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F. HODGKINSON
ELASTIC FLUID TURBINE
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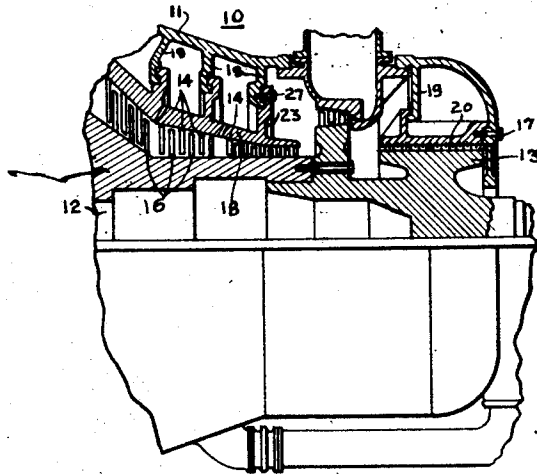


Fig. 1.

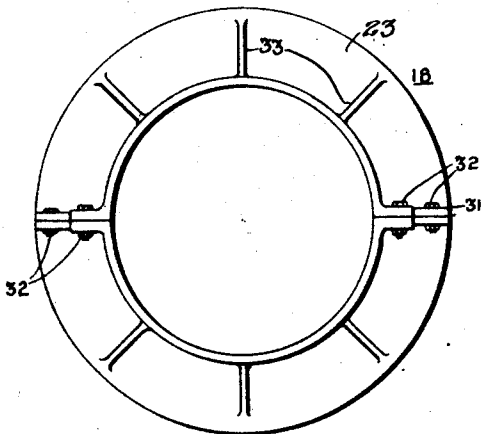


Fig. 2.

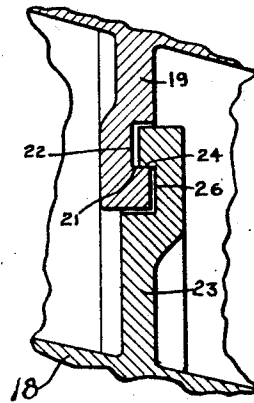


Fig. 3.

WITNESSES:
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ELASTIC-FLUID TURBINE.

Application filed December 27, 1924. Serial No. 758,403.

My invention relates to elastic-fluid turbines, more particularly to the stationary blade-carrying elements thereof, and it has for its object the provision of apparatus of the character designated which shall, when subjected to varying temperature conditions in service, retain its proper shape and position relative to other parts of the turbine.

Apparatus embodying features of my invention is illustrated in the accompanying drawing, forming a part of this specification in which Fig. 1 is a fragmentary longitudinal sectional view taken through a turbine having my improved blade-carrying ring applied thereto; Fig. 2 is an end elevation of one of the rings with the blading removed, and Fig. 3 is an enlarged sectional view showing the means of attaching the ring to the turbine casing.

Heretofore, the stationary blade-carrying elements of a turbine, as known to me, have been in the form of rings with a turned outer surface fitting into a complementary bore in the cylinder. In order to allow for unequal rates of expansion of the blade ring and cylinder, it has been found necessary to have some clearance therebetween. In such a construction, where any rubbing occurs between the stationary and the moving elements of the turbine, causing local heating, the blade ring has a tendency to go out of round, assuming a distorted shape and causing further rubbing of the parts and disturbances to the operation of the turbine.

In accordance with my invention, I provide the blade-carrying element with a bore and the supporting cylinder with a turned portion, the bore of the blade-carrying element overhanging and snugly fitting the turned portion of the support. With this construction, while the blade-carrying element may expand outwardly, it is prevented from moving inwardly by the turned portion of the support. Rubbing between the rotor of the turbine and the stationary blades is thus prevented or at least the whole cylinder structure must be deformed before any portion of the blade ring can move inwardly.

Referring now to the drawing for a better understanding of my invention, I show, at 10, a turbine having a casing 11, a rotor 12 and a dummy piston 13. At 14-14, I show rows of stationary blades and at 16-16, rows of moving blades. At 17 are

shown labyrinth packing elements carried by the dummy piston 13 and similar cooperating elements carried by one of my stationary blade-carrying rings 20, said rings being suitable for carrying either the labyrinth packing elements or the stationary blades 14-14. Hereinafter, in this specification and in the claims, it is to be understood that the term "stationary blade-carrying ring" is intended to include a ring for carrying either the stationary blades of the turbine or the labyrinth packing elements.

