

Jan. 24, 1933.

J. H. DENNEDY

1,894,943

SEALED COUPLING

Filed April 25, 1928

2 Sheets-Sheet 1

Fig. 1.

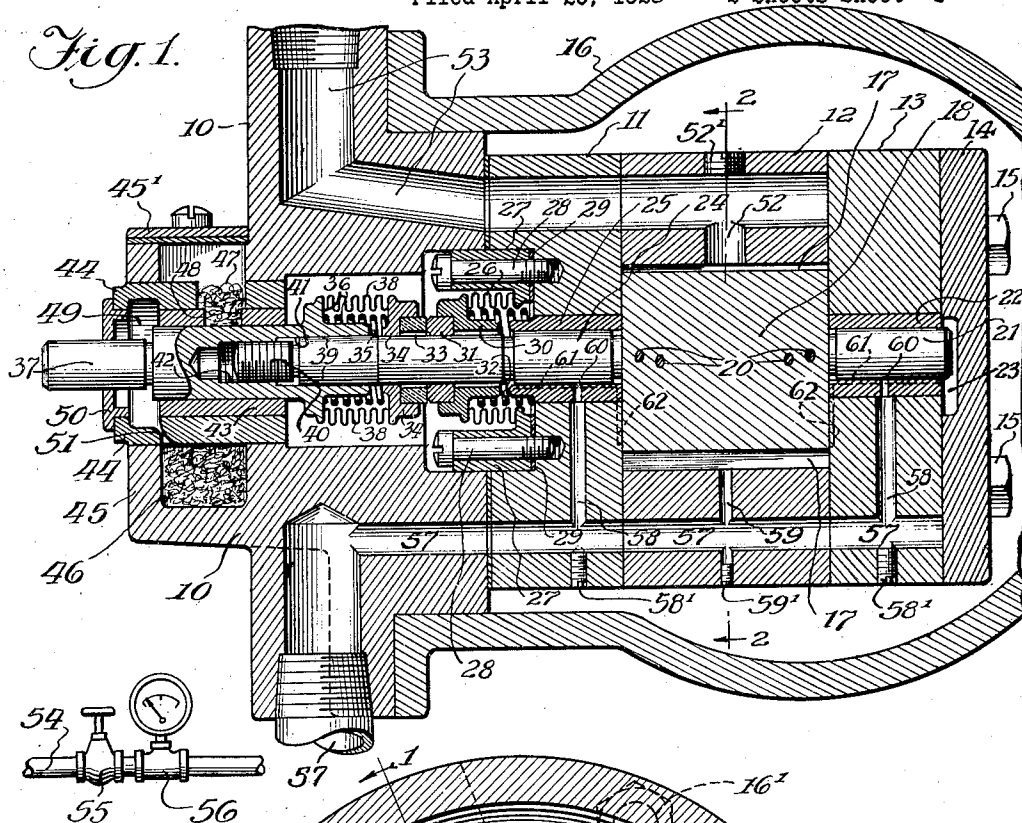
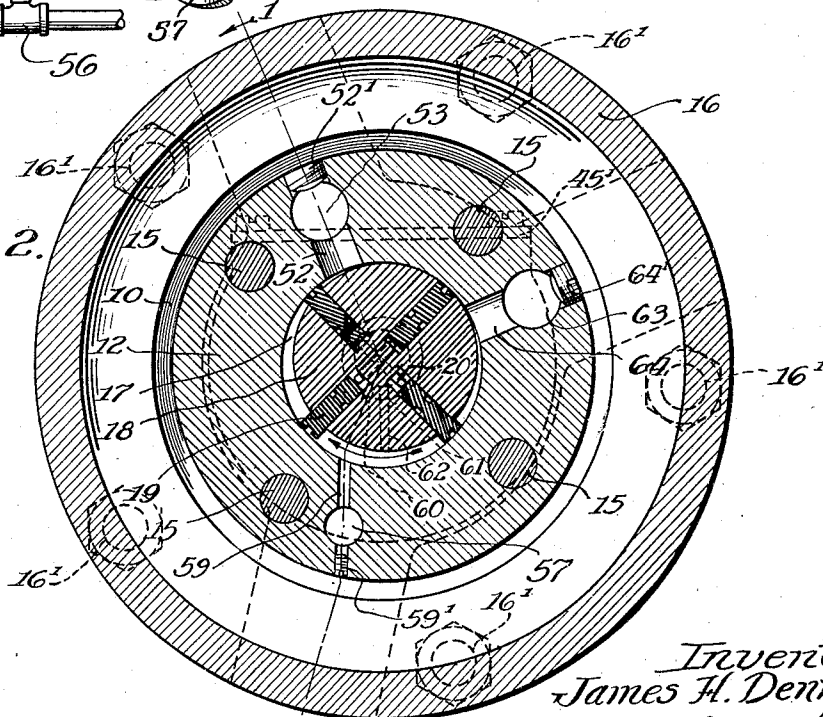


Fig. 2.



