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M. J. TOURNERE
LOCKING DEVICE FOR THE MOVING
BLADES OF TURBO-MACHINES
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2,846,184

Fig: 2

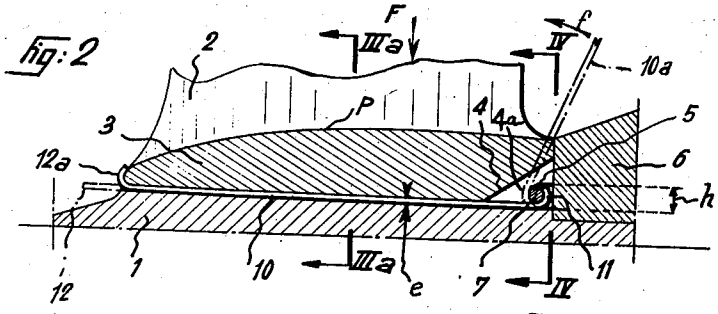


Fig: 1

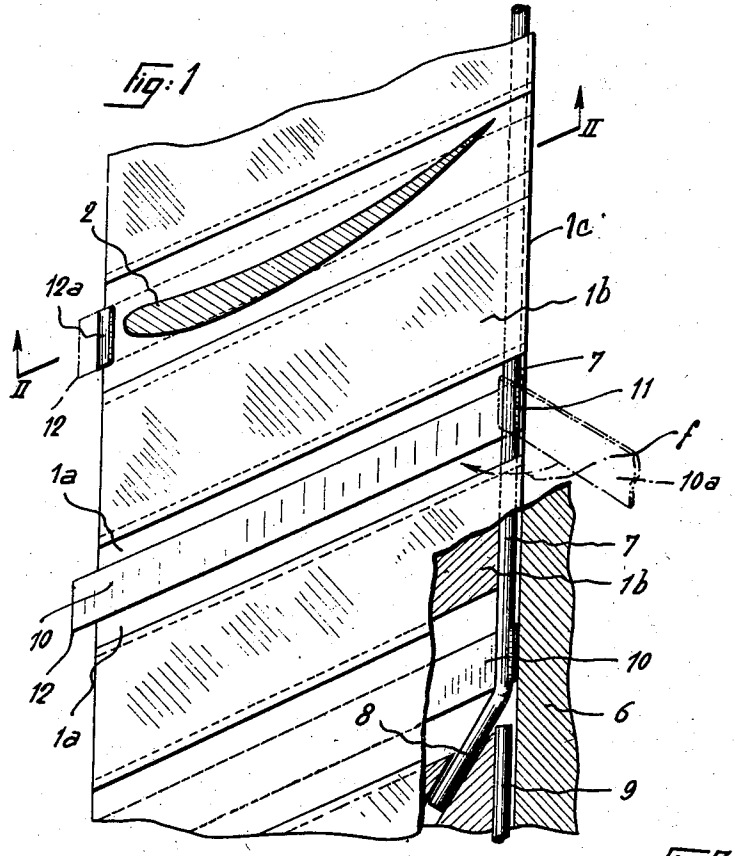


Fig: 3

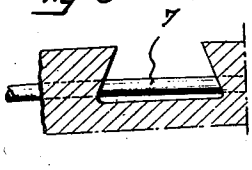


Fig: 4

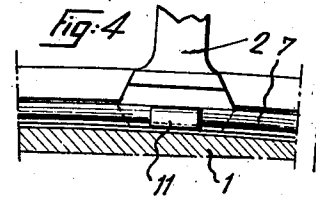
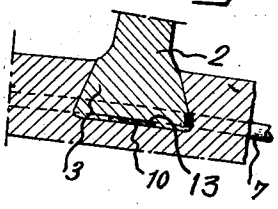


Fig: 3a



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LOCKING DEVICE FOR THE MOVING BLADES OF TURBO-MACHINES

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6 Claims. (Cl. 253—77)

The moving blades of turbines or compressors are generally introduced laterally in the direction of the axis, into slots provided at the periphery of the rotors of these machines.

The roots of the blades, whether they are in the form of a dove-tail assembly, a hammer head, a fir-tree shape, etc. are then laterally locked in position by various devices, such as internal screws, jagging, keys, pins, etc.

These usual devices are not only difficult to machine but they are not always practical when it is a question, for example, of replacing any particular blade; it frequently happens that it is necessary to dismantle the whole of the blading.

The device in accordance with the invention provides a practical device for locking a moving blade in its slot on the rotor. The device is easy to produce by reason of the very simple machining of the members concerned. It enables any particular blade to be dismantled and replaced very rapidly whenever required.

The device comprises essentially a projection or a circular ring formed in a groove in the rotor and an elongated locking plate shaped so as to be supported by one of its extremities on the locking ring, passing underneath the blade, its free end being adapted for folding back over the front of the root of the blade, which is thus locked in position without any possible displacement, whilst at the same time it is free to expand.

The description which follows below with respect to the attached drawings (which are given by way of example only and not in any sense by way of limitation) will make it quite clear how the invention may be carried into effect, the special features which may be brought out, either in the text or in the drawings, being understood to form a part of the said invention.

