Jan. 8, 1935. F. A. WEGENER 1,986,905

COMPRESSOR AND SEALING MEANS THEREFOR

Filed June 8, 1926 2 Sheets-Sheet 1

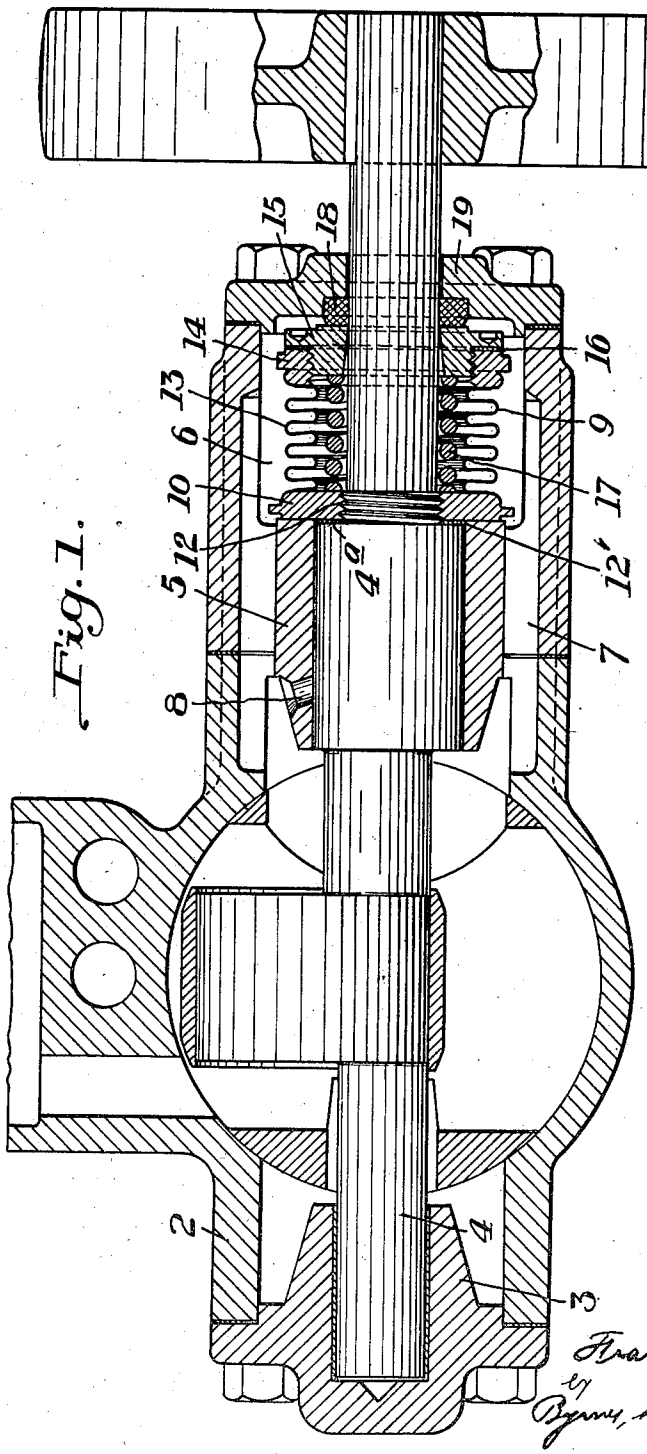


Fig. 1.

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Fig. 2.

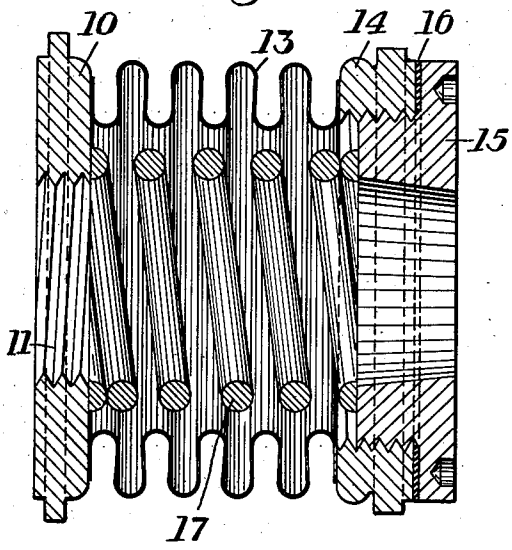


Fig. 3.

