

July 21, 1942.

C. E. FLOEGER
COMPRESSOR SHAFT SEAL

2,290,813

Filed June 28, 1940

2 Sheets-Sheet 1

FIG. 1.

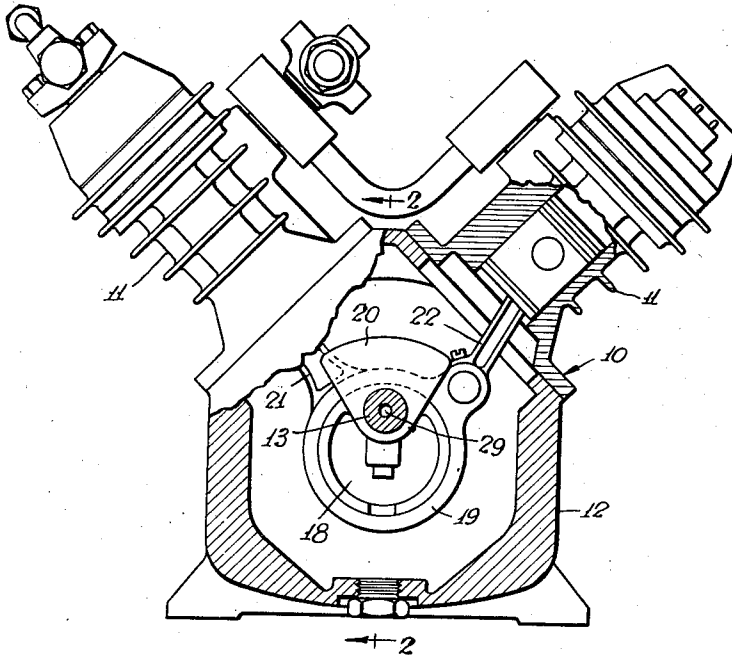
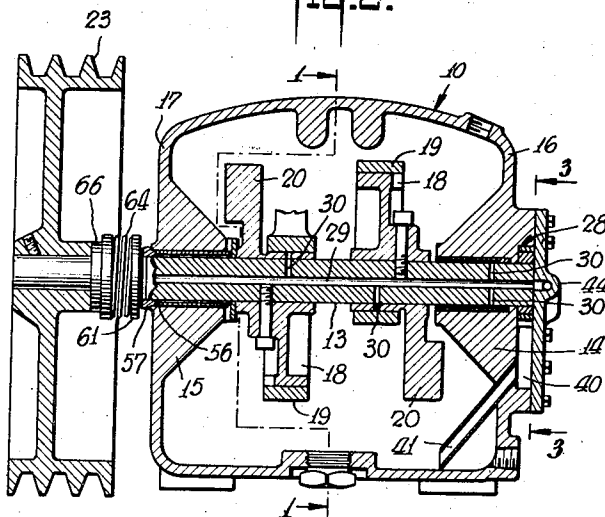


FIG. 2.



INVENTOR
Clyde E. Floeger
BY
D. C. Heath
ATTORNEY

July 21, 1942.

C. E. PLOEGER
COMPRESSOR SHAFT SEAL

2,290,813

Filed June 28, 1940

2 Sheets-Sheet 2

Fig. 3.

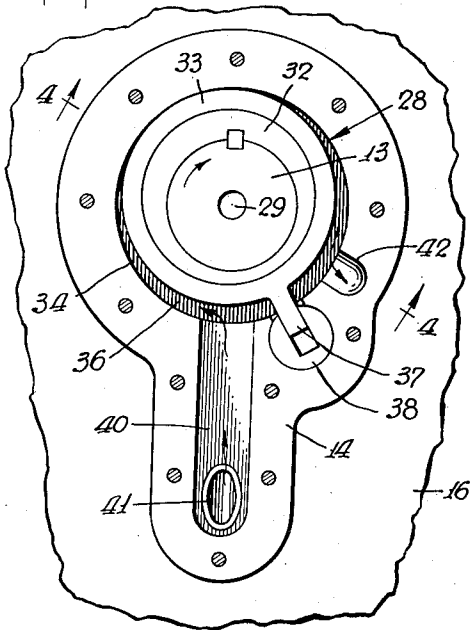


Fig. 4.

