

(12) **United States Patent**
Ali

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(54) **RADIO RECEIVER**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(30) **Foreign Application Priority Data**

Oct. 8, 1998 (GB) 9821839

(51) **Int. Cl.⁷** **H03D 3/22; H04L 27/22**

(52) **U.S. Cl.** **375/332; 375/316; 455/130**

(58) **Field of Search** 341/131, 143, 341/61, 155; 375/316, 215, 233, 332

(56) **References Cited**

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Primary Examiner—Stephen Chin

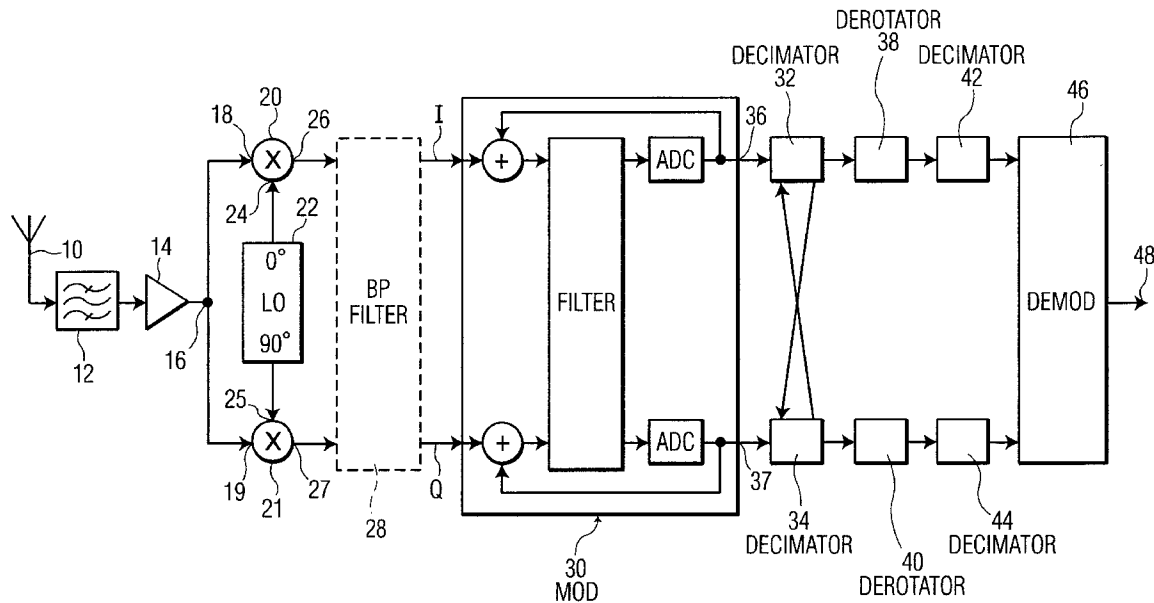
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(57) **ABSTRACT**

A radio receiver has an input coupled to first and second quadrature related low-IF frequency translation stages generating IF signals at substantially half the channel bandwidth or channel spacing. The IF signals which may be optionally filtered in a pre-filter, for example a polyphase filter, are applied to first and second cross-coupled continuous time, low pass Sigma-Delta modulators. The modulators include transconductor-capacitor integrators, all but the first integrators of which are cross-coupled by gyrators set to resonate at the IF frequency. Outputs of the Sigma-Delta modulators include 1 bit oversampled signals. The oversampled signals may be filtered in first decimation stages which provide anti-aliasing. The decimated signals are derotated and decimated in a second decimation means to provide outputs at base band. The base band outputs are equalized and demodulated to provide an output. The input signal may be frequency translated to zero IF and then filtered in low pass filters.

