July 31, 1962 S. L. LEAVITT 3,047,268

BLADE RETENTION DEVICE

Filed March 14, 1960 2 Sheets-Sheet 1

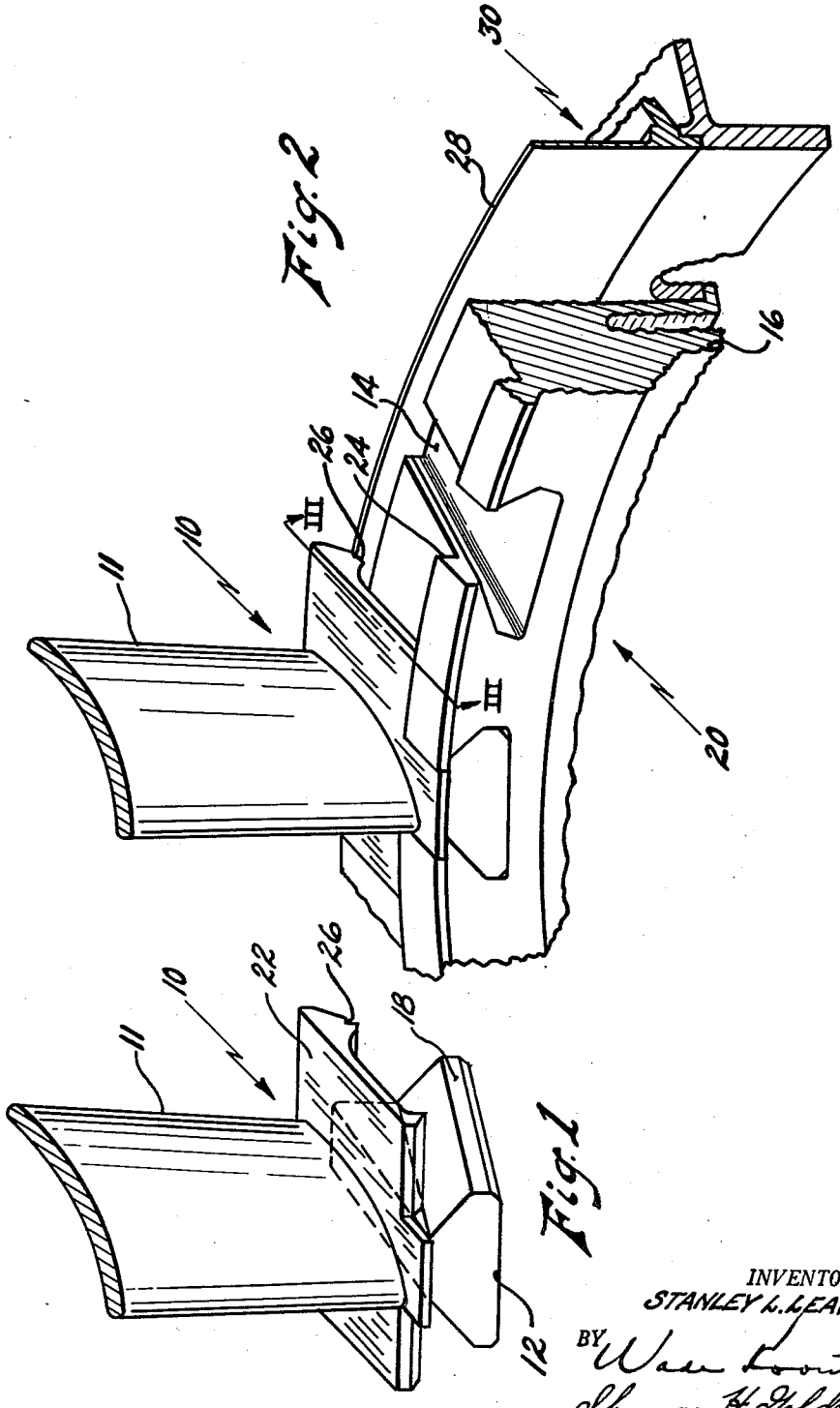

Fig. 2

Fig. 1

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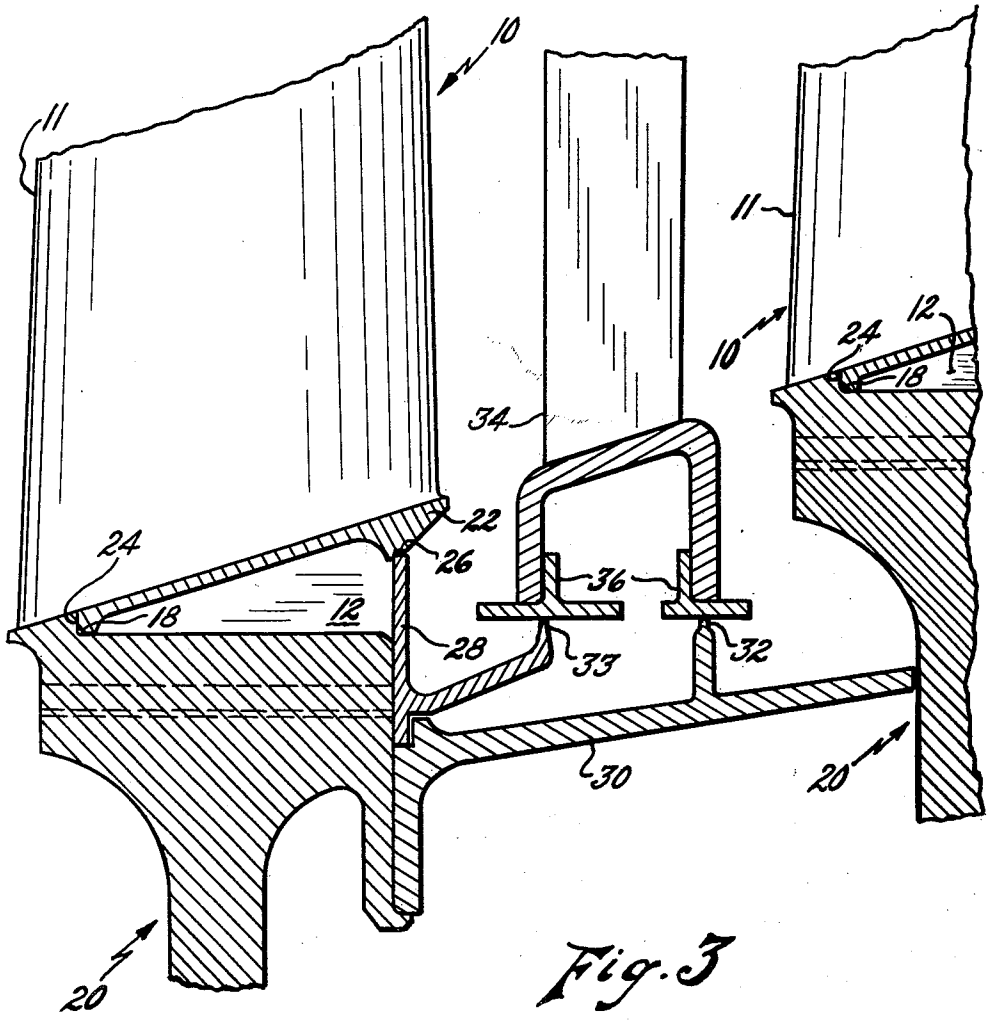

Fig. 3

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BLADE RETENTION DEVICE

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2 Claims. (Cl. 253—77)

This invention relates generally to a blade retention device suitable for securing rotor blades in the compressor or turbine stages of a gas turbine engine, and more particularly to one which eliminates the utilization of tablocks or rivets customarily used to retain blades in engines.

In engines of this type there may be several compression stages driven by several stages of turbines, each stage consisting of one or more discs upon the periphery of which are mounted a plurality of blades. The blades are not made integral with the discs and it is desirable to have some means for securing the blades to the discs which will hold them firmly in place and at the same time allow convenient removal and replacement.

