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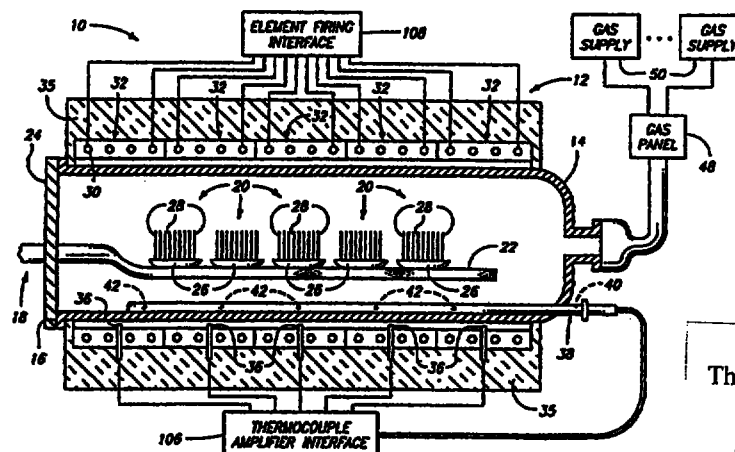
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(54) Title: MODEL BASED TEMPERATURE CONTROLLER FOR SEMICONDUCTOR THERMAL PROCESSORS



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## (57) Abstract

Controllers and associated methods for controlling a thermal reactor or other thermal semiconductor processors which include a heating element (30) powered by a power source, and having profile thermocouples (42) and spike thermocouples (36). One preferred method comprises the following steps: modeling thermal dynamic characteristics of the thermal reactor (12), the modeling step including providing thermocouple instrumented wafers (26) in the thermal reactor, perturbing the thermal reactor by controlling the heating element (30) using a stimulation sequence, and developing models based on changes in temperature created by the perturbations. The models are developed off-line and can include one or more models, such as a model of power versus spike thermocouple readings, a model of spike thermocouple reading versus profile thermocouple readings, and a model of profile thermocouple readings versus thermocouple instrumented wafer readings. On-line models are further derived and used during operation to control power input to the zones of the thermal processor using measured profile and spike temperatures. The models can be cascaded or selectively activated to achieve different control regimes.