Fig. 1 shows a view from above, looking in the direction of the arrow F (see Fig. 2), of the root portion of a moving blade system with a part broken away so as to show the two extremities of the locking ring in accordance with the invention.

Fig. 2 is a cross-section taken along the line II—II of Fig. 1, showing the locking plate of a blade, in two different positions.

Figs. 3 and 3*a* are cross-sections taken across a slot of the rotor; one with the blade removed and the other with the blade in position.

Fig. 4 is a cross-section along the line IV—IV of Fig. 2.

There is seen at 1 the exterior of a rotor with slots or grooves 1*a* designed for housing blade roots and which are here shown as dove-tail fittings, they leave between them protruding portions 1*b*, the outline of the slots in the direction of the axis is complementary to that of the roots 3 of the blades 2. These roots 3 of the blades are sharply chamfered, as shown at 4.

On the other hand, a U-shaped groove 5 with a rounded bottom is machined on the end face 1*c* of the portions 1*b* at the right of Figs. 1 and 2 along a circumference corresponding roughly to the bottom of the slots

1*a*. The roots 3 are so chamfered at 4 that an uninterrupted passage is formed which includes the groove 5. This passage is adapted to receive the circular wire or ring 7, and the said passage is then closed by the flange member 6 which is secured to the rotor and against which all the blades are abutted.

In this way, in the finished member there is produced a continuous circular housing constituted alternately by the portions of groove 5 in the protruding portions 1*b* of the rotor, and the spaces 4*a* situated under the chamfered portions 4 of the blades. The circular ring 7 which is preferably of cold-drawn wire is rigidly imprisoned in this housing.

As can be seen from Fig. 1, the locking of the circular ring 7 is obtained by folding back slightly one of its extremities 8 which is then housed in a hole bored in the rotor to receive this extremity, whilst the other end 9 of the ring is not so deformed and this permits of free expansion.

For each blade, a small elongated locking plate 10 is supported on the ring 7 by an end which is bent back in the form of a hook 11, by about 120°, so that it can pivot about this ring for placing the plate in position before the assembly of the corresponding blade. In Fig. 2, there has been shown at 10*a* in chain-dotted lines the position of the plate corresponding to the introduction of the curved-back extremity 11 under the ring. From this position, the plate is pivoted in the direction of the arrow *f* until it rests on the bottom of the slot provided for the blade.

It is an advantage to make the groove 5 (see Fig. 2) with a height *h* which is only slightly greater than $(d+e)$, where *d* is the diameter of the ring 7 and *e* is the thickness of the plate.

At the lower part of the roots of the blades (see Fig. 3*a*) and along their whole length, there is formed a longitudinal channel 13 having a depth *e* and of the same width as the plate in order that the latter may not interfere with the correct supporting contact of the surfaces of the dove-tail fitting.

When the plates have once been placed in position in the slot of each of the blades, the latter are slid into their slot and the free extremity 12 of each plate 10 is then bent back on the root of the corresponding blade, as indicated at 12*a*. The blades are thus prevented from moving axially.

When a blade is to be replaced, it is only necessary to release the hooked extremity 12*a* of the plate from the blade. The blade may then be extracted to be replaced by the new blade which will then be fixed in the manner described. If necessary, the locking plate will also be replaced to fix the new blade with greater safety.

It will, of course, be understood that modifications may be made to the form of embodiment which has just been described above, in particular by the substitution of equivalent technical means, without thereby departing from the spirit or from the scope of the present invention.

What I claim is:

1. A bladed wheel comprising a rotor bearing spaced protruding portions having sides bounding peripheral recesses and an end face provided with a groove lying on a circle whose radius is substantially equal to the distance of the bottom of said recesses from the axis of the rotor, blades having roots slidably accommodated in said recesses, the sides of said protruding portions and said roots having cooperating surfaces that prevent radial outward displacement of the roots, said roots having an end remote from and a part adjacent to said end face, shaped to leave said circle unobstructed whereby an uninterrupted passage is formed along said circle through said grooves and across said roots, a wire ex-

tending along said passage, a flange member mounted on said rotor and engaging said parts of the roots and covering said grooves, and blade locking plates extending underneath said roots and attached at one end to said wire and at the other to said end of said roots whereby said blades are secured against axial displacement in said recesses.

2. A bladed wheel as claimed in claim 1 wherein the part of the blade roots adjacent the end faces of the protruding portions of the rotor, are chamfered to form a recess registering with the grooves in the adjacent protruding portions.

3. A bladed wheel as claimed in claim 1 wherein the wire is secured at one end thereof to the rotor, the other end being free whereby said wire is free to expand.

4. A bladed wheel as claimed in claim 1 wherein the grooves have a width substantially equal to the sum of the diameter of the wire and the thickness of the locking plate.

5. A bladed wheel as claimed in claim 1 wherein the locking plates are pivotally attached to the wire.

6. A bladed wheel as claimed in claim 1 wherein the blade roots are recessed at the underpart thereof to accommodate the locking plates.

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