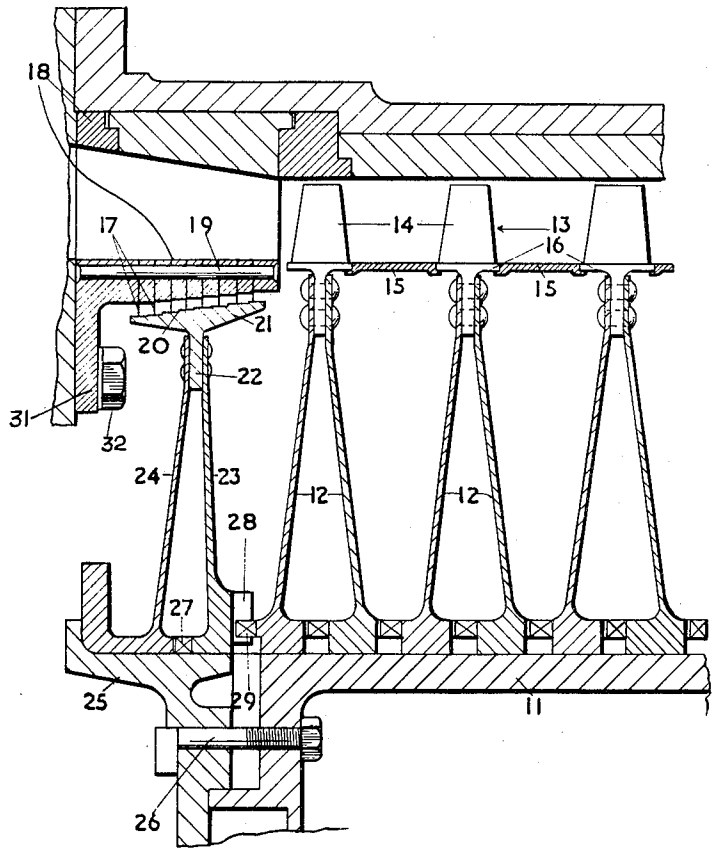
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ARRANGEMENT OF LABYRINTH PACKING FOR A ROTARY TYPE OF FLUID-PRESSURE APPARATUS

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ARRANGEMENT OF LABYRINTH PACKING FOR A ROTARY TYPE OF FLUID-PRESSURE APPARATUS

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4 Claims. (Cl. 230—132)

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This invention relates to a rotary type of fluid-pressure apparatus, such as a compressor or internal-combustion or other turbine, and particularly one intended to operate with a relatively very high linear speed of the radially-outer portions of the rotor.

Our main object is to provide a labyrinth packing means which will serve in a satisfactory manner for balancing the axial thrust on the rotor to a greater or less extent.

According to the invention, a labyrinth packing, for a rotary type of fluid-pressure apparatus, includes a series of axially-spaced annular discs interacting between the stator and a ring to provide a tortuous passage for the fluid-pressure, and the ring is rigidly supported from the rotor of the apparatus by a pair of supporting discs fast with the rotor, at least one of the supporting discs being a cone-like disc arranged concavely to the other.

In a preferred arrangement the rotor is a ring or drum, and the supporting discs are shrunk on to it, or similarly mounted upon it, being axially located upon it and having intermeshing driving dogs, while one of them also has driving dogs which intermesh with driving dogs fast (directly or indirectly) with the drum. For preference the supporting discs are of high tensile steel, and the drum of a steel having a high thermal expansion characteristic, so that the radial fit will be maintained in working conditions between the supporting disc and the drum.

The single figure of the accompanying drawings is a fragmentary sectional elevation of part of an axial-flow compressor fitted, at its delivery end, with a labyrinth packing means according to the invention.

The drawing shows a rotor drum 11 having fast thereon pairs of opposed cone-like discs 12, as disclosed in the specification accompanying U. S. Patent Application Serial No. 709,644, filed December 13, 1946, now U. S. Patent No. 2,497,151, dated February 14, 1950, in the names of the present applicants. The flow through the compressor is in the direction of the arrow 13, the stationary compressor blades, between the rows of rotor blades 14, being omitted for the sake of simplicity. The inner wall of the passage for the air is completed by means of rings 15 disposed between the roots 16 of the blades 14 of each row.

