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**Tsujishita et al.**

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(54) **DIGITAL AUDIO BROADCASTING RECEIVER**

5,550,812 A \* 8/1996 Philips ..... 370/203  
5,787,123 A \* 7/1998 Okada et al. .... 375/324  
5,812,523 A \* 9/1998 Isaksson et al. .... 370/208

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**FOREIGN PATENT DOCUMENTS**

EP 0656706 A2 6/1995  
FR 2721778 12/1995  
WO WO9520848 8/1995

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**OTHER PUBLICATIONS**

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

"A Digital Audio Broadcasting (DAB) Receiver", K. Taura, et al., IEEE Transactions on Consumer Electronics, U.S. IEEE Inc. vol. No. 3, Aug. 1996, pp. 322-326.

\* cited by examiner

(21) Appl. No.: **09/015,768**

*Primary Examiner*—Chau Nguyen  
*Assistant Examiner*—Jasper Kwoh

(22) Filed: **Jan. 29, 1998**

(30) **Foreign Application Priority Data**

(57) **ABSTRACT**

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(51) **Int. Cl.**<sup>7</sup> ..... **H04L 27/06**

A digital audio broadcasting receiver comprises a phase error detector for detecting a phase error from data from a differential demodulator, an average value processing unit for determining the average value of phase errors, a memory for storing the phase errors of the carriers outputted from the phase error detector, and a phase error correcting unit which excludes a phase error whose sign is opposite to that of the average value among the phase errors stored in the memory, and determined the average value of phase errors again, thereby making it possible to obtain a phase error signal which is less affected by leakage from other carriers.

(52) **U.S. Cl.** ..... **370/210; 375/340; 375/344**

(58) **Field of Search** ..... 370/203, 210, 370/350, 503, 516; 375/316, 324, 329, 330, 340, 341, 344

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

5,228,025 A 7/1993 Le Floch et al. .... 370/20  
5,282,222 A \* 1/1994 Fattouche et al. .... 375/260