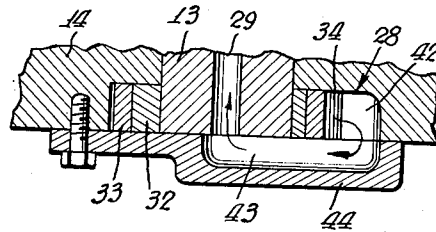
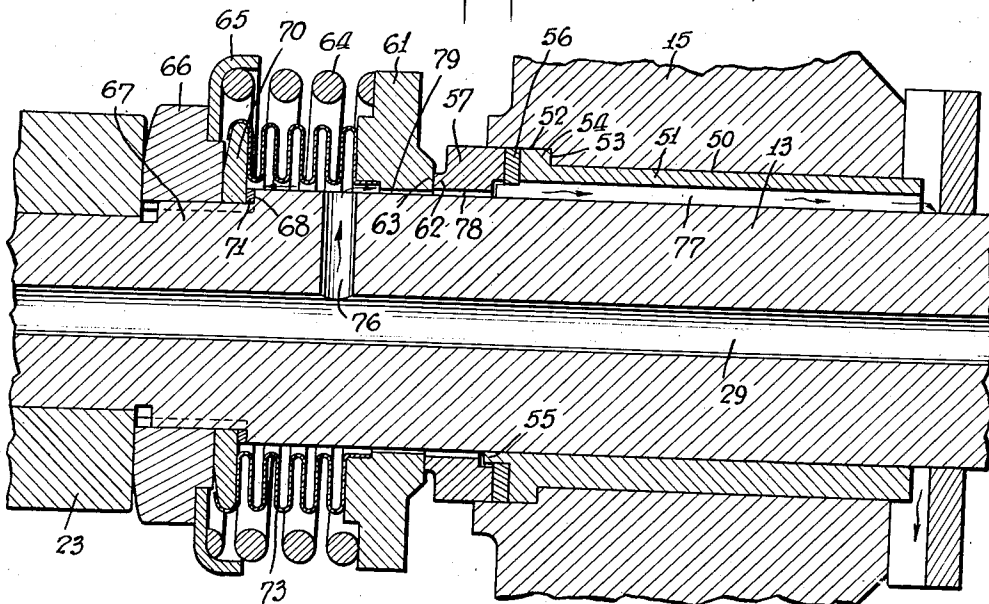


Fig. 5.



INVENTOR
Clyde E. Ploeger
BY
D. S. Heath
ATTORNEY

UNITED STATES PATENT OFFICE

2,290,813

COMPRESSOR SHAFT SEAL

Clyde Edward Ploeger, Evansville, Ind., assignor
to Servel, Inc., New York, N. Y., a corporation
of Delaware

Application June 28, 1940, Serial No. 342,887

2 Claims. (Cl. 308—36.1)

This invention relates to compressors and more particularly to compressor shaft seals.

An object of the invention is to provide a compressor shaft seal which is self-aligning and which can be easily demounted for repair or replacement.

The invention, together with other objects and advantages thereof, is set forth with particularity in the following description in connection with the accompanying drawings, of which:

Fig. 1 shows a compressor, partly in section taken on line 1—1 of Fig. 2 and partly in front elevation, and embodying the invention;

Fig. 2 is a section taken on line 2—2 of Fig. 1;

Fig. 3 is a section taken on line 3—3 of Fig. 2, and showing details of a rotary oil pump constituting part of the shaft lubricating system;

Fig. 4 is a section taken on line 4—4 of Fig. 3; and

Fig. 5 is a detail sectional view of part of the compressor shown in Fig. 2.

A compressor 10 is a four-cylinder V type, with cylinder blocks 11 mounted at a 90° angle. In a crankcase 12 below the cylinder blocks 11 is a crankshaft 13 journaled in the bearing sections 14 and 15 of the respective end walls 16 and 17 of said case. A pair of spaced eccentrics 18, formed with counterweights 20 are secured on shaft 13. Pistons in one cylinder block 11 are connected to the eccentric cranks 18 by master connecting rods 21. Pistons in the other block are connected to straps 19 of the master rods 21 by articulated rods 22. A belt pulley or sheave 23 is secured on the end of shaft 13 outside of the casing.

The main lubricating system comprises a rotary pump 28 at one end of shaft 13 which forces oil under pressure through an axial bore 29 in the shaft 13, and then through radial bores 30 to the eccentric surfaces and the shaft bearing opposite the pulley end. The crankcase 12 is filled with oil to a level high enough to immerse the lower sections of the eccentric cranks so that cylinders and pins are oiled by splash.

The oil pump 28 may be of any suitable construction, but merely as an example it is shown comprising an eccentric 32 keyed to the shaft 13, and ring 33 journaled on eccentric 32 in a circular pump chamber 34. Pump chamber 34 is a recess in the end wall section 14 of the crankcase, and is concentric with the crank shaft 13. The ring 33 is positioned to tangentially contact and roll on the periphery of the pump chamber 34. A radial blade 37 on the ring 33 projects into a slot formed in a disc 38 journaled in the end wall section 14 of the case 12.

Also formed in the end wall section 14 of the crankcase 12 is an inlet port 40 communicating with the pump chamber 34 on one side of the blade 37, and supplied with oil from the lower oil sump section of the crankcase through a pipe 41. Communicating with the pump chamber 34 on the other side of the blade 37 is a discharge port 42 communicating with the central shaft bore 29 through a channel 43 formed in an end closure plate 44 of the pump 28.

