May 2, 1961 O. E. ROSAEN 2,982,219

VANE TYPE PUMPS

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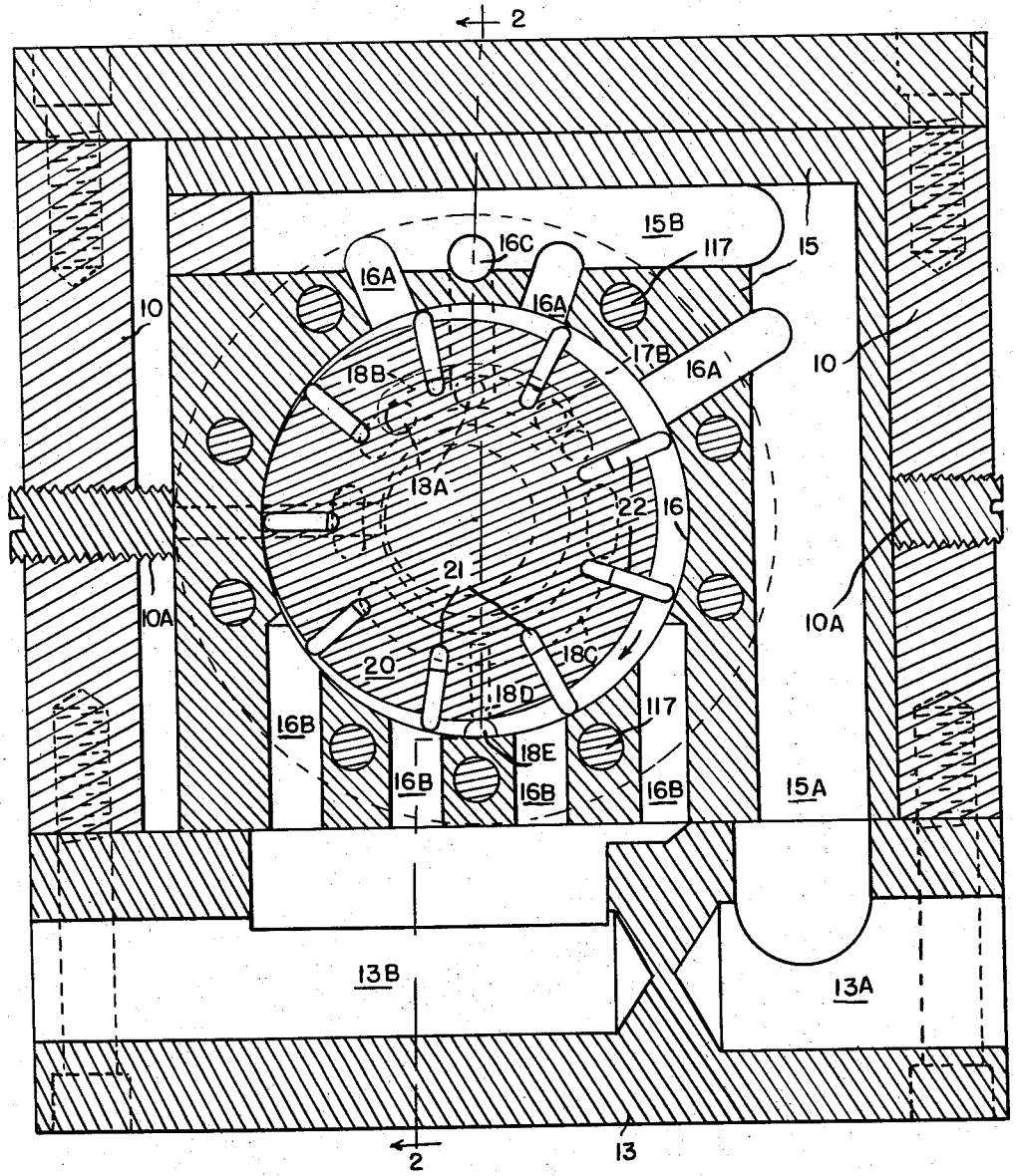


FIG.I.

