

**(12) United States Patent
Philipp**

(10) Patent No.: US 6,452,514 B1
(45) Date of Patent: Sep. 17, 2002

(54) CAPACITIVE SENSOR AND ARRAY

**(76) Inventor: Harald Philipp, 7 Cirrus Gardens,
Hamble Hampshire SD31 4RH (GB)**

(*) 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.: 09/491,129

(22) Filed: Jan. 26, 2000

Related U.S. Application Data

(60) Provisional application No. 60/117,326, filed on Jan. 26, 1999.

(51) Int. Cl.⁷ H03K 17/94

(52) U.S. Cl. 341/33; 341/22; 178/18.06

(58) Field of Search 341/33, 22; 178/18.06, 178/18.07; 200/343; 345/168

(56) References Cited

U.S. PATENT DOCUMENTS

4,550,221 A	10/1985	Mabusth	
4,651,133 A	3/1987	Ganesan et al.	
4,879,461 A	11/1989	Philipp	
5,543,591 A	8/1996	Gillespie et al.	
5,572,205 A	11/1996	Caldwell et al.	
5,730,165 A	3/1998	Philipp	
5,841,078 A	11/1998	Miller et al.	
5,861,583 A	1/1999	Schediwy et al.	
5,914,465 A *	6/1999	Allen et al.	341/33

5,973,623 A *	10/1999	Gupta et al.	341/33
6,256,022 B1 *	7/2001	Manaresi et al.	178/18.06
6,288,707 B1 *	9/2001	Philipp	341/22

* cited by examiner

Primary Examiner—Timothy Edwards, Jr.
(74) Attorney, Agent, or Firm—David Kiewit

(57) ABSTRACT

Proximity of a body, which may be a user's finger, to an electrode pair is sensed by a charge transfer capacitive measurement approach. The electrode pair thus acts as a key that can be arrayed with other electrode pairs to form a keypad, keyboard, linear slider control, or liquid level sensor. In one embodiment of the invention each key is associated with an alternating voltage source and a pair of electrodes mounted on or within a solid dielectric substrate or panel so as to be separated from each other by a gap. The voltage source is connected to a driven electrode, a sampling charge detector is connected to a second, receiving, electrode, and the output of the charge detector is, in turn, fed into a signal processor. Disturbances in coupling between the two electrodes are detected through the solid substrate or panel material when a substance or object approaches or contacts the panel. The receiving electrode is a low-impedance node during the sampling phase of the process, which aids in keeping the sensor from being affected by wiring length or by extraneous objects near an output lead..

10 Claims, 7 Drawing Sheets

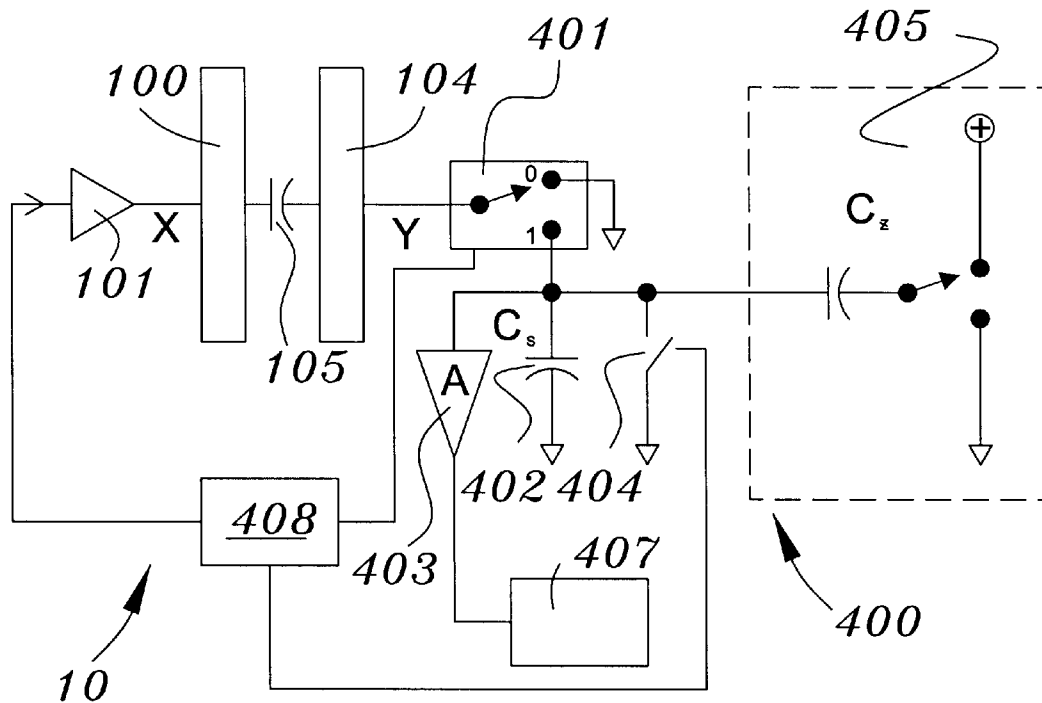


FIG. 1a

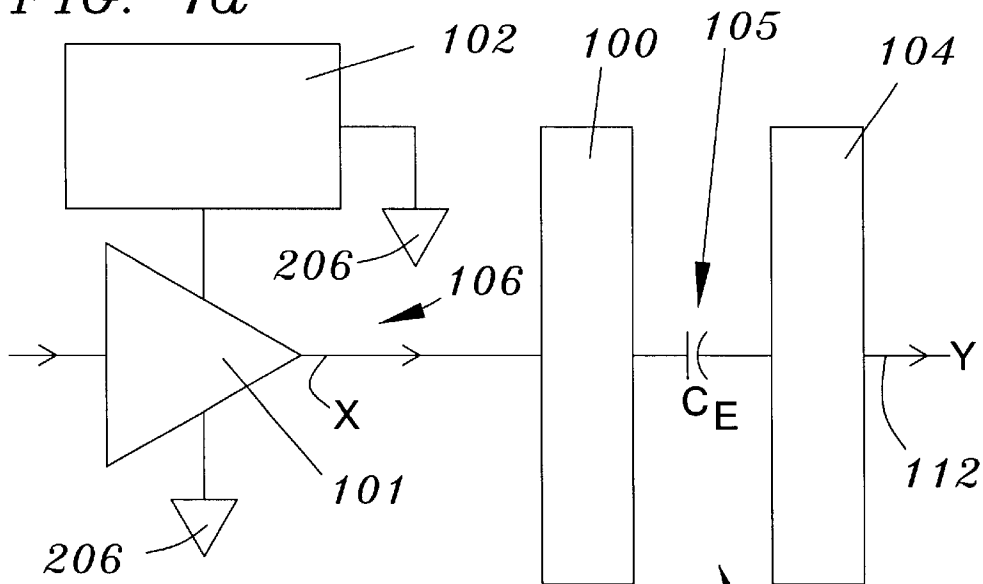


FIG. 1b

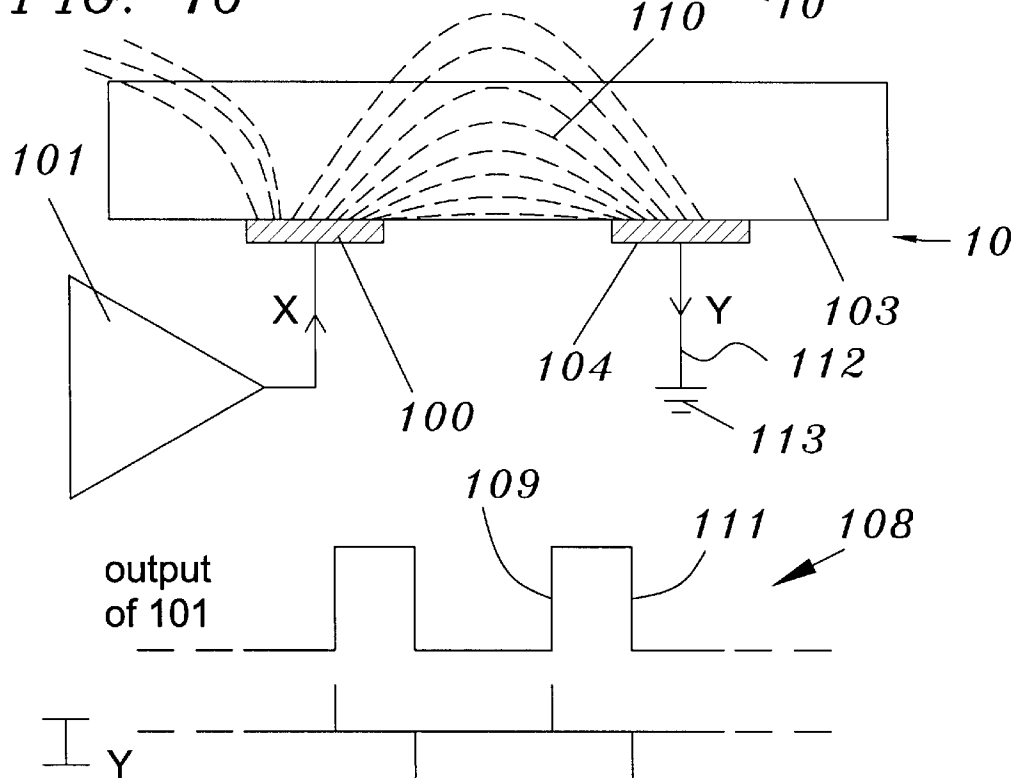


FIG. 1c

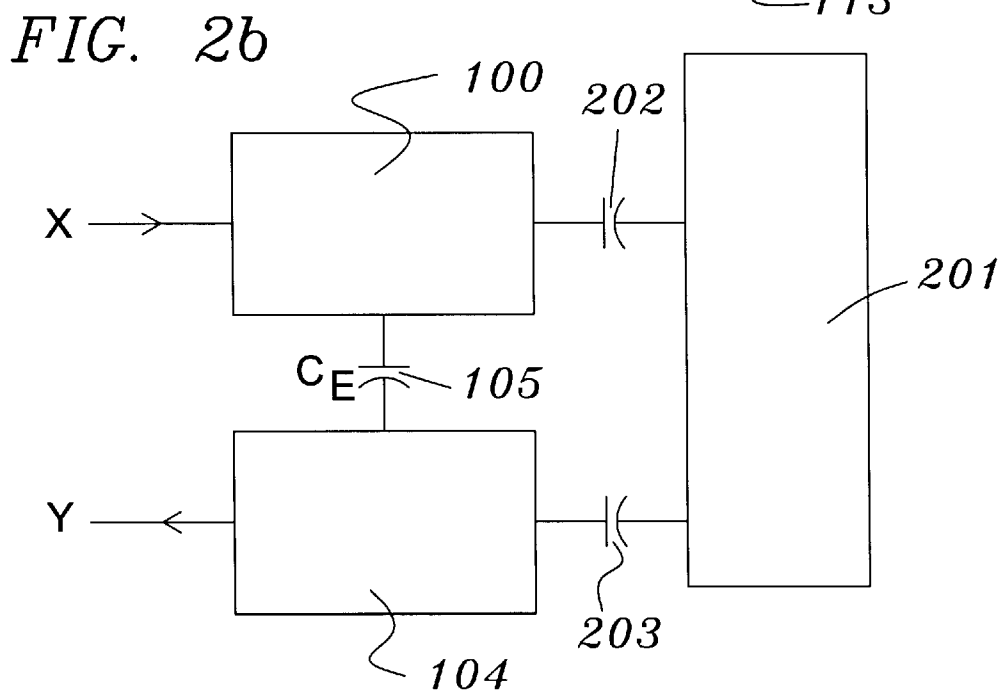
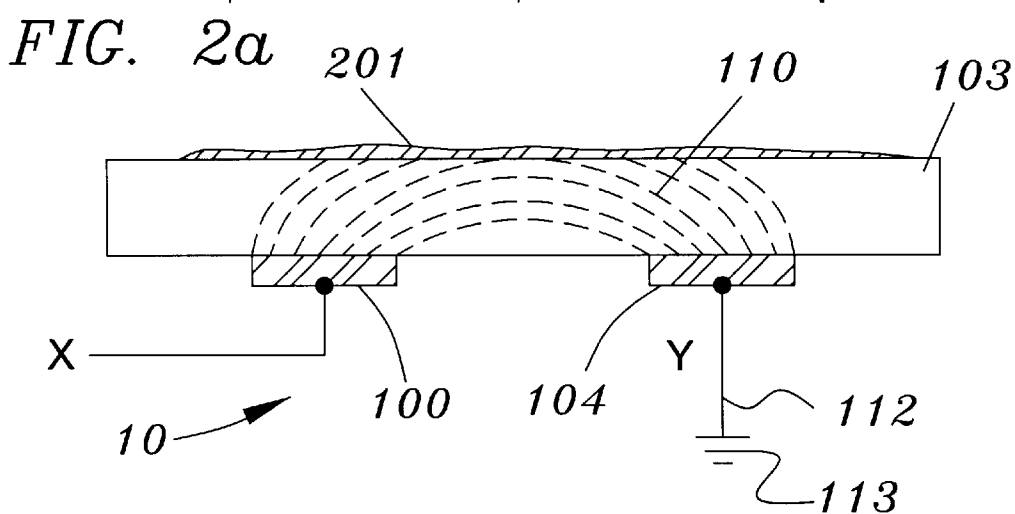
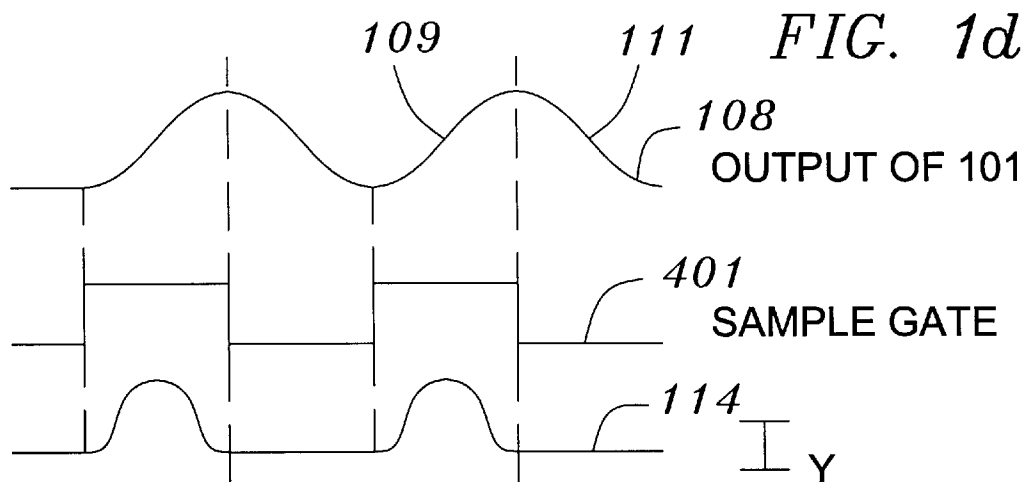


FIG. 3a

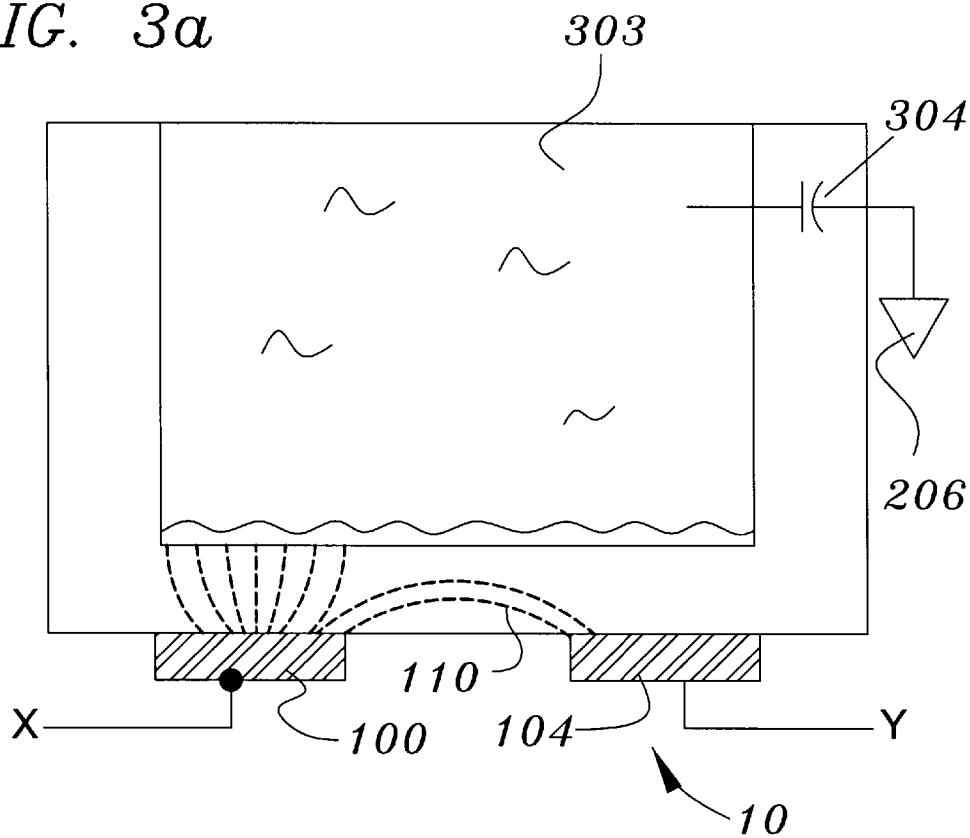
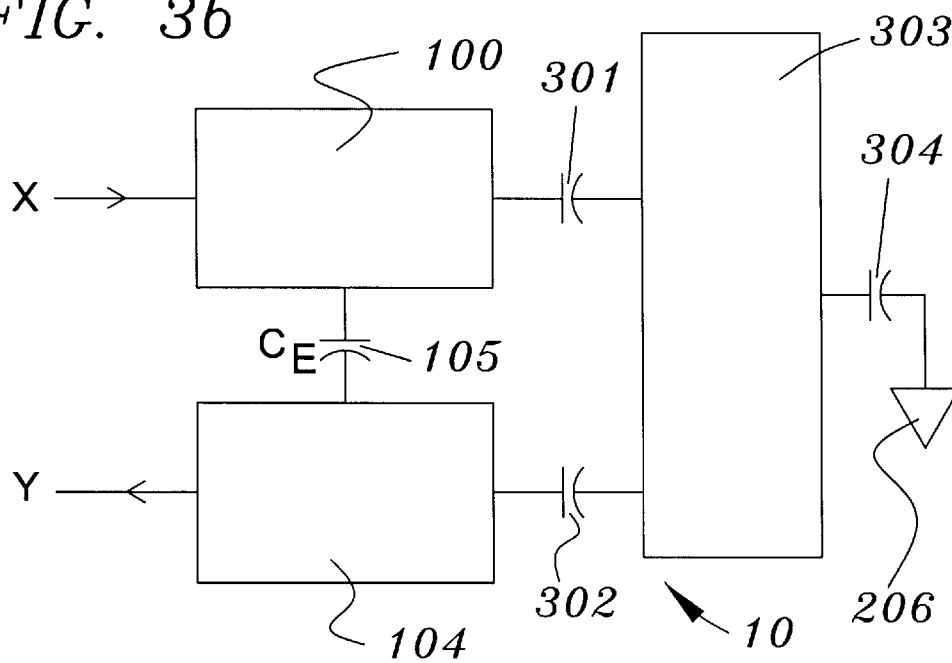
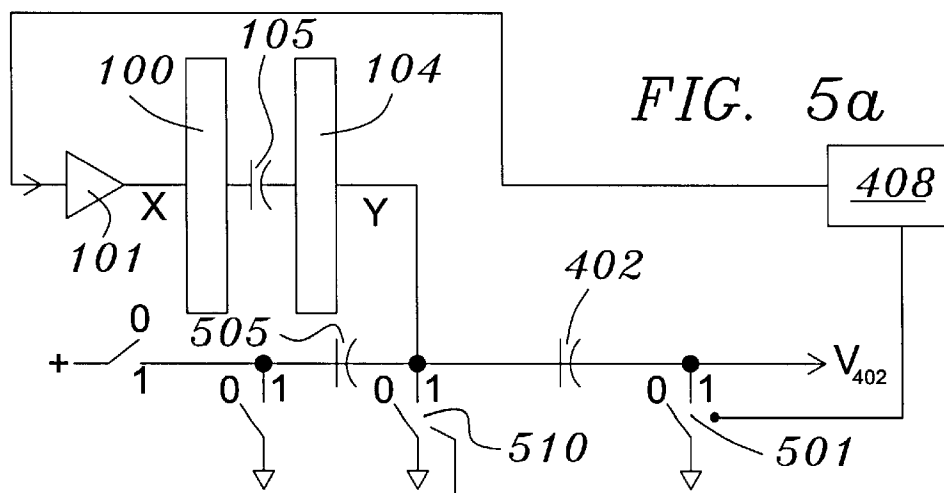
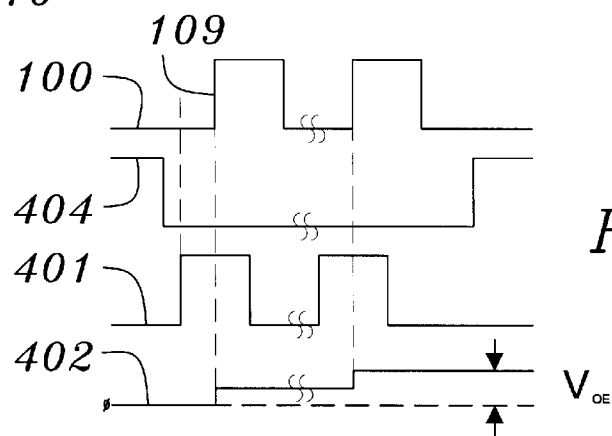
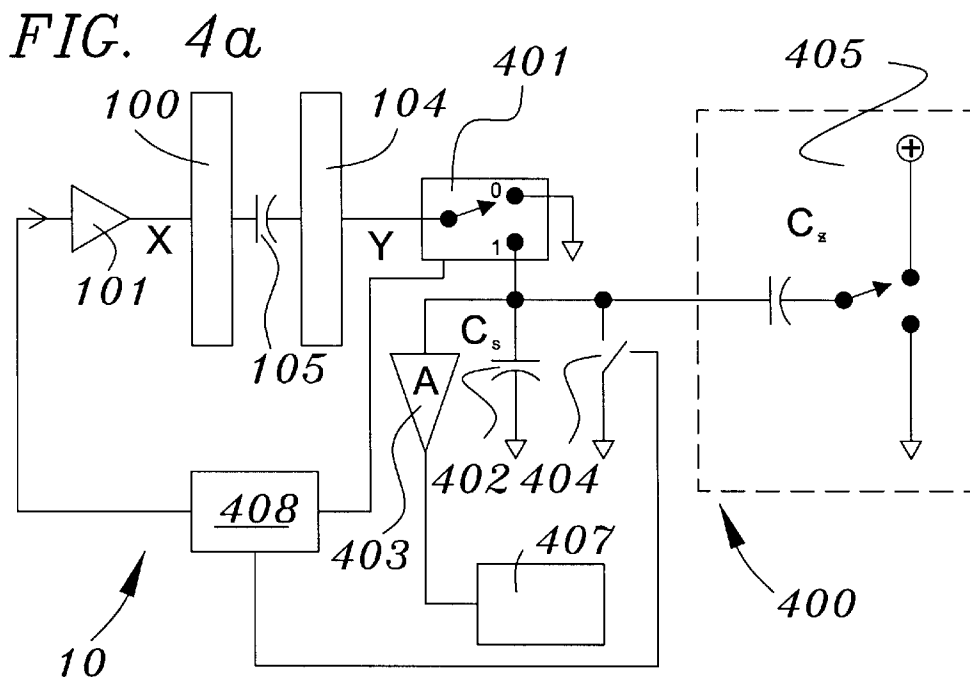


FIG. 3b





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.