

[54] **WIDEBAND OPERATIONAL AMPLIFIER**

5,512,859 4/1996 Moraveji ..... 330/267

5,786,698 7/1998 Mallory ..... 324/611

5,786,731 7/1998 Bales ..... 330/267

5,892,356 4/1999 Chuang .

5,982,201 11/1999 Brokaw et al. .

5,986,507 11/1999 Itakura et al. .

6,011,427 1/2000 Cargill .

[75] Inventors: **Kenneth W. Murray; Joel M. Halbert,**  
both of Tucson, Ariz.

[73] Assignee: **Texas Instruments Tucson Corporation,** Tucson, Ariz.

[21] Appl. No.: **09/215,402**

[22] Filed: **Dec. 18, 1998**

[51] **Int. Cl.<sup>7</sup>** ..... **H03F 3/45**

[52] **U.S. Cl.** ..... **330/255; 330/257**

[58] **Field of Search** ..... **330/255, 257**

[56] **References Cited**

**U.S. PATENT DOCUMENTS**

4,446,443 5/1984 Johnson et al. .... 330/257

4,945,259 7/1990 Anderson .

4,970,470 11/1990 Gosser .

5,103,188 4/1992 Bender ..... 330/265

5,280,346 1/1994 Ross ..... 358/38

5,317,281 5/1994 Vinn et al. .... 330/265

5,399,991 3/1995 Moraveji ..... 330/255

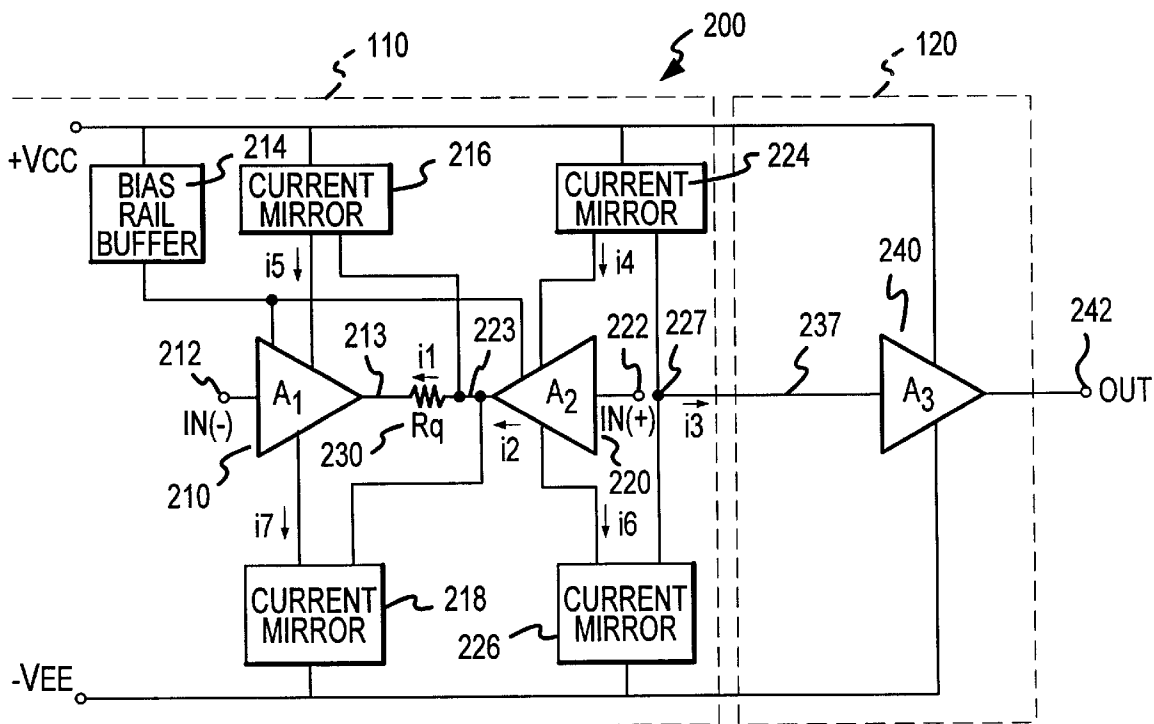
5,510,754 4/1996 Moraveji et al. .... 330/267

*Primary Examiner*—Robert Pascal  
*Assistant Examiner*—Henry Choe  
*Attorney, Agent, or Firm*—Snell & Wilmer L.L.P.

[57] **ABSTRACT**

A wideband operational amplifier in accordance with the present invention overcomes many shortcomings of the prior art. A wideband operational amplifier may be configured to provide a high output voltage and high output current. The amplifier may comprise an input stage having a first input buffer and a second input buffer, and an output stage amplifier having an output buffer. The input stage may also include current mirrors configured to facilitate a lower input offset voltage and lower input voltage noise. Moreover, the operational amplifier may also provide a wide common-mode input range and full power bandwidth simultaneously.

