March 18, 1947. G. E. REILICH 2,417,568

ROTARY VANE TYPE PUMP

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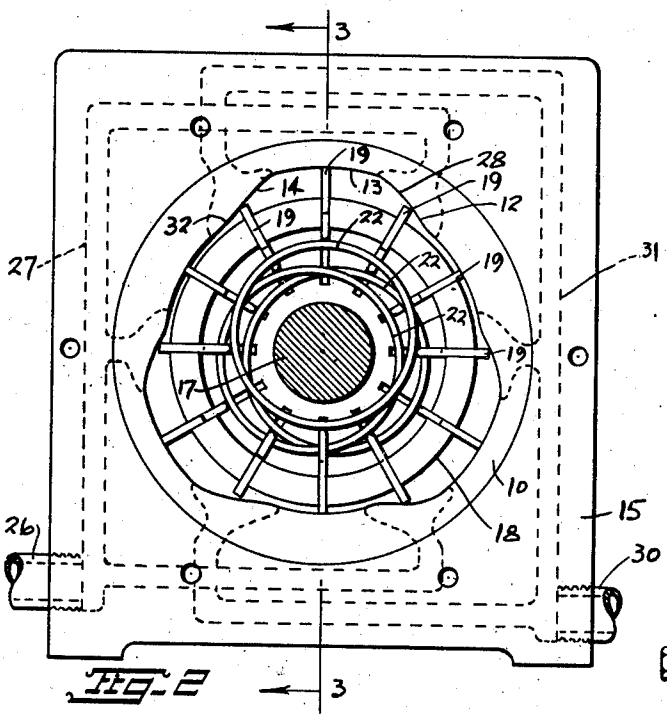


Fig. 2

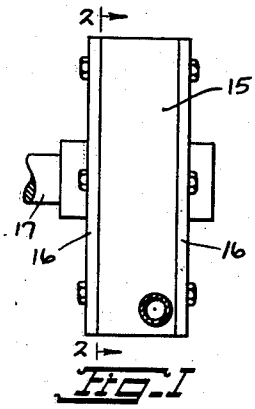


Fig. 1

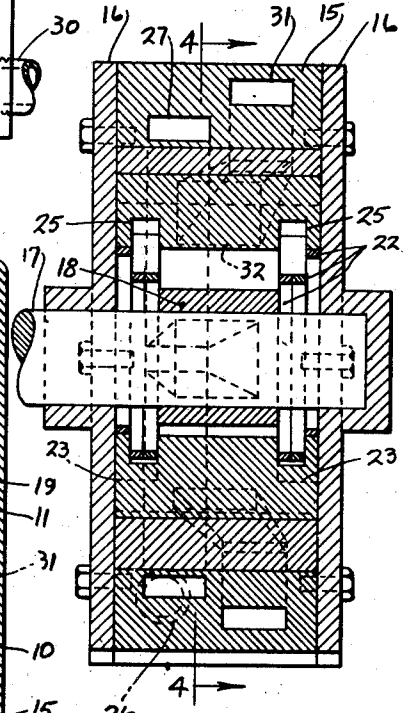


Fig. 3

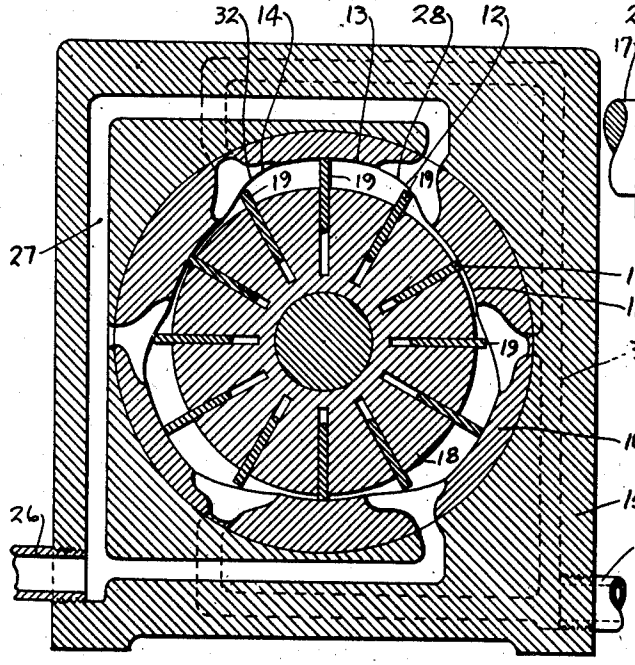


Fig. 4

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ROTARY VANE TYPE PUMP

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1 Claim. (Cl. 103—136)

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This invention relates to new and useful improvements in a rotary vane type pump, fluid motor or compressor. For simplifying this specification the invention will be described applied to a pump, but it applies equally to a fluid motor, and gas or air compressors without any variation in the invention proper.

