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NASA TECH BRIEF

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Improved Vacuum Deposition Apparatus

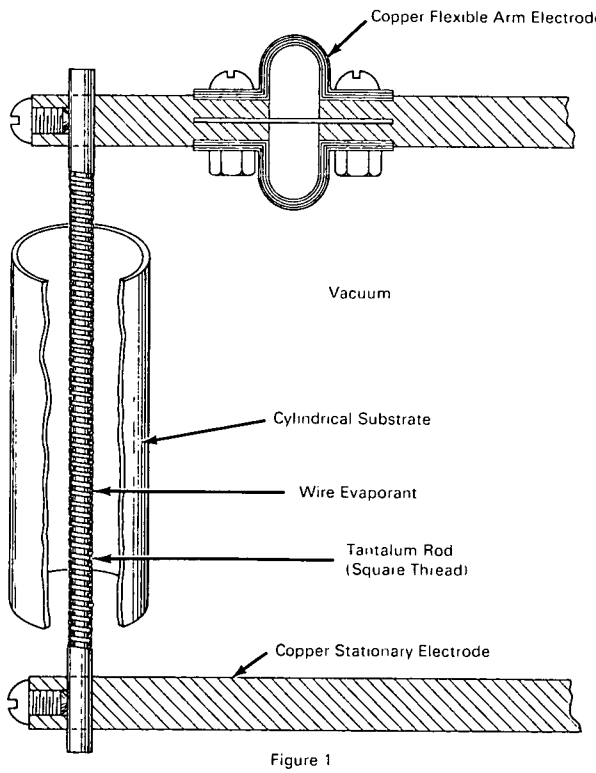

Figure 1

This innovation is an improved apparatus for accomplishing vacuum deposition of thick (.001 inch) metal films on the inside surface of a cylinder, such as an rf cavity. The innovation orients the substrate cylinder vertically to preclude droplets from forming on the plated surface due to gravity effects. The heater rod is threaded so that the evaporant wire (copper, silver, niobium or other) is wound in a uniform helix along the rod. Details of the innovation are shown in figure 1. In the past it has been difficult to coat a long cylindrical form such as an rf cavity with a thick uniform coating having a single layer of evaporant. The effects of gravity on the evaporant and the nonuniformity of placement of the evaporant wire on the heater rod caused blotching and general nonuniformity of the coating.

With this new arrangement, the evaporant is deposited to a uniform thickness and distribution on the inside surface of the substrate without imperfections that would otherwise result from droplet formation. Trial deposits of copper film were made on the inner walls of a pyrex glass cylinder. A pyrex cylinder in

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place after the deposition of a copper film is shown in figure 2. The film adhered very closely to the walls and was evenly distributed. The quantity of evaporant necessary to deposit a 1-mil thickness inside the cylinder is equivalent to a rod 0.180 inch in diameter and about 12 inches long. Since it would have been difficult to accomplish the evaporation of such an extremely large amount of material in a horizontal position using a conventional heat source, it was necessary to design an electrode with flat plateaus so that the evaporant would not fall off. The actual evaporation took about 20 minutes and required about 400 A through the electrode. Heaters are normally in the range of 500 amperes at 10 volts requiring heavy copper bus bars extending into the vacuum chamber from the heater power supply. A portion of the electrode loaded with copper wire prior to evaporation is illustrated in figure 3. The electrode is fabricated from a 0.25-inch-diam × 18-inch-long tantalum rod, with convolutions 0.064 inch wide and 0.062 inch deep. The electrode is suspended vertically and coaxially in the cylinder.

Note:

No additional documentation is available. Inquiries may be directed to:

Technology Utilization Officer
NASA Pasadena Office
Pasadena, California 91103
Reference: B69-10365

Patent status:

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Source: H. Erpenbach of
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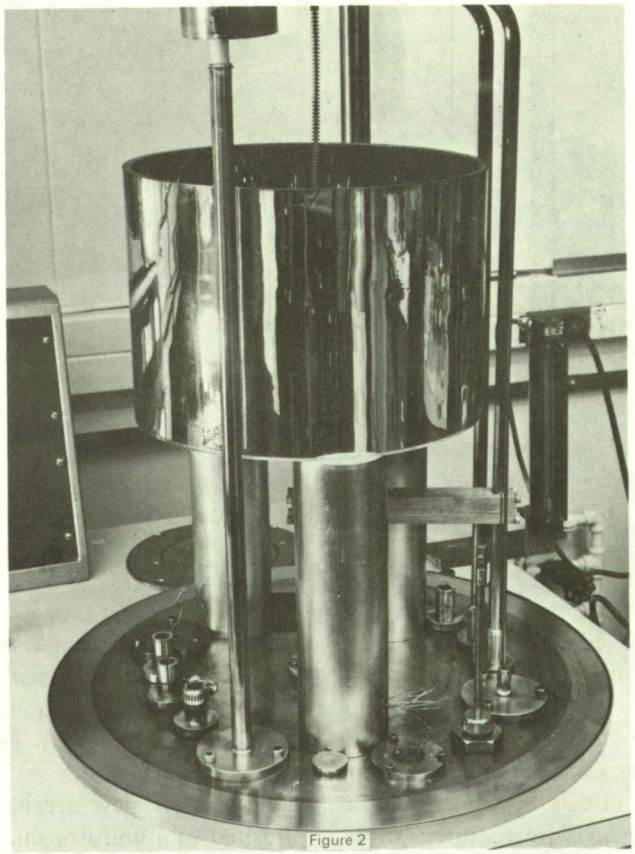

Figure 2

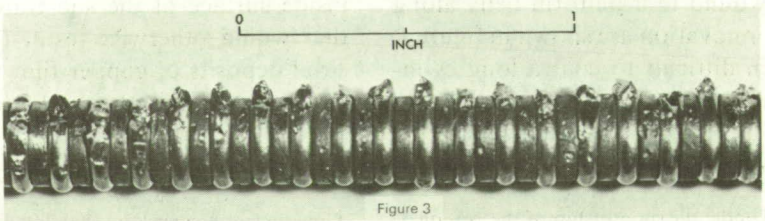

Figure 3