**13 Claims, 8 Drawing Sheets**



1/8

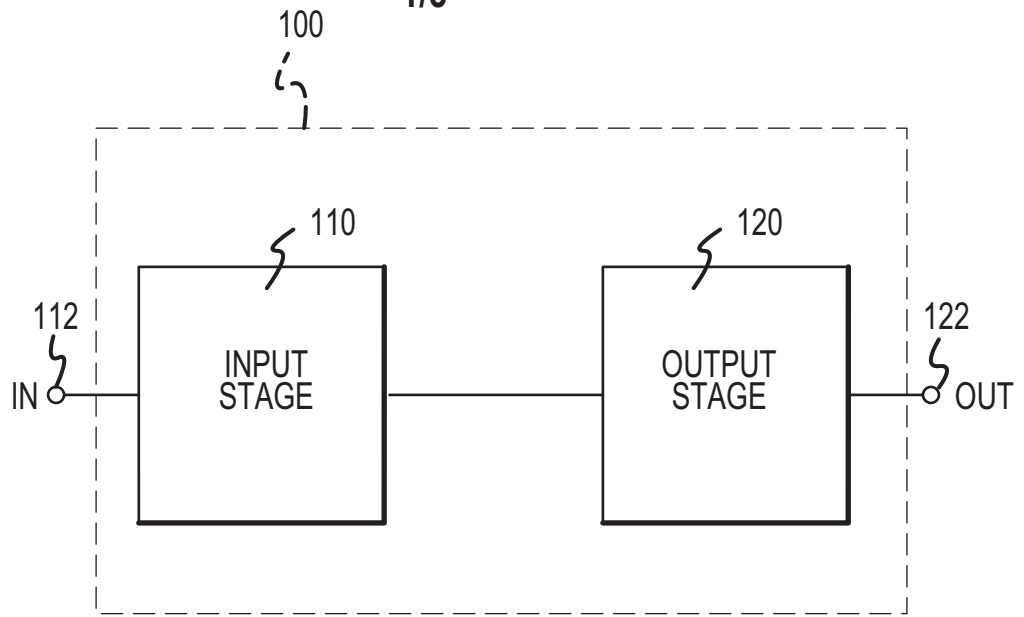


FIG.1

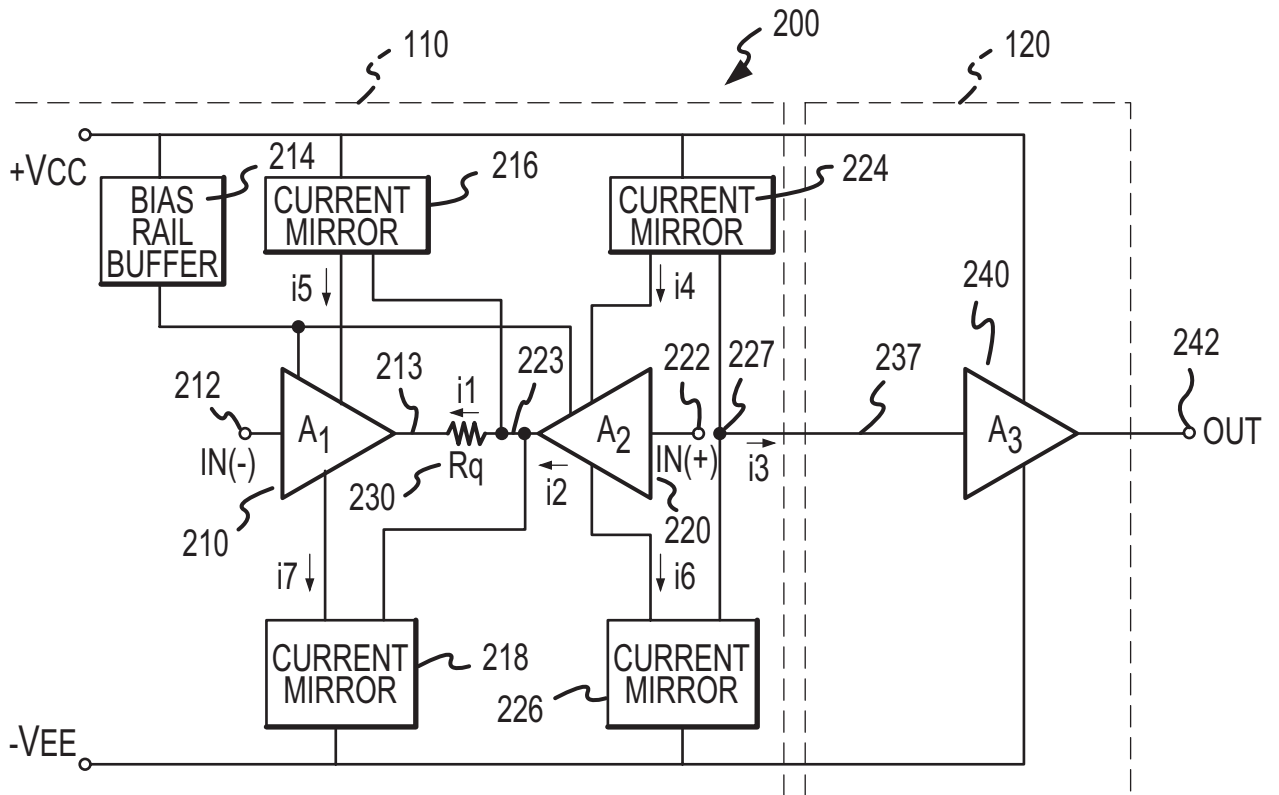


