MISSING UPON PUBLICATION

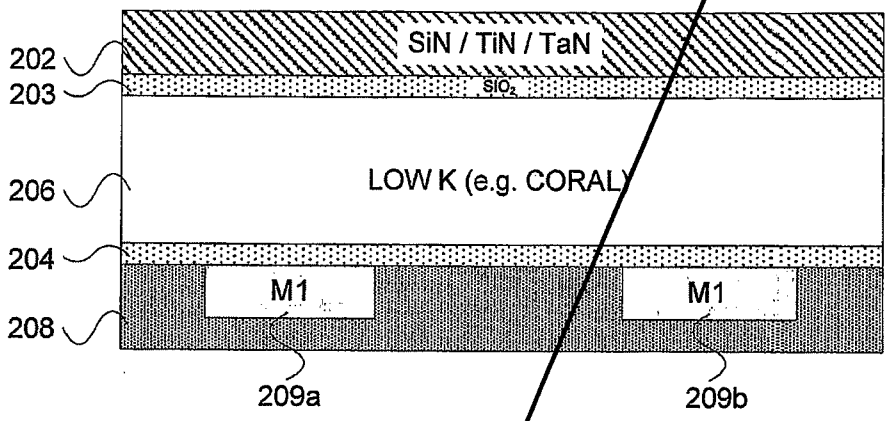

202
203
206
204
208
SiN / TiN / TaN
SiO2
LOW K (e.g. CORAL)
M1
M1
209a
209b

FIG. 2A

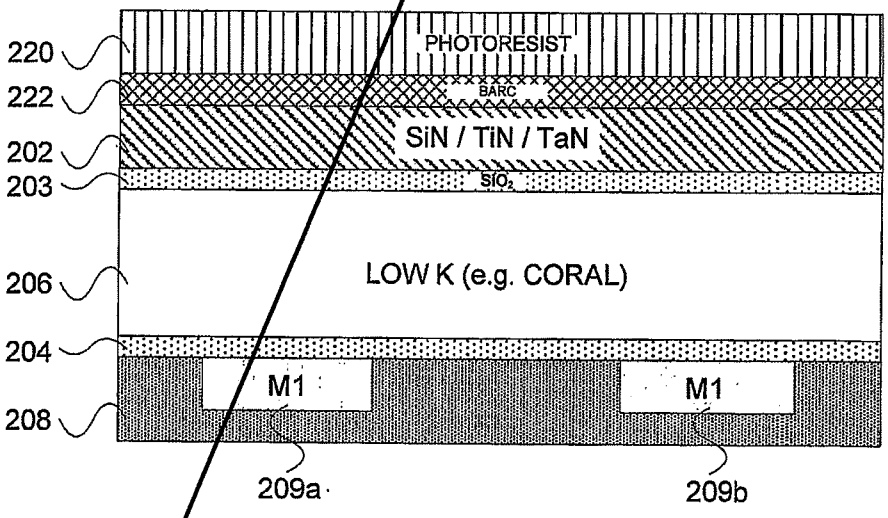

220
222
202
203
206
204
208
PHOTORESIST
BARC
SiN / TiN / TaN
SiO2
LOW K (e.g. CORAL)
