LIQUID RING PUMP OF THE DUPLEX TYPE

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References Cited
UNITED STATES PATENTS
1,662,250 3/1928 Jennings ...................... 417/68
2,928,585 3/1960 Keef et al. .................... 417/68

FOREIGN PATENTS OR APPLICATIONS
1,185,754 3/1970 Great Britain .................. 417/68
462,208 3/1937 Great Britain .................. 417/68
1,116,339 11/1961 Germany ..................... 417/68

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ABSTRACT
A liquid ring pump of the duplex, center-port type in which the two rotors are mounted upon a common shaft and disposed between them and common to each section of the pump, is a single header to which the outlet from the pump sections are delivered and from which the intake is drawn.

4 Claims, 7 Drawing Figures
LIQUID RING PUMP OF THE DUPLEX TYPE

This invention is concerned with liquid ring pumps of the center-port, duplex type.

A typical pump of this kind is described in U.S. Pat. No. 3,154,240 issued Oct. 27, 1964 I. C. Jennings. That patent shows a pump with a unitary rotor defined by a pair of end shrouds, a center shroud or partition and a plurality of generally radially extending vanes which are disposed between the shrouds and which, with the shrouds, define working chambers or buckets. One end shroud, the center shroud and the vanes therebetween, define one impeller section and the other end shroud, with the center shroud and the vanes between it and the center shroud, defines the second impeller section. Each impeller section has a central eye and in each eye is disposed a fixed port member each of which port members has inlet and outlet ports which are alternately brought into register with the buckets as the rotor turns. The ports communicate with interior inlet and outlet passages of the port members those passages leading to headers disposed adjacent each end shroud.

The port members are conventionally of frustoconical shape, the eyes of the rotor are, of course, correspondingly shaped, and the smaller bases of the port members are disposed adjacent to one another and adjacent the center shroud of the rotor.

Accordance to this invention, in such a pump, instead of having the unitary rotor and two headers, a pair of rotors are spacedly mounted upon a shaft and the port members of each rotor communicate with a central header disposed between the two rotors.

With this arrangement, the external passageways not only for the inlets and outlets but also for the cooling and sealing liquid deliveries to the pump are simplified.

Other advantages and features of this invention will become apparent from the following description of the drawings.

In the drawings:
FIG. 1 is a schematic axial section of the pump according to this invention;
FIG. 2 is the section of the line 2—2 of FIG. 1;
FIG. 3 is a section on the line 3—3 of FIG. 2;
FIG. 4 is a section on the line 4—4 of FIG. 2;
FIG. 5 is a section on the line 5—5 of FIG. 2;
FIG. 6 is a section on the line 6—6 of FIG. 2; and
FIG. 7 is a front view of the header of the pump.

Referring particularly to FIG. 1, the pump comprises a drive shaft 10 which is driven, conventionally, by a suitable motor connected to the right-hand end of the shaft.

The shaft is mounted in bearings 12 and 14 which are supported in pedestal elements 16 and 18 respectively. The pedestal means each comprise housings 20 which have bearing support surfaces 22 and feet 24.

As the opposite sides of the pump are generally similar, only one side will be described in detail hereinafter. Disposed within the housing 20 is a lobe casing 26 with a central opening 28 through which the shaft passes and which is sealed against leakage by a packing 30.

As is conventional, the lobe casing 26 is eccentric and, in this particular case, has a double lobe, i.e. is of generally elliptical form in the regions of the rotor.

Keyed to the shaft 10 and within the lobe casing 26 is a rotor 32 which has inner and outer shrouds 34 and 36 respectively (the expression inner and outer being used herein to distinguish between the shrouds which are closest and furthest from the head respectively).

Disposed within a central eye of the rotor which is defined by surfaces 40 and 42 of the shrouds and the radially inner edges 44 of the vanes, is a frustoconical port member 46 which has a radial base 48 which is described in greater detail hereinafter.

It is to be noted that the surfaces 22 which supports bearings 12 and 14 and the surface 50 and surfaces 52 of the casings 20 are machinable in a single pass so that their concentricity is substantially insured. In this way, the closeness of the clearance between the rotor eye and the cone or port member can be maintained. It is to be appreciated that pump efficiency is related to that clearance.

Since both sides of the pump are similar, the positioning of the shaft and, with it, of course, the rotors, is determined only by the accuracy with which the machining of the two casings 20 is performed.

Reference is now made to FIGS. 2–7 which show in greater detail the head of this pump.