FIG.2

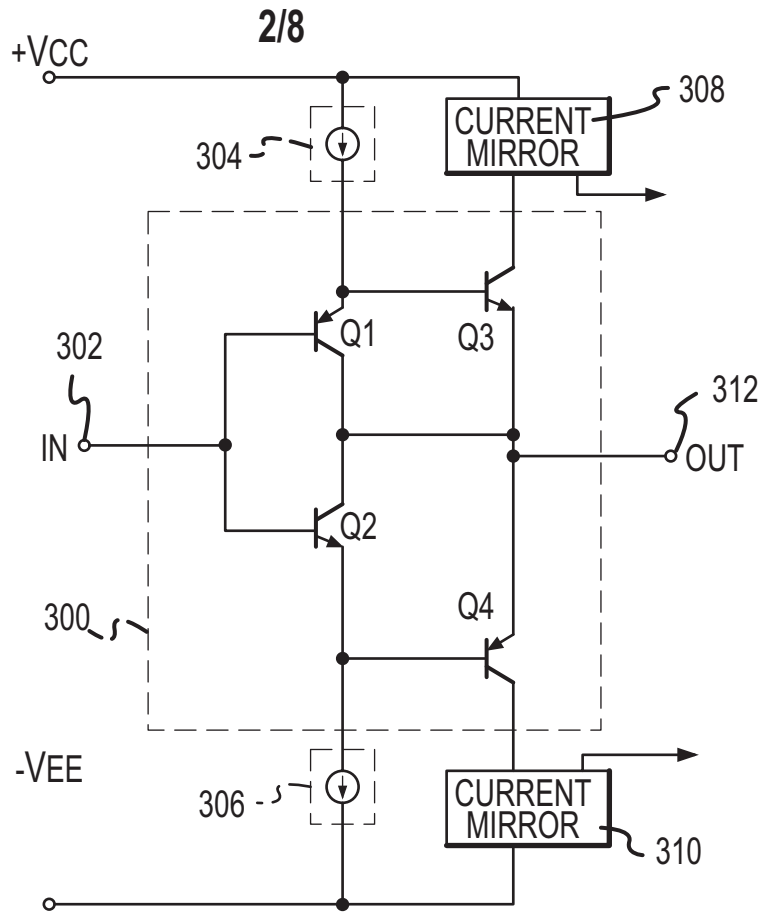


FIG.3

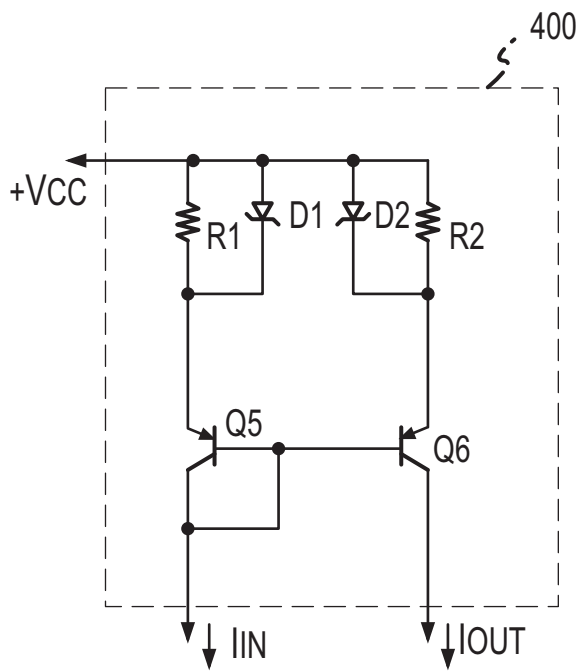


FIG.4A

