July 28, 1942. R. E. B. SHARP 2,291,110

LEAKAGE CONTROL FOR ADJUSTABLE GUIDE VANES

Filed Feb. 27, 1940

Fig. 1

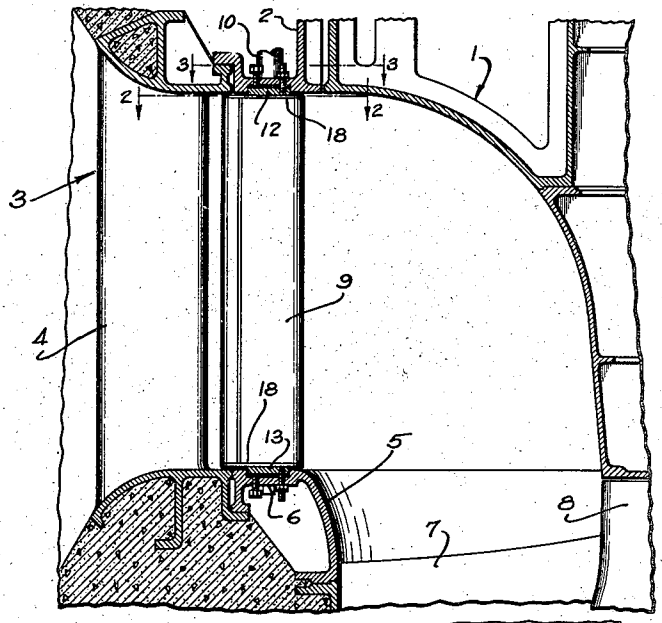


Fig. 2

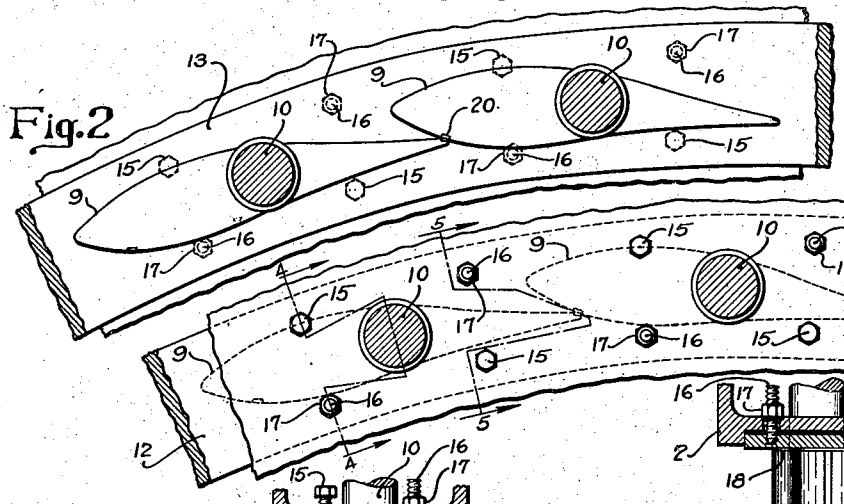


Fig. 3

Fig. 4

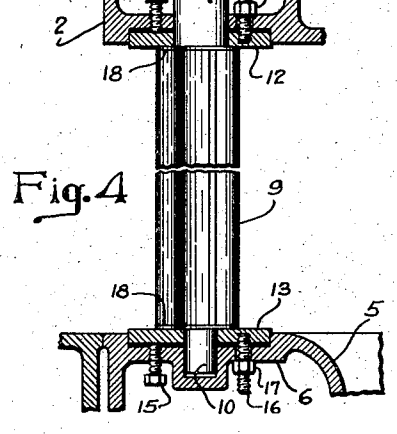
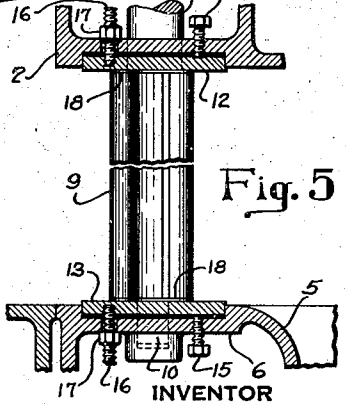


Fig. 5



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LEAKAGE CONTROL FOR ADJUSTABLE GUIDE VANES

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5 Claims. (Cl. 253—122)

This invention relates generally to rotary hydraulic machines, such as hydraulic turbines and pumps, and relates more particularly to apparatus for reducing leakage past adjustable vanes such as the guide vanes or wicket gates.

A great many various arrangements have heretofore been proposed and used in an attempt to reduce leakage past guide vanes when the same are in their closed position. Some of these arrangements are reasonably effective in preventing leakage but are very expensive or are subject to appreciable wear and other possible difficulties.

It is an object of my invention to provide improved means for sealing the guide vanes while in their closed positions and yet allow complete freedom of movement of the guide vanes when being moved to open or closed position.

A further object is to provide an improved sealing means for guide vanes that is simple and economical in construction, operation and maintenance and is rugged and positive in operation and does not impose undue restrictions in the fluid flow through the unit.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawing in which:

Fig. 1 is a partial vertical sectional view through one side of a propeller type hydraulic turbine, although the invention is equally applicable to so-called Francis type turbine;

Figs. 2 and 3 are fragmentary horizontal sections taken substantially on the lines 2—2 and 3—3 respectively of Fig. 1; and

Figs. 4 and 5 are respectively transverse sections taken substantially on the lines 4—4 and 5—5 of Fig. 3.

