June 12, 1923. 1,458,183

F. J. HEIDEMAN

SHAFT SEAL FOR COMPRESSORS

Filed Sept. 6, 1918

Fig. 1.

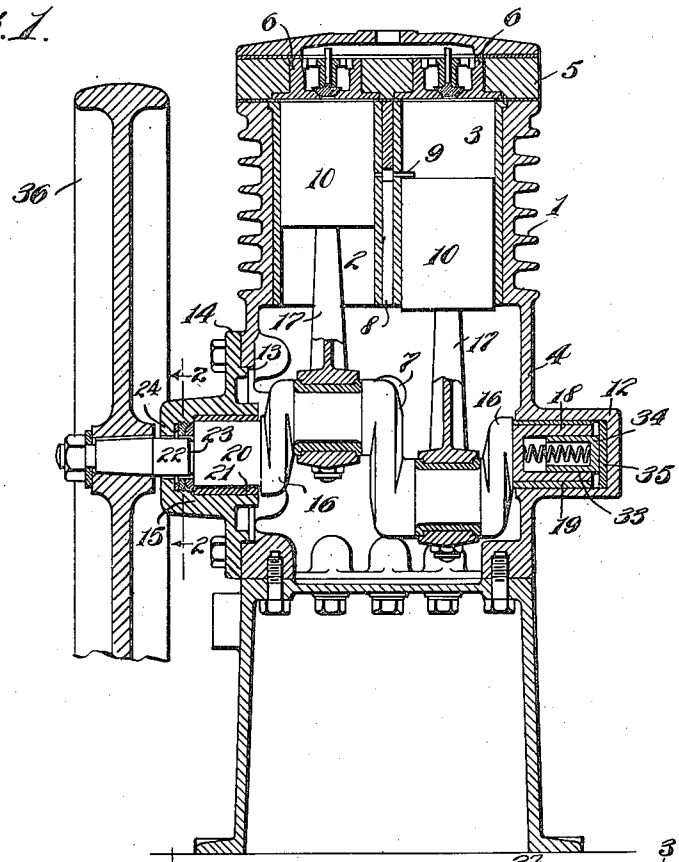


Fig. 3.

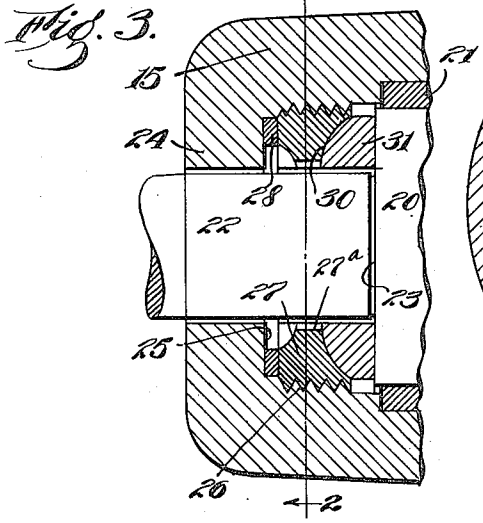
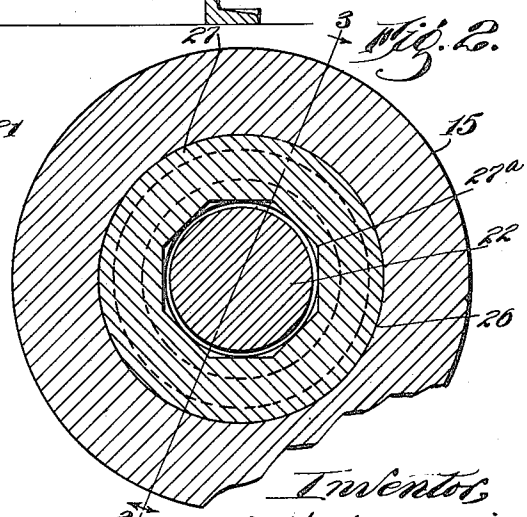


Fig. 2.