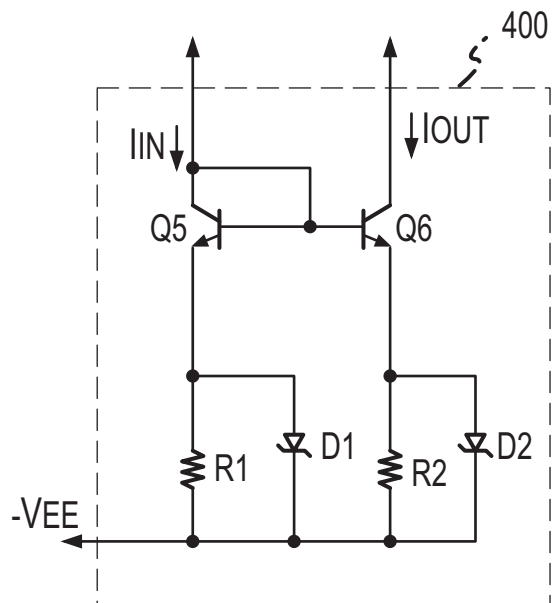


FIG.4B

3/8

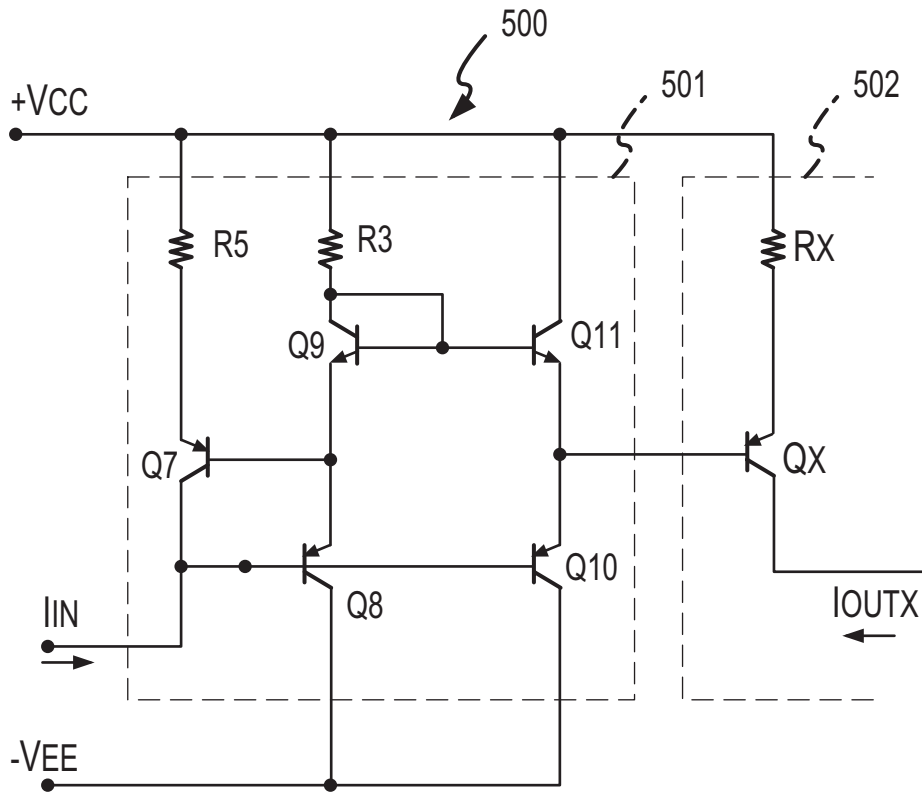


FIG.5A

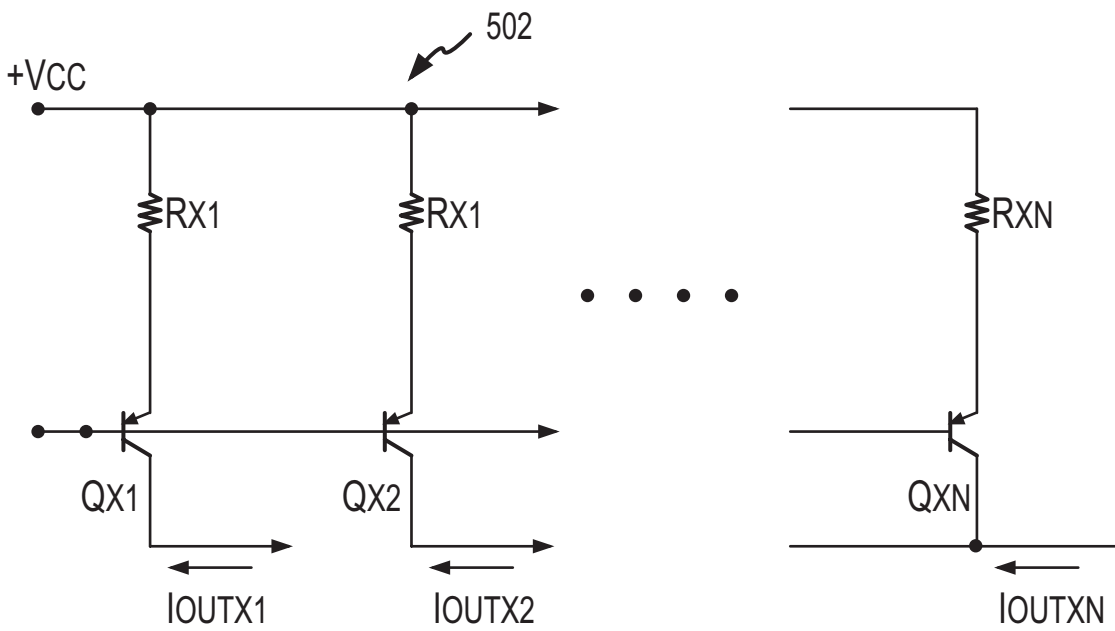


