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Mounting, Support, and Isolation of Various Components of a Hydrogen Maser

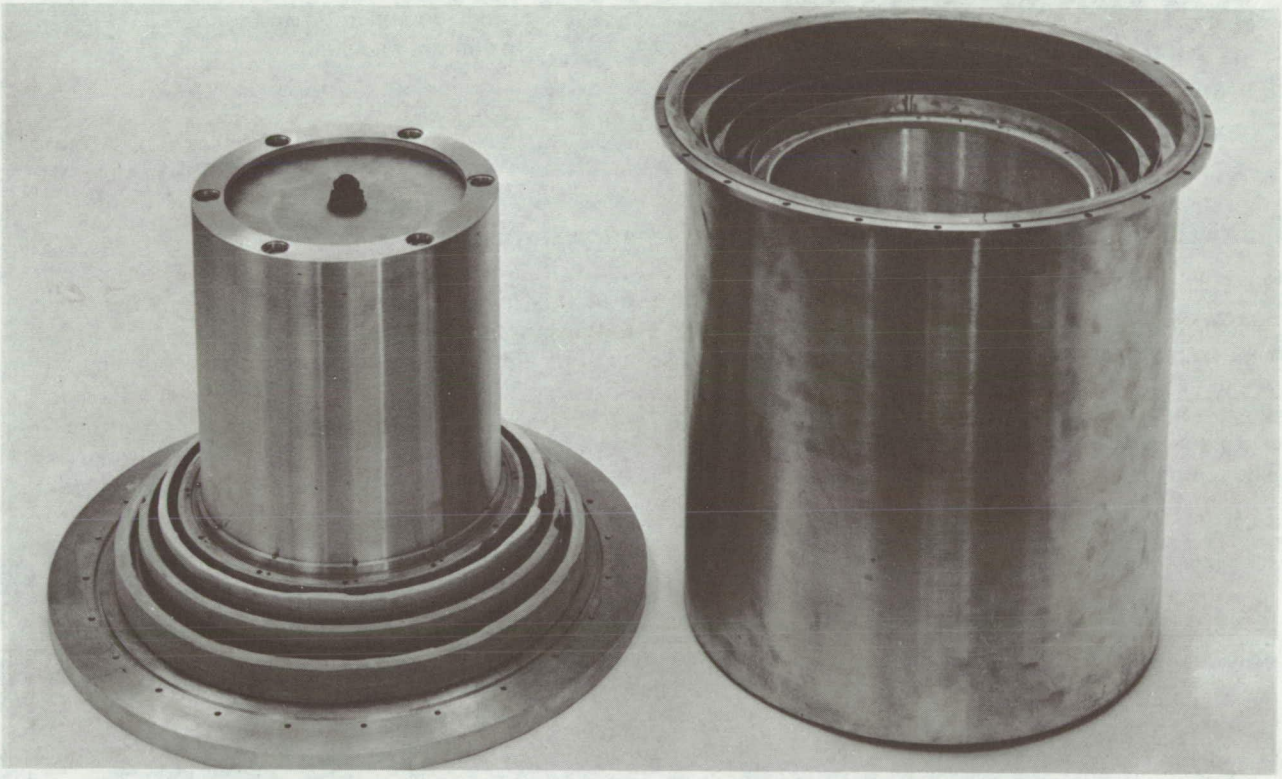

Figure 1. Maser Cavity and Shields

In the design of hydrogen masers, it is necessary to mount the maser cavity in a thermally controlled environment with a uniform magnetic field of minimum intensity. A system has been developed that provides structural support and magnetic isolation for the cavity without degrading the thermal control required in maser operation.

The isothermal and magnetic shield canisters are insulated and spaced by a coil of polytetrafluoroethylene tubing that has been partially collapsed during assembly. This procedure protects the shields from stress due to thermal expansion. The thermal insulation in the large spaces between the shields is made from an epoxy foam cast in position and cured under high temperature. This structure is rigid and stable enough that, when the vacuum bell jar is mounted within the array, the cavity-bulk assembly within the jar can be kept aligned to the atomic beam from the state selector. The maser cavity and shields are shown in Figure 1.

(continued overleaf)

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Figure 2. Hydrogen Maser Atomic Source Mounting Array

A self-jigging, stacked mounting array for the maser's hexapole magnet and the source of hydrogen atoms has also been developed. The hexagonally symmetric ion pump, an integral part of the maser, is used to support the source and the hexapole magnet. The source flange is used in conjunction with a large Belleville-type washer to provide a compressive preload on a stacked array located along the axis of the pump. The array consists of: 1) a three-legged spacing piece fastened to the output end of the magnet; 2) the hexapole magnet; and 3) a second three-legged device at the input end of the magnet. The mounting array and atomic hydrogen source are shown in Figure 2.

Notes:

1. This information may be of interest to designers and manufacturers of microwave components and communication equipment.
2. The following documentation may be obtained from:

   Clearinghouse for Federal Scientific
   and Technical Information
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.65)

   Reference:
   NASA-CR-94937 (N68-25901), Atomic Hydrogen Maser for Space Vehicle Application, Phase I

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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