



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

(10) **Patent No.:** **US 6,806,584 B2**
(45) **Date of Patent:** **Oct. 19, 2004**

(54) **SEMICONDUCTOR DEVICE STRUCTURE INCLUDING MULTIPLE FETS HAVING DIFFERENT SPACER WIDTHS**

(75) Inventors: **Ka Hing Fung**, Fishkill, NY (US);
Percy V. Gilbert, Poughquag, NY (US)

(73) Assignee: **International Business Machines Corporation**, Armonk, NY (US)

(*) 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.: **10/277,907**

(22) Filed: **Oct. 21, 2002**

(65) **Prior Publication Data**

US 2004/0075151 A1 Apr. 22, 2004

(51) **Int. Cl.**⁷ **H01L 27/088**

(52) **U.S. Cl.** **257/900; 257/368; 257/369**

(58) **Field of Search** **257/900, 368, 257/369**

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,577,391 A	*	3/1986	Hsia et al.	29/571
4,648,937 A		3/1987	Ogura et al.	
4,729,006 A		3/1988	Dally et al.	
5,254,866 A	*	10/1993	Ogoh	257/369
5,291,052 A	*	3/1994	Kim et al.	257/369

5,296,401 A	*	3/1994	Mitsui et al.	437/57
5,547,894 A		8/1996	Mandelman et al.	
5,763,312 A		6/1998	Jeng et al.	438/303
5,828,103 A		10/1998	Hsu	257/344
5,899,722 A		5/1999	Huang	438/305
5,905,293 A		5/1999	Jeng et al.	257/408
5,994,743 A	*	11/1999	Masuoka	257/369
6,028,339 A	*	2/2000	Frenette et al.	257/364
6,064,096 A	*	5/2000	Son	257/368
6,222,238 B1	*	4/2001	Chang et al.	257/369
6,239,467 B1	*	5/2001	Gardner et al.	257/900
6,245,621 B1		6/2001	Hirohama	438/303
6,248,623 B1		6/2001	Chien et al.	438/241
6,448,618 B1	*	9/2002	Inaba et al.	257/900
6,512,273 B1	*	1/2003	Krivokapic et al.	257/369
6,548,877 B2	*	4/2003	Yang et al.	257/382

FOREIGN PATENT DOCUMENTS

JP 3-180058 * 8/1991 257/900

* cited by examiner

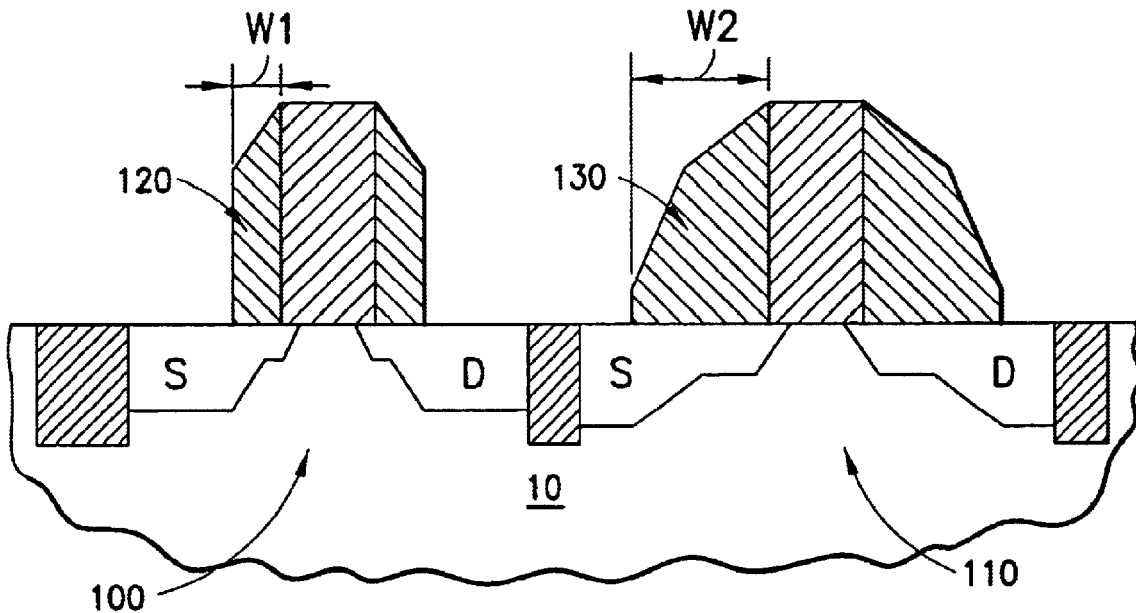
Primary Examiner—Mark V. Prenty

(74) *Attorney, Agent, or Firm*—Joseph P. Abate

(57) **ABSTRACT**

A semiconductor device structure includes at least two field effect transistors formed on same substrate, the first field effect transistor includes a spacer having a first width, the second field effect transistor includes a spacer having a second width, the first width being different than said second width. Preferably, the first width is narrower than the second width.

8 Claims, 8 Drawing Sheets



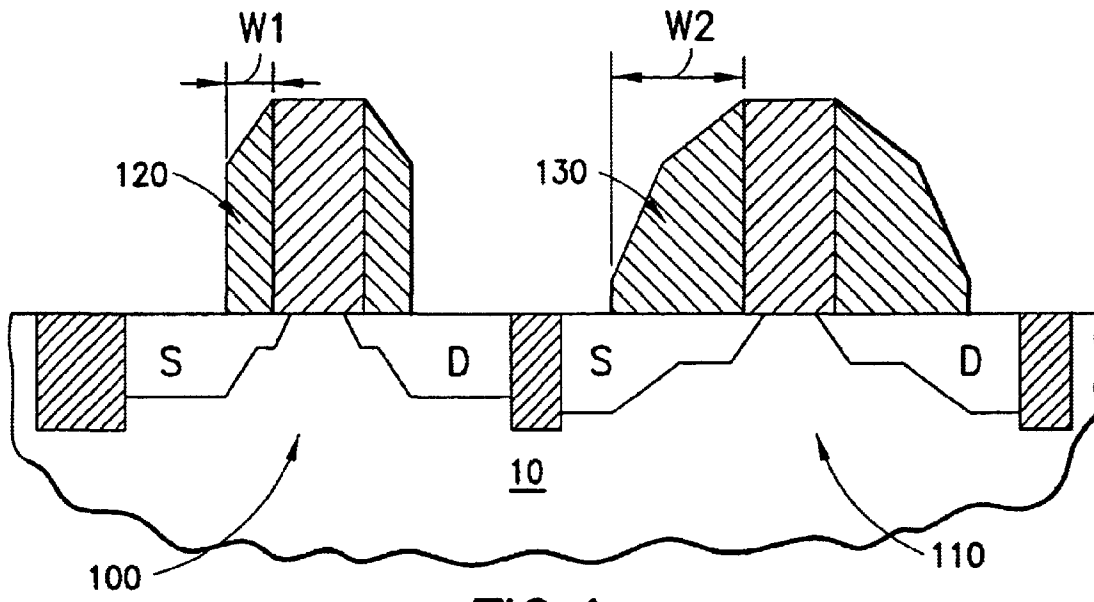


FIG. 1

INCREASE DRIVE
CURRENT

DECREASE SHORT
CHANNEL EFFECT

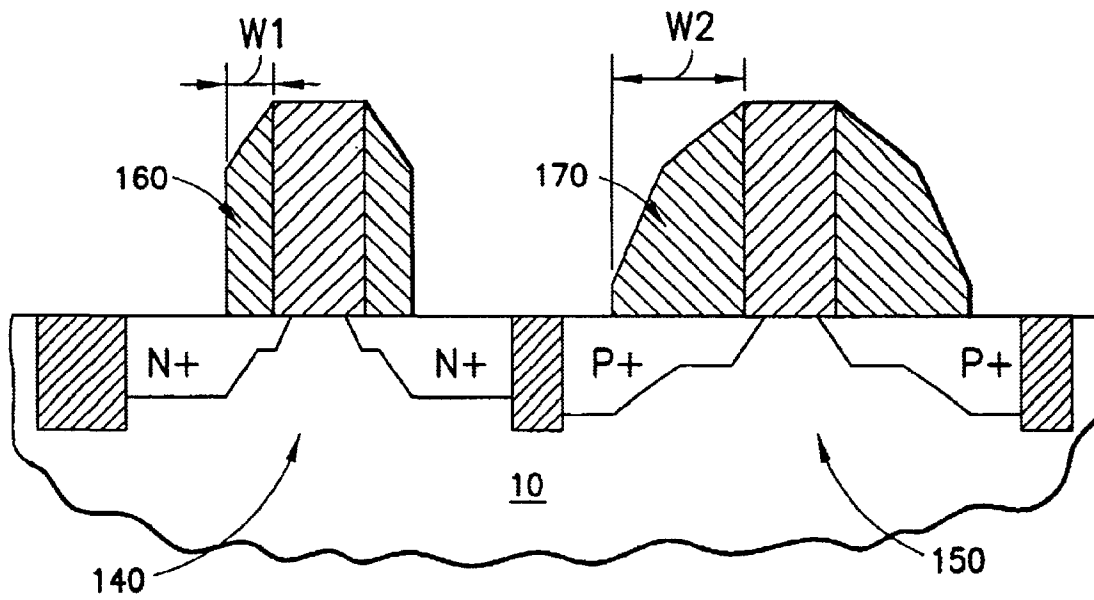


FIG. 2

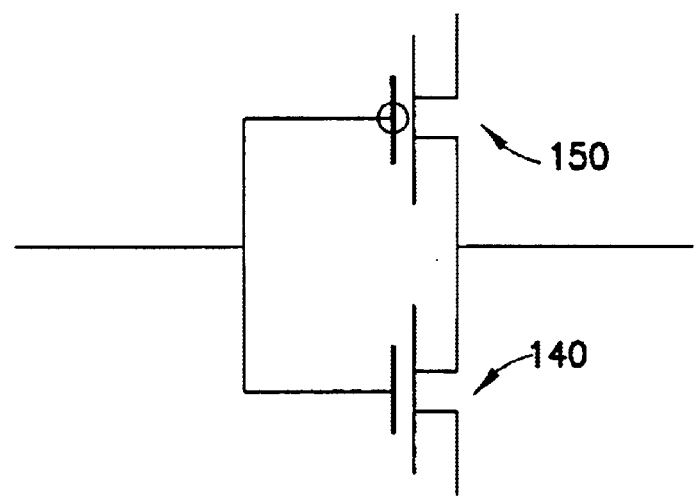


FIG. 3a

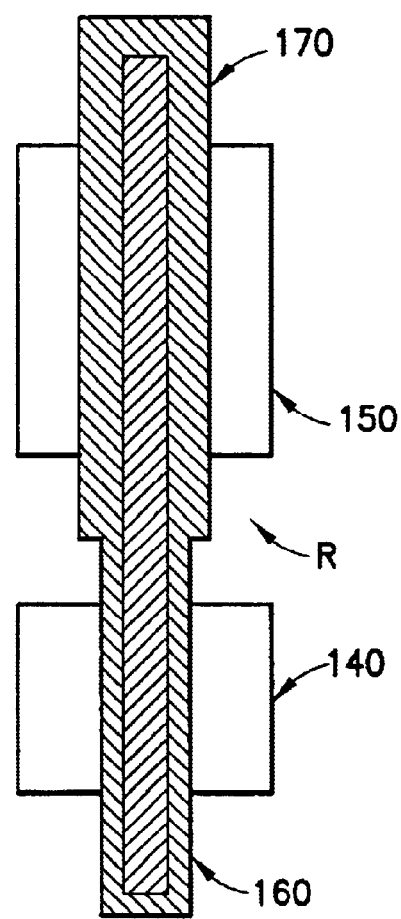


FIG. 3b

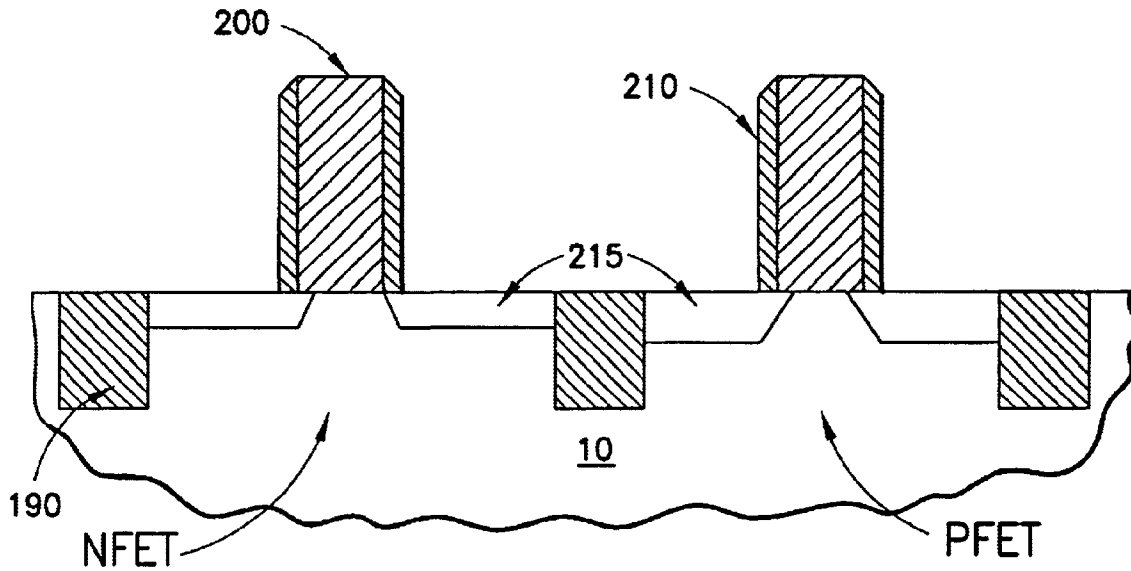


FIG. 4

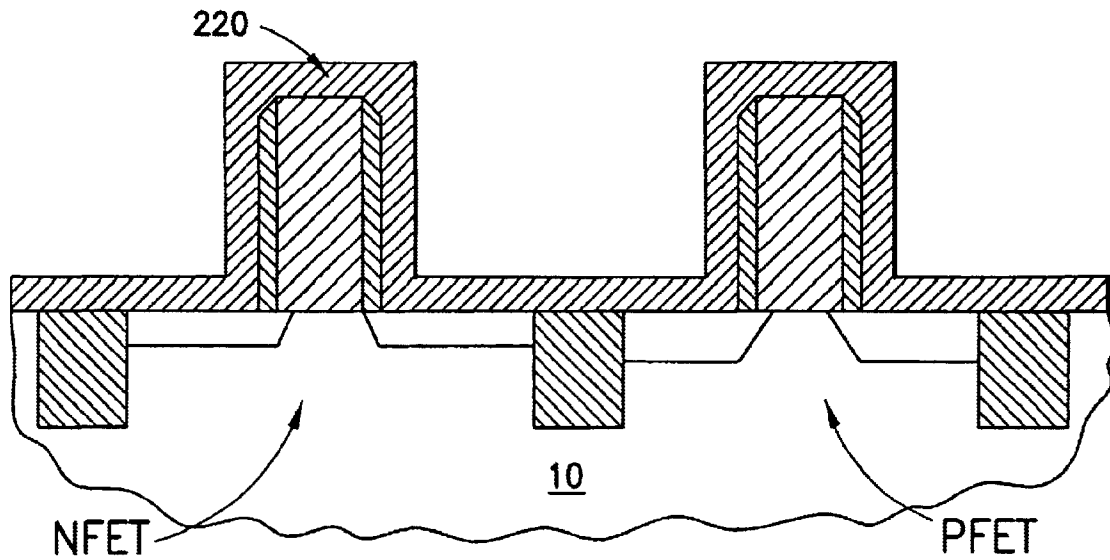


FIG. 5

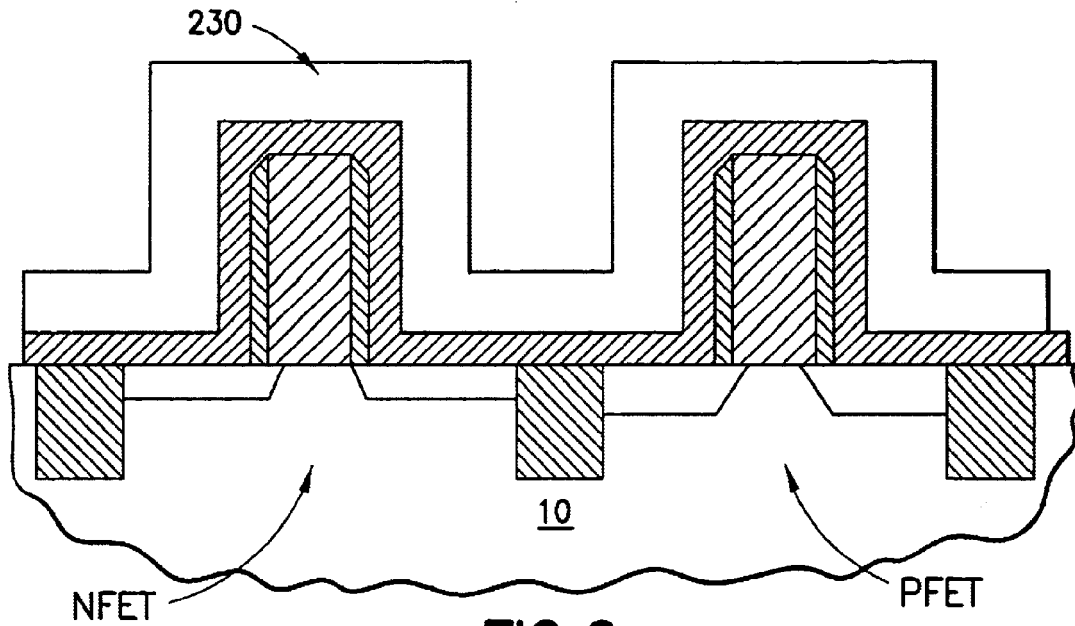


FIG. 6

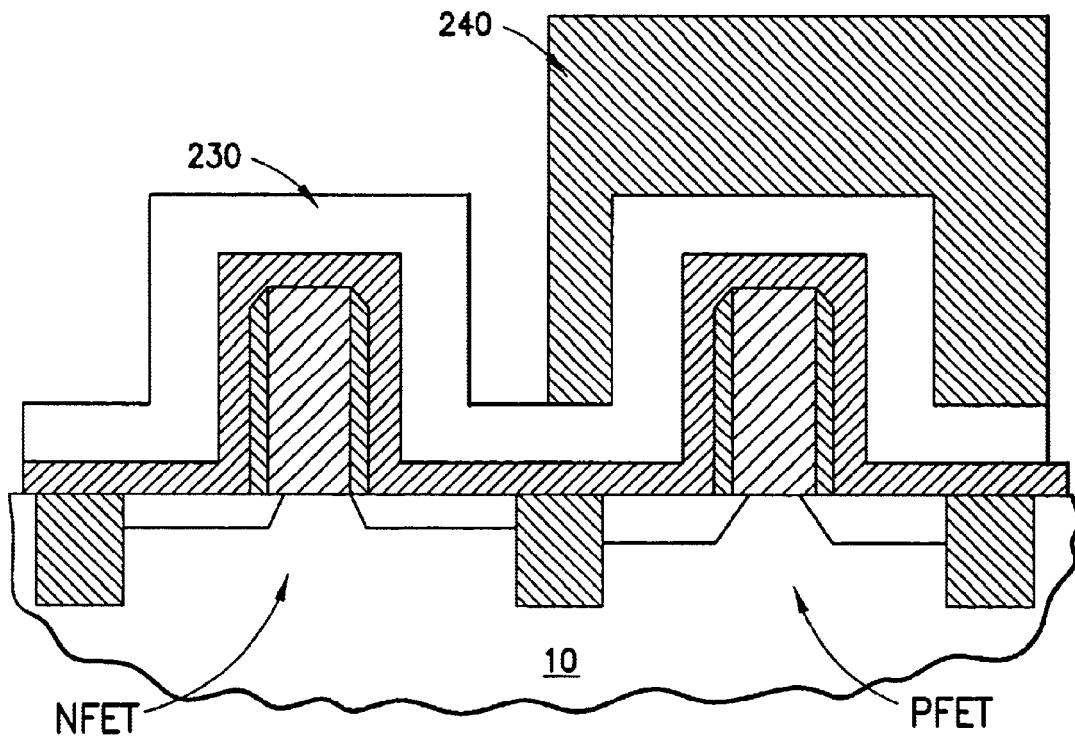


FIG. 7

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.