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TURBINE BLADE COOLING

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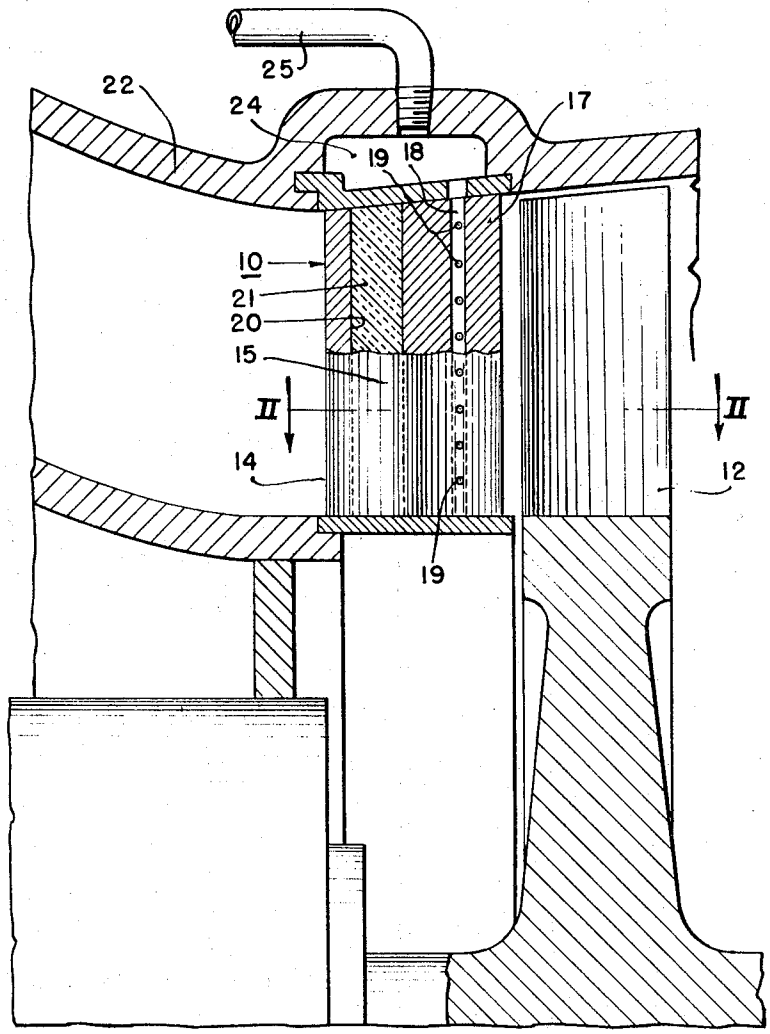


FIG. 1.

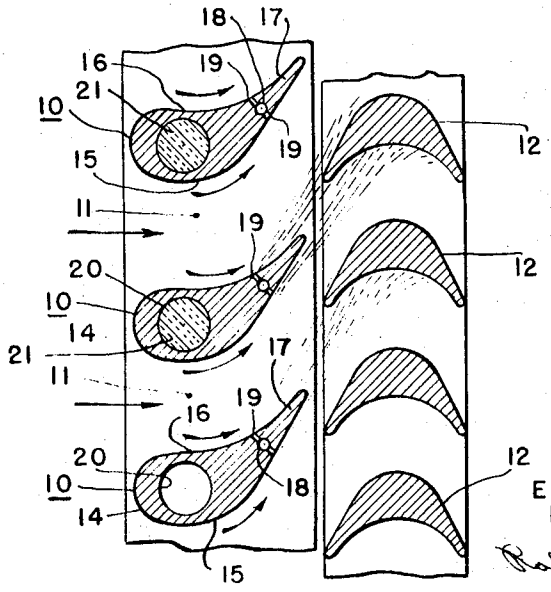


FIG. 2.

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TURBINE BLADE COOLING

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This invention relates to turbines, more particularly to the cooling of turbine blades by insulation with, and vaporization of, liquid sprayed thereon, and has for an object to provide improved blade structure for this type of cooling.

