Dec. 27, 1949 J. P. JOHNSON 2,492,868

RECIPROCATING VANE ROTARY PUMP

Filed May 3, 1945

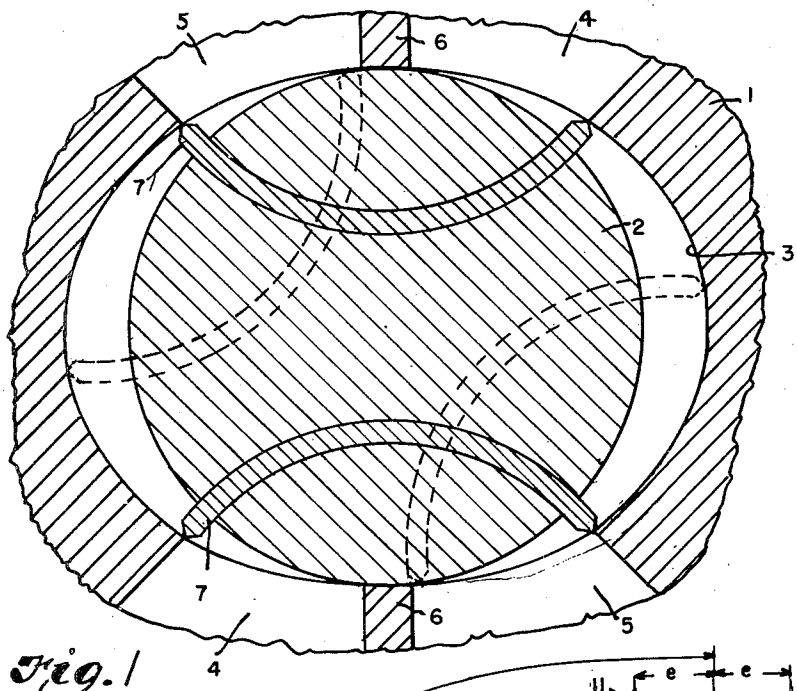


Fig. 1

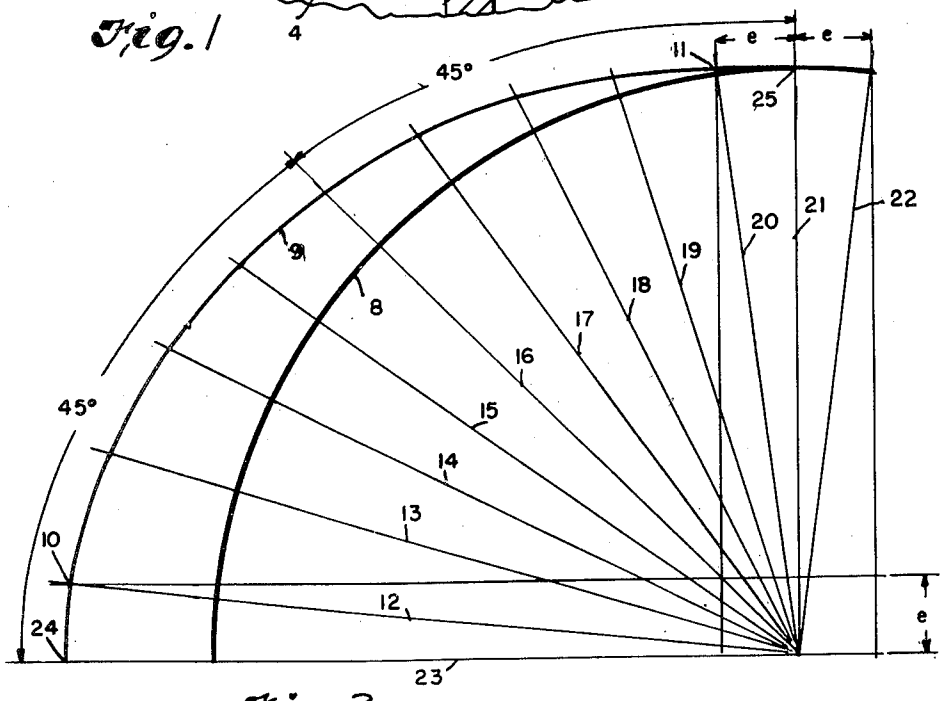


Fig. 2

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Patented Dec. 27, 1949 2,492,868

UNITED STATES PATENT OFFICE

2,492,868

RECIPROCATING VANE ROTARY PUMP

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Application May 3, 1945, Serial No. 591,683

2 Claims. (Cl. 103—135)

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This invention relates as indicated to rotary pumps and more especially to the type of pump employing a rotor operating in a stator having a non-cylindrical bore with the rotor carrying blades extending therethrough and in engagement at their opposite ends with the wall of said bore.

It is a principal object of my invention to provide a pump of the character described having a unique arrangement of blades and bore whereby there is produced a pump having improved operating characteristics.

Other objects of the invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a transverse sectional view of the rotor and stator portions of a pump constructed in accordance with my invention; and

Fig. 2 is a diagrammatic representation of the manner in which is formed the bore of the construction of Fig. 1.

Referring now more specifically to the drawing and more especially to Fig. 1, the pump here illustrated is of the type to which Davis Patent No. 2,272,635 dated Feb. 10, 1942 is directed. Since the type of pump to which the invention relates is thus fully illustrated in the prior art it is believed only necessary to illustrate and describe those features to which the invention specifically relates.

