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(54) **METHOD AND APPARATUS FOR HEAT PIPE COOLING OF AN EXCIMER LAMP**

6,194,821 B1 * 2/2001 Nakamura 313/238
6,201,355 B1 * 3/2001 Morgan et al. 315/248
6,379,024 B1 * 4/2002 Kogure et al. 362/263

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* cited by examiner

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(57) **ABSTRACT**

(21) Appl. No.: **10/189,167**

Embodiments of the present invention are directed to a method and apparatus for heat pipe cooling of an excimer lamp. In one embodiment, a heat pipe is used to dissipate heat from an excimer lamp. The heat pipe is in direct contact with at least one electrode of the excimer lamp. In one embodiment, heat is transferred through the heat pipe to a cooling point that is electrically isolated from the lamp. In one embodiment, dissipation of heat from the cooling point is done by conventional means. In one embodiment, the heat pipe is on the inside of the lamp. In another embodiment, a heat pipe is attached to the outside of an excimer lamp. In another embodiment, two heat pipes are used, one on the inside and one on the outside of an excimer lamp. In yet another embodiment, a heat pipe is used with a flat lamp.

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(52) **U.S. Cl.** **315/248**; 313/238

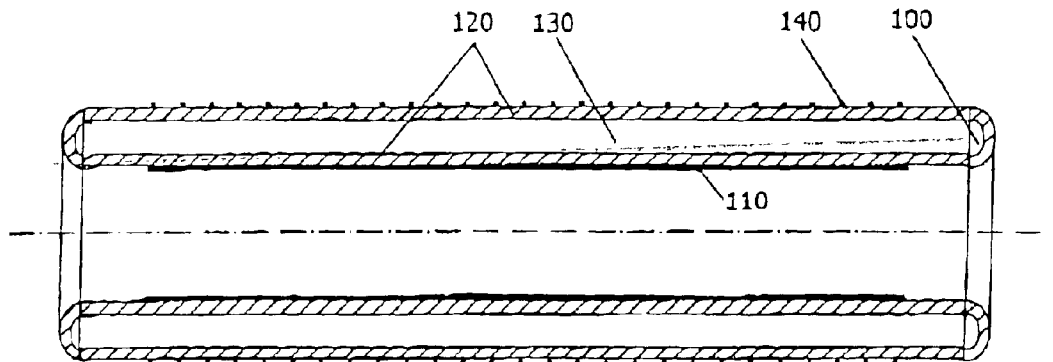
(58) **Field of Search** 313/238, 15, 17,
313/36

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,928,607 A * 7/1999 Frisk 422/29

12 Claims, 7 Drawing Sheets



side-on view of typical co-axial DBD lamp