FIG.6A

4/8

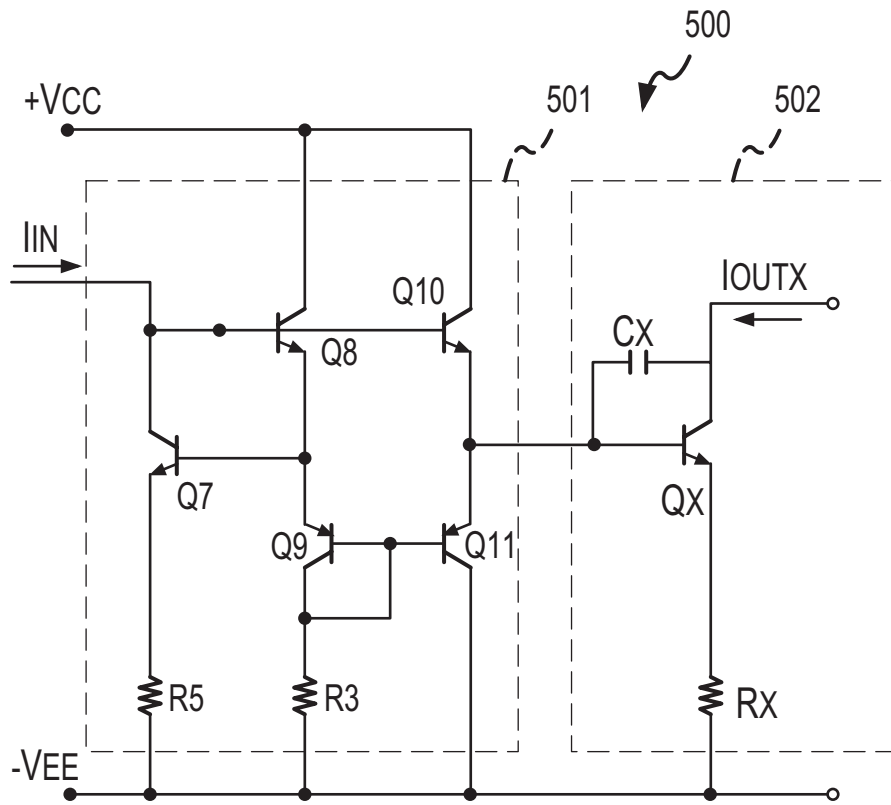


FIG.5B

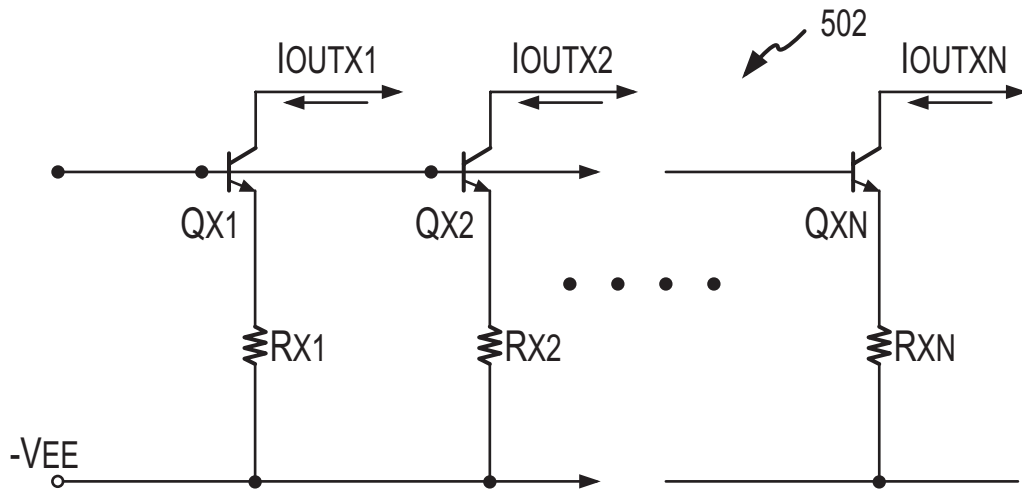


