DEVICE FOR WICKET GUIDE STEMS FOR WATER TURBINES, PUMP TURBINES OR PUMPS

FIG. 2

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The present invention relates to a device for wicket guide stems for water turbines, pump turbines or pumps, particularly those with high heads.

In water turbines, pump turbines or pumps with wicket guides, the ring area of the cover which is between the seal against the impeller and the stay wheel and the stay wheel ring will be influenced by axial forces, which, at high heads, can be considerable. These axial forces cause rolling moments of the cover, and in hitherto known designs of same it has been necessary to use a sturdy joint to transmit these axial forces to the stay wheel, which is thereby subjected to an extra stress. In order to keep stresses and deformations within permissible limits, it has also been necessary to make the cover rigid, which has involved an increased cover height. Because of the high cover, the upper wicket guide stem must be made comparatively long, which involves certain disadvantages which, among other things, has the consequence that, as a rule, an extra guide bearing must be provided for the upper wicket guide stem.

The space between the wicket guide and the cover should be as little as possible, particularly when there are high heads, as leakage through this space results in a lower degree of efficiency of the unit and can also cause cavitation damages to the wicket guide. Attempts have been made to overcome this problem through appropriate pre-setting via the cover but, owing to the tendency of the cover to roll, it has been impossible to achieve a satisfactory seal in this way. The corresponding condition applies also to the space between the lower end of the wicket guide and the lower guide wheel ring.

The above-mentioned disadvantages are entirely eliminated by the present invention, which is mainly characterized in that wicket guides with stems have been designed to form a connecting joint between the head cover and the bottom ring. The wicket guide stems can appropriately be provided with axial bearings, and it is also possible to pre-set the wicket guide stems in such a way that the leakage through the space between the wicket guide and the cover and the bottom ring, respectively, is reduced to a minimum.

The invention will now be described in more detail with reference to a design shown in the attached figures. FIG. 1, thus shows a device for wicket guide stems for a water turbine, according to the present invention, in perspective and with certain parts cut away, while FIG. 2 shows a section of the same device.

The stay wheel, consisting of the upper and lower stay rings 1 and 2, respectively, and the stays 3 is joined by means of the bolt 4 to the turbine cover 5, which by means of labyrinth seal 6 is sealed against the impeller 7. The upper lug or stem 9 of each wicket guide or gate 8 is arranged in the turbine cover 5, and its upper end is threaded and provided with a nut 10. Under the nut 10, the wicket crank 11 is arranged, and under the wicket guide crank 11 there is an axial bearing 12. The wicket guide stem 9 is also provided with seals and guide bearings, in a conventional way. The lower wicket guide lug or stem 13 is provided in a corresponding way with a nut 14 and an axial bearing 15, and is arranged in the bottom ring 16. By placing the nuts 10 and 14 on the upper and lower wicket guide stems 9 and 13, respectively, the stems serve as connecting joints between the turbine cover 5 and the bottom ring 16. The axial forces which occur will thus be absorbed by the two axial bearings 12 and 15. This has the consequence that the stress on the stay ring is relieved, and the stays 3 can therefore be made with smaller dimensions than would have been the case with the designs hitherto applied.

The rolling moments acting upon the turbine cover 5 and the bottom ring 16 will be quite inconsiderable, and the cover 5 can therefore be dimensioned for only the membrane stresses, which means that in most cases it will be sufficient to make the cover from a plate.

Due to the thus reduced thickness of the cover, the upper wicket guide stem 9 can be made considerably shorter and much more simple than has been the case with the designs hitherto applied.

Owing to the fact that, with the present invention, the turbine cover 5 will have practically no rolling moment, very good control of the space between the wicket guide 8 and the turbine cover 5 and the bottom ring 16, respectively, is obtained, and the leakage through said spaces can be reduced to a minimum by appropriate pre-setting by means of the wicket guide stems 9 and 13.

1. In a turbine pump or pump, a head cover and a bottom ring disposed in superimposed spaced-apart relationship, a plurality of wicket gates disposed between said cover and said ring and having at each end a mounting lug, said cover and said ring including passage openings for said lugs and said lugs protruding through said openings, abutment means secured to each protruding lug portion and axial thrust bearing means interposed between each of said abutment means and the adjacent sides of said cover and said ring, respectively.

2. A turbine pump or pump according to claim 1, wherein said abutment means are lengthwise adjustable on said lug portions for pressing said head cover and said bottom ring toward each other by selectively reducing the distance between the abutment means and the cover and the ring, respectively, to reduce leakage between said wicket gates and said cover and ring, respectively.

3. A turbine pump or pump according to claim 2, wherein each of said protruding lug portions has a threaded end, and a screw member is screwed upon said threaded end to effect the aforesaid adjustment of the distance.

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