April 25, 1950 A. J. STEPANOFF 2,505,071

ADJUSTING DEVICE

Filed March 1, 1946

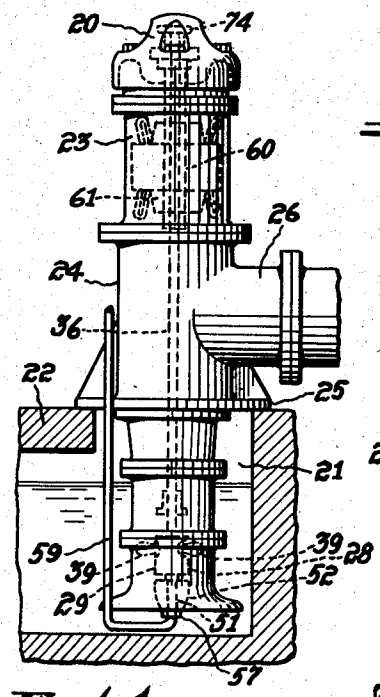

FIG.-1.

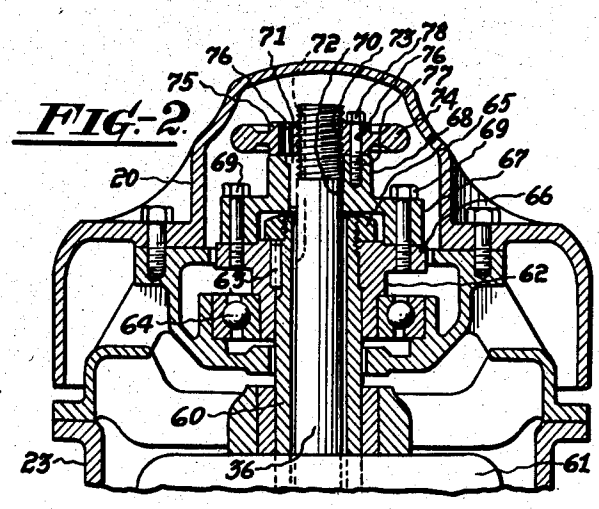

FIG.-2.

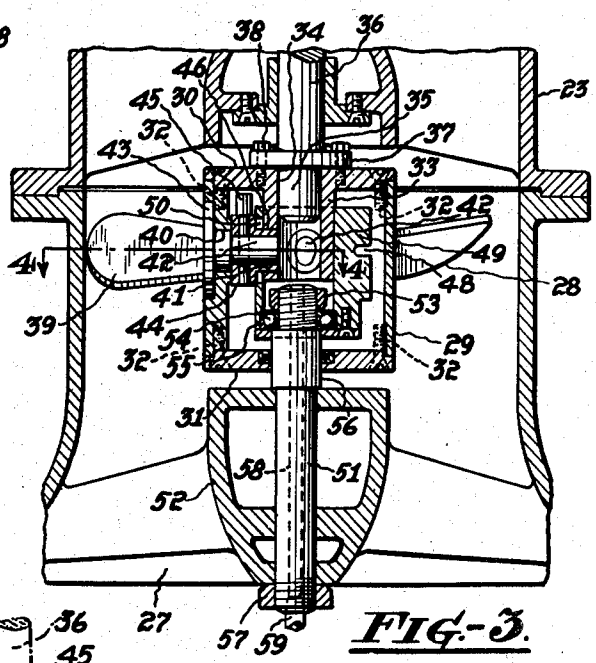

FIG.-3.

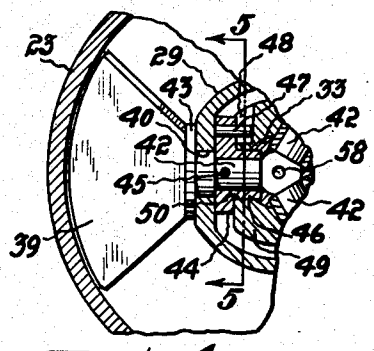

FIG.-4.

