

EXHIBIT E

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

(10) **Patent No.:** **US 7,080,330 B1**
(45) **Date of Patent:** **Jul. 18, 2006**

(54) **CONCURRENT MEASUREMENT OF
CRITICAL DIMENSION AND OVERLAY IN
SEMICONDUCTOR MANUFACTURING**

(75) Inventors: **Bryan Choo**, Mountain View, CA (US);
Bharath Rangarajan, Santa Clara, CA
(US); **Bhanwar Singh**, Morgan Hill,
CA (US); **Carmen Morales**, San Jose,
CA (US)

(73) Assignee: **Advanced Micro Devices, Inc.**,
Sunnyvale, CA (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 433 days.

(21) Appl. No.: **10/379,738**

(22) Filed: **Mar. 5, 2003**

(51) **Int. Cl.**
G06F 17/50 (2006.01)

(52) **U.S. Cl.** **716/4**; 716/19; 716/21

(58) **Field of Classification Search** 716/4,
716/19, 20, 21
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,042,009 A * 8/1991 Kazerounian et al. . 365/185.18

6,650,424 B1 * 11/2003 Brill et al. 356/601
2002/0018217 A1 * 2/2002 Weber-Grabau et al. 356/601
2002/0158193 A1 * 10/2002 Sezginer et al. 250/237 G

OTHER PUBLICATIONS

Kynett et al., "A in-system reprogrammable 32 Kx8 CMOS
Flash Memory", Oct. 1988, IEEE Jpurnal of Solid-State
Circuits, vol. 23, iss. 5, pp. 1157-1163.*

* cited by examiner

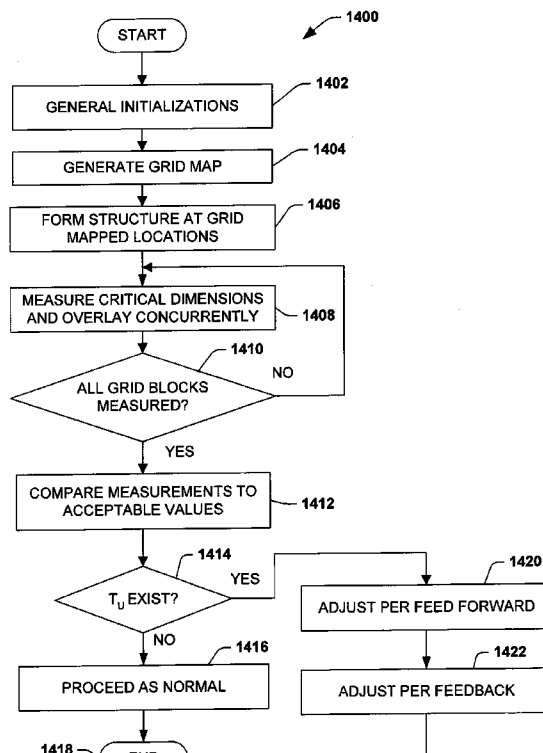
Primary Examiner—Sun James Lin

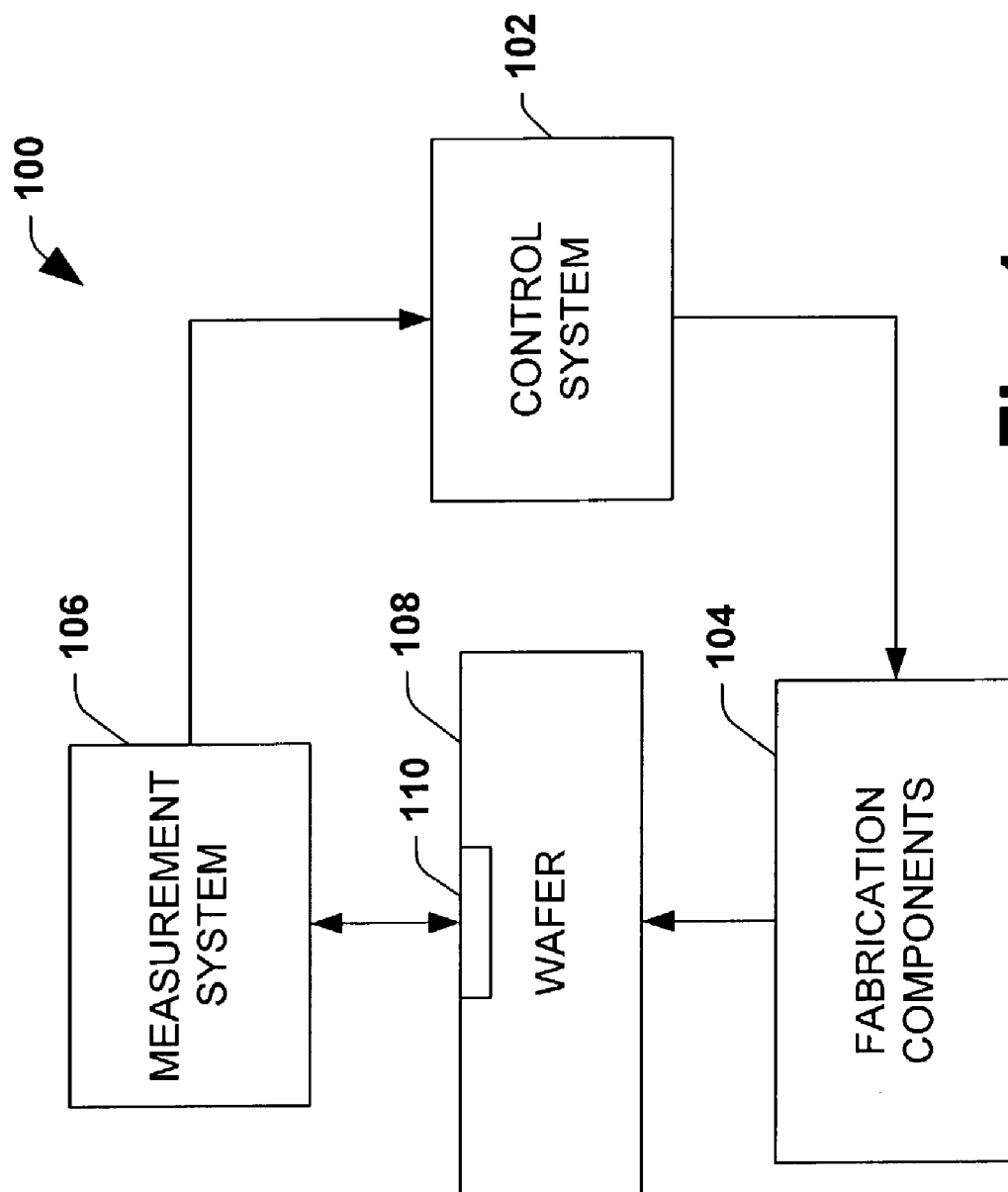
(74) *Attorney, Agent, or Firm*—Amin & Turocy, LLP

(57) **ABSTRACT**

A system and methodology are disclosed for monitoring and
controlling a semiconductor fabrication process. One or
more structures formed on a wafer matriculating through the
process facilitate concurrent measurement of critical dimen-
sions and overlay via scatterometry or a scanning electron
microscope (SEM). The concurrent measurements mitigate
fabrication inefficiencies, thereby reducing time and real
estate required for the fabrication process. The measure-
ments can be utilized to generate feedback and/or feed-
forward data to selectively control one or more fabrication
components and/or operating parameters associated there-
with to achieve desired critical dimensions and to mitigate
overlay error.

25 Claims, 18 Drawing Sheets



**Fig. 1**

U.S. Patent

Jul. 18, 2006

Sheet 2 of 18

US 7,080,330 B1

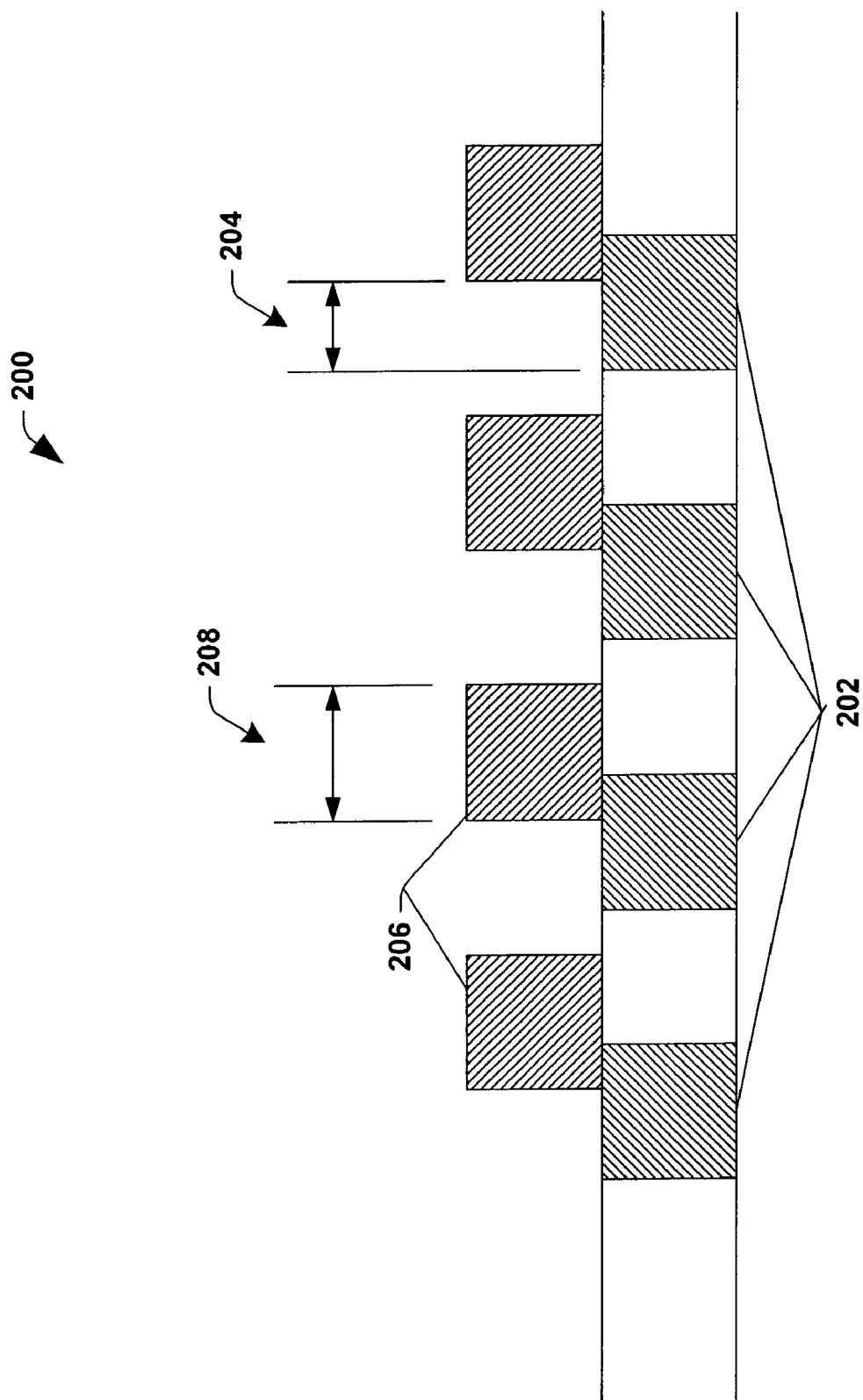
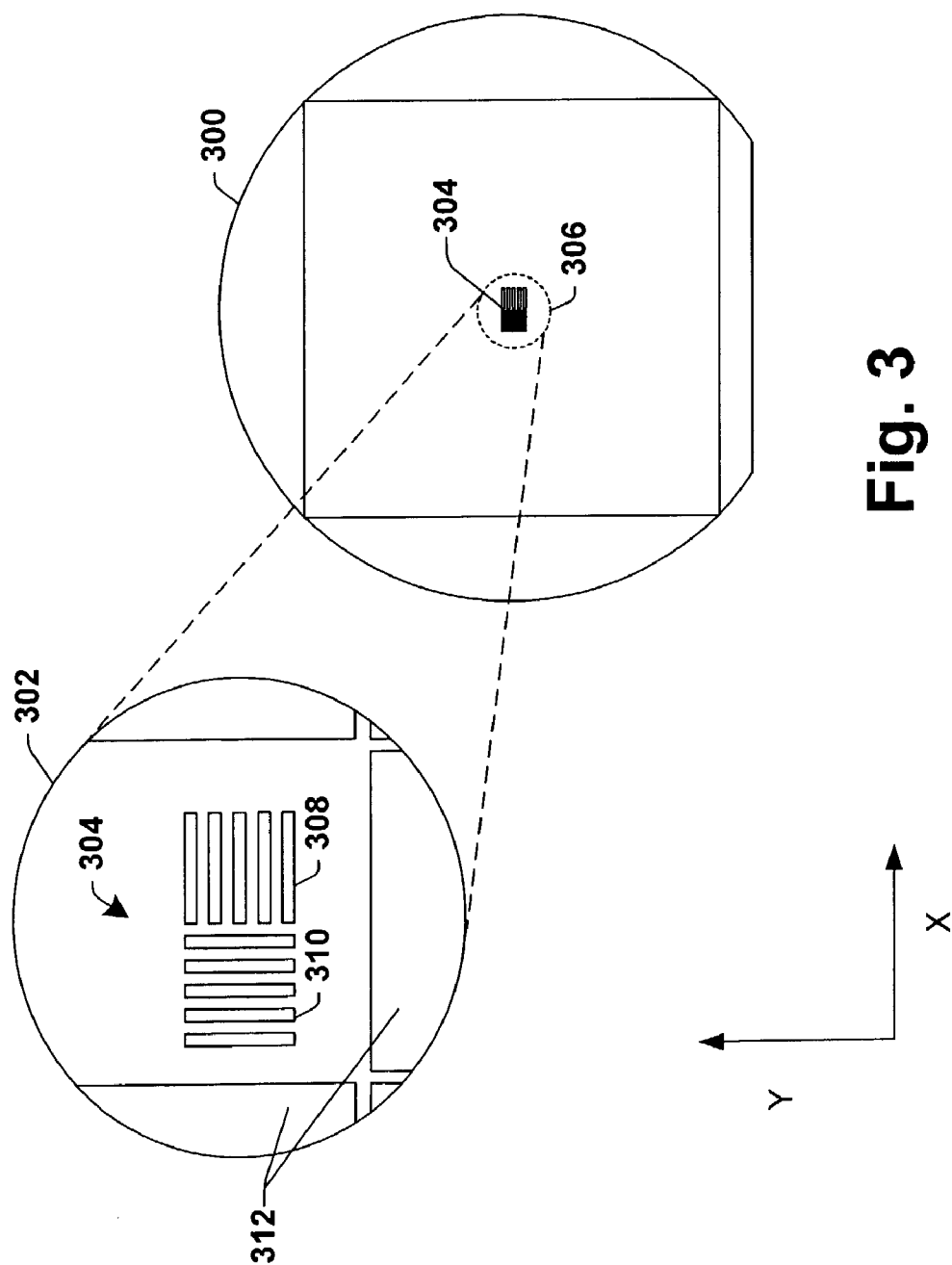


Fig. 2



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.