The structure illustrated in Fig. 1 comprises a stator generally indicated at 1 and a rotor generally indicated at 2. The stator 1 is provided with a bore generally indicated at 3 which is of non-circular cross-section as shown and from which lead inlet ports 4 and outlet ports 5. These ports are arranged in pairs with a relatively thin barrier 6 therebetween, with such barriers so arranged that their center lines coincide and pass through the axis of the rotor 2, thus dividing the pump bore into two similar and oppositely arranged sections.

The various parts are of such relative proportions that the rotor 2 has a close running fit with the opposed faces of the barriers 6 providing a fluid seal in such contact areas.

The rotor 2 in the area inside the bore 3 carries arcuate vanes 7 so positioned that the ends thereof project from the rotor 2 at 90° intervals.

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The bore 3 consists of four similar and alternately oppositely arranged curves each formed in the manner illustrated by the diagram in Fig. 2.

In Fig. 2, the curve 8 is a 90° segment of a circle whose center is at the axis of rotation of the rotor, the lines 21 and 23 leading from such axis of rotation to the points 25 and 24 respectively denoting one half of the minor and major axes of the bore 3. The distance *e* is equal to one-fourth the difference between the major and minor axes of the finished bore. The curve 9 is the curve of the finished bore and is formed as follows:

The portion of the curve 9 lying between points 10 and 11 is a section of an Archimedes spiral and is laid out by drawing the radial lines 12 to 20 inclusively with equal central angles therebetween. Numeral 22 designates a line similar to line 20 except disposed on the opposite side of line 21. The lines 12 to 20 are each extended radially beyond the circular arc 8. On such radial extensions are located points radially displaced from each other by an amount proportionate to the central angle therebetween, i. e. the curve between points 10 and 11 is an Archimedes spiral. The sections of the curve 9 lying at the extremities of the section between 10 and 11, i. e. the curve between points 10 and 24 and between points 11 and 25 may be substantially circular arcs as shown and substantially tangent to the points 10 and 11 of the Archimedes spiral and perpendicular to the lines 23 and 21 at the points 24 and 25. This arrangement produces a curve which has no sharp breaks and over which the ends of the vanes 7 may move even at extremely high speeds. With a curve generated in the manner explained the opposite ends of each of the vanes 7 are always substantially in contact with the wall of the bore.

A pump constructed as above explained is easy to manufacture, is capable of operating at high speeds and because of the smooth nature of the bore curve is subject to little wear.

It will be observed by reference to Fig. 1 that the distances between the ends of the blades 7 are equal to the chordal distances between the edges of one port 4 and one port 5 on one side of and remote from the barriers 6 and between the edges of the other port 4 and the other port 5 on the other side of and remote from the barriers 6. Thus by reason of the running fit of the rotor 2 with the barriers 6 in the rotor housing bore 3 and because the distances between the ends of the blades 7 are equal to the chordal width across

each wide barrier formed between the edges of the ports 4 and 5 as aforesaid, such ports will never be in communication with one another whereby loss of delivery pressure is avoided during the rotation of rotor 2 and housing 1 relative to one another.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I, therefore, particularly point out and distinctly claim as my invention:

1. A rotary pump comprising a rotor housing having a bore of oblong cross section with major and minor axes intersecting at a right angle and consisting of four equal Archimedes' spiral sections, one in each quadrant, having a common pole coinciding with the point of intersection of such axes and so arranged that the sum of the lengths of any two polar rays thereto 90° apart is a constant, and curved portions at the ends of said sections crossing over such axes and smoothly connecting said sections together, the wall of such bore being intersected by two pairs of diametrically opposed ports forming two pairs of barriers between them, one pair of such barriers having the centers thereof coinciding with such minor axis and the other pair of such barriers having the centers thereof coinciding with such major axis, said one pair of barriers being narrower than said other pair, a cylindrical rotor in said bore having a close running fit with said one pair of barriers, and two similar arcuate blades carried by said rotor and arranged so that the ends of said blades project radially from the rotor at 90° intervals, the arcuate length of said blades being such that both ends of each blade are substantially at all times in engagement with the wall of said bore, and the distance between the ends of said blades being substantially equal to the chordal distance across each barrier of said other pair of barriers.

2. A rotary pump comprising a rotor housing having a bore of oblong cross section with major and minor axes intersecting at a right angle and consisting of four equal Archimedes' spiral sections, one in each quadrant, having a common pole coinciding with the point of intersection of such axes and so arranged that the sum of the lengths of any two polar rays thereto 90° apart is a constant, the opposite ends of said sections terminating equal distances from the major and minor axes, and curved portions at the ends of said sections crossing over such axes and smoothly connecting said sections together, the wall of such bore being intersected by two pairs of diametrically opposed ports forming two pairs of barriers between them, one pair of such barriers having the centers thereof coinciding with such minor axis and the other pair of such barriers having the centers thereof coinciding with such major axis, said one pair of barriers being narrower than said other pair, a cylindrical rotor in said bore having a close running fit with said one pair of barriers, and two similar arcuate blades carried by said rotor and arranged so that the ends of said blades project radially from the rotor at 90° intervals, the arcuate length of said blades being such that both ends of each blade are substantially at all times in engagement with the wall of said bore, and the distance between the ends of said blades being substantially equal to the chordal distance across each barrier of said other pair of barriers.

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

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Number	Name	Date
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2,272,635	Davis	Feb. 10, 1942
2,352,941	Curtis	July 4, 1944