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Fig. 3.

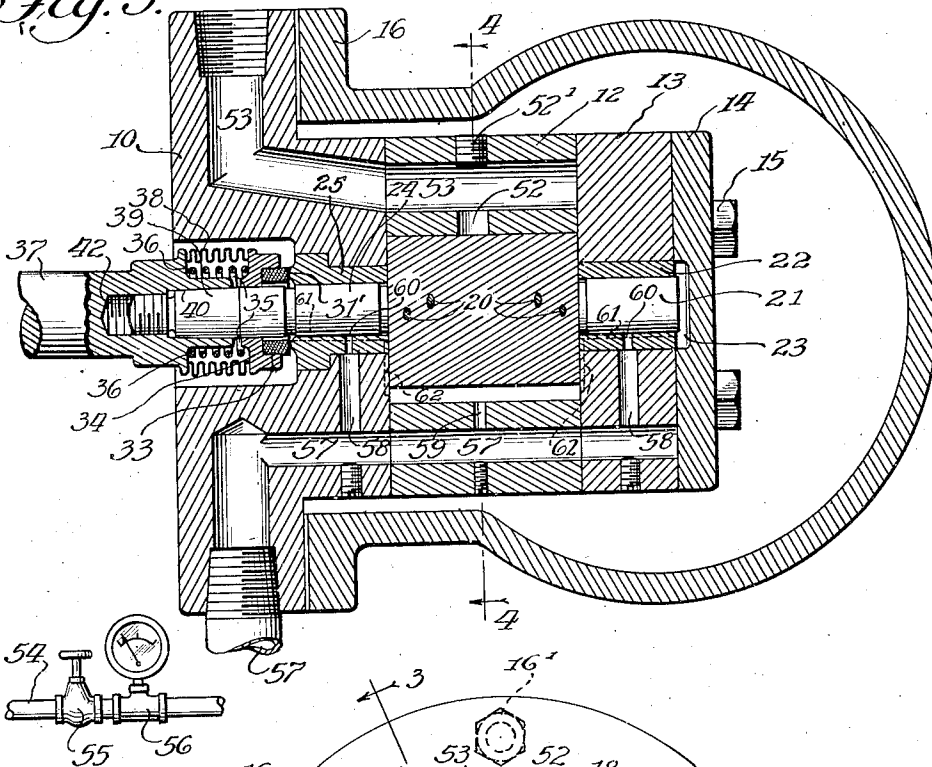
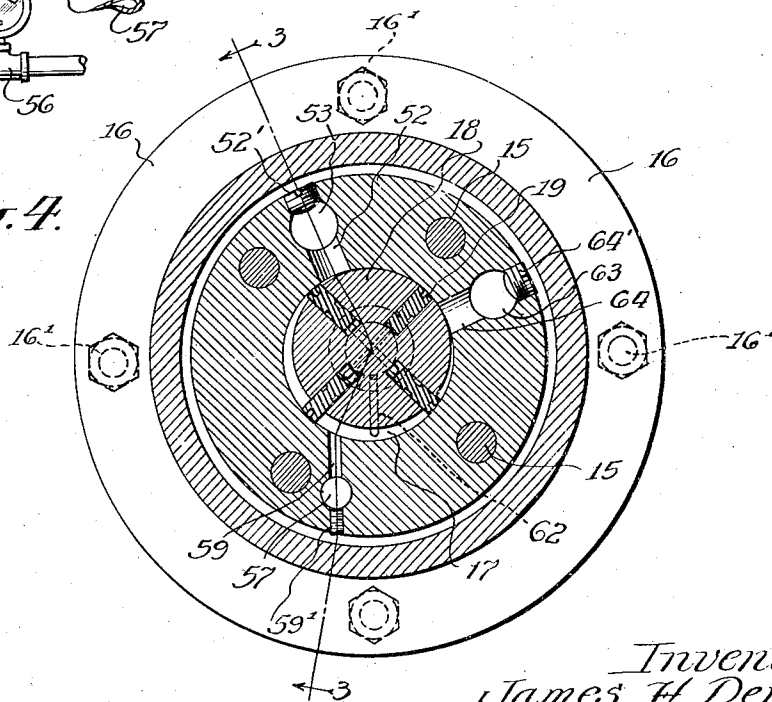


Fig. 4.



