Sept. 1, 1953 H. L. SIMON 2,650,754

COMPRESSOR

Filed Feb. 21, 1950 2 Sheets-Sheet 1

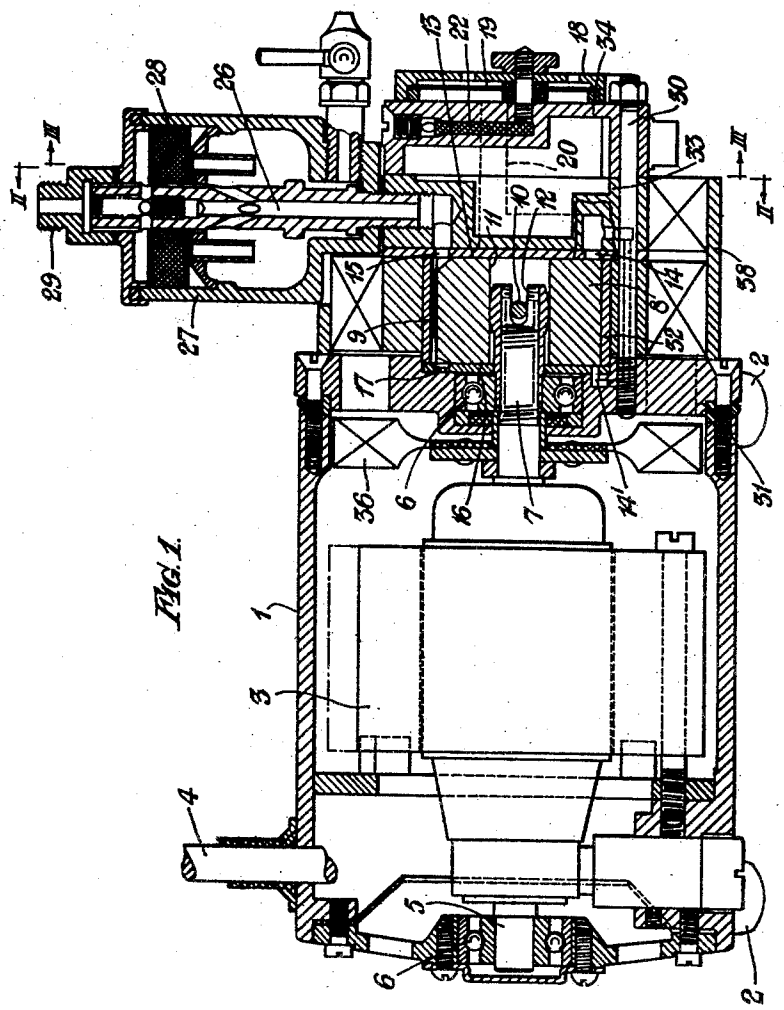

Fig. 1.

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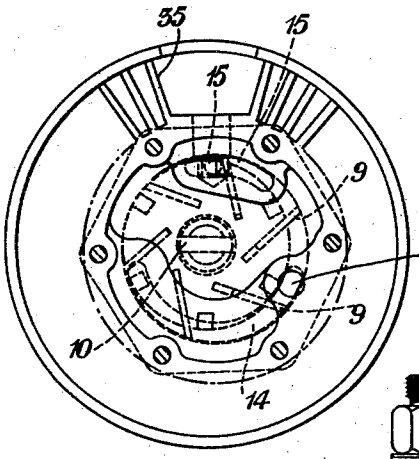

