



US006341123B1

(12) **United States Patent**
Tsujishita et al.

(10) **Patent No.:** **US 6,341,123 B1**
(45) **Date of Patent:** **Jan. 22, 2002**

(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

(75) Inventors: **Masahiro Tsujishita; Masayuki Ishida; Kenichi Taura; Tadatoshi Ohkubo; Masakazu Morita**, all of Tokyo (JP)

FOREIGN PATENT DOCUMENTS

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

(73) Assignee: **Mitsubishi Denki Kabushiki Kaisha**, Tokyo (JP)

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**

Jan. 31, 1997 (JP) 9-018592

(51) **Int. Cl.**⁷ **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

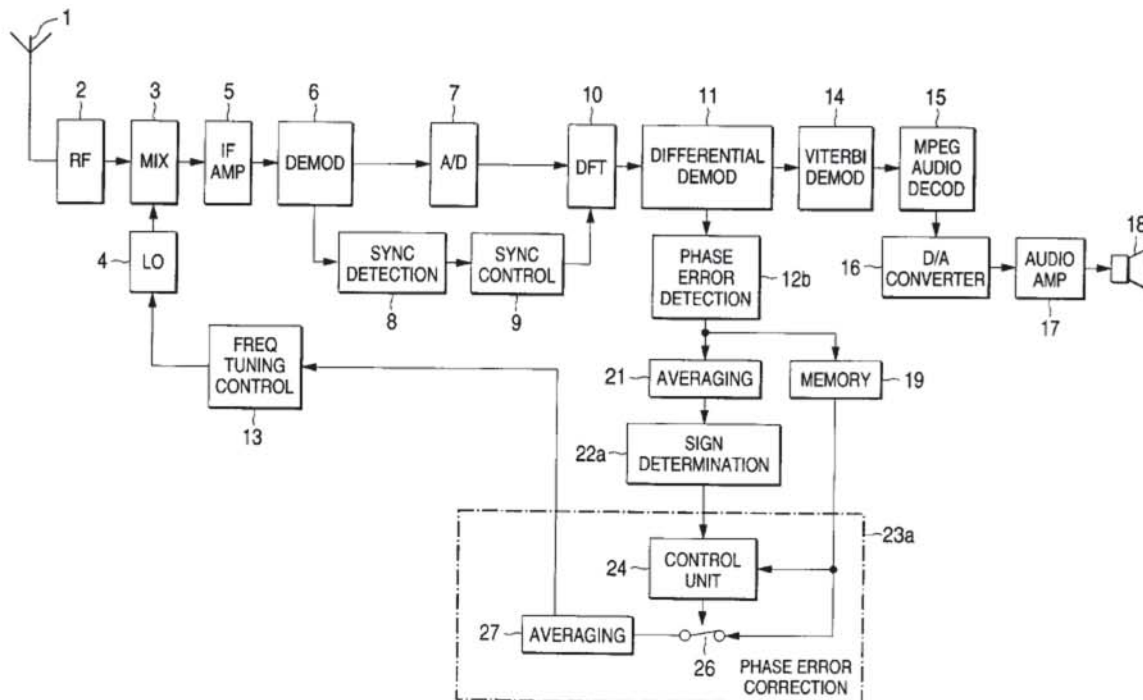


FIG. 1

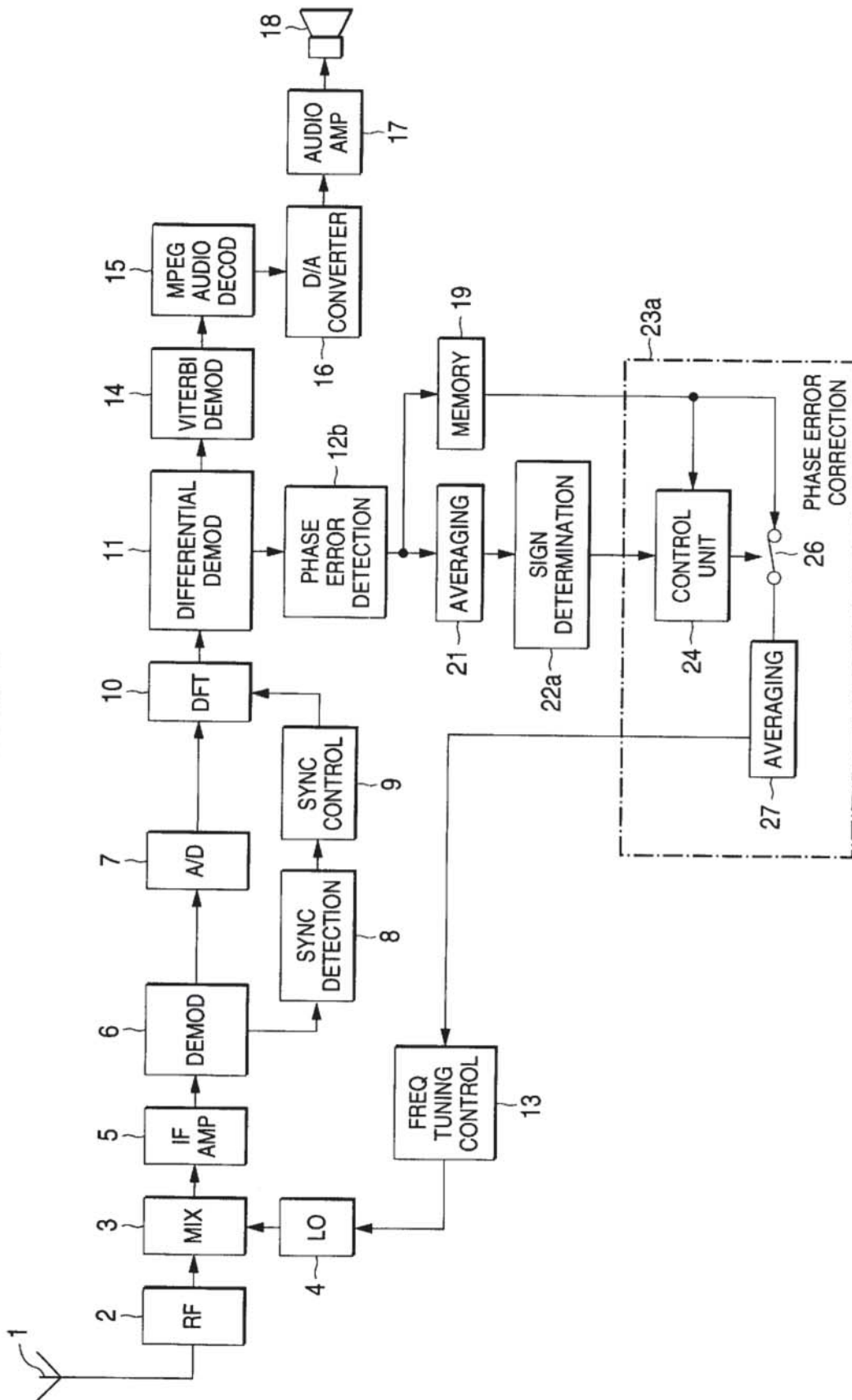
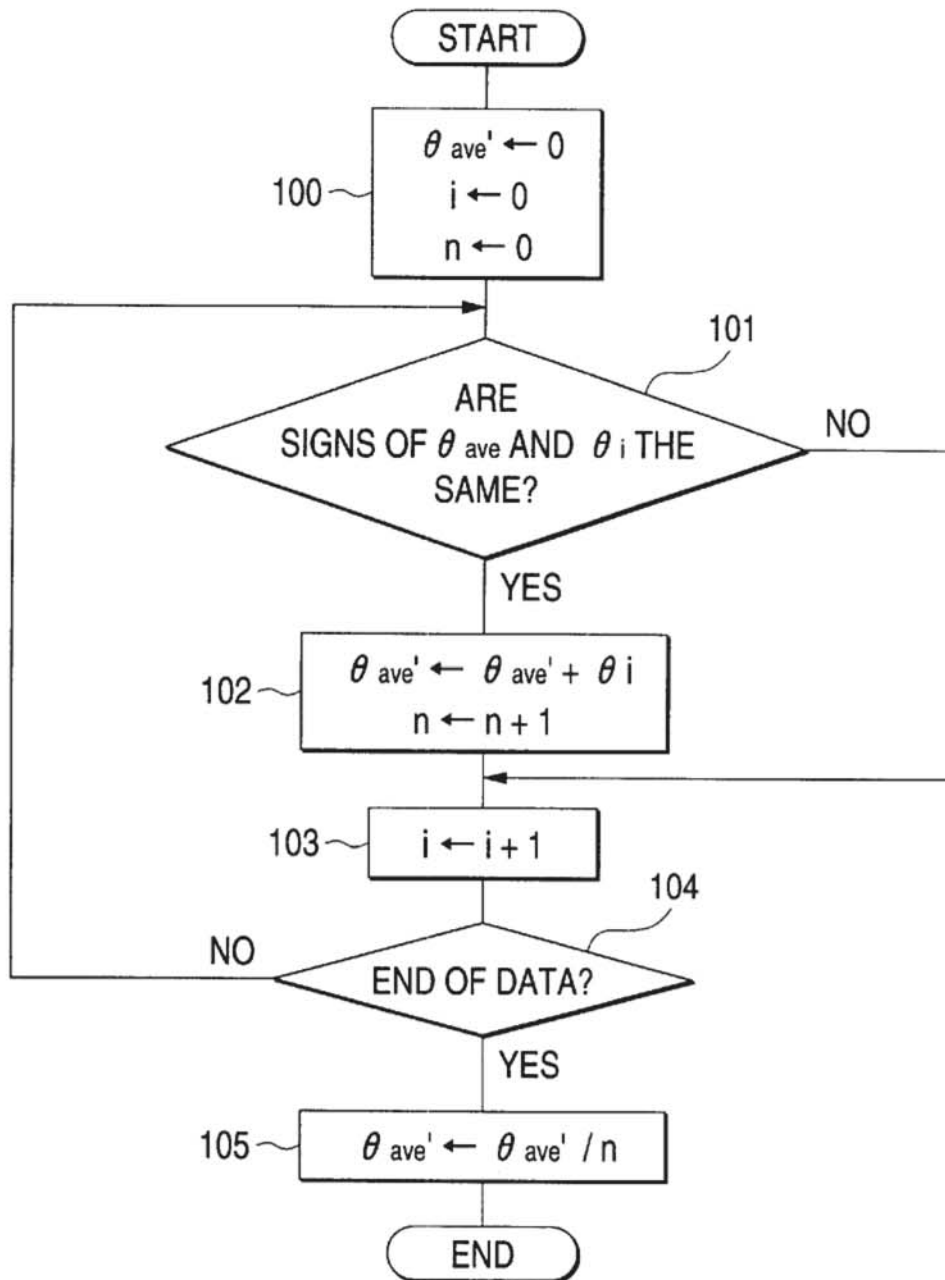


