

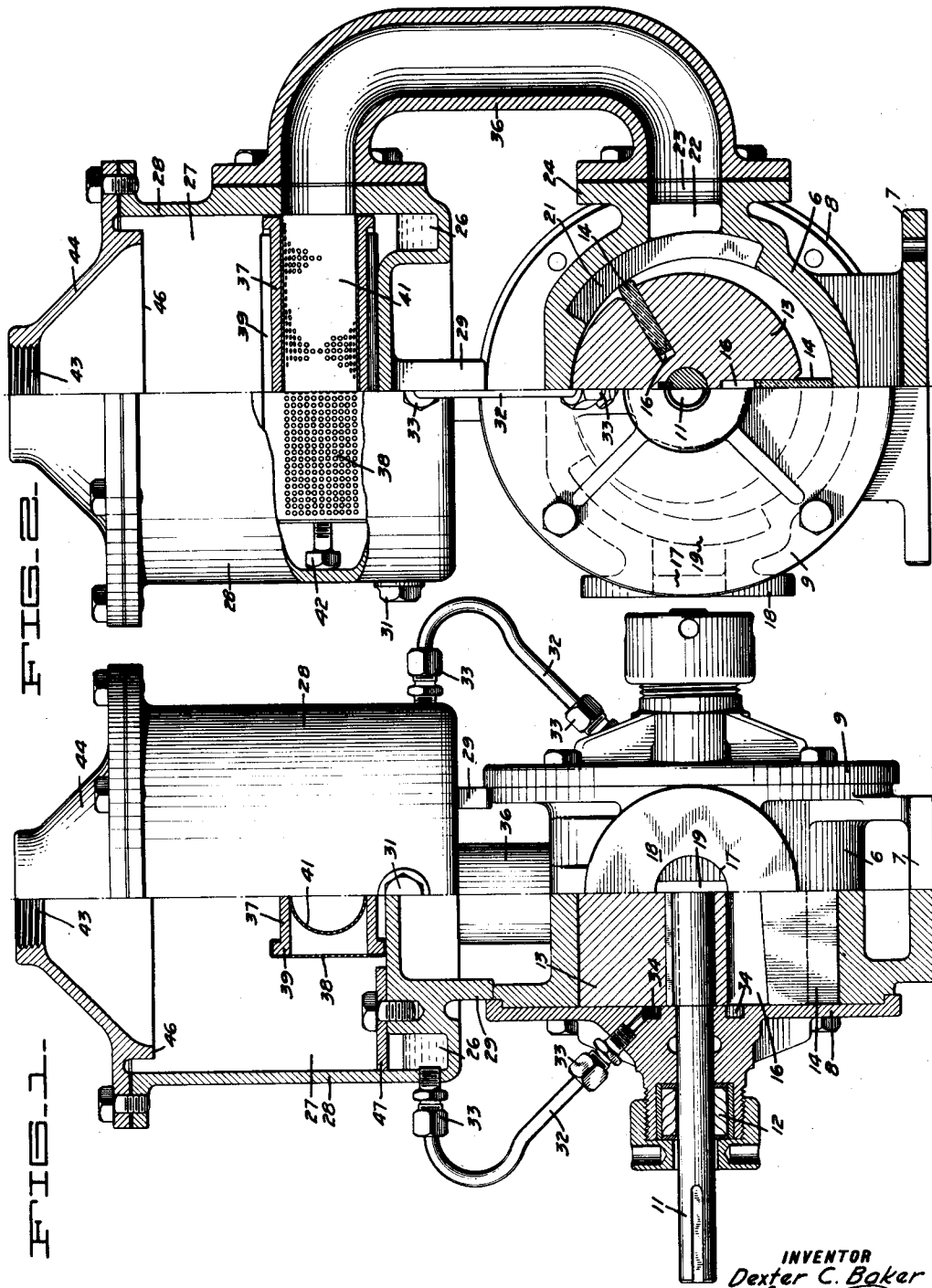
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ROTARY PUMP

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ROTARY PUMP

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My invention relates to pumps, especially air pumps, of the type employing a vaned rotor in an eccentric casing and relates particularly to means for lubricating and sealing the pump against leakage.

An object of my invention is to provide a pump which will be amply and positively lubricated.

Another object of my invention is to provide an effective seal to prevent leakage of the pump.