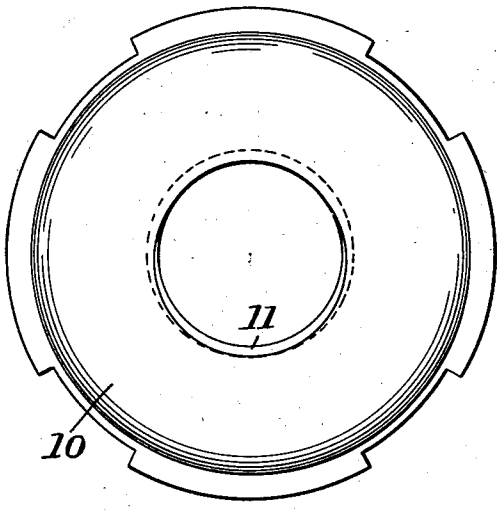


Fig. 4.

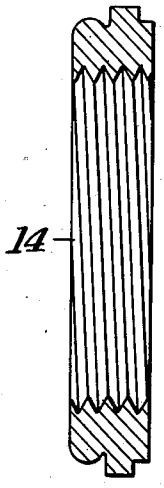
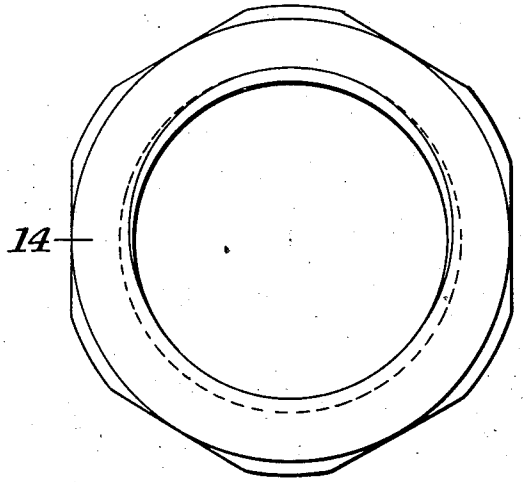


Fig. 5.



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UNITED STATES PATENT OFFICE

1,986,905

COMPRESSOR AND SEALING MEANS THEREFOR

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Application June 8, 1926, Serial No. 114,466

13 Claims. (Cl. 286—11)

The present invention relates broadly to the art of sealing rotating members such as shafts, against the possibility of leakage of a gaseous medium in either direction, and more particularly to compressors of a character suitable for use in refrigerating systems and to means whereby the passage of refrigerant outwardly from the compressor is prevented as well as the possibility of infiltration of air.

In refrigerating apparatus the compressor represents one of the most difficult parts of the installation both from a constructional as well as an operating standpoint. This is true not only because of the necessity of maintaining an absolutely tight seal around the shaft, but by reason of the offensive and corrosive nature of the fluids frequently handled by the compressor.

It not infrequently happens that refrigerating machinery of the general character herein contemplated is left idle for a considerable period of time under such conditions that the refrigerant, which is ordinarily in a liquefied state becomes gasified with a resulting pressure requiring effective means to prevent its dissipation. Such dissipation must be prevented if the apparatus is to be successful inasmuch as many of the installations are designed for domestic purposes under conditions wherein proper attention is not available.

It has heretofore been proposed to provide sealing means for compressors of the nature referred to, which sealing means comprises flexible diaphragms disposed between the compressor casing and the shaft in such manner as to effect a seal both against outward leakage of a refrigerant and infiltration of air. Such structures as heretofore provided have, however, ordinarily required extreme care during the installation thereof in order to effect the necessary sealing requirements from an assembly standpoint, as well as frequent lubrication in order to prevent undue wear or gas leakage.

