April 16, 1940. J. C. BOHAN 2,197,334

TURBINE APPARATUS

Filed Sept. 14, 1938

FIG. 1.

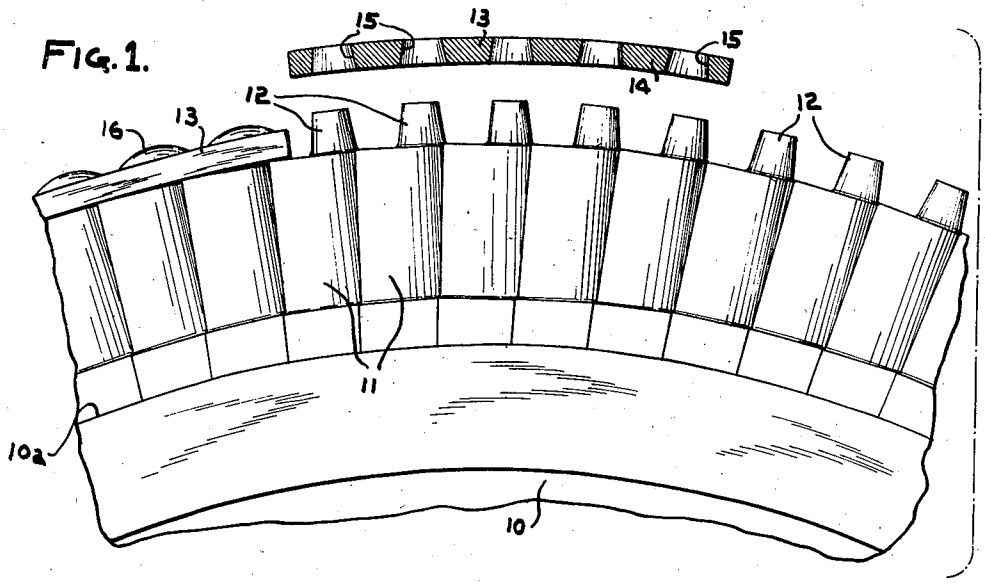
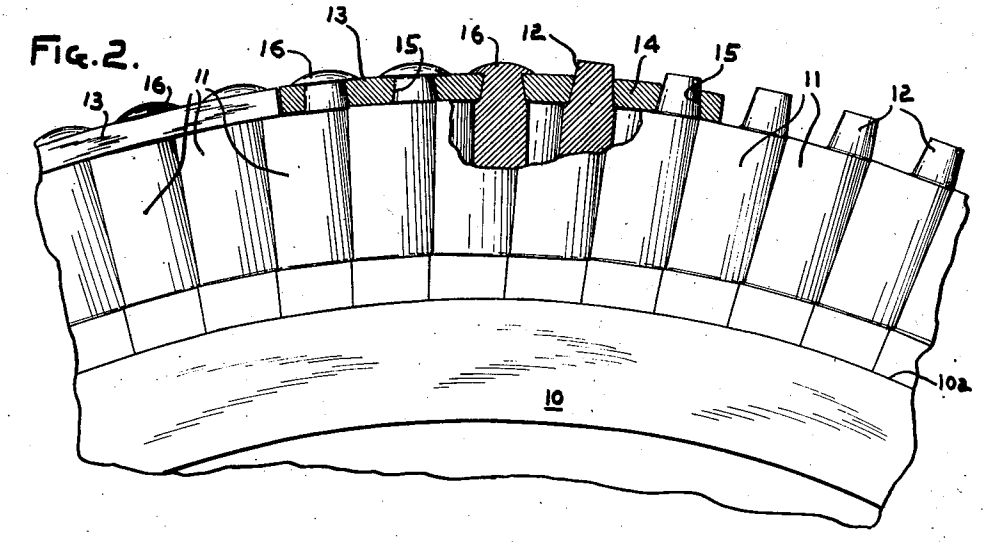


FIG. 2.



