# United States Patent [19]

**Carroll**

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[54] **BLADE DISC STRUCTURE FOR TURBOMACHINES**


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[52] **U.S. Cl.** ..... **416/174,** 416/221, 416/198

[51] **Int. Cl.** ..... **F01d 5/32**

[58] **Field of Search** ..... 416/174, 220, 221, 416/218, 198, 200, 201; 415/169, 171, 172



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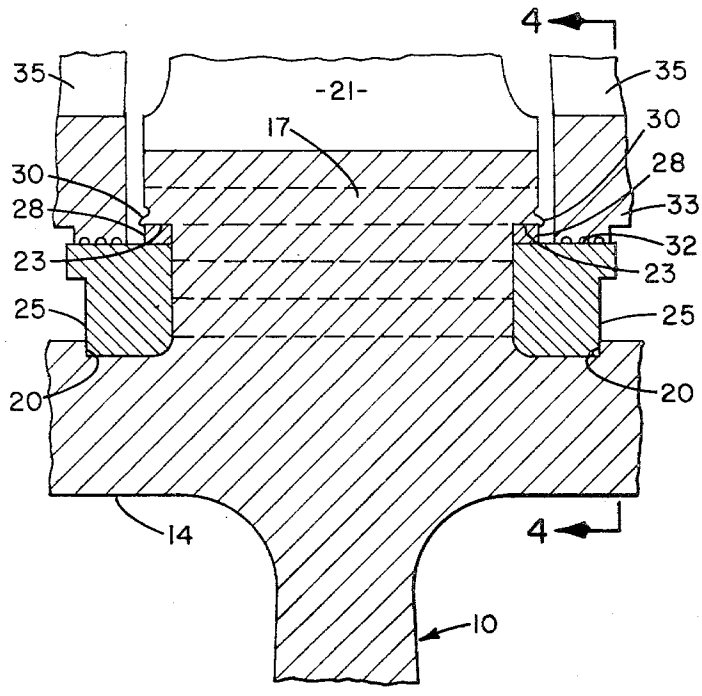
*Attorney*—Harry G. Martin, Jr. and J. Raymond Curtin



[57] **ABSTRACT**

The invention has to do with a blade disc structure for turbo rotors, and more particularly, with the sealing ring structure therefor. The blade disc is formed with a peripheral cylindrical rim surface and an outwardly extending rib portion formed intermediate the sides of the rim. The root portions of the blades are fixedly mounted in the rib portion of the disc. The cylindrical peripheral rim surface of the disc is formed with a circumferentially extending shoulder spaced axially from each side of the rib portion. The rib portion is formed, at each side, with a circular shoulder spaced concentrically outwardly from the rim portion. Sealing ring members are positioned between the rim shoulders and each side of the rib and having a snug fit therewith. Caulking ring sections are positioned between the periphery of the sealing ring members and the shoulder formed in the rib portion. The caulking ring sections have snug engagement with the periphery of the sealing ring structure and the inner surface of the shoulder formed on the rib portion. The caulking ring sections are retained in place, preferably by peening areas in the sides of the rib portion over the outer surface of the caulking ring sections.