18 Claims, 7 Drawing Sheets



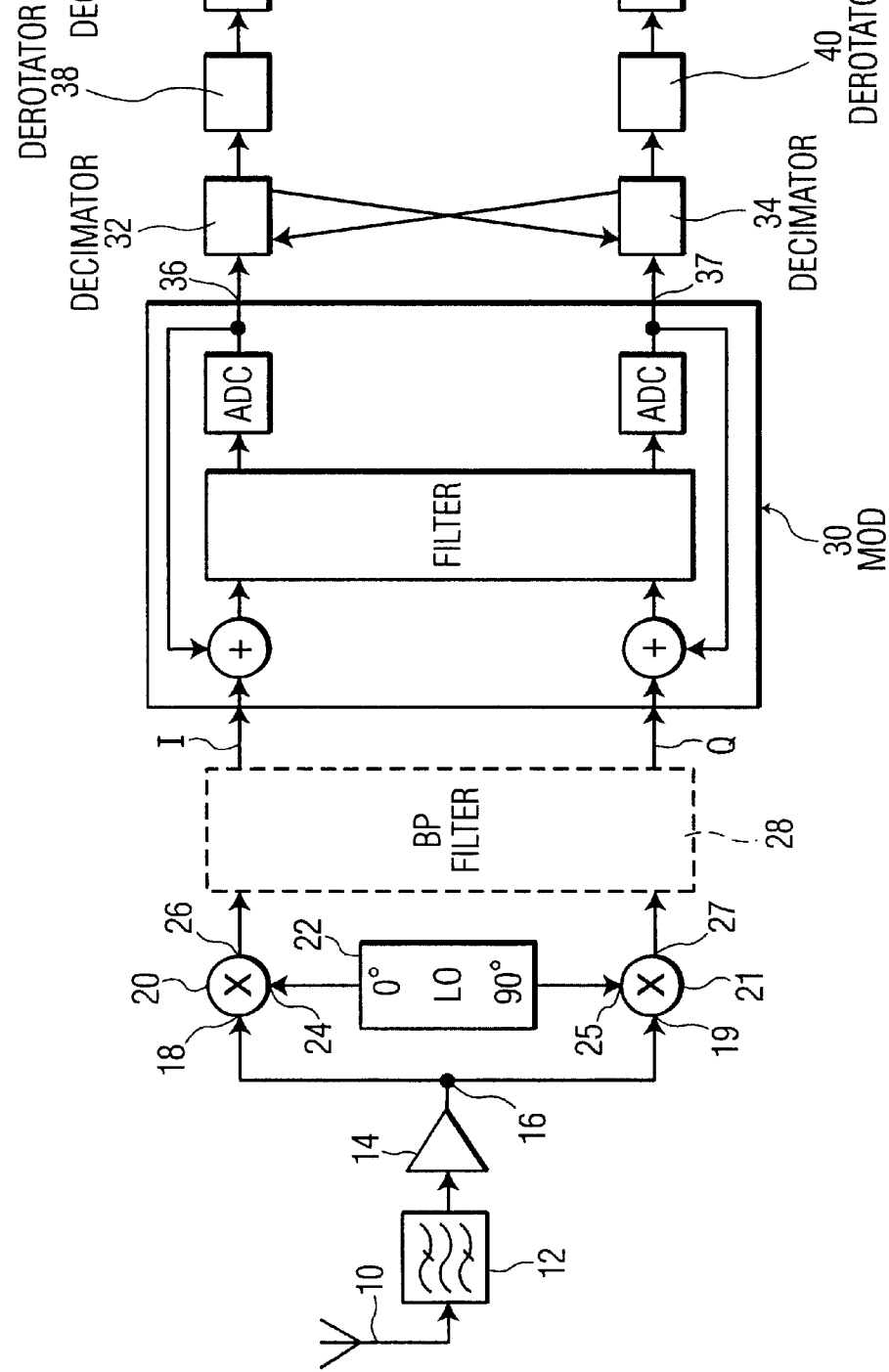


FIG. 1