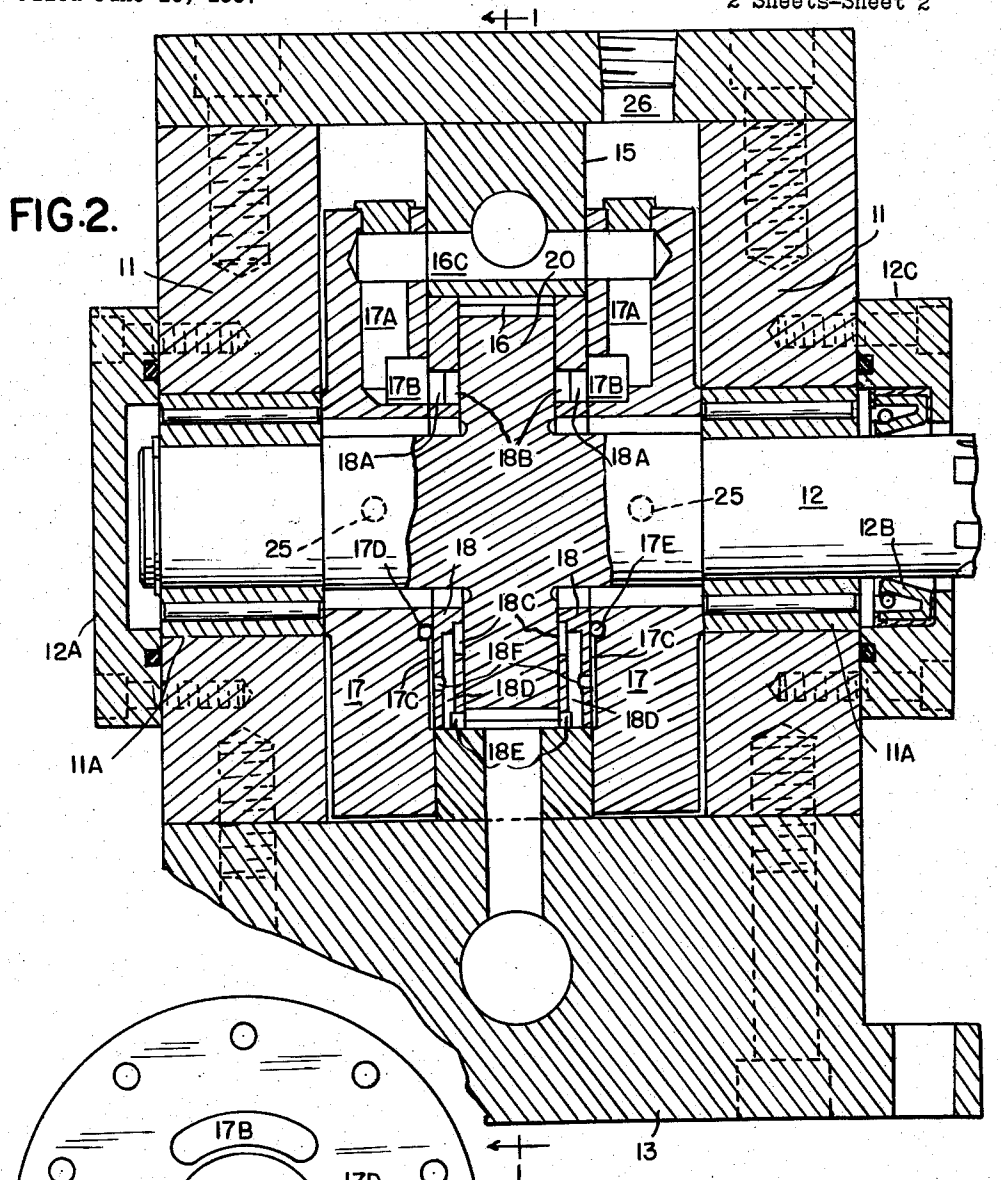
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FIG.2.