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UNITED STATES PATENT OFFICE

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SEALED COUPLING

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This invention relates to sealed couplings and it pertains more particularly to sealed couplings as applied to the compressor of a refrigeration machine.

5 The object of my invention is to prevent compressed gases from escaping around the shaft of the refrigerant compressor.

A further object is to provide an improved coupling for securing the drive shaft to the
10 compressor shaft.

A further object is to provide a means for hermetically sealing a coupling on the compressor shaft.

A further object is to provide a conduit
15 from the low pressure side of the compressor to a hermetically sealed space around the shaft whereby gases escaping around said shaft are sucked back into the compressor.

A further object is to provide a sealed coupling combined with a lubrication system.

20 Other objects will be apparent as the detailed description of my invention proceeds.

In the accompanying drawings which represent preferred embodiments of my invention and in which similar parts are designated
25 by like reference characters throughout the several views,

Fig. 1 is a vertical section through my improved compressor substantially along the
30 lines 1—1 of Fig. 2 (this figure shows both the improved sealed coupling and the lubrication system);

Fig. 2 is a transverse section along the lines 2—2 of Fig. 1;

35 Fig. 3 is a vertical section of another embodiment of my sealed coupling, the section being taken along the lines 3—3 of Fig. 4; and

Fig. 4 is a transverse section taken along the lines 4—4 of Fig. 3.

40 Referring to Figs. 1 and 2, my compressor comprises a base plate or casting 10 secured to compressor end plate 11, compressor cylinder 12, compressor end plate 13 and cap plate 14, all of which parts are securely held
45 together and in alignment by suitable bolts 15. A casing 16 is secured to the plate 10 by suitable bolts 16', this casing being adapted to contain oil for the compressor.

The compressor which I have illustrated
50 is of the rotary sliding vane type. In the

space 17 of compressor cylinder 12 there is eccentrically mounted a cylindrical rotor 18 carrying a plurality of sliding vanes 19, the vanes preferably being oppositely disposed and held against the compressor walls by
55 spacing rods 20 or suitable spring means. These vanes are preferably provided with slots adapted to catch and hold oil for perfecting the seal between the vanes and the compressor walls.

The cylindrical rotor 18 is centrally mounted on a shaft 21 rotatable in bearing 22 in end plate 13, the end of the shaft projecting into a clearance space 23 in the cap
60 plate 14 as shown in Fig. 1. The other end of cylindrical rotor 18 is mounted on a shaft 24 which rotates in bearing 25 in the compressor end plate 11. It is understood, of course, that shafts 24 and 21 may be integral and may extend through the cylindrical rotor or the shafts and rotor may be
65 cast together as a unit.

One end of an extensible metal tube 26, preferably of corrugated brass, is secured to
70 end plate 11 by means of an annular ring clamp 27 adapted to be forced against the end plate by screws 28, a suitable gasket 29 preferably being used to prevent the escape of gases at this joint. The other end of the extensible tube 26 is secured to a collar 30
75 which holds a friction ring 31.

A coil spring 32 is spaced between the extensible tube 26 and the shaft 24, one end of the spring bearing against end plate 11 and the other end of the spring bearing against
80 a shoulder on the collar 30, the spring tending to urge the collar and friction element away from end plate 11.

A second friction ring 33 is held by a collar 34 and urged against the first friction
85 ring by a spring 35, one end of which bears against collar 34 and the other end against a shoulder 36 on the drive shaft 37.

An expansible metal tube 38 is hermetically sealed to drive shaft 37 and to collar 34,
90 as shown in Fig. 1. One of the friction rings is preferably of hard metal, such as steel, and the other is preferably a soft friction ring, such as bronze.

It will be evident from the above descrip-
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tion that any gas which leaks around shaft 24 will be retained in the space which is hermetically sealed by expansible tubes 26 and 38, the only possible escape for the gas being the joint between friction rings 31 and 33, which friction rings become more gas-tight with use.

The compressor shaft 24 is tapered at 39 and the end of shaft 24 is provided with threads 40. The driving shaft 37 is provided with an aperture, the outer part of which has a tapered portion 41 corresponding to the taper 39 of shaft 24 and the inner part of this aperture is tapped, that is, is provided with threads 42 to engage with the threads 40 on the end of shaft 24.

