



- [54] **ELECTRICALLY POWERED CERAMIC COMPOSITE HEATER**
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- [73] Assignee: **Philip Morris Incorporated**, New York, N.Y.
- [21] Appl. No.: **291,690**
- [22] Filed: **Aug. 16, 1994**

**Related U.S. Application Data**

- [63] Continuation-in-part of Ser. No. 224,848, Apr. 8, 1994, which is a continuation-in-part of Ser. No. 118,665, Sep. 10, 1993, Pat. No. 5,388,594, which is a continuation-in-part of Ser. No. 943,504, Sep. 11, 1992.
- [51] Int. Cl.<sup>6</sup> ..... **H05B 3/10**; A24F 1/22
- [52] U.S. Cl. .... **219/553**; 219/543; 131/194
- [58] Field of Search ..... 219/553, 541, 219/543, 544, 390; 338/283, 284, 285, 294; 373/111, 117; 252/516, 518; 264/60; 131/194, 195

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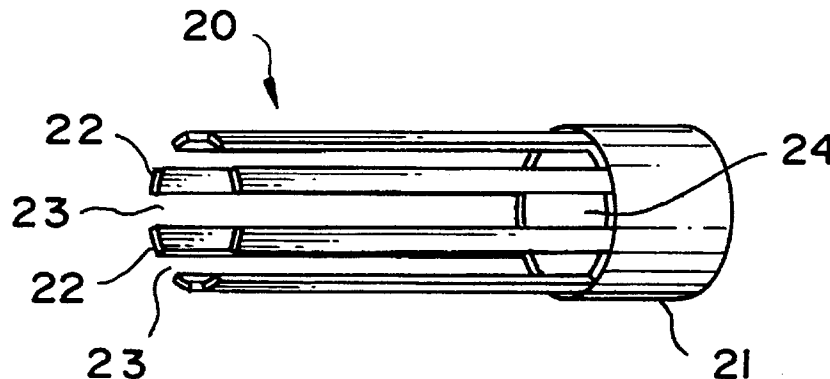
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**ABSTRACT**

[57] An electrically powered ceramic composite heater useful for devices such as a cigarette lighter. The electrical resistance heater includes a discrete heating segment configuration wherein each individual segment of the heater can be activated using an electric control module, and is capable of heating to a temperature in the range of 600° C. to 900° C. using portable energy devices. The ceramic heater can be made by extrusion of a ceramic precursor material followed by secondary processing steps to obtain discrete heating segments. The heater design is such that a hub on one end of the heater provides structural integrity, and functions as a common for the electrical terminals. The ceramic heater can include one or more insulating or semiconductive metal compounds and one or more electrically conductive metal compounds, the compounds being present in amounts which provide a resistance which does not change by more than 20% throughout a heating cycle between ambient temperatures and 900° C.

