



US005721783A

# United States Patent [19]

[11] Patent Number: **5,721,783**

Anderson

[45] Date of Patent: **Feb. 24, 1998**

[54] **HEARING AID WITH WIRELESS REMOTE PROCESSOR**

### OTHER PUBLICATIONS

[76] Inventor: **James C. Anderson**, 40 Aran Rd., Westwood, Mass. 02090

“Q & A about Biological Effects and Potential Hazards of RF Radiation”, OET Bulletin 56, FCC, Washington, D.C., Jan. 1989, pp. 1-3.

[21] Appl. No.: **479,629**

“How to Buy a Hearing Aid”, Consumer Reports Magazine, Nov. 1992, pp. 716-712.

[22] Filed: **Jun. 7, 1995**

T. Tanji, “A digital Radio Hearing Aid”, I-P-14, Program and Abstracts of First Biennial Conference on Advancing Human Communication: An Interdisciplinary Forum on Hearing Aid Research and Development, National Institutes of Health, Bethesda, MD, Sep. 11-13, 1995.

[51] Int. Cl.<sup>6</sup> ..... **H04R 25/00**

[52] U.S. Cl. .... **381/68.6; 381/68; 381/68.2; 381/68.4**

[58] Field of Search ..... 381/68, 68.2, 68.4, 381/68.6; 342/42-51, 2; 340/6, 825.54, 505

SHS Wireless Radio Communications Data Sheet From E.A.R. Inc.; Jan. 1990.

CROS Product Data Sheets From Telex Communications, Inc.; Jan. 1989.

### [56] References Cited

#### U.S. PATENT DOCUMENTS

2,774,060	12/1956	Richardson	325/9
3,384,892	5/1968	Postmann	343/6.5
3,493,955	2/1970	Minasy	340/258
3,518,546	6/1970	Augenblick	325/8
3,601,550	8/1971	Spracklen	179/82
3,711,848	1/1973	Martens	340/280
3,754,226	8/1973	Fearon	340/280
4,051,331	9/1977	Strong et al.	
4,063,229	12/1977	Vaughan et al.	
4,334,315	6/1982	Ono et al.	
4,791,672	12/1988	Nunley et al.	
4,918,736	4/1990	Bordewijk	381/68
4,918,737	4/1990	Luethi	
4,947,432	8/1990	Topholm	
5,027,410	6/1991	Williamson et al.	
5,115,160	5/1992	Knoll et al.	310/313 R
5,202,927	4/1993	Topholm	381/68.6
5,210,803	5/1993	Martin et al.	
5,226,086	7/1993	Platt	381/58
5,241,923	9/1993	Janning	340/573
5,295,191	3/1994	Van Vroenhoven	
5,303,306	4/1994	Brillhart et al.	381/68.2
5,390,254	2/1995	Adelman	
5,479,522	12/1995	Lindemann et al.	381/68.2
5,613,495	3/1997	Mills et al.	128/696
5,636,285	6/1997	Sauer	381/68.2

H. Levitt, A. Neuman, R. Mills and T. Schwander, “Digital Master Hearing Aid” Journal of Rehabilitation Research and Development, vol. 23, No. 1, 1986, pp. 79-87, May 1986.

