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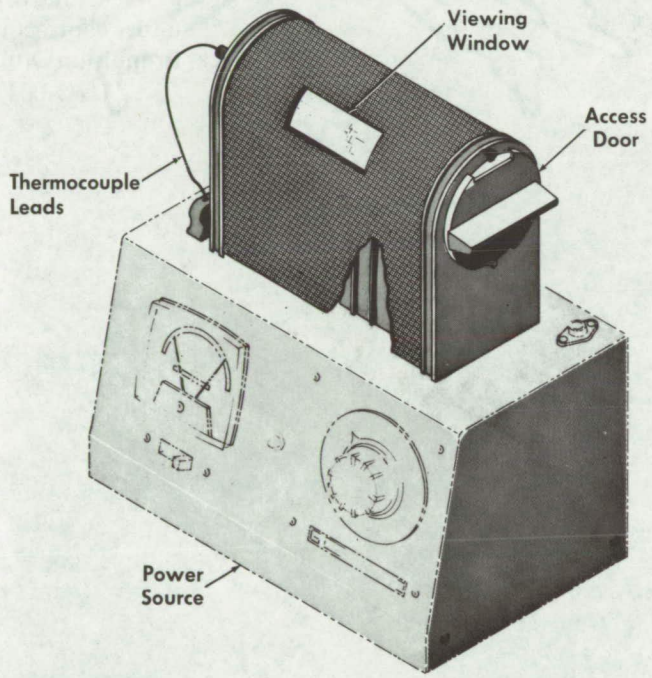
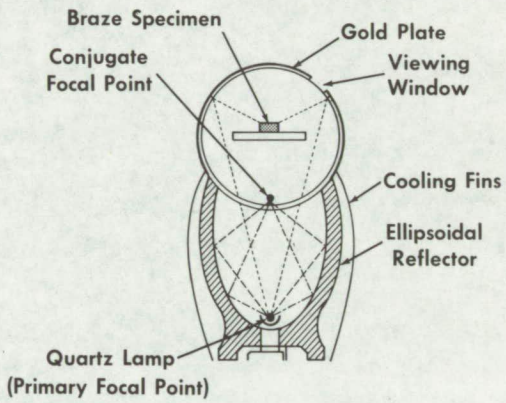
Brief 66-10268

NASA TECH BRIEF

High-Speed Furnace Uses Infrared Radiation for Controlled Brazing





END VIEW (SCHEMATIC)

The problem:

To design a furnace that will be capable of producing controlled heat for brazing and heat treating metals over a wide range of temperatures (from 100° to more than 2000° F). The furnace must operate with a simple power supply, maintain a pure atmosphere required for brazing, be capable of rapid heatup and cooldown, and permit visual observation of the braze specimen. Conventional furnaces, including those employing gas or rf induction heating, are deficient in one or more of these attributes.

The solution:

A furnace employing a near-infrared heat source positioned at one focus of an ellipsoidal reflector mounted below a cylindrical quartz chamber in which the braze specimen is placed.

How it's done:

A quartz lamp is mounted at one focus of an ellipsoidal reflector made of highly polished aluminum. This assembly is mounted below a quartz cylinder, which serves as the furnace chamber. The conjugate focus of the reflector, where most of the radiant heat energy from the lamp is concentrated, is located immediately inside the quartz furnace chamber. This chamber is gold plated over most of its exterior surface to ensure that the radiant energy will be reflected toward the braze specimen placed within it. Two portions of the chamber are unplated, one portion to allow

(continued overleaf)

entry of the infrared radiation and the other to allow visual observation of the braze specimen.

One end of the furnace chamber has a sealable, hinged access door, and the other end is arranged to provide for the insertion of a monitoring thermocouple and circulation of a gaseous atmosphere. Single-phase, 60-cycle electrical power supplied to the lamp can be varied from 115 to 280 volts in order to control the temperature of the furnace, as sensed by the thermocouple.

Notes:

1. For a specimen of medium size in a furnace chamber 12 inches long and 6 inches in diameter, a complete brazing operation required only 30 seconds for heatup and 1 minute for cooldown. Heat concentration toward the braze specimen was so efficient during the brazing that the exterior of the furnace could be touched without discomfort.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   AEC-NASA Space Nuclear Propulsion Office
   U.S. Atomic Energy Commission
   Washington, D.C., 20545
   Reference: B66-10268

Patent status:

The heat source configuration, consisting of the lamp, ellipsoidal reflector, and cooling fins, is covered by U.S. Patent 3,242,314, issued to the Aerojet-General Corporation. NASA does not contemplate patent action for the overall furnace configuration.

Source: P. N. Eckles
of Aerojet-General Corp.
under contract to
Space Nuclear Propulsion Office
(NU-0047)