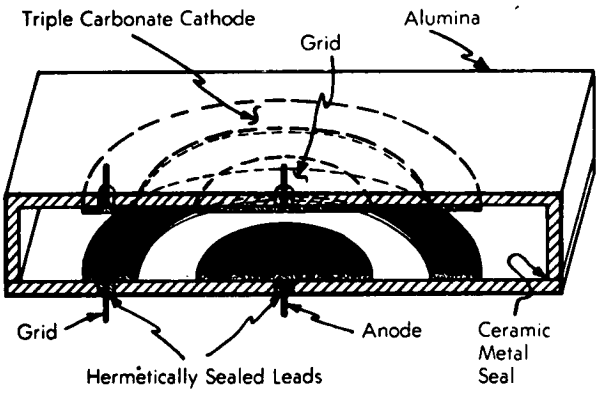
NASA TECH BRIEF

Ames Research Center

Integrated Structure Vacuum Tube — A Concept

The problem:

To provide a miniature high-efficiency vacuum tube which can withstand high temperatures in intense radiation fields.



The solution:

A miniature vacuum tube which is operated at 600°C to provide cathode emission and is comprised of planar electrode structures on refractory substrates.

How it's done:

A single vacuum tube structure with circular electrode geometry is shown in the diagram. The electrodes are placed on the refractory substrate by conventional photolithographic techniques; connections to the electrode films are made by means of pins passing through the substrate. The grid electrodes are interconnected externally.

In use, cathode emission is made to occur by heating the entire structure to 600°C, and a postive potential is applied to the anode with a negative potential on the grids, as is customary with ordinary vacuum tubes. Electron flow takes place from the ring cathode to the circular anode through the electric field produced by the grids. In the diagram, electron flow is from top to bottom.

A number of concentric thin- or thick-film grid structures can be interposed within the cathode ring on the upper planar assembly shown in the diagram and a similar number of grid structures can be disposed concentrically about the central anode area on the lower planar assembly to provide multigrid high-temperature devices corresponding to the tetrodes and pentodes of the present family of vacuum tubes.

The diagram illustrates the concept only in the form of planar, circular electrode structures, but it is evident that the electrodes can also be linear; linear structures can be used to provide increased current and power-handling capability. Recent use has been made of integrated vacuum tubes with two-dimensional structures; however, multidimensional structures of the type represented in the diagram should be more efficient and provide higher transconductances than are obtainable with one-dimensional devices. The multidimensional structures should be cheaper to construct, smaller, and lighter in weight than conventional vacuum tubes.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
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Reference: B74-10110

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-

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B74-10110

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