

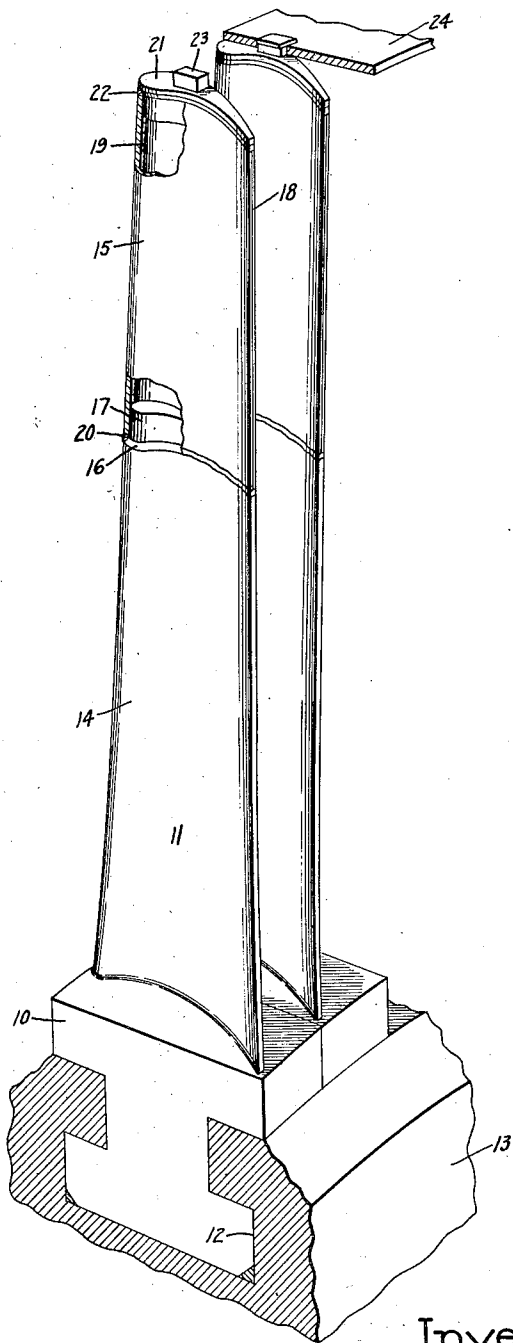
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TURBINE BUCKET

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TURBINE BUCKET

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The present invention relates to buckets for elastic fluid turbines usually comprising a base and a blade having an elongated form and, broadly speaking, a crescent-shaped cross-section decreasing in area from its inner to its outer end. In the design of long buckets for the last stage or stages of elastic fluid turbines attention must be paid to the high centrifugal forces to which the buckets are subjected, and also to the wear, corrosion and erosion of the bucket-material caused by wet steam. Owing to the fact that the wet steam flows mainly through the outer region of the turbine, the outer portions of the buckets are subjected more to the injurious effects of wet steam or like elastic fluid than the inner portions.

The object of my invention is to provide an improved construction for buckets whereby the injurious effect of wet steam or the like on the outer blade portions as well as the great centrifugal forces acting on said outer portions are considerably reduced.

For a consideration of what I believe to be novel and my invention, attention is directed to the following description and the claims appended thereto in connection with the accompanying drawing.

In the drawing I have shown a perspective view, partly broken away, of two buckets embodying my invention.

Each bucket comprises a base 10 and a blade 11. The base is dovetail shaped and held in a groove 12 of a rim or disk 13. In accordance with my invention I make the blade of two portions, an inner portion 14 and an outer portion 15. The inner portion 14 is solid or massive and integrally formed with the base 10 and made of forged or rolled steel or alloy. The outer end of the inner portion 14 is reduced in cross section to form a shoulder 16 and a projection 17.

The outer portion 15 is hollow and made of an extremely hard material with high resistivity against wear by steam or like elastic fluid. Preferably I make the outer portion from a material generally known as "Stellite" which is a composition of 34-75% cobalt, 13-36% chromium and 5-40% of tungsten and/or molybdenum. Stellite sheet metal is pressed or punched in two parts welded together at their edges 18 and 19. The lower end of the outer portion 15 telescopes the projection 17 and is seated against the shoulder 16 of the inner portion. The two portions are welded or brazed together as indicated by a weld 20. A plug 21 is inserted in the outer end of the hollow portion 15 and fastened thereto by a weld 22. The plug has a projection 23 to be inserted into a shroud band 24 for holding the outer ends of a plurality of buckets together.

My improved bucket has two important advantages, namely, first, its outer portion is light, thereby reducing the centrifugal forces transferred from the outer portion to the inner portion to a minimum, permitting the inner portion to be made with a smaller cross-section than necessary were the outer portion solid or massive; and second, the outer portion being made of Stellite or like material is little affected by wet steam. The manufacture of the outer portion by pressing a sheet of Stellite over a die having the shape of the hole defined by the finished outer portion is very simple and less expensive than the manufacture of a solid portion. The light outer portion of the blade permits the use of a larger blade which by decreasing the velocity loss of the steam or like elastic fluid from the last wheel will cause an increase in efficiency of the turbine. Also, if the efficiency is kept constant, the capacity of a turbine can be increased for a given speed. This permits the cost per kilowatt of a turbine to be decreased, as the last wheel, in general, determines the limitation in the capacity for a given speed.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A turbine bucket having a blade comprising an inner solid portion having a reduced outer end forming a shoulder and an outer hollow portion made from sheet metal and welded to the reduced end of the inner portion, the outer surface of the outer portion forming a smooth continuation of the outer surface of the inner portion.

2. A turbine bucket having a blade comprising an inner solid portion made from steel and having a reduced outer end forming a shoulder, and an outer hollow portion made from a sheet material harder than steel telescoping the reduced end of the inner portion and being united therewith, the outer surface of the outer portion forming a smooth continuation of the outer surface of the inner portion.

3. A turbine bucket having a base and a blade, the blade comprising an inner solid portion integrally formed with the base, the outer end of the inner portion being reduced to define a shoulder, and an outer hollow portion made of sheet metal with a resistivity against corrosion greater than the resistivity of the material forming the inner portion, the inner end of the outer portion facing the shoulder defined by the reduced outer end of the inner portion and being united therewith, the outer surface of the outer portion forming a smooth continuation of the outer surface of the inner portion.

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