M1
M1
209a
209b

FIG. 2B

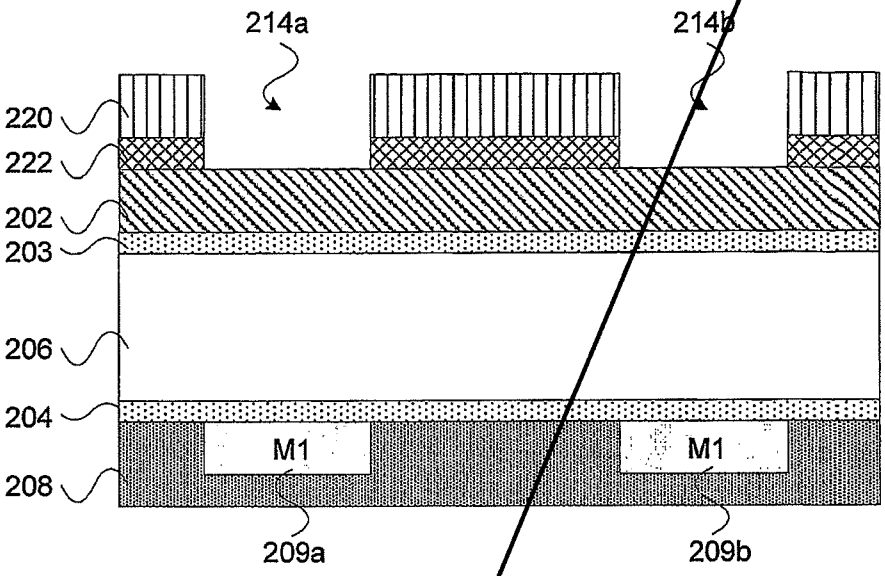

214a
214b
220
222
202
203
206
204
208
M1
M1
209a
209b

FIG. 2C

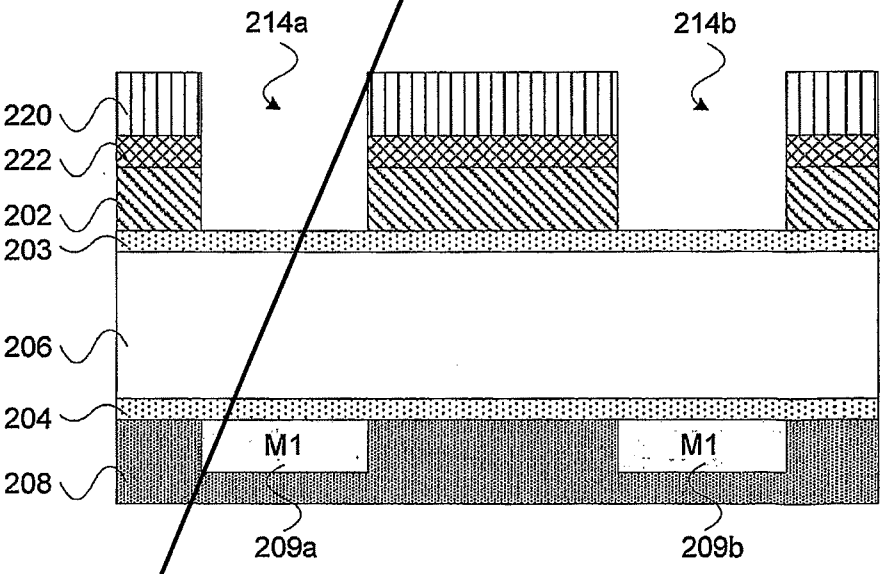

214a
214b
220
222
202
203
206
204
208
M1
M1
209a
209b

FIG. 2D

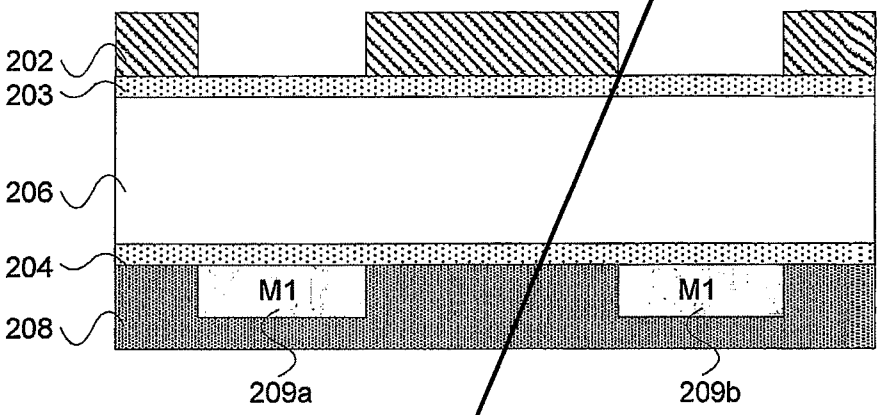

