

June 24, 1947.

F. W. KNOWLES

2,422,972

WINGED-STRAP ROTARY COMPRESSOR

Filed May 26, 1944

3 Sheets-Sheet 1

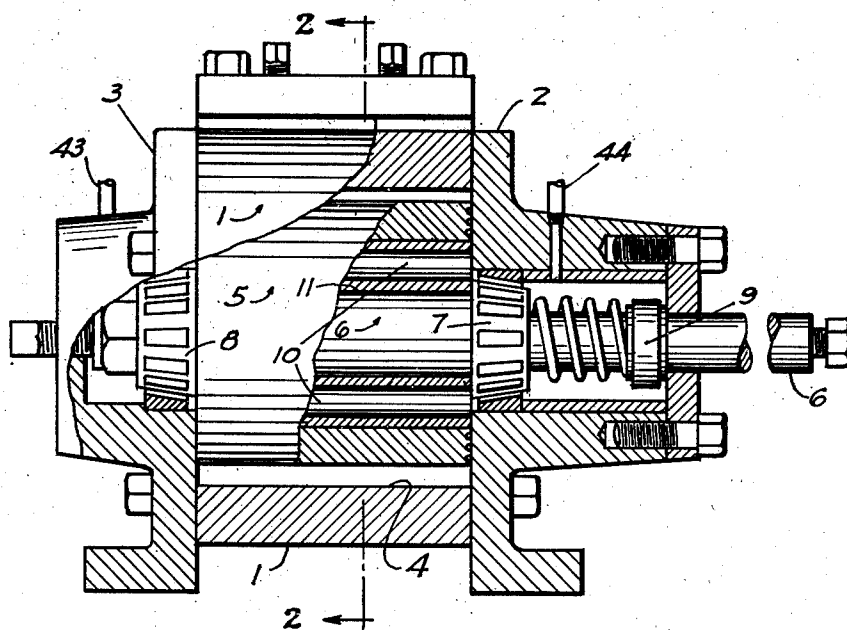


Fig. 1.

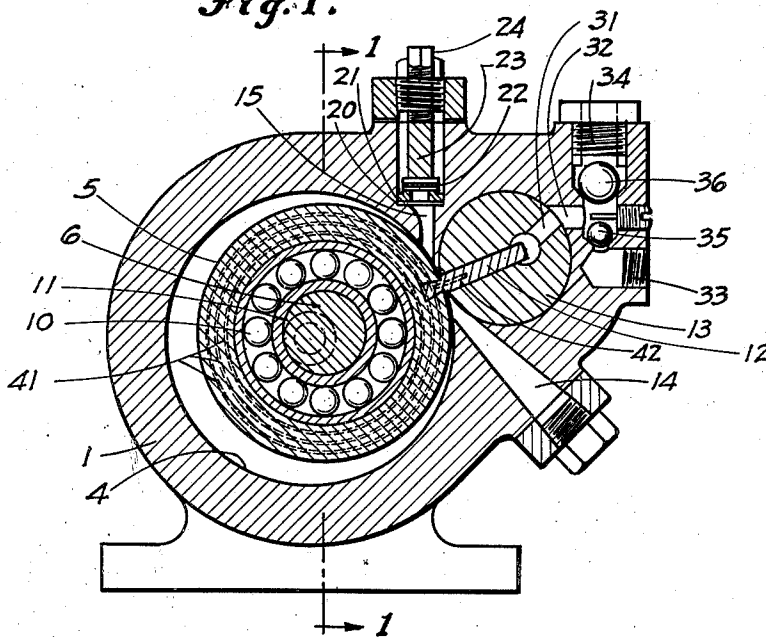


Fig. 2.

INVENTOR.

Frank W. Knowles

BY

Paul Bliven
ATTY.

June 24, 1947.