**7 Claims, 19 Drawing Sheets**

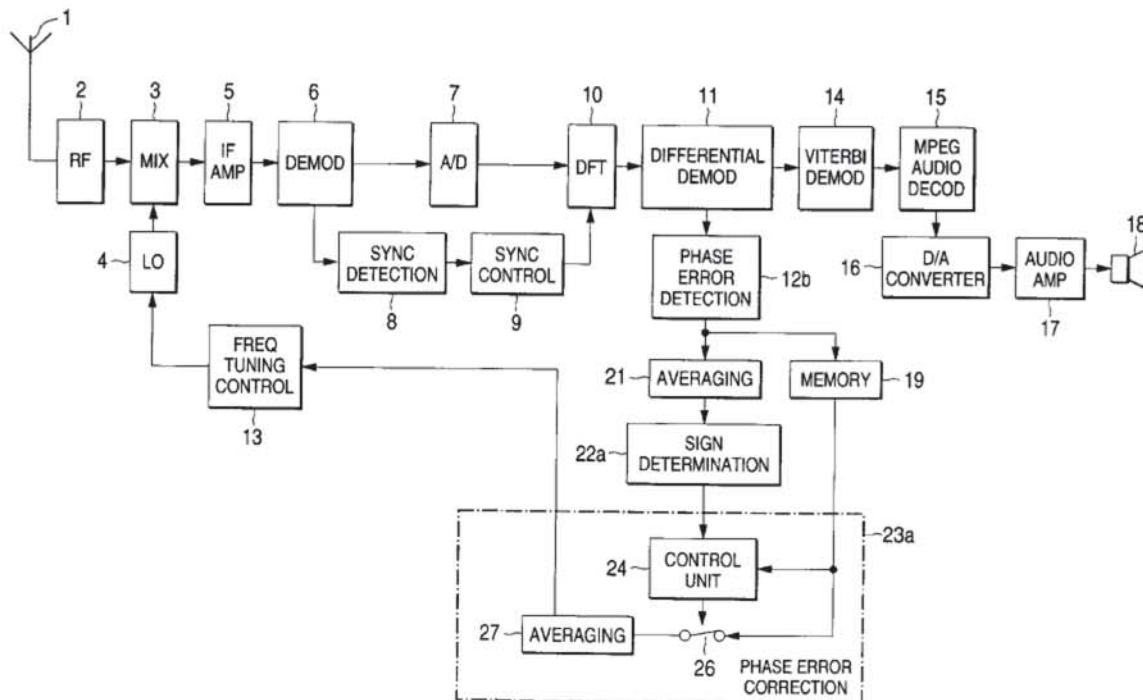


FIG. 1

