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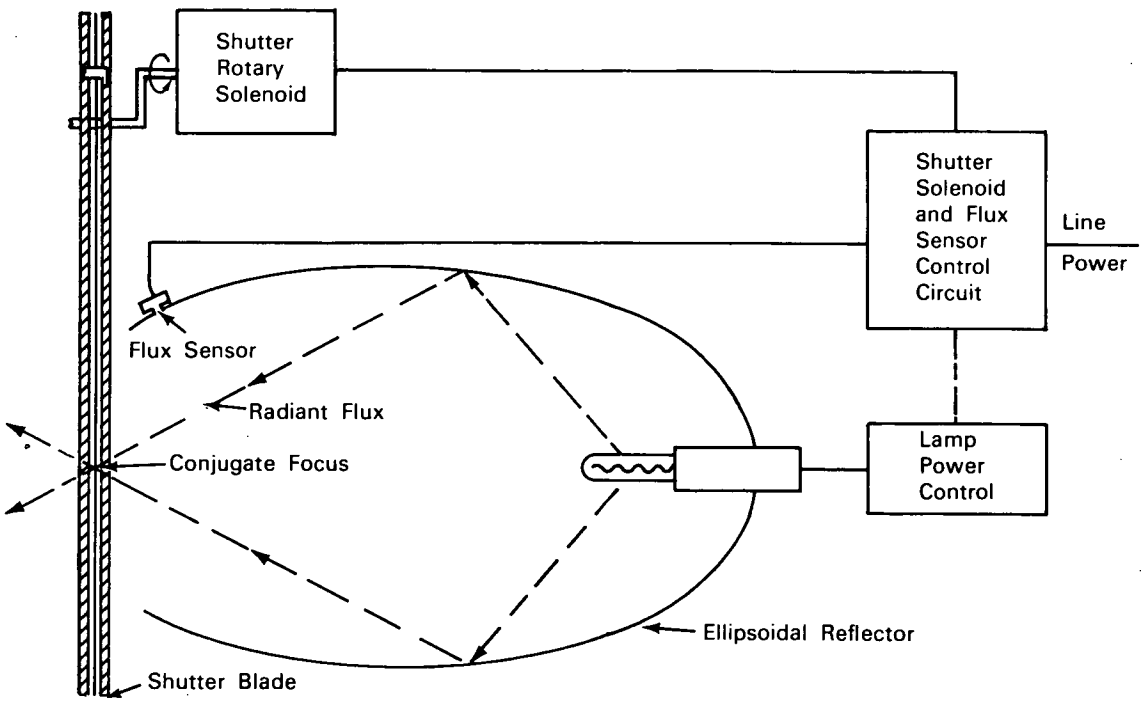
Brief 70-10694

NASA TECH BRIEF

High Intensity Heat-Pulse Source Operates Without Cooling System



The problem:

High intensity radiant energy pulses are ordinarily obtained from a continuously operating source, via a shuttering mechanism. However, provisions must be made for dissipating the excessive heat produced by the source, and for preventing damage to the shutter. Elaborate mechanisms must be employed to place an externally cooled shield between the shutter and the source when the shutter is not open. It is desirable to have an apparatus that will operate effectively without a cooling system to produce high intensity radiant heat pulses of specified magnitude and duration.

The solution:

A tungsten-iodine quartz lamp which can readily be turned on and off is mounted at one focus of an ellipsoidal reflector, and a shutter is mounted at the conjugate focus. A flux sensor monitors the lamp and actuates the shutter which emits a heat pulse when the radiant flux builds up to a requisite level. The lamp is turned off at the end of the shuttered pulse.

How it's done:

As shown in the diagram, a high intensity radiant heat source (e.g., a 750-watt tungsten-iodine quartz lamp) is located at one focus of a polished el-

(continued overleaf)

lipsoidal reflector, and a thin pivoted-blade shutter is located within the region of the conjugate focus. The object to be irradiated is placed immediately outside the shutter so that it is substantially in the conjugate focal region in order to receive maximum energy from the source.

The lamp is turned on, and the intensity of the emitted radiation is monitored by a semiconductor sensor. When the flux reaches a desired level, the sensor and solenoid control circuit actuates the shutter which produces a radiant heat pulse of calibrated intensity and duration. At the end of the pulse the lamp is turned off. The shutter can be adjusted to vary the pulse duration from a few milliseconds to several seconds. With a 750-watt lamp, the flux level can be varied from about 5 to 25 watts/cm^2. Since the lamp is turned off at the end of the pulse, it is only slightly longer than necessary to irradiate an object. Thus there is no prolonged high temperature to damage any of the components, thereby obviating the need of water or forced-air cooling.

Notes:

1. The heat source and control circuitry can be mounted on a single portable chassis. The unit is especially useful for calibrating and testing thermal sensors and heat transfer gages (e.g., gages used for measuring transient temperatures in shock tunnels.)
2. Requests for further information may be directed to:

   Technology Utilization Officer
   Ames Research Center
   Mail Stop N-240-2
   Moffett Field, California 94035
   Reference: B70-10694

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

Patent Counsel
Mail Code 200-11A
Ames Research Center
Moffett Field, California 94035

Source: L. D. Russell
Ames Research Center
(ARC-10178)