**49 Claims, 8 Drawing Sheets**



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FIG. 1

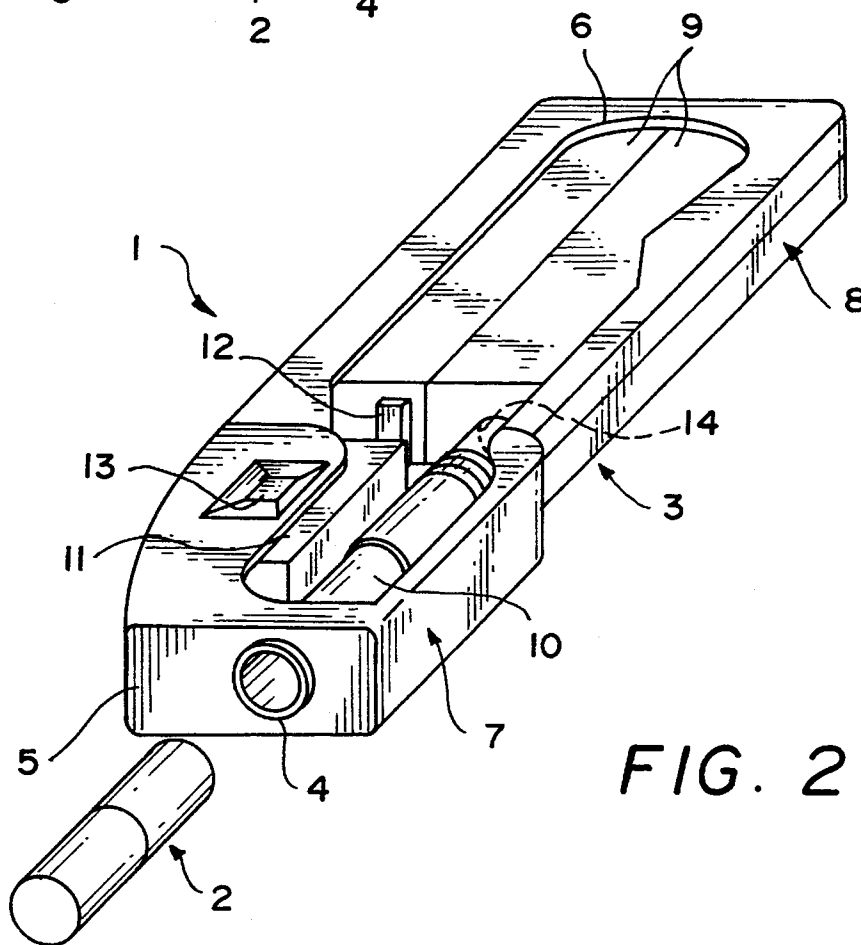
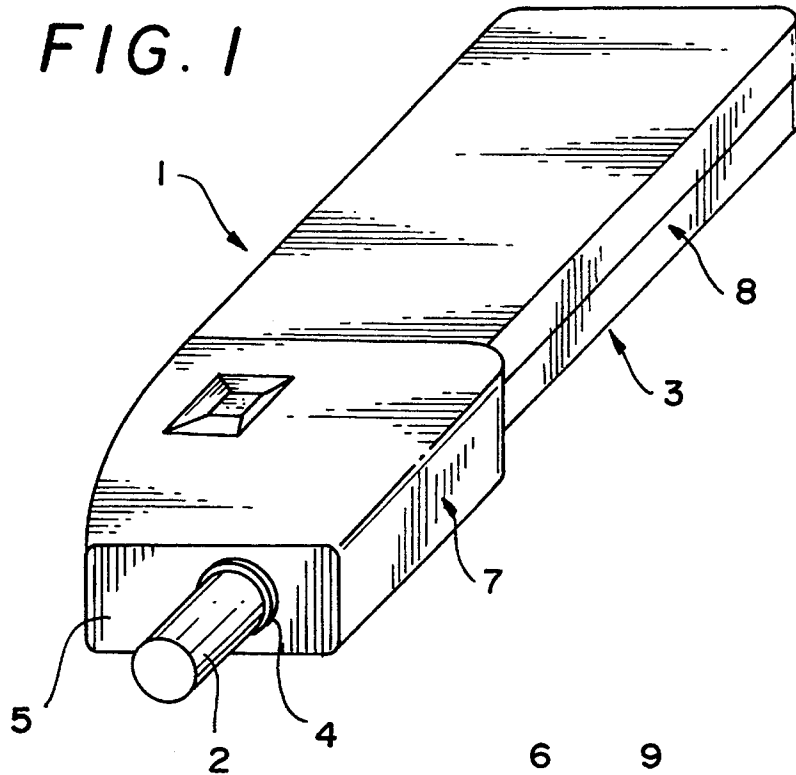


