Jan. 20, 1931. W. G. E. ROLAFF 1,789,843

COMPRESSOR

Filed Nov. 21, 1927

Fig. 1.

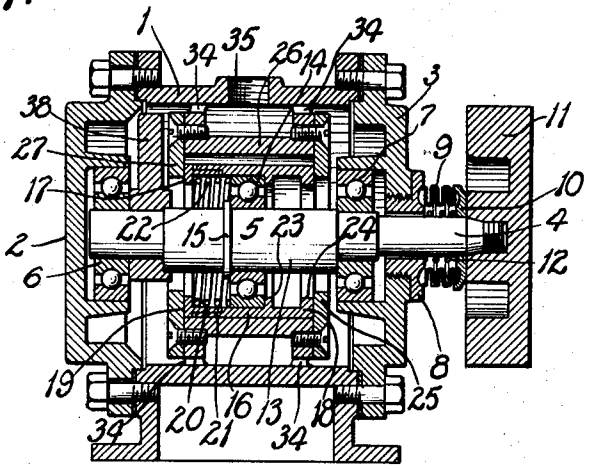
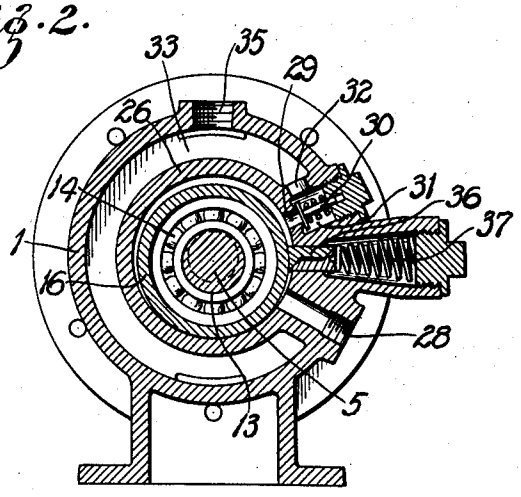


Fig. 2.



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UNITED STATES PATENT OFFICE

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COMPRESSOR

Application filed November 21, 1927. Serial No. 234,689.

This invention relates to rotary compressors, designed more particularly for use in the art of mechanical refrigeration, but, in principle, equally applicable for use in the general art of displacing liquids and gases.

In order that my invention may be more clearly understood, I will first refer to my prior patent No. 1,603,983, dated October 19th, 1926, in which a rotor operates within a cylinder having one movable end wall; and to my prior patent No. 1,632,562, dated June 14th, 1927, in which the rotor has a flange which constitutes the end wall of the cylinder.

My present invention differs from both of my prior patents in that both end walls of the cylinder are stationary and the rotor itself is made telescoping, so that normally by spring pressure, and after initiation of operation, by developed pressure within the compressor, the ends of the rotor will be maintained by expansion of the rotor in frictional contact with the end walls of the cylinder.

In the embodiment of the invention shown in the drawing, the cylinder is stationary, but my improved telescoping rotor could equally well be embodied in a structure in which the cylinder also rotates.

The general object of my invention therefore, is to provide a rotary compressor having a telescoping rotor maintained in sealing contact with the end walls of the cylinder by developed pressure within the machine.

In the accompanying drawing:

Figure 1 is a longitudinal sectional view of a compressor constructed according to my invention; and

Figure 2 is a cross-sectional view thereof.

Referring to the drawing, the numeral 1 indicates the casing of the machine having a closed end wall 2 and an open end wall 3 through which extends one end 4 of a shaft 5. The end of the shaft at the closed end of the casing is mounted in a ball bearing 6 and the opposite end portion of the shaft is mounted in a corresponding bearing 7, both bearings being housed in the casing 1 in the manner shown. The projecting end 4 of the shaft extends loosely through a sleeve 8, screwthreaded in the open end of the casing, and is surrounded by a metal bellows 9 which at one end bears against the outer face of the sleeve 8 and at its opposite end carries a friction ring 10 which bears against the flat face of the central portion of a pulley 11 mounted on the outer end of the projecting portion 4 of the shaft. Within the metal bellows 9 is a coil spring 12 which operates to maintain the friction ring 10 in contact with the face of the pulley 11.

The above arrangement provides an effective seal against the escape of lubricant or the compressed medium around the crank-shaft 5 at the open end of the casing, as any liquid or gas passing through the sleeve 8 will enter the metal bellows 9 and serve to expand the same, thereby pressing the ring 10 more firmly against the face of the pulley 11. The drive shaft 5 is provided intermediate its ends with an eccentric portion 13, on which is mounted a ring bearing 14 which abuts at one side against a shoulder 15 formed on the eccentric portion of the shaft. Surrounding the ring bearing 14 and supported thereby is a rotor 16 made in two telescoping parts 17 and 18, the part 18 constituting the main body of the rotor and the part 17 constituting, as it were, a telescoping end of the rotor and comprising a flat annular portion 19 located at the end of the body 18 of the rotor and the external diameter of which is the same as that of the body portion 18. The inner circumference of the annulus 17 is less than that of the body portion 18, whereby an inwardly extending portion 20 is provided which is subject to pressure within the rotor. Projecting inwardly from the annulus 17 is an integral cylindrical portion 21 which fits snugly within the end of the body portion 18 of the rotor, which is recessed at that end, as shown in Fig. 1, to receive said cylindrical portion 21. Between the inwardly projecting portion 17 of the annulus and the bearing 14, I mount a coil spring 22 which normally tends to press the two parts 17 and 18 of the rotor apart. The body portion 18 of the rotor is provided with an inwardly extending annular shoulder 23 against which the other side of the ring bearing 14 is embraced, so that said ring bearing is retained between the shoulder 15 and

