressors for air or other gases of the type having radial vanes sliding relatively in a rotor arranged eccentrically to the barrel, it being understood that the term "air" hereinafter used in the specification and claim includes other gases.

Attempts have been made to lubricate and to seal the vanes by means of oil, the oil discharged with the air or gas being separated therefrom and returned to the compressor or pump.

When intended for the compression of air up to fairly high pressures, for instance, about 100 lbs. per square inch or more, it is usual to provide the compressor with a cooling jacket and also to compound several compressors, except in the case of compressors of small capacity.

The object of the invention is to enable effective lubrication, sealing and cooling to be obtained in a very simple manner which reduces the necessity for the complication of cooling jackets on the compressor and also for compounding, even for the compression of air up to about 100 lbs. per square inch or more, in the case of compressors of larger capacity, or higher speeds, than have hitherto been possible.

According to the invention, a compressor of the known type comprising a cylindrical casing, for convenience hereinafter termed "a barrel", having an air inlet and a compressed air outlet, and a rotor eccentrically mounted in said barrel to form therewith an air-chamber, the rotor having radial sliding vanes, has orifices in the end plates of the barrel through which cooling oil is injected, in the form of jets or as fine spray, directly into the air chamber to be mixed intimately with the air therein and thereafter to strike the forward surface of each vane and to be thrown by centrifugal action against the barrel where it makes an effective seal against leakage of air or gas past the vanes, means being provided for not only separating the oil from the air discharged, but for cooling the separated oil before its return to the compressor. If desired, the mixture of compressed air and oil may be cooled either partly or wholly before separation. Lubrication of the suction side of the compressor is insured by a small but sufficient quantity of oil being carried past the rotor seal by each revolving blade.

In the accompanying drawings:

Figures 1 and 2 are sectional elevations of one form of compressor provided with cooling and sealing means according to the invention, the sections being taken respectively on the line I—I and II—II of each figure.

Figure 3 is a detail sectional view on a larger scale showing one of the injection holes and the screen or strainer.

Figures 4 and 5 are sectional views, the sections being taken respectively on the line IV—IV and V—V of each figure, showing a second form of atomizer for the oil.

Figure 6 is a diagrammatic lay-out of the compressor and auxiliary plant.

In the example illustrated, the compressor comprises a barrel 1 having an air inlet 2 and compressed air or gas outlet 3. A rotor 4 eccentrically mounted in the barrel 1 on a shaft 4' is provided with radially sliding blades or vanes 5 which bear at their outer edges on the inner wall of the barrel 1 and at the side edges against end plates 6. The barrel 1 has hollow end covers 7 and 8 which communicate with each other by holes 9, recesses 9' in the central part of the rotor, and the slots 10 for the blades. The end covers form oil reservoirs 30, 31, oil being admitted to them through pipes 11 and 12.

Each end plate 6 is provided with an orifice or a series of injection orifices 13 which may be filled with helically grooved plugs 14 (Figure 3), so that oil from the reservoirs enters the air chamber of the compressor in a whirling and atomized form to cool the air and to settle as spray on the forward sides of the blades or vanes to be thrown by centrifugal action towards the cylindrical surface of the barrel 1 and seal the blades against leakage of air past them.

Each series of orifices may be covered by a screen or strainer 15 carried by a plate 16 fixed by screws 17 to the end plate, as shown more clearly in Figure 3.

It will be appreciated that the oil discharged with the compressed air at 3 may be separated in a suitable separator and be passed through a cooler before being returned to the compressor, as is well known practice in the art. The separator may be used to cool the oil and the cooled oil can then be returned to the compressor; or the air and oil may be partly or wholly cooled before being separated.

As shown in Figure 6, the compressor, designated generally by the numeral 18 is driven by a direct coupled electric motor 19. The compressed air and the intermixed cooling oil pass out of the compressor through a pipe 20 to any suitable separator 21. The compressed air, free from oil, can be led from the separator through a service pipe 22 which may be controlled by a valve 23. The separated oil then passes through a pipe 24 to a cooler 25 of any well known type.