In the particular embodiment of the invention such as is disclosed herein merely for the purpose of illustrating one specific form among possible others that the invention might take in practice, I have shown in Fig. 1 a hydraulic turbine having a usual head cover 1 supported in a continuation 2 of the head cover 1 supported in any usual manner upon a stay ring generally indicated at 3. A series of stationary stay vanes 4 support the head cover and their superstructure. A throat ring 5 has a horizontal guide wall portion 6 suitably supported on the lower portion of the stay ring structure. The turbine as shown herein for purposes of illustration has a propeller runner 7 and hub 8 rotatable about a usual vertical axis.

A series of adjustable guide vanes 9 is supported by a shaft and pintle 10 journalled in the upper and lower annular members 2 and 6. To control or minimize leakage past the guide vanes 9 when in their closed position as shown in Figs. 2 and 3, I provide upper and lower annular distributor plates 12 and 13 vertically adjustably disposed within suitable recesses formed in members 2 and 6. The shaft and pintle 10 extend substantially through the center of the upper and lower plates 12 and 13.

To adjust the distributor plates so as to bring them into close firm sealing contact with the upper and lower ends of the guide vanes when in their closed position or, if desired, to provide a very close operating clearance between the plates and the guide vanes so that the vanes are free to be moved at any time, I provide a series of jack screws 15 placed in staggered relation around the entire circumference of the distributor plates as shown in Fig. 3, these jack screws preferably being placed diagonally across the axis of the shafts 10. If a close operating clearance is desired between the distributor plates and guide vanes a series of screws 16 are threaded into the distributor plates and adapted to have free vertical movement through suitable openings in the members 2 and 6. To limit the inward movement of the screws and plates stop nuts 17 are adjustably threaded on the screws and may be suitably locked in any position thereon. These limit screws and nuts are preferably disposed diagonally across the axis of the guide vane shafts 10 entirely around the circumference of the plate thereby insuring a uniform clearance for all guide vanes. The thickness of the distributor plates and staggered distribution of the jack screws 15 permit the plates to be firmly moved inwardly until the stop nuts 17 are in firm engagement with the upper and lower members 2 and 6.

The foregoing arrangement is not only extremely simple and effective but also insures complete flexibility of adjustment in obtaining any desired clearance tolerance or, if desired, of permitting a firm sealing contact between the distributor plates and guide vanes in the event of an extended shaft down to the turbine. The distributor plates may be, if desired, of corrosion resistant material and the upper and lower ends of the guide vanes may be provided with a small thickness of similar resistant material diagrammatically indicated at 18. Any other usual sealing strips may be employed along the joints of vertical contact between adjacent vanes as shown at 20, Fig. 2.

It will of course be understood that various changes in details of construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. In combination, a rotary machine having means forming a fluid passageway and adjustable guide vanes therein, means for pivotally supporting the vanes so that they may be adjusted into overlapping relation, an adjustable distributor plate disposed within said fluid passageway and located at one end of said guide vanes, means operable from the exterior of said passageway and extending into the same for moving said distributor plate away from said guide vane ends so that the guide vanes may be freely moved and for subsequently moving said distributor plate toward said guide vane ends thereby to adjust the clearance at the adjacent ends of said guide vanes, and studs secured to and movable with said distributor plate and having stop nuts for limiting adjustable movement of the plate to a predetermined position.

2. In combination, a rotary machine having means forming a fluid passageway and adjustable guide vanes therein, means for pivotally supporting the vanes so that they may be adjusted into overlapping relation, adjustable distributor plate located at one end of said guide vanes, jack screws operable from the exterior of said passageway for moving said distributor plate toward said guide vane ends, and means also operable from the exterior of said passageway for moving said distributor plate away from said guide vane ends thereby to allow free movement of the guide vanes during adjustment thereof.

3. In combination, a rotary machine having means forming a fluid passageway and adjustable guide vanes therein, means for pivotally supporting the vanes so that they may be adjusted into overlapping relation, an adjustable distributor plate located at one end of said guide vanes, jack screws operable from the exterior of said passageway for moving said distributor plate toward said guide vane ends, said jack screws being disposed in staggered relation around said distributor plate, and means for moving said distributor plate away from said guide vanes thereby to allow said guide vanes to be adjusted.

4. In combination, a rotary machine having means forming a fluid passageway and adjustable guide vanes therein, means for pivotally supporting the vanes so that they may be adjusted into overlapping relation, an adjustable distributor plate located at one end of said guide vanes, jack screws operable from the exterior of said passageway for moving said distributor plate toward said guide vane ends, and studs also operable from a point exterior of said passageway and carried by and movable with said distributor plate and having stop nuts for adjusting and limiting inward movement of said plate, said jack screws being disposed on a diagonal line substantially across the axis of said guide vanes and said limiting studs being disposed on the other diagonal line substantially across the pivotal axis of the guide vanes.

5. A rotary hydraulic machine having adjustable guide vanes supported in upper and lower stationary structures forming a fluid passageway between the same, a distributor plate supported by one of said structures within said fluid passageway to form a portion of the flow surface of said passage wall and interposed between said last mentioned structure and the adjacent ends of said guide vanes, the front side of said plate having a continuously smooth flow surface throughout, said distributor plate being adapted to have movement axially toward or away from the adjacent ends of said guide vanes but otherwise remaining at all times in a fixed angular relation to said stationary structure whereby said distributor plate remains stationary during adjustable angular movement of the guide vanes, and means extending through and operable from the exterior of said last mentioned stationary structure for axially moving said distributor plate away from said guide vane ends so that the guide vanes may be freely adjustably moved and for moving said distributor plate toward said guide vane ends to control leakage clearance when the guide vanes are in their closed position, said exteriorly operable means having operating engagement with said distributor plate wholly from the back side thereof thereby to allow the front side of said distributor plate to have its continuously smooth surface.

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