The problem:
To provide a lightweight, efficient, and dependable one-shot heat source capable of creating a prede-
termined temperature around sealed packages.

The solution:
A pyrotechnic heater, composed of a blend of an active chemical element (boron, zirconium, or mag-
nesium) and another compound (molybdenum tri-
oxide, barium chromate, or cupric oxide), which
reacts exothermically when ignited and produces
fixed quantities of heat. Positive ignition is electric-
ally initiated.

How it’s done:
The pyrotechnic heater consists of two main sec-
tions, the initiator section and the heater section. The
initiator section is composed of an aluminum tube
fitted with a Sauereisen seal at one end and a lac-
quered seal at the other. This section contains blended
chemicals capable of ignition by an electrical firing
network. The lacquered seal end is fitted with an
internally threaded aluminum container which fits
over the firing end of the heater section.

The heater section is also an aluminum tube, con-
taining a preselected blend of pyrotechnics capable of
producing the desired temperature rise time, heating
temperature, and burning time. The end which mates
with the initiator section has a swaged seal and a
narrow threaded neck to fit into the container of the
initiator. The other end is fitted with an end plug
which will not melt or burn at the heater's operating
temperature.

In operation, an electrical impulse ignites the
chemical blend of the initiator section. When the flame
(continued overleaf)
front reaches the lacquered seal and the thin aluminum container at the screw thread of the next section, the seal melts and the heater section is ignited. The pyrotechnic blend burns until the flame front reaches the end plug. Several heater sections may be joined to provide for the parameters of burn time and heat required. Physical configuration requirements can be met by bends or angles in any section.

Notes:
1. Pyrotechnic heaters are capable of providing 850 to 900 BTU's per pound, while storage-battery-driven heaters can produce only 70 to 120 BTU's per pound. Temperatures of $600^\circ \pm 15^\circ F$ are attainable with a barium pyrotechnic blend.

2. Inquiries concerning this innovation may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
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   Reference: B68-10062

Patent status:
No patent action is contemplated by NASA.
Source: Vincent R. Lalli and Henry C. Haller of TRW Equipment Laboratories under contract to Lewis Research Center (LEW-10131)