April 13, 1954 L. T. CONDE 2,674,953

ROTARY PUMP

Filed March 18, 1950 2 Sheets-Sheet 1

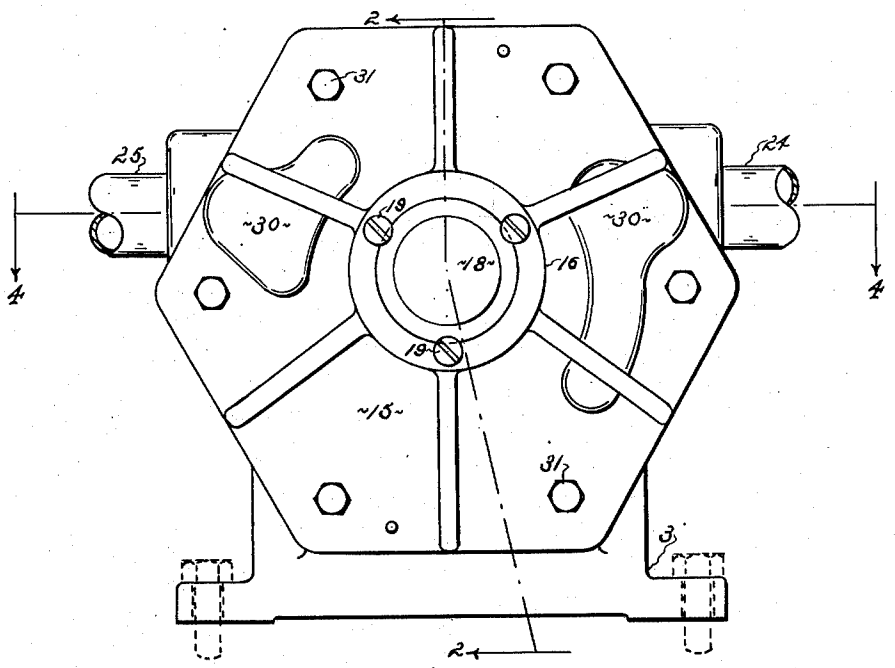

Fig. 1

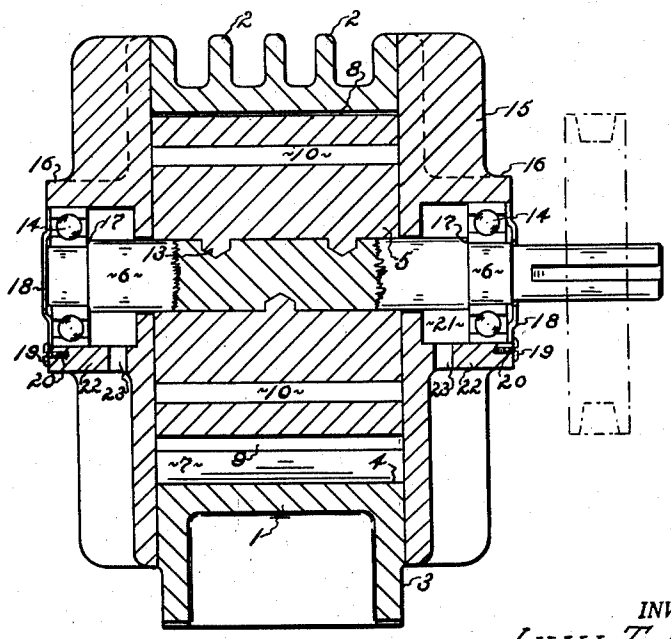

Fig. 2

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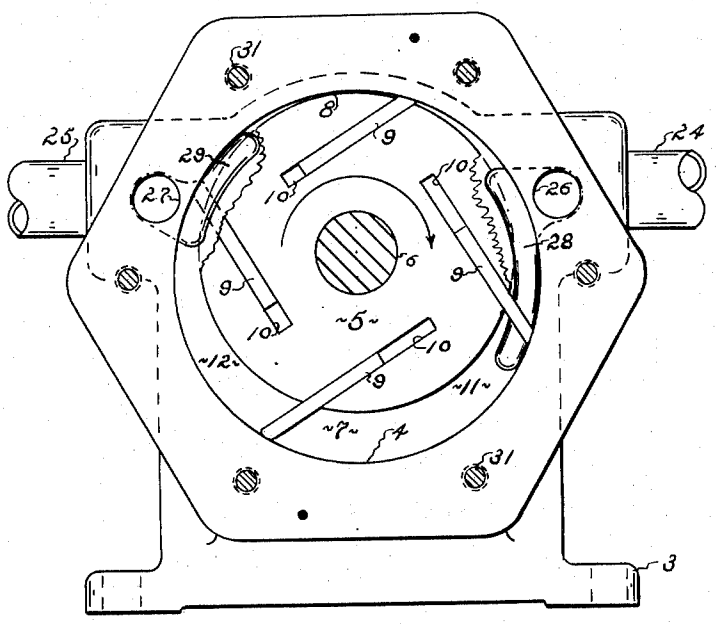

Fig. 3

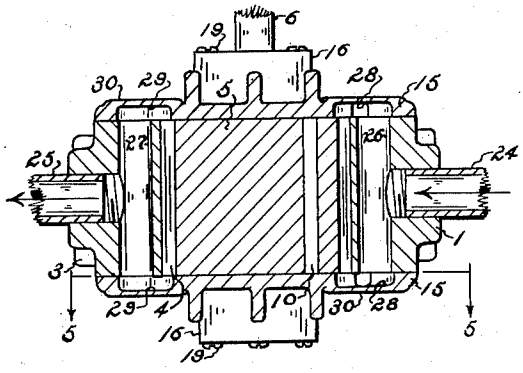

Fig. 4

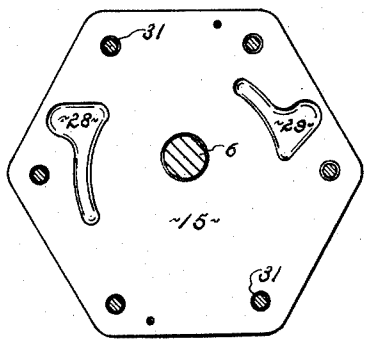

Fig. 5

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ROTARY PUMP

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2 Claims. (Cl. 103—135)

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This invention relates to rotary pumps, both vacuum pumps and compressors.

An object of the invention is to provide a rotary pump which has dry vanes that are self lubricating, and sealed bearings that do not require additional lubrication, and wherein the sealed bearings are under normal atmospheric pressure at all times, even when the pump is operating with a vacuum or positive pressure existing within the body of the pump.

Another object of this invention is to provide a rotary pump so constructed that the air or other fluid drawn into and exhausted from the chamber of the pump enters and leaves through recesses at the side of the chamber instead of holes or recesses in the periphery of the chamber, said construction resulting in a continuous smooth surface on the periphery of the chamber for the sliding vanes to travel on, thus reducing the friction and wear caused by the passage of the vanes, under high centrifugal pressure, over an uneven surface.

A further object of the invention is to provide a rotary pump in which vanes are so constructed as to slide in rectangular recesses open at one end and arranged so as to form part of imaginary secants to the outer circumferential surface of the pump rotor.

A still further object of the invention is to provide a rotary pump so constructed as to provide a more complete exhaustion of the compressed air or other fluid than has heretofore been obtained.

The above and other objects and advantages of my invention will be more fully understood from the following description of one embodiment of the rotary vacuum pump and from the appended drawings in which like parts are identified by like reference characters throughout.

In the drawings:

Fig. 1 is a front face view of the pump.

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

Fig. 3 is an end elevation with one of the pump plates removed.

Fig. 4 is a view taken on line 4—4 of Figure 1, with parts omitted.