It has previously been proposed to cool turbine blades by spraying liquid thereonto from the tail portions of the nozzle blades upstream thereof, the liquid being carried along with the turbine motive fluid for impingement upon the following row or rows of rotor and stator blades to cool the latter by vaporization and by partially insulating them from the hot gas stream.

The nozzle blades have longitudinal passages in the tail portions thereof, and ports therefrom distributed along the tail portions provide for spraying of liquid into the nozzle passages. With this arrangement, the entire cross-section of each nozzle blade will be reduced in temperature by conduction of heat to the liquid passing through the tail portion passage.

Since the nozzle blades are not subject to centrifugal stress, such blades can be subjected to full gas temperature. In accordance with the present invention, therefore, the nozzle blades are each hollowed out between the inlet edge and the tail portion to leave an insulating air gap to reduce the conduction of heat to the water passing through the tail portion passage, and the heat loss to the nozzle blade will thereby be reduced considerably; and, in this connection, the heat loss may be even further reduced if the hollowed-out portion is filled with ceramic material. Therefore, the present invention has for its object to improve direct liquid cooling of the blades by having the nozzle blades, from which liquid is sprayed for this purpose, hollowed out between the inlet edges and the tail portions and to fill the hollowed-out portions with ceramic material to reduce the heat loss from such blades to the liquid traversing the passages in order that the liquid may be more effective for spray-cooling of the moving blades.

The foregoing and other objects are effected by the invention as will be apparent from the following description taken in connection with the accompanying drawing, forming a part of this application, in which:

FIG. 1 is a fragmentary view of a pair of rows of gas turbine nozzles and moving blades; and

FIG. 2 is a fragmentary sectional view, taken along the line II—II of FIG. 1, looking in the direction indicated by the arrows, showing liquid supplied to the nozzle blades.

In the drawing, there is shown a turbine row of nozzle blades **10** defining nozzle passages **11** and followed by a moving row of blades **12**.

Each nozzle blade has a rounded inlet edge **14** and convex and concave faces **15** and **16**, which converge to define the tail portion **17**.

Each tail portion **17** has a longitudinal passage **18** formed therein, supplied with water or other suitable liquid, and from which water is sprayed into the adjacent

nozzle passages by ports **19** distributed along the tail portions. The sprayed water is carried along with the motive fluid traversing the nozzle passages for impingement upon the moving blades **12** to cool the latter by evaporation and by insulation.

To secure more effective cooling of the moving blades, each of the nozzle blades is hollowed out at **20**, thereby reducing the heat conductive section of the blade between the inlet edge and the tail portion passage. While such hollowing out reduces the heat loss to the water traversing the passage, this action may be made even more effective by filling the hollowed-out portion with ceramic material **21**.

Any suitable means may be used to assure of the nozzle blade passages being supplied with liquid. For example, the cylinder **22** carrying the nozzle blades may have annular chambers **24** supplied with liquid by a conduit **25**. As the passages **18** of the nozzle blades continue through the roots thereof and communicate with the annular chambers, provision is thereby made for adequate liquid flow through the passages.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

What is claimed is:

1. In gas turbine blade cooling, a row of nozzle blades followed by a row of moving blades; the tail portions of the nozzle blades having longitudinal passages formed therein, adapted to be supplied with liquid and having ports through which liquid may sprayed into the nozzle passages from the tail portion passages; and each of said nozzle blades being hollow between the inlet edge thereof and the tail portion to reduce the heat conductive area between the inlet edge and the tail portion.

2. The combination as claimed in claim **1** wherein the hollows of the nozzle blades are filled with ceramic material.

3. In gas turbine blade cooling, a row of nozzle blades followed by a row of moving blades; each of said nozzle blades having an inlet edge portion and a tail portion, said tail portion having passages formed therein adapted to be supplied with liquid and having ports through which the liquid may be ejected into the nozzle passages from the tail portion passages; each of said nozzle blades having a hollow portion between said inlet edge portion and said tail portion to reduce the heat conductive area between said inlet edge portion and said tail portion, and a mass of insulating material disposed in said hollow portion.

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