Nov. 20, 1956 L. J. WEYMOUTH, JR 2,771,267

LACING FOR COMPRESSOR BLADES

Filed May 27, 1952

FIG. 2

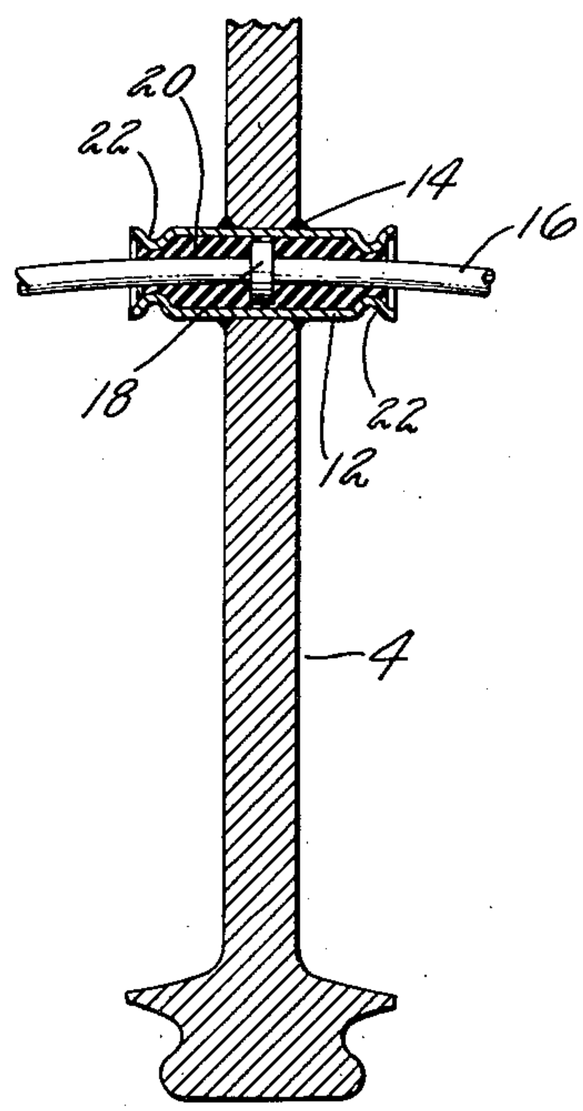
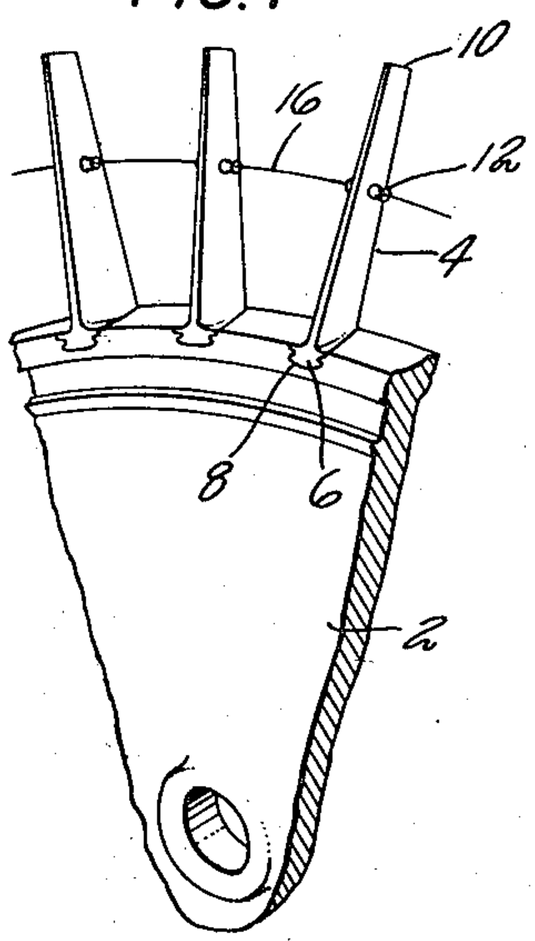


FIG. 1



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LACING FOR COMPRESSOR BLADES

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10 Claims. (Cl. 253—77)

The present invention relates to a vibration damping means for blading and is particularly applicable to blades in axial flow compressors.

One feature of the invention is an arrangement of damping means which extends between adjacent blades in a rotor disc and is located between the tips of the blades and the roots to effect a damping action other than at the tip or the root. Another feature of the invention is an arrangement of a lacing wire extending through a number of blades on the periphery of the disc and connected to each blade through a damping medium thereby to effect a damping action for each of the blades individually.

More specifically, one feature of the invention is a lacing wire having an enlarged portion at each compressor blade which is receivable in a tube fixed to the blade with a damping medium within the tube for restricting the movement of the wire within the tube.

Other objects and advantages will be apparent from the specification and claims, and from the accompanying drawings which illustrate an embodiment of the invention.

Fig. 1 is a fragmentary perspective view of a rotor disc having a number of blades on its periphery with the damping means applied thereto.

Fig. 2 is a sectional view through one of the blades showing the damping arrangement in greater detail.