FIG.6B

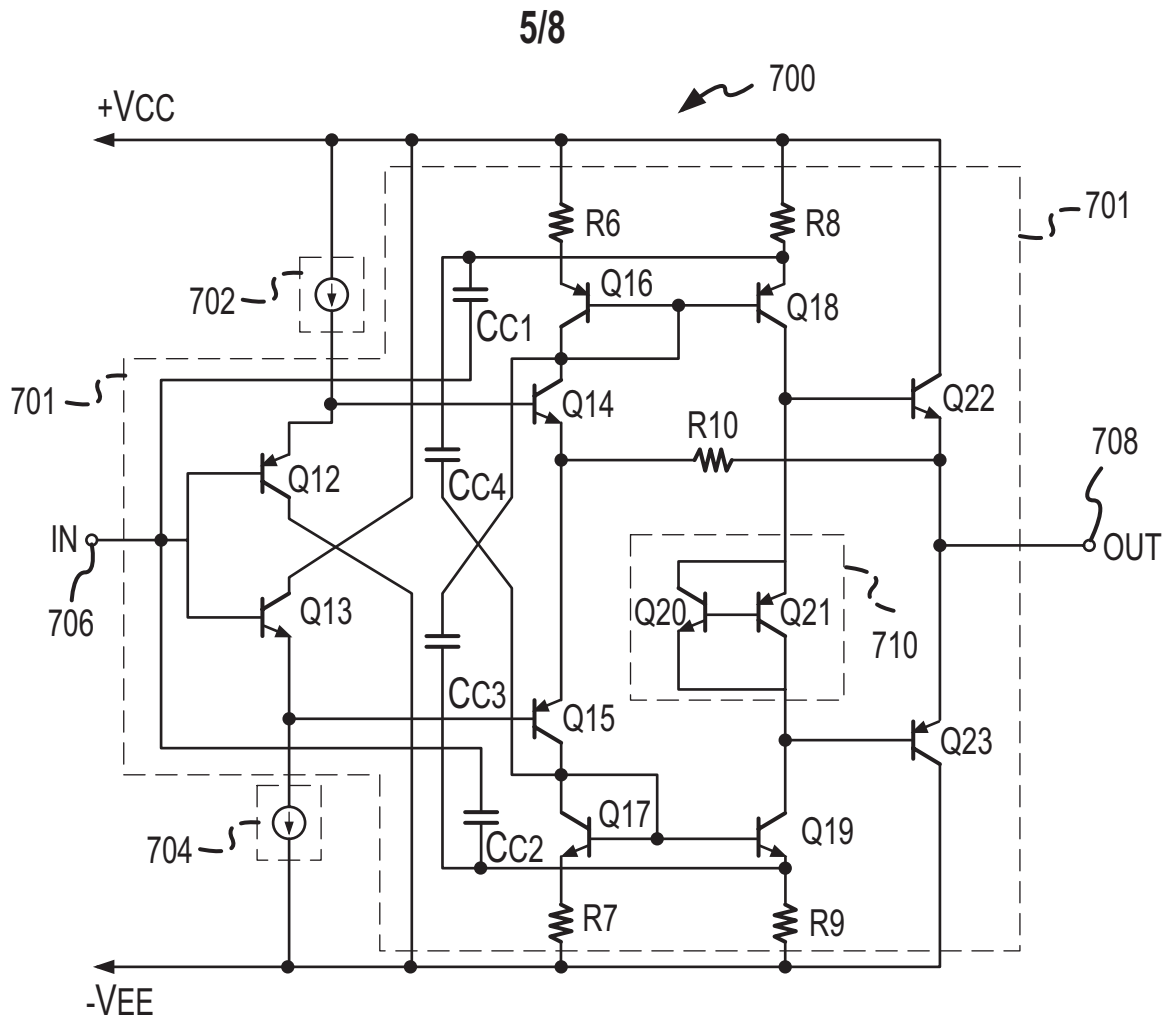


FIG.7

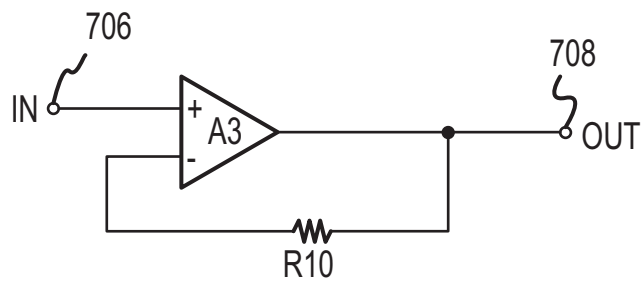


FIG.7A