The cooler is provided with the usual inlet and outlet connections 26, 27 for the cooling water. The cooled oil is led by a pipe 28 through a strainer 29 from whence it passes back to the oil reservoirs 30, 31 in the compressor, through pipe 32 and branches 11 and 12.

Such a circulatory system for the oil ensures that the oil is maintained at a substantial pressure to ensure its injection into the air space of the compressor.

There is a tendency for air carried into the reservoirs 30, 31 by the oil to collect at the top of the reservoirs. There is a tendency for this air to collect to such an extent that it prevents the oil level reaching the height of the bearings for the shaft 4'. This may be avoided by providing a pipe 33 which can vent this air to the barrel. The pipe may be screwed into a plate 16 and have its lower end in communication with an orifice 13 through a channel 34. One or both reservoirs may be provided with a pipe 33.

The orifice or orifices 13 may be directed at various angles, if desired, to ensure that the whole of each blade is sprayed with oil and the oil is sprayed through-out the air chamber.

The holes 13 being arranged in series ensure that oil is injected continually into the air or gas during the passage of the blades past them.

As the oil can pass between the end covers or reservoirs and the slots in the rotor, the rotor is also cooled.

Introduction of cool oil into the compressor reduces the power required for compression and keeps the parts cool enough to maintain the viscosity of the oil to ensure adequate sealing.

The injection of the cooling oil into the compression space through the end plates of the barrel, is more efficient than injection through substantially radial ports, in the rotor or in the cylindrical wall of the barrel, as has been suggested for lubricating oil. Oil injected from the ends of the barrel is better able to mix with the air under compression, and so insure efficient cooling. The edges of the blades or vanes in contact with the cylindrical wall of the barrel are rounded off at a radius smaller than that of the barrel to ensure line contact between each vane and the barrel. When oil ports are arranged in the cylindrical wall of the barrel, no matter how small the ports may be, a momentary connection is made between the high and low pressure sides of each vane as the vane passes over the port. This connection may cause a blow back and consequently a slight loss of pressure on the pressure side of the vane.

It will be appreciated that in the present invention the orifices 13 may be of considerable size before such a blow back could occur during the passage of a vane 5 over them.

Further the connection of the two oil reservoirs 30 and 31 by the passages 9, recesses 9' and slots 10 ensures the presence of cooling oil, under pressure, behind the vanes 5, so that the vanes may be maintained against the cylindrical wall of the barrel. It will be appreciated that the cooling oil is kept under pressure throughout its circuit, so that it may be injected into the air space.

If desired, the oil may be injected into the compression space through an atomizer such as is shown in Figures 4 and 5. Each injection orifice 13 is formed in a plug 35, preferably of hardened tool steel. The plug 35 is screwed into the end plates 6 and is provided at its outer end with two tangential slots 36 which enter a conical portion 37 of the orifice 13. A cover 38 is screwed onto the plug and is provided with a number of holes 39 which, by means of a circumferential recess 40 in the cover 38, are in communication with the tangential slots 36. Oil in the reservoir passes through the holes 39 and the tangential slots 36 cause it to pass into the conical recess with a whirling motion, so that it becomes atomized.

I claim:

A rotary compressor for air, comprising a cylindrical barrel having end plates, an air inlet and a compressed air outlet, a rotor eccentrically mounted in said barrel to form therewith an air chamber, said rotor having radial sliding vanes, oil compartments adjacent to said end plates, orifices in said end plates for admitting oil from said compartments into said air chamber in the form of a spray to mix intimately with the air therein to cool the same and to strike the forward side of each vane and to be forced by centrifugal action against the inner surfaces of the barrel to seal the vanes against leakage of air past them, means for supplying oil under pressure to said oil compartments, and means connected to the compressed air outlet of said casing for separating oil from the compressed air discharged therefrom, substantially as and for the purposes hereinbefore set forth.

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