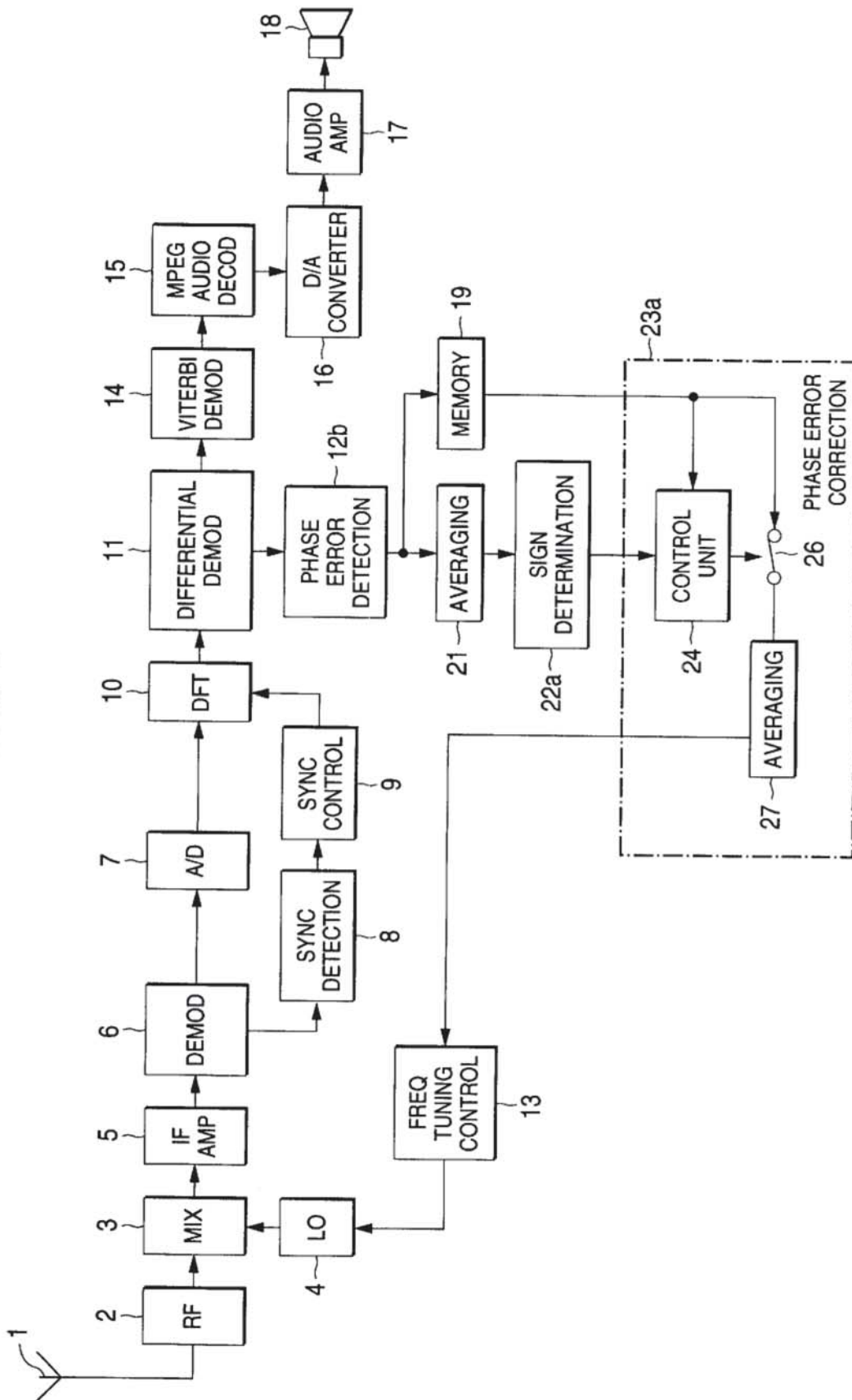
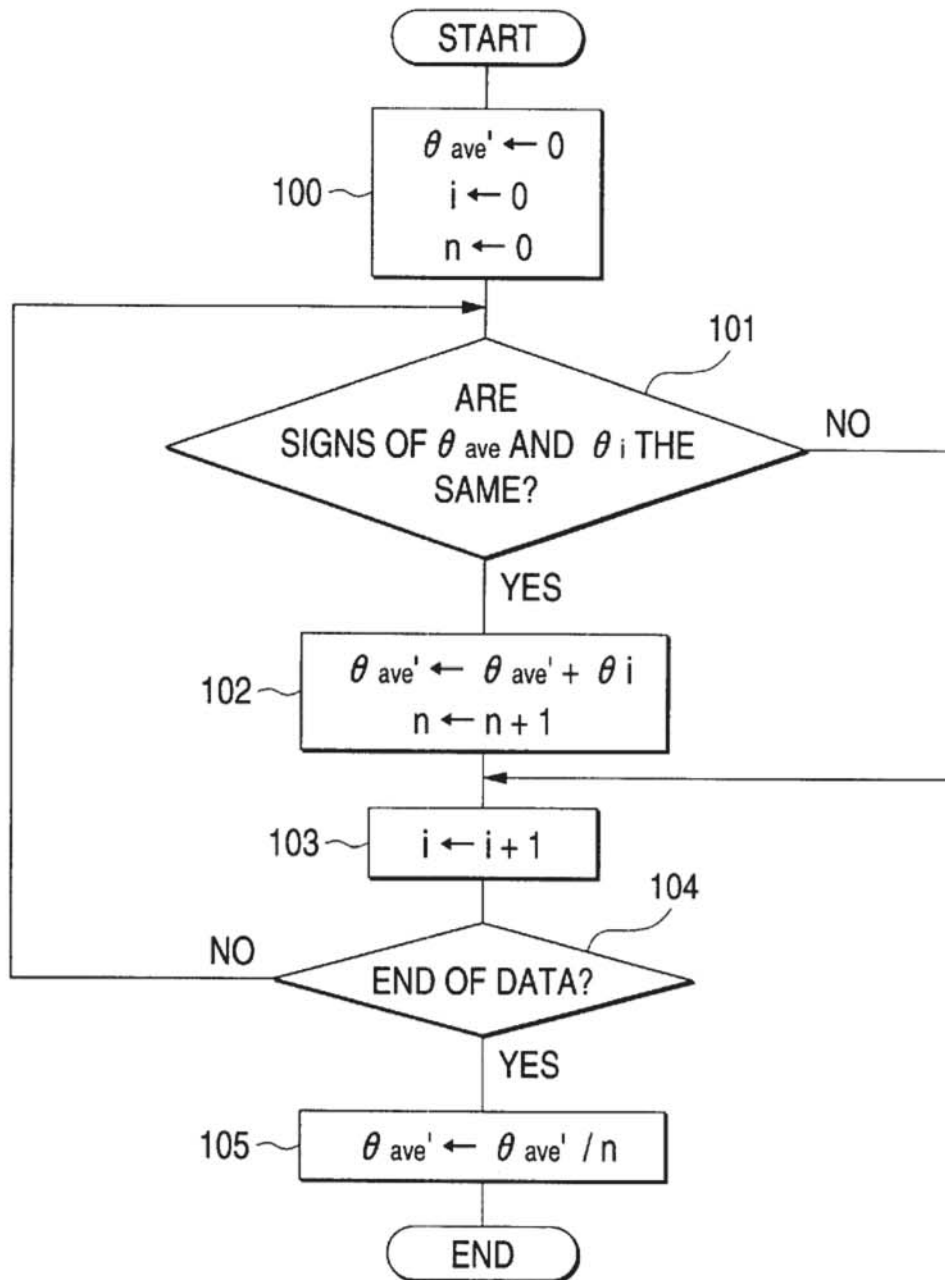


