March 4, 1930. H. R. STEVENSON 1,749,449

TURBINE BLADING AND LASHING THEREFOR

Filed June 6, 1928

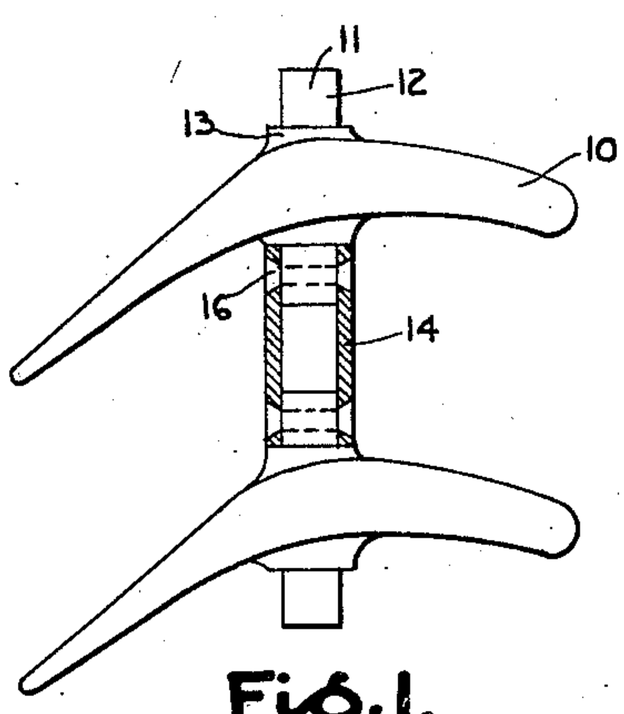

Fig. 1.

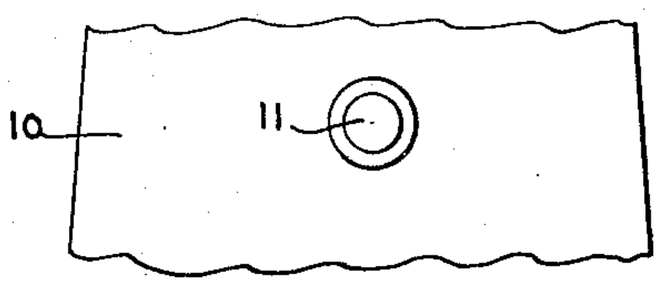

Fig. 2.

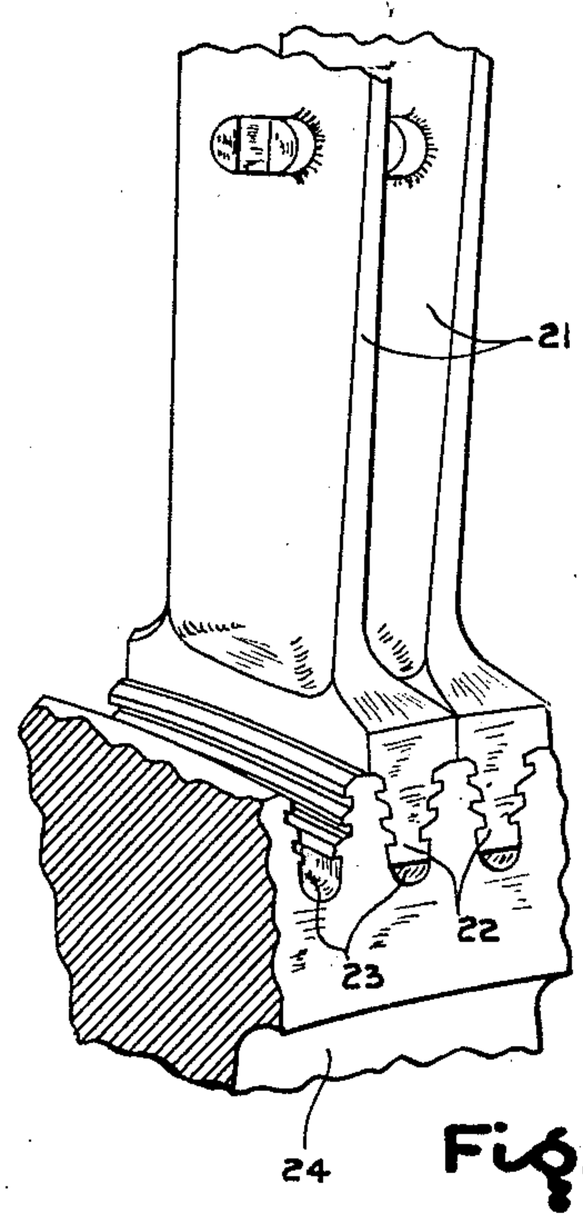

Fig. 3.

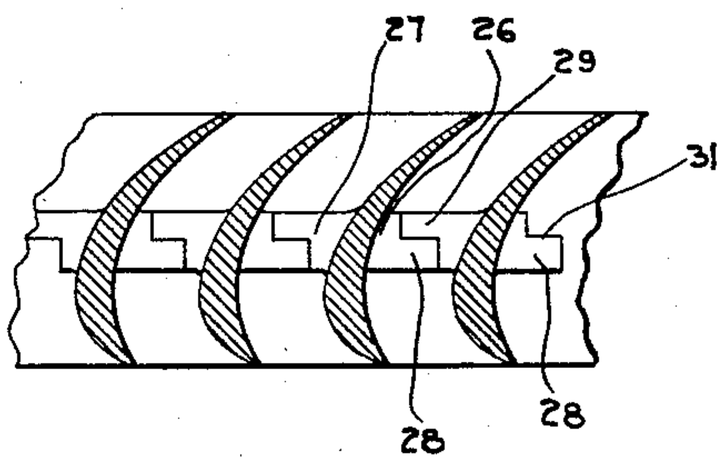

Fig. 4.

