Abstracts

Internal Flow of Rotating Labyrinth Seal
with Low Static Pressure Difference and Large Clearance

by
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Abstract
In this paper, we discuss a straight-through-type labyrinth seal. This labyrinth seal is used for axial flow fans that have an outer ring at the blade tip to seal the clearance between the ring tip and the fan shroud, in order to prevent reverse flow or leakage. These fans are used for cooling of automobile radiators. In these cases, the labyrinth seal is used under an extremely low static pressure difference and a large clearance. A significant decrease in leakage rate was reported even when the labyrinth seal rotated at a comparatively low speed under this unique condition in our former study. However, this phenomenon is different from that observed in past research. Furthermore, the cause of this phenomenon has not been determined. Therefore, the internal flow was depicted using Computational Fluid Dynamics (CFD) in order to determine the cause of this phenomenon. The results of CFD show that leakage rate decreases significantly because the carry-over flow is intercepted in the expansion groove. This is a newly discovered phenomenon that occurs under the unique condition of an extremely low differential pressure. This has not been pointed out before as an explanation for the decrease in leakage rate with rotation.

Keywords: Fluid Machinery, Blower, Internal Flow, Computational Fluid Dynamics, Labyrinth Seal

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Reduction in Corner Dullness of Machined Microhole
by EDM Using Assisting Plate

by
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Abstract
When hole and microhole machinings are carried out by electric discharge machining (EDM) using a straight electrode, the hole and microhole diameters become different at the inlet and outlet of the machined hole. This shape irregularity is caused by the wear of the electrode and debris. A method was proposed for reducing the diameter difference between the hole and the microhole by EDM using a stepped electrode. Experiments showed that the difference in diameter between a hole and a microhole is reduced by EDM using a stepped electrode but the corner dullness of the machined hole and microhole is caused by electrolysis. In a previous paper, a new method was proposed for reducing the corner dullness of a machined hole by EDM using an assisting plate. Experiments showed that the corner dullness of a machined hole is reduced by EDM using an assisting plate.

This paper describes the application of this assisting plate method to microhole machining. The following experimental results were obtained. (1) The corner dullness of a machined microhole is reduced by EDM using an assisting plate. (2) Microholes of the desired diameter and without corner dullness can be machined by EDM using an assisting plate.

Keywords: EDM, Microhole, Microholes, Assisting plate, Corner dullness

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