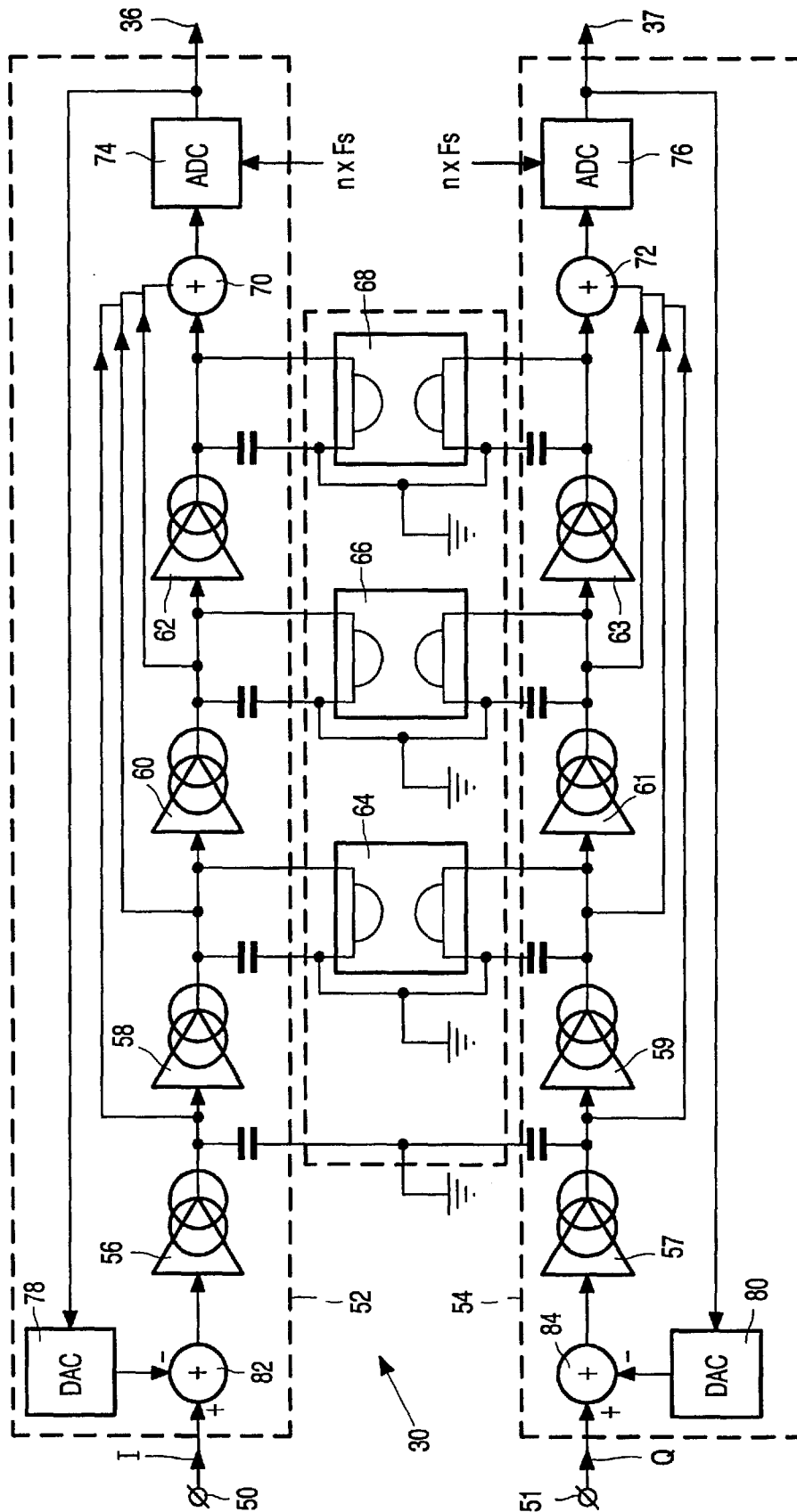


FIG. 2

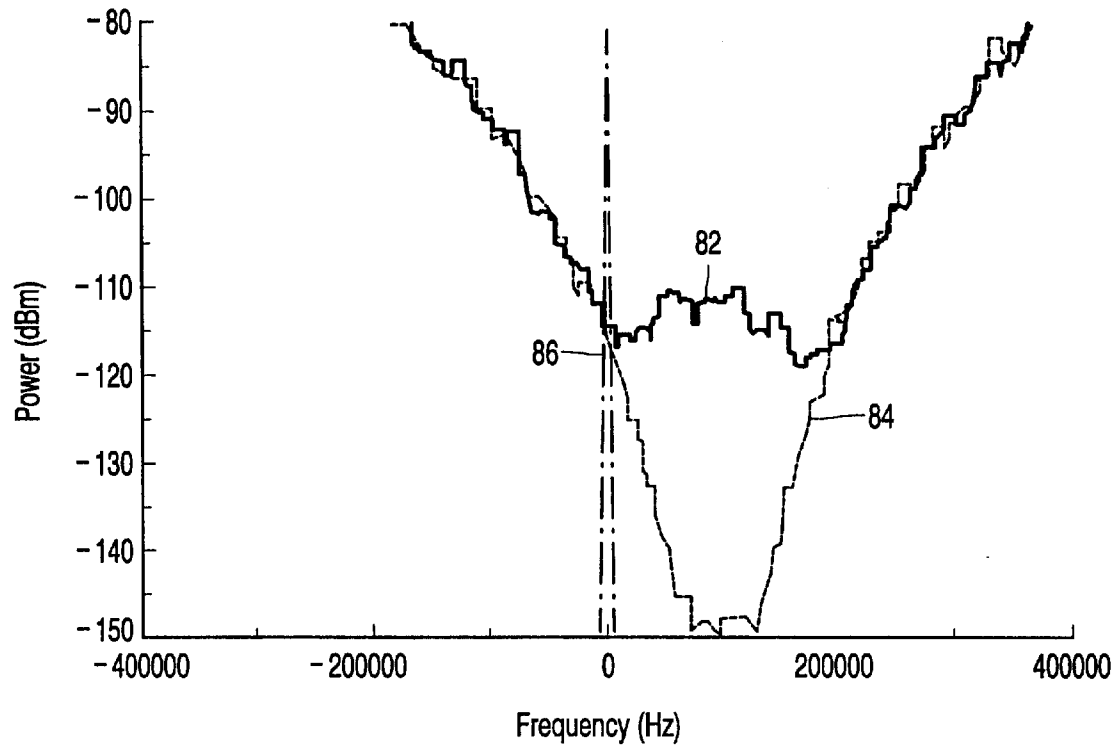


FIG. 3