F. W. KNOWLES

2,422,972

WINGED-STRAP ROTARY COMPRESSOR

Filed May 26, 1944

3 Sheets-Sheet 2

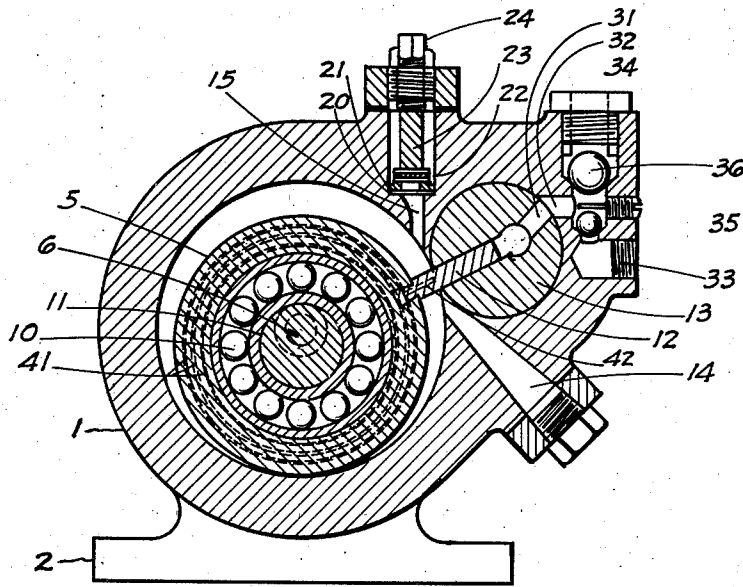


Fig. 3.

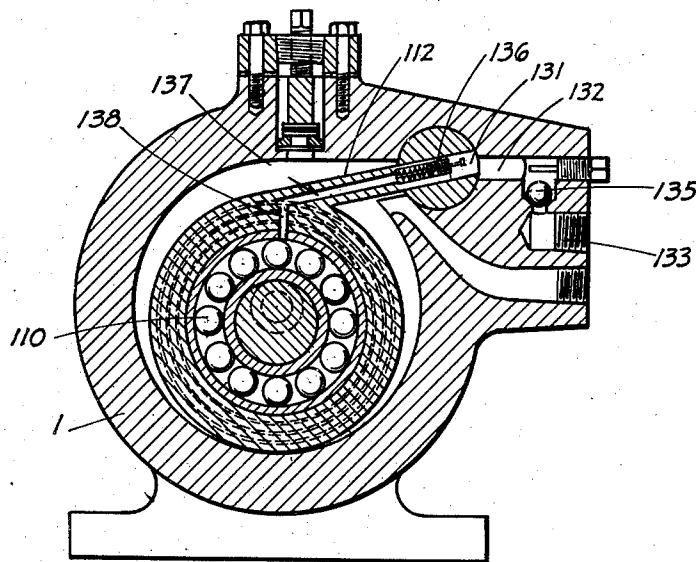


Fig. 7.

BY

INVENTOR.

Frank W. Knowles

Paul Bliven
ATTY.

June 24, 1947.

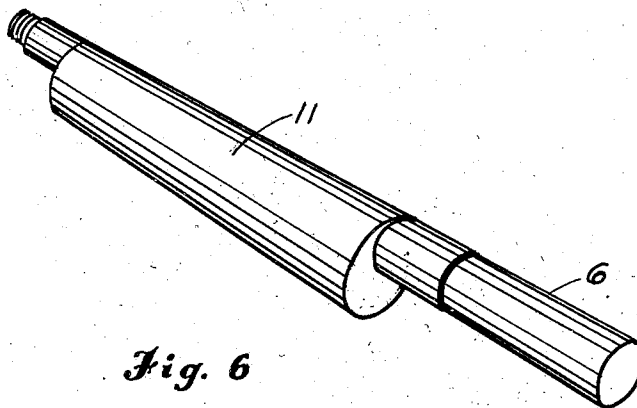
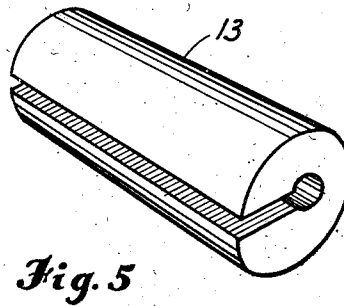
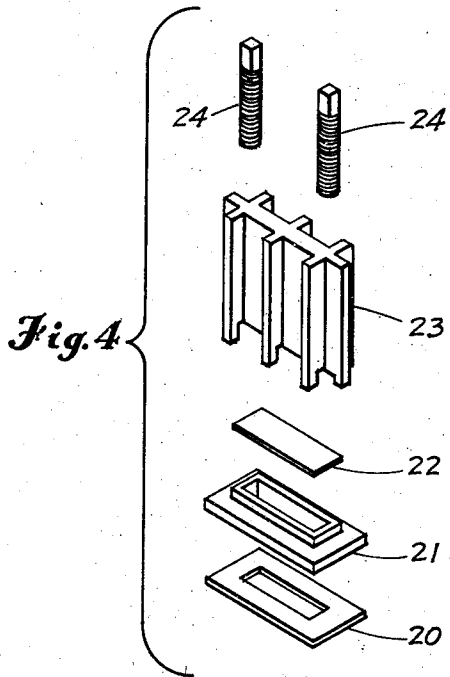
F. W. KNOWLES