*Primary Examiner*—Curtis Kuntz

*Assistant Examiner*—Rexford N. Barnie

*Attorney, Agent, or Firm*—Richard F. Benway; Martin M. Santa

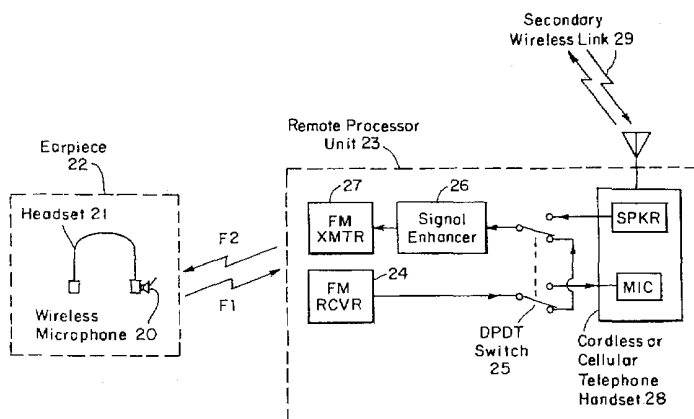
#### FOREIGN PATENT DOCUMENTS

2651634 3/1991 France

### [57] ABSTRACT

A hearing aid or audio communication system includes an earpiece (10) that can be hidden in the ear canal, and which communicates wirelessly with a remote processor unit, or RPU (16), that enhances audio signals and can be concealed under clothing. Sounds from the environment are picked up by a microphone (12) in the earpiece and sent with other information over a two-way wireless link (17) to the RPU (16). The wireless link (17) uses microwaves for component miniaturization. Furthermore, use of radar technology to implement the wireless link (17), with an RPU (16) interrogator and earpiece (10) transponder, reduces earpiece size and power, as no microwave oscillator is needed in the earpiece (10). Optional secondary wireless link circuitry (19) can be used between the RPU (16) and a cellular telephone system or other sources of information. Electronic voice recognition and response can control system operation.