An additional object of my invention is to prevent the contamination of compressed air discharged from the pump by lubricating oil.

My invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description where I shall outline in full that form of the rotary pump of my invention, which I have selected for illustration in the drawings accompanying and forming part of the present specification. In said drawings I have shown one form of rotary pump embodying my invention, but it is to be understood that I do not limit myself to such form since the invention, as set forth in the claim, may be embodied in a plurality of forms.

In the drawings:

Fig. 1, on the left half, is a transverse section of the pump of my invention, and, on the right half, is an elevation of the pump.

Fig. 2 on the left half, is a side elevation of the pump with a fragmentary portion broken away, and on the right half, is a longitudinal section of the pump.

My invention preferably comprises a rotary pump for fluids such as air, provided with means for circulating lubricating oil to various points of the pump for lubricating and sealing purposes, the circulating means including the current of air which is generated by the pump.

In the embodiment of the invention disclosed in the drawings, the pump casing 6 preferably is a cylindrical shell made of cast iron and provided with a supporting foot 7. The ends of the casing are closed by end plates 8 and 9 bolted to flanges on the casing

6. A shaft 11 is supported in the central portion of the end plates 8 and 9 by roller bearings 12 and extends thru the casing with its axis parallel to but not coincident with the axis of the cylindrical casing 6. Mounted on the shaft 11 is a rotor 13 which is a cylindrical body concentrically disposed on the shaft and therefore lying eccentrically within the casing 6. The rotor fits within the casing with but scant axial clearance.

To provide means for pumping a current of air thru the casing, vanes 14 are provided on the rotor. They are slidably mounted in grooves or channels 16 which extend longitudinally of the rotor and preferably are radially arranged. Rotational movement of the rotor within the casing 6 is attended by radial displacement of the vanes 14, since the vanes follow the inner contour of the relatively eccentric casing 6. The chambers bounded by two adjacent vanes, the rotor and the casing, and the end plates, vary in size as the rotor revolves and produce a pumping action. As clearly shown in the drawings the grooves or channels 16 are closed at their inner longitudinal edges.

An entrance to the rotor for the fluid to be pumped is provided by an aperture 17 formed at one side of the casing 6. The air entrance is disposed in the region in which the vanes are moving outwardly of the rotor, and the size of the chambers between the vanes is increasing. The direction of rotation of the rotor, as seen in Fig. 2, is assumed to be counterclockwise, and the air entrance is located on the left side of the casing. A flange 18 is cast on the casing surrounding the aperture and serves as a connection for a conduit, not shown, attached to the flange. The air flows from the entrance into a series of three peripherally extending channels 19 which are evenly spaced along the length of the rotor casing 6. The peripheral extent of the channels is preferably of the order of 90°.

As the rotor revolves, the outwardly moving vanes provide an increasingly large chamber between the vanes and a flow of air thru the channels 19 into the casing 6 results. Each vane continues to move outwardly until it reaches bottom central position, after

which it retracts due to the converging side of the casing 6. The following vane 14 has meanwhile closed off the passage 19 and the air is entrapped between the two vanes in a space which is continuously becoming smaller. Upon further movement of the rotor 13 the entrapped air is compressed and flows outwardly when communication is opened with three peripherally extending channels 21 spaced apart longitudinally of the casing 6. The channels 21 are similar to the channels 19 and communicate with a transverse passage 22 extending substantially for the length of the casing 6 and leading into an exit 23. The exit is surrounded by a flange 24 preferably cast integrally with the casing 6 and provided for the attachment of a conduit.

