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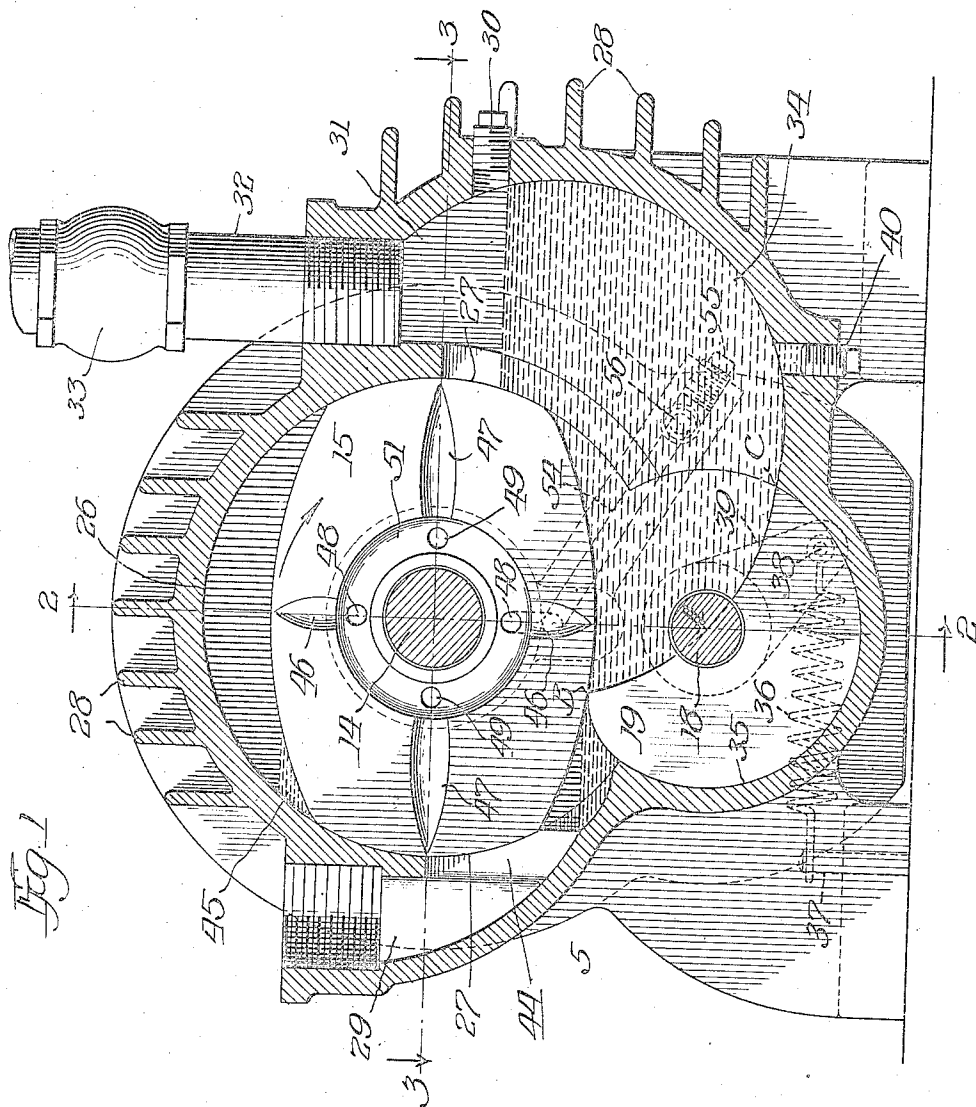
M. BALCKER