**71 Claims, 9 Drawing Sheets**



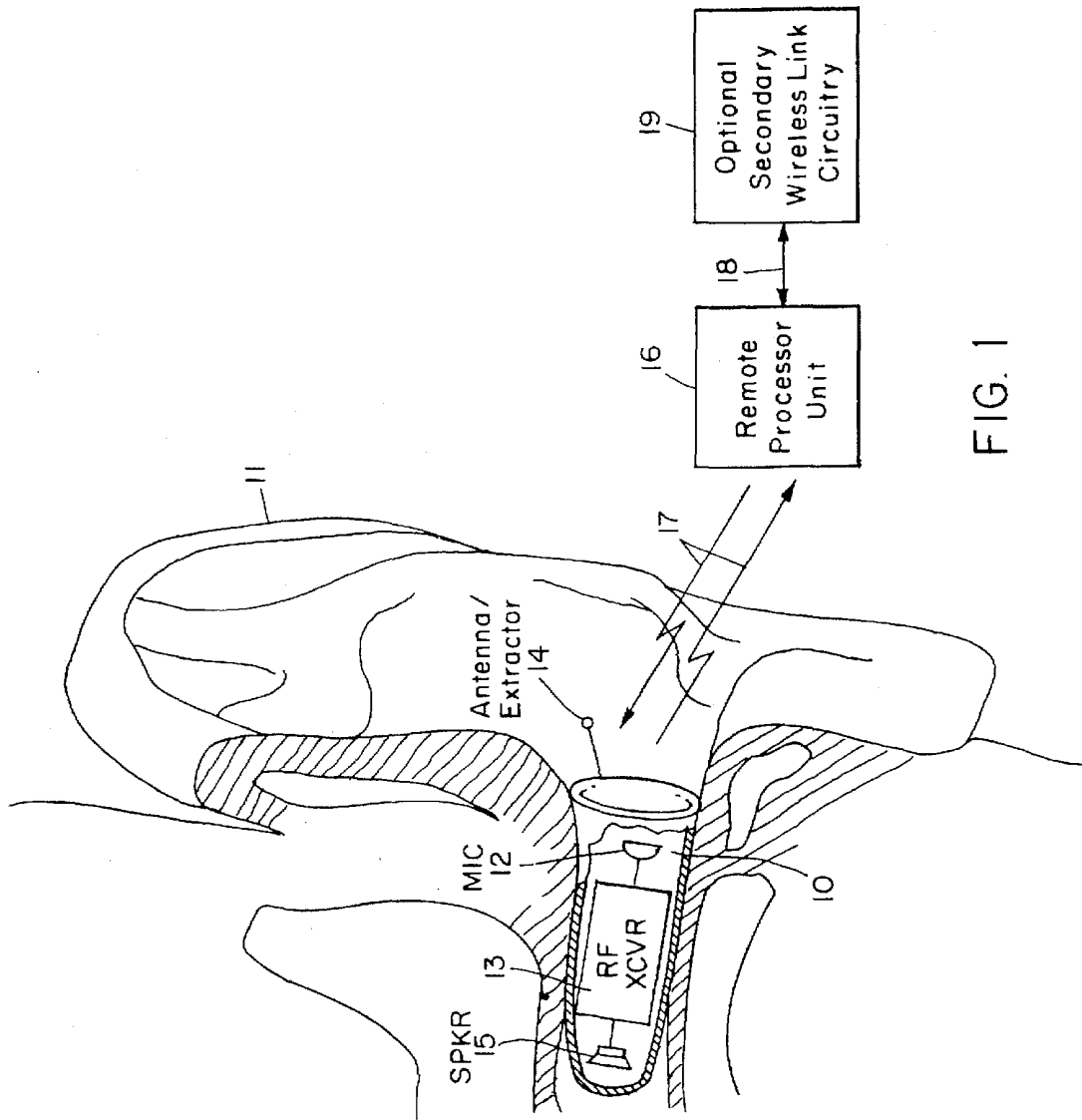


FIG. 1

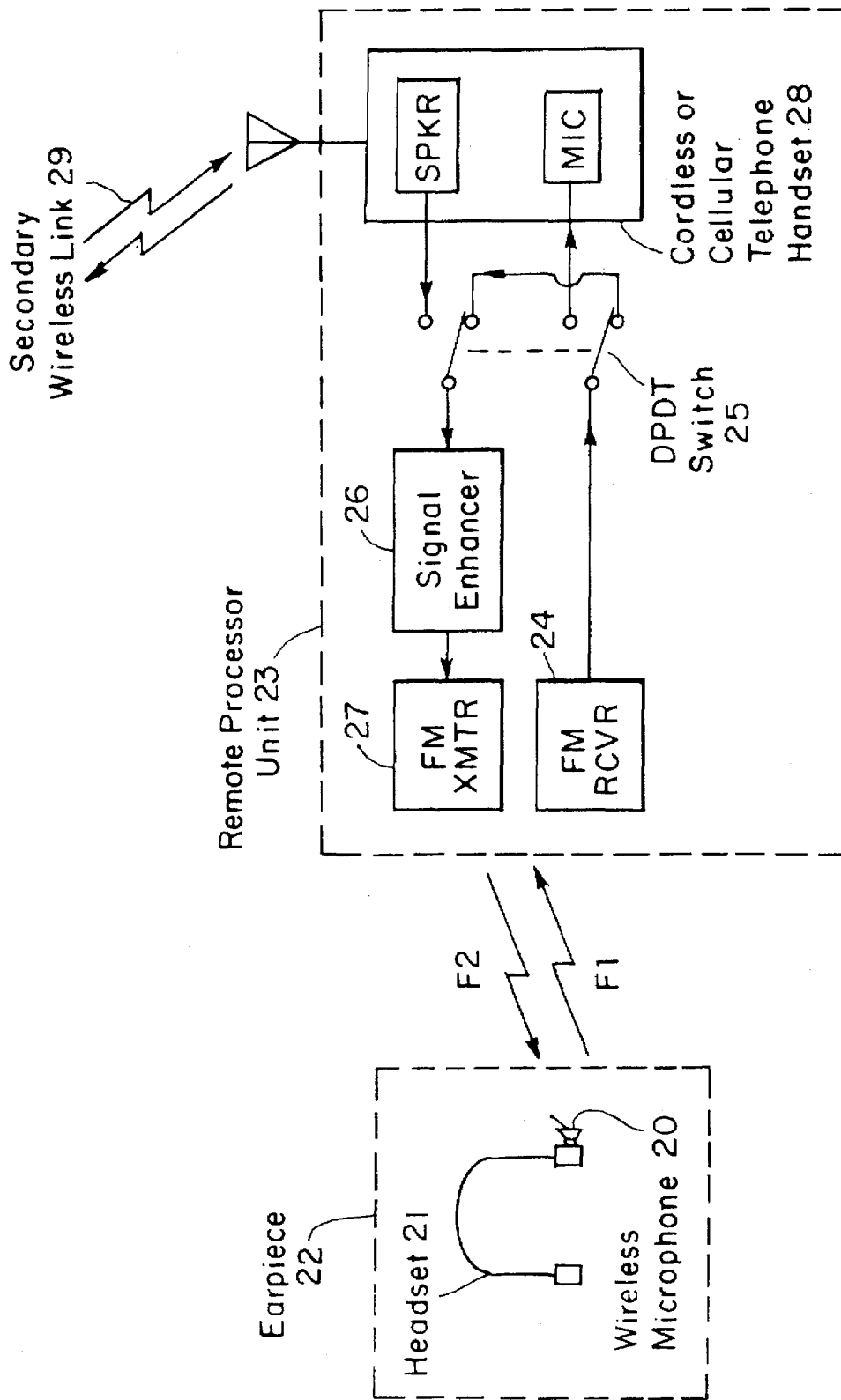