2,422,972

WINGED-STRAP ROTARY COMPRESSOR

Filed May 26, 1944

3 Sheets-Sheet 3



INVENTOR.
Frank W. Knowles
BY *Paul Bliven*

UNITED STATES PATENT OFFICE

2,422,972

WINGED-STRAP ROTARY COMPRESSOR

Frank W. Knowles, Seattle, Wash.

Application May 26, 1944, Serial No. 537,475

4 Claims. (Cl. 230-147)

1

The present invention relates to a winged-strap rotary compressor, and, in more particular, to a rotary compressor in which there is a winged strap largely filling a circular chamber, and an oscillatory member entered by the wing of said strap; and to the use of the outer edge of the wing for a secondary compression member for the pumping of oil to the parts of the compressor needing such; and to the particular construction of the strap and wing so that they will be properly oiled and sealed.

Among the many somewhat similar pumps that have been constructed in the past, are Bogre, 1,544,929, July 7, 1925, and Tamura, 1,898,153, February 21, 1933.

However, all of these prior art pumps have had three primary defects. The first of these defects is that of improper oiling; second, that of leakage of the material being compressed across the end faces of the strap and wing; and, third, that of a large clearance ratio, that is, the ratio between the displacement of the strap, or rotor, and the volume remaining at the point of maximum displacement in under the outlet valve, or check.

Having in mind these defects of the prior art, it is an object of the present invention to construct and to use a part of the mechanism necessarily present in such a pump to act as a secondary, or oil, pump, for pumping oil to the parts of the compressor needing such.

A further object of the present invention is the use of oil grooves on the end of the strap and wing with proper ducts leading from the oil pressure source to these oil grooves.

A further object of the present invention is that of reducing the clearance ratio by forming on the compression member a flat spot adjacent the juncture of the strap and the wing with the outlet valve in a coacting flat spot in the housing wall.

The above mentioned defects of the prior art are remedied, and these objects attained by means of the construction shown in the accompanying drawings, and more particularly described hereinafter, in which:

Figure 1 is an elevational view of my device, partly in section;

Figure 2 is a sectional view on the line 2-2 of Figure 1, but showing the ends of the moving parts;

Figure 3 is a view similar to that of Figure 2 showing the strap or compression member in a different position;

Figure 4 is an expanded view of the outlet check, or valve, assembly;

2

Figure 5 is a perspective view of the wing guide, or oscillatory member;

Figure 6 is a perspective view of the crank shaft;

Figure 7 is a sectional view of a modified form of my invention showing the method of construction to obtain a small clearance volume.