said annular portion 23. The outer end of the body portion 18 of the rotor is further provided with an inwardly extending annular portion 24 which provides an area against which pressure within the rotor may be exerted to force this end of the rotor into sealing contact with the corresponding end 25 of the cylinder. The cylinder is indicated at 26 and is shown as cast integral with the interior wall of the casing 1. The numeral 27 indicates the opposite end wall of the cylinder to that first referred to, and both the ends 25 and 27 of the cylinder and the ends of the rotor are open, as shown, to permit of the free circulation of the lubricant and compressed medium within the interior of the compressor.

As shown by Fig. 2, the wall of the casing is provided with an inlet port 28 extending into the cylinder and an outlet port 29 controlled by a spring-pressed valve 30. The port 29 opens into a valve chamber 31 which has an opening 32 communicating with an annular space 33 surrounding the cylinder. The web extending between the wall of the cylinder and the wall of the casing is provided on each side of the space 33 with openings 34 to allow the free circulation of the compressed medium and lubricant to opposite ends of the casing so that it may enter the rotor. The numeral 35 indicates the outlet from the casing for the compressed medium.

Between the outlet port 29 and the inlet port 28, I mount a sliding blade 36 which is normally held in contact with the outer surface of the rotor 16 by means of a coil spring 37.

As in the case of my prior patents, the outer end of this blade will be subject to pressure developed within the compressor so as to force the blade into contact with the surface of the rotor with force proportioned to the pressure developed within the compressor. I have not, however, thought it necessary to illustrate this arrangement, as it forms no part of the present invention, and especially as the spring will operate satisfactorily under all but very high pressures.

In Fig. 1, I have shown an arm 38 mounted on the drive shaft 5 and extending from the side thereof opposite to that from which the eccentric projects from said shaft in order to balance the rotating parts and relieve strain on the bearings.

By observing Fig. 1, it will be seen that the outer surface of the rotor presents no area against which pressure can be exerted, but that both ends of the rotor present such pressure areas on the interior of the rotor. Thus, as the compressor is operated and the whole interior of the casing subject to pressure, such pressure can only be exerted on the rotor in a manner to expand the rotor, that is, in a direction tending to separate the telescoping members 17 and 18. In effect, this pressure is largely exerted in a functional way on the end member 17, which is forced thereby into sealing contact with the end walls 27 of the casing. The body portion 18 cannot move inwardly, or toward the left, as shown in Fig. 1, owing to the interposition of the ring bearing between the annular shoulder 23 on the interior of the rotor and the shoulder 15 on the shaft. The outer end of the body portion 18 of the rotor is normally in sealing contact with the inner face of the end 25 of the cylinder and developed pressure within the compressor, of course, serves to maintain such contact.

It will be understood, of course, that any wear due to friction between the ends of the rotor and the cylinder ends will be automatically compensated for by expansion of the rotor, first, by the spring 20, and, after pressure is developed in operation, by such developed pressure.

I claim:

1. In a compressor, in combination with a cylinder, and expanding, unitary rotor eccentrically mounted therein for gyratory movement within the cylinder and in rolling engagement throughout its length with the wall thereof.

2. In a compressor, in combination with a stationary cylinder, an expanding, unitary rotor eccentrically mounted therein for gyratory movement within the cylinder and in rolling engagement throughout its length with the wall thereof.

3. In a compressor, in combination with a cylinder having fixed end walls, an expanding rotor eccentrically mounted therein for gyratory movement within the cylinder and in rolling engagement with the wall thereof, and means tending normally to expand the rotor to force the ends thereof into sealing contact with the respective end walls of the cylinder.

4. In a compressor, in combination with a cylinder, a longitudinally expanding, unitary rotor mounted for movement therein.

5. In a compressor, in combination with a cylinder, a longitudinally expanding, unitary, cylindrical rotor mounted for gyratory movement within the cylinder.

6. In a compressor, in combination with a cylinder, a longitudinally expanding, unitary, cylindrical rotor mounted for gyratory movement within the cylinder and in rolling engagement with the wall thereof.

7. In a compressor, in combination with a cylinder having fixed end walls, a unitary rotor eccentrically mounted therein comprising severable end members, means for imparting a gyratory movement to the rotor while maintaining the same in rolling engagement with the wall of the cylinder, said rotor having opposed interior pressure areas presented by the respective members and subject to developed pressure within the ma-

chine whereby in the operation of the machine, such pressure will tend to expand the rotor and force the outer ends thereof into sealing contact with the respective end walls of the cylinder.

In testimony whereof, I have hereunto set my hand.

WALTER G. E. ROLAFF.