FIG. 2

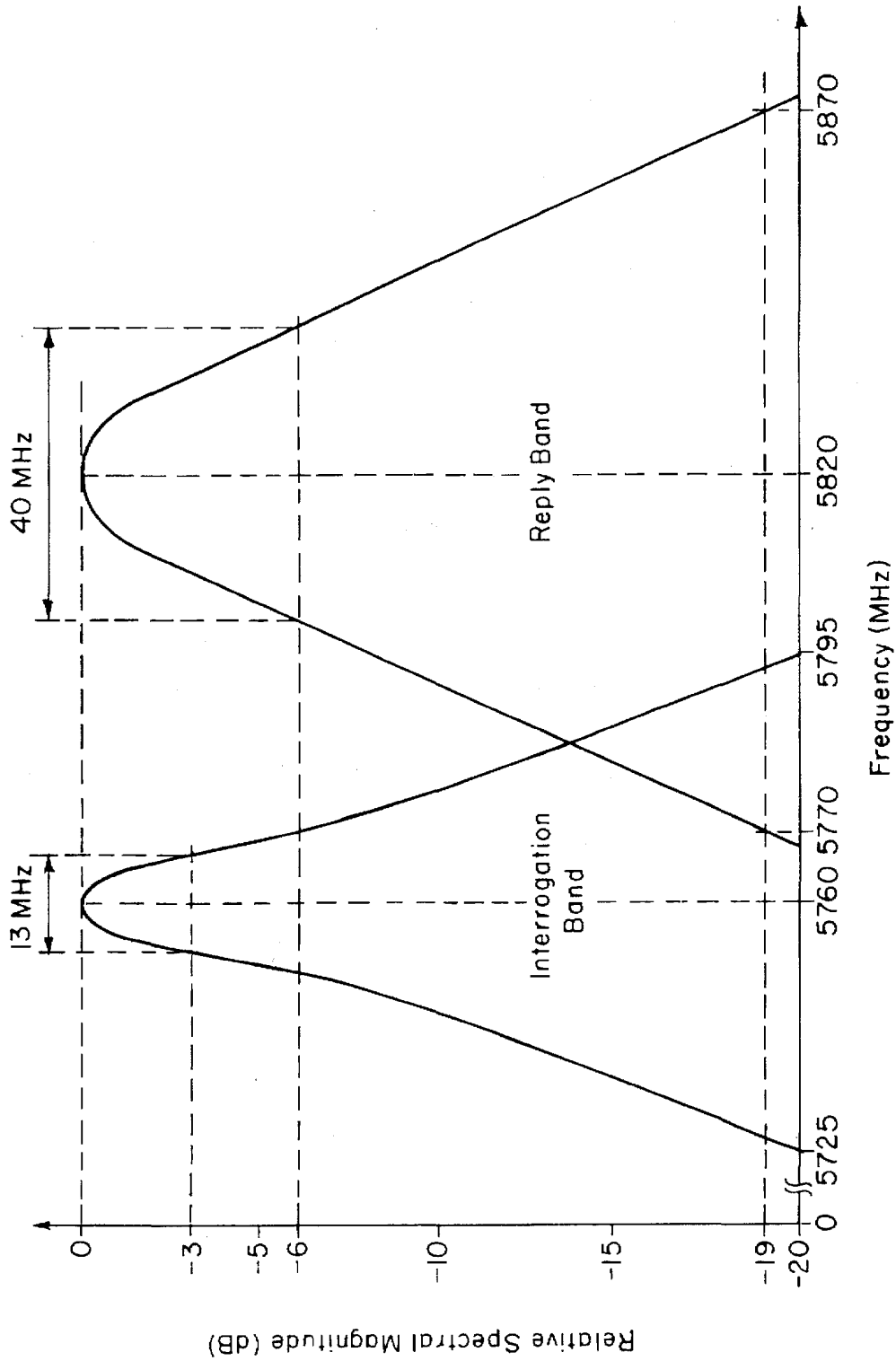
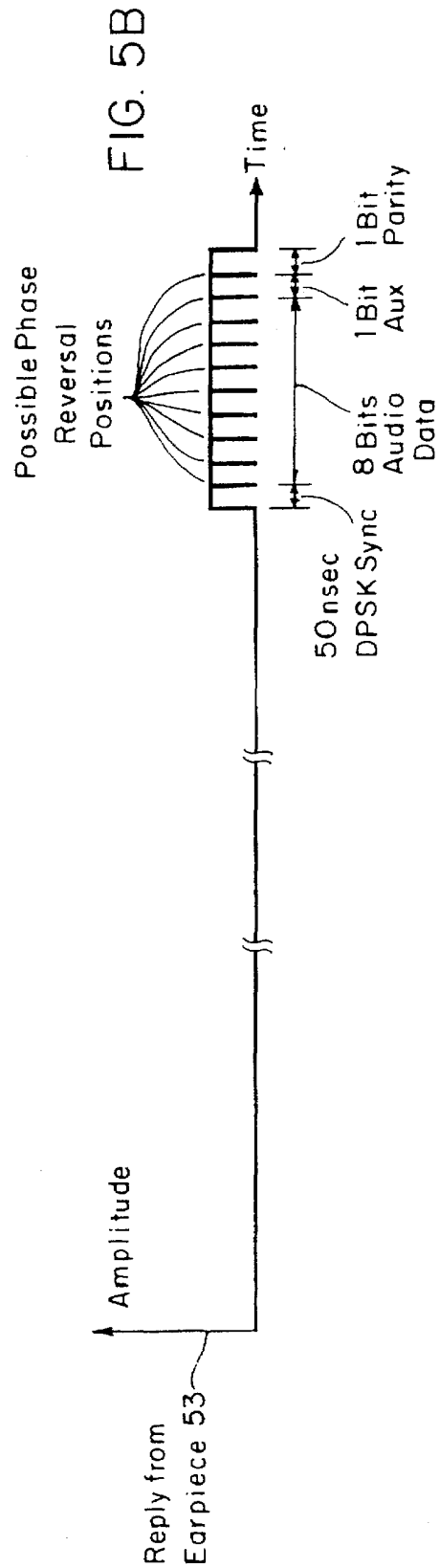
