



US005962988A

# United States Patent [19]

[11] Patent Number: **5,962,988**

Nuckolls et al.

[45] Date of Patent: **Oct. 5, 1999**

[54] **MULTI-VOLTAGE BALLAST AND DIMMING CIRCUITS FOR A LAMP DRIVE VOLTAGE TRANSFORMATION AND BALLASTING SYSTEM**

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(List continued on next page.)

[73] Assignee: **Hubbell Incorporated**, Orange, Conn.

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[21] Appl. No.: **08/968,093**

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[22] Filed: **Nov. 12, 1997**

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[63] Continuation-in-part of application No. 08/556,878, Nov. 2, 1995, Pat. No. 5,825,139.

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[51] Int. Cl.<sup>6</sup> ..... **G05F 1/00**

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[52] U.S. Cl. .... **315/291**; 315/240; 315/244; 315/209 CD; 315/DIG. 4

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*Attorney, Agent, or Firm*—Jerry M. Presson; Stacey J. Longanecker

[58] **Field of Search** ..... 315/99, 100, 106, 315/105, 199, 209 CD, 219, 243, 244, 247, 258, 259, 283, 284, 289, 291, 307, 340, 347, DIG. 5, 240, DIG. 4

### ABSTRACT

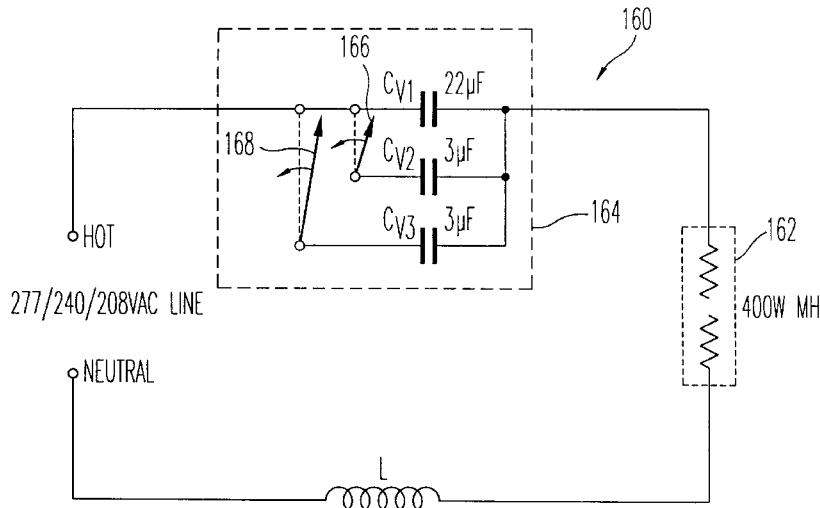
[57] A discharge lamp operating circuit is connected to a source of alternating current (AC) voltage, and has a discharge lamp and a semi-resonant circuit connected to the source of alternating current voltage and in series with the lamp. A starting circuit for initiating operation of said discharge lamp is also connected in the circuit. The lamp switching maintains the series semi-resonant circuit in oscillation and the series semi-resonant circuit maintains the lamp in operation after operation has been initiated by the starting circuit. Highly efficient energy transfer between inductive and capacitive components of the system result in low loss and high power factor. A variable capacitance circuit is provided to allow use of the discharge lamp operating circuit with different line voltages, and to allow dimming.

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**9 Claims, 13 Drawing Sheets**



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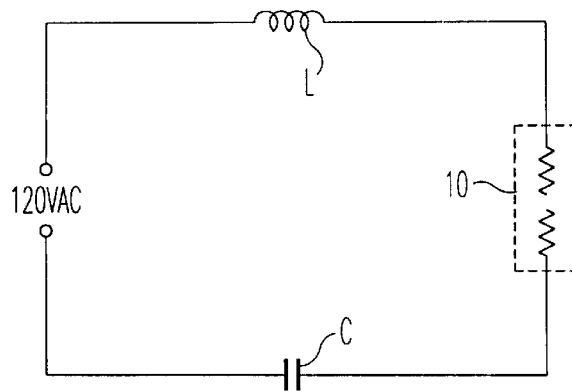