1,451,859

ROTARY COMPRESSOR

Filed March 28, 1921

2 Sheets-Sheet 1



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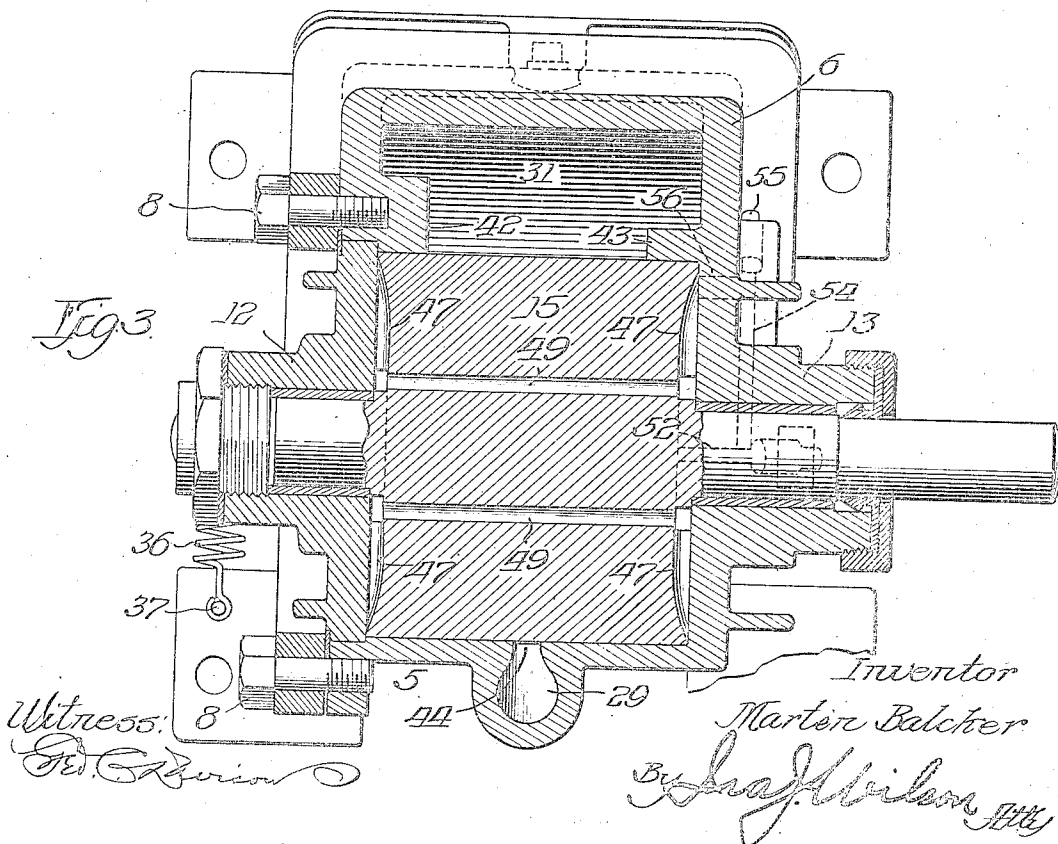
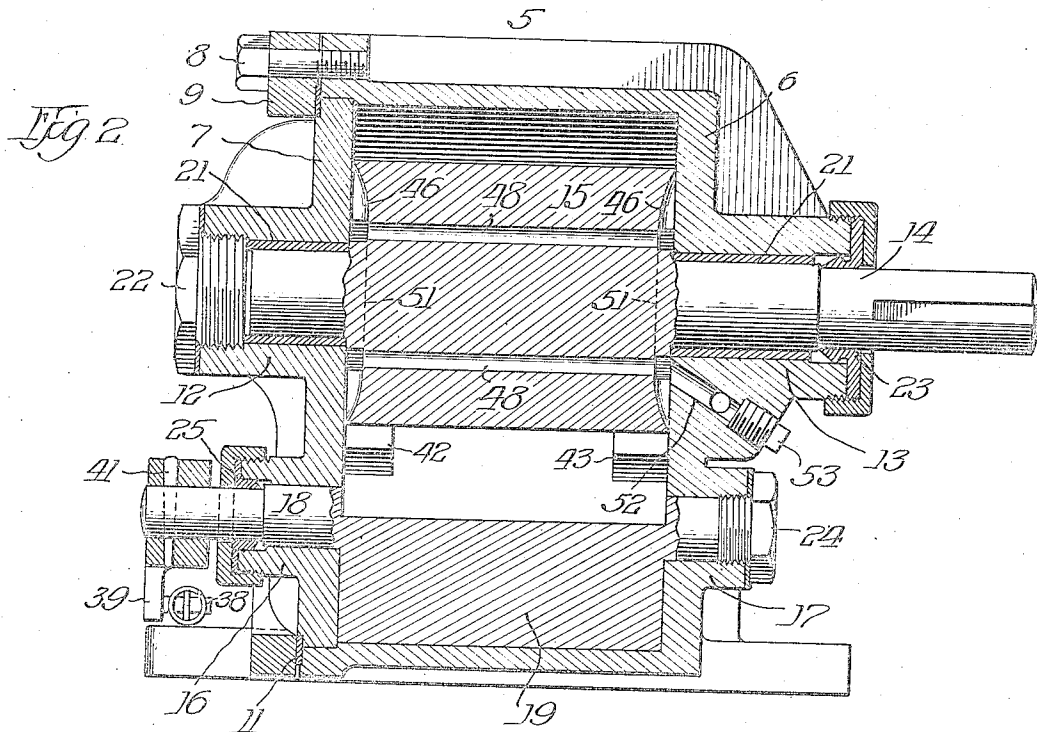
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE.