202
203
206
204
208
M1
M1
209a
209b

FIG. 2E

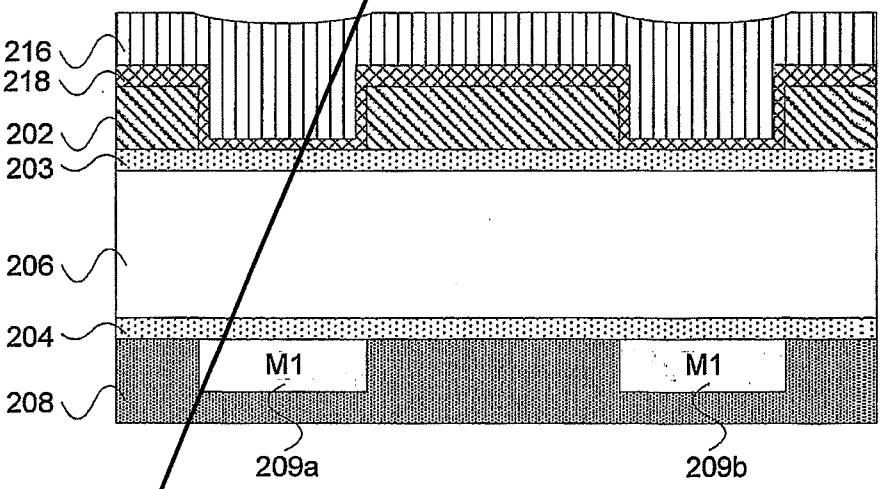

216
218
202
203
206
204
208
M1
M1
209a
209b

FIG. 2F

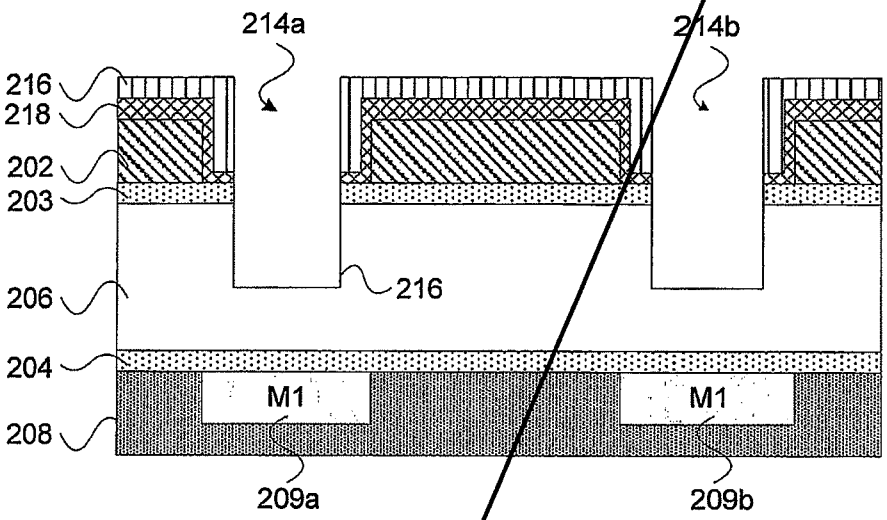

214a
214b
216
218
202
203
206
216
204
M1
M1
208
209a
209b

FIG. 2G

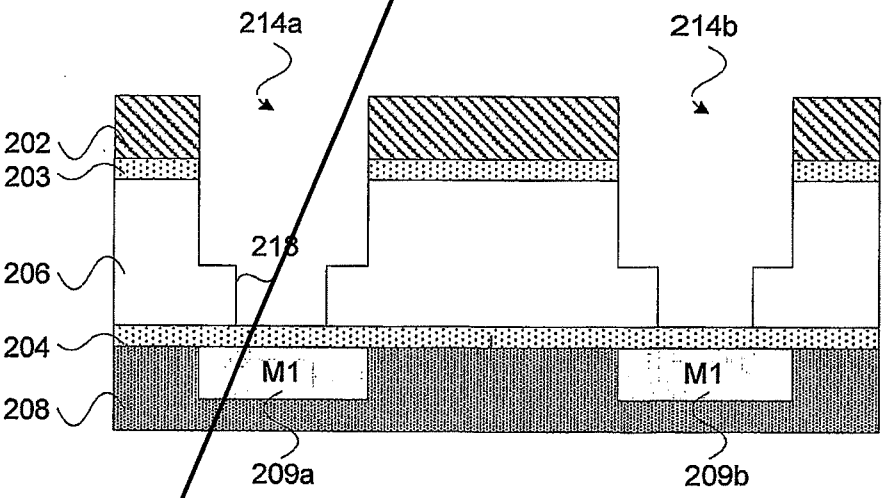