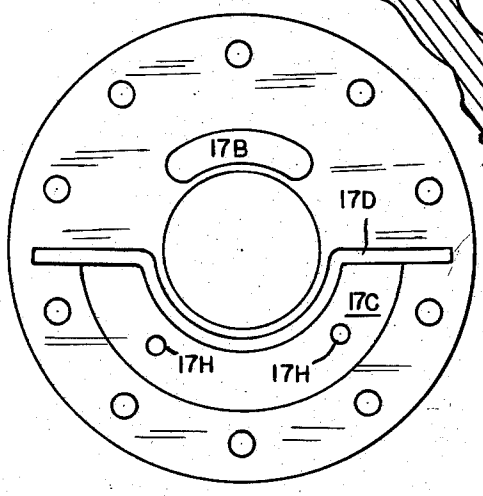


FIG.3.

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VANE TYPE PUMPS

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4 Claims. (Cl. 103—120)

The present invention relates to pumps of the vane type and more specifically to a vane pump adjustable for variable delivery.

Among the objects of the invention is to provide a pump in which all of the operating parts except the drive shaft are completely enclosed.

Another object is to provide a vane pump in which the variation in delivery is obtained by moving the pump relative to the rotor and drive shaft.

Other objects and advantages will be apparent to those skilled in the art upon reference to the following description and the accompanying drawings in which

Fig. 1 is a vertical sectional view of the pump on line 1—1 of Fig. 2.

Fig. 2 is a similar view on line 2—2 of Fig. 1.

Fig. 3 is a view in elevation somewhat reduced in size of one of the outer cheek plates.

As shown, the pump comprises an outer casing the end walls of which are provided with threaded openings receiving the adjusting screws 10A. The side walls 11 will be provided with openings in which are fitted the outer races of suitable antifriction bearings 11*a* in which is mounted the drive shaft 12, one end of which projects sufficiently to provide attachment of driving means (not shown). The other end of shaft 12 may project a short distance but is covered by a suitable cap 12A.

The bottom 13 of the casing will be of sufficient thickness to allow the formation therein of an inlet passage 13A and an outlet passage 13B, both having suitable openings leading to the inside of the casing and, of course, provided with means for attachment of suitable conduits (such means and conduits not being shown). The projecting end of shaft 12 is shown as surrounded by an oil ring 12B and cap 12C to prevent leakage.

As shown, the entire pump, except for the projecting end of the shaft 12, is enclosed within the casing, and comprises a central block or plate 15 having fixed thereto the cheek plates 17 to form a unit enclosing the rotor, which unit is or may be loosely slidable in the casing and have clearance around the sides and top—the block 15 however, fits closely at its bottom to bottom of the casing and is provided with a vertical passage 15A open at its bottom to the inlet 13A and at its top to a horizontal passage 15B.

Block 15 is also provided with an open circular pump chamber 16, and with a plurality of radially arranged passages 16A leading from the inlet passages 15A—15B to the pump chamber 16. It is also provided with a plurality of passages 16B leading from the chamber 16 to the outlet 13B. Another passage 16C in block 15 opens to both side faces of the block and is also open to the inlet passage 15B.

On each side face of block 15 is fixed, by means of suitable screws 117, an outer cheek plate 17, each of which is provided with an opening substantially larger than the diameter of shaft 12. Each of the cheek plates is also provided with a radially arranged passage 17A open to the passage 16C in block 16 and extending to adjacent the shaft opening where it opens to an arcuate chember 17B milled in the inner face of the plate.

Diametrically opposite chamber 17B, each plate 17 is milled to provide a shallow chamber 17C, substantially semi-circular in length and of a width radially to extend from the outer wall of the pump chamber to near the shaft opening to a small groove 17D in which is laid a round rubber gasket 17E. As will be noted the groove 17D and gasket 17E follow the contour of the radially inner wall of chamber 17C and then radially outward at the ends of the chamber, extending a short distance outwardly of the pump chamber. By so locating the gaskets 17E, the high pressure on the discharge side of the pump is sealed off from the shaft opening.

Mounted within the pump chamber on either side of the rotor and prevented from rotation by suitable dowels (not shown) are a pair of inner cheek plates 18 each of which is provided with passages 18A in its outer face open to an arcuate chamber 18B in its inner face, the passages 18A and chamber 18B being opposite and communicating with the chambers 17B in the outer cheek plates 17.