The hub **2** which is shown as a hub for use in an axial flow compressor has a number of blades **4** projecting radially outward from its periphery, the blade being secured in place by blade roots **6** received in slots **8** extending in an axial direction through the hub at its periphery. The blades are angularly spaced apart on the hub as will be apparent. The hub with the blades thereon form a disc which may be one of several in a multistage rotor.

Each of the blades has positioned therein, at a point between the tip **10** of the blade and the root and preferably substantially midway of the blade length, a tube **12** which is permanently attached to the blade as by soldering or welding **14**, Fig. 2. The tube extends in a circumferential direction and is open at both ends as shown to permit the insertion of a lacing rod or wire **16** which extends through a number of adjacent blades on the periphery and preferably is a continuous wire extending entirely around the disc. The lacing wire has a number of integral piston elements **18** which are spaced apart to correspond to the spacing of the blades. These piston elements are received within the tubes **12** as shown in Fig. 2 with the elements preferably midway of the length of the tubes. The piston elements **18** are a loose fit within the tube and are resiliently supported against circumferential movement within the tube by elastic damping material **20** such as rubber or a similar damping compound which may be bonded to the sides of the piston element **18** and to the tube. The ends of the tube may be crimped as shown at **22** in order to retain the damping material more securely within the tube.

With this arrangement it will be apparent that vibration of any individual blade will be effectively damped by the damping material since the attempt of any blade to move circumferentially will tend to cause a movement of the tube with respect to the piston element with the damping material resiliently resisting this movement.

It is to be understood that the invention is not limited to the specific embodiment herein illustrated and described, but may be used in other ways without departure from its spirit as defined by the following claims.

I claim:

1. A compressor rotor having a hub with slots in its periphery and a number of radially extending blades surrounding the hub, the blades having root portions at one end fitting within the slots, in combination with a wire extending between adjacent blades between the tips of the blades and the roots and rubber damping means between and connecting said wire and blades and bonded to the wire and blades.

2. A compressor rotor having a hub with slots in its periphery and a number of radially extending blades surrounding the hub, the blades having root portions at one end fitting within the slots, in combination with damping means extending between adjacent blades between the tips of the blades and the roots, said damping means including a wire extending through several of the blades in a circumferential direction and rubber damping means connecting the wire to the blades and bonded to the wire.

3. A compressor rotor having a hub with slots in its periphery and a number of radially extending blades surrounding the hub, the blades having root portions at one end fitting within the slots, in combination with damping means extending between adjacent blades between the tips of the blades and the roots, said damping means including a wire extending through several of the blades in a circumferential direction, a tube fixed within each blade and receiving the wire, and rubber damping means within the tubes and surrounding the wire, said damping means being secured to the wire and to each of the tubes.

4. A rotor having a hub and a plurality of blades extending radially outward from the hub, each of said blades having a tube extending circumferentially therethrough and secured against movement therein, a lacing wire extending circumferentially of the rotor and through several of the tubes, and rubber damping means within each tube and surrounding the wire, said damping means being secured to said wire and tubes and thereby providing a damping connection between the wire and each of said tubes.

5. A rotor having a hub and a plurality of blades extending radially outward from the hub, each of said blades having a tube extending circumferentially therethrough and secured against movement therein, a lacing wire extending circumferentially through several of the tubes, said wire having piston elements thereon at each blade fitting within the adjacent tube, and an elastic damping means secured in each tube and providing an elastic connection from each piston element to the associated tube to damp the circumferential movement of each blade with respect to the piston element associated therewith.

6. A rotor having a hub and a plurality of blades extending radially outward from the hub, each of said blades having a tube extending circumferentially therethrough between the ends of the blade, said tube being secured in said blade, a lacing wire extending circumferentially of the rotor and through said tubes, said wire having enlargements thereon fitting in said tubes and movable therein, and an elastic damping means secured within each of said tubes at each side of the enlargement.

7. A rotor having a hub and a plurality of blades extending radially outward from the hub, each of said blades

having a tube extending circumferentially therethrough between the ends of the blade, said tube being secured in said blade, a lacing wire extending circumferentially of the rotor and through said tubes, said wire having enlargements thereon fitting in said tubes and movable therein, and an elastic damping means secured within each of said tubes at each side of the enlargement, the ends of the tubes being crimped to retain the damping material in position.

8. A rotor having a hub with slots in its periphery and a number of radially extending blades surrounding the hub, the blades having root portions at one end fitting within the slots, in combination with a tube extending through each of at least two adjacent blades, a wire extending between said blades and into said tubes, the wire having an enlargement thereon located within each tube, and elastic damping means positioned within each both said tube and enlargement, said damping means tube and surrounding the enlargement and connected to providing an elastic connection from the wire to each tube.

9. A compressor rotor including a hub and blades extending in a row radially outward from the hub, in combination with a wire extending circumferentially between adjacent blades and spaced radially outward from the hub, and rubber damping means between and connecting said wire and blades and bonded to the wire and blades.

10. A compressor rotor including a hub and blades extending in a row radially outward from the hub, in combination with a wire extending through several of the blades in a circumferential direction and spaced radially outward from the hub, and rubber damping means connecting the wire to the blades and bonded to the wire.

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