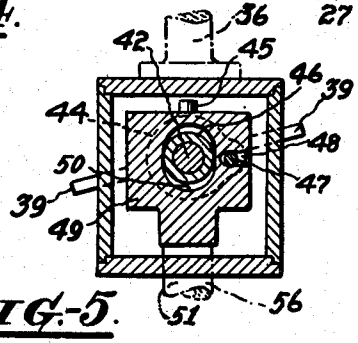

FIG.-5.

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ADJUSTING DEVICE

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2 Claims. (Cl. 103—89)

1

This invention relates to pumps, and more particularly to an adjusting device for varying the pitch of the vanes of a rotary pump.

One object of the invention is to selectively vary the impelling effect of the pump.

Another object is to avoid overloading the motor driving the pump when operating at a reduced capacity.

A further object is to permit of the adjustment required for varying the pitch of the pump vanes to be readily effected from the upper end of the pump.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings accompanying this specification and in which similar reference numerals refer to similar parts,

Figure 1 is an elevation of a pump of a type to which the invention may be advantageously applied and a foundation, shown in section, to support the pump,

Figures 2 and 3 are enlarged views, in elevation and partly in section, of the upper and lower portions, respectively, of the pump,

Figure 4 is a transverse view taken through Figure 3 on the line 4—4, and

Figure 5 is a similar view taken through Figure 4 on the line 5—5.

Referring more particularly to the drawings and at first to Figure 1, the pump designated, in general, by 20 is of the vertical axial-flow type shown extending into a pit 21 defined by a foundation 22 supporting the pump.

The casing 23 of the pump is shown as consisting of ring-like sections that may be secured together in any suitable manner. One of the casing sections, designated 24, has a flange 25 that seats upon the foundation 22 to support the pumping mechanism and in said section 24 is an outlet 26 for the liquid discharged by the pump.

The inlet 27 is at the lowermost end of the pump casing 23 and within the casing section defining it is the impeller, designated in its entirety by 28, and comprising a bearing member which includes a hollow casing 29 the upper and lower ends of which are closed by covers 30 and 31, respectively. The covers are fastened to the casing 29 by screws 32, and on the inner surface of the cover 30 is a depending hollow extension 33 that forms a continuation of a bore 34 in the cover 30 for the accommodation of the lower end portion 35 of the drive shaft 36 of the pump which has an external flange 37 that seats upon the cover 30 and is fastened thereto by screws 38 for fixedly securing the bearing member to the drive shaft.

The casing 29 and the extension 33 carry the pump vanes 39 and are, respectively, provided with apertures 40 and 41 to receive enlarged and reduced portions of the journals 42 of the

2

vanes. Each vane 39 carries a collar 43 to seat on the outer surface of the casing 29 for preventing movement of the vanes toward the axis of the pump, and on the reduced portion of the journal 42 is a collar 44 that abuts the inner surface of the casing 29 to prevent movement of the vane 39 in an outwardly direction. The collar 44 is secured to the journal 42 by a pin 45 and has a hollow extension 46 encircling the inner end of the journal to serve as a renewable wearing surface therefor.

The vanes are rotatable on their axes in order that their pitch may be selectively changed and such rotational movement is effected by suitable devices preferably actuated manually and operating to rotate the vanes in unison. The connections between the vanes and the device, or devices, serving to rotate them are also of such nature as to cause all the vanes to be rotated in equal degree. In furtherance of these ends, each collar is provided with a crank pin 47 that lies in parallelism with the journal 42 and has an end extending into a slot 48 in a sleeve 49 having a sliding fit on the hollow extension 33.

The sleeve 49 lies between the collars 44 and the hollow extension 33 and has longitudinally extending oblong apertures 50 through which project the extensions 46 for engagement with the extension 33. The side walls of the apertures 50 have a slide fit on the hollow extensions 46 so that the journals will be free to rotate within the slot and to move endwise thereof. Owing to this arrangement the sleeve 49 will be interlocked with the journals and will rotate with the drive shaft 36.

Means are provided, however, for holding the sleeve 49 against movement axially of the pump. To this end a rod 51 is arranged in a support member 52 below the drive shaft 36 and has secured thereto, by means of a nut 53, an antifriction bearing 54 the outer race of which lies in an annular groove 55 in the lower end of the sleeve 49. The nut 53 acts against the inner race of the bearing 54 for clamping it against an enlargement 56 on the rod 51, and the enlargement 56 is held against the top of the support member 52 by a nut 57 threaded onto the lower end of the rod 51 to bear against the support member 52.