Diametrically opposite the chambers 18B, the plates 18 are provided on their inner faces with another arcuate chamber 18C whose length peripherally is sufficient to have its ends radially opposite the outer discharge passages 16B. Both chambers 18B and 18C are so located that they communicate only with the bottoms of the vane slots in the rotor.

At the bottom of each of the plates 18 there is provided a radial passage 18D which is open at its upper end to the chamber 18C and at its bottom end to the pump chamber through a suitable notch 18E. Passage 18D is also open to the chamber 17C in each of the outer plates 17 through a small passage 18F.

Mounted on the shaft 12 or integral therewith is a rotor 20, consisting of a disc provided with slots 21 in its periphery having radially slidable vanes 22 therein. The thickness of the disc and lateral width of the vanes is such that there is a sliding fit between them and the inner cheek plates 18.

In the operation of the pump, assuming the adjusted position to be as shown in the drawings, the fluid being pumped will enter the inlet 13A and flow into the pump chamber through the passages 16A and also into the vane slots under the vanes through the passages 16C—17A—17B—18A—18B. As the rotor turns clockwise, pressure builds up as soon as the vanes leave the last passage 16A. As the horizontal portion of the gasket 17E is substantially diametrical, the vane passes its point of farthest outward movement as it passes the gasket location and into the high pressure area.

As the vane in its further travel begins to be pushed inwardly by the outer wall of the pump chamber and so expels the fluid from the vane slot into the chamber 18C and through passages 18D—18F into chamber 17C to press the inner cheek plates 18 inwardly and axially against the sides of the rotor, the fluid passing out through the notches 18E.

Any leakage of fluid from the high pressure area into the space around the shaft 12 will pass out into the outer casing through passages 25 in blocks 17 and eventually drained through the drain opening 26.

In the drawing, the pump is shown as in the position of greatest eccentricity of the rotor and pump chamber and consequently, in position for maximum deliver. Adjustment toward a position of concentricity is accomplished by any suitable means such as screws 10A. This of course decreases delivery.

I claim:

1. In a fluid pump of the vane type a rotor consisting of a disc having radially arranged slots in its periphery,

vanes slidably mounted therein, a pump ring surrounding said rotor and having a circular opening therein of a somewhat larger radius than said disc to provide a pumping chamber, outer cheek plates fixed to said ring, inner cheek plates disposed within said ring between said outer cheek plates and said disc and fixed against rotation, inlet and outlet passages connected with said pump chamber, passage means connecting said inlet passage to said slots beneath said vanes for admitting fluid thereto for biasing the vanes outwardly into contact with the inner surface of said ring by the inlet fluid pressure, means for axially moving said inner cheek plates toward the side faces of said rotor and vanes, said last mentioned means comprising chambers at the outer faces of said inner cheek plates and conduit means connecting said chambers with the vane slots under said vanes.

2. The subject matter of claim 1 wherein the chambers at the outer faces of said inner cheek plates are formed in said outer cheek plates.

3. The subject matter of claim 1 wherein said chambers adjacent the outer faces of said inner cheek plates and said conduit means connecting said chambers with the vane slots under said vanes are located on the high pressure discharge side of said pump and gasket means disposed between said outer cheek plates and said inner cheek plates to prevent leakage of the fluid from said chambers to the low pressure side of said pump.

4. In a fluid pump of the vane type a rotor consisting of a disc having radially arranged slots in its periphery, vanes slidably mounted therein, a pump ring surrounding said rotor and having a circular opening therein of a somewhat larger radius than said disc to provide a pumping chamber, the axes of said rotor and pump chamber being relatively adjustable from concentric to eccentric relation, outer cheek plates fixed to said ring, inner cheek plates disposed within said ring between said outer cheek plates and said disc and fixed against rotation, inlet and outlet passages connected with said pump chamber, and a line gasket extending diametrically across said pump chamber in the direction of axis adjustment and disposed between each outer and inner cheek plate and adjacent the axes.

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