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UNITED STATES PATENT OFFICE

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TURBINE BLADING AND LASHING THEREFOR

Application filed June 6, 1928. Serial No. 283,345.

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

In the construction of elastic fluid turbines it has been customary to provide holes in the blades through, or into which the lashing or bracing members have been inserted. These holes tend to weaken the blades and where blade failures occur, it is not uncommon to find the blades broken through these holes.

A more specific object of this invention, therefore, is to provide turbine blading which shall be free from holes or other recesses such as are usually provided for lashing or bracing members and, at the same time, to make ample provision for properly securing lashing, or bracing members to the blades and thus, to obtain stronger and more durable blading.

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

Fig. 1 is a plan view of turbine blading, showing the lashing element in section for purposes of illustration;

Fig. 2 is a partial front elevation of the blading shown in Fig. 1;

Fig. 3 is a perspective view of another type of turbine blading; and,

Fig. 4 is a plan view of the blading shown in Fig. 3.

In accordance with my invention, both faces of a turbine blade are provided with projections which, preferably, are circumferentially aligned, and these projections are then secured together, either directly as by soldering, welding, riveting or the like, or a spacing element is secured to these projections in any approved manner. In this way, a blade lashing may be provided without weakening the blades by means of holes, or other recesses, which have heretofore been considered necessary.

In Figs. 1 and 2 of the drawings, I show the turbine blades 10, provided with projections 11, which are, preferably, in alignment circumferentially of the rotor and which have their outer end portions 12 reduced to provide a shoulder 13 adjacent the blade. In the form of my invention shown in these figures, a tubular spacing member 14 is fitted over the reduced end portions 12 of the projections 11 and against the shoulders 13. This tubular member 14 may be secured by soldering, brazing, welding or the like, but preferably, is secured to these projections by means of the rivets 16, which extend transversely through the tubular member and through the projections. In this way, it is possible to provide a lashing which is simple and inexpensive to construct and has the requisite physical characteristics and at the same time does not weaken the blades. A form of lashing similar to the conventional wire lashing is thus produced; that is, a lashing of small cross-section, spaced from the ends of the blades and located intermediate the inlet and outlet edges thereof.

The form of my invention shown in Figs. 3 and 4, while suited to any type of blading, is particularly adapted to the side entry type of blades, such as shown in Fig. 3. In this view, it will be noted that the blades 21 are provided with root portions 22, which fit in transversely extending grooves 23 in the turbine disc 24.

Projections 26 and 27, as shown in Fig. 4, are formed on the front and back faces of the blades, respectively, and are, preferably, circumferentially aligned with respect to the rotor, the same as the projections shown in Figs. 1 and 2. The projections 26 and 27 preferably have their end portions arranged to interfit in some suitable manner, as for example, by means of a tongue and groove joint, or by means of the overlapping connection as shown in Fig. 4. This overlapping connection is formed merely by removing a portion of the outer end of one of the projections and the converse portion of the outer end of the opposite projection, so as to form the complementary tongues 28 and 29 which may be soldered along the joint 31.

From the construction shown in Fig. 4, it

will be obvious that these blades may be inserted, one at a time, in transverse grooves in a rotor and then connected, as for example, by inserting the blade carrying the tongue 29 in the rotor 24 from the right, in Fig. 3 and then inserting the blade-carrying tongue 28 from the same side of the rotor.

It will be quite apparent that I have provided a relatively simple and inexpensive and yet very efficient form of blade-lashing which does not require that the blades be weakened by holes or other recesses in order to provide for the lashing, and furthermore, while I have shown my invention as embodied in a lashing element, it will be quite obvious that my invention is not so limited, but that it may also be embodied in a manner similar to that just described in a system of bracing for turbine blades.

While I have shown my invention in several 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. In a turbine, a plurality of imperforate blades in a row, lashing means comprising a plurality of lashing elements interposed between adjacent blades, said lashing elements being located intermediate the inlet and outlet edges and spaced from the ends of the blades, the outer terminal portions of the lashing elements being integral with the adjacent blades, and means for securing the lashing elements together between the blades.

2. In a turbine, a plurality of blades in a row, projections on the blades and integral therewith, and a tubular member secured to adjacent projections to form a lashing element.

3. In a turbine, a plurality of blades in a row, projections integral with the blades and located intermediate of the inlet and outlet edges and spaced from the ends thereof, and means connecting the projections to form a lashing element.

4. In a turbine, a plurality of blades in a row, projections integral with the faces of the blades and substantially in alignment circumferentially of the rotor, said projections being located intermediate the inlet and outlet and outlet edges and spaced from the ends of the blades, and means connecting the projections to form a lashing.

5. In a turbine, a plurality of blades in a row, projections integral with the faces of the blades and intermediate of the inlet and outlet edges thereof, and a tubular member secured to adjacent projections to form a lashing element.

6. In a turbine, a plurality of blades in a row, projections integral with the faces of the blades and having their outer ends reduced to provide a shoulder adjacent the blade, a tubular member fitting over the reduced portions of adjacent projections and substantially abutting the shoulders on said projections, and means for securing the tubular member to said projections.

7. In a turbine, a plurality of blades in a row, projections integral with the faces of the blades, each projection having its outer end portion reduced to provide a shoulder adjacent the blade, a tubular member fitting over the reduced end portions of adjacent projections and substantially abutting the shoulders on said projections, and a rivet extending transversely through the reduced end portion of each projection and through the tubular member for securing the tubular member to the projections.

In testimony whereof, I have hereunto subscribed my name this 29th day of May, 1928.

HOWARD R. STEVENSON.