The stationary blade-carrying ring 18 is supported from the casing by means of inwardly extending web members 19, a plurality of said members projecting from the casing for supporting the ring 18, and a single web member 19 being provided for supporting one end of the ring 20 carrying the labyrinth packing elements 17. Each of the web members 19 is turned so as to form an outwardly facing shoulder 21 near its inner circumference, the shoulder 21 forming the support for the blade-carrying rings 18 and 20. The blade-carrying ring 18 is provided with a suitable number of outwardly-extending flange or web members 23, each being bored to form an inwardly facing shoulder 24 near its outer periphery. The shoulder 24 of the blade-carrying ring 18 overhangs the shoulder 21, turned on the web member 19 of the casing 11. The shoulders 21 on the web members 19 supporting the stationary blade-carrying ring may be so formed as to provide a groove as at 22 adjoining the shoulder 21 and into which the shoulder 24 of the web members 23 fits. The shoulder 24 on the web members 23 may also be so formed as to provide a groove 26 adjoining the shoulder 24 and into which the shoulder 21 fits. Thus the grooves and shoulders of the cooperating web members form telescopic or interlocking fits. It will be seen from the drawing that the shoulder 24 of the blade-carrying ring is narrower than the groove 22 of the casing web member 19 and that the shoulder 21 of the casing web member 19 is narrower than the groove 26 on the blade-carrying web or flange-member 23. Thus when the turbine is in operation and the blade-carrying ring for any reason expands at a relatively greater rate than the casing, it is free to move outwardly by the amount of

clearance between the shoulders and the grooves. If, however, the blade-carrying ring 18 should become cooler than the casing and thus tend to contract or distort from any other cause and cause a rubbing between the stationary and the moving blades, its contraction is resisted by the strength of the casing, due to the interlocking fit of the shoulder 24 in the groove 22. This feature of my invention prevents the stationary blades 14—14 from contacting and rubbing against the rotor 12 as well as preventing the moving blades 16—16 from contacting and rubbing against the ring 18. At 27 I show means for securing one pair of cooperating flange or web members together such as by a stud or bolt. For example, in the drawing, I show the securing means 27 in the form of a tap bolt; and, in order that the blade-carrying elements or ring may expand freely, I show suitable clearance for this purpose.

The ring 18 is preferably made in halves with flange joints 31—31 and held together by means of bolts 32—32. I also show the rings provided with a plurality of radial reinforcing webs 33—33 in order to give them greater strength.

From the foregoing description, it will be seen that the blade-carrying rings or elements may be placed in position with respect to or removed from the inwardly-extending webs of the casing by axial movement of the blade-carrying rings or elements.

From the foregoing, it will be apparent that I have invented an improved stationary blade-carrying ring which, while permitting a limited amount of radial and axial expansion, prevents a distortion of the ring, or a contraction thereof beyond safe limits under varying temperature conditions when in operation.

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 other 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, the combination of a casing provided with an annular shoulder having an outwardly facing cylindrical surface and a blade-carrying element provided with an annular shoulder having an inwardly facing cylindrical surface engaging over the first cylindrical surface, said cylindrical surface each being of substantially uniform radius throughout and said shoulders being so formed that the blade carrying element may have its shoulder brought into position and removed from the casing shoulder by axial movement of the blade-carrying element.

2. In a turbine, the combination of a casing having an inwardly extending web portion provided with an annular shoulder having an outwardly facing cylindrical surface and an axially elongated blade-carrying element having an outwardly extending web portion provided with an annular shoulder having an inwardly facing cylindrical surface engaging the first-mentioned cylindrical surface, said cylindrical surfaces being each of substantially uniform radius throughout and said shoulders being so formed that the blade-carrying element shoulder may be brought into position and removed with respect to the casing shoulder by axial movement of the blade-carrying element.

In testimony whereof, I have hereunto subscribed my name this ninth day of December, 1924.

FRANCIS HODGKINSON.