FIG. 2



$\theta_{ave}$  : AVERAGE VALUE OF PHASE ERRORS

$\theta_{ave}'$  : CORRECTION VALUE FOR THE AVERAGE VALUE OF PHASE ERRORS

$\theta_i$  : PHASE ERROR IN AN  $i$ -TH CARRIER

FIG. 3

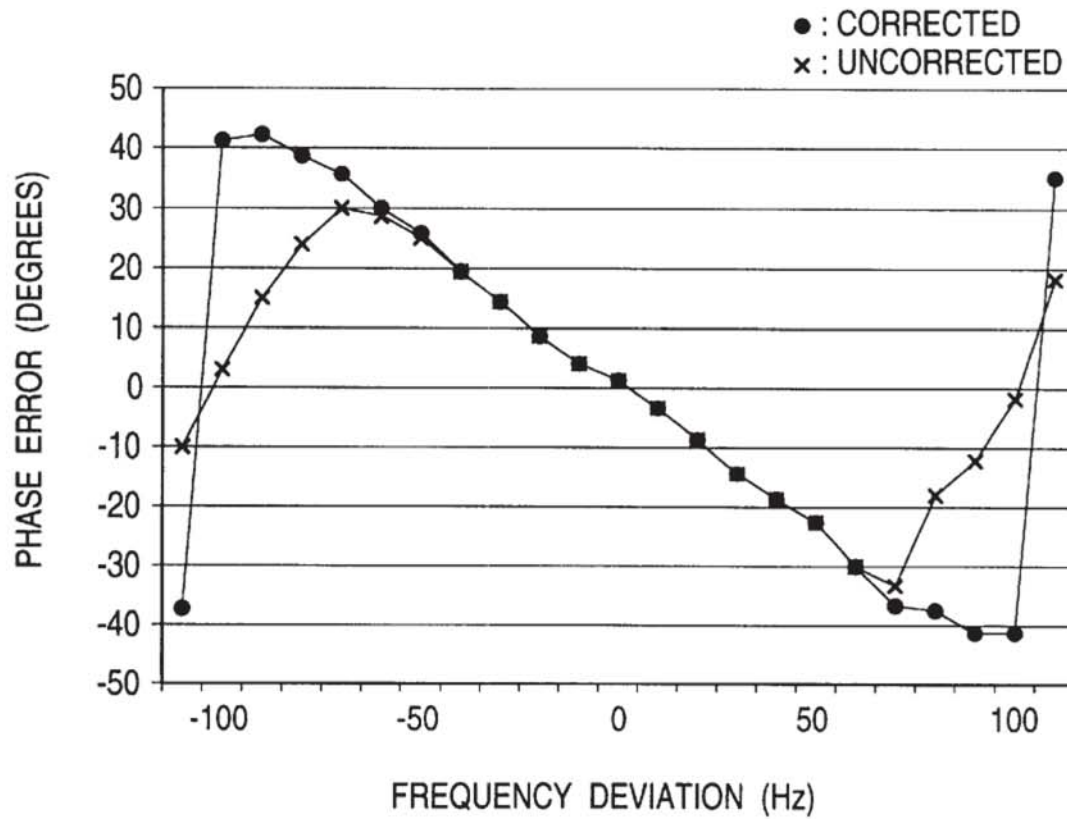
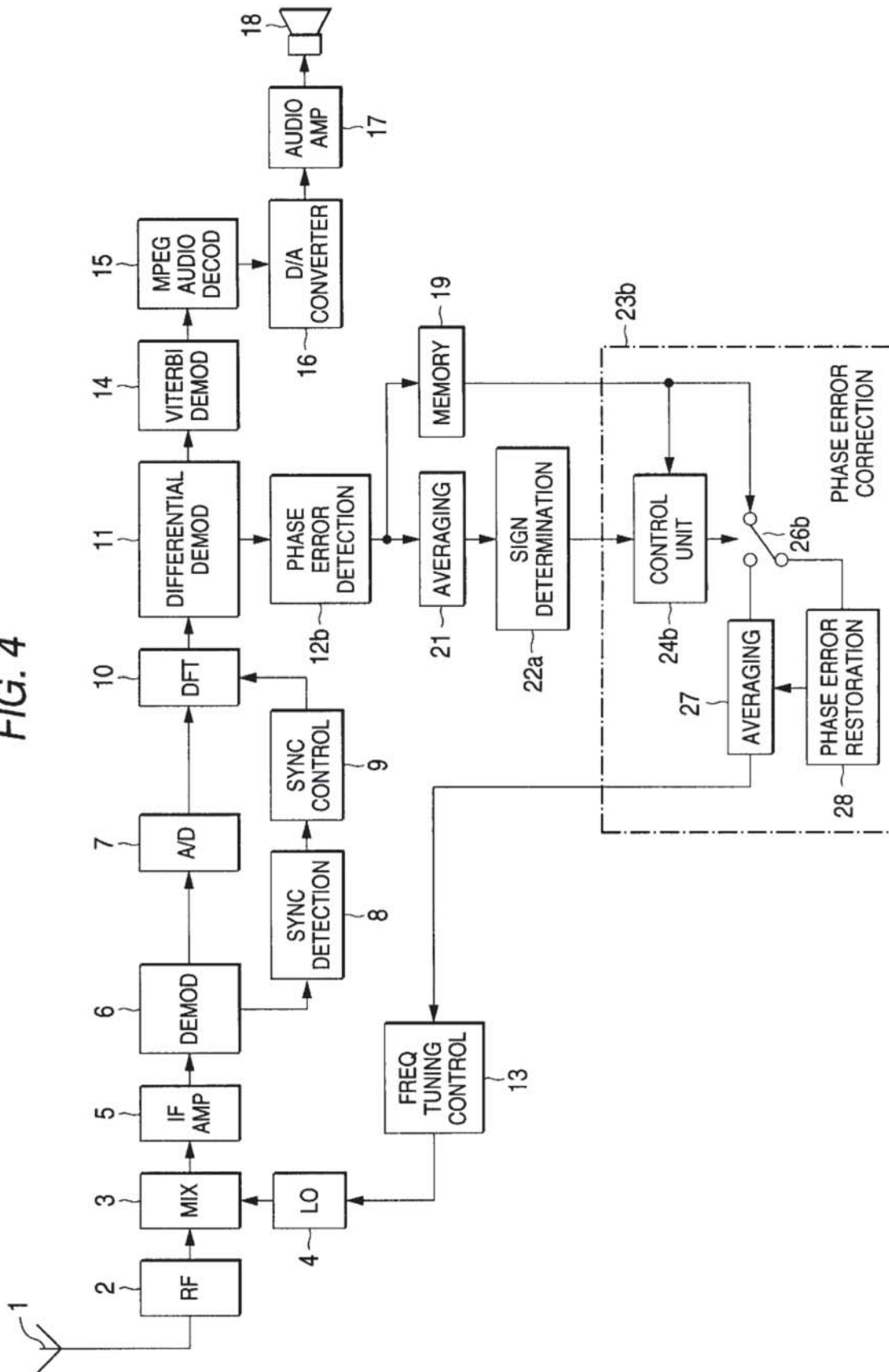


FIG. 4



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