



- [54] **MOTION BASED EVENT DETECTION SYSTEM AND METHOD**
- [75] Inventor: **Jonathan D. Courtney**, Dallas, Tex.
- [73] Assignee: **Texas Instruments Incorporated**, Dallas, Tex.
- [21] Appl. No.: **08/795,432**
- [22] Filed: **Feb. 5, 1997**

Related U.S. Application Data

- [60] Provisional application No. 60/011,106, Feb. 5, 1996.
- [51] Int. Cl.⁶ **H04N 7/18**
- [52] U.S. Cl. **348/143; 348/135; 348/155**
- [58] Field of Search 348/135, 142, 348/152, 154, 155, 143, 171, 172; 382/103, 107, 236

References Cited

U.S. PATENT DOCUMENTS

5,243,418	9/1993	Kuno et al.	358/108
5,428,774	6/1995	Takahashi et al.	395/600
5,550,965	8/1996	Gabbe et al.	395/154
5,666,157	9/1997	Aviv	348/152
5,721,692	2/1998	Nagaya et al.	364/516
5,734,737	3/1998	Chang et al.	382/107

FOREIGN PATENT DOCUMENTS

0 318 039 11/1988 Japan .

OTHER PUBLICATIONS

Lee, S., et al., "Video Indexing—An Approach Based on Moving Object and Track," in Wayne Niblack, editor, *Storage and Retrieval for Image and Video Databases*, Proc. SPIE 1908, 25–36 (1993).

Ioka, M, et al., "A Method for Retrieving Sequences of Images on the Basis of Motion Analysis," in *Image Storage and Retrieval Systems*, Proc. SPIE 1662, 35–46 (1992).

Day Y F, et al., "Object-Oriented Conceptual Modeling of Video Data", Supplied by Applicant, 402–408, Mar. 6, 1995.

Abe S, et al., "Scene Retrieval Method using Temporal Condition Changes", Supplied by Applicant, whole document, Jan. 1, 1993.

Hirotsada Ueda, et al., "Automatic Structure Visualization for Video Editing", Supplied by Applicant, whole document, Apr. 24, 1993.

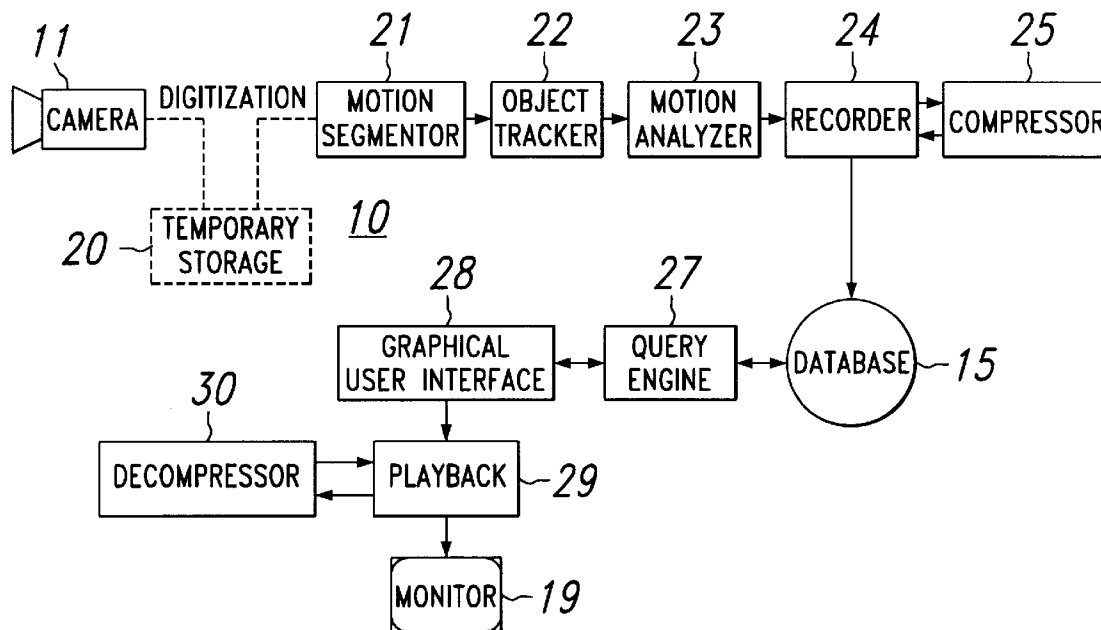
Orkisz, M, "Moving Objects Location in Complex Scenes Filmed by a Fixed Camera", Supplied by Applicant, 325, 327–328, Jan. 1, 1992.

Primary Examiner—Tommy P. Chin
Assistant Examiner—John Voisinnet
Attorney, Agent, or Firm—Robert L. Troike; Richard L. Donaldson

[57] **ABSTRACT**

A method to provide automatic content-based video indexing from object motion is described. Moving objects in video from a surveillance camera 11 detected in the video sequence using motion segmentation methods by motion segmentor 21. Objects are tracked through segmented data in an object tracker 22. A symbolic representation of the video is generated in the form of an annotated graphics describing the objects and their movement. A motion analyzer 23 analyzes results of object tracking and annotates the graph motion with indices describing several events. The graph is then indexed using a rule based classification scheme to identify events of interest such as appearance/disappearance, deposit/removal, entrance/exit, and motion/rest of objects. Clips of the video identified by spatio-temporal, event, and object-based queries are recalled to view the desired video.

22 Claims, 11 Drawing Sheets



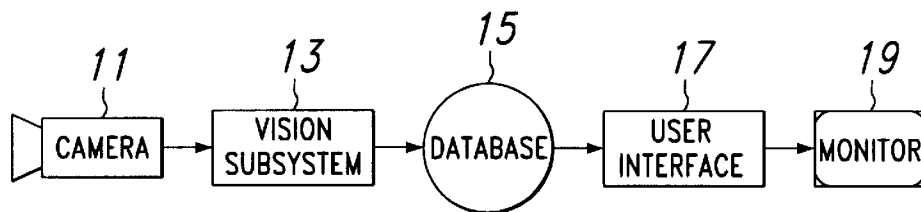


Fig. 1

10

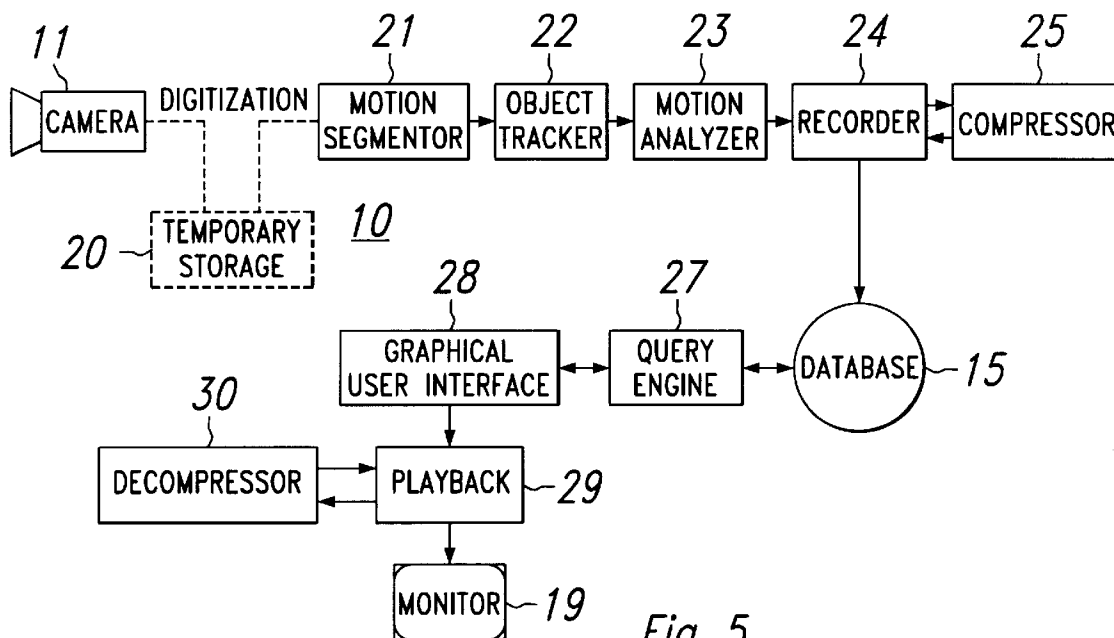


Fig. 5

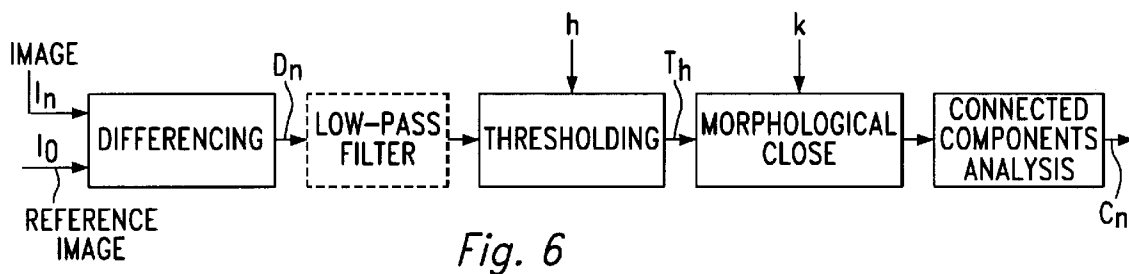


Fig. 6

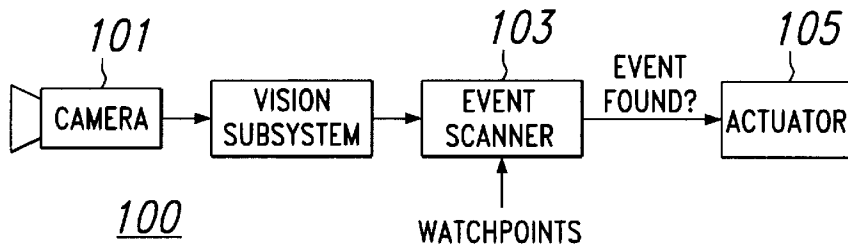


Fig. 27

100

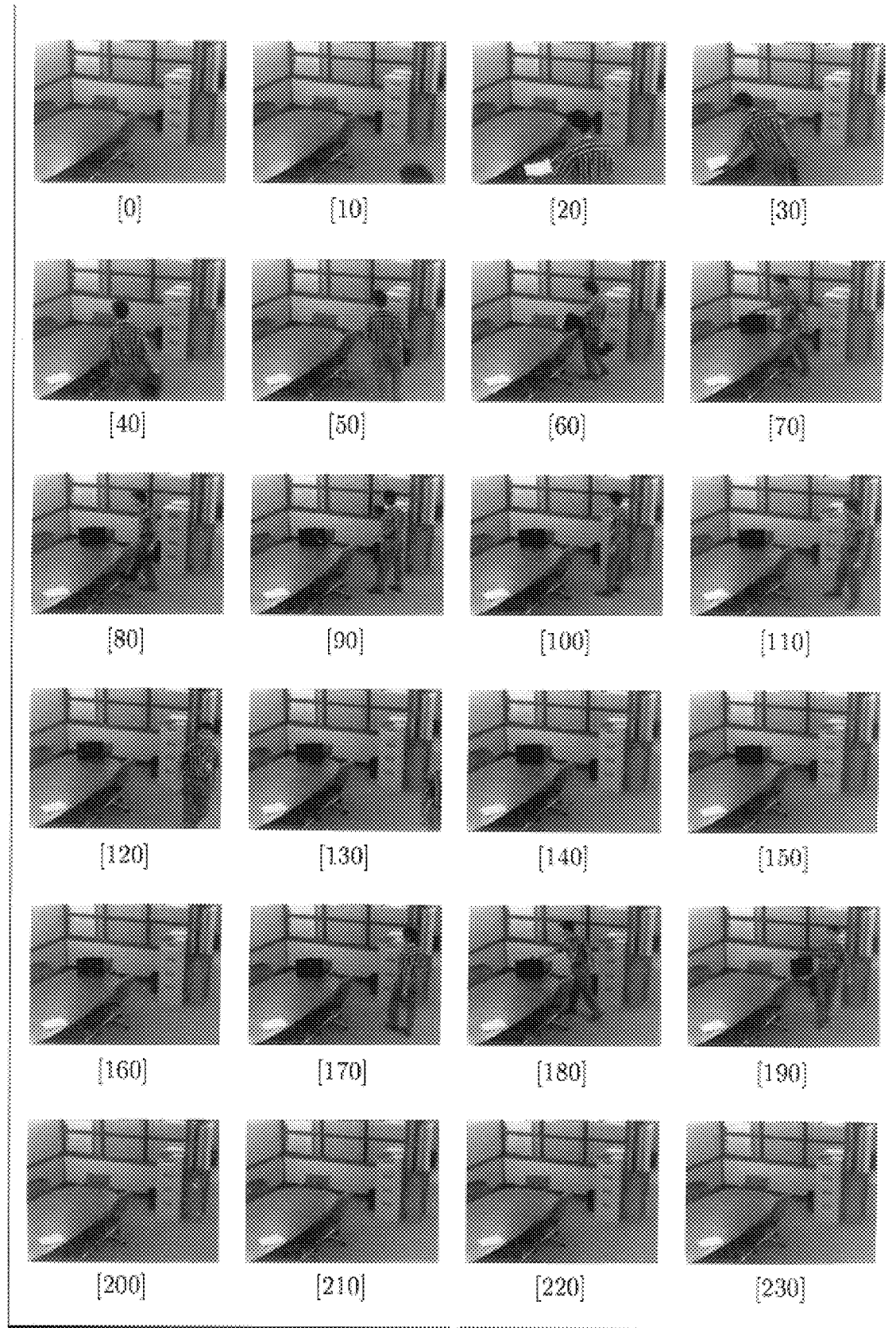


Fig. 2

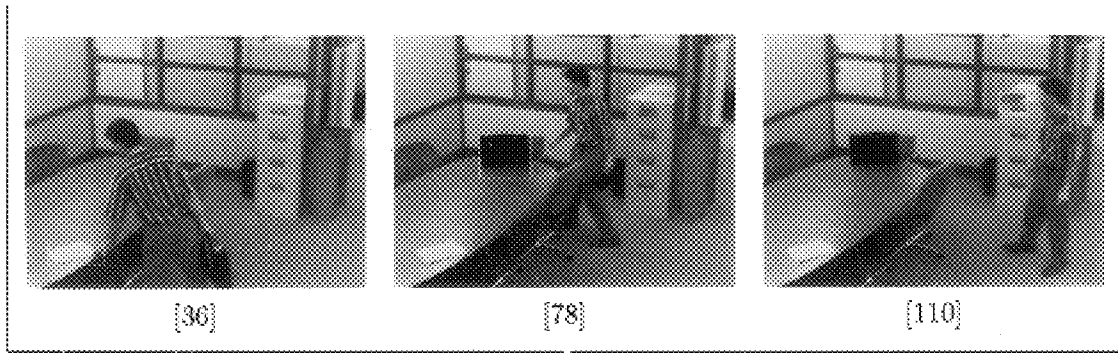


Fig. 3

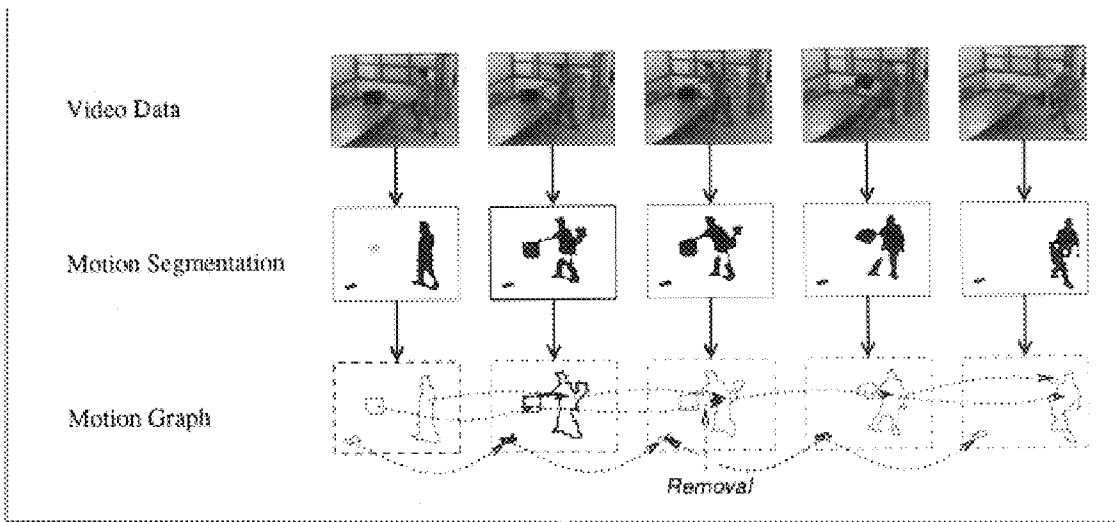


Fig. 4

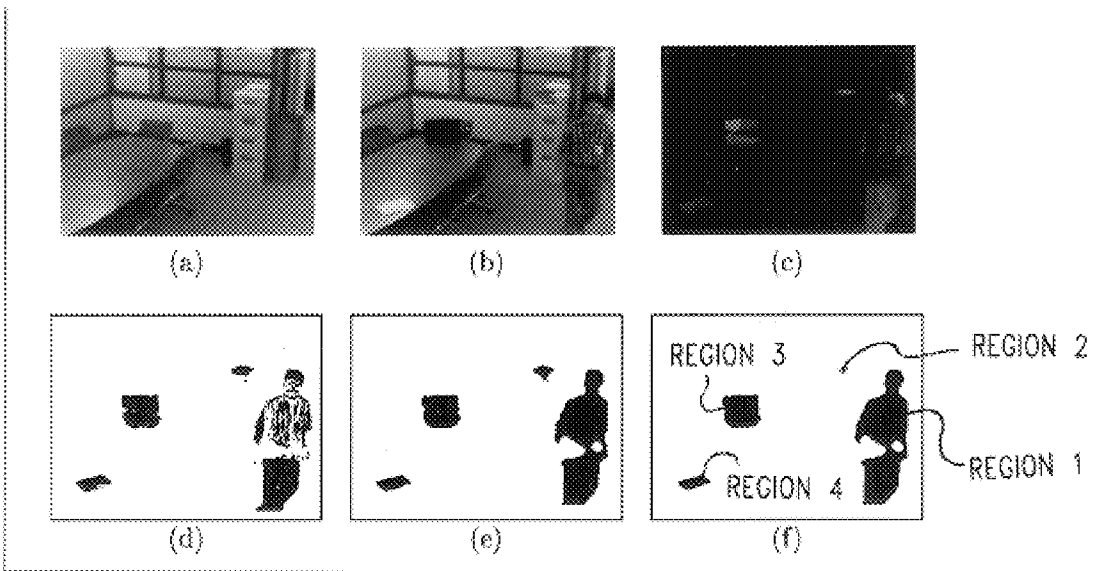


Fig. 7



Fig. 8

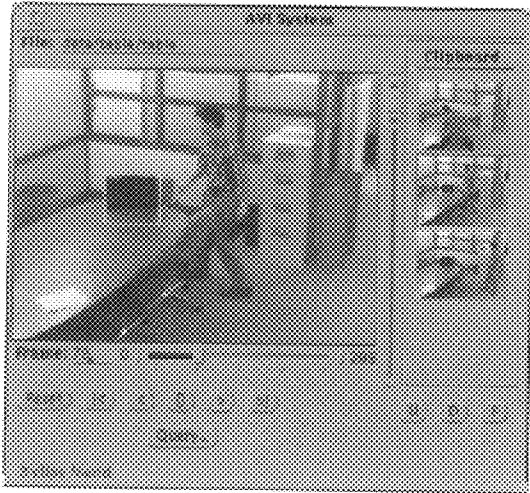


Fig. 24a

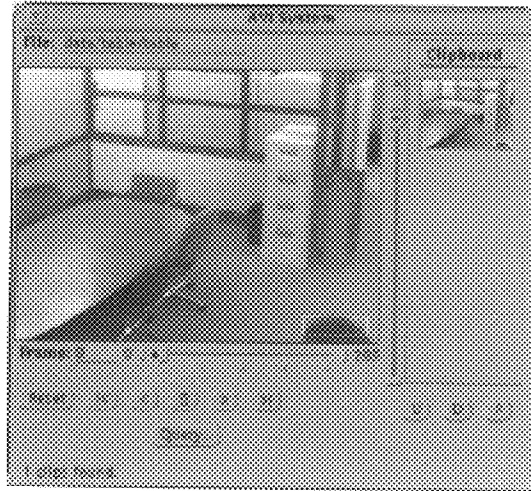


Fig. 24b

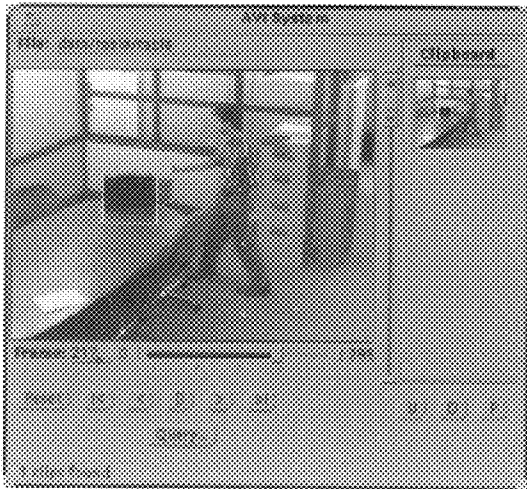


Fig. 24c

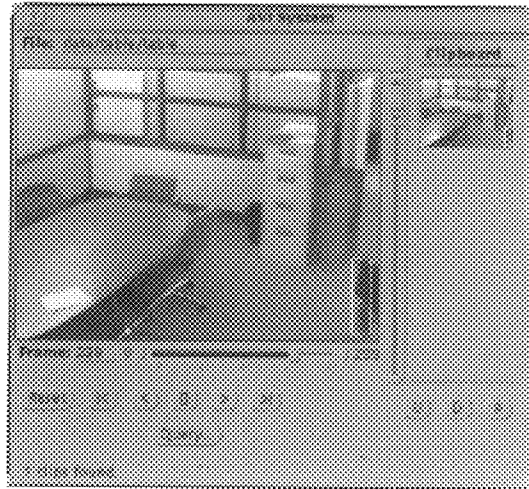


Fig. 24d

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.