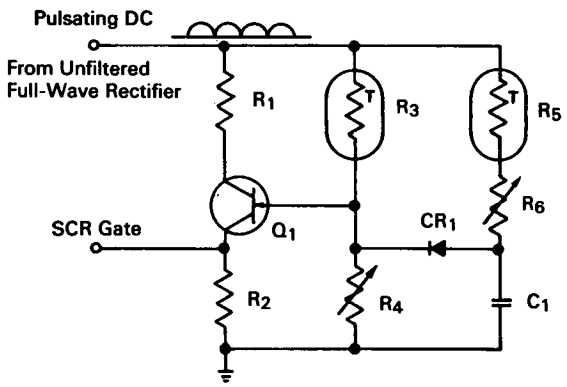
NASA TECH BRIEF

Heater Control Circuit Provides Both Fast and Proportional Control



The problem:

To provide a simple and reliable circuit that will supply a heater with full current, from a pulsating dc source, up to a present temperature and then switch over to proportional control for fine temperature regulation. Existing methods require one or more additional transistors and associated circuitry. These additional components result in a lower circuit reliability.

The solution:

Add two resistors and a diode to an existing proportional control circuit.

How it's done:

The figure illustrates a conventional proportional control circuit combined with a fast heating circuit to control a silicon controlled rectifier (SCR) and heater. The fast heating circuit consists of a voltage divider (resistors R_3 and R_4). The fast heating circuit provides a voltage, at low temperatures, sufficient to trigger transistor Q_1 on the leading edge of each input dc pulse so that the heater operates during the full input pulse duration. As the temperature rises above a preset value, the change in resistance of R_3 reduces the voltage supplied by the voltage divider so that heater control is shifted to the proportional control circuit. The SCR gate output from unijunction transistor Q_1 is then delayed on each input dc pulse by the charge time of capacitor C_1 through R_5 and R_6. Because of this delay, the heater does not turn on in the early portion of each input pulse. Diode CR_1 is used to isolate the fast heating circuit from the proportional control circuit.

Notes:

1. When provided with proper sensors, the circuit could be adapted to provide control of other functions, such as pressure, volume, fluid level, motor speed, voltage, light intensity, etc.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B67-10097

(continued overleaf)

Patent status:

No patent action is contemplated by NASA.

Source: R. W. Baslock
of IBM
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