**8 Claims, 4 Drawing Figures**



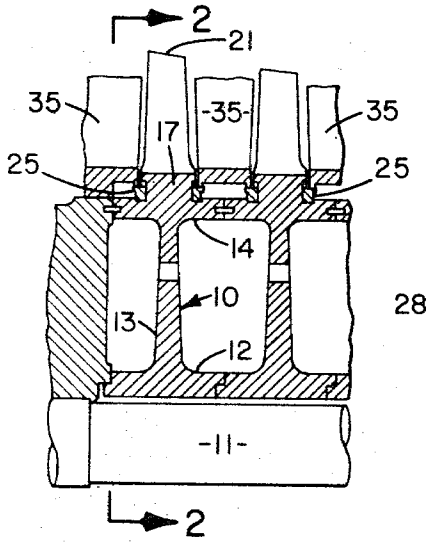



FIG. 1

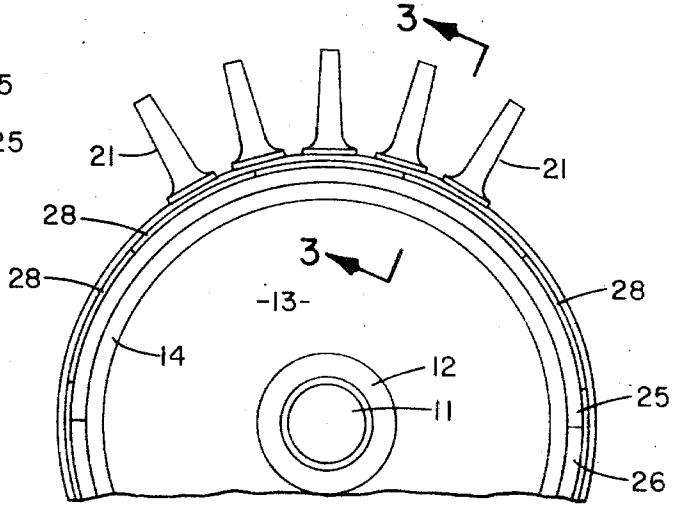



FIG. 2

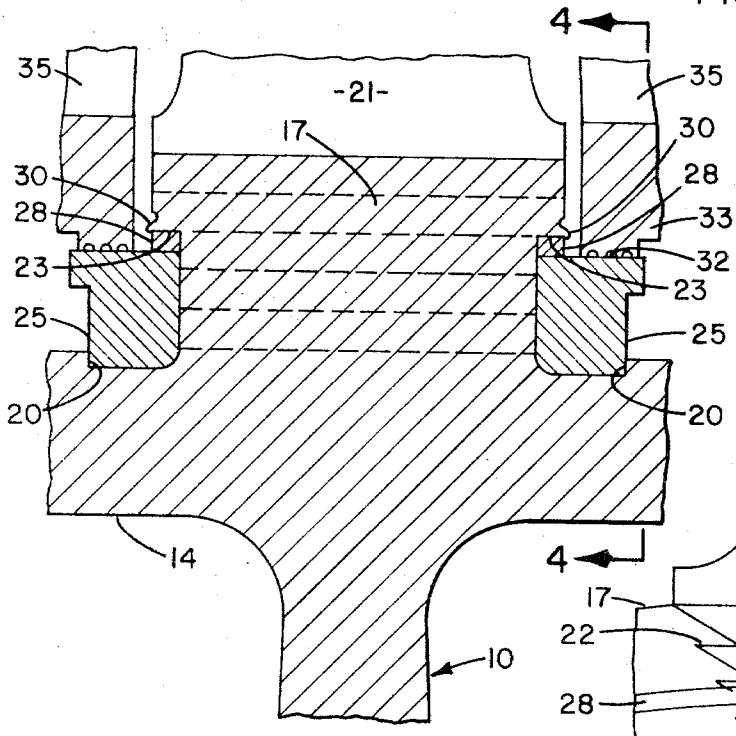



FIG. 3

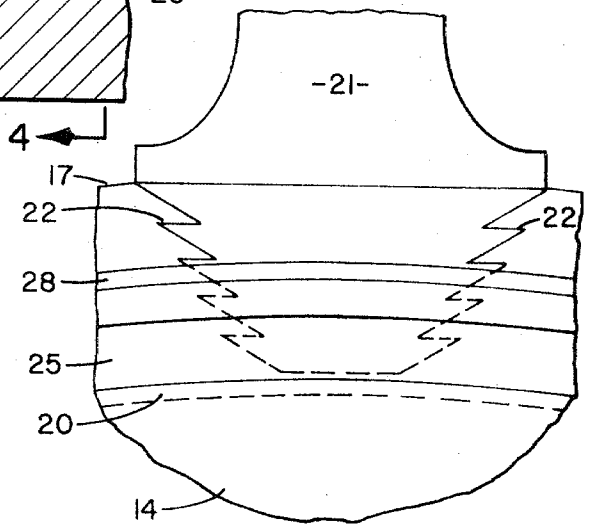



FIG. 4

# BLADE DISC STRUCTURE FOR TURBOMACHINES

## BACKGROUND OF THE INVENTION

It is common practice to form blade carrying discs in turbomachines with a radial rib portion in which the roots of the blades are fixedly interlocked by a form of dovetail construction. A ring is positioned at each side of the rib portion, the ring serving to prevent axial movement of the blades in the discs, and to also provide a cylindrical surface for engagement by labyrinth seal structures carried in the inner ends of the stationary blades of the machine.

Such rings are attached to the discs by a plurality of cap screws. This procedure necessitates drilling a multiplicity of holes through the sealing ring structure and in the rib portion of the disc. The latter holes have to be tapped to receive the retaining screws. This invention has as an object a structural arrangement by which the sealing ring structure is fixedly secured to the disc without the use of screw fasteners, and without the drilling and tapping procedures referred to.