The dominating object of this invention is the construction of a rotary vane type pump in which the rotor is hydraulically balanced and in which the vanes are positively moved during the operation of the pump. Heretofore, rotary vane pumps have been constructed in which the rotors were hydraulically balanced, but because of their construction it was impossible to give the vanes positive movements. It became necessary to depend on centrifugal force or springs, or other mechanisms in which the vanes do not necessarily have to move as they are intended to move. Pumps have been constructed in which the vanes have positive movements, but in these types of pumps the rotors were not hydraulically balanced. Because of their designs it was physically impossible to hydraulically balance their rotors.

A positive vane movement is necessary for all heavy and viscous liquids. A hydraulically balanced rotor is desirable to reduce the wear in the bearings and to assure long trouble free life of the pump.

Structurally, the new and improved rotary vane type pump is characterized by a cylinder having consecutive groups of internal sections, each of these sections consisting of a small diameter section continuing into an increasing cam shaped section continuing into a large diameter section continuing into a decreasing cam shaped section. It is proposed that these groups be arranged so that the large diameter sections are diametrically opposite the small diameter sections and the increasing cam shaped sections are diametrically opposite the decreasing cam shaped sections. With this arrangement the vanes may be arranged in diametrically opposite pairs, and these pairs may be moved simultaneously in one direction, or the other direction radially of the rotor of the pump. Moreover, with the new and improved construction it will be found that the pressure areas of the rotor will hydraulically balance the rotor.

One specific embodiment of the new and improved rotary vane type pump will be given in this specification, though other embodiments will readily be apparent to those skilled in the art. The specific embodiment shown has three of the large diameter sections equally spaced from each other around the circumference of the rotor. These large diameter sections comprise the pockets for the fluid being pumped. Since they are equally spaced from each other the pressure

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areas will be correspondingly spaced, and the rotor will be hydraulically balanced. To those skilled in the art it will be apparent that pumps may be constructed embodying the principles of this invention and containing more than three of these pockets. For example, it is a simple matter to construct a pump, in accordance with this invention, which will have five or seven, or more pockets equally spaced from each other around the rotor.

In the specific embodiment to be disclosed in this specification, the vanes are moved with rings. However, this is only by way of illustration since other positive movements of the vanes may be obtained in other ways.

Still further the invention proposes the construction of a rotary vane type pump, in accordance with this invention, which is exceptionally durable, efficient, and which may be manufactured and sold at a low cost.

For further comprehension of the invention, and of the objects and advantages thereof, reference will be had to the accompanying drawing and description, and to the appended claim in which the various novel features of the invention are more particularly set forth.

In the accompanying drawing forming a material part of this disclosure:

Fig. 1 is a fragmentary front elevational view of a rotary vane type pump constructed in accordance with this invention.

Fig. 2 is an enlarged vertical sectional view taken on the line 2—2 of Fig. 1.

Fig. 3 is a sectional view taken on the line 3—3 of Fig. 2.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3.

The new and improved rotary vane type pump, in accordance with this invention, includes a cylinder 10 having consecutive groups of internal sections, each group consisting of a small diameter section 11 continuing into an increasing cam shaped section 12 continuing into a large diameter section 13, continuing into a decreasing cam shaped section 14. In the particular design of cylinder illustrated there are three of these repeating groups arranged in succession around the interior of the cylinder. It should be noticed that these groups are so arranged that the large diameter sections 13 are diametrically opposite the small diameter sections 11, and the increasing cam shaped sections 12 are diametrically opposite the decreasing cam shaped sections 14. This arrangement can be obtained with all odd numbers of repeating groups, such as three, five, seven, etc. The cylinder 10 is in the nature of a liner which is fixedly mounted within a housing 15 of the pump.