FIG. 2

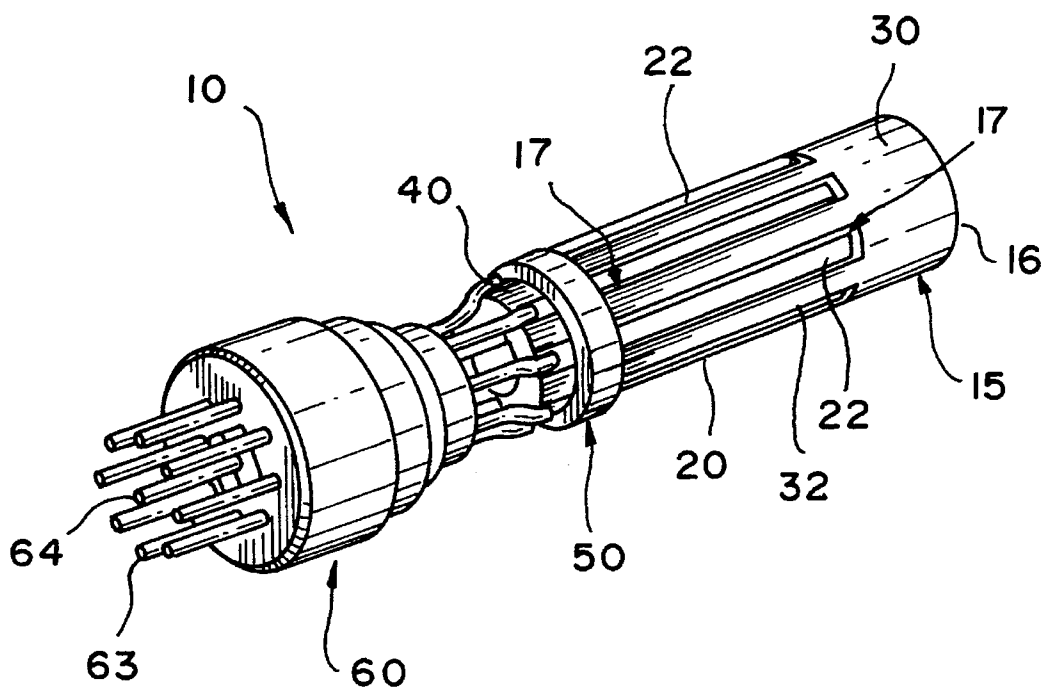


FIG. 3

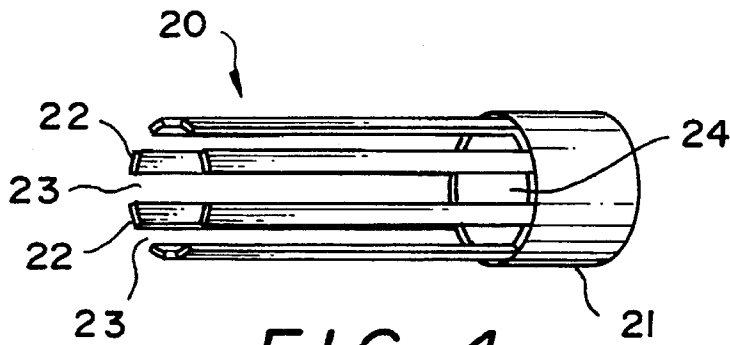


FIG. 4

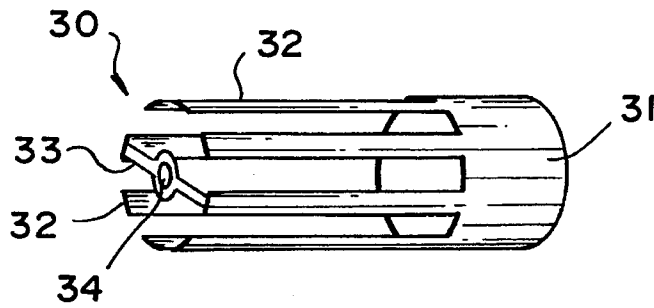


FIG. 5

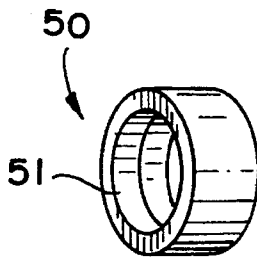


FIG. 7

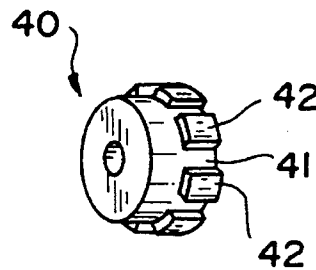


FIG. 6

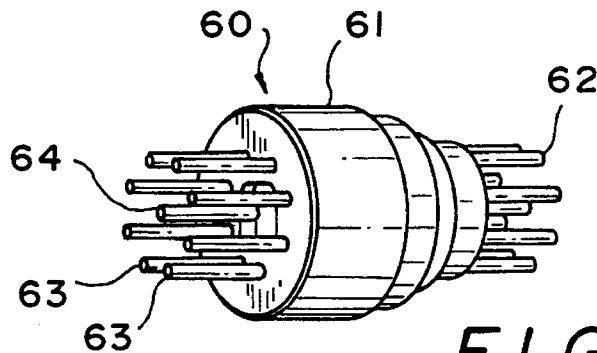


FIG. 8

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