Abstract

Embodiments of an electric heater apparatus are disclosed. In one embodiment, an electric heater apparatus includes: (a) a first thermally conductive layer comprising an electrically insulating material; (b) one or more electrically conductive heating elements disposed in one or more grooves arranged on the top side of the first thermally conductive layer; and (c) a second thermally conductive layer disposed on the top side of the first thermally conductive layer over the one or more heating elements. The one or more heating elements include one or more refractory hard metals doped with at least one of carbon, nitrogen, aluminum, yttrium, or oxygen. The doped one or more refractory hard metals include a temperature insensitive electrical resistance over operational temperatures ranging from ambient temperature to about 850˚C as compared to undoped refractory hard metals. The one or more heating elements are independently controllable to provide one or more heating zones.

[Fig. 1]