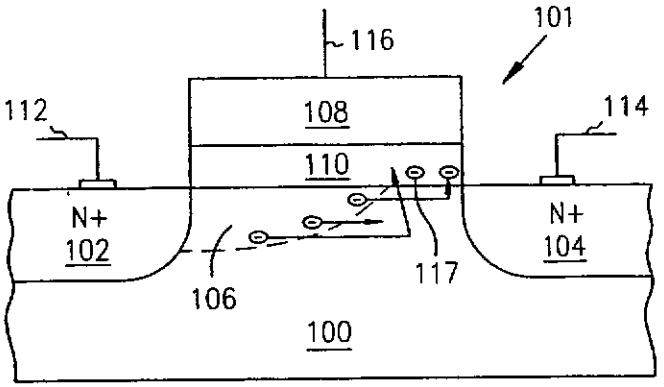


FIG. 1A

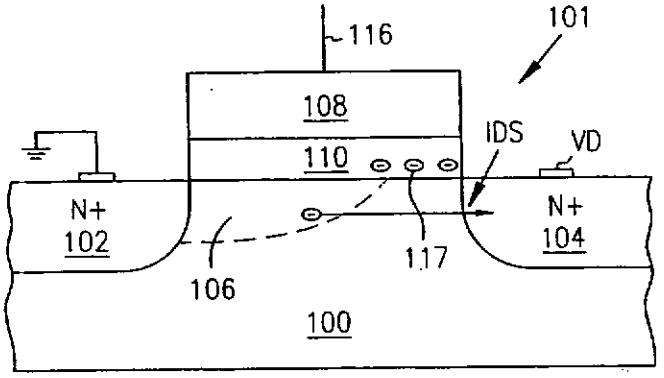


FIG. 1B

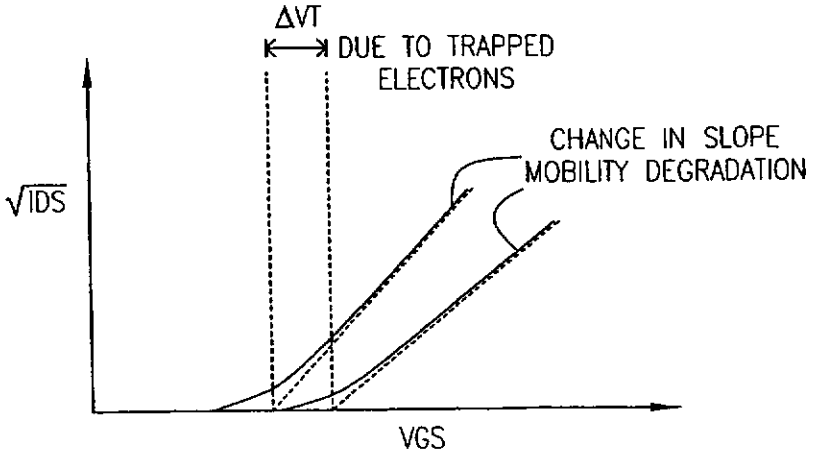


FIG. 1C

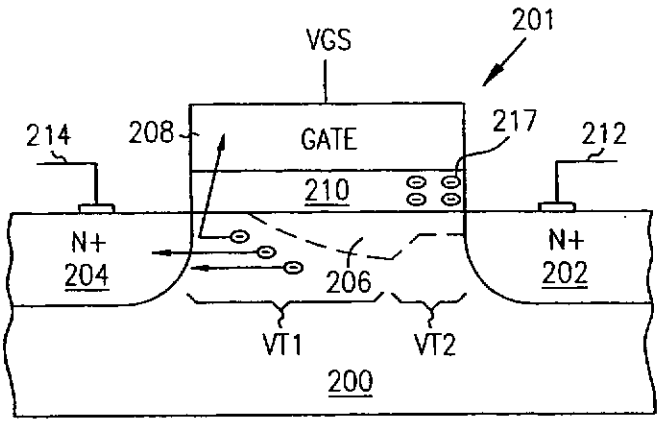


FIG. 2A

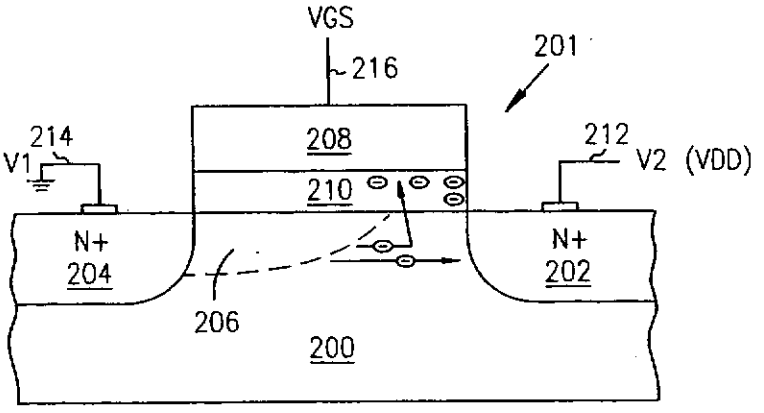