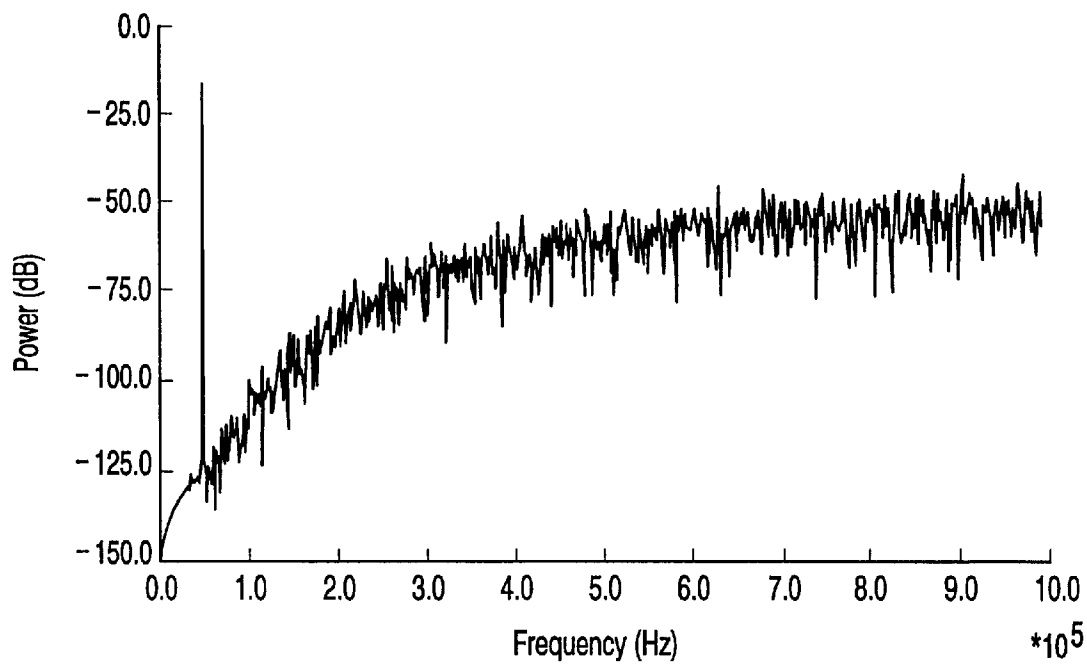


FIG. 4

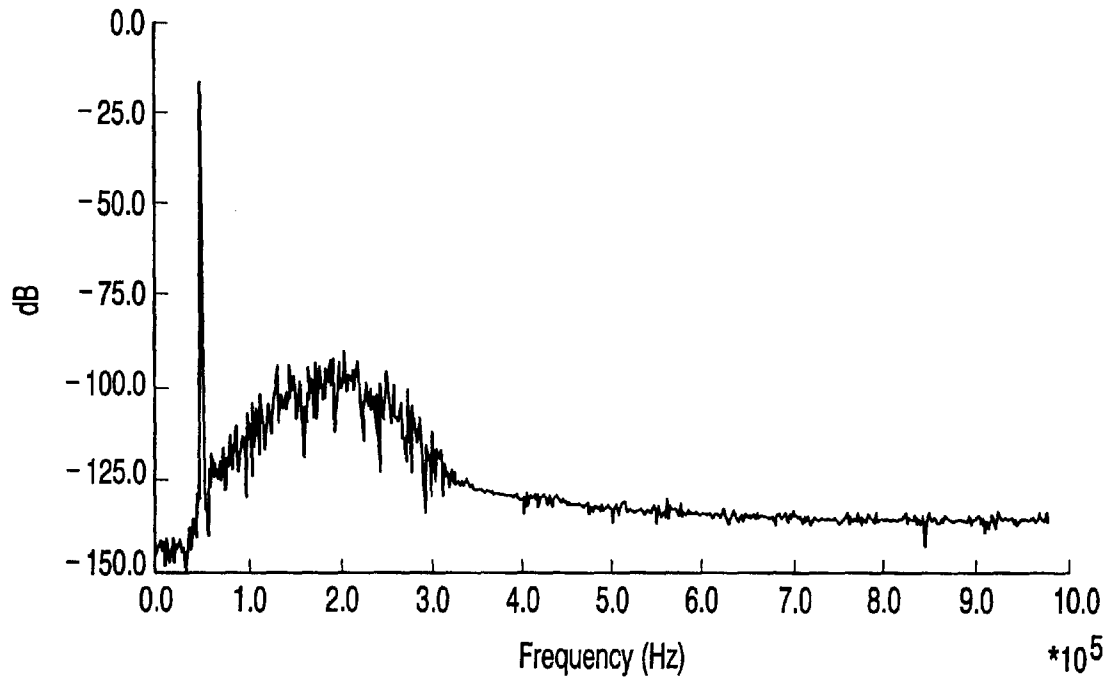


FIG. 5

