United States Patent [19]

Wrench, Jr. et al.

[11] **Patent Number:** 5,036,539

[45] **Date of Patent:** Jul. 30, 1991

[54] **REAL-TIME SPEECH PROCESSING DEVELOPMENT SYSTEM**

[75] Inventors: **Edwin H. Wrench, Jr.; Alan L. Higgins,** both of San Diego, Calif.

[73] Assignee: **ITT Corporation,** New York, N.Y.

[21] Appl. No.: **376,076**

[22] Filed: **Jul. 6, 1989**

[51] Int. Cl.⁵ G10L 7/08; G10L 7/02

[52] U.S. Cl. 381/43; 381/41

[58] Field of Search 381/41–46; 364/513.5

[56] **References Cited**

U.S. PATENT DOCUMENTS

|			
4,144,582	3/1979	Hyatt	381/43
4,641,238	2/1987	Kneib	364/200
4,653,097	3/1987	Watanabe et al.	381/42
4,695,977	9/1987	Hansen et al.	364/900
4,799,144	1/1989	Parruck et al.	364/200
4,827,522	5/1989	Matsuura et al.	381/43

OTHER PUBLICATIONS

Perdue et al., AT&T Technical Journal, *Conversant 1 Voice System: Architecture and Applications,* Sep./Oct. 1986, vol. 65, No. 5; pp. 34–47.

[57] **ABSTRACT**

A real-time speech processing development system has a control subsystem (CS) and a recognition subsystem (RS) interconnected by a CS/RS interface. The control subsystem includes a control processor, an operator interface, a user interface, and a control program module for loading any one of a plurality of control programs which employ speech recognition processes. The recognition system RS includes a master processor, speech signal processor, and template matching processors all interconnected on a common bus which communicates with the control subsystem through the mediation of the CS/RS interface. The two-part configuration allows the control subsystem to be accessed by the operator for non-real-time system functions, and the recognition subsystem to be accessed by the user for real-time speech processing functions. An embodiment of a speaker verification system includes template enrollment, template training, recognition by template-concatenation and time alignment, silence and filler template generation, and speaker monitoring modes.
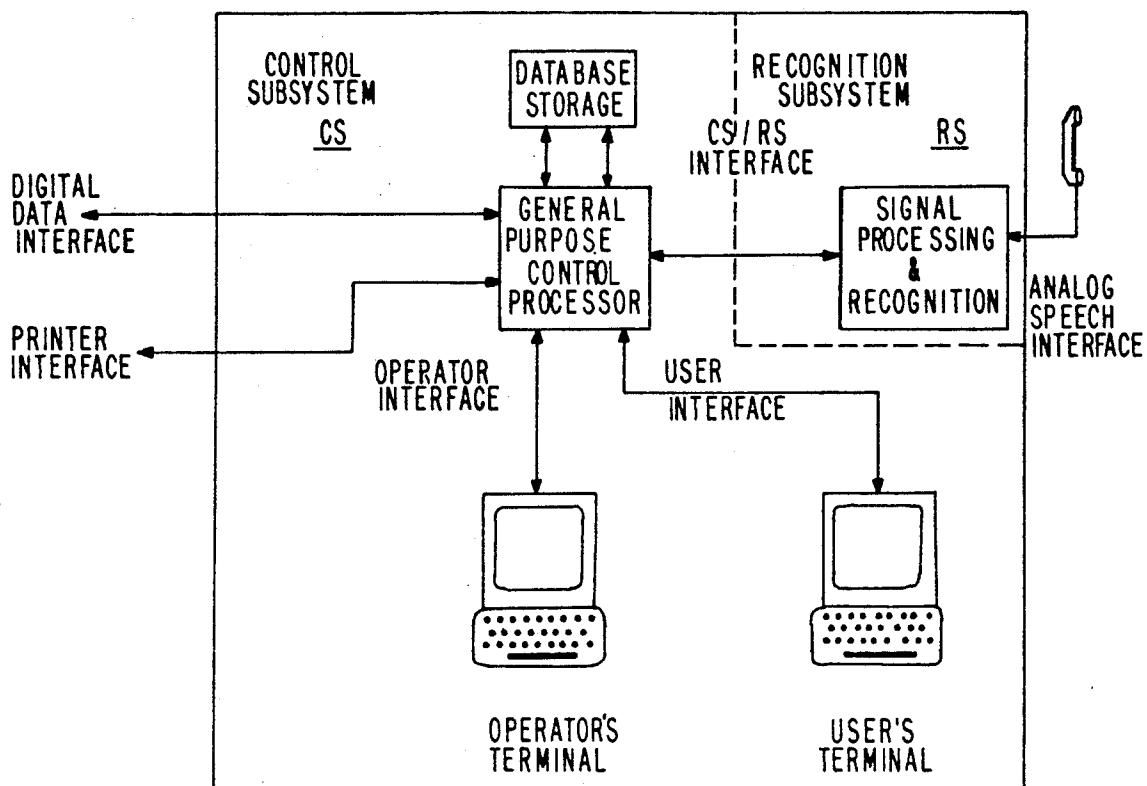
11 Claims, 5 Drawing Sheets
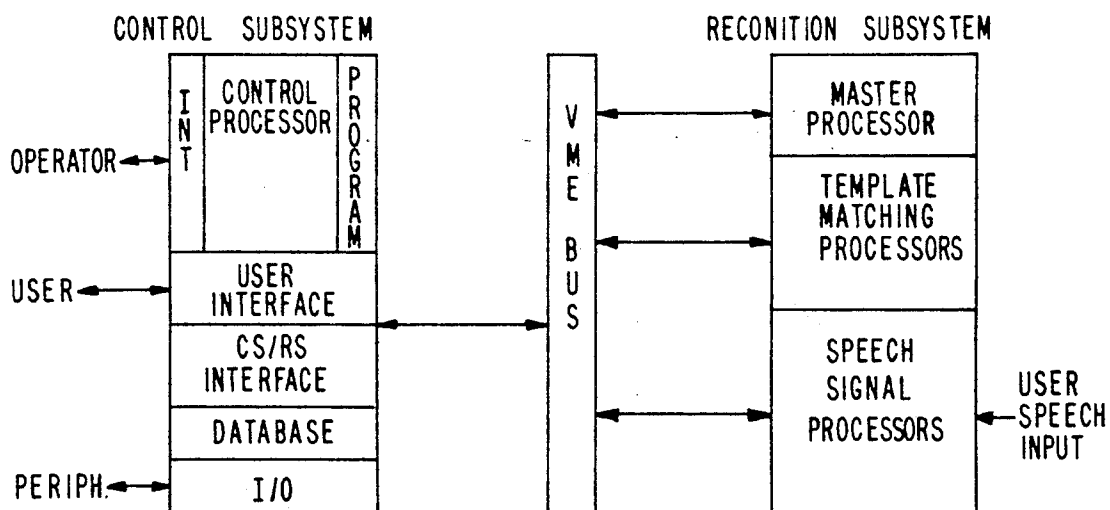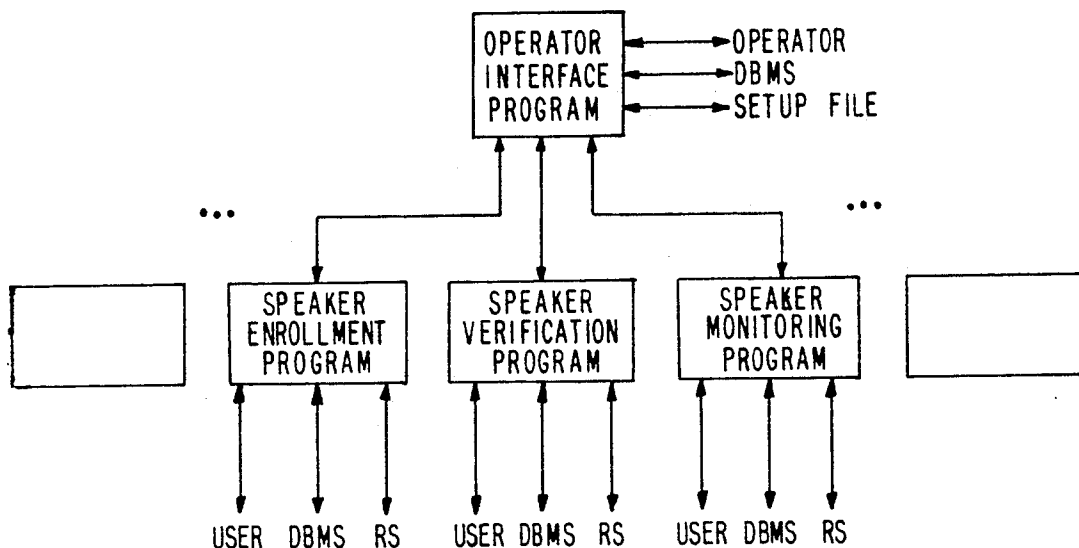
FIG. I
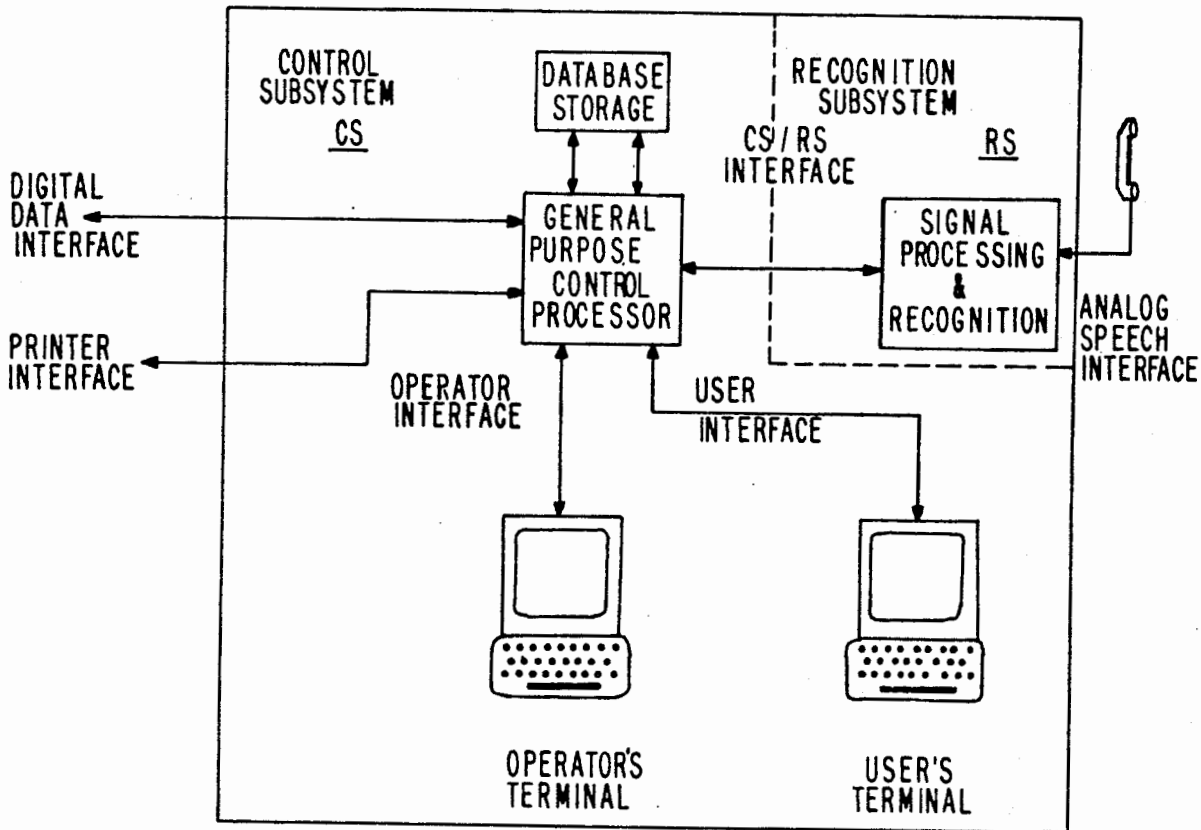
FIG. 2

CONTROL SUBSYSTEM CONTROL STRUCTURE

FIG. 3

RECOGNITION SUBSYSTEM CONTROL STRUCTURE
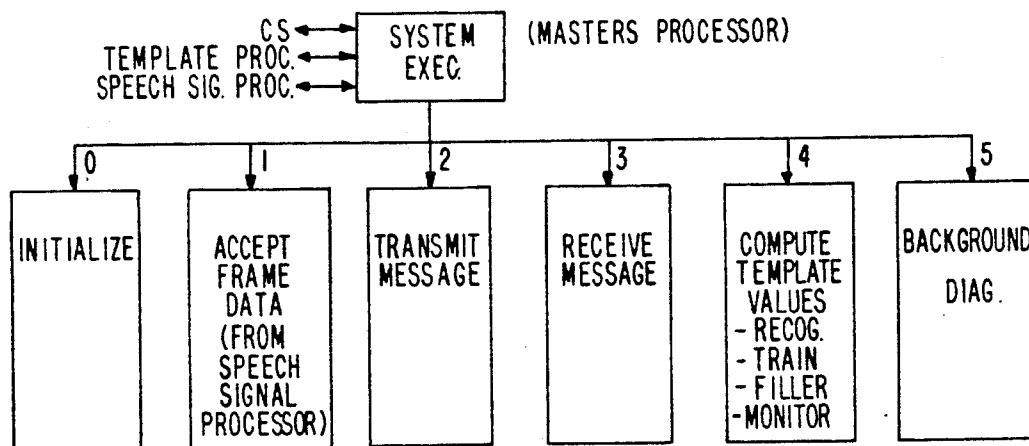
FIG. 4

MESSAGE PROTOCOL FOR TEMPLATE TRAINING
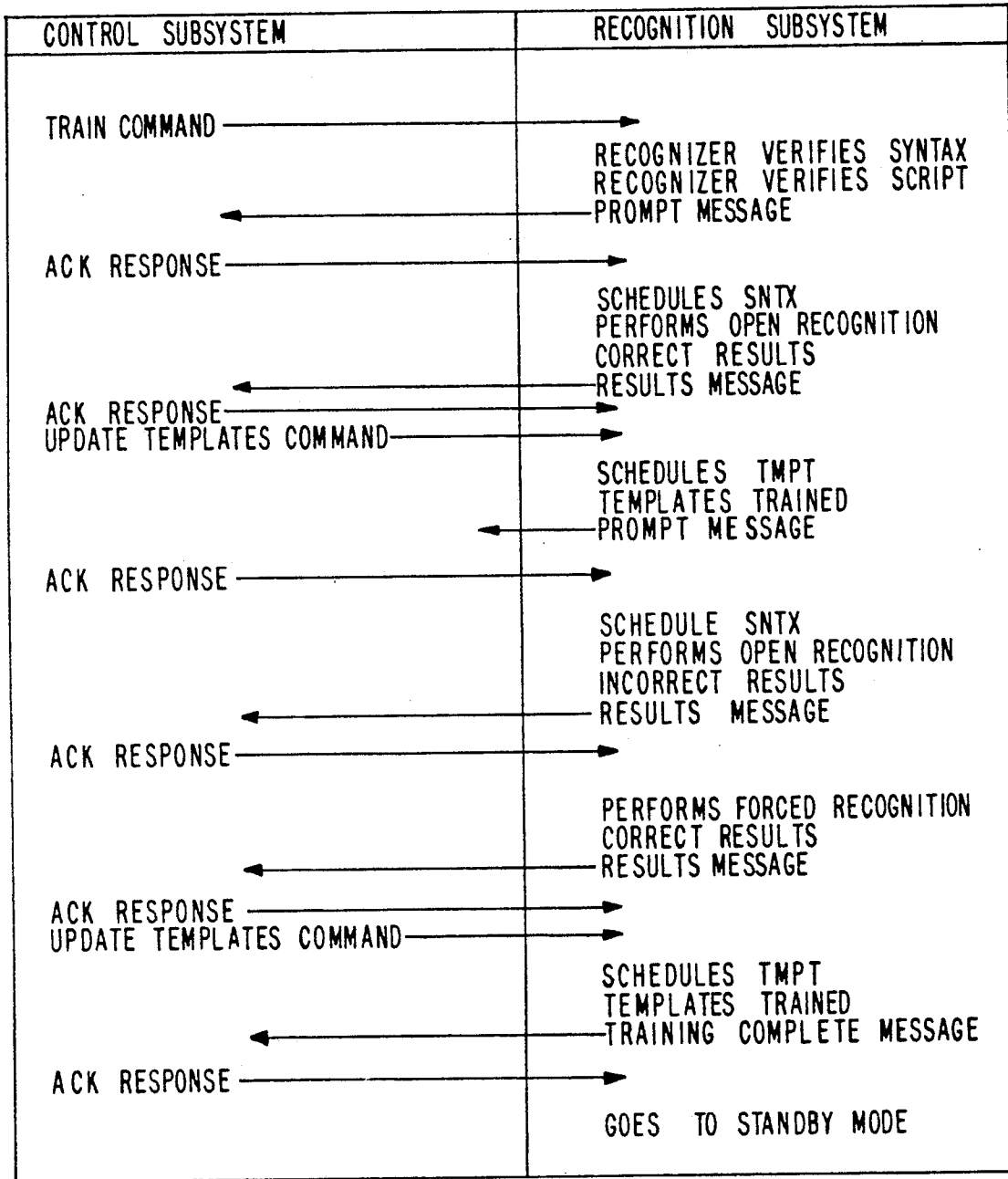
CONTROL SUBSYSTEM	RECOGNITION SUBSYSTEM

TRAIN COMMAND ────────────────▶

             RECOGNIZER VERIFIES SYNTAX
             RECOGNIZER VERIFIES SCRIPT
◀──────────────── PROMPT MESSAGE

ACK RESPONSE ────────────────▶

             SCHEDULES SNTX
             PERFORMS OPEN RECOGNITION
             CORRECT RESULTS
◀──────────────── RESULTS MESSAGE

ACK RESPONSE ────────────────▶
UPDATE TEMPLATES COMMAND ─────▶

             SCHEDULES TMPT
             TEMPLATES TRAINED
◀──────────────── PROMPT MESSAGE

ACK RESPONSE ────────────────▶

             SCHEDULE SNTX
             PERFORMS OPEN RECOGNITION
             INCORRECT RESULTS
◀──────────────── RESULTS MESSAGE

ACK RESPONSE ────────────────▶

             PERFORMS FORCED RECOGNITION
             CORRECT RESULTS
◀──────────────── RESULTS MESSAGE

ACK RESPONSE ────────────────▶
UPDATE TEMPLATES COMMAND ─────▶

             SCHEDULES TMPT
             TEMPLATES TRAINED
◀──────────────── TRAINING COMPLETE MESSAGE

ACK RESPONSE ────────────────▶

             GOES TO STANDBY MODE

FIG. 5

MESSAGE PROTOCOL FOR TEMPLATE ENROLLMENT

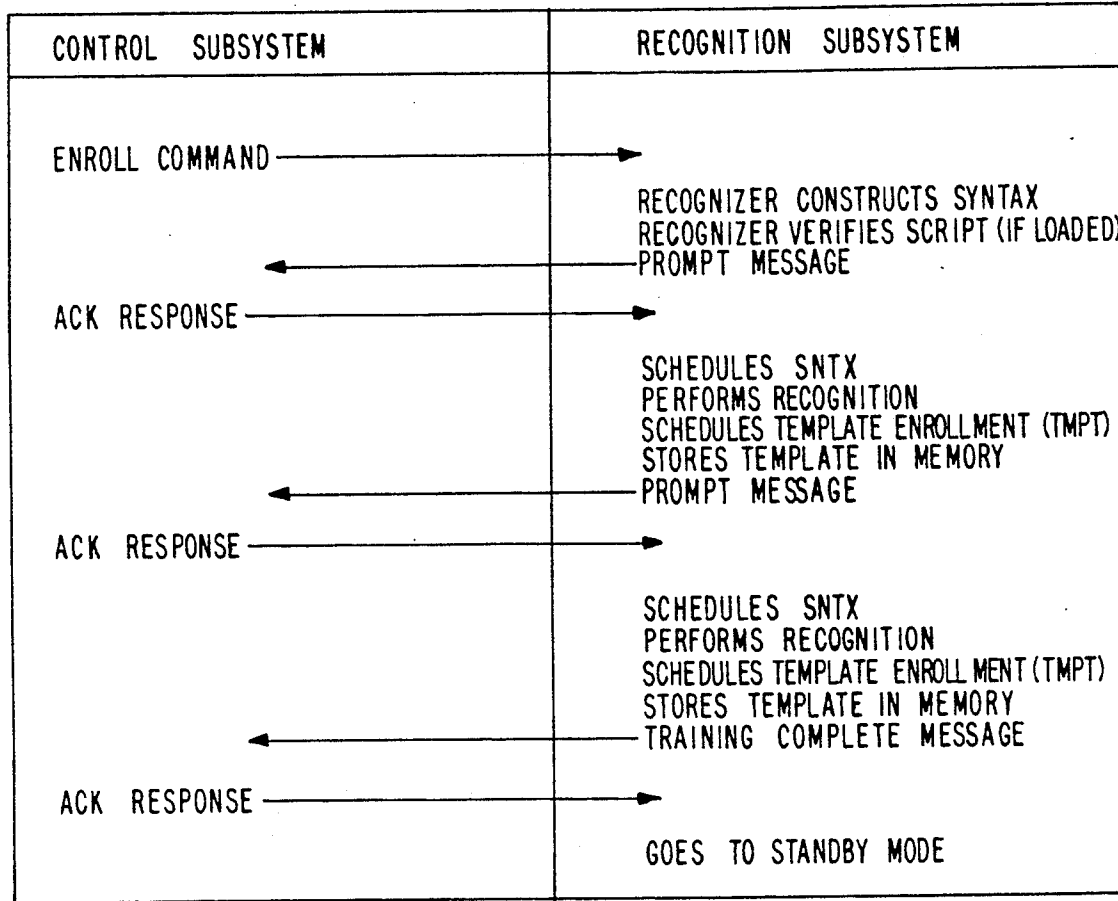| CONTROL SUBSYSTEM	RECOGNITION SUBSYSTEM
ENROLL COMMAND ⟶	
	RECOGNIZER CONSTRUCTS SYNTAX
	RECOGNIZER VERIFIES SCRIPT (IF LOADED)
⟵	PROMPT MESSAGE
ACK RESPONSE ⟶	
	SCHEDULES SNTX
	PERFORMS RECOGNITION
	SCHEDULES TEMPLATE ENROLLMENT (TMPT)
	STORES TEMPLATE IN MEMORY
⟵	PROMPT MESSAGE
ACK RESPONSE ⟶	
	SCHEDULES SNTX
	PERFORMS RECOGNITION
	SCHEDULES TEMPLATE ENROLLMENT (TMPT)
	STORES TEMPLATE IN MEMORY
⟵	TRAINING COMPLETE MESSAGE
ACK RESPONSE ⟶	
	GOES TO STANDBY MODE

FIG. 6

DOCKET ALARM

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.

fastcase
Smarter legal research.