FIG. 1

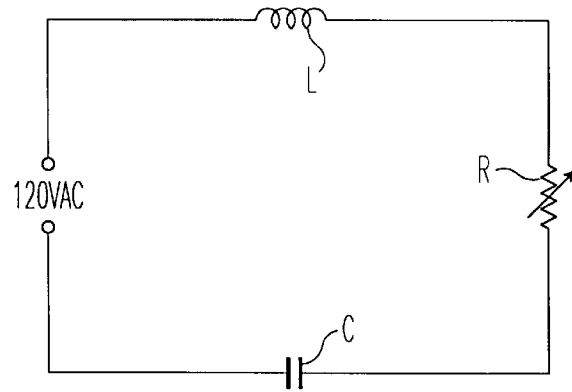


FIG. 2

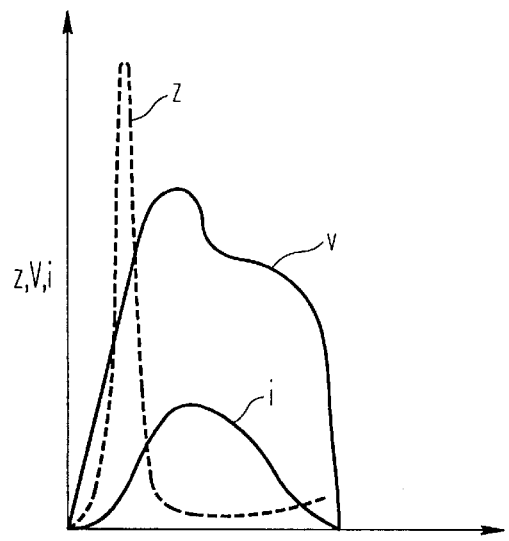


FIG. 3

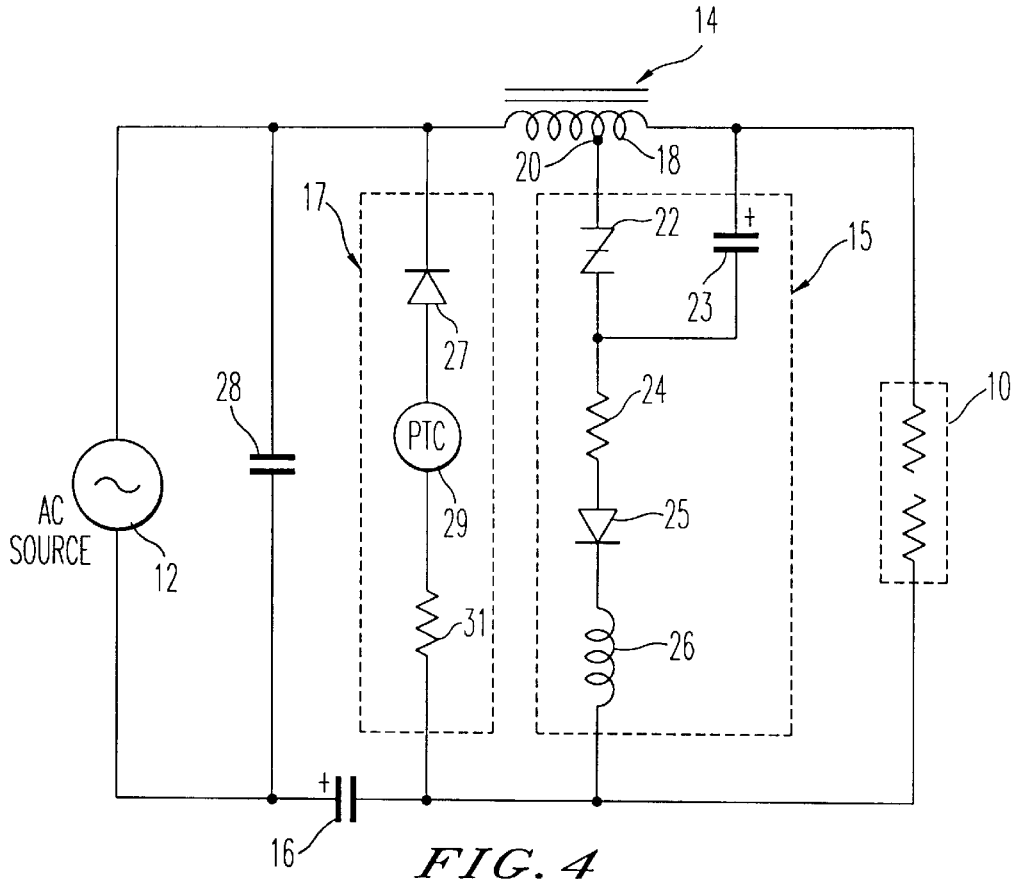


FIG. 4

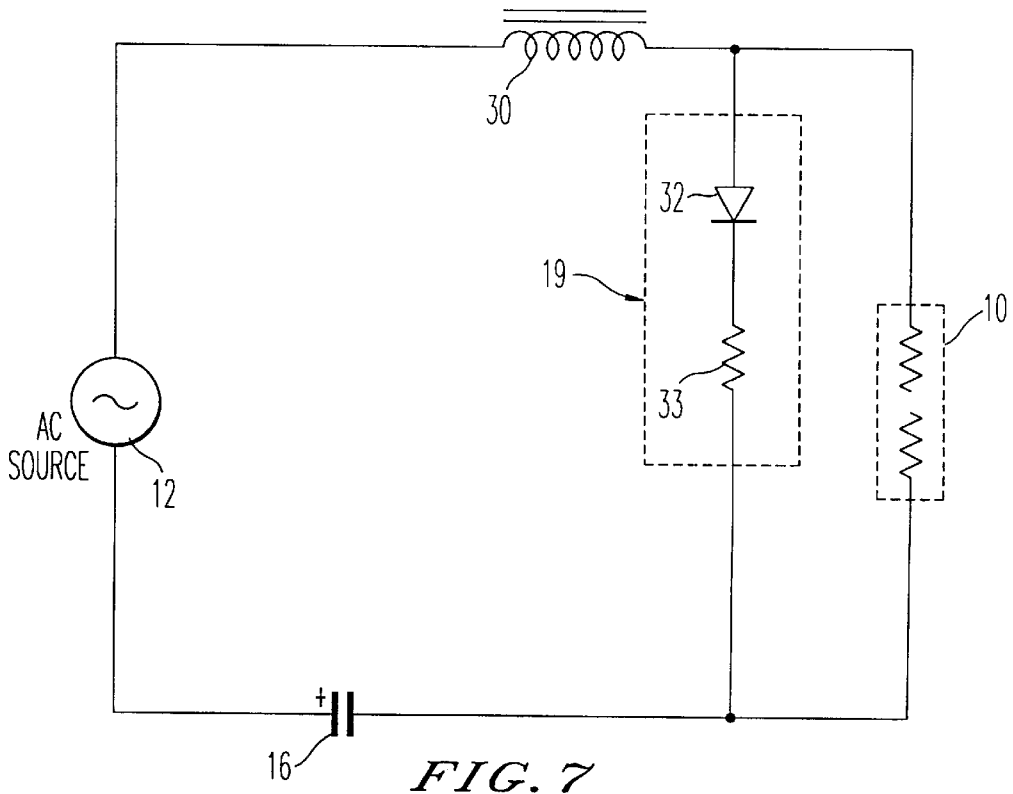