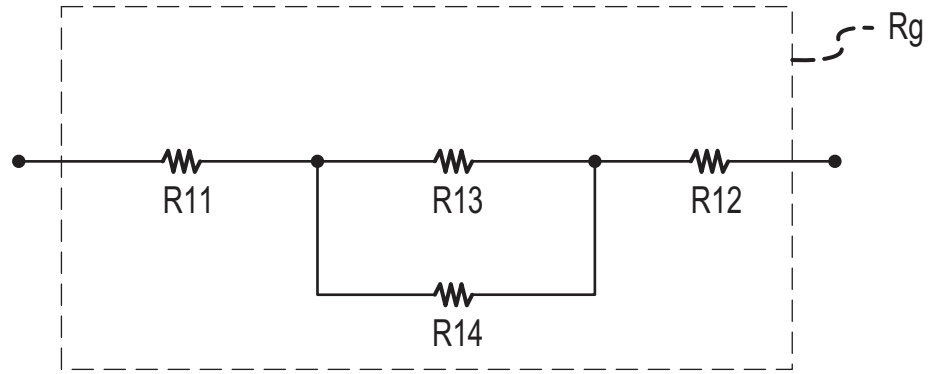


FIG.8

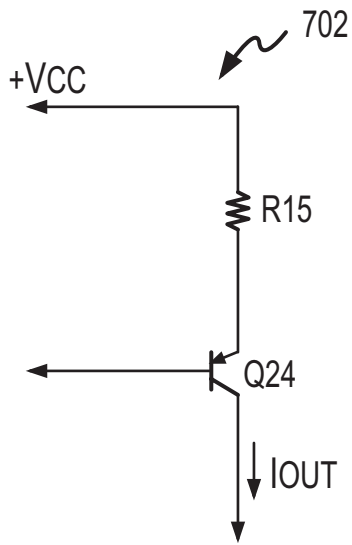


FIG.9A

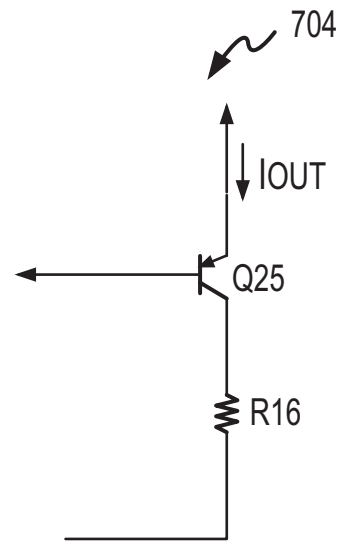