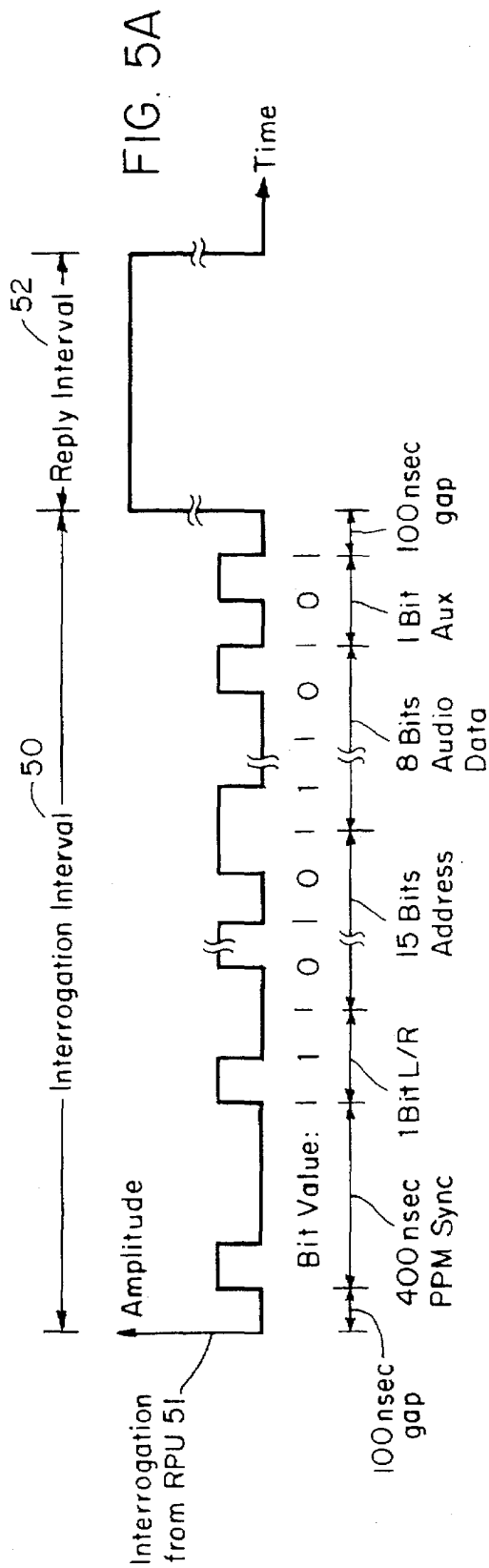


FIG. 3



# 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.