AEC-NASA TECH BRIEF

High-Reluctance Rotor Rings Improve Homopolar Generator Performance

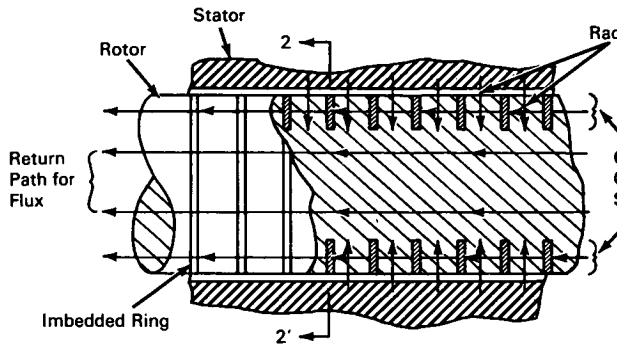

FIGURE 1

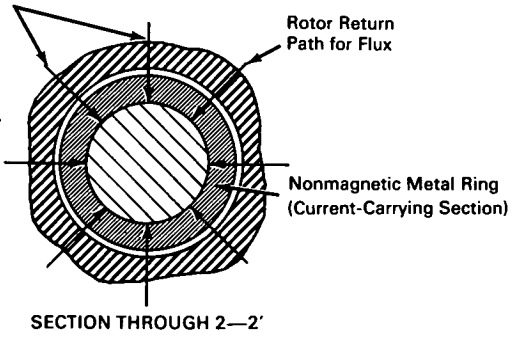

FIGURE 2

The problem:

To devise a means of keeping the induction flux entering the rotor of a homopolar generator in a radial path. In the present state of homopolar generator construction, the induction flux has a pronounced tendency to deviate from its radial path shortly after entering the rotor. The maximum induced EMF is obtained when the induction flux enters the rotor radially. Also, machine efficiency can be controlled by varying the radial depth of the flux path.

The solution:

Nonmagnetic metal rings are imbedded in the generator rotor normal to its axis, forcing the flux to remain radial as it penetrates the periphery of the rotor.

How it's done:

A homopolar generator consists of a cylindrical rotor of solid iron or steel and a stator enclosing the rotor. The stator contains a field winding which produces a radial magnetic field. A series of nonmagnetic metal rings made of copper or aluminum are imbedded in the rotor, normal to its axis, as shown in figure 1. The rings present a high reluctance magnetic path near the periphery of the rotor, but present no additional impedance to the longitudinal electric current. The high reluctance path forces the flux to penetrate the rotor in a radial path throughout the entire depth of the current-carrying cross section. The electric current-carrying cross section is clearly defined by the inner and outer diameter of the rings, separating the current-carrying portion of the rotor from the magnetic return path (figure 2). The outer diameter of the rings is approximately equal to the diameter of the rotor, while the inner diameter is a value defining an optimum current-carrying cross section for the particular requirements of the machine.

Use of the rings permits optimum rotor design for any given set of operating requirements and simplifies the task of predicting the operational characteristics

(continued overleaf)

of the generator. Excitation power requirements are considerably decreased and voltage regulation is improved.

Note:

Additional information concerning this innovation is given in U.S. Patent No. 3,217,199 available from U.S. Patent Office. Inquiries may also be directed to:

Office of Industrial Cooperation
Argonne National Laboratory
9700 S. Cass Avenue
Argonne, Illinois 60439
Reference: B66-10543

Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

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