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(12) **United States Patent**
Lam

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(54) **DC SELF-BIASED VACUUM TUBE
DIFFERENTIAL AMPLIFIER WITH
GRID-TO-CATHODE OVER-VOLTAGE
PROTECTION**

4,134,077 A * 1/1979 Kelly et al. 330/69
6,111,460 A * 8/2000 Yamasita 330/69
7,304,535 B2 12/2007 Lam
7,482,867 B2 * 1/2009 Lam 330/69

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FOREIGN PATENT DOCUMENTS

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GB 743588 A1 1/1956

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* cited by examiner

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(65) **Prior Publication Data**

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(57) **ABSTRACT**

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H03F 3/45 (2006.01)

A single stage differential amplifier is disclosed as comprising a pair of vacuum tube triodes for amplifying two input signals and generating two output signals. The differential amplifier has DC self-biasing ability and grid-to-cathode over-voltage protection for directly coupling from the outputs of another differential amplifier. By possessing these unique features, this differential amplifier becomes an important building block in forming a balanced amplifier by cascading multi differential amplifiers in a directly coupled fashion.

(52) **U.S. Cl.** 330/69; 330/252

(58) **Field of Classification Search** 330/69,
330/46, 41, 42, 43, 44, 252

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2,776,343 A * 1/1957 Yuni 330/96
3,127,569 A 3/1964 Murray

14 Claims, 8 Drawing Sheets