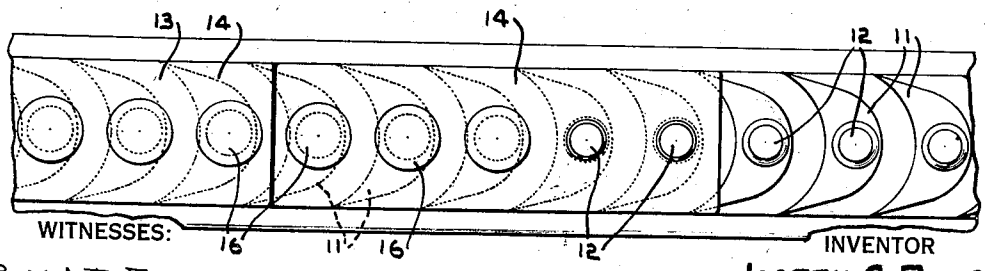


FIG. 3.

WITNESSES:

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TURBINE APPARATUS

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3 Claims. (Cl. 253—77)

My invention relates to shrouded turbine blading and it has for an object to provide a tenon and shroud connection permitting of the use of a relatively thick shroud.

A further object of my invention is to provide blades with tenons which are tapered radially outward to receive a shroud strip having tapered openings formed to fit the tenons, the strip having such arcuate length that planes normal to the plane of rotation and tangent to the outer sides of the outer openings are parallel or converge outwardly with the result that, irrespective of shroud thickness, the tenon openings may be formed to fit the tenons and to permit assembly without interference.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawing forming a part of this application, in which:

Fig. 1 is an exploded view, in side elevation and partially in section, of the invention;

Fig. 2 is a side elevational view, partially in section, showing a shroud strip partially connected in assembled relation to its blade; and,

Fig. 3 is a top plan view of the structure shown in Fig. 2.

Referring now to the drawing more in detail there is shown, at 10, an inner supporting member having an arcuate outer periphery 10*a*, from which periphery a plurality of turbine blades or brackets 11 extend radially outward. These blades may be attached to the supporting member 10 in any well known manner.

The outer free ends of the blades are provided with radially outwardly extending tenons 12 concentrically tapered towards their outer ends. The outer ends of the blades are braced by means of a relatively thick shroud ring 13 comprised by segments 14 having openings 15 therein for the reception of the blade tenons 12. These tenons are tapered outwardly towards the ends and the openings 15 of the shroud segments 14 are complementally tapered to provide for a relatively close fit of the tenons in the openings.

In the arrangement shown in the drawing, each shroud ring segment is associated with a group of five blades, the cord of the segments having an angle of approximately 14 degrees. Each blade tenon has an included angle of taper of 14 degrees, corresponding to the angle of the cord of the segments. Expressed another way, the outermost walls of the outer openings of each shroud segment are substantially parallel, whereby the shroud ring segments may be readily assembled on the tenons with the latter filling the openings and without interference. If the shroud ring segments should be of such length as to include a greater number of blades, defining a greater angle, then the tenons will have an included angle of taper corresponding to this greater angle.

Preferably, the tenons are of such length as to extend beyond the outer peripheral surface of the shroud ring so that the excess material projecting therebeyond may be deformed, as by peening or spinning, to provide heads 16 securely retaining the blades and shroud ring in assembled relation.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In a turbine, a supporting member having an arcuate periphery, blades extending radially outwardly from the periphery of said supporting member, tenons extending radially outwardly from the outer ends of the blades and a relatively thick segmental shroud ring having holes for passage therethrough of the tenons, said tenons being concentrically tapered towards their outer ends and the holes in the shroud ring being complementally tapered, the included angle of taper of each tenon being not less than the angle of the cord of the segments, whereby the shroud ring segments may be freely assembled on the radially extending tenons.

2. In a turbine, a supporting member having an arcuate periphery, blades extending radially outwardly from the periphery of said supporting member, tenons extending radially outwardly from the outer ends of the blades and a relatively thick segmental shroud ring having holes for passage therethrough of the tenons, said tenons being concentrically tapered towards their outer ends and the holes in the shroud ring being complementally tapered, the included angle of taper of each tenon being not less than the angle of the cord of the segments and the outer ends of the tenons extending beyond the outer surface of the shroud ring and being peened over thereagainst.

3. In a turbine, a supporting member having

an arcuate periphery, blades extending radially outwardly from the periphery of said supporting member, tenons extending radially outwardly from the outer ends of the blades and a relatively thick segmental shroud ring having openings for passage therethrough of the tenons, said tenons being concentrically tapered towards their outer ends and the openings in the shroud ring segments being complementally tapered, the taper being of such degree that the two endmost walls of the openings of each segment are substantially parallel, whereby the shroud ring segments may be freely assembled on the tenons by purely rectilinear movement.

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