The rod 51 is shown as having a passage 58 therethrough to convey lubricant to the various bearing surfaces in the casing 29 and such lubricant is delivered to the passage 58 by a supply conduit 59 threaded to the lower end of the rod 51.

The force required for changing the pitch of the vanes 39 is transmitted to the vanes by the drive shaft 36 which is readily adjustable axially of the pump. The drive shaft extends through the hollow shaft 60 of a motor 61 serving to drive the

impeller and is interlockingly connected at its upper end with the corresponding end of the shaft 60 so that the drive shaft will rotate at the speed of the motor shaft.

The means serving to this connect the shafts together comprise a sleeve 62 that encircles the upper portion of the motor shaft 60 and is interlocked therewith by a key 63. The lower portion of the sleeve 62 extends into the inner race of an anti-friction bearing 64 the outer race of which is seated in the pump casing 23, and the sleeve 62 is clamped against the inner race of the anti-friction bearing by a nut 65 threaded onto the end of the shaft 60 and bearing against the end of the sleeve.

At the upper end of the sleeve 62 is an external flange 66 that serves as a seat for the flange 67 of a sleeve 68 supporting the upper end of the drive shaft 36. The flanges 66 and 67 are secured together by bolts 69, and in the bore 70 of the sleeve 68 is a key 71 that has a slide fit in an elongated key-slot 72 in the drive shaft 36.

The drive shaft 36 has a sliding fit in the bore 70 and its upper end is threaded externally for cooperation with the threads 73 of a hand-wheel 74 that bears against the end of the sleeve 68 and serves as a convenient means for causing endwise movement of the shaft 36. The hub 75 of the handwheel is provided with holes 76 to register selectively with a threaded aperture 77 in the sleeve 68 for the accommodation of a bolt 78 that normally locks the hand-wheel to the sleeve.

The operation of the device is as follows: Whenever it is desired to change the pitch of the vanes 39 the hand-wheel is released from the sleeve 68 and is then rotated to cause endwise movement of the drive shaft relatively to the sleeve 49. During such movement of the drive shaft, the crank pins 47, being movable with the shaft endwise of the pump and in interlocking engagement with the sleeve 49, will cause the vanes to be rocked about their axes for either increasing or decreasing their impelling effect.

I claim:

1. In an adjusting device for varying the pitch of pump vanes, a motor having a hollow shaft, a drive shaft extending through the hollow shaft and being movable axially thereof, a bearing member fixedly secured to one end of the drive shaft to move rotatively and axially therewith, vanes carried by the bearing member and having journals therein, a sleeve in slidable engagement and rotatable with the bearing member, a keeper for holding the sleeve against movement axially of the bearing member, crank pins on the vanes engaged by the sleeve for rotating the vanes about their axes upon axial movement of the drive shaft and the bearing, means rotatable with the hollow and drive shafts for transmitting movement from the hollow shaft to the drive shaft, and adjusting means on the drive shaft seating upon the said means for effecting axial movement of the drive shaft with respect to the hollow shaft to rock the vanes about their axes and being rotatable with the hollow and drive shafts.

2. In an adjusting device for varying the pitch of pump vanes, a motor having a hollow shaft, a drive shaft extending through the hollow shaft and being movable axially thereof, a bearing member fixedly secured to one end of the drive shaft to move rotatively and axially therewith, vanes carried by the bearing member and having journals therein, a sleeve in slidable engagement and rotatable with the bearing member, a keeper for holding the sleeve against movement axially of the bearing member, crank pins on the vanes engaged by the sleeve for rotating the vanes about their axes upon axial movement of the drive shaft and the bearing, means rotatable with the hollow and drive shafts for transmitting movement from the hollow shaft to the drive shaft, an adjusting member threaded onto the drive shaft and seating against the said means for effecting axial movement of the drive shaft to rock the vanes about their axes, and means for locking the adjusting member to the said means for rotation therewith.

ALEXEY J. STEPANOFF.

REFERENCES CITED

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

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