FIG. 2

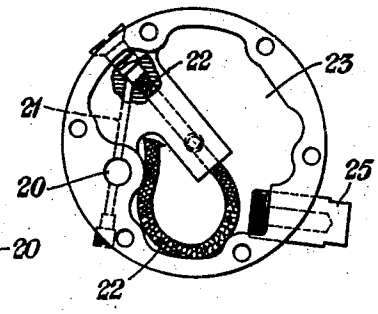

FIG. 3

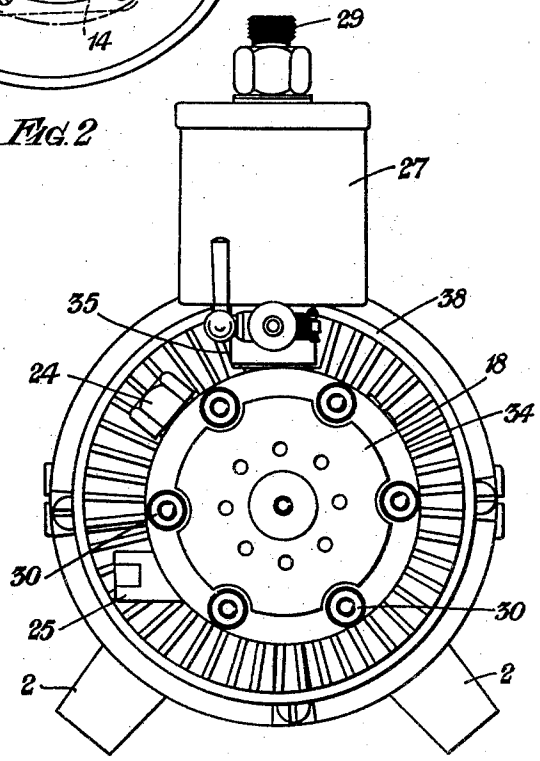

FIG. 4

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Patented Sept. 1, 1953 2,650,754

UNITED STATES PATENT OFFICE

2,650,754

COMPRESSOR

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Application February 21, 1950, Serial No. 145,372
In Great Britain January 12, 1949

1 Claim. (Cl. 230—152)

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The present invention relates to compressors and more particularly to compressors of the crescent chamber type of rotary motor in which a rotor provided with sliding vanes is mounted eccentrically within a cylindrical chamber.

An object of the invention is to supply a compact and self-contained apparatus for supplying compressed air which apparatus is easily assembled and disassembled and requires little attention.

Broadly the invention comprises a compressor of the type referred to in which the rotor is mounted upon its driving shaft to permit a freedom of axial and angular movement the chamber for the rotor being provided with inlet and exhaust ports on one or both of its end walls means being provided for introducing oil into the chamber to provide a continuous oil film on its peripheral internal face to serve as a bearing surface for the vanes and a seal between the tips of the crescent chamber.

A further feature of the invention comprises an exhaust port or ports in one or both end walls of the chamber which are so positioned that a fraction of compressed air is left in the front of each vane in the compression chamber which air serves to force the lubricant between the ends of the rotor and the end walls of the chamber and between the vanes and the slots in which they work.

Yet a further feature of the invention is the provision of lubricating means for the rotor chamber which includes a wick to which oil is fed and a portion of which is exposed to the air on its way to the pump chamber. In this connection it is preferred to provide two inlet ports one in each end wall of the pump chamber so as to ensure introduction of oil into each end of the chamber. Means are provided where necessary for extracting oil from the air as it is being delivered from the pump.

In a preferred form of the invention the rotor is coupled directly to the end of the shaft of an electric motor the shaft for this purpose being extended and provided with suitable coupling means which enables the rotor to float in its chamber in accordance with the invention. The invention will now be described with reference to the accompanying drawings in which:

Figure 1 shows in longitudinal cross section apparatus in accordance with the present invention,

Figure 2 shows a section on the line II—II of Figure 1,

Figure 3 shows a cross section on the line III—III of Figure 1, and

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Figure 4 shows an elevation of the apparatus from the compressor end.

Referring to the drawings a main casing 1 provided with feet 2 houses an electric motor 3 to which the normal electric lead 4 is provided.

The shaft 5 of the electric motor 3 is carried at each end in suitable races 6. One end 7 of the shaft extends through the race 6 and is coupled to a rotor 8 of a crescent chamber type compressor provided with vanes 9. The coupling between the shaft 7 and the rotor 8 is a universal one and consists in this case of a transverse pin 10 secured across the bore 11 of the rotor which pin engages a slot 12 in the end of the shaft 7. The end of the shaft 7 is slightly spherical so as to allow the rotor 8 to float in its chamber.

The rotor chamber is provided in the plate 13 with an inlet port 14 and an outlet or exhaust port 15. These ports respectively connect with inlet and exhaust manifolds to be described later.