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UNITED STATES PATENT OFFICE.

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SHAFT SEAL FOR COMPRESSORS.

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To all whom it may concern:

Be it known that I, FRED J. HEIDEMAN, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a certain new and useful Improvement in Shaft Seals for Compressors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to refrigerating apparatus and particulaly to a compressor for use with such apparatus. The invention has especial reference to refrigerating apparatus intended for domestic use, and hence required to operate with little or no attention, although not necessarily limited thereto. The requirements to which such apparatus is subjected are particularly severe because in addition to the absence of skilled attention the apparatus is operated irregularly, being often left unused for long periods of time is subject at all times to the corrosive effect of refrigerant fluid, and yet is demanded to start readily and operate perfectly at all times. The chief obstacles to the successful operation of such devices have always been leakage and corrosion: leakage because of the fact that the refrigerant fluid is ordinarily offensive or even dangerous, and because the escape of fluid or inlet of air even in small amount will greatly impede the operation of the apparatus; and corrosion because of the resulting tendency of the parts to stick and bind, particularly during the idle period. Practically all refrigerating systems of the compression-liquefaction type employ a power driven compressor, one feature of which is the employment of a drive shaft which necessarily projects through a wall of the apparatus, and this drive shaft has always constituted a problem of particular difficulty, both as regards corrosion and leakage; for if the bearing is made sufficiently loose to allow successful running the egress of refrigerant or ingress of air has generally been experienced, while if made sufficiently tight to prevent these difficulties, then the effect of corrosion has generally interfered with the operation of the device. Lubricating substances such as oils and greases have been employed in an attempt to reduce the leakage while overcoming the corrosion and binding, but even these under the influence of the pressure generally become dissipated in the course of a few months, and the absence of skilled attention renders their replenishment very difficult.

The objects of the present invention are the provision of a compressor of such construction as to overcome the leakage around the main shaft without such nicety of fit as will impede the operation of the compressor and without danger of loss of lubricant; the provision of a compressor of such nature as always to remain tight under all conditions of temperature and pressure; the provision of a new and improved construction of sealing bearings; the provision of a new and improved expedient for maintaining the contact of parts of such a bearing; while further objects and advantages of my invention will become apparent as the description proceeds.

In the drawings accompanying and forming a part of this application I have shown a few of the mechanical constructions in which my inventive idea can be embodied, although it will be understood that these drawings are illustrative only and do not limit me to the particular constructions therein disclosed. In the drawings Fig. 1 represents a longitudinal, vertical, sectional view through a preferred design of compressor embodying my invention; Fig. 2 is a detail sectional view taken on the line 2—2 of Figs. 1 and 3; Fig. 3 is a detail sectional view taken on the line 3—3 of Fig. 2.

Describing more at length the constructions illustrated herein and with relation to the characters of reference on the drawings, the particular compressor shown is of the cylinder type and operates upon the two cycle principle, although neither of these features is necessary to my invention. In the present embodiment the cylinder block 1 having therein the cylinders 2 and 3 is cast integral with the hollow crank-case 4. The cylinders are shown as surmounted by the head block 5, having therein the outlet valve casings 6—6, while one side of the crank casing is formed with an inlet aperture 7. The cylinder block is here shown as formed with a longitudinal duct 8 adjacent to the cylinders and communicating with the inlet ports 9 in the cylinder walls which are adapted to be alternately covered and uncovered by the pistons 10—10 which is well known in the art, as for example as in Patents No. 1,032,603, Hayner or 309,493, Rose.

One end of the crank-case is formed with a hollow, integral boss 12 which supports the bearing for one end of the shaft, while the opposite end of the case is formed with an axial opening 13 receiving the cover plate 14 hermetically bolted thereto, and carrying a boss 15 in which is mounted the other bearing of the shaft.