FIG. 7

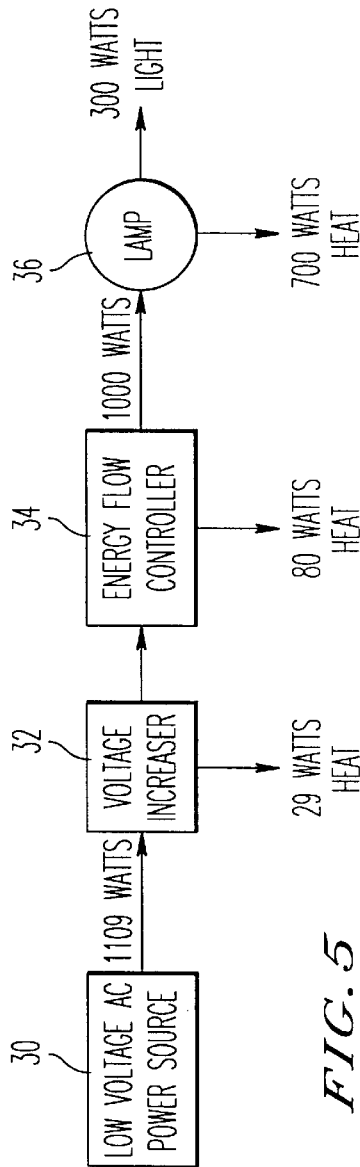


FIG. 5  
PRIOR ART

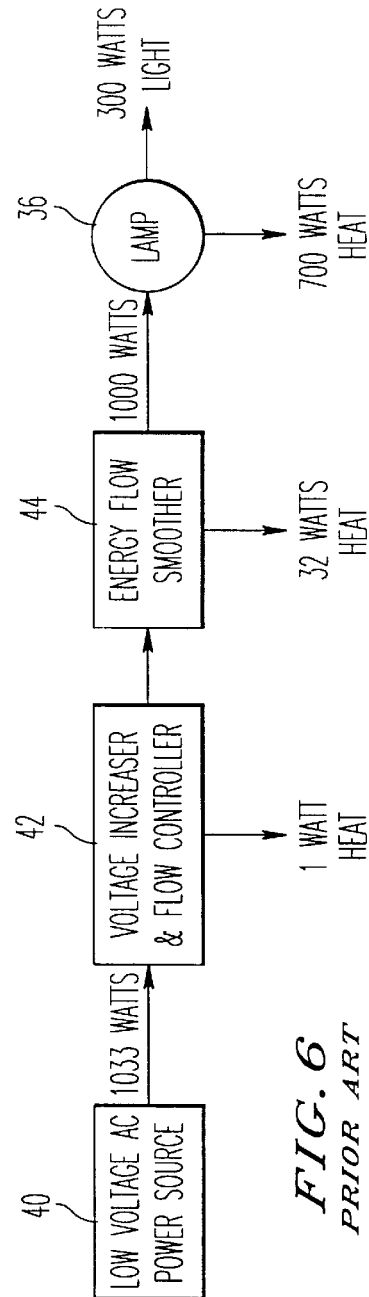


FIG. 6  
PRIOR ART

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