For efficient operation and to reduce air leakage the vanes 14 are forced radially outward into contact with the casing. I preferably supplement the centrifugal action which tends to move the vanes outwardly, with oil under pressure admitted beneath the inner ends of the vanes. The oil is advantageously lubricating oil and not only displaces the vanes but provides a seal between the rotor and casing and lubricates the sliding vanes. The supply of oil is preferably contained in an oil reservoir 26 at the lower end of a chamber 27 enclosed by a housing 28. The housing is supported above the casing 6 by means of depending lugs 29. The oil reservoir 26 is preferably of annular contour and is provided with a plug 31 located in the side of the housing for draining and replenishing the supply of oil. Conduits 32 conduct the oil from the oil reservoir into the interior of the casing 6. The conduits are attached by suitable connections 33 to the casing 6, and communicate with annular grooves 34 formed in the faces of the end plates 9. The oil grooves 34 are concentric with the shaft 11 and they extend radially beyond the bottoms of the channels 16. Since the channels extend longitudinally for the entire length of the rotor 13, the oil is free to flow from the annular grooves 34 into the spaces between the inner ends of the channels and the inner ends of the vanes. The oil flow is preferably uninterrupted thruout the entire cycle of the rotor, as the groove 34 is continuous. The possibility of a vane seating in the bottom of its channel 16 and thereby preventing the entrance of oil therebetween is precluded by tapering the inner end of the vane with the greatest clearance adjacent the groove 34. Even though the central portion of the vane seats on the inner side of the channel 16, oil may nevertheless enter the clearance provided at the end of the vane.

The oil entering the bottom or inner end of the channel 16 is distributed over the entire area of the vane 14 and over the inner surface of the casing by the pressure of the oil and centrifugal force as well as

by gravity head due to the elevated position of the reservoir 26. The entire pump is thereby well and copiously lubricated and is amply sealed against leakage of air. With such a large supply of lubricant, however, it is inevitable that the current of air flowing thru the pump becomes admixed with a considerable proportion of oil. It is usually desired to have the compressed air free from oil not only to conserve the expensive lubricating oil but also so that the air furnished will be uncontaminated air. I have therefore provided means for separating the lubricating oil from the compressed air.

The exit 23 of the pump leads thru a U-shaped pipe 36 to the side of the chamber 27. Abutting the opening of the pipe 36 into the chamber 27 is a separating device for removing the sealing and lubricating oil from the air current. The separating device preferably comprises a metallic box 37 of rectangular cross section having one end open and in registration with the opening of the pipe 36 and the other end closed. The sides of the box are open and are covered by a perforate sheet 38, usually of brass, which is hooked at its edges to grip a bead 39 formed on the box 37. Within the box, a cylindrical screen 41 is provided and the entire assembly is held tightly within the chamber 27 by means of a screw 42 in threaded engagement with the end of the box and the head of which abuts the wall of the housing. The current of air discharged by the pump and containing a portion of oil enters the box 37 and the oil is thrown against the screen 41. The velocity of the oil is quickly reduced by the impact against the solid surfaces of the screen and the air passes on. Any oil which is not trapped within the first screen is stopped by the perforated sheets 38 which impede further progress of the oil but permit the air to flow on. The air passes upwardly to an outlet 43 in the cap 44 of the housing 28. The outlet is threaded for the attachment of a pipe, not shown, which, of itself and through its connections offers sufficient resistance to maintain a pressure in the chamber 27 during the operation of the pump. The outflowing air tends to induce a thin film of oil to creep up the walls of the chamber 27 and mix with the air. The cap 44 carries a depending flange 46 which interrupts the flow of any oil which may gather on the walls of the chamber and prevents it reuniting with the air.

The separated oil returned to the reservoir 26 has completed a circuit and is ready to be used over and over again. Thruout the circuit the oil is exposed to pressure substantially the same as the pressure of the air on the discharge side of the pump and therefore circulates readily. To prevent sudden reverse rushes of oil from the conduit 32

from gushing into the discharging air stream and contaminating it with oil, which may occur when the pump is started after a protracted period of rest, I have provided a baffle 47 of arcuate contour which is placed
5 over the inlet of the conduit 32 and is bolted to the bottom of the housing 27. The baffle extends for a small portion of the circumference of the chamber 28 and acts as a
10 stop for oil discharged upwardly from the conduit 32 into the reservoir 26.

I claim:

A rotary pump comprising a cylindrical casing, a substantially solid cylindrical rotor mounted eccentrically in said casing;
15 said rotor having longitudinal radially extending channels cut therein and said channels being closed at one end, vanes in each of said channels adapted to be radially displaced upon rotation of said rotor so as to
20 bear upon the inner contour of said casing; said vanes being tapered at their inner ends, an entrance port in said casing for fluid to be pumped, an exit port for said fluid, annular grooves in said casing in communi-
25 cation with said channels radially inward from said vanes, and means for causing lubricating fluid to flow in said grooves and in said channels.

30 In testimony whereof, I have hereunto set my hand.

DEXTER C. BAKER.

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