Feb. 18, 1930. R. C. ALLEN 1,747,690

BLADE LASHING

Filed Dec. 15, 1927

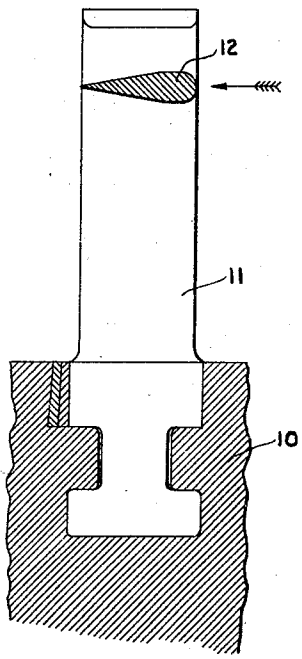


Fig. 1.

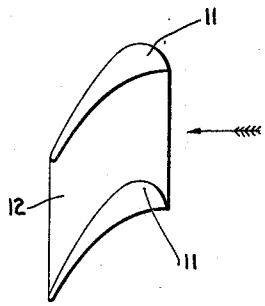


Fig. 2.

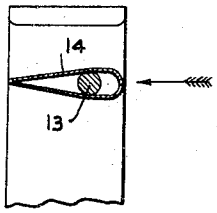


Fig. 3.

WITNESS
E. Lutz.

INVENTOR
R.C.Allen

BY A. B. Reavis
ATTORNEY

Patented Feb. 18, 1930 1,747,690

UNITED STATES PATENT OFFICE

ROBERT C. ALLEN, OF SWARTHMORE, PENNSYLVANIA, ASSIGNOR TO WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, A CORPORATION OF PENNSYLVANIA

BLADE LASHING

Application filed December 15, 1927. Serial No. 240,263.

My invention relates to elastic fluid turbines, and more particularly to the blade lashing for such turbines, and it has for an object to improve the construction of apparatus of this character.

As the blade lashing in a turbine is disposed directly in the path of fluid flow, it is advantageous to have a lashing which offers as little resistance to fluid flow as possible. The lashing should also be as light in weight as is consistent with the requisite strength and rigidity, and for this reason, when lashing wires are used, they are usually circular in section. Furthermore, it is much simpler to make round holes in the blades than to cut a hole of some other shape. On the other hand, where the lashing consists of a series of relatively rigid spacing pieces placed between the blades it is equally advantageous to have a lashing possessing the proper physical characteristics and which also offers minimum resistance to fluid flow.

More particularly, therefore, an object of my invention is to provide a lashing which shall possess the requisite physical characteristics and shall be simple and inexpensive to manufacture and assemble and shall also offer minimum resistance to fluid flow.

Apparatus embodying the features of my invention is shown in the accompanying drawings, forming a part of this specification; and wherein,

Fig. 1 is a sectional elevation of a portion of a turbine rotor and showing the blading therein;

Fig. 2 is a developed plan of the blading shown in Fig. 1; and,

Fig. 3 is a fragmentary elevation of a turbine blade, showing another form of lashing in section.

In each of the figures, the direction of fluid flow is indicated by the arrow.

In Fig. 1, I show a turbine rotor 10 having a suitable blade 11 mounted therein in any approved manner. I also provide a lashing comprising spacing pieces 12, which are substantially ichthyoidal in section.

As is clearly shown in Fig. 2, the lashing pieces 12 extend circumferentially of the rotor and substantially for the width of the blades to which the pieces 12 may be secured by fusion of metal, as for example by brazing, welding or by means of silver solder, but preferably by the latter means.

Inasmuch as a lashing having substantially an ichthyoidal section, as shown, offers approximately one eighth the resistance to fluid flow that is offered by a circular section whose diameter equals the least thickness of the ichthyoidal section, it will readily be seen that a considerable improvement in efficiency can be effected by using a lashing of this type. Also, by designing the pieces 12 so that they present an ichthyoidal section which extends in the direction of fluid flow for the full width of the turbine blade, it is possible to more nearly approximate the form of least resistance as found by laboratory experiments.

In Fig. 3, I show a modified form of my invention in which, instead of the pieces 12, I pass a flexible element, such as the lashing wire 13, through the blades, this wire being secured to the blades in any approved manner, preferably, however, by silver solder. The wire 13 may be of circular section as shown, and in order to reduce the resistance offered by this wire it is enclosed in a tubular member 14 having substantially the same shape and dimensions as the ichthyoidal pieces 12 described with reference to Figs. 1 and 2.

The tubular members 14 may be made by cutting a circular tube into pieces of the proper length to fit between the blades and then flattening these tubular sections to obtain the ichthyoidal shape. The tubular pieces 14 may be assembled upon the wire 13 and secured thereto in their proper positions by means of silver solder, or the like.

In this form of my invention it will be observed that all the advantages of using a circular lashing wire are obtained without the disadvantage of the relatively large resistance to flow which is offered by the circular section.

While I have shown my invention in two forms, 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. The combination with the blading of an elastic fluid turbine, of a lashing therefor comprising a flexible lashing element extending through the blades and fastened thereto and thin walled tubular members disposed between the blades and enclosing portions of the lashing element therebetween, the tubular members being ichthyoidal in section and extending in the direction of fluid flow entirely across the width of the blades, the entrance side of the lashing being a smooth, uninterrupted surface.

2. The combination with the blading of an elastic fluid turbine, of a lashing therefor comprising a flexible lashing element extending through the blades and fastened thereto and thin walled tubular members disposed between the blades and enclosing portions of the lashing element therebetween, the tubular members being ichthyoidal in section and extending in the direction of fluid flow entirely across the width of the blades, the maximum dimension of the tubular members in a direction normal to the fluid flow being the minimum distance which will permit the lashing element to pass through the tubular members, the entrance side of the lashing being a smooth, uninterrupted surface.

In testimony whereof, I have hereunto subscribed my name this 8th day of Dec., 1927.

ROBERT C. ALLEN.