Fig. 5 is taken on line 5—5 of Fig. 4.

Referring more particularly to the drawings, the device embodies a casing 1 of hexagonal shape provided with the usual fins 2 that transfer the heat generated in the rotary pump to the atmosphere for cooling purposes. A base 3 is formed integral with the hexagonal casing 1. Base 3 has bolt holes for securing the pump to any solid surface.

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An annular chamber 4 is made in casing 1. A pump rotor 5 carried to turn with pulley shaft 6 is located in chamber 4. The rotor 5 is mounted eccentrically to said chamber 4, whereby to leave a comparatively large space at 7, between the outer peripheral surface of the rotor 5 and the inner peripheral surface of annular chamber 4, whereas the narrow space 8 is disposed between the top of annular chamber 4 and rotor 5. Said narrow space 8 in conjunction with vanes 9 (when said vanes 9 are in extended operating position with respect to recess 10, as shown in Fig. 3) divide the vacuum section 11 and the pressure section 12 of the pump.

Annular grooves 13 are made in pulley shaft 6 around which is cast the pump rotor 5, preferably made of cast iron. Pulley shaft 6 is projected transversely through the casing body 1. It rests on antifriction bearing members 14, 14 located at the outer end portions of suitable small recesses made in the bosses of each pump plate 15, 15 and on bearing sleeves 16, 16 cast integral with end or pump plates 15, 15 as shown in Fig. 2.

Shoulders 17, 17 are made in shaft 6 against which the inner sides of sealed bearing members 14, 14 rest, whereby to limit their inward movement. Bearing retaining means consisting of embossed cover plates 18, 18 are held in place by the overlapping edges of the heads 19 of screw bolts 20, screw mounted to sleeves 16, 16 also seal the bearing members 14, 14 against foreign matter from the outside, and hold bearings 14, 14 from moving outward in either direction thus centering the rotor 5 within pump body 1. In one instance, embossed plate 18 has an aperture for the projection of pulley shaft 6. It will be apparent that other means such as a flange cast integrally may be employed for retaining bearing members 14, 14 in place. The sealed bearings referred to here are sealed bearing members packed with a lubricant and sealed in a manner conventional in the sealed bearing art.

The means for preventing the suction or positive pressure from drawing the lubricant inward and out of the sealed bearing members 14, 14 or pushing said lubricant outward, depending on the positive or negative pressure contemplates a chamber 21 made in each of the hubs 22, 22. This chamber 21 is an extension of the chamber housing the bearing member 14. Atmosphere vents 23, 23 comprising small holes are made in sleeves 16, 16, whereby to allow the air access to said chambers 21, 21. Said atmosphere vents 23, 23 and chambers 21, 21 permit air to enter

or pressure to escape from the pump body thus permitting bearing members 14, 14 to operate under normal atmospheric conditions instead of under positive pressure or vacuum. Instead of vents which permit the air or atmosphere to enter the space 21 a web construction of hubs 22, 22 may be employed thus providing an air space between sealed bearings 14, 14 and the annular chamber 4 of the pump.

The means for drawing the air in conduit pipe 24 at one side of the pump and forcing it out of the exhaust pipe 25 contemplates vanes 9 preferably made of carbon graphite, which vanes are therefore, self lubricating.

Vanes 9 have a sliding fit in rectangular open recesses 10 arranged in rotor 5 so as to form portions of imaginary secants to the outer circumferential surface of the pump rotor, as shown in Figure 3 of the drawing.

Conduit pipes 24 and 25 do not communicate in a straight line through casing 1 but through channels or ports 26 and 27 which are disposed at right angles thereto as shown on Fig. 4. Annular channel 26 extends across casing 1 and communicates with irregular crescent shaped recesses 28, 28 in cover plates 15, 15 as shown in Figure 4. In a similar manner but at the opposite end of casing 1, annular channel 27 extends across casing 1 and communicates with smaller irregular crescent shaped recesses 29, 29. Said cover plates 15, 15 are cast with embossed parts 30 which provide said recesses 28, 29. Furthermore, by making ports 26, 27 open into crescent shaped recesses 28 and 29 in end plates 15 and 15 rather than directed through the wall of casing 1 the wear which has heretofore been experienced because of the passage of vanes 9 over such ports, is avoided.

