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2,297,446

HOLLOW BLADE FOR EXHAUST GAS TURBINE ROTORS

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Fig. 1

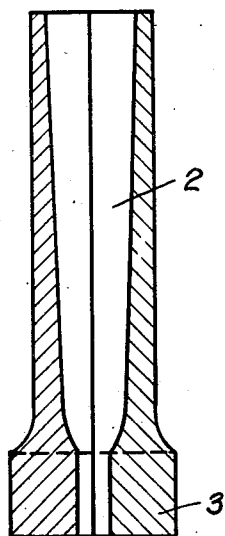


Fig. 3

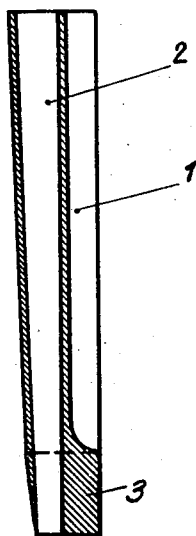


Fig. 2

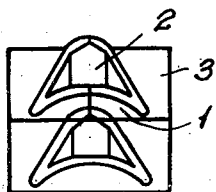
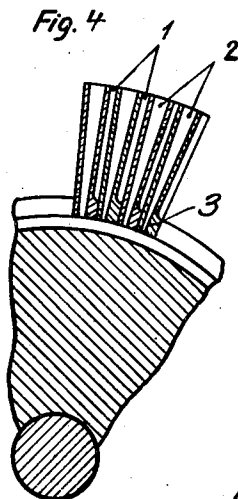


Fig. 4



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HOLLOW BLADE FOR EXHAUST GAS
TURBINE ROTORSGustav Zellbeck and Alfred Müller, Munich, Ger-
many; vested in the Alien Property CustodianApplication December 23, 1939, Serial No. 310,690
In Germany December 3, 1938

4 Claims. (Cl. 60—41)

Turbine blades for the utilization of gaseous working fluids are sometimes made hollow in order to obtain an efficient cooling by allowing a cooling fluid to pass through the hollow interior of the blade.

When employing such blades, a disadvantage is caused by the usual arrangement and construction of the blades in that the throughflow passage for the working fluid between the single blades progressively enlarges from the blade foot to the outer periphery. This enlargement of the throughflow passage for the working fluid brings about an unfavourable course of flow and facilitates the formation of vortices thus diminishing the efficiency of the turbine.

It is an object of the invention to eliminate this disadvantage. This is effected in such a manner that the total depth of the blade increases progressively from the outer periphery of the rotor to the outer end of the blade to such an extent that the throughflow passages formed between adjacent blades have nearly the same peripheral depth along the whole radial length of the blade.

By this arrangement a blade passage is obtained with nearly parallel walls and the throughflow of the gases takes place essentially without formation of vortices in contrast to the previously usual outwardly diverging passage. It goes without saying that in this way the efficiency of the turbine is considerably improved.

The accompanying drawing shows one form of embodiment of the blade according to the invention.

Fig. 1 shows a longitudinal section of a blade normal to the rotor plane,

Fig. 2 is a top view of Fig. 1 two adjacent blades being shown,

Fig. 3 shows a longitudinal section of the blade through the rotor plane,

Fig. 4 shows a rotor section with successive blades arranged at its periphery.

In the drawing 1 designates the throughflow passages for the working fluid and 2 the hollow spaces for the throughflow of the cooling means. The numeral 3 designates any known or suitable foot by means of which the blade is attached to the rotor hub.

The total depth of the blade according to the invention increases outwardly in the direction of the rotor plane, whereby the gas throughflow passages for the working fluid between the blades are given an unvariable depth over the whole length of the blades, which is especially to be seen in Figs. 3 and 4.

It will be noted that the peripheral depth of the cooling fluid passage 2 as measured in the plane of the rotor increases gradually outwardly along the radial length of the blade. This permits making the walls of the blades at least as thin at their outer ends as at their inner ends. Thus, in the section shown in Fig. 3, the walls of the blades are of substantially uniform thickness throughout their length whereas in the section of Fig. 1 the walls are thinner near their outer ends. In this way an accumulation of material at the outer end of the blades is avoided and the resultant centrifugal forces reduced. This gradual increase in the peripheral depth of the cooling fluid passage is not objectionable.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In an elastic fluid turbine wheel, a blade carrying member and blades projecting radially therefrom, said blades each having a leading face and a following face, the leading face being equidistant from the following face of the preceding blade over their entire radial length whereby the throughflow passages between the blades will have the same peripheral depth over the entire radial length of said passage, each blade being formed with a cooling fluid passage between its leading and its following face, said cooling fluid passage gradually enlarging toward the periphery of the wheel whereby a constant wall thickness between the cooling fluid passage and the leading and following faces is maintained over the entire radial length of said faces.

2. As an article of manufacture, a turbine blade having a leading face and a following face, the blade and its faces being of such conformation that when juxtaposed the throughflow passage between the leading face of one blade and the following face of the preceding blade will have the same peripheral depth over the entire radial length of said passage, each blade being formed with a cooling fluid passage between the leading face and the following face, which cooling fluid passage is of gradually increasing peripheral depth toward the outer end of the blades.

3. As an article of manufacture, a turbine blade having a leading face and a following face, the blade and its faces being of such conformation that when juxtaposed the throughflow passage between the leading face of one blade and the following face of the preceding blade will have the same peripheral depth over the entire radial length of said passage, each blade being formed with a cooling fluid passage between

the leading face and the following face, which cooling fluid passage is of gradually increasing peripheral depth toward the outer end of the blades, the walls surrounding the cooling fluid passage being no thicker at their outer ends than at their inner ends.

4. As an article of manufacture, a turbine blade having a leading face and a following face, the blades and its faces being of such conformation that when juxtaposed the through-flow passage between the leading face of one blade and the following face of the preceding

blade will have the same peripheral depth over the entire radial length of said passage, each blade being formed with a cooling fluid passage between the leading face and the following face, which cooling fluid passage is of gradually increasing peripheral depth toward the outer end of the blades, the walls surrounding the cooling fluid passage and the following face being no thicker at their outer ends than at their inner ends.

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