214a
214b
202
203
218
206
204
M1
M1
208
209a
209b

FIG. 2H

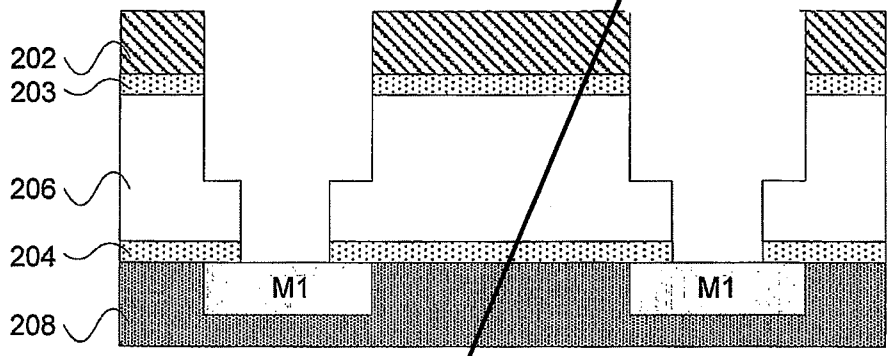


FIG. 2I

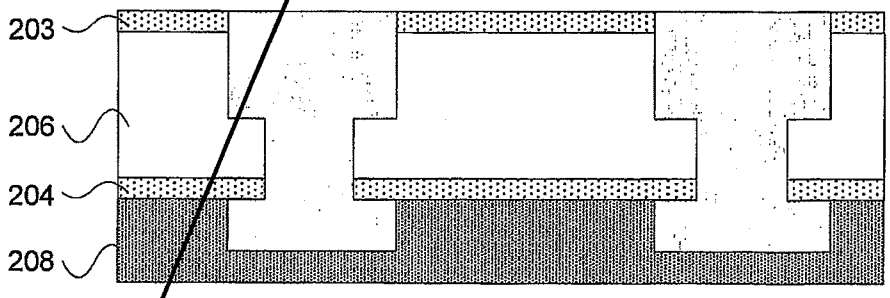


FIG. 2J

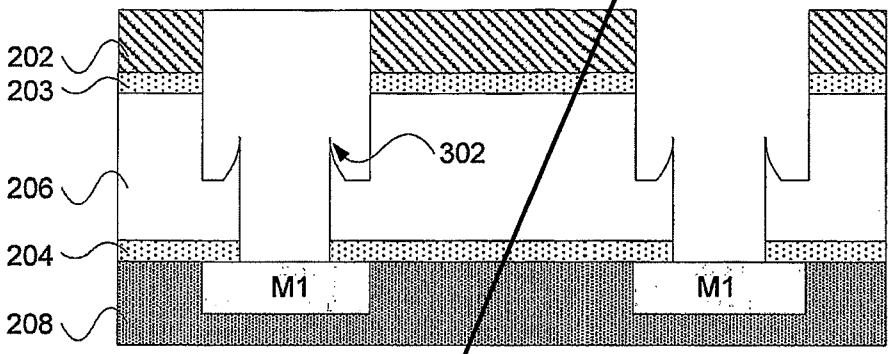


FIG. 3A

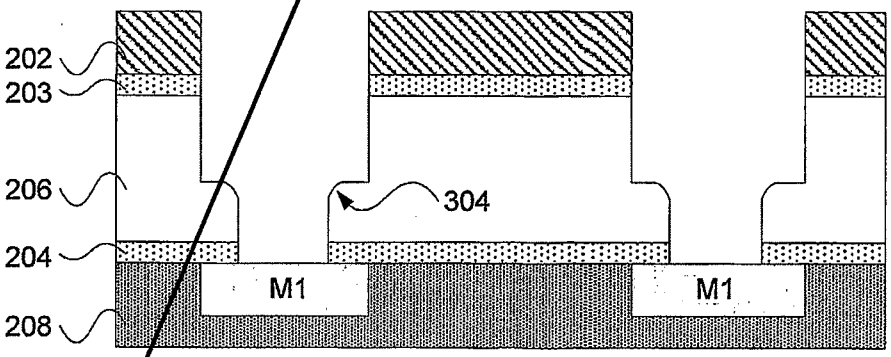


FIG. 3B

