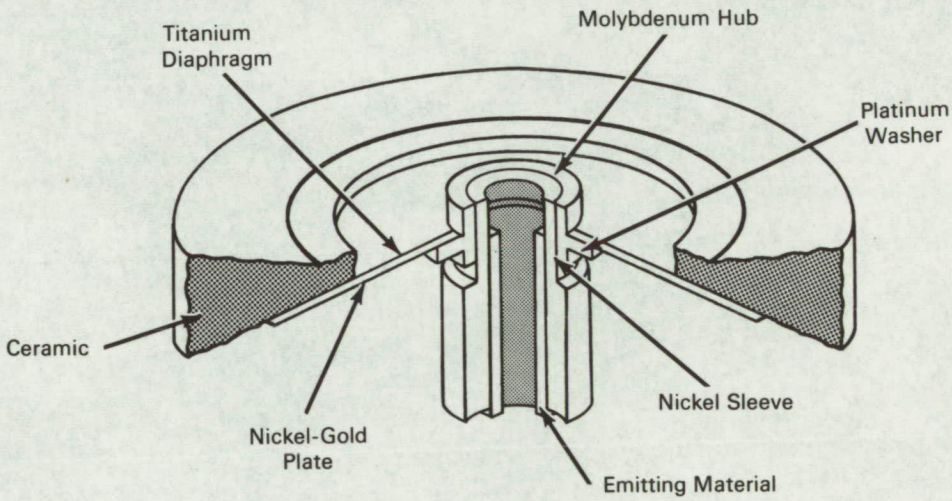
NASA TECH BRIEF

Titanium Diaphragm Makes Excellent Amplitron Cathode Support



The problem: To prevent radial misalignment between the cathode and anode in amplitrons.

The solution: A cathode support structure designed around a titanium diaphragm that exhibits low thermal conductivity, tolerates lateral thermal expansion of the cathode, and is a poor primary and secondary emission medium.

How it's done: The titanium diaphragm is brazed to the ceramic support structure after first metallizing the surface of the ceramic by conventional techniques. A gold-nickel eutectic is used as a brazing material since it melts in a desirable temperature range. A molybdenum hub isolates the nickel cathode from the titanium diaphragm since their eutectic point is at approximately the same temperature as that required during cathode processing. The molybdenum hub is welded to the titanium diaphragm with a thin platinum washer. The cathode is welded to the molybdenum hub after the parts have been assembled in the amplitron tube.

Notes:

1. The strength of titanium, even at elevated temperatures, allows lateral thermal expansion of the cathode without loss of the necessary radial alignment with respect to the anode.
2. Because of its poor primary and secondary emission characteristics, the titanium acts as an end shield to prevent spreading of the electron cloud in the interaction space. It also contributes to performance stability by its effective absorption of residual gases in a high-vacuum environment.

(continued overleaf)

3. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
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Reference: B65-10298

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated by NASA.

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