It will be appreciated that the head is secured to two pump casings by means of bolts 60 which pass through flanges of the casings and into appropriately threaded holes in the head. Additional set bolts 62 are disposed to secure the port member to the head.

The head is symmetrical about a central radial plane and defines an inlet passage 70 the form of which can be determined from a consideration of FIGS. 2 and 3. The cylindrical wall 72 of the head has radial faces 74, 76, which have sealing engagement with flanges 52 of the pedestals 16 and 18 and the face 79 of the central passage through which the drive shaft passes is, of course, in abutting and sealing engagement with the adjacent radial face of the conical port member of the pump.

The inlet is defined by the cylindrical wall 72, circular face 79 of the central passage and radial and chordal partitions 78, 80–88. Additionally and as described hereinafter, the inlet passage is bridged by other passages.

The part circular bridge 84 constitutes a part of the discharge passage and as can be seen in FIG. 3 that portion of the discharge passage being disposed centrally of the header and spaced from the plane of the flanges 52 of the pedestal portion. Not visible in FIG. 2 but discernable from FIG. 3, the inlet passage 70 has two ports 90 and 92 for each pump section which register with inlet ports of the respective pump sections.

An inlet union 94 communicates radially with the passage 70 and is the only external inlet connection for pumped medium to the header.

Referring now to FIGS. 2, 4 and 7, the form of the discharge passage 100 can be determined.

The discharge passage is defined by portions 80 and 82 of partition 78 and by a partition 102 which comprises chordal portions 104 and 106. The discharge passage is completed by passage 84 which extends concentrically around opening 86 of the head through which the drive shaft passes.

From a consideration of FIG. 7, it will be clear that the discharge passage 100 has ports in the regions identified as 110 and 112 with which it communicates, as can be seen in FIG. 4, with the discharge passages of the port members of the respective pump sections.
An exit 120 from the discharge port 100 is the only exit from the discharge passage 100 and opens radially opposite to inlet 94 to the header.

To supply make-up liquid to the pump the head is provided with an inlet 130 (FIG. 5) which communicates via a passage 132 with a groove 134 forming a bridging element 136 which extends radially of the header and communicates with a through opening 138 which, as can be seen in FIG. 5, is aligned with passages 140 and 142 which lead to the pump chambers through the cone. A similar bridge with passages identified by the same numbers is disposed radially opposite to the passage above described in the header.

To achieve balancing and the sealing of the rotor, much in the manner described in U.S. Pat. No. 3,289,918 we provide inlets 150 (FIG. 6) to the header which communicate via passages 152 with port 154 which registers with corresponding ports in the base of the port member. The admission port 150 to the header is connected to supply lobe pressure liquid for the sealing purpose.

Additionally, a similar outlet 160 is formed in the head which communicates via passageway 162 with ports 164 of the head which align with passages 166 in the base of the cone. Through these ports and passages the water of the ring is unloaded from the pump as required.

Additional drain taps 180 and 182 are provided in the discharge and inlet passages respectively of the head through which the pump can be completely drained when desired.

It will be appreciated that by the arrangement here described that the construction of a pump, which would normally have two heads, is very much simplified as are the connections to be made to that pump.

What is claimed is:
1. A liquid ring pump comprising a pair of spaced rotors, said rotors each having a plurality of generally radially extending vanes defining a plurality of radially open ended work chambers, each rotor having an associated two-lobe casing, means for delivering liquid into said casing to define under the influence of rotation of said rotor, a ring, said ring alternately advancing into and receding from said work chambers as the rotor turns to produce a pumping action, a central port member associated with each rotor, two inlet and two outlet passages in each port member each passage terminating in a port with which the work chambers of the rotor are sequentially brought into register as the rotor turns, a header common to said port members and disposed between the rotors, said header having a single discharge passage and a single inlet passage, said discharge passage of the header communicating with terminal portions of each of said outlet passages of each port member and said inlet passage of the header communicating with terminal portions of each of said inlet passages of each port member, and said header includes a seal liquid passage communicating with a seal liquid passage of each pump section.

2. A liquid ring pump as claimed in claim 1 wherein said header includes a ring liquid unloading outlet.

3. A liquid ring pump as claimed in claim 1 wherein said header comprises opposite faces abutting the casings of said rotors and said port members, said header including inlet and outlet ports registering with said internal inlet and outlet passages of said port member.

4. A liquid ring pump as claimed in claim 3 wherein each port member has two inlet and two outlet passages alternatively spaced around the pump center line and said header has two inlet and two outlet ports registering with said port member passages said two outlet ports being connected by a conduit extending through the inlet passage of the header.