## SUMMARY OF THE INVENTION

The cylindrical rim of the disc is formed with a shoulder spaced axially from each side of the central rib portion of the disc. Each side of the rib portion is formed with a circumferentially extending shoulder arranged in concentrically spaced relation to the rim portion. A sealing rim structure, consisting of two or more arcuate sections, is positioned to encircle the rim portion of the disc intermediate the shoulder formed thereon and the confronting side of the rib portion. A caulking ring structure, preferably consisting of a plurality of arcuate members, is inserted between the periphery of the sealing ring structure and the shoulder formed in the rib portion of the disc. These caulking ring sections have a tight engagement with the sealing ring members and rib shoulder and are conveniently retained in place by peening the rib portion over the outer surface of the caulking members.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a partial sectional view of a rotor structure embodying my invention, the view including two blade discs;

FIG. 2 is a view taken on a line corresponding to line 2—2, FIG. 1, the adjacent stationary blade being omitted from the figure;

FIG. 3 is an enlarged sectional view taken on line 3—3, FIG. 2; and

FIG. 4 is a view taken on line 4—4, FIG. 3.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

The rotor structure includes blade discs **10** mounted for rotation with the shaft **11** about the axis thereof. Each disc is formed with a hub **12** and a discoidal portion **13** extending radially outwardly from the hub and terminating in a cylindrical rim portion **14**. Each disc is also formed with a circumferential rib **17** extending radially outwardly from the rim portion **14**, intermediate the sides thereof.

A circular series of blades **21** are fixedly mounted in the rib portion **17**, as by a dovetail structure or the like as shown at **22** in FIG. **4**. The rim portion **14** of the disc is formed with shoulders **20** spaced axially from the



sides of the rib portion **17**. The rib portion **17** is formed in each side thereof with a circumferentially extending shoulder **23**. The shoulders **23** are spaced radially outwardly from the rim portion **14**. The shoulders **20** are conveniently and economically formed by simply machining a recess in the peripheral surface of the rim portion **14**. Also, the shoulders **23** may be formed in like manner by machining a circular recess in each side of the rib portion **17**.

A sealing ring structure consisting of two or more arcuate members **25, 26**, see FIGS. **2** and **3**. The sealing ring sections **25** are dimensioned axially for a snug fit between the shoulders **20** on the rim portion **14**, and the confronting side wall of the rib **17**. The peripheral surface of the sealing rings **25** are spaced inwardly from the rib shoulders **23**.

A caulking ring structure which may consist of a plurality of arcuate sections **28** is positioned between the periphery of the sealing ring members **25** and the shoulders **23**. The caulking ring members **28** have an axial length coextensive with the axial length of the shoulders **23**, and have a radial dimension providing a snug fit between the periphery of the sealing ring sections **25** and the shoulders **23**. The caulking ring sections **28** may be retained in place by portions of the rib section **17** being peened over the outer surface of the caulking ring sections as indicated at **30**, FIG. **3**.

The sealing ring sections **25** have an axial length sufficient to provide on their perimeters a cylindrical sealing surface **32** cooperable with labyrinth seal structures **33** carried by the stationary blade members **35**.

In addition to providing the sealing surface, the sealing rings **25** overlap the inner root portions of the blades **21** to prevent axial displacement from the discs **10**.

It will be apparent this invention effects a substantial reduction in the cost of fabricating and assembling the rotor structure.

While a preferred embodiment of this invention has been described for purposes of illustration, it will be appreciated that this invention may be otherwise embodied within the scope of the following claims.

I claim:

**1.** A blade disc structure for turbomachine rotors comprising a blade disc having a cylindrical rim surface, a rib portion extending circumferentially about said rim surface and radially outwardly therefrom, said rib portion being positioned intermediate the sides of said rim portion, a circular series of blades fixedly mounted in said rib portion and extending radially outwardly therefrom, said rib portion being formed at each side thereof with a circumferentially extending shoulder spaced in outward concentric relation to said rim portion, said rim portion being formed with a circumferentially extending shoulder spaced axially from each side of said rib portion, a sealing ring structure encircling said rim portion at each side of said rib portion, said sealing ring structures being positioned between and having engagement with a rim shoulder and said rib portion, the periphery of said sealing ring structures being spaced inwardly from said shoulders in said rib portion, a caulking ring structure encircling each of said sealing ring structures, said caulking ring structures being dimensioned for tight engagement with the periphery of said sealing ring structure and said rib shoulder and means restraining displacement of said caulking ring structures.

2. A blade disc structure as set forth in claim 1 wherein said sealing ring structure consists of semicircular members.

3. A blade disc structure as set forth in claim 1 wherein said caulking ring structure consists of a plurality of arcuate members.

4. A blade disc structure as set forth in claim 1 wherein said rib portion is peened over the outer surface of said caulking ring structure.

5. A blade disc structure as set forth in claim 1 wherein said shoulders on said rib portion are formed integral therewtih.



6. A blade disc structure as set forth in claim 1 wherein said shoulders on said rib portion are formed integral therewith.

7. A blade disc structure as set forth in claim 1 wherein said shoulders on said rim portion are formed by circumferentially extending recesses formed in said rim portion at opposite sides of said rib portion.

8. A blade disc structure as set forth in claim 1 wherein said shoulders on said rib portion are formed by circular recesses in the side surfaces of said rib portion.

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