It is one of the objects of the present invention to provide a seal which may be sold and assembled as a unit by unskilled labor, thereby insuring standardization of all compressors equipped therewith.

Another object of the present invention is to provide sealing means effective when in position for insuring automatic lubrication, thereby obviating the necessity of the attention heretofore required by installations of this general character.

Still another object of the present invention is to provide a compressor structure in which the shaft may have bearings provided closely adjacent the shaft to prevent any undue whipping thereof, even with shafts of small diameter and furthermore to so locate the bearings that automatic lubrication thereof during the operation of the compressor is insured.

In the accompanying drawings there is shown, for purposes of illustration only, a preferred embodiment of the present invention, it being understood that the drawings do not define the limits of my invention as changes in the construction and operation disclosed therein may be made without departing either from the spirit of the invention or the scope of my broader claims. In the drawings,

Figure 1 is a vertical sectional view through a portion of the compressor casing with certain of the parts illustrated in elevation,

Figure 2 is an enlarged detail view of the sealing unit,

Figure 3 is an end elevation of the thrust nut for the sealing unit,

Figure 4 is a sectional view through the lock nut for the sealing unit, and

Figure 5 is an end elevation of the nut shown in Figure 4.

In carrying out the present invention there may be provided a casing 2 of suitable construction dependent upon the character of the compressor with which it is utilized. This casing may be provided with a bearing 3 at one end thereof for supporting the compressor shaft 4, it being contemplated that the bearing shall cooperate with the casing through a gasket or suitable packing in such manner that a tight joint effective to prevent the passage of air or gases in either direction is provided.

At the opposite side of the compressor the casing is extended to provide an intermediate bearing 5 for the shaft and a chamber 6 beyond this bearing. The chamber is preferably in communication with the interior of the casing through one or more openings 7 constituting not only means for equalizing the pressure within the chamber and casing but for permitting a flow of lubricant from the casing into the chamber.

Extending through the bearing 5 and communicating with one of the passages 7 is a collecting port 8 effective for supplying lubricant to the bearings.

In order to effectively seal the chamber 6 against the possibility of leakage to the extent required by ordinary operating characteristics, there is provided a unit assembly sealing means 9. This unit assembly conveniently comprises a thrust nut

or collar 10 internally threaded as indicated at 11 to cooperate with the threaded portion 12 of the shaft to permit the collar to be threaded upwardly against a sealing gasket 12' positioned between the same and the shoulder 4a on the shaft. In this manner a tight joint is provided preventing the leaking of gas in either direction past the threads. Secured to the collar 10 in such manner as to form an hermetic closure therewith is a flexible diaphragm 13, one end of the diaphragm preferably being soldered or otherwise secured to the collar. The opposite end of the flexible diaphragm may be similarly secured to a nut 14 internally threaded, as clearly shown in Figure 4, to cooperate with a thrust nut 15 preferably formed of hardened steel. The joint between the lock nut and the thrust nut may be formed by a gasket 16 similar to the gasket 12'. Mounted within the flexible diaphragm and abutting at its opposite ends against the collar 10 and the thrust nut 15, respectively, is a compression spring 17.

With the unit sealing device in position, the spring effectively forces the thrust nut 15 against a bearing ring 18 carried by the cap 19, bolted or otherwise secured to the casing to provide a tight joint therewith as previously referred to in connection with the bearing 3. The bearing ring 18 may be of special composition, of anti-friction material, of white metal, lubricant saturated wood or other fibre, or the like.

