May 15, 1928.

1,669,797

O. A. WIBERG

TURBINE

Filed Oct. 20, 1926

FIG. 1.

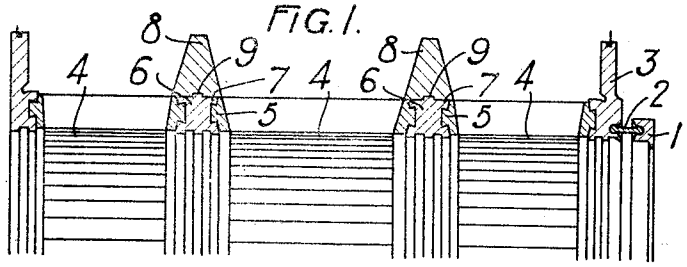


FIG. 2.

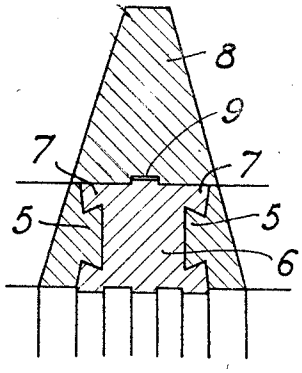


FIG. 3.

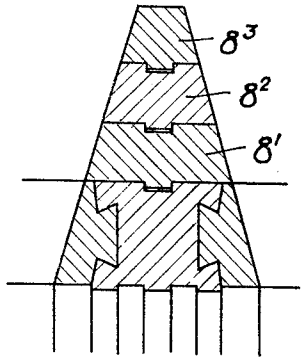


FIG. 4.

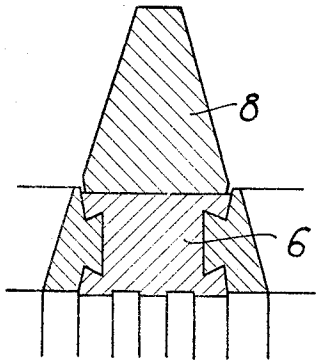
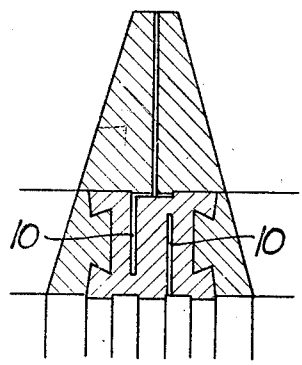


FIG. 5.



Inventor,
Oscar Anton Wiberg,
By Kenway & Jenney
Attys.

Patented May 15, 1928. 1,669,797

UNITED STATES PATENT OFFICE.

OSCAR ANTON WIBERG, OF FINSPONG, SWEDEN.

TURBINE.

Application filed October 20, 1926, Serial No. 143,009, and in Great Britain February 11, 1926.

This invention relates to radial flow turbines and more particularly to blade drums of such turbines.

With such dimensions of the outermost blade drums of radial flow turbines as are nowadays desirable those stresses on the material of the strengthening rings due to the centrifugal forces and due also to the steam pressure acting on the blades will be very high, unless the width of the strengthening rings be materially increased. As the width of the blade system is determined by the length of the outermost drum it is of the utmost importance to reduce said length as far as possible. This object cannot be obtained by merely reducing the width of the strengthening rings, as this would result in too heavy stresses on the material of the strengthening rings. A mere increase of the radial extension of the strengthening rings to allow a reduction of the width thereof would be impracticable, as edges of the strengthening rings must be free to allow the said edges to be caused to overlap the dove-tailed roots of the blades by rolling operation.

The object of this invention is to provide a method and means whereby the width of the strengthening rings may be reduced without interfering with the resistance of the ring to centrifugal forces, nor with the possibility of subjecting the edges of the ring to the rolling operation above referred to.

According to this invention an auxiliary ring is shrunk on the strengthening ring after the rolling of the latter is completed.

The invention is illustrated in the accompanying drawing.

Fig. 1 is an axial section through a blade drum according to this invention.

Fig. 2 is a similar section through one strengthening ring of said drum on a larger scale.

Figs. 3, 4 and 5 show each a section of a different type of strengthening ring.

With reference to Fig. 1, the numeral 1 denotes one of the seating rings by means of which the blade drum is secured to the turbine discs (not shown). 2 is the expansion ring connecting the respective end ring 3 of the drum to the seating ring 1. 4 is the blade system and 5 denotes the dove-tailed roots of the blades. In the embodiment shown the drum includes two inner strengthening rings 6, 6, dividing the blade system into three sections as shown. The edge portions of said strengthening rings are caused by rolling to overlap the dove-tailed roots, as shown at 7, to hold the blades in place securely.

Shrunk on each of said strengthening rings 6, 6 after said rolling operation is completed, is a ring 8, preferably tapering outwardly at the same rate as the roots of blade. To prevent the shrunk rings 8 from axial displacement relatively to the rings 6 a circumferential groove may be formed in the inner surface of the shrunk ring engaged by a corresponding rib on the surface of the strengthening ring, as shown at 9. Obviously the groove may be formed in the strengthening ring and the rib on the shrunk ring.

The shrunk ring 8 prevents positively the parts 7 of the strengthening rings from being bent outwardly under the influence of the centrifugal force, whereby the blades might otherwise become loose causing want of balance of the rotary system.

In Fig. 2 one strengthening ring of Fig. 1 with its associated roots of the blade and shrunk ring is shown to a larger scale.

According to Fig. 3, the shrunk ring is composed of three concentric parts 8^1, 8^2, 8^3, surrounding each other in succession. It is evident, however, that two parts only or more than three parts may be used.

Fig. 4 illustrates a modified method of holding the shrunk ring against axial displacement. In this case those surfaces of the shrunk ring 8 and the strengthening ring 6 bearing against each other are both smooth and the shrunk ring is held in place by engaging a groove formed by using a strengthening ring of a smaller outer diameter than that of the roots of the blade.

According to Fig. 5 the shrunk ring is slit radially and the strengthening ring is formed with radial circumferential slots 10 in order to render the blade drum flexible.

What I claim is:

1. In a blade drum for radial flow turbines axially extending blades divided in sections in their longitudinal directions, rings to connect said sections to each other, and auxiliary rings shrunk on said first-mentioned rings.

2. In a blade drum for radial flow turbines, axially extending blades divided in sections in their longitudinal direction, strengthening rings inserted between the various sections to interconnect them, auxiliary rings shrunk on said strengthening rings, and means to prevent axial displace-

ment of said shrunk rings to their respective strengthening rings.

3. In a blade drum for radial flow turbines, axially extending blades divided in sections in their longitudinal direction, strengthening rings inserted between the various sections to interconnect them, auxiliary rings shrunk on said strengthening rings, and cooperating grooves and ribs formed on those surfaces of the shrunk and strengthening rings bearing against each other.

4. In a blade drum for radial flow turbines, axially extending blades divided in sections in their longitudinal direction, strengthening rings interconnecting said sections, dovetail grooves in the sides of said rings engaged by ribs on the blades of the respective sections, and auxiliary rings shrunk on said strengthening rings.

In testimony whereof I have signed my name.

OSCAR ANTON WIBERG.