FIG.9B

7/8

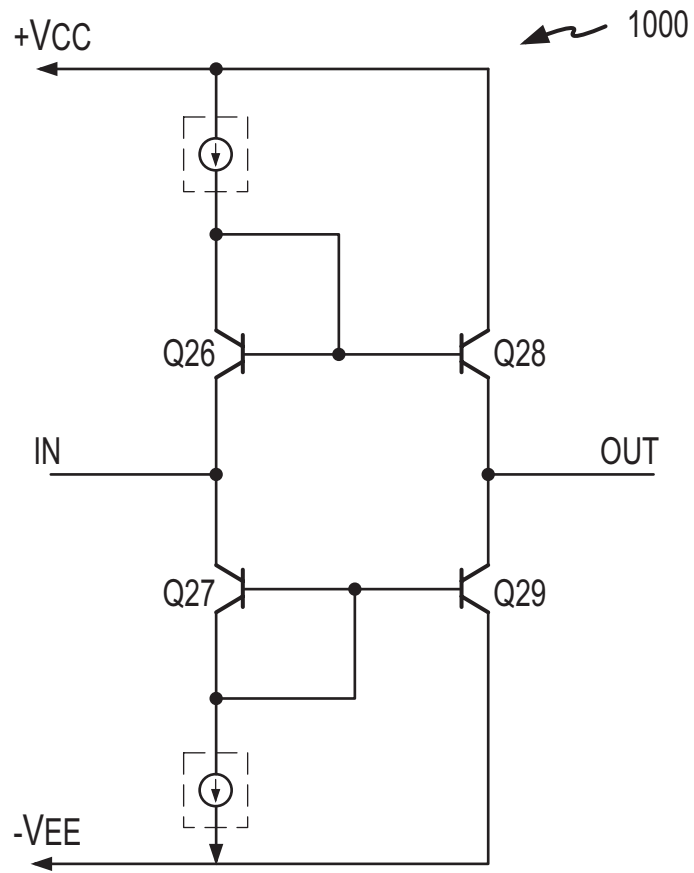


FIG.10

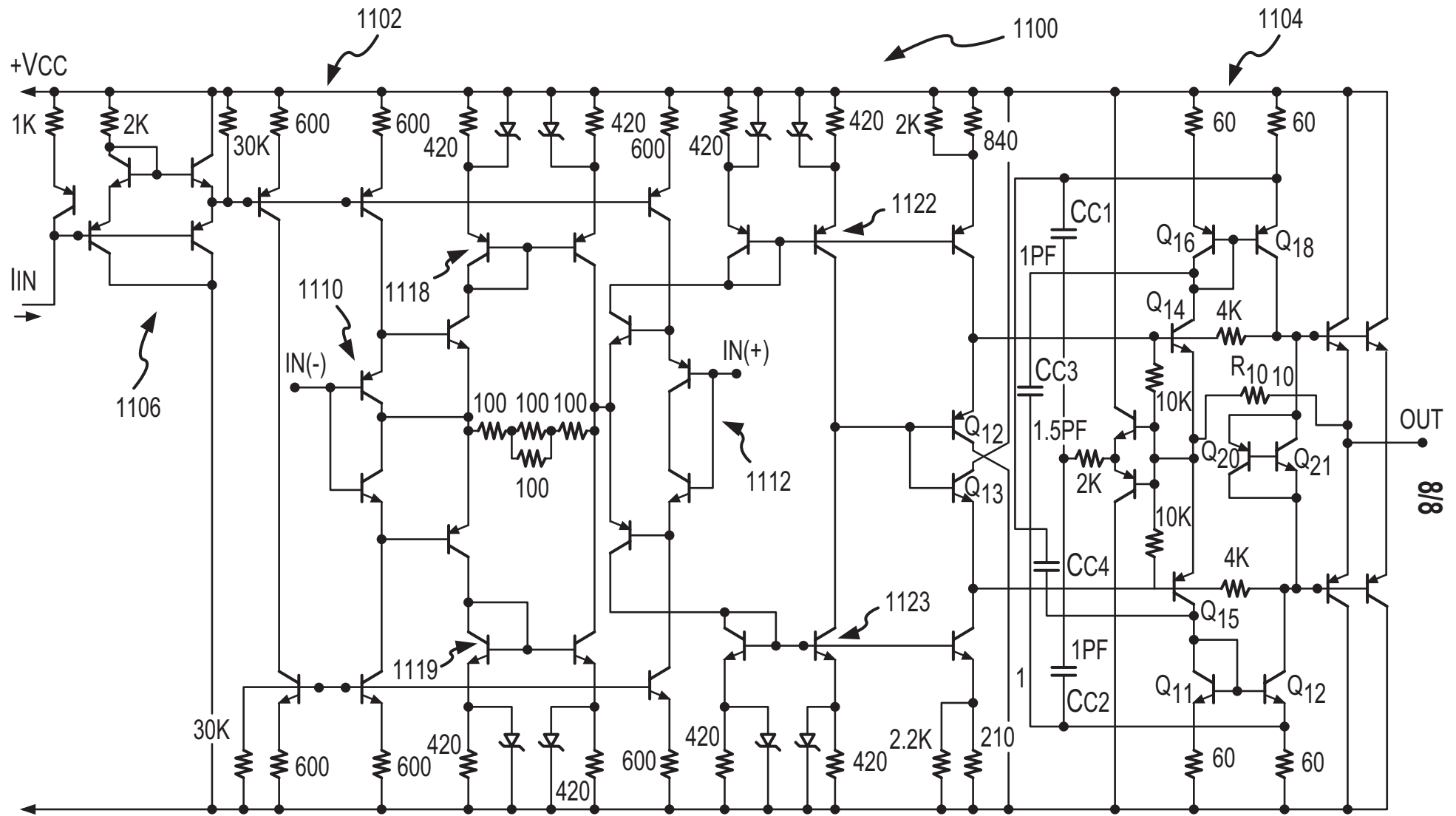


FIG.11