The crank shaft 16 shown in Fig. 1 of the usual two-throw type has associated therewith the usual connecting rods 17—17. At its rearward end it is formed with an exteriorly cylindrical portion 18, rotatably and slidably journaled in a bushing 19 of suitable anti-friction metal, located in the boss 12; at the forward end said shaft is formed with an exteriorly cylindrical portion 20 rotatably and slidably journaled in the anti-friction bushing 21 mounted in the boss 15. Forward of the portion 20 the crank shaft is formed with a reduced extension 22 surrounded by the abrupt shoulder 23, while the boss 15 is formed with an internal flange 24 defining an interior shoulder 25 which faces the shoulder 23.

Adjacent to the shoulder 25 the boss 15 is formed with an interiorly threaded portion 26 in which is located the bearing ring 27 whose interior is preferably formed of a polygonal shape as shown at 27^a to receive a wrench, while between said bearing ring and the shoulder 25 there is inserted a packing ring 28, generally of some soft metal such as lead or copper, and adapted to prevent leakage around the outside of said ring via the screw threads. The opposite face of the ring is formed as a surface of revolution 30, here spherical in contour, adapted to receive the complementary face of a sealing ring 31 whose opposite side rests against the shoulder 23.

In order to effect close, constant, and sealing contact between the rings 31 and 27 the whole shaft is forced bodily endwise. In the present embodiment the portion 18 of the shaft is formed with an interior axial cavity 33, receiving the spring-pressed button 34 which rests against a thrust plate 35 seated in the bottom of the boss 12. Suitably secured to the outer end of the shafts 20 and 22 is the drive wheel 36, by means of which power is transmitted to the shaft.

Within the scope of my invention the rings 27 and 31 may be made in any number, of any material, contour or arrangement, and wide variations may occur in the arrangements for holding the shaft in sealing contact therewith. I prefer to make the ring 27 of a hard and wear-resisting metal such as hard steel, and to make the ring 31 of some softer and more clinging metal such as bronze, babbitt, or other soft composition; and I prefer to have the ring 27 concaved upon its outer surface concentric with the drive shaft as shown in Figs. 1 and 3; although all of these matters may be varied widely as will now be shown.

It will be understood that lubricant may or may not be employed depending upon the metals used and the temperatures and friction-coefficients permitted, but that when used and of sufficient viscosity it may be considered as a part of the sealing means though not always a necessary part. It will also be understood the embodiments here shown constitute only a small number out of the many constructions by which my inventive idea may be utilized and even the features herein illustrated may be shifted about and interchanged to a great extent, wherefore I do not limit myself to the several constructions herein shown except as the same are specifically recited in the claims hereto annexed or rendered necessary by the prior state of the art.

Having thus described my invention what I claim is:

1. In a compressor, a crank case one of whose walls is formed with an aperture and the opposite wall with a recess in line with said aperture, said aperture being formed with a bearing portion, a threaded portion, and an inwardly facing seating portion, a bearing ring screwed into said threaded portion from within and provided with means for seating it against said seating portion and having its inner face formed as a surface of revolution coaxial with said bearing portion, an operating shaft journaled in said bearing portion and having an extension projecting through said aperture, a sealing ring embracing said shaft and having its outer face complementary to said bearing ring, and spring means in said recess and operating against the opposite end of said shaft to force said rings together.

2. A refrigerating apparatus having a closed casing and a rotatable shaft journaled therein, one wall of said casing having an aperture which is reduced at its outer end, and said shaft having a reduced extension projection outwardly through the reduced portion of said aperture, a portion of the aperture being threaded, a bearing ring having a threaded exterior and an arcuate interior screwed into said threaded portion and provided with means for sealing it against the reduced portion of the aperture, the interior face of said ring being formed as a surface of revolution coaxial with said shaft, a sealing ring embracing the reduced portion of said shaft and having its face formed complementary to the face of said bearing ring and means yieldingly forcing said shaft longitudinally of its bearing in a direction to force said rings into contact with each other.

In testimony whereof, I hereunto affix my signature.

FRED J. HEIDEMAN.