



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

(10) **Patent No.:** **US 6,337,560 B1**
(45) **Date of Patent:** **Jan. 8, 2002**

(54) **LIFE CYCLE CHARGING FOR BATTERIES**

(75) Inventors: **Sarandis Kalogeropoulos**, Malmö;
Jan-Olof Svensson, Landskrona, both
of (SE)

(73) Assignee: **Telefonaktiebolaget LM Ericsson**
(publ), Stockholm (SE)

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

(21) Appl. No.: **09/722,884**

(22) Filed: **Nov. 28, 2000**

(51) **Int. Cl.**⁷ **H02J 7/00**

(52) **U.S. Cl.** **320/160; 320/125**

(58) **Field of Search** 320/160, 125,
320/130, 162

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,528,121 A	6/1996	Okamura	
5,631,533 A	5/1997	Imaseki	
5,939,864 A	8/1999	Lenhart et al.	
6,011,380 A *	1/2000	Paryani et al.	320/132

OTHER PUBLICATIONS

Copy of U.S. application No. 09/397,001, filed Sep. 15,
1999.
European Standard Search Report, *Date of Completion:* Jun.
19, 2001; *Date of Mailing:* Jun. 25, 2001.

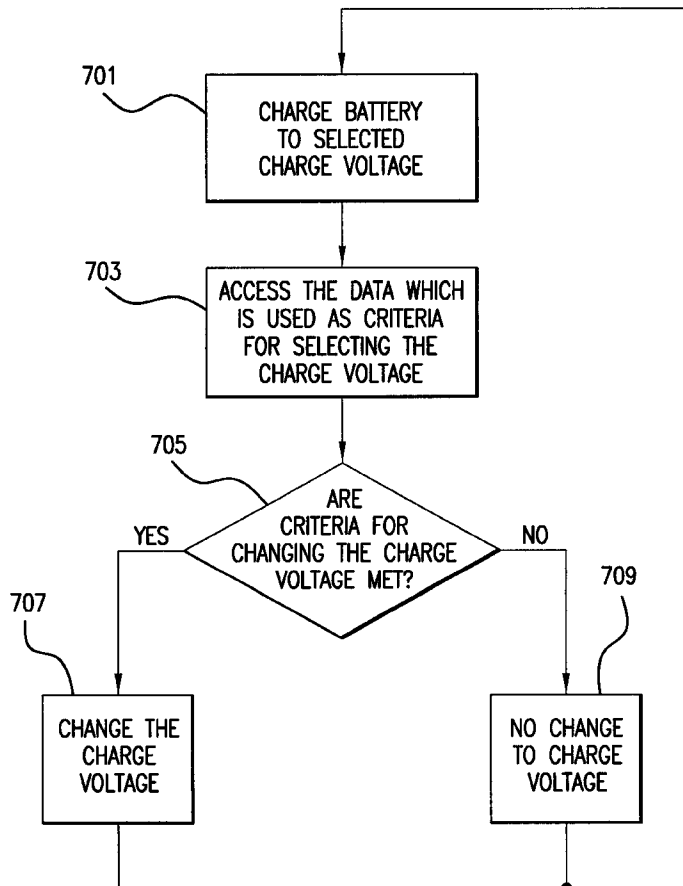
* cited by examiner

Primary Examiner—Gregory J. Toatley, Jr.
(74) *Attorney, Agent, or Firm*—Burns, Doane, Swecker &
Mathis, L.L.P.

(57) **ABSTRACT**

A method and apparatus for extending the cycle life of a
battery by using different charge voltages or different current
cut-offs to recharge the battery during the course of the
battery's life. The capacity of a battery is gradually depleted
as the battery is repeatedly charged and discharged. The rate
at which the battery capacity is depleted varies in accor-
dance to the charge voltage, or the current cut-off, used to
recharge the battery. For example, higher charge voltages
cause the capacity to be more rapidly depleted than lower
charge voltages. A battery may be charged using a high
charge voltage, e.g., its rated charge voltage, during periods
of expected high usage. To extend the battery's cycle life,
the battery may be charged using a low charge voltage
during periods of expected low usage.

31 Claims, 9 Drawing Sheets



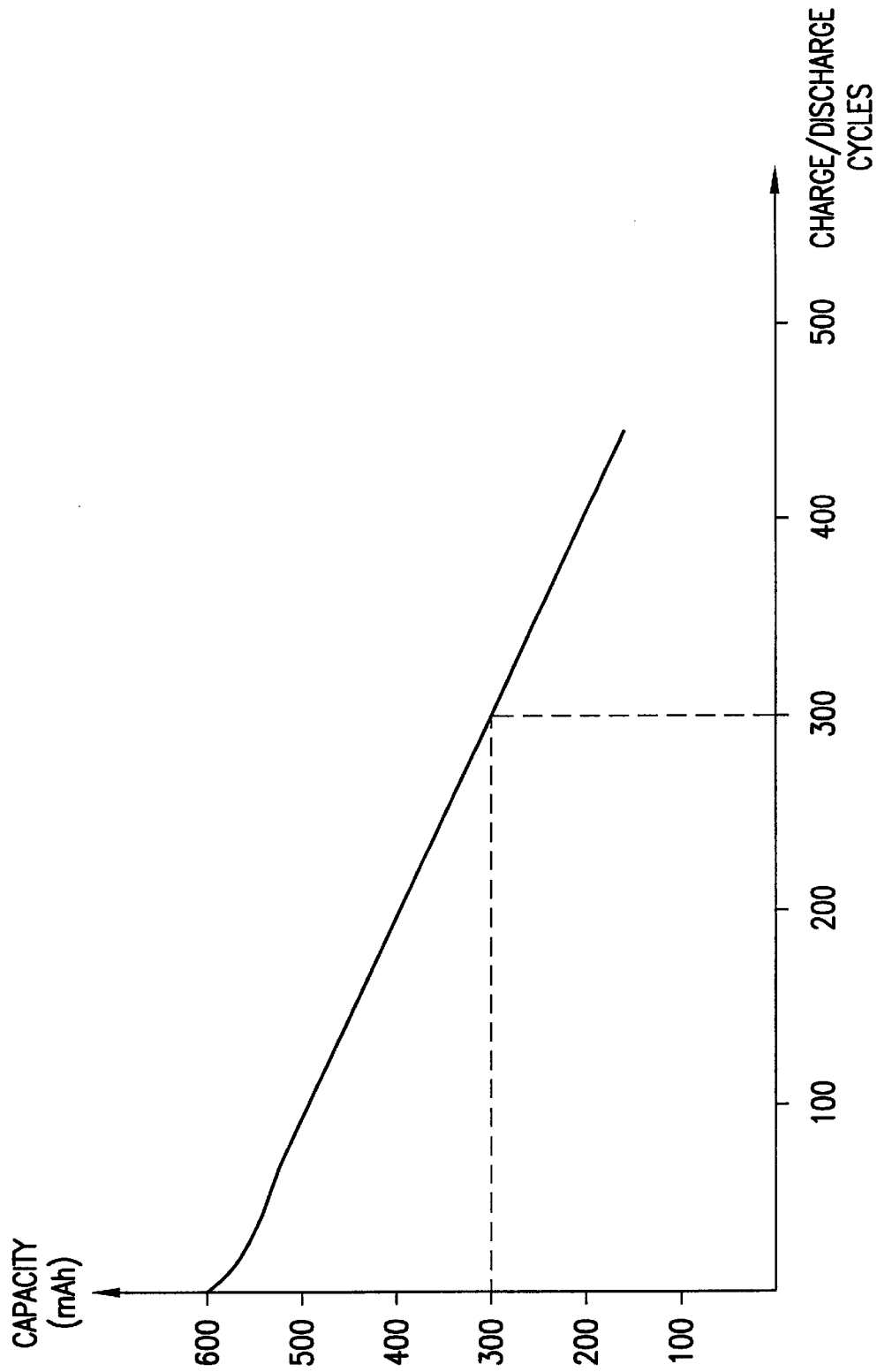


FIG.1

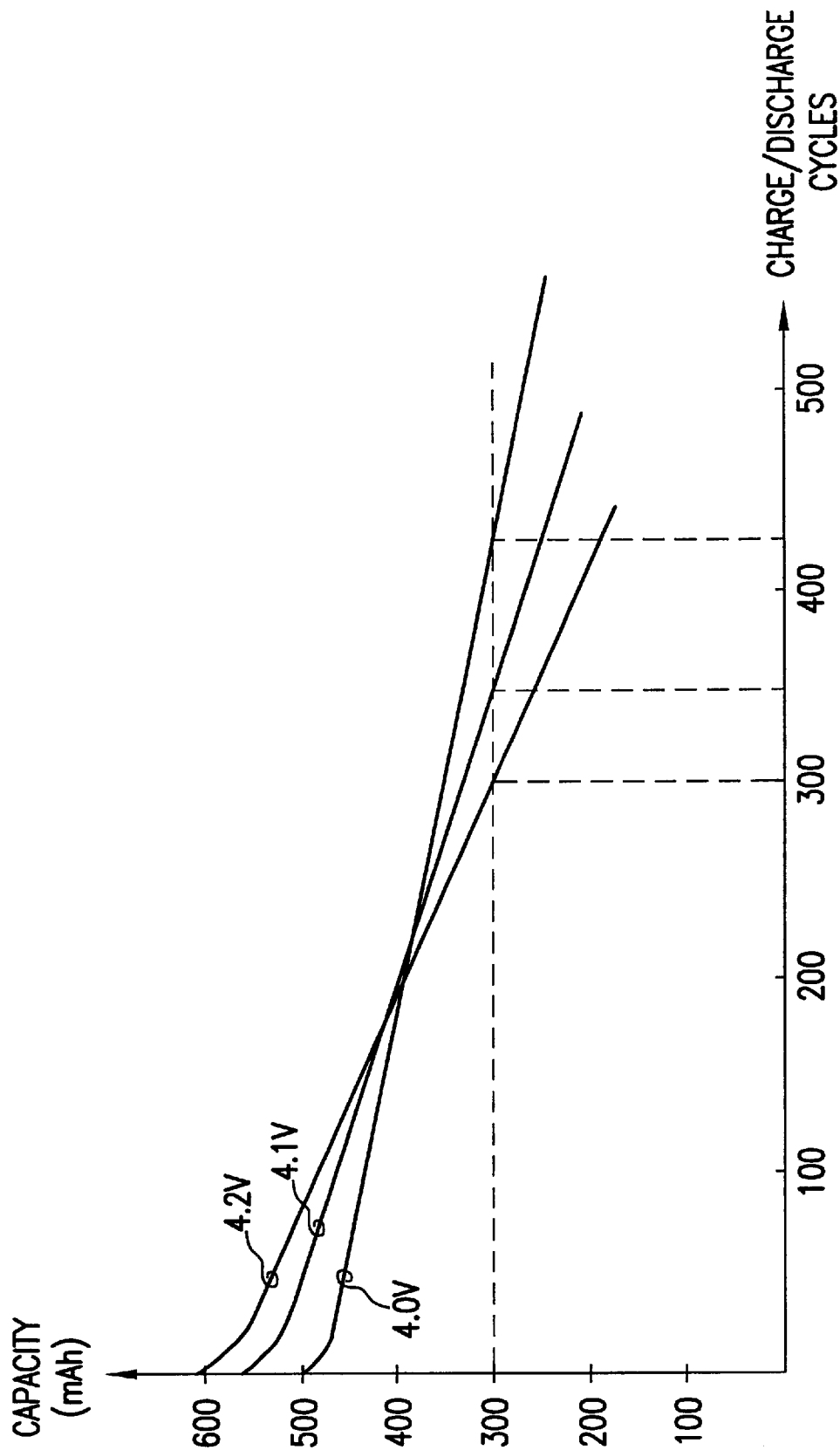


FIG.2

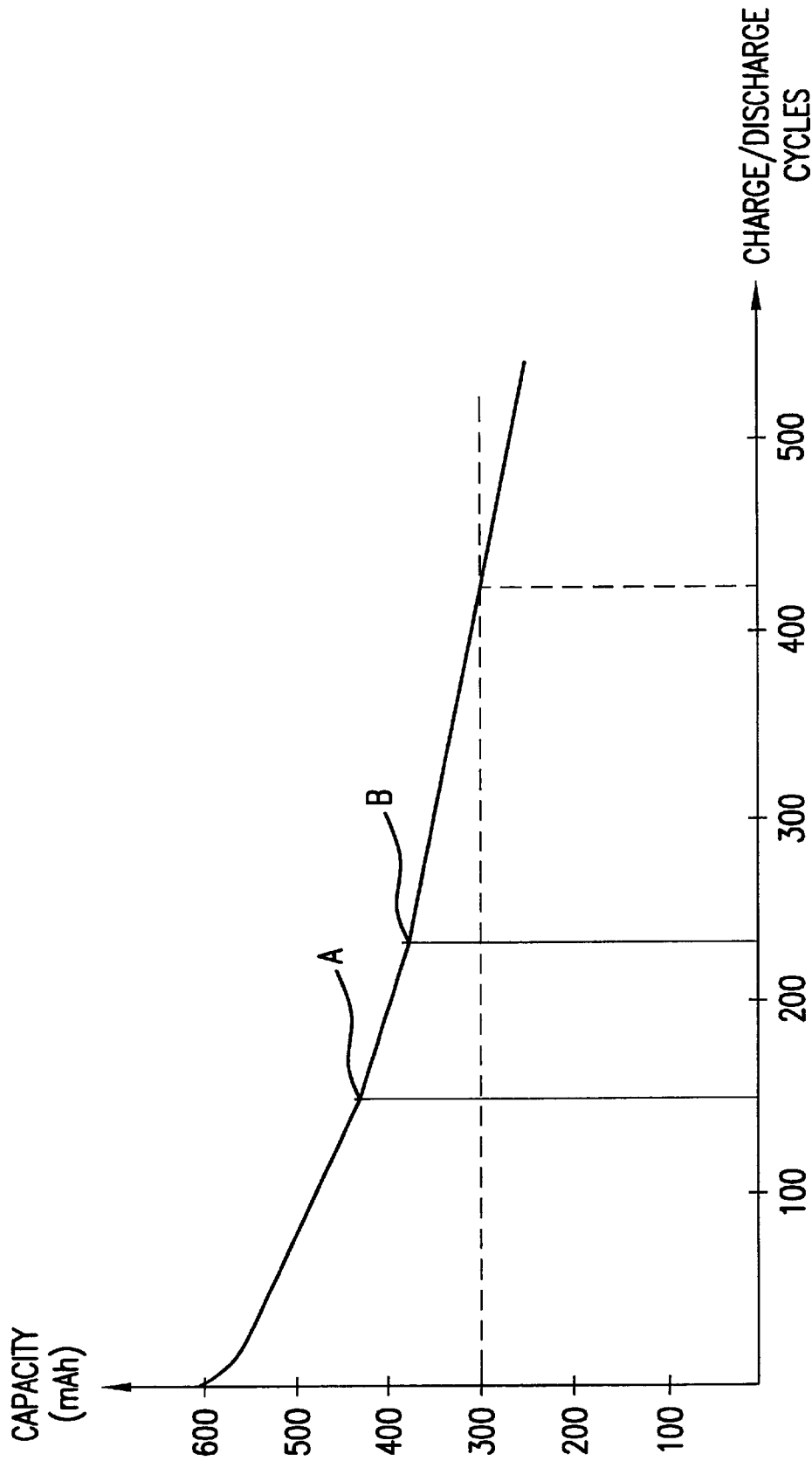


FIG.3

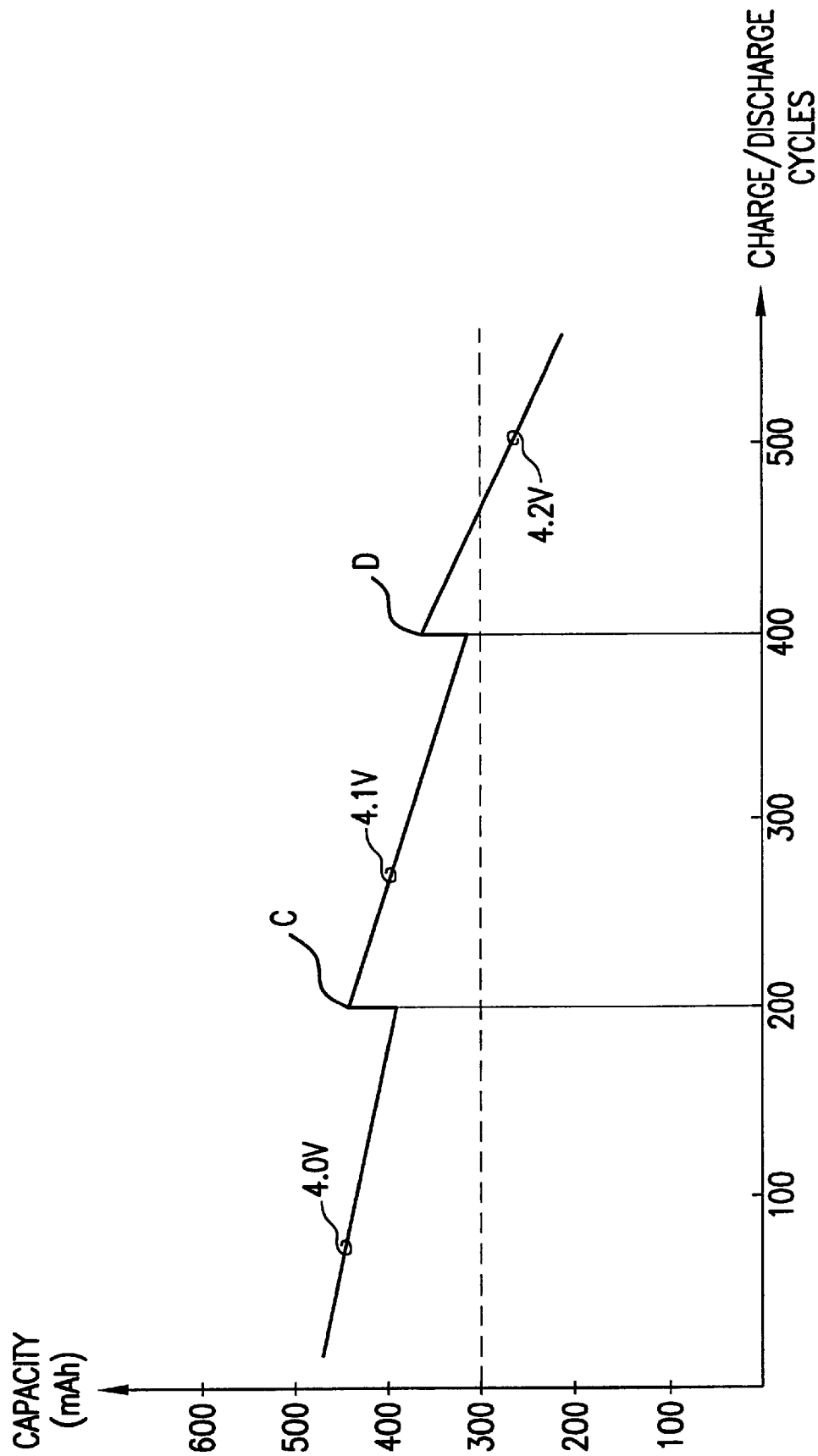


FIG. 4

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.