FIG. 2B

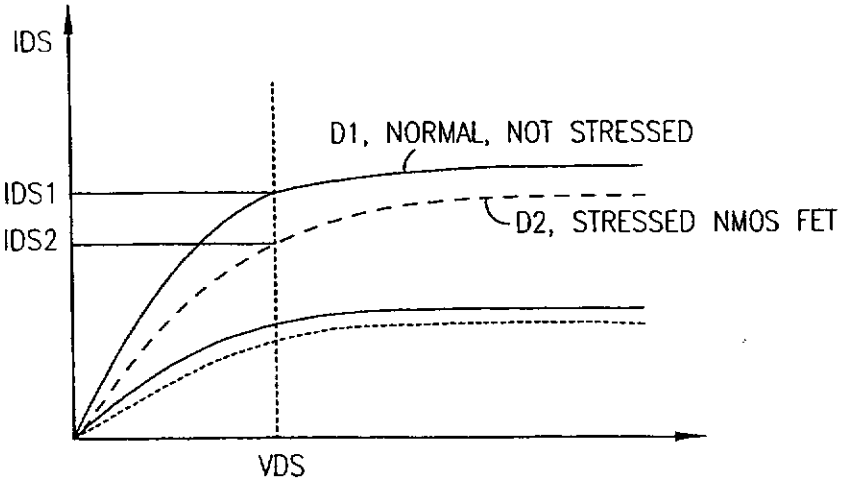


FIG. 2C

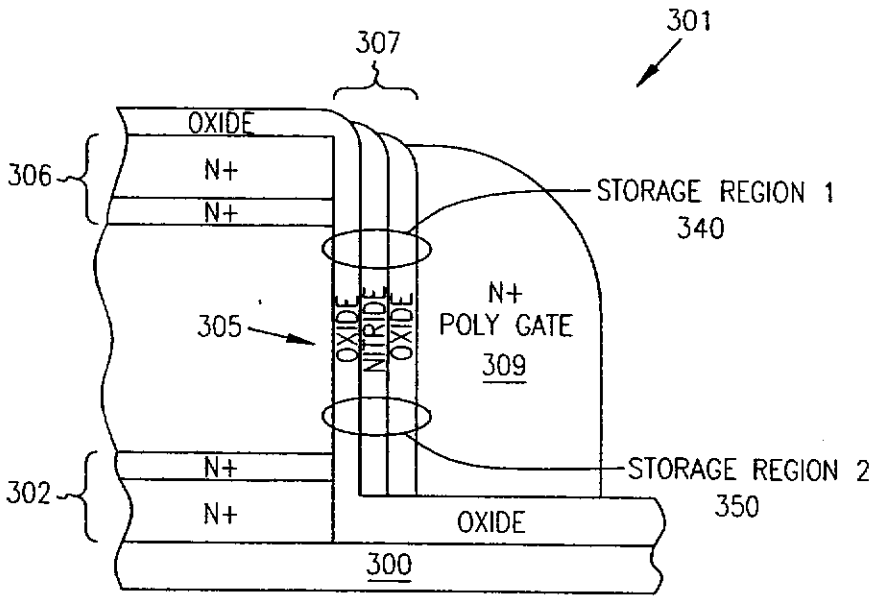

301
307
OXIDE
306
N+
N+
STORAGE REGION 1
340
305
OXIDE
NITRIDE
OXIDE
N+
POLY GATE
309
N+
302
N+
STORAGE REGION 2
350
OXIDE
300

