

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

(10) **Patent No.:** **US 8,773,146 B1**
(45) **Date of Patent:** **Jul. 8, 2014**

(54) **WATERPROOF SCANNING OF A CAPACITIVE SENSE ARRAY**

(56) **References Cited**

U.S. PATENT DOCUMENTS

(75) Inventors: **Michael Patrick Hills**, Lynnwood, WA (US); **Volodymyr Burkovskyy**, Lviv (UA); **Oleksandr Karpin**, Lviv (UA); **Seok Pyong Park**, Gyeonggi-do (KR); **Patrick Prendergast**, Clinton, WA (US)

(73) Assignee: **Cypress Semiconductor Corporation**, San Jose, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 392 days.

(21) Appl. No.: **13/075,762**

(22) Filed: **Mar. 30, 2011**

6,283,504 B1 *	9/2001	Stanley et al.	280/735
6,504,530 B1	1/2003	Wilson et al.	
8,054,296 B2 *	11/2011	Land et al.	345/173
2005/0001633 A1 *	1/2005	Okushima et al.	324/658
2008/0136792 A1	6/2008	Peng et al.	
2008/0158146 A1	7/2008	Westerman	
2008/0158174 A1	7/2008	Land et al.	
2008/0158182 A1	7/2008	Westerman	
2009/0009485 A1 *	1/2009	Bytheway	345/174
2009/0073140 A1	3/2009	Fujita et al.	
2009/0174676 A1	7/2009	Westerman	
2009/0322351 A1	12/2009	McLeod	
2010/0007631 A1 *	1/2010	Chang	345/174
2010/0060608 A1	3/2010	Yousefpor	
2010/0328262 A1 *	12/2010	Huang et al.	345/174
2012/0050214 A1 *	3/2012	Kremin et al.	345/174

* cited by examiner

Related U.S. Application Data

(60) Provisional application No. 61/325,124, filed on Apr. 16, 2010.

(51) **Int. Cl.**
G01R 27/26 (2006.01)
G06F 3/041 (2006.01)
G06F 3/045 (2006.01)
G01N 27/22 (2006.01)
G06F 3/0488 (2013.01)

(52) **U.S. Cl.**
CPC **G01N 27/22** (2013.01); **G06F 3/0488** (2013.01)
USPC **324/658**; 324/662; 324/663; 345/173; 345/174

(58) **Field of Classification Search**
USPC 324/662, 663, 658; 345/173, 174
See application file for complete search history.

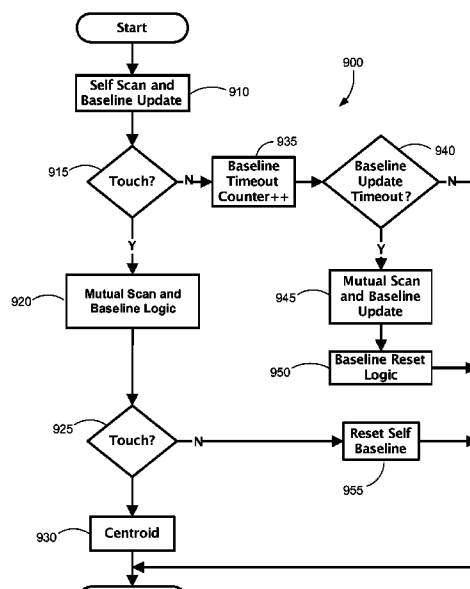
Primary Examiner — Amy He

(57) **ABSTRACT**

A water-resistant capacitance sensing apparatus comprising a plurality of capacitive sense elements and a capacitance sensing circuit configured to measure both the mutual capacitance and self-capacitance on the plurality of capacitive sense elements.

A method for water-resistant capacitance sensing, the method comprising performing a self-capacitance scan and a mutual capacitance scan, and detecting, by a processing device, a presence of an object with the plurality of sense elements. The method further determines whether the detected presence of the object is legitimate.

18 Claims, 9 Drawing Sheets



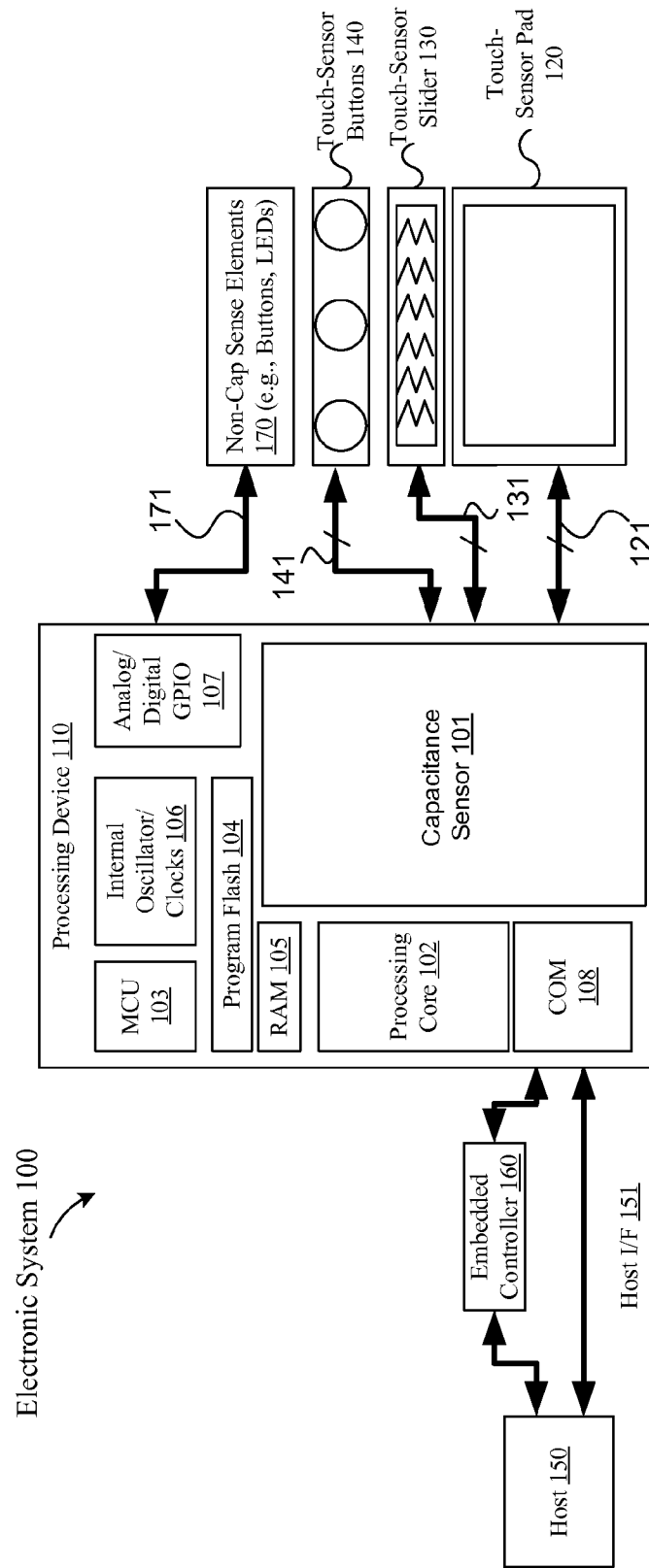
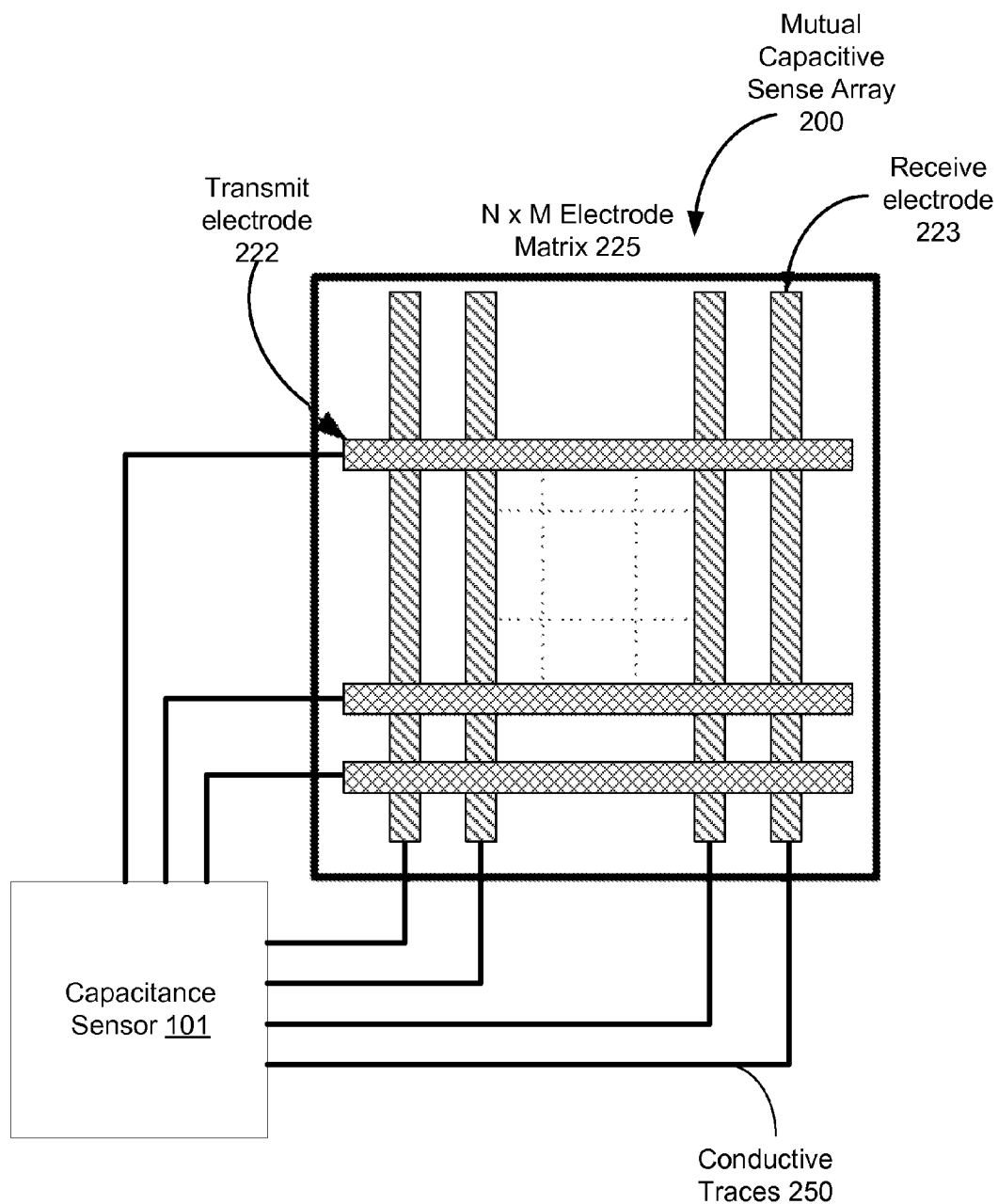


FIG. 1

**FIG. 2**

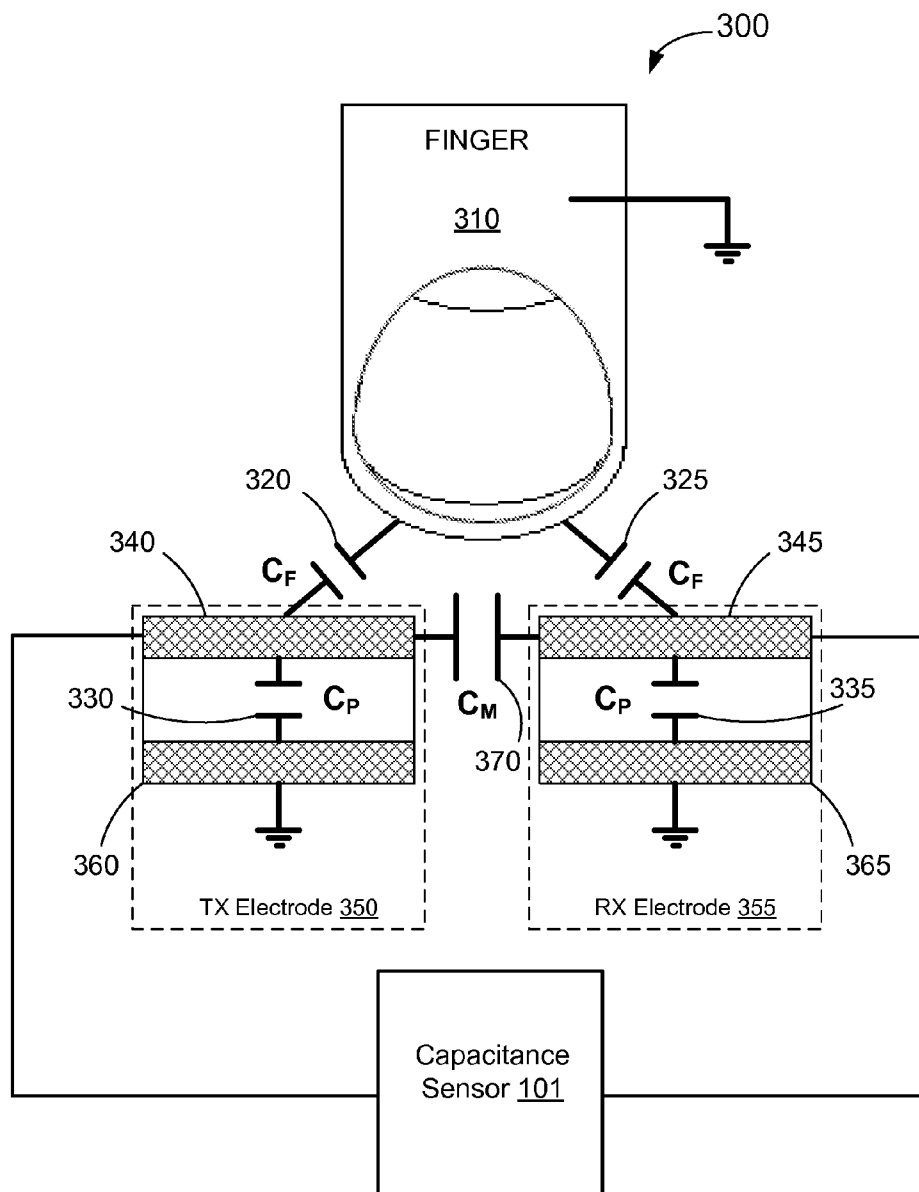
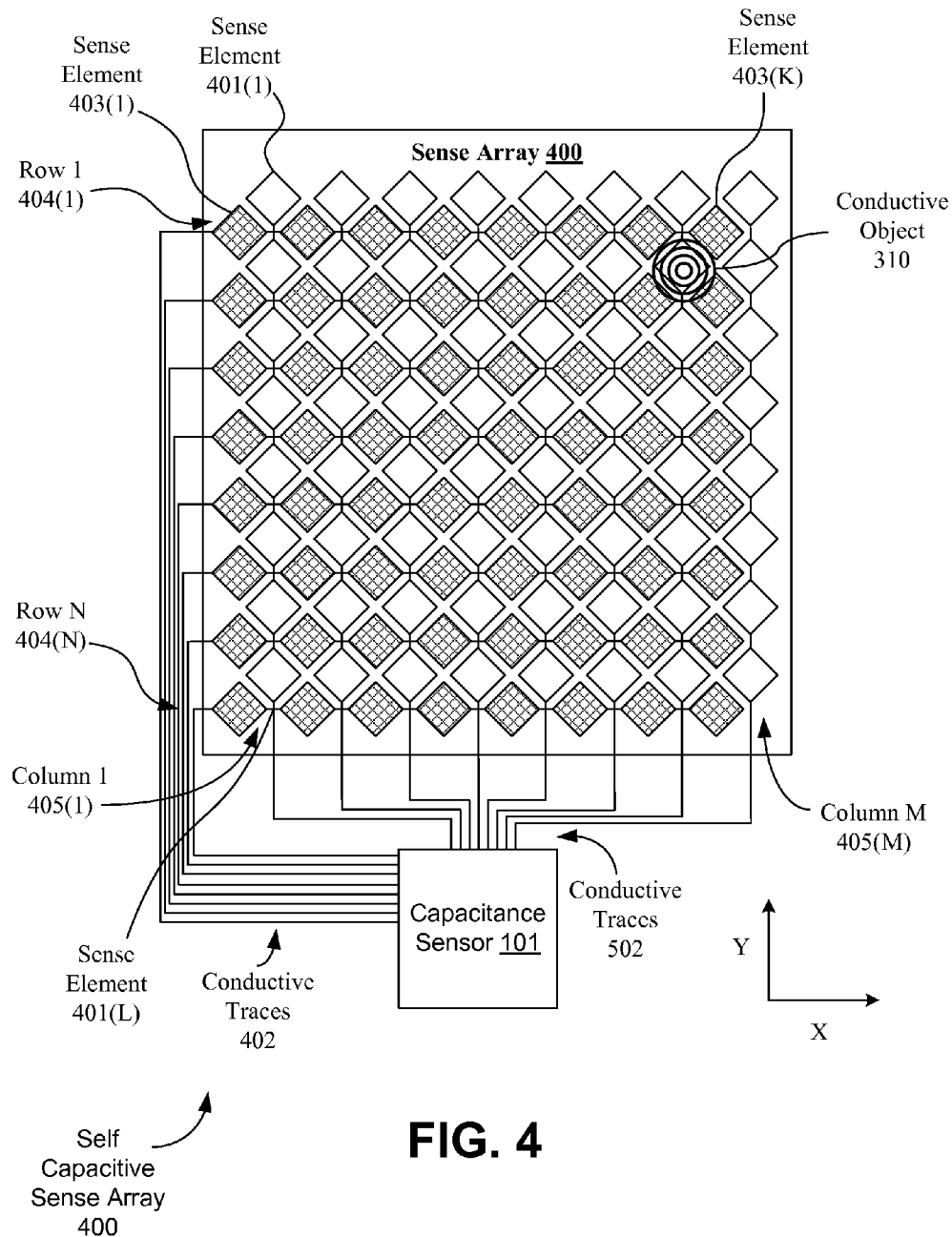


FIG. 3





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.