In actual operation, the collar 10 will be threaded into position on the threads 12 to the limit permitted by the gasket 12', whereby further movement thereof is prevented and a gas tight joint insured. Thereafter, with the cap 19 in position, the spring 17 will be effective for maintaining a tight engagement between the thrust nut 15 and the bearing member 18 constituting part of the casing. Inasmuch as the chamber 6 containing the unit sealing device is open to the interior of the casing, lubricant may freely flow into the chamber 6 from the casing. This lubricant is in turn thoroughly agitated and distributed by the rotation of the sealing unit in such manner that an oil film is constantly maintained between the thrust nut 15 and the casing through the bearing member 18. In actual practice it has been found that while this joint cannot be formed as an hermetic closure due to the necessity of permitting relative movement between the parts, gas tight characteristics are effectively obtained not only by the tight contact between the relatively movable surfaces but also through the medium of the oil film constantly maintained thereon.

By providing the bearing 5 closely adjacent the compressor, whipping of the shaft 4 is effectively prevented, and by reason of the communicating channels 7, automatic lubrication for all of the parts is automatically maintained. The chamber 6 enables the sealing unit to be completely housed and protected as well as automatically lubricated. In the event of failure of the sealing unit, the cap 19 may be easily removed, the unit 9 unscrewed from the shaft 4 and a new unit quickly screwed into position.

Certain advantages of the present invention arise from the provision of sealing means carried by the shaft to be sealed and within the casing whereby it serves as an efficient lubricant distributor.

Other advantages of the invention arise from the provision of sealing means in the form of a unit adapted to be removed or applied as such.

Still further advantages arise from the provision of a casing having a chamber outside of one of the shaft bearings but in communication with the casing and adapted to receive the sealing means whereby automatic lubrication of the parts is accomplished simultaneously with the sealing thereof.

I claim:

1. In apparatus having a rotatable shaft, a casing, bearings in said casing for said shaft, there being a chamber in said casing exteriorly of one of said bearings and in free communication with the interior of the casing, a threaded portion on the shaft within the chamber, and sealing means for the shaft in said chamber and threaded onto said threaded portion, said sealing means comprising a unit assembly adapted for bodily removal from the shaft.

2. In apparatus having a rotatable shaft, a casing, bearings in said casing for said shaft, there being a chamber in said casing exteriorly of one of said bearings and in free communication with the interior of the casing, a threaded portion on the shaft within the chamber, and sealing means for the shaft in said chamber and threaded onto said threaded portion, said sealing means comprising a flexible diaphragm having a packed joint with the shaft at one end and a sliding engagement with the casing at the opposite end.

3. In apparatus having a rotatable shaft, a casing providing a bearing to one side of the interior thereof, there being a chamber in said casing exteriorly of said bearing and free communication between the interior of said casing and said chamber, said shaft having an enlarged portion for cooperating with said bearing and for providing a shoulder on the shaft, and a sealing unit within said chamber and in sealing engagement with said shoulder, said sealing unit including a fixed element threaded on the shaft adjacent said shoulder and a bearing element flexibly connected to the fixed element.

4. Sealing means for rotatable shafts, comprising a unit including an internally threaded collar at one end, a bearing ring at the other end, a flexible diaphragm sealed to said collar and ring, a spring within said diaphragm bearing against said collar and ring, respectively, said ring comprising a lock nut to which only the diaphragm is sealed at one end and a thrust nut, and packing means between said lock nut and thrust nut, said thrust nut being removable from said lock nut without disturbing the joint between said diaphragm and said lock nut.

5. Sealing means for rotatable shafts, comprising a unit including an internally threaded collar at one end, a bearing ring at the other end, a flexible diaphragm sealed to said collar and ring, a spring within said diaphragm bearing against said collar and ring, respectively, said ring comprising a lock nut to which only the diaphragm is sealed at one end and a thrust nut, and packing means between said lock nut and thrust nut, said thrust nut being removable from said lock nut without disturbing the joint between said diaphragm and said lock nut and said thrust nut having a bearing face formed thereon adapted to provide a sliding seat during operation.