MARTEN BALCKER, OF CHICAGO, ILLINOIS, ASSIGNOR TO JOHN NELSON, OF CHICAGO, ILLINOIS.

ROTARY COMPRESSOR.

Application filed March 28, 1921. Serial No. 456,416.

To all whom it may concern:

Be it known that I, MARTEN BALCKER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rotary Compressors, of which the following is a specification.

This invention relates in general to compressors adapted to compress air and other fluids, and pertains more particularly to the type commonly known as rotary compressors.

One of the primary purposes of my present invention is to provide a compressor of this type, which will effectually preclude leakage from the delivery side back to the intake side of the compressor, thereby resulting in a compressor of high efficiency which is capable of producing higher pressures than can customarily be obtained with rotary compressors heretofore manufactured.

Another purpose of my invention is to provide for adequate and effectual lubrication of the moving parts so that they will not stick and to insure this lubrication by delivering the oil under the pressure existing at the delivery side of the compressor so that the pressure of the oil is increased proportionately to the work being performed by the compressor.

A further object of the invention is to provide a compressor which will consist of few parts, so that it can be cheaply manufactured and readily assembled, and one which will not be liable to get out of order, and which will be efficient and extremely durable.

Other objects and many of the inherent advantages of this invention should be readily appreciated as the same becomes better understood, by reference to the following description when considered in connection with the accompanying drawings.

Referring to the drawings:

Fig. 1 is a transverse sectional view through a compressor embodying my invention; and

Figs. 2 and 3 are longitudinal vertical and horizontal sectional views taken on the lines 2—2 and 3—3 respectively of Fig. 1.

Referring now to the drawings more in detail, reference character 5 indicates generally the casing of my improved compressor, the casing being of any preferred construction, but for convenience of manufac-

ture, preferably made in two parts, one consisting of the circumferential walls and one end wall, being designated by reference character 6, and the other consisting of the opposite end wall 7 which is fixed to the first-mentioned part preferably by clamping bolts 8 passing through a clamping ring 9 which overlies the margin of the end 7, and threaded into tapped openings in the opposed face of the body member. A suitable gasket 11 is preferably interposed between the ring 8 and the faces against which it lies to insure against leakage at this joint.

The end walls of the casing are shaped to form bearings 12 and 13 respectively, in which the shaft 14 of the rotor 15 is journaled, and also to provide bearings 16 and 17 respectively directly beneath the rotor shaft in which the shaft 18 of the sealing device 19 is journaled. The bearings 12 and 13 are equipped with suitable bushings 21 and the end of the bearing 12 is preferably closed by a plug 22 which precludes leakage of oil at this point. The opposite end of the shaft 14 extends outwardly beyond the bearing 13 for connection to any suitable source of power by which the rotor is driven and leakage around the shaft at this end is prevented by a packing gland 23 of any approved construction. Similarly, the end of bearing 17 is closed by a plug 24 and leakage around the projecting end of shaft 18 at the opposite end of the casing is precluded by a packing gland 25.