There are many retention devices for securing compression or turbine blades on discs, such as tabs of metal bent to secure the blade, wedges or rivets which hold the blades in place but which are difficult of removal and, furthermore, cause projections in the air stream causing unwanted friction or drag.

It is an object of this invention to provide a blade retention device which will make removal and replacement of blades easy and convenient.

It is a further object of this invention to provide a blade retention device which holds the blades securely in place without projections.

It is a further object to provide a blade retention device which will allow a larger and stronger root section of the blade than is customary with tablock securing and at the same time decrease the dead rim volume of the disc.

A still further object is to provide a blade with a wider and stronger foot which will enable simpler disc construction and make unnecessary the use of heavy spacer platforms.

It is a further object to provide a combination windage cover and retainer plate which carries integral seal supports.

The above and still other objects, advantages and features of my invention will become apparent upon consideration of the following detailed description thereof, especially when taken in conjunction with the following drawings in which:

FIGURE 1 is a perspective view of part of a rotor blade showing the construction of the foot;

FIGURE 2 is a perspective view, partly in section, showing part of a disc and rotor blade assembly; and

FIGURE 3 is a sectional view showing the novel rotor blade mounting in conjunction with a portion of a multi-stage compressor.

In FIGURES 1 and 2, a rotor blade unit **10** is shown with a portion of the root **12** formed to fit in a generally dove-tailed slot **14** in the rim **16** of a disc **20**. The root portion includes a platform **22** from which blade portion **11** protrudes. A leading edge **18** of the platform **22** of the rotor blade unit **10** fits against a shoulder **24** cut on the rim **16** of the disc **20**. This structure prevents axial movement of the rotor blade unit **10** in one axial direction. The root of the rotor blade unit **10** is held in the slot **14** by a retainer plate **28**,

the edge of which fits in a notch **26** cut in lower portion of the rear edge of the rotor blade platform **22**. The retainer plate **28** is held firmly in place by a combination windage cover and seal support **30**.

As can best be seen in FIGURE 3, the retaining plate **28** is held firmly against the notch **26** of the foot of blade unit **10** by the strut, or bracing action of the windage cover **30** which abuts the forward face of a disc **20** of the next stage. The windage cover **30** carries a seal support **32** which meets with a sealing surface **36** attached to stator blade **34**. The retainer plate **28** also carries a seal support **33** which meets a similar sealing surface **36** on the stator blade **34**.

As can be seen in FIGURES 1 and 2, the platform **22** of the blade **10** is of a width to meet the platform of the adjacent blade when the said blades are inserted in the slots **14** in the rim **16** of the discs **20**, thus eliminating the necessity of a spacer plate between blades and strengthening the seat of the blade **10**.

Not only does this construction give a stronger blade seat and more resistance to axial and radial movement of the blade on the disc, but it makes the machining of the blade and the disc much simpler and easier. The rim of the disc can be much lighter, with this simplified construction, as well as easier to form.

Although this invention has been described with reference to a particular embodiment, it will be understood that the invention is capable of a variety of alternative embodiments within the spirit and scope of the appended claims.

I claim:

1. For a gas turbine engine, the combination with a turbine rotor comprising a rotor disc, a series of axial dovetail slots extending through the outer circumference of said rotor disc, a series of rotor blades, each of said blades having a blade portion of airfoil cross-section, a root section secured to said blade portion, said root section comprising a platform and a dovetail of a size to be received by said dovetail slots, said platform being located between said blade portion and said dovetail, a shoulder on the outer circumference of said rotor disc forming circumferential segments separated by said dovetail slots in said rotor disc, said platforms having cutout portions equal to the depth of said shoulder segments such that insertion of said root section in said slots provides abutment of said platform against said shoulder segments to limit axial movement of said rotor blades in one direction, a notch in said platform opposite said cutout portions and on the side of said platform adjacent said dovetail, and an annular plate in engagement with said notch for limiting movement of said rotor blades in the other of said axial directions.

2. For a gas turbine engine as defined in claim 1 the combination including a windage cover in engagement with said disc, said windage cover providing a support for said plate.

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