Oil which enters space 36 through the inlet port 40 is displaced clockwise in said space by the rolling action of the ring 33 toward the discharge port 42. From discharge port 42, the oil travels through the channel 43 of the closure plate 44 and into the open end of the shaft bore 29. The oil under pressure travels along this central bore 29, and is distributed therefrom to the said shaft and eccentric bearings through the radial ducts 30.

At the pulley end of shaft 13, the bearing section 15 of the end case wall 17 is provided with a hole 50 into which is fitted a bearing sleeve 51 for said shaft. This hole 50 is enlarged at its outer end 52 to afford an annular shoulder 53, against which abuts an annular flange 54 on the bearing sleeve 51. The end section of the bearing sleeve 51 beyond its flange 54 is reduced to form an annular rim or projection 55. A gasket or packing ring 56 sealably embraces this sleeve rim 55, and is clamped between the sleeve flange 54 and an annular seal nose 57. The seal nose 57 seats in the end case section 15 on the gasket 56, and extends outward into contact with a seal ring 61 loosely encircling the shaft 13. The contact faces of the seal nose 57 and seal ring 61 are ground for perfect sealing contact, and are formed on annular end projections or bosses 62 and 63 of said seal rings respectively.

The seal ring 61 is yieldably urged into sealing contact with the seal nose 57 by a compression coil spring 64 encircling the shaft 13 and having one end abutting the seal ring 61 and the other end abutting a spring retaining disc 65. Disc 65 is held by a nut 66 threaded onto a reduced section 67 of the shaft 13 which makes a shoulder 68 against which is thrust a disc 70, sealed against said shoulder by a packing ring 71.

Between the sealing ring 61 and the disc 70 is a Sylphon bellows 73 encircling said shaft within the coil spring 64. The ends of the bellows 73 are connected respectively to the ring 61 and disc 70 by welding, brazing, soldering or any suitable means which will produce a fluid tight joint.

The clearance between the two rings 57 and 61

and the shaft 13, which permits said rings to move axially of said shaft and to tilt to a limited extent with respect thereto, and the yieldable support afforded said seal rings by the gasket 56 and the spring-pressed bellows 73 causes said rings to automatically self-align into fluid tight surface contact.

Pressure in the crankcase 12 transmitted to the bellows 73 causes said bellows to expand, so that the greater the pressure, the greater the sealing pressure between the contact surfaces of the seal rings 57 and 61.

The balanced pressure sealing device above described is disposed on the outside of the crankcase 12 between said crankcase and the pulley 23. When the pulley 23 is slipped off the end of the shaft 12, the whole sealing device is immediately accessible for ready removal, without the necessity of demounting any part of the crankcase 12. The seal nose 57 extends outward beyond the crankcase 12 to permit its easy removal for regrounding or replacement purposes.

To keep the seal cool, the shaft 13 has a duct 76 extending radially from the central oil bore 29 into the bellows 73. The bearing sleeve 51 is provided with a groove 77, extending along the inner face thereof, and communicating with the interior of the bellows 73 through the annular clearances 78 and 79, formed between the two seal rings 57 and 61 and the periphery of the shaft 13. With this construction, the lubricating oil delivered under pressure from the oil pump 28 through the central shaft bore 29 travels through the radial duct 76 into the bellows 73 to fill said bellows. The oil returns along the annular clearances 79 and 78 within the seal rings 61 and 57, and then into the groove 77 to lubricate the bearing 51. The oil discharges from the bearing into the oil sump in the crankcase 12.

Various changes and modifications may be made within the scope of this invention as set forth in the following claims.

What is claimed is:

1. In a compressor having a crankcase, a crankshaft jutting through a wall of said case, and a bearing for said shaft in said wall, said bearing providing for flow of lubricating oil therethrough; a shaft seal comprising a first seal ring resiliently sealed in fluid tight relation in the outside of said wall around and spaced from said shaft, a second seal ring also around and spaced from said shaft outside said wall and revolubly engaging said first seal ring in sealing contact, a bellows having one end connected in fluid tight engagement with said second seal ring and the other end similarly connected to said shaft by a removable connection, the spaces around said shaft within said bellows and seal rings being in communication with each other and with said bearing, said shaft having a passage leading to the space between said shaft and said bellows, and an oil pump connected to withdraw oil from said crankcase and force the oil through said passage whence it flows in the spaces around said shaft within said bellows and seal rings and then through said bearing back to the crankcase.

2. In a compressor having a crankcase and a crankshaft jutting through a wall of said case; a bellows type shaft seal including a bellows, revoluble seal ring, and stationary seal ring, all removable by withdrawal over the end of said shaft outside said case, there being spaces around said shaft within said bellows and seal rings which spaces are in communication with each other and with said crankcase, said shaft having a passage leading to the space around the shaft within said bellows, and an oil pump connected to withdraw oil from said crankcase and force the oil through said passage whence it flows in said spaces around said shaft within said bellows and seal rings and then back to the crankcase.

CLYDE EDWARD PLOEGER.