FIG. 3A

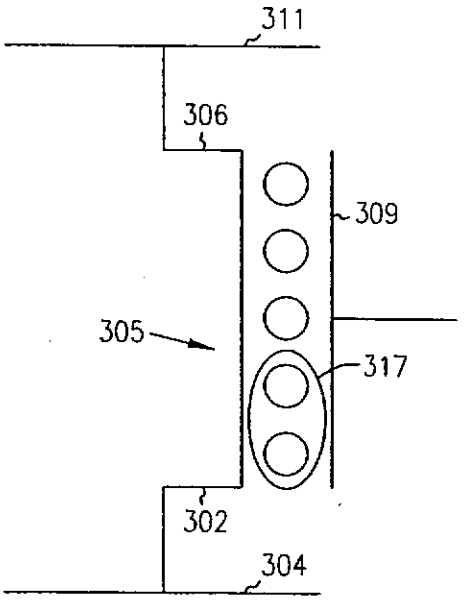

311
306
309
305
317
302
304

FIG. 3B

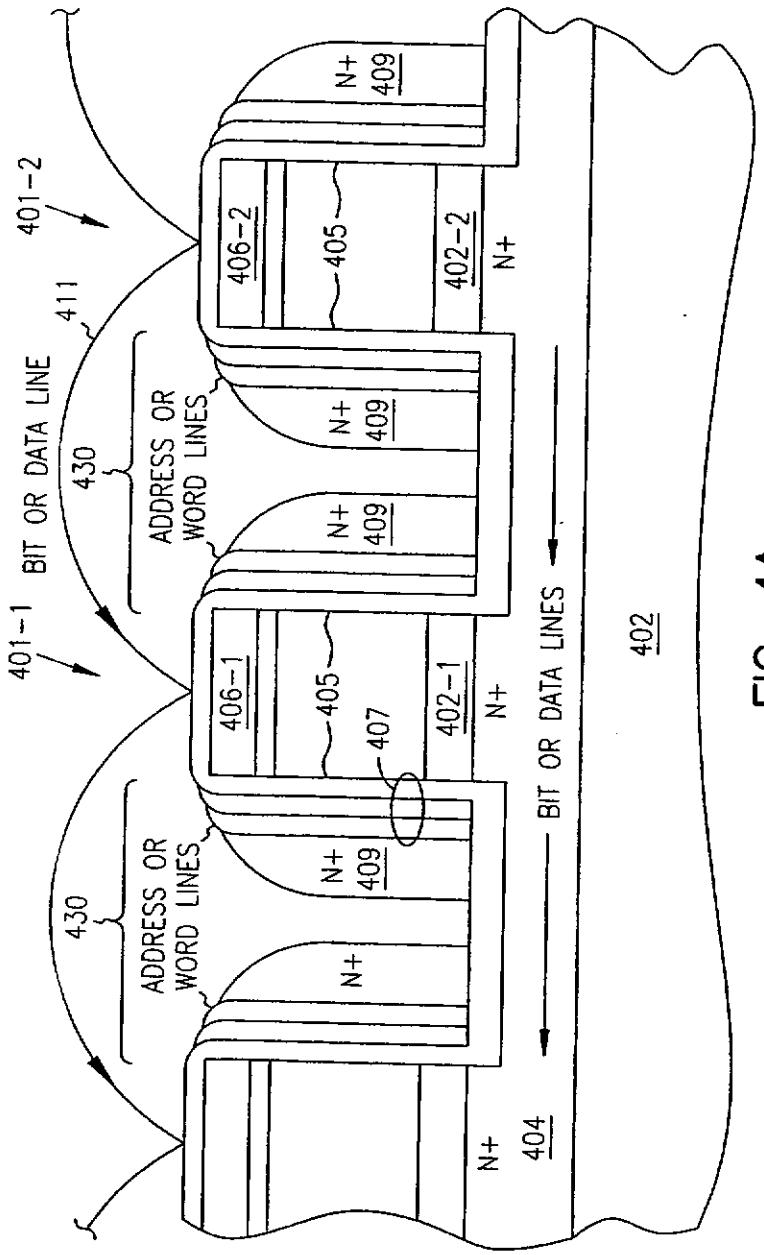

401-2
411
BIT OR DATA LINE
401-1
430
ADDRESS OR WORD LINES
430
ADDRESS OR WORD LINES