6. Sealing means for rotatable shafts, comprising a unit including an internally threaded collar at one end for direct cooperation with the shaft to be sealed and adapted to form the only point of connection between the unit and the parts being sealed, a bearing ring at the other end, a flexible diaghragm sealed to said collar and ring, a spring within said diaphragm bearing

against said collar and ring, respectively, said ring comprising a lock nut to which only the diaphram is sealed at one end and a thrust nut, and packing means between said lock nut and thrust nut, said thrust nut being removable from said lock nut without disturbing the joint between said diaphragm and said lock nut and said thrust nut having a bearing face formed thereon adapted to provide a sliding seat during operation.

7. In apparatus having a rotatable shaft, a casing providing a bearing to one side of the interior thereof, there being a chamber in said casing exteriorly of said bearing and a passageway in substantially the plane of the lowermost portion of the chamber between the interior of the casing and said chamber outside of said bearing, and sealing means within said chamber secured to the shaft adjacent said bearing for rotation with said shaft.

8. In apparatus having a rotatable shaft, a casing providing a bearing to one side of the interior thereof, there being a chamber in said casing exteriorly of said bearing and a passageway between the interior of the casing and said chamber outside of the bearing, and flexible sealing means for said shaft, said sealing means including a fixed element at the inner end of said sealing means secured to said shaft and a bearing element at the outer end of said sealing means flexibly connected to the fixed element and lubricated and sealed by means of fluid supplied through said passageway.

9. In apparatus having a rotatable shaft, a casing, bearings in said casing for said shaft, there being a chamber in said casing exteriorly of one of said bearings and in free communication with the interior of the casing, a threaded portion on the shaft within said chamber, and bearing means for the shaft in said chamber threaded onto said threaded portion, said bearing means comprising a unit assembly including an internally threaded collar at one end, a separable lock nut and thrust nut at the opposite end and a flexible diaphragm extending therebetween, all of said parts being removable as a unit.

10. Sealing means for rotatable shafts, comprising a unit including an internally threaded collar at one end, a bearing ring at the other end, a flexible diaphragm sealed to said collar and ring, said ring comprising a lock nut to which only the diaphragm is sealed at one end, and a thrust nut, said thrust nut being removable from said lock nut without disturbing the joint between said diaphragm and said lock nut, and a spring within said diaphragm bearing against said collar at one end and against said thrust nut only at the opposite end, said spring being removable from said diaphragm upon removal of said thrust nut.

11. In a device of the character described; a casing; a bearing in said casing; a shaft journaled in said bearing; a projection on said casing adjacent the bearing to form a cavity around said shaft; fluid passages connecting said casing and said cavity; a longitudinally expansible cylindrical sheath surrounding the shaft, lying inside of said cavity, and having one end hermetically attached to said shaft; a sealing ring hermetically attached to the other end of said sheath and adapted to contact with said projection on said casing and means for holding said sealing ring in contact with said projection on said casing.

12. The combination with a wall having an outwardly opening recess, a closure for the outer open end of said recess, and a rotatable shaft extending through said wall and closure and having a shoulder adjacent the inner end of said recess, of a seal within the recess for preventing a fluid such as a lubricant from creeping longitudinally of the shaft from the recess through the closure comprising a sealing ring frictionally engaging the inner face of said closure, a gasket engaging said shoulder, a nut on the shaft maintaining the gasket firmly against the shoulder, yieldable means on the shaft extending between the nut and ring maintaining the latter in sealing engagement with the closure, and a tubular, longitudinally contractible and expansible member surrounding the yieldable means and shaft and terminally secured to said nut and ring, the ring, expansible member and nut being rotatable as a unit with the shaft and being arranged in such a way that lubricant will be prevented from entering said expansible member and will be thrown by said unit toward the walls of said recess and away from the contacting faces of said ring and closure.

13. In combination with a compressor having a casing and a shaft, a shaft seal comprising a collar threaded onto the shaft, a longitudinally expansible cylindrical sheath surrounding the shaft and hermetically sealed at one of its ends to said collar, a sealing ring surrounding said shaft at the other end of said sheath, and a spiral spring on said shaft surrounded by said sheath, said sealing ring comprising an outer member hermetically sealed to said sheath and an inner spring retaining member threaded into the outer member and removable therefrom.

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