In the assembly view of the compressor there is shown a rotor housing 1, or cylinder, between an inboard end 2 and an outboard end 3. The ends of the compressor are formed with suitable feet for maintaining the compressor in an upright position. The rotor housing 1 is provided with a cylindrical bore in which is contained an eccentric strap 5. This strap is mounted on a crank shaft 6, each end of which is supported on bearings 7, 8 mounted in the inboard and outboard ends of the compressor. The shaft does not extend through the outboard end of the compressor but does extend through the inboard end for connection to a suitable power drive. An oil and vapor tight packing 9 is provided around the shaft where it leaves the inboard end. Suitable roller bearings 10 are provided for supporting the strap 5 on the eccentric 11 of the crank shaft 6. These roller bearings may bear directly on the strap and the eccentric or they may be placed in a suitable race. The diameter of the strap 5 is slightly smaller than the internal diameter of the housing and its eccentricity gives it contact with the cylinder wall. Rotation of this strap is prevented by a wing 12, which is secured to the strap 5 in a radial manner and extends outwardly therefrom into the wall of the housing. This wing fits in a slot in an oscillatory member 13 that is cylindrical in shape and mounted parallel to the strap and in the housing. The wing 12, or blade, serves not only to prevent rotation of the strap but to separate the inlet port 14 from the exhaust port 15 as the strap oscillates under the driving impulse of the crank shaft. Return of fluid through the outlet is prevented by means of a check valve mounted therein.

An extended assembly of the check valve is shown in Figure 4, in which there is shown: a gasket 20 to be placed between the reed seat 21 and the compressor housing, a reed 22 to bear upon the seat 21, a reed retainer 23, and screws 24 to hold the reed retainer in proper relation to the rest of the assembly. As shown in Figures 2 and 3 the whole of this valve assembly is held in place in the housing by means of a cap member 25 which is bolted to the outside of the housing.

The oscillatory wing guide 13 has leading through the back side thereof one or more passageways 31 connecting with another passage-

3

way 32 arranged in the housing. This latter passageway 32 in turn connects with an oil inlet 33 and an oil outlet 34. Ball checks 35 and 36 are arranged to prevent the return of oil through the inlet port and the outlet port, respectively.

On the ends of the strap 5 there are shown three annular oil grooves 41. There is also an extension 42 of one of these oil grooves part way up each end of the wing 12. These oil grooves are well shown in Figure 2 in which the sectional view has been modified to show one end of the strap, the wing, and the wing guide oscillating members. Suitable oil grooves may be provided in the ends of the wing guide oscillating member 13 as well as in its cylindrical and flat faces so that it will be well lubricated by oil from the passageways 31 and 32. A suitable oil supply is arranged and connected to the oil inlet 33 and suitable piping, 43, 44, or ducts, is provided for taking oil from the outlet 34 and supplying it to the bearings of the crank shaft. From these crank bearings 7, 8 the oil will pass to the eccentric roller bearing of the strap and then be pushed outwardly past the end of the strap into the oil grooves 41 and 42 to thereby properly lubricate the ends of the strap 5 and the wing 12 as well as a quantity of the oil finding its way past the edge of the strap into the compression chamber to lubricate the outer face of the strap and the cylinder wall. This oil will not only act to lubricate the ends of the strap and the wing but also to seal these surfaces against the passage of the fluid being compressed.

The operation of the present device is well exemplified by the showings of Figures 2 and 3. In Figure 2 one compression cycle has just finished and another is about to start on the full charge of fluid between the strap and the housing. As the strap revolves, the charge of gas will be expelled through the exhaust port, as shown in Figure 3, and a fresh charge will be drawn in through the intake port. Also as shown in Figures 2 and 3, the wing 12 of the strap 5 will reciprocate back and forth in the oscillatory member 13 as the strap is being oscillated around the interior of the housing 1 by the crank shaft 6. This reciprocating movement of the wing 12 is used to pump oil for use in the compressor. This is done by arranging the inlet 35 and the outlet 36 checks and suitable oil passageways and ducts in relation to these checks so that oil may be taken into the inlet 33 past the inlet check 35 and into the passageways 31 and 32 to the edge of the wing. The oil on the return of the wing will be expelled past the outlet ball, check 36 and through the outlet 34, from which it is delivered through the pipes 43 and 44 to the bearings of the compressor. From these bearings 7, 8 it will pass to the roller bearing 10 of the eccentric, to the end faces of the strap, and to the ends of the wing. It is also to be appreciated that the pressing of the oil by the edge of the wing may also cause oil to flow through suitable oil grooves along the faces of the oscillatory member.