The rotor 15, as will be apparent from Fig. 1, is of generally elliptical shape in transverse cross section, and the upper portion of the casing, indicated by reference character 26, is formed concentrically with the axis of rotation of the rotor and is formed on a radius substantially equal to but slightly greater than the major radius of the rotor so that a substantial fit is secured between this portion of the casing and the concentric walls 27 of the rotor, sufficient clearance, however, being provided to prevent sticking or binding as the result of expansion or contraction of the parts. For cooling purposes, this upper portion of the casing is preferably equipped with radiating ribs 28 to dissipate the excess heat produced by the operation of the machine.

The casing is also formed to provide at one side, the intake passage 29 and at the opposite side, to provide the delivery pas-

sage 31. The delivery pipe 32 connected to this passage, is provided with a check valve 33 of usual or any preferred construction. While the upper portion of the casing substantially fits the rotor, as previously explained, the lower portion is enlarged to provide an oil chamber 34, and directly beneath the rotor, this chamber is interiorly curved to provide a pocket or recess 35, in which the arcuate outer wall of the sealing device 19 snugly but slidably fits. This oil chamber may be filled with oil by removal of the filling plug 30, and the normal oil level in the chamber is shown in Fig. 1. The chamber may be drained of the oil whenever necessary by removal of the drain plug 40.

It will be observed that the delivery passage 31 is simply the upper portion of the oil chamber 34, and consequently, the pressure produced in this passage by the operation of the rotor is exerted directly upon the oil in this chamber so that the pressure of the oil is exerted upon the sealing device or blade 19. From Fig. 1, it will be observed that the upper radius of this device is shorter than the lower radius, or, in other words, that the distance from the center A to point B is less than the distance from the center A to point C. The area of the surface AC exposed to the oil pressure is therefore greater than the area AB, with the result that the upper edge of the sealing device is urged against and in contact with the rotating perimeter of the rotor 15 to provide a seal at this point which divides the intake passage from the delivery passage, and obviously, the pressure exerted on this line of contact is directly proportional to the pressure created in the delivery passage 31. This seal therefore prevents the escape of air from the delivery back to the intake side of the machine below the rotor, and leakage of air at this point is further insured against by the fact that this point is always submerged in the oil so that no air can obtain access to the sealing line between the rotor and the blade 19. As a further precaution to insure that the sealing device will be in operative position when the compressor is started and before any appreciable pressure has been created in the delivery passage, I prefer to employ a coil tension spring 36, attached at one end to a pin 37 fixed to the casing base, and at its other end to a pin 38 projecting laterally from an arm 39 which is fixed by a pin 41, or otherwise, to the projecting end of the blade shaft 18, as will be apparent from Fig. 2.

From Fig. 3 it will be observed that the delivery passage 31 is open to the periphery of the rotor thru a port of large area between the inwardly projecting walls or ribs 42 and 43, which are provided for leakage

