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United States Patent [19]

Griffin et al.

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[54] **BALLAST SHUT-DOWN CIRCUIT RESPONSIVE TO AN UNBALANCED LOAD CONDITION IN A SINGLE LAMP BALLAST OR IN EITHER LAMP OF A TWO-LAMP BALLAST**

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[57] ABSTRACT

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An abnormal or unbalanced load operating condition is detected in a single lamp ballast circuit or in either lamp of a two-lamp ballast circuit by feedback voltage signals that are proportional to the flow of current through the cathodes of each lamp. The analog feedback signals are combined algebraically by a summing circuit that produces a null (zero) value corresponding with normal lamp operation, and produces a non-zero value in response to abnormal cathode current flow. The non-zero value is compared with the reference value to generate a shut-down signal. In one embodiment, the cathode currents are sensed by primary windings of a toroid transformer, and the feedback signals are the magnetic flux components that are generated in response to cathode current flow through the current sensing windings. In another protective circuit embodiment, feedback signals derived from the positive and negative portions of an asymmetrical waveform appearing across the power input pins of a lamp are compared and summed together to produce an output voltage that triggers a shut-down signal if the energy content of the positive portion or of the negative portion of the asymmetrical waveform is greater than a predetermined threshold value.

Related U.S. Application Data

[63] Continuation of application No. 08/621,955, Mar. 26, 1996, Pat. No. 5,636,111.

[51] Int. Cl.⁶ **H02M 5/45; H05B 37/02**

[52] U.S. Cl. **363/37; 315/225**

[58] Field of Search 363/34, 37, 53, 363/56; 315/201, 203, 205, 209 R, 211, 225

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1 Claim, 6 Drawing Sheets