N+ 409
406-2
405
402-2
N+
N+ 409
N+ 409
406-1
405
407
402-1
N+
N+ 409
N+
BIT OR DATA LINES
402
N+
404

FIG. 4A

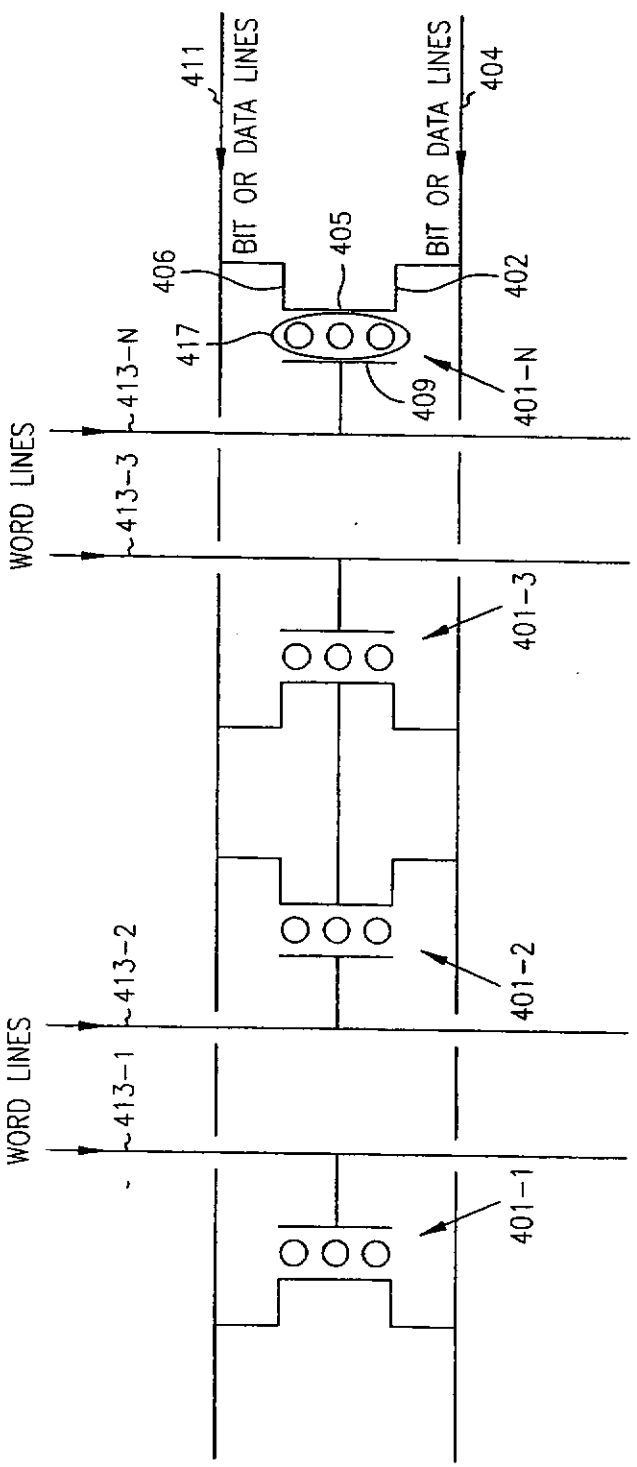
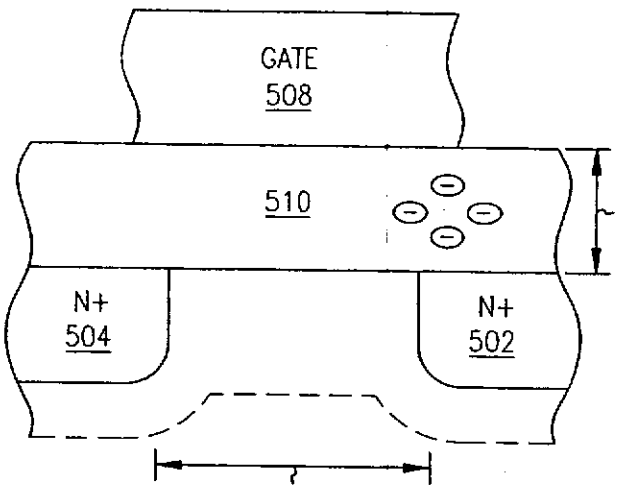