prevention, but the intake passage 29 at the opposite side of the machine communicates with the rotor through a long, but relatively narrow port 44, the area of which, however, is substantially equal to the cross sectional area of the intake passage 29. Inwardly of this port 44 and between the port and the upper end of the sealing device 19, the chamber extends the full length of the casing so that air entering through the port when the short radius of the rotor is opposite the port, will fill the chamber and be trapped ahead of the following long radius of the rotor and carried thereby around and above the rotor to the delivery side of the casing. While the sealing device 19 will closely hug the perimeter of the rotating rotor as the same travels in a clockwise direction, viewing Fig. 1, nevertheless, the direction of travel of the rotor and the irregularity in its contour will cause a small quantity of oil to leak past the sealing device into the chamber at the left hand side thereof, viewing Fig. 1, and immediately beneath the port 44. Since the oil in this chamber will extend from end to end in the casing, and since the port 44 is relatively narrow, it will be obvious that a portion of this oil will be picked up by the long radius portion of the rotor and carried with the air also trapped above the oil, around to the delivery side of the casing. Centrifugal force will cause this trapped oil to collect at the outer end of the rotor, as indicated by reference character 45 (Fig. 1), and this oil therefore, forms a seal between the rotor and the concentric upper portion of the casing so as to effectually preclude leakage of air back past the rotor at its perimeter. All of the air trapped in the upper portion of the casing will therefore be delivered, together with the oil seal, into the delivery passage 31 of the casing, where the oil will collect in the chamber 34, while the air will be delivered under pressure through the pipe 32. At each half revolution of the rotor, therefore, a small quantity of oil will be displaced under pressure from the right hand side to the left hand side, viewing Fig. 1 of the sealing device 19, and at the same time, this displaced oil will be picked up by the rotor and returned to the delivery side of the casing, the oil serving in its return passage as a liquid seal between the rotor and the casing to prevent leakage of air. It will thus be apparent that both the upper and lower sides of the rotor are effectually sealed by oil against leakage of air from the delivery to the intake side of the casing.

For the purpose of preventing leakage of air past the ends of the rotor, I have also provided for an oil seal at these ends, and for that purpose, each end of the rotor is provided with a plurality of radially disposed

grooves 46 and 47, the grooves 46 being disposed on the short radius and the grooves 47 on the long radius of the rotor. The outer ends of these grooves are closed, as shown, and the inner ends of grooves 46 at opposite ends of the casing are connected by passage-ways 48, while similarly, the grooves 47 at opposite ends of the rotor are connected by passage-ways 49. All of the radial grooves at each end of the rotor are also connected by an annular groove 51 so that oil delivered to this groove will be thrown by centrifugal force into the radial grooves, thus keeping them filled with oil to form seals at the ends of the rotor.

The oil is supplied to these sealing grooves under pressure from the oil chamber 34 through a suitable passage which, in the present instance, is formed in the end wall of the casing and comprises an inclined portion 52 opening at its inner end into the opposed groove 51 and closed at its outer end by a plug 53, a second passage 54 opening at its upper end into the passage 52, and closed at its lower end by a plug 55 and a lateral passage 56 extending from the passage 54 into the chamber 34. These passages are shown in dotted lines in Fig. 1 for purposes of clarity, although strictly, they would not appear in this figure. It will be apparent, therefore, that oil will be delivered under pressure from the chamber 34 to the grooves at both ends of the rotor, and also to the bearings for the rotor shaft 14, keeping these bearings thoroughly lubricated, and at the same time, keeping the sealing grooves full of oil under pressure, resulting from the pressure exerted on the oil in the chamber 34, and also from the centrifugal force exerted upon the oil and the grooves themselves by the rotation of the rotor. An effectual oil seal is therefore provided at each end of the rotor, which precludes leakage of air past the ends of the rotor, and since both the top and bottom of the rotor are also effectually oil-sealed, as previously explained, it will be apparent that the oil seals around the perimeter and at the ends of the rotor effectually preclude any leakage of air from the high pressure delivery side to the low pressure intake side of the compressor.

It will be apparent from the foregoing that I have provided a compressor which comprises only two moving parts, namely, the rotor and the sealing device: that the rotor is effectually sealed by an oil seal under pressure against leakage, and that the device is at all times thoroughly lubricated by oil under pressure. Furthermore, the utilization of the pressure in the delivery passage for providing the seal insures that the greater the pressure in this passage, the greater will be the pressure exerted upon the oil seals at the ends of the rotor and at the bottom

thereof. Also the pressure of the sealing device against the perimeter of the rotor will increase in proportion to the increase in pressure in the delivery passage. My compressor, therefore, is simple in construction, cheap to manufacture, and highly efficient and durable in operation, and while I have shown and described a preferred embodiment, it should be obvious that the invention may be incorporated in structures differing materially in their details of construction from that shown and described, without departing from the essence of the invention as defined in the following claims.