The labyrinth packing, which is disposed at the output end of the compressor, comprises a number of axially-spaced annular discs 17 which in this instance are shown as being carried by a stator ring 18 to which their radially-outer ends

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are secured by rivets, one of which is shown at 19. In the present instance the said stator ring 18 is shown as being built-up of a plurality of rings between which the various labyrinth discs 17 are held in axially spaced relation, the individual stator rings and labyrinth discs being secured to one another by the aforesaid rivets 19. The ring 18 is formed with an inwardly extending flange 31 by which it is secured in position by means of bolts one of which is shown at 32. The discs 17 project radially-inwardly to different extents, and their inner peripheries coact with a correspondingly-stepped surface 20 of a ring 21. It will be understood, however, that the annular discs 17 could alternatively be carried by the ring 21, their external peripheries projecting radially to different extents and coacting with a correspondingly-stepped surface on the stator ring 18. Alternatively, some of the annular discs 17 could be carried by the ring 21 and others by the stator ring 18.

The ring 21 in this instance has a flange 22 riveted to the outer edges of a pair of cone-like supporting discs 23, 24 which are arranged concavely to one another, the disc 23 having relatively-slight conicity (i. e. being almost flat) compared with the disc 24. The discs 23, 24 are fast with the rotor 11, and in the present instance they are shown as being carried by a drum or flanged ring 25 which is bolted to the rotor drum 11, one of the bolts being shown at 26. The ring 25 may be of a material having a high thermal expansion characteristic, the discs 23, 24 being of high tensile steel, and they may be shrunk on to the periphery of the ring 25. The ring 25 provides axial location for the disc hubs, and, in addition, these are fitted with intermeshing driving dogs, as shown at 27, whilst the disc 23 carries dogs, as shown at 28, engaged by dogs, as shown at 29, on the hub of the adjacent disc 12 of the compressor.

The labyrinth packing acts in a known manner to reduce leakage of pressure, and the output pressure of the compressor is available against the appropriate face of the disc 23, tending to force this axially towards the left—i. e., biasing the rotor 11 axially in the opposite direction to that in which it is biased by the reaction of the rows of blades 14 from the fluid passing through the compressor. The construction is one which is well able to withstand this pressure without distortion. Thus, the thrust bearings for the rotor are relieved to a greater or less extent.

What we claim as our invention and desire

to secure by Letters Patent of the United States is:

1. In combination, a rotor of a steel having a high thermal expansion characteristic, a stator, said rotor and stator forming coacting parts of an internal combustion turbine plant, a ring, a labyrinth packing between said stator and ring and comprising axially spaced annular discs which are fast with one of those parts and which effect a peripheral seal with the other, a pair of supporting discs for said ring, at least one of said supporting discs being cone-like and arranged concavely to the other, said supporting discs being of high tensile steel and forming an end wall of a pressure fluid space within said plant, the outer side of said wall being exposed to a considerably lower pressure than that of said pressure fluid, and means relatively-non-rotatively supporting said discs from said rotor, said means including a clamping ring detachably secured to the adjacent end of the rotor and having an outward radial flange for axially engaging a hub portion of the axially-outer one of said supporting discs.

2. For use with rotary type of fluid pressure apparatus having a rotor and a stator, a stator ring carried by said stator, discs carried by said rotor, a rotor ring carried about the periphery of said discs, a labyrinth packing between said stator ring and rotor ring comprising axially spaced annular members secured to one of said rings, and means for supporting and axially compressing said laybrinth packing carried by one of said rings, support means between said discs and rotor, said support means being of a steel having a high thermal expansion characteristic whereby in operation when hot fluids are passed over the rotor said support means will be expanded radially outwardly thereby compressing and assuring a tight fit between the rotor and stator rings and the labyrinth packing therebetween, and means for securing said support means to said rotor for rotation therewith.

3. A device as claimed in claim 2 characterised by the fact that said rotor ring is provided with a plurality of axially stepped faces about the periphery for registering successfully with said members which are carried by the stator ring.

4. A device as claimed in claim 3 characterised by the fact that the members of the labyrinth packing are provided with stepped walls from the axial medial radial inner portion.

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