End plates 15 and 15 are held in position by bolt screws 31.

Operation

Pulley shaft 6 is rotated, whereby to rotate pump rotor 5. As rotor 5 revolves the vanes 9 in the recesses 10 slide up and down in their respective open recesses 10, and when actuated with centrifugal force are pressed firmly against the inner periphery of chamber 4. When the successive vanes 9 come opposite port 26 they will be in extended position in recesses 10, whereby to close one end of a passage between the contiguous outer surface of rotor 5 and the surface of chamber 4. The space left open will be in communication with the oppositely disposed crescent shaped recesses 28, 28 in end plates 15 and 15.

The air thus admitted through pipe 24 to crescent shaped recesses 28, 28 will be carried or pushed by the compression stroke of the pump to the opposite side of the pump where it will be allowed to escape through smaller crescent shaped recesses 29, 29 and port 27 to the exhaust side 25 at the opposite side of the pump. In this later position the vane 9 will have slid down to its lowermost position in recess 10. Since the rotor 5 is suspended in chamber 4 in case 1 eccentrically, the vanes, if four are used, create at each revolution four intake or suction cycles and four exhaust or pressure cycles. As each vane 9 passes the port or crescent shaped opening 28 in each end plate, air is drawn in conduit 24 until the next vane 9 following reaches this same crescent shaped opening 28 which causes the air to be trapped and carried to the opposite side

to the crescent shaped opening 29 where it is exhausted through a similar crescent shaped opening and through conduit 25. This process continues as the rotor continues to revolve within the case 1.

The inlet recesses 28, 28 in end plates 15, 15 are so arranged relative to recesses 29, 29 therein that the exhaust port is closed before the intake port is open. There is a small space open at all times at 8 between the outer surface of rotor 5 and the inner surface of the chamber 4 in casing 1 which will allow any compressed air in this location to exhaust and not be carried over into the intake port and thereby achieve a more perfect exhaust before starting the evacuation cycle.

As used herein the terms "end plate," "pump plate" and "cover plate" are interchangeable.

It will be noted that various changes and alterations may be made to the instant structure and that the drawings and description herein contained are for the purpose of illustration only and not to be construded as a limitation or definition of the elements of the invention; reference being had to the appended claims for the scope of the invention.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is as follows:

1. In a rotary pump, a casing having a cylindrical rotor chamber therein, a rotor mounted in said chamber in eccentric relation thereto, a shaft affixed centrally within said rotor and projecting beyond opposite ends of said chamber, end plates secured to the casing to close the ends of said chamber, said end plates each having a bearing-supporting recess formed therein in close spaced relation to said rotor chamber and each centrally receiving the shaft therein, a bearing member interposed between the shaft and each of the outer end portions of said recesses, and means for retaining said bearings within said recesses, said shaft extending through one of said end plates, said end plates each having a port formed therein disposed on said end plates so as to interconnect the space between said bearing and said rotor with the atmosphere.

2. In a rotary pump, a casing having a cylindrical rotor chamber therein, a rotor mounted in said chamber in eccentric relation thereto, a shaft affixed centrally within said rotor and projecting beyond opposite ends of said chamber, end plates secured to the casing to close the ends of said chamber, said end plates each having a bearing-supporting recess formed therein in close spaced relation to said rotor chamber and each centrally receiving the shaft therein, a bearing member interposed between the shaft and each of the outer end portions of said recesses, and a cover plate affixed to each of said end plates over the recess therein, said shaft extending through one of said end plates, said end plates each having a port formed therein disposed on said end plates so as to interconnect the space between said bearing and said rotor with the atmosphere.

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