I claim:

1. A compressor, comprising a casing provided with inlet and delivery passages, an elliptical rotor in said casing, a pivoted sealing member engaging the lower portion of said rotor, an oil seal in which said sealing member and the lower portion of said rotor are submerged, and means for maintaining an oil seal between said casing and the end walls of said rotor, said sealing device having a portion exposed to the pressure of said oil seal whereby close contact is maintained between said sealing device and the periphery of said rotor.

2. A compressor, comprising a casing provided with inlet and delivery passages, a portion of the casing below said passages being shaped to form an oil chamber, a rotor mounted in said casing concentrically with the upper portion thereof with its lower portion submerged in the oil in said chamber, and a sealing device pivotally mounted in said oil chamber in position to engage said rotor, said sealing device presenting a surface to the oil in said chamber under the pressure of the delivery side of the compressor whereby said device is maintained by said pressure in engagement with said rotor.

3. A compressor, comprising a casing, an elliptical rotor mounted therein, the upper portion of said casing being concentric with the rotor and the lower portion being shaped to provide an oil chamber, inlet and delivery passages communicating with said chamber above the oil therein, a pivotally mounted sealing device disposed beneath said rotor and submerged in the oil in said chamber, said device having an area exposed to the oil under the pressure of the delivery side of the casing whereby said device is rocked on its pivot into engagement with the periphery of said rotor, means for maintaining an oil seal between the upper portion of said casing and the perimeter of the rotor, and means for maintaining an oil seal under the pressure exerted upon the oil within said casing between the end walls of said casing and the opposed end faces of said rotor.

4. A compressor, comprising a casing pro-

vided at opposite sides with intake and delivery passages respectively, a rotor in said casing, and means for maintaining a liquid seal under pressure between the intake and delivery sides of said casing.

5 5. A compressor, comprising a casing provided with intake and delivery passages at opposite sides thereof, a rotor rotatably mounted within said casing, the upper portion of the casing being formed concentrically with the axis of rotation of said rotor, and means for maintaining a liquid seal between the opposed faces of said rotor and casing.

15 6. A compressor, comprising a casing providing an oil chamber in the lower portion thereof, an integral elliptical rotor mounted therein and partially submerged in said chamber, grooves formed in the ends of said rotor, passages through the rotor connecting the grooves at the ends of the rotor, a sealing device submerged in said chamber and engaging the perimeter of said rotor to seal the outlet from the inlet of the casing, and
20 a passage for delivering oil under pressure from said chamber to the grooves and passages of said rotor to effect an oil seal between the ends of said rotor and the opposed end walls of said casing.

25 7. A compressor, comprising a casing, an elliptical rotor mounted in said casing, the upper portion of said casing being formed concentrically with the axis of rotation of the rotor and the lower portion being formed to provide an oil chamber, an inlet passage communicating with one side of said chamber, a delivery passage communicating with

the other side thereof, a sealing device submerged in said chamber beneath the rotor and constructed to be maintained in contact with said rotor by the pressure in the delivery side of the casing, said rotor being adapted to carry the oil which leaks past said sealing device, from the intake side of the casing to the delivery side thereof, said oil serving when carried by the rotor to provide an oil seal between said rotor and the casing.

8. A compressor, comprising a casing provided with intake and delivery passages, an oil chamber connecting said passages, a sealing device disposed in said oil chamber, a rotor mounted in said casing and adapted to peripherally contact with said sealing device, and means for supplying oil under pressure from said chamber to the ends of said rotor to maintain an oil seal between said ends and the end walls of the casing, said casing being so shaped that oil in the intake side of said chamber will be carried by said rotor to the delivery side thereof.

9. A compressor, comprising a casing providing an oil chamber in the lower portion thereof, an elliptical rotor mounted in said casing, and partially submerged in the oil in said chamber, the ends of said rotor being provided with radially disposed grooves, a connection through the rotor between the grooves at opposite ends of said rotor, a sealing device submerged in said chamber and a passage through which oil is supplied under pressure produced by said rotor from said chamber to said grooves.

MARTEN BALCKER.