It is known that this wing has been used for many purposes in the prior art, including those of a valve and a pump member. All of these prior art uses have been for the purpose of aiding in the compression of the fluid being acted upon by the compressor, whereas in the present instance this reciprocating action of the wing is used for the feeding of oil to the compressor, a very necessary feature.

4

Figure 7 is a modification in which the strap 105 has the wing 112 attached tangentially thereto. This arrangement has the advantages of allowing the outlet port to be placed closer to the juncture point of the strap and wing, and to allow the exhaust valve or reed to be closer to the cylinder wall. These two features combine to reduce the clearance ratio, that is, the ratio of the volume under the valve at the end of the compression cycle to the volume under the valve at the beginning of the cycle. This will be more readily seen by a comparison with the construction of Figures 2 and 3 where there is a long passageway between the cylinder and the under face of the reed, and the exhaust port is situated away from the base of the wing.

Another feature of this modification, one which may be used with the previously described construction, is that of forming a passageway 137 the length of the wing to connect at one end with another passageway 138 leading to the eccentric bearing 110 and at the other end with the passageways 131 and 132 for the supply of oil through the inlet port 133 and inlet check 135. An outlet check 136 is placed in the wing passageway 137.

This construction reduces the outside piping and supplies the oil first to the eccentric and then to the oil grooves and shaft bearings.

Having thus described my invention, I claim:

1. An eccentric winged strap rotary pump having a housing, in said housing an eccentric winged strap having a plurality of unconnected concentric oil groove circles in its end faces, and an oscillatory member slidably entered by the wing of said strap, said strap and housing forming a primary pumping unit; and an oil pump for delivering oil to said grooves and the other parts of said pump requiring oil, formed by a secondary compression chamber in said housing and communicating with the free end of said wing, valving means to regulate the flow of oil through said chamber, and duct means communicating with said chamber and the parts of said pump requiring oil including a passage for delivering oil to said concentric oil grooves.

2. An eccentric winged strap rotary pump having a housing, in said housing an eccentric winged strap and an oscillatory member slidably entered by the wing of said strap, said wing having one face tangential to the outer surface of said strap, and an outlet valve in opposed relation to said tangential face.

3. An eccentric winged strap rotary pump having a housing, in said housing an eccentric winged strap and an oscillatory member slidably entered by the wing of said strap, said wing and strap forming a compression member, said wing adjacent the junction of said wing and strap having a flat surface, and in said housing a flat surface located to come into opposition to the flat surface on said compression member, an outlet opening formed in the flat surface in said housing, said housing having formed therein an outlet communicating with said outlet opening, and in said outlet a valve adjacent said outlet opening.

4. In a rotary pump, a housing having a bore, a strap within said housing, means including a bearing for moving the strap in an eccentric path in said bore, a member having a slot therein mounted for oscillatory movement adjacent said bore, a wing blade carried by the strap extending into said slot whereby the blade wing recip-

5

rotates in said member during eccentric movement of the strap, said wing blade having a passage therein communicating with said bearing, a check valve mounted within said passage, and a supply of oil adjacent the end of said wing blade. 5

FRANK W. KNOWLES.

REFERENCES CITED

The following references are of record in the file of this patent:

Number
751,014
1,591,030
1,616,913
2,134,936
1,890,574
2,094,525
10 1,624,607
845,114
1,379,248

6

UNITED STATES PATENTS

Name	Date
Rein -----	Feb. 2, 1904
Finch -----	July 6, 1926
McCallum -----	Feb. 8, 1927
Getchell et al. -----	Nov. 1, 1938
Dubrovin -----	Dec. 13, 1932
Calling -----	Sept. 28, 1937
Leiman -----	Apr. 12, 1927
Palmer -----	Feb. 26, 1907
Carrey -----	May 24, 1921