FIG. 2



θ_{ave} : AVERAGE VALUE OF PHASE ERRORS

θ_{ave}' : CORRECTION VALUE FOR THE AVERAGE VALUE OF PHASE ERRORS

θ_i : PHASE ERROR IN AN i -TH CARRIER

FIG. 3

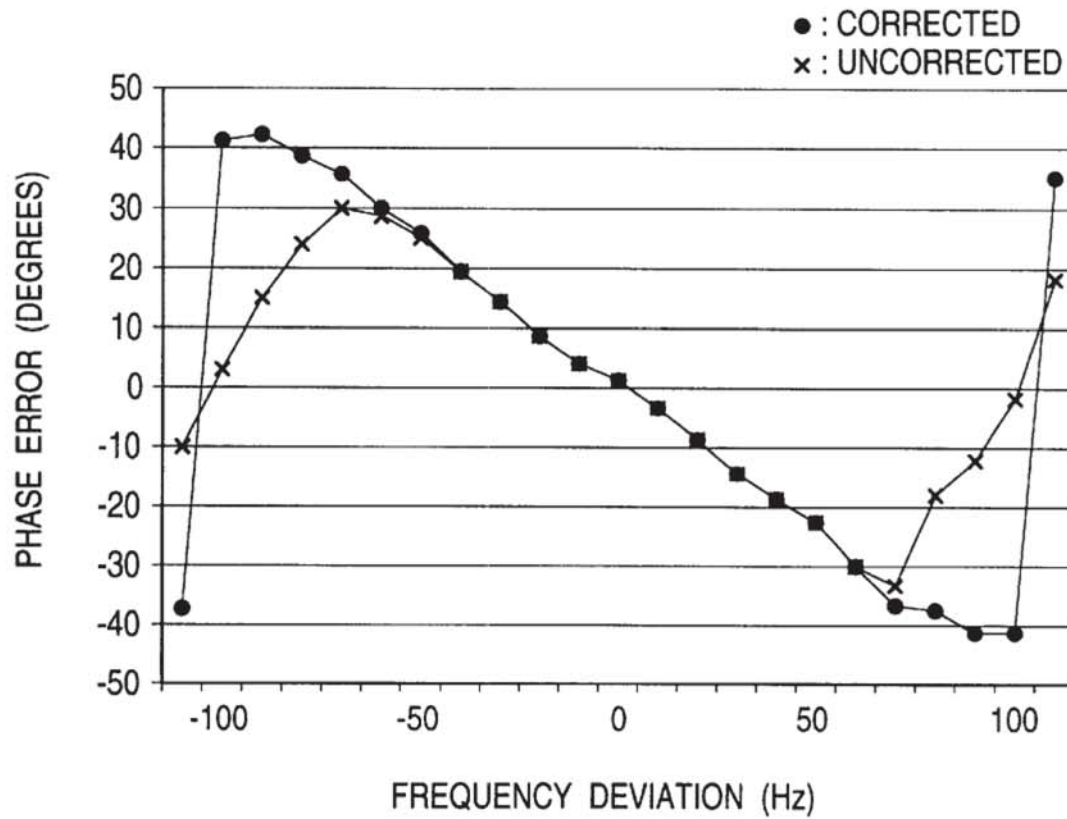
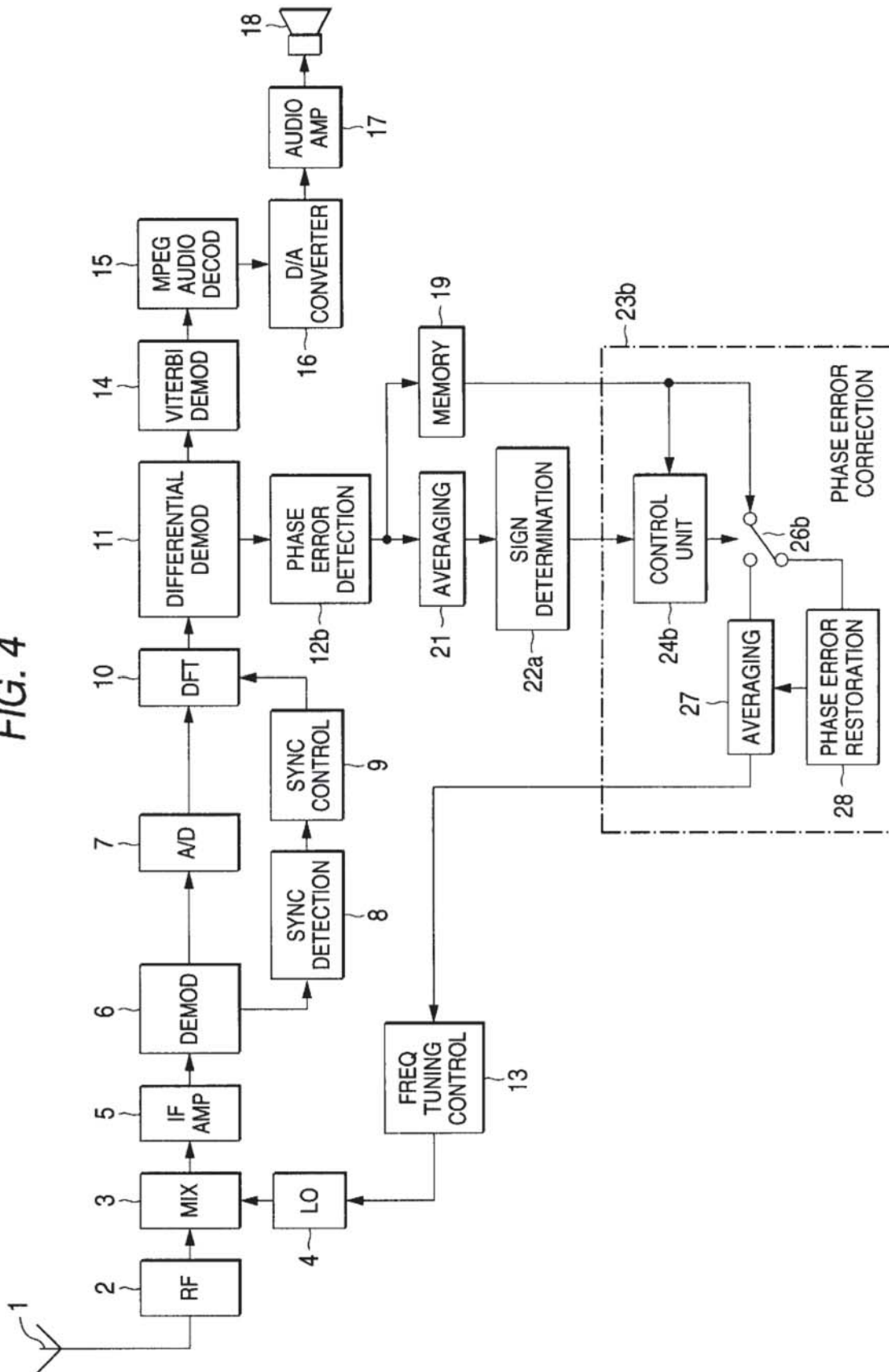


FIG. 4



Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.