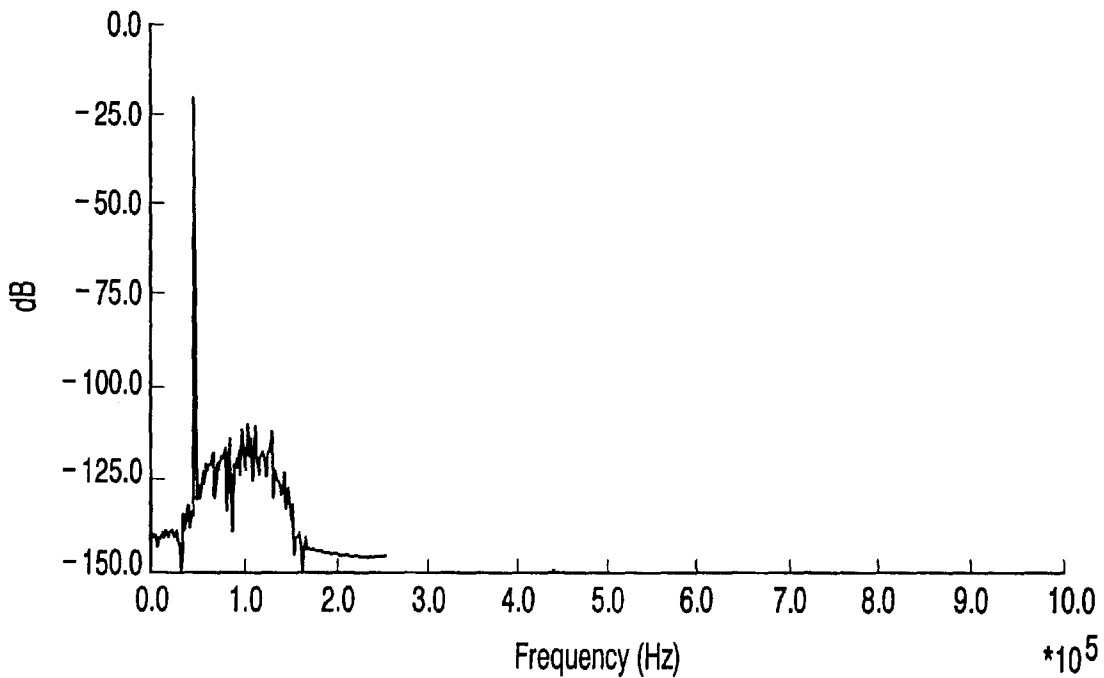


FIG. 6

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