It will be apparent that as the driving shaft 37 rotates the engaging threads 40 and 42 will tend to pull the tapered portions 39 and 41 of the respective shafts together, whereby these shafts are firmly held in frictional engagement and in proper alignment with no abnormal stress on the threaded portion.

The driving shaft 37 is mounted in a bearing 43 held in place by a cylindrical member 44 secured by an outwardly extending flange 45 on the casting 10. This flange incloses an oil-well 46 which contains cotton waste or other wick material 47 and oil, said waste contacting the shaft in apertures 48 in the bearing 43 and cylinder 44. The oil from the end of the bearing drips in the compartment 49 which is sealed by a cap plate 50, the compartment 49 draining into oil-well 46 through a hole 51 in cylinder 44.

The oil leaves the compressor with the compressed gases through aperture 52 and the aligned passageways 53 (the outer end of the opening 52 being plugged as at 52'). The oil is separated from the gas in this mixture by any suitable means, and the oil is returned by a pipe 54 leading through a valve 55 and pressure gauge 56 to the oil main 57. The end plates 11 and 13 are provided with bores 58 (their outer ends being sealed by plugs 58') and the compressor cylinder is provided with a bore 59 (the end of which is closed by plug 59').

Bores 58 communicate with an aperture 60 in the bearings 22 and 25. The oil supplied under pressure through this aperture is forced around the bearing and is caught in a horizontal slot 61 spaced about 340° from the aperture 60. The slots 61 communicate with slots 62 extending downwardly in the end plates 11 and 13, as shown in Figs. 1 and 2. The bore 59 communicates with the opening 17 in the compressor.

The inlet or suction side of my compressor is a passageway 63 which corresponds to passageway 53, shown in Fig. 1, this passageway communicating with space 17 through an opening 64, the outer end of which is closed by a plug 64'.

The modification illustrated in Figs. 3 and 4 is substantially the same as that above described except that end plate 11 is made integral with the frame or casting 10 and the bearing 25 is provided with an annular protruding friction shoulder or ring 31' which takes the place of ring 31 of Fig. 1 and which obviates the use of tube 26, ring 27, bolts 28, etc. Besides being more economical, this modification has been found to be more easily assembled and to be a more satisfactory seal.

The operation of my invention may be briefly described as follows:

Gas from the low pressure side is admitted through passageway 63 and opening 64 to space 17. The cylindrical rotor 18, revolving in the direction indicated, causes the vanes 19 to entrap a portion of this gas, carry it around the cylinder, compress it and discharge it through opening 52 and passageway 53. It should be noted that substantial compression of the gas does not begin until the vane has passed opening 59 and that the space with which bore 59 communicates is always at relatively low pressure. Also, the slot or conduit 61 communicates with the interior of the compressor at this low pressure side, the slot 61 leading into slot 62 for distributing the oil along the ends of the vanes.

It should be noted that the slot or conduit 61 serves two very important functions: it provides a distributor and an outlet for used oil, an essential element of the lubrication system, and it provides a means for conducting gas from the sealed space surrounding the shaft to the suction or low pressure side of the compressor.

Gas will inevitably leak around the shaft, especially from the high pressure side. This gas accumulating in the sealed space around the shaft will build up a pressure which may deform or rupture the thin brass tube unless something is done to relieve this pressure. Conduit 61 performs this function.

It should also be noted that this conduit prevents the gas from escaping between friction elements 31 and 33 since the pressure of this gas is maintained at substantially atmospheric pressure. Conduit 61 also serves to remove any oil which may find its way into the sealed chamber around the shaft.

While I have described a preferred embodiment of my invention, it is understood that I am not limited to the details therein set forth except as defined by the following claim.

I claim:

The combination with a compressor comprising a compressor casing, a compressor shaft journaled in the casing and extending out through a wall thereof, the compressor shaft outwardly of the wall being in two parts, a pair of relatively rotatable co-operating sealing members, one carried by the casing and the other mounted on one portion of the shaft, a flexible metallic bellows one end

of which is sealed to the shaft mounted sealing member and the other end of which is sealed to the other shaft member,— of means for aligning the shaft mounted sealing member and the second shaft portion to minimize the flexing of the bellows during rotation, comprising a taper joint for the shaft portions which joint is located within the bellows.

In witness whereof, I hereunto subscribe my name this 21st day of April, 1928.

JAMES H. DENNEDY.