Opposite to the exhaust port 15 there is provided in the opposite end wall 16 a recess 17 of exactly the same shape as the exhaust port. This recess serves to balance any back pressure upon the rotor 8 exerted by the compressed air leaving the exhaust port.

In addtion to the main inlet port 14 a further inlet port 14^1 is provided in the end wall 16, and is connected thereto by a bore extending through the wall of the rotor chamber as indicated in broken line in Figure 1. The purpose of this second inlet port is mainly to ensure that oil is introduced at that end of the rotor and chamber the oil being carried in the air being drawn into the pump in a manner to be described hereinafter.

The exhaust port 15 is so positioned in relation to the crescent chamber that a fraction of air is retained in the front of each vane after the port is closed which air is then compressed to be driven between the end walls of the chamber and the end faces of the rotor and so to introduce lubricant between these faces. The air is also driven down between the vanes 9 and the guide slots in the rotor 8 similarly to lubricate these sliding faces.

The air is introduced through a removable cap 18 carrying a filter element 19 and passes through a conduit 20 bored in the body of the unit to the inlet ports 14 and 14^1. The conduit 20 is exposed via a boring 21 with the top of a wick 22 the end of which is immersed in an oil bath or reservoir 23. Access to this reservoir is by a filler cap 24 and conveniently a transparent plug 25 is pro-

vided in the bottom of the oil bath so that the oil may be replenished as required. When the pump is operating a reduced pressure exists in the conduit 20 and the boring 21 and oil is carried off the top of the wick 22 as required. The oil is carried by the air in the form of minute droplets into the chamber where it performs its lubricating functions as described above.

The compressed air leaves the exhaust port 15 and passes via conduit 26 into an oil separation chamber 27 from whence it passes through a filter 28 to an airline connected to the screw mechanism 29. The chamber 27 is provided with a drain cock 27^1.

For convenience of assembly the pump unit is formed in five main parts all of which are assembled axially and maintained in position by the bolts 30. The five main parts are the end wall 16 which is in the form of a plate located in a recess in the member 31 carrying the race 6 for the motor shaft 7; the rotor 8 and the chamber 32; the plate 13 forming the other end wall; the section 33 forming half the oil reservoir chamber and carrying the outlet conduit 26 and the section 34 carrying the other half of the oil reservoir and the oiling wick 22. All these parts are located mainly by the bolts 30 and may also be located to finer accuracy by dowel pins between each part if desired. The bolts also hold the assembly to the member 31.

By reason of the fact that the rotor is free to slide axially with respect to the driving shaft 7 and may also turn within limits upon the spherical face of the shaft 7 any slight mis-alignment of the shaft with the pump chamber does not affect the free floating of the rotor in its chamber.

The chamber 32 and the section 33 carry cooling vanes 35 through which air is blown by the fan 36 carried on the shaft 7. These vanes may also serve to locate the pump unit in its casing 38.

This pump is capable of operating at high speed and may for example be coupled to a motor which rotates under load at 10,000 R. P. M. and may supply compressed air at 25 lbs. per square inch or more.

What I claim is:

A high speed air compressor comprising a hollow cylindrical member positioned between a first and a second end member to define a cylindrical chamber, first and second end plates in juxtaposition with said first and second end members respectively and forming opposed end walls of said chamber, a free floating rotor eccentrically positioned in said chamber between said end plates, vanes on said rotor for sliding engagement with the said cylindrical chamber, mechanical means extending through said second end member and said second end plate and freely connected with said rotor for rotating said rotor, an outlet duct in said first end member communicating solely with an outlet port in said first end plate, an inlet duct in said first end member communicating with an inlet port in said first end plate and with a secondary inlet duct in said second end member leading to a secondary inlet port in said second end plate, a closed recess in said second end plate of like configuration to and in axial alignment with the outlet port of said first end plate and effective to balance the axial thrust on the rotor due to the flow of air from the chamber through the said outlet port, and a source of lubrication in communication with the said inlet duct whereby air drawn through the said inlet duct is charged with lubricant entrained therein which lubricant is deposited on the walls of the chamber by the air flowing into each end of the chamber through the inlet port and secondary inlet port respectively.

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