The ends of the housing 15 are provided with the usual housing heads 16. A shaft 17 is rota-

tively supported coaxially through the housing 15 and supports a rotor 18. This rotor 18 is located within the cylinder 10 and is of a diameter slightly smaller than the diameter of said small diameter sections 11. A minimum of five vanes, indicated by the reference numerals 19, is provided for each of said groups of internal sections. These vanes 19 are radially slidably mounted in the rotor 18 and are spaced substantially equal distances from each other, with the first and last vanes 19 during one instant of rotation of said rotor 18, on the extreme ends of each of said groups of said internal sections, and with the first and last vanes of each group being common to adjacent groups. In the particular design of pump shown, with three of the large diameter sections 13 used, we would require twelve vanes 19. Of course, a larger number of vanes may be used without affecting the efficient operation of the pump, but a smaller number would not be satisfactory as the pump would work very inefficiently because leakage will take place between the inlet and outlet ports, as will be more clearly understood as this specification proceeds.

The vanes 19 are arranged in diametrically opposite pairs to facilitate moving them in a positive fashion. The vanes 19 are associated with means for moving them in unison and in the same direction. This means is illustrated as comprising two groups of rings 22, though one or more groups may be used. The rings 22 are contained in recesses 23 formed in the ends of the rotor 18. For small pump sizes, one group of rings 22 may be used at the center of the rotor. Each ring 22, in the particular design of the pump illustrated, is used to move four of the vanes 19. This may be seen by a close inspection of Fig. 2. It should be noted that each ring 22 is engaging and is capable of moving four of the vanes 19 which are spaced 90° from each other. The vanes 19 are formed with cutout portions 25, where necessary, so that each of the rings 22 used to move four of the vanes 19 will not engage or interfere with the movements of the remaining vanes 19. The construction is such that during rotation of the rotor 18 each diametrically opposite pair of vanes 19 will be moved, first in one direction and then in the other direction, and the vanes 19 will be following the internal contour of the cylinder 10.

The housing 15 is provided with an inlet 26 which connects with a passage 27 terminating in inlet ports 28 extending substantially the entire circumferential lengths of the increasing cam shaped sections 12. The housing 15 is also provided with an outlet 30 which connects up with a passage 31 connecting up with outlet ports 32 which extend substantially the entire circumferential lengths of the decreasing cam shaped sections 14. In the particular design shown on the drawing, the inlet and outlet ports are each connected in parallel groups. However, persons skilled in the art will well know how to connect them in series groups, if this is desired.

Further details of the pump will not be given in this specification as they form no part of this invention. However, it should be understood that the pump requires stuffing boxes, and packing, a lubricating system, and all the other essential parts of pumps.

The operation of the new and improved rotary vane type pump may be understood from the following:

The fluid to be pumped is connected with the inlet 26 to reach the inlet ports 28. The rotor 18 is driven. The fluid will be moved by the vanes 19 to the outlet ports 32. During this movement the fluid, which is being pumped, will be cut off from the inlet ports and will be forced out of the outlet ports. This produces the necessary pumping action. The vanes 19 will follow the contour of the interior of the cylinder 10 during the operation of the pump. The vanes 19 are positively moved by the rings 22. For this reason they cannot possibly stick since they are being forced inwards and outwards, as required. The outer edges of the vanes 19 will be forced to follow the internal contour of the cylinder 10, and the rings 22 will transfer the forcing movements from the vanes 19 being forced inwards to those vanes 19 which are required to move outwards. The vanes 19 are moving in opposite pairs, first in one direction and then in the other direction.

A dominating feature of the new and improved rotary vane type pump resides in the fact that the pockets of the pump, formed by the large diameter sections 13 are equally spaced from each other so as to hydraulically balance the rotor 18. Another important feature is that the vanes 19 are being positively moved while the rotor 18 is hydraulically balanced.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise constructions herein disclosed and the right is reserved to all changes and modifications coming within the scope of the invention as defined in the appended claim.

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

In a rotary vane type device of the class described having a cylinder formed with three consecutive groups of internal sections, each group consisting of a small diameter section continuing into an increasing cam shaped section continuing into a large diameter section continuing into a decreasing cam shaped section and said groups being arranged so that said large diameter sections are diametrically opposite said small diameter sections, a rotor within said cylinder of a diameter slightly smaller than the diameter of said small diameter sections, twelve vanes radially slidably mounted in said rotor and spaced substantially equal distances from each other and arranged in diametrically opposite pairs, and means for moving diametrically opposite vanes simultaneously in unison in the same direction comprising three rings for each end of said rotor and housed in recesses formed in the end of said rotor and each ring engaging the inner edges of a different group of four of said vanes which are spaced 90° from each other, and each vane having each end portion formed with a cutout on its inner edge portion through which two of said three rings idle during the operation of said rotary vane type device.

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REFERENCES CITED

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

FOREIGN PATENTS

Number	Country	Date
19,119	British	1911
22,696	Australian	1935
293,869	British	1928