

[54] **INTERBLADE BAFFLE AND DAMPER**
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FOREIGN PATENTS OR APPLICATIONS

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[58] Field of Search 416/219-221, 500

[56] **References Cited**

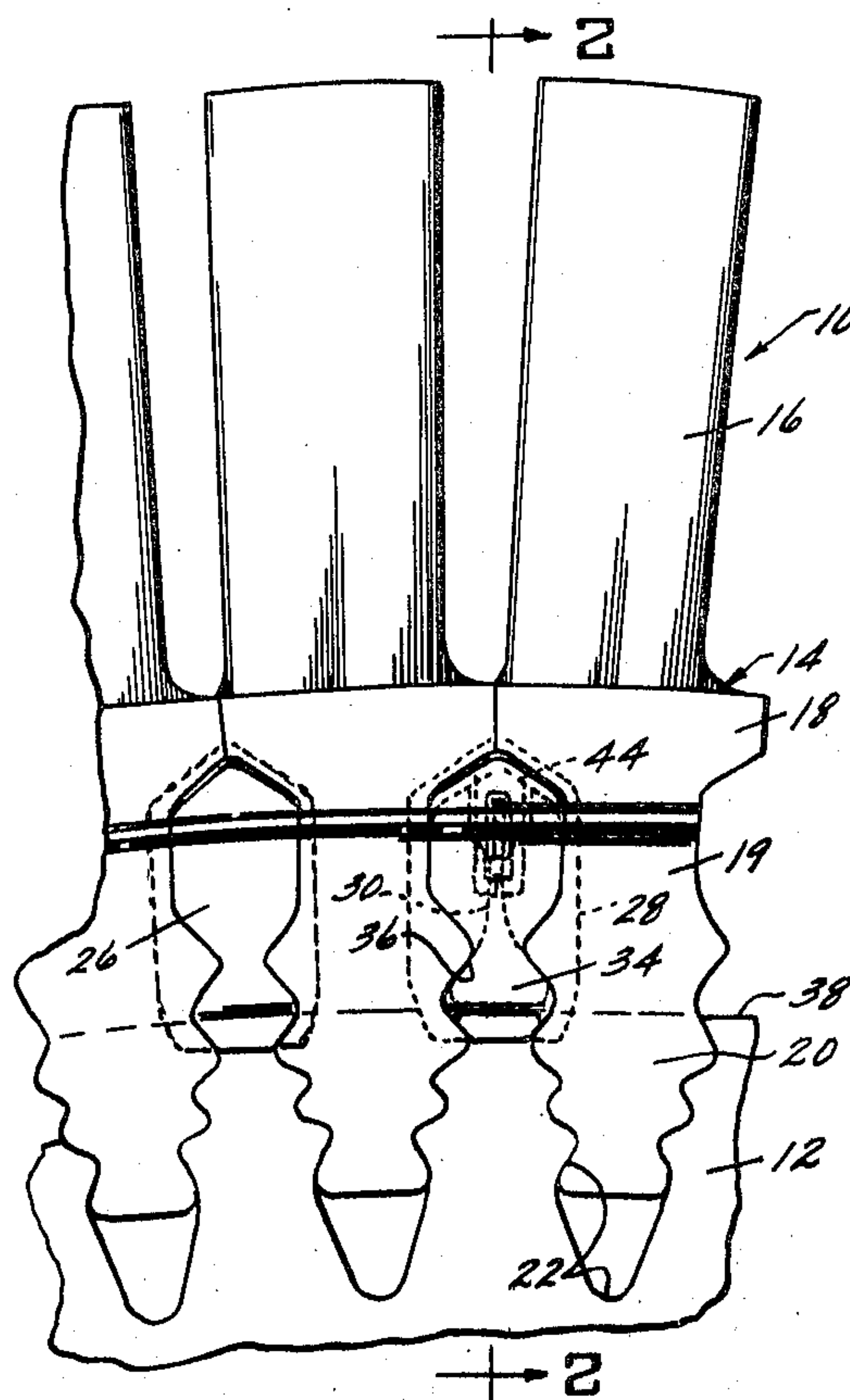
UNITED STATES PATENTS

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[57] **ABSTRACT**

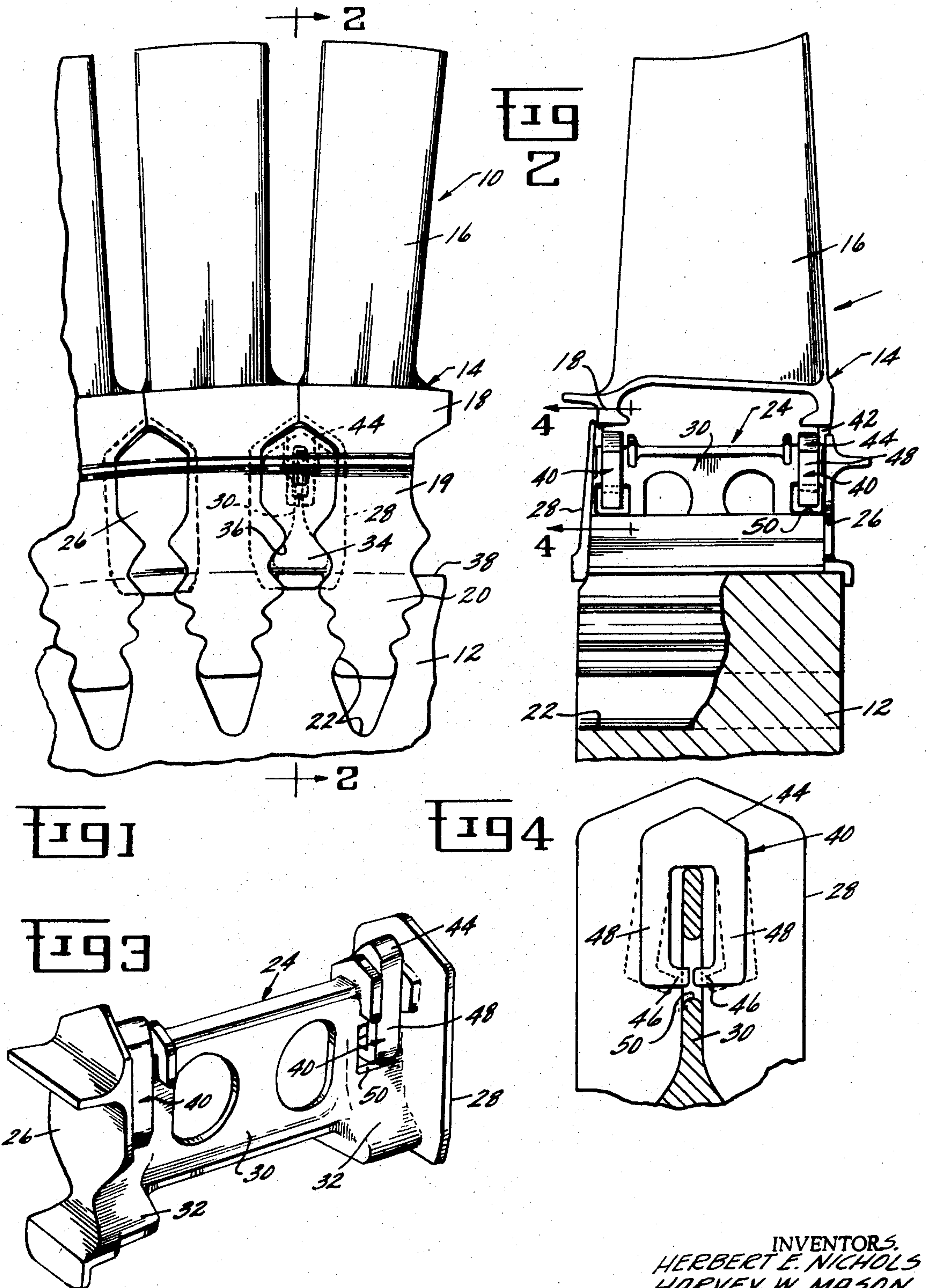
A baffle and damper assembly includes end plates for closing the opening between adjacent blade shanks, a connecting member extending between the end plates, retaining means to lock the assembly to its adjacent blades against the urging of centrifugal force, and at least one damper weight movably secured to the connecting member and adapted to bear against the blade platforms under the urging of centrifugal force.

2 Claims, 4 Drawing Figures



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INTERBLADE BAFFLE AND DAMPER

This invention relates to turbomachinery and, more particularly, to a combined damping and sealing arrangement for use in turbomachinery rotor assemblies. The invention herein described was made in the course of or under a contract, or a subcontract thereunder, with the United States Department of the Air Force.

In turbomachinery rotor assemblies, of the type having a plurality of blades extending radially from a rotor wheel or disc, it is generally important that a seal be provided between the wheel rim and the blade platform to reduce fluid leakage axially across the wheel, so as to forestall efficiency loss of the turbomachine.

In addition to gas leakage, another difficulty which may be encountered in turbomachinery rotor assemblies is vibration between the rotor wheel or disc and the blades and between the blades themselves.

U.S. Pat. No. 3,112,915, assigned to the assignee of this application, discloses a rotor assembly air baffle which includes axially spaced end plates which are interconnected by axially extending connecting members. The end plates close the space between adjacent blade shanks while one of the connecting members is suitably shaped so as to bear against the underside of the adjacent blade platforms, under the urging of centrifugal force, to provide damping of blade vibration through the mechanism of heat-producing relative slip between the connecting member and the adjacent blade platforms.

While the baffle of the above-referenced patent may be advantageously employed in numerous rotor assembly configurations, in some applications the size of the baffle required for sealing militates against the desired damping effect. That is, it has been found that as the weight of the baffle increases, the baffle may, under the urging of centrifugal force, assume a fixed position against one or both of the blade platforms. When this occurs, the damping function is lost or substantially diminished and, from a vibration standpoint, the baffle acts as an integral part of one or both of the blades.

This invention, then, is concerned with an improved air baffle structure which retains the advantageous features of the above-mentioned patent while avoiding the foregoing problem.

One object of this invention is to provide an improved sealing and blade damping structure for use in a turbomachinery rotor assembly.

Another object of this invention is to provide an air baffle for sealing between adjacent turbomachinery blade shanks which carries at least one damper weight which is movably affixed thereto and is adapted to bear against the adjacent blade platform, under the urging of centrifugal force, and damp vibration through the mechanism of heat-producing relative slip.

Briefly stated, in accordance with one aspect of the present invention, there is provided a baffle and damper assembly comprising spaced, axially facing end plates sized to generally close the opening between adjacent blade shanks in a turbomachinery rotor assembly, with a connecting member extending between and joining the end plates. Support means, in the form of dovetails, are integrally formed with the connecting member adjacent each end plate and are sized for engagement with a dovetail slot which is cooperatively formed by one or more axial corrugations projecting from each blade shank readily outwardly of the rotor

disc periphery so as to retain the baffle and damper assembly against the urging of centrifugal force in the same manner that each blade is retained to the rotor disc. One or more damper weights are movably or floatingly secured to the connecting member in a position where they will bear against the underside of the adjacent blade platforms to provide the desired damping through the mechanism of heat-producing relative slip.

It is believed that the invention will be better understood upon reading the following description in conjunction with the accompanying drawing wherein:

FIG. 1 is a partial elevational view of a turbomachinery rotor assembly employing the baffle and damper assembly of this invention;

FIG. 2 is a cross-sectional view taken along lines 2—2 of FIG. 1;

FIG. 3 is an enlarged perspective view of the baffle and damper assembly of this invention; and

FIG. 4 is an enlarged partial cross-sectional view of the baffle and damper assembly of this invention taken along lines 4—4 of FIG. 2.

With reference now to the drawing and particularly to FIG. 1, a portion of an exemplary turbomachinery rotor assembly has been shown at 10 as including a rotor wheel or disc 12 which carries a plurality of radially extending blades 14. Each blade 14 is formed with an airfoil portion 16, a platform portion 18, a shank portion 19, and a root portion 20. The rotor disc 12 is formed with a suitable axial locking slot 22 for each blade 14, with each slot suitably shaped to receive the blade root portion 20 and lock the blade to the disc against the urging of centrifugal force. The locking slots 22 are suitably spaced around the periphery of the disc 12, in cooperation with the circumferential extent of the platforms 18, so that each platform abuts or is closely spaced to each peripherally adjacent blade platform. In this manner, the platforms collectively form a generally continuous annular inner boundary for the motive fluid flow across the blade airfoil portions 16.

In accordance with the present invention, a baffle and damper assembly 24 is provided between peripherally adjacent blades 14 to retard motive fluid leakage axially across the disc 12 in the area of the blade shanks 19, and, at the same time, to damp vibration between the blades 14 and between each blade 14 and the disc 12.

As best shown in FIG. 3, each baffle and damper assembly 24 includes spaced, axially facing end plates 26, 28 which are interconnected by an axially extending connecting member 30. With reference now to FIGS. 1 and 3, the connecting member 30 is formed with one or more dovetails or is provided with otherwise suitably shaped retention means 32 for engaging a locking slot 34 which is cooperatively defined by one or more axial corrugations 36 projecting from the shanks of peripherally adjacent blades 14 in an area radially outwardly of the disc periphery 38. As will be understood, the locking slot 34 is sized so as to engage the dovetails or retention means 32 and locked the baffle and damper assembly 24 to its adjacent blade shanks, against the urging of centrifugal force, in generally the same manner that each blade 14 is locked to the disc 12.

Each assembly 24 includes at least one damper weight 40 which is movably secured to the connecting member 30 and is shaped and positioned so that with the assembly 24 installed, as in FIGS. 1 and 2, and

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under the urging of centrifugal force, the damper weight will move radially outwardly and contact the underside of the adjacent blade platforms 18. In the embodiment depicted in the drawing, two damper weights have been employed, with each weight extending radially above the connecting member 30 and being located adjacent to an end plate. The underside of each blade platform 18 is formed with an angular land 42 against which the similarly formed upper edge or damping surface 44 (as viewed in FIG. 4) of the weight bears. The weight may be generally U-shaped in inverted cross section and may be conveniently secured to the connecting member 30 through tabs 46 which extend from each leg 48 into a slot 50 formed through the connecting member 30. It will be understood, however, that various other damper weight configurations and attachment means may be effectively employed, it being preferred though that each weight 40 be permanently but movably secured to the connecting member 30.

As shown in FIG. 3, the end plates 26 and 28, the connecting member 30 and the retaining means or dovetails 32 may be conveniently formed as an integral, cast member. To facilitate installation, the damper weights 40 may be formed with the legs 48 separated as shown by the dotted lines of FIG. 4. With the legs 48 so formed, each weight may be secured to the connecting member 30 by simply bending the legs 48 toward each other until the tabs 46 engage the slot 50.

While an exemplary embodiment has been depicted and described, it will be understood that many modifications and changes may be made thereto without departing from the fundamental theme of the invention.

What is claimed is:

1. For use in a turbomachinery rotor assembly of the type including a plurality of blades extending generally radially from the periphery of a rotor disc, said blades having platform portions spaced outwardly from said rotor disc periphery by shank portions, with said platforms defining the inner boundary for motive fluid flow through said rotor assembly and said blades defining locking slot means, a baffle and damper assembly comprising:

spaced, axially facing end plates sized to generally

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close the opening between adjacent blade shanks, a connecting member extending between and joining said end plates, retaining means sized to engage said slot means and secure said baffle and damper means between a pair of adjacent blades against the urging of centrifugal force, and at least one damper weight movably carried by said baffle and damper assembly and adapted to bear against the underside of the platforms of said adjacent blades under the urging of centrifugal force and damp blade vibration through the mechanism of heat producing relative slip, said damper weight secured to said connecting member and movable with respect thereto into and out of engagement with the underside of the platforms of said adjacent blades.

2. For use in a turbomachinery rotor assembly of the type including a plurality of blades extending generally radially from the periphery of a rotor disc, said blades having platform portions spaced outwardly from said rotor disc periphery by shank portions, with said platforms defining the inner boundary for motive fluid flow through said rotor assembly and said blades defining locking slot means, a baffle and damper assembly comprising:

spaced, axially facing end plates sized to generally close the opening between adjacent blade shanks, a connecting member extending between and joining said end plates, retaining means sized to engage said slot means and secure said baffle and damper means between a pair of adjacent blades against the urging of centrifugal force, and at least one damper weight movably carried by said baffle and damper assembly and adapted to bear against the underside of the platforms of said adjacent blades under the urging of centrifugal force and damp blade vibration through the mechanism of heat producing relative slip, further characterized in that said connecting member is formed with a slot for each said damper weight, each said damper weight being generally U-shaped in cross section and including tabs which project from each leg thereof into said slot to thereby movably secure said damper weight to said connecting member.

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