



US005822781A

# United States Patent [19]

[11] Patent Number: **5,822,781**

Wells et al.

[45] Date of Patent: **Oct. 13, 1998**

- [54] **SECTOR-BASED STORAGE DEVICE EMULATOR HAVING VARIABLE-SIZED SECTOR**
- [75] Inventors: **Steven Wells**, Citrus Heights; **Robert N. Hasbun**, Shingle Springs; **Kurt Robinson**, Newcastle, all of Calif.

5,493,574 2/1996 McKinley ..... 371/40.1

### FOREIGN PATENT DOCUMENTS

- 2088442 7/1993 Canada ..... 13/16
- 0175458A2 3/1986 European Pat. Off. .
- 0392895 10/1990 European Pat. Off. .... 16/6
- 2251323 1/1992 United Kingdom ..... 12/2
- 2251324 1/1992 United Kingdom ..... 12/2

[73] Assignee: **Intel Corporation**, Santa Clara, Calif.

### OTHER PUBLICATIONS

- Robinson, Kurt, "Trends in Flash Memory System Design", *Wescon Conference Record*, Nov. 1990, pp. 468—472.
- Markus A. Levy and Dave Elbert, "Solutions for High Density Applications Using Intel Flash Memory," Intel Application Note AP-343, pp. 6-297 through 6-364 (Oct. 1990).
- Solid-State Mass Storage Arrives, Product Feature, Memory Card Systems & Design, Jul./Aug. 1992.

[21] Appl. No.: **969,131**  
 [22] Filed: **Oct. 30, 1992**

- [51] Int. Cl.<sup>6</sup> ..... **G06F 12/04**
- [52] U.S. Cl. .... **711/171; 395/500**
- [58] Field of Search ..... 395/400, 425, 395/412, 430, 497.01, 497.02, 497.03, 497.04, 500; 365/900 MS, 185; 711/171, 172

### [56] References Cited

#### U.S. PATENT DOCUMENTS

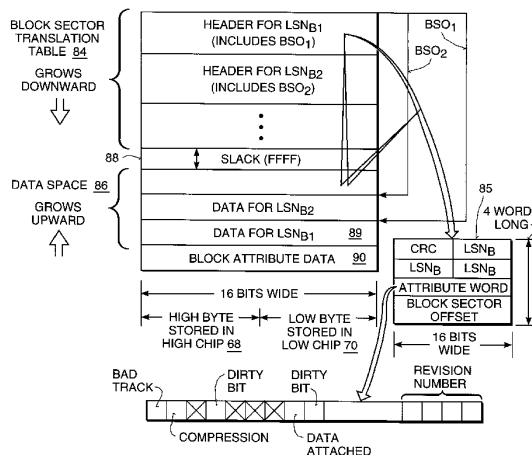
3,648,255	3/1972	Beausoleil et al. ....	340/172.5
4,430,727	2/1984	Moore et al. ....	395/425
4,642,759	2/1987	Foster .	
4,644,494	2/1987	Muller .	
4,758,944	7/1988	Bartley et al. ....	395/425
4,763,305	8/1988	Kuo .	
4,802,117	1/1989	Chrosny et al. .	
4,849,878	7/1989	Roy ..... 395/600	
4,864,497	9/1989	Lowry et al. .... 395/650	
4,896,262	1/1990	Wayama et al. .... 395/500	
4,958,315	9/1990	Balch ..... 395/500	
5,012,425	4/1991	Brown .	
5,067,128	11/1991	Nakane .	
5,070,474	12/1991	Tuma et al. .	
5,077,737	12/1991	Leger et al. .... 371/10.1	
5,109,498	4/1992	Kamiya et al. .... 395/497.03	
5,111,385	5/1992	Hattori ..... 395/425	
5,131,089	7/1992	Cole ..... 395/500	
5,210,854	5/1993	Beaverton et al. .... 395/430	
5,237,460	8/1993	Miller et al. .... 360/8	
5,280,611	1/1994	Mohan et al. .... 395/600	
5,291,584	3/1994	Challa et al. .... 395/500	
5,297,148	3/1994	Harari et al. .... 371/10.2	
5,305,295	4/1994	Chu ..... 369/30	
5,313,429	5/1994	Chevallier et al. .... 365/226	
5,359,205	10/1994	Orshinsky ..... 257/3	

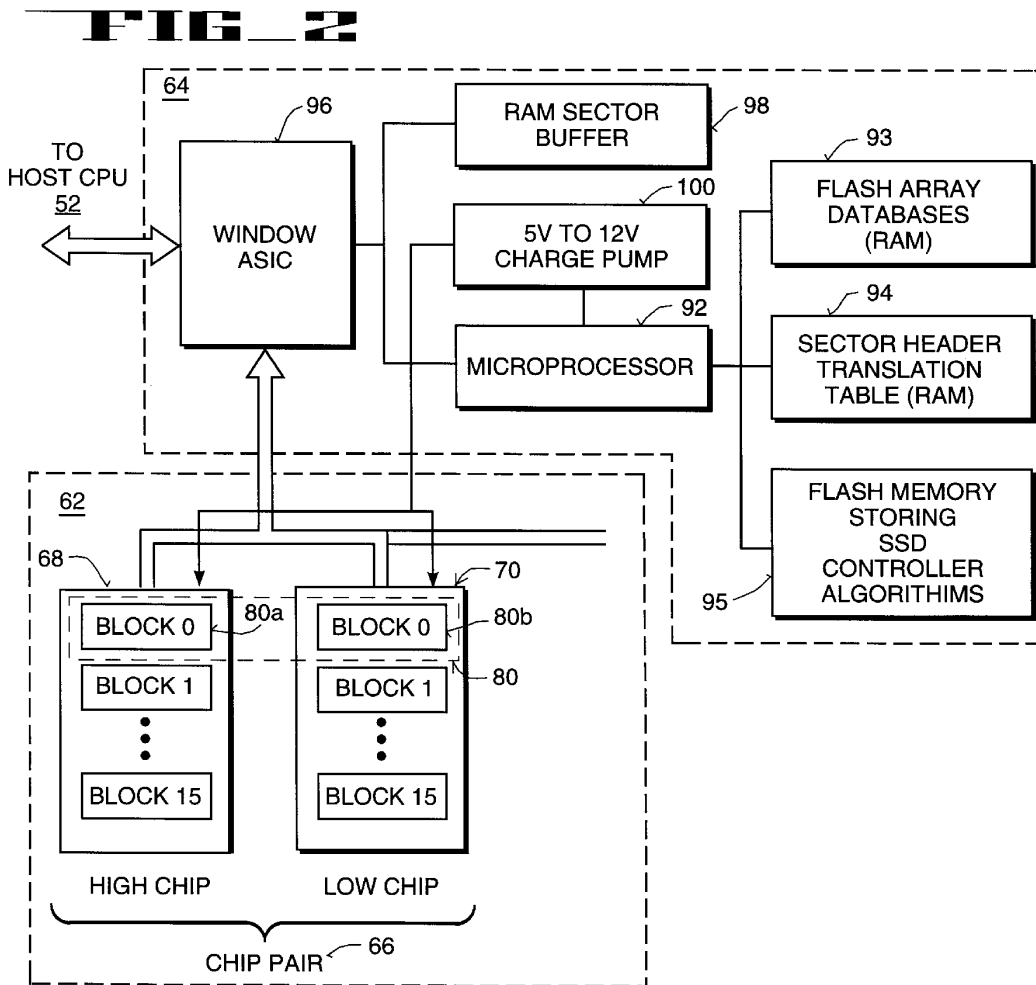
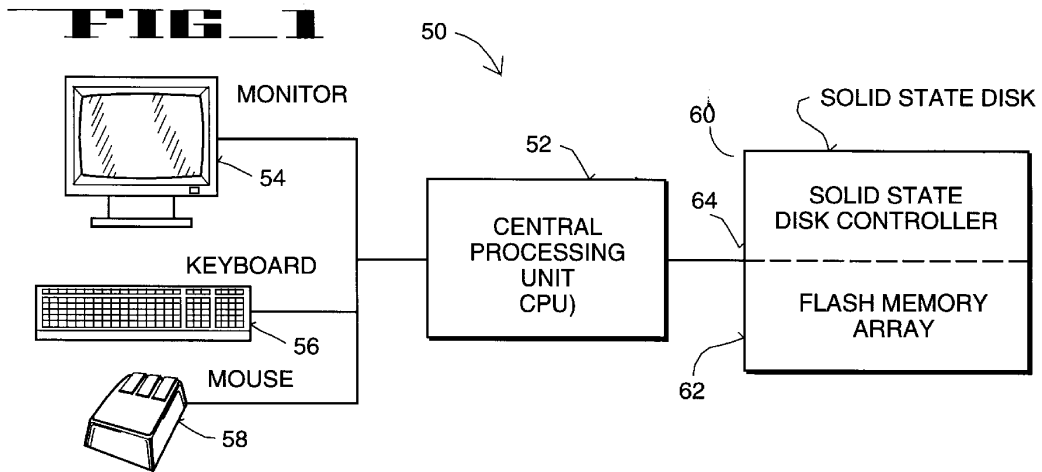
Primary Examiner—Eddie P. Chan  
 Assistant Examiner—Hiep T. Nguyen  
 Attorney, Agent, or Firm—Blakely, Sokoloff, Taylor & Zafman

### [57] ABSTRACT

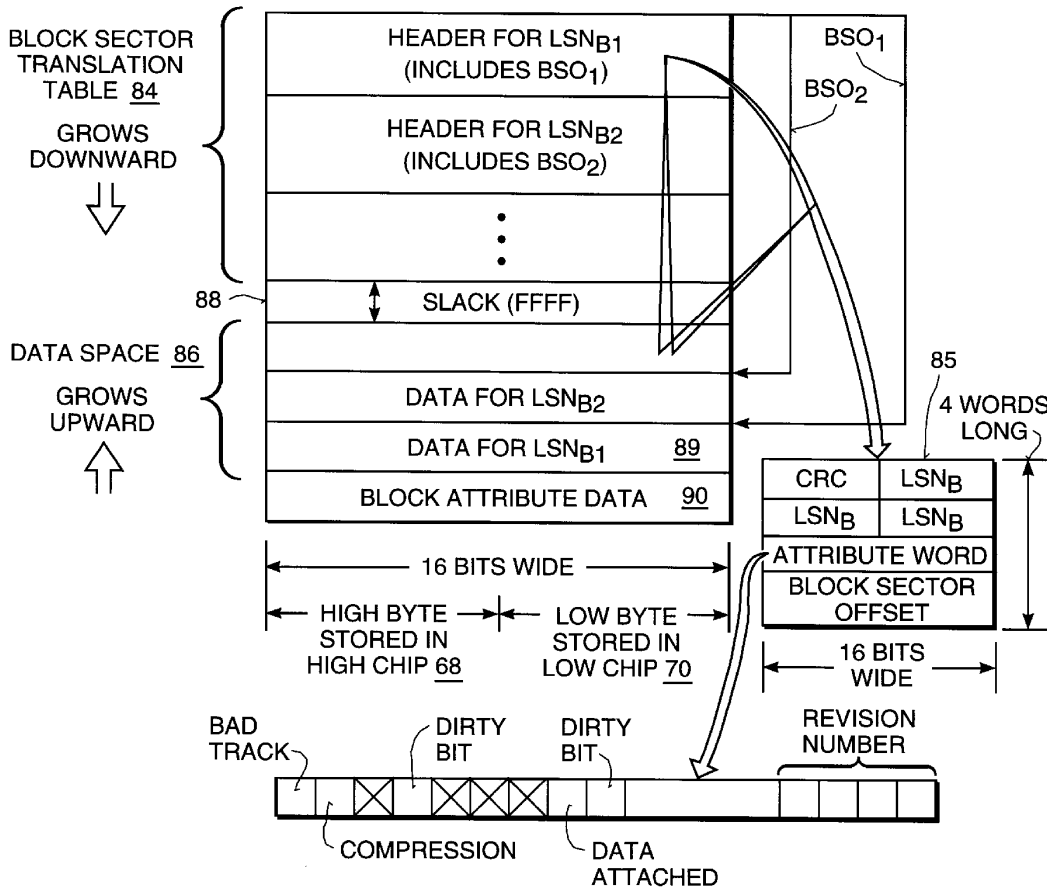
A solid state memory disk that stores data on a sector basis is described. The solid state disk includes an array of FLASH memory devices, which store the sectors of data. Each block of memory within the FLASH array includes data space for storing many sectors of data and a block sector translation table. The block sector translation table identifies each sector of data stored in the block's data space by a sector number. The solid state disk also includes a controller. Among its many responsibilities, the controller manages the writing of sector data into the array and the reading of sectors of data from the array. The controller responds to a write request by seeking an earlier version of the sector which has a logical sector number equal to the sector's sector number and marking that sector dirty. Afterward, the controller allocates free memory space for the sector of data. The sector of data is then written into the allocated memory space. The controller reads sectors of data by seeking a sector header translation table to convert sector numbers into physical addresses.

31 Claims, 22 Drawing Sheets

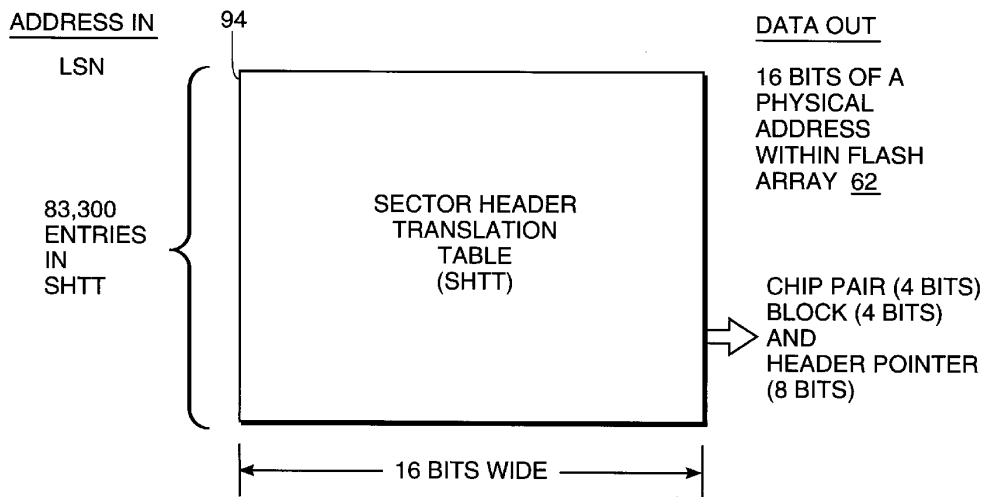




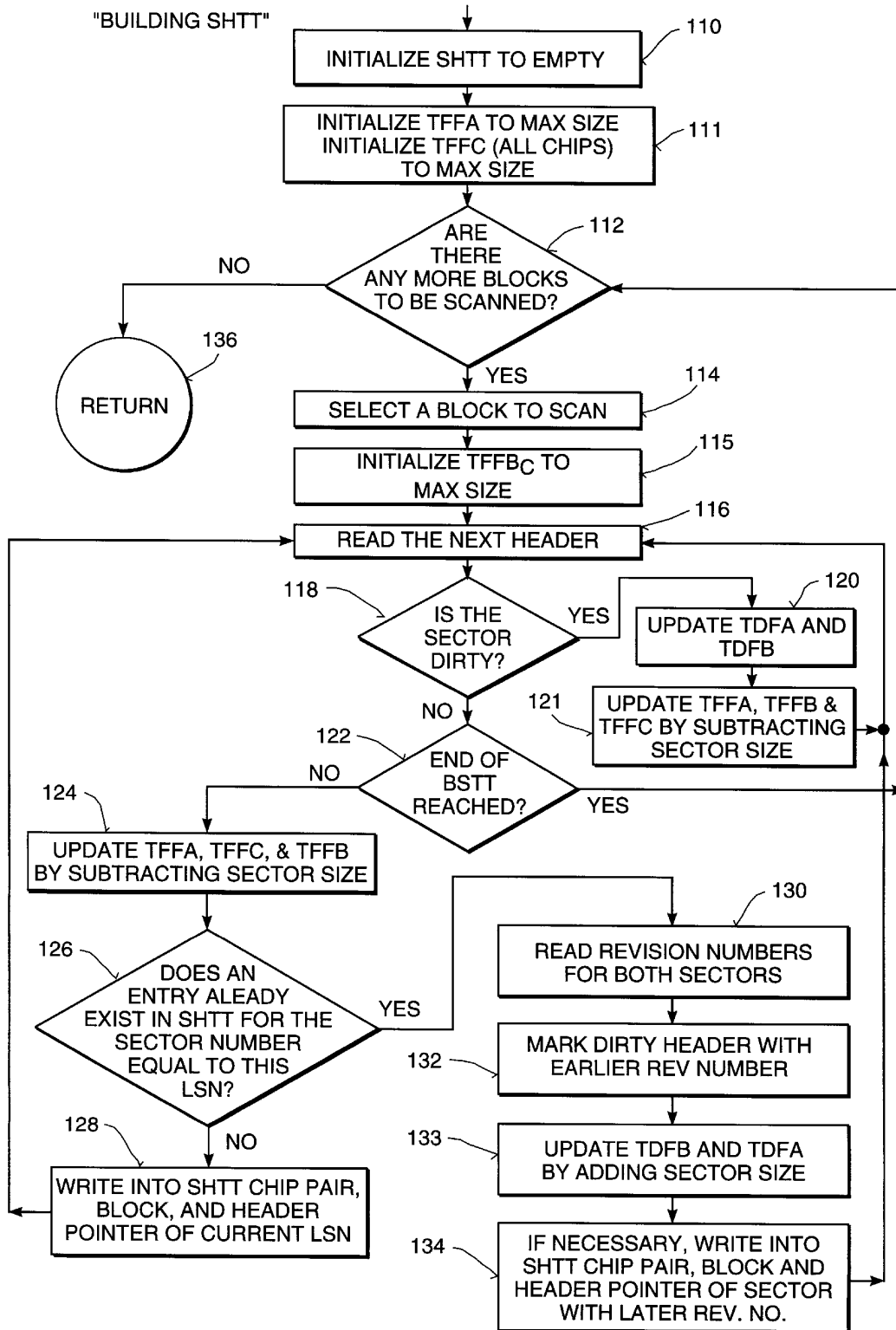
**FIG 3**



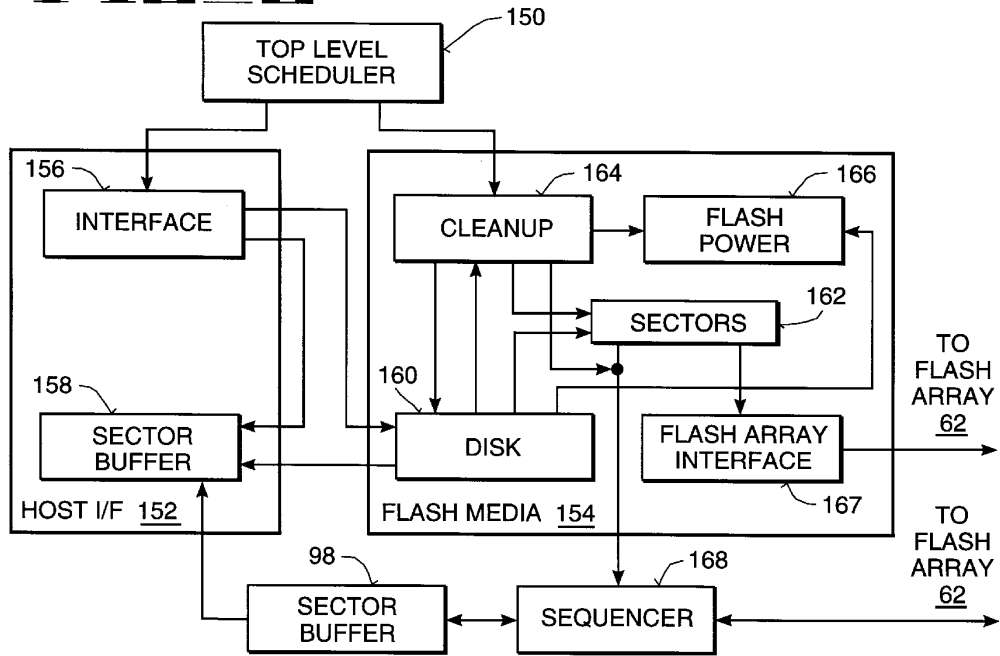
**FIG 4**



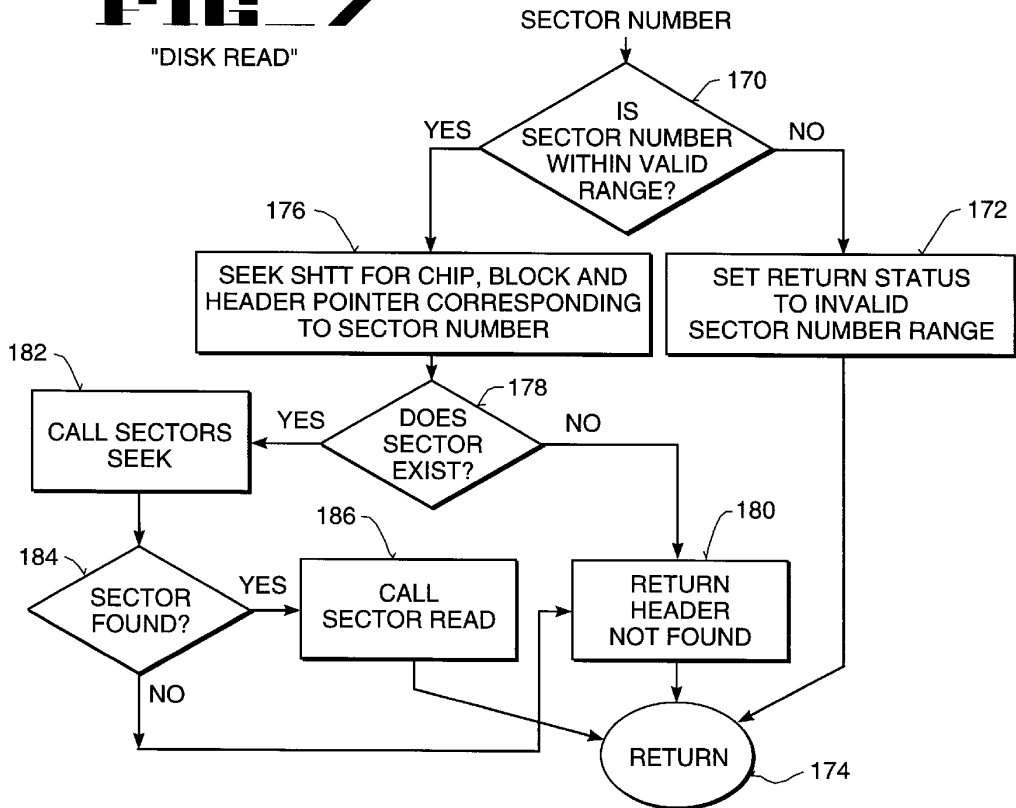
**FIG. 5**  
"BUILDING SHTT"



**FIG 6**



**FIG 7**



# 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.