ADJUSTING DEVICE FOR PUMP IMPELLERS

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This invention relates to pumps, and more particularly to centrifugal pumps serving to pump water carrying abrasive material, such as mud, sand and the like.

In pumps intended for service of the type described, the abrasive material entrained in the water effects rapid wear upon the portions of the pump which define the clearances between its rotative and the stationary parts, and in many structures, when the parts serving to prevent back-flow from the discharge channels to the inlet side of the impellers become worn to the extent of seriously lowering the efficiency of the pump it becomes necessary to disassemble the pump in order to restore it to its original condition.

It is accordingly an object of the present invention to render the impellers readily adjustable axially of the pumping chambers to assure the correct clearances between the impellers and the pump casing.

Another object is to enable such adjustment of the impellers to be made without requiring the disassembling of the pumping mechanism.

A more specific object is to make possible the adjustment of the impellers axially of the pumping chambers from the exterior of the pump.

Still another object is to enable such adjustment of the pump impellers to be effected without disturbing the bearings for the pump shafting or the sealing devices serving to prevent leakage of fluid from the pumping chambers to the bearings.

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 a longitudinal view, partly broken away, of a multi-stage pump equipped with an adjusting device constructed in accordance with the practice of the invention.

Fig. 2 is a similar view somewhat enlarged of a fragmentary portion of the pump showing more particularly the wearing plates on the impellers and the pump casing depended upon to maintain the correct degrees of clearances a between the impellers and the pump casing.

Fig. 3 is a transverse view taken through Fig. 1 in the line 3—3 looking in the direction indicated by the arrows, and

Fig. 4 is an enlarged view, partly in section, of the adjusting device for the impeller shaft.

Referring more particularly to the drawings, 20 designates, in general, a centrifugal pump comprising a casing 21, an impeller assembly 22, a shaft assembly 24 for the impeller assembly and a drive shaft 25 for transmitting rotary movement to the shaft assembly 24 from a motor (not shown).

The casing 21 is recessed to provide a chamber 26 for the accommodation of an inner casing 27 which is held against endwise movement by a wall 28 at the inner end of the chamber 26 and by a head 29 which forms a closure for the chamber 26 and is secured to the casing 21 by bolts 30. The inner casing 27 is retained in axial align-
3 coupling members and the nut clamp these parts securely together and also prevent unauthorized rotation of the nut with respect to the shaft 44. The shafts 25 and 44 are held in axial alignment with each other by bosses 68 and 69 on the coupling member 63 and the nut 61 which are secured in depressions 70 and 71 in the nut 62 and the coupling member 62, respectively.

Preferably, a guard 72, of cup-shape, is disposed about the coupling assembly and the nut 61 and secured to the end of the casing 21 by bolts 73.

In practice, whenever it becomes apparent that the efficiency of the pump has been lowered as a consequence of erosion on the plates 59 and 51, the impellers may be adjusted axially of the impeller chambers to restore the clearances 52 to their original widths in the following manner. First, the guard 72 is removed from the casing 21 to uncover the coupling assembly. The bolts 67 are then removed to release the nut 61 and the nut is rotated to effect movement of the shaft 44 in a right hand direction, as Figure 1 is viewed in the drawings, until the wearing plates 59 engage the plates 51. The nut is then rotated in the opposite hand direction to retrace the impellers and thereby restore the original clearances 52 between the wearing plates.

The arc through which the nut must be rotated to establish such clearance may be readily determined from the lead of the threads of the portion 69 of the impeller shaft. In thus rotating the nut 61 it is, of course, essential to maintain its bolt holes into alignment with those of the coupling members for re-insertion of the bolts 67 but, owing to the close spacing of the holes the nut need be rotated only slightly in one direction or the other from any given position to establish such registry and the widths of the clearances 52 will be little affected by such maneuvering of the nut.

As will be readily apparent from the foregoing description, these adjustments of the impellers axially of the impeller chambers may be conveniently made without requiring the dismantling of any of the essential parts of the pump assembly and without disturbing its bearing portions or the devices serving to seal the pumping chambers from the bearing portions.

We claim:

1. In an adjusting device, the combination of a centrifugal pump casing having an impeller chamber, an impeller in the impeller chamber, an impeller shaft in the casing secured to the impeller, a drive shaft for driving the impeller shaft positioned in axial alignment therewith, a coupling comprising coupling members on the shafts for drivingly connecting said impeller shaft to the drive shaft and constituting the sole driving connection therebetween, one of said coupling members being slidably interconnected with the impeller shaft against rotary motion relative thereto, another coupling member on the drive shaft and secured against rotary motion relative thereto, adjustable means engaged to the impeller shaft against longitudinal movement relative thereto, means engaging the adjustable member and said coupling member for maintaining the coupling members in coaxial alignment and holding the adjustable member in an adjusted position, said adjustable means being movable longitudinally relative to the impeller shaft upon release by the last said means for effecting endwise movement of the impeller shaft relative to the casing.

2. In an adjusting device, the combination of a centrifugal pump casing having an impeller chamber, an impeller in the chamber, there being a clearance between the eye-end of the impeller and an opposed surface of the chamber, a shaft for the impeller, a drive shaft for driving the impeller shaft positioned in axial alignment therewith, a coupling comprising coupling members for drivingly connecting the impeller shaft to the drive shaft and constituting the sole driving connection therebetween, one of said coupling members being slidably interlocked with the impeller shaft against rotary motion relative thereto, another coupling member on the drive shaft and secured against rotary motion relative thereto, the end portion of the impeller shaft adjacent the drive shaft being threaded, a nut between the coupling members threadedly connected with the threaded portion of the impeller shaft for effecting endwise movement thereof to move the impeller relatively to such opposed surface, and means for clamping the coupling members to the nut interlockingly engaging the nut to prevent unauthorized relative movement of said nut with respect to the impeller shaft.

3. In an adjusting device, the combination of a centrifugal pump casing having an impeller chamber, an impeller in the chamber, a hollow shaft secured to the impeller and having a sliding fit in the hollow shaft, a drive shaft for driving the impeller shaft and positioned in axial alignment therewith, a coupling comprising coupling members for drivingly connecting the impeller shaft to the drive shaft and constituting the sole driving connection therebetween, one of said coupling members being fixedly secured to the hollow shaft and being slidably interlocked with the impeller shaft against rotation relative thereto, another coupling member on the drive shaft and secured against rotary motion relative thereto, the end portion of the impeller shaft adjacent the drive shaft being threaded, a nut between the coupling members threaded on the threaded portion of the impeller shaft for imparting endwise movement thereto to move the impeller axially of the impeller chamber, another coupling member on the drive shaft for securing the coupling members of the drive shaft and the nut together.

4. A device for adjusting and maintaining a pump shaft relative to its casing which comprises a sleeve surrounding the shaft and keyed thereto, a thrust bearing mounted on the sleeve and fixed axially with respect to said casing, a threaded member on said shaft to permit movement of said shaft axially with respect to said sleeve, means to couple said threaded member with the sleeve axially and radially including a pair of shaft coupling members, one of said members being attached to said sleeve, and coupling bolts holding said members rigidly together with said threaded member therebetween.

5. An adjusting device for adjusting the longitudinal position of a longitudinal movable shaft relative to a longitudinal stationary shaft positioned in axial alignment therewith, a coupling connecting the shafts for transmitting rotary motion therethrough and constituting the sole driving connection therebetween, said coupling comprising a coupling member on the end portion of the movable shaft adjacent the stationary shaft and slidably connected against rotary motion relative to the movable shaft, a coupling member on the stationary shaft end portion adjacent the movable shaft and secured against rotary motion relative to the stationary shaft, adjusting means between the coupling members adjustably connected with said end portion of the movable shaft for effecting longitudinal adjustment thereof relative to the stationary shaft, and means for securing said coupling members against movement relative to each other and for holding the adjusting means in its adjusted position.

6. An adjusting device for adjusting the longitudinal position of a longitudinal movable shaft relative to a longitudinal stationary shaft positioned in axial alignment therewith, a coupling connecting the shafts for transmitting rotary motion therethrough and constituting the sole driving connection therebetween, said coupling comprising a coupling member on the end portion of the movable shaft adjacent the stationary shaft and slidably connected against rotary motion relative to the movable shaft, a coupling member on the stationary shaft end portion adjacent the movable shaft and secured against rotary motion relative thereto, the end portion of the movable shaft adjacent the stationary shaft being threaded, and means between the coupling members threadedly connected with the threaded portion of the
movable shaft for effecting longitudinal adjustment there- 
of relative to the stationary shaft and having a portion ad-
adapted to be clamped between said coupling members 
to hold said means in its adjusted position.

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