411
BIT OR DATA LINES
404
BIT OR DATA LINES
406
405
402
417
413-N
409
401-N
WORD LINES
413-3
401-3
413-2
401-2
WORD LINES
413-1
401-1

FIG. 4B

WO 2004/001856 PCT/US2003/014497



$\sim 10^{6}$cm=100Å =10nm

$\epsilon i = 0.3X10^{-12}$F/cm

$Ci = \frac{3X10^{-13}}{10^{-6}} = 3X10^{-7}$F/cm^2

$\Delta Q = 10^{12}/cm^2 X 1.6X10^{-19}$

$\Delta V_T = \Delta Q/Ci$

$= \frac{1.6X10^{-7}}{3X10^{-7}} = 1/2$ VOLT

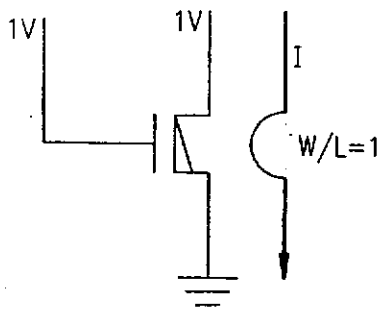
V_T(ORIGINAL)=1/2 VOLT

V_T(WITH CHARGE TRAPPING)=1 VOLT

$Q \Rightarrow 10^{12}/cm^3$ AREA=10^{-10} cm^2

$Q \Rightarrow 100$ ELECTRONS

FIG. 5A



$\mu Cox = \mu Ci = 100\ \mu A/V^2$

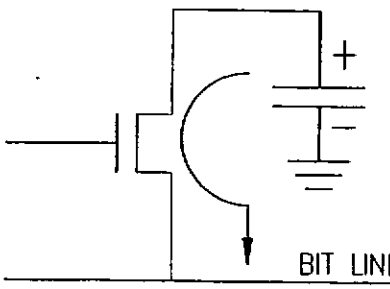
IF V_T=1/2 VOLT

$I = \frac{100\mu A}{V^2}\left(\frac{W}{L}\right)\frac{(V_{GS}-V_T)^2}{2}$

$I = 100\ \frac{1}{2}\ \frac{1}{4} = 12.5\mu A$

IF V_T=1V I=0

FIG. 5B



30fF 1.5V Q=50fC

READ OVER 5ns

I~50fC/5ns=10μA

$Q = \frac{50fC}{1.6X10^{-19}} = 30X10^{4} = 300{,}000$ ELECTRONS

CONVENTIONAL DRAM

FIG. 6

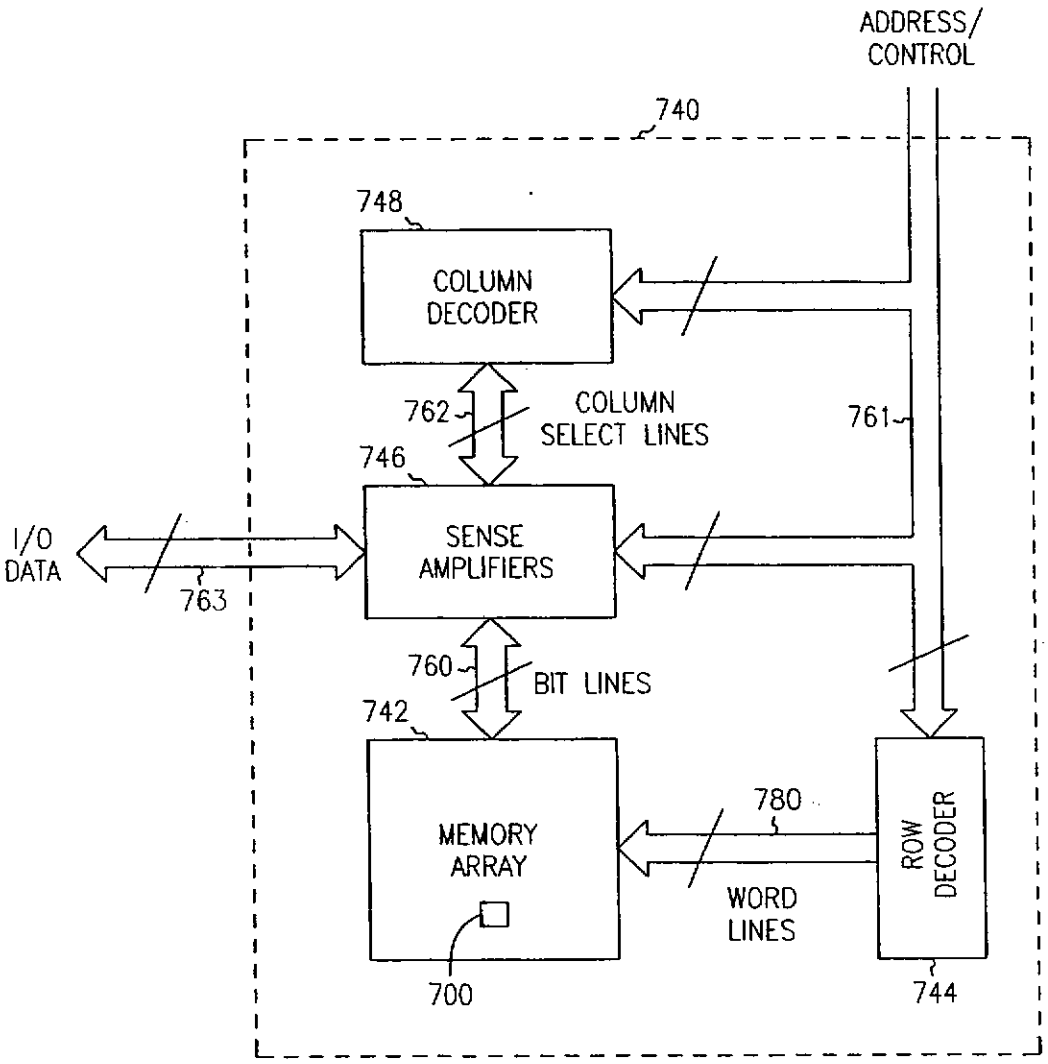

ADDRESS/
CONTROL
740
748
COLUMN
DECODER
762
COLUMN
SELECT LINES
761
746
I/O
DATA
SENSE
AMPLIFIERS
763
760
BIT LINES
742
MEMORY
ARRAY
780
WORD
LINES
ROW
DECODER
700
744

FIG. 7

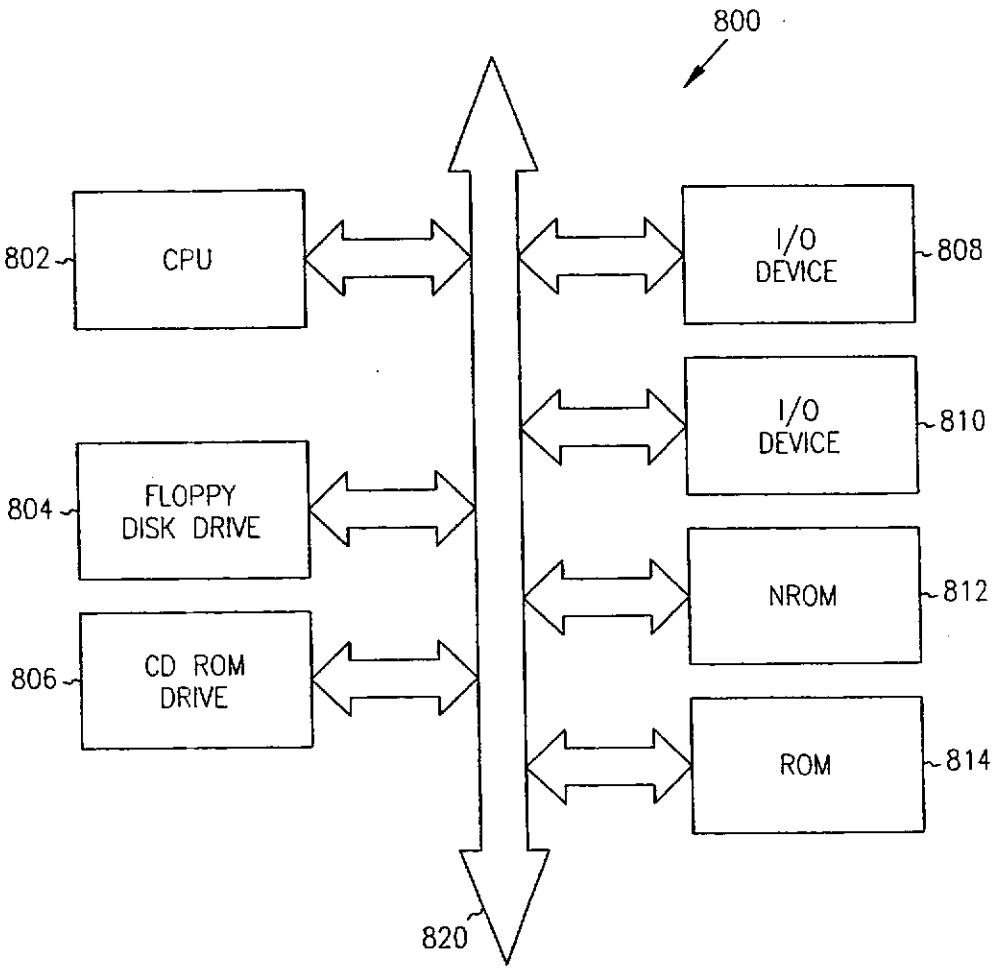

800
802
CPU
804
FLOPPY DISK DRIVE
806
CD ROM DRIVE
I/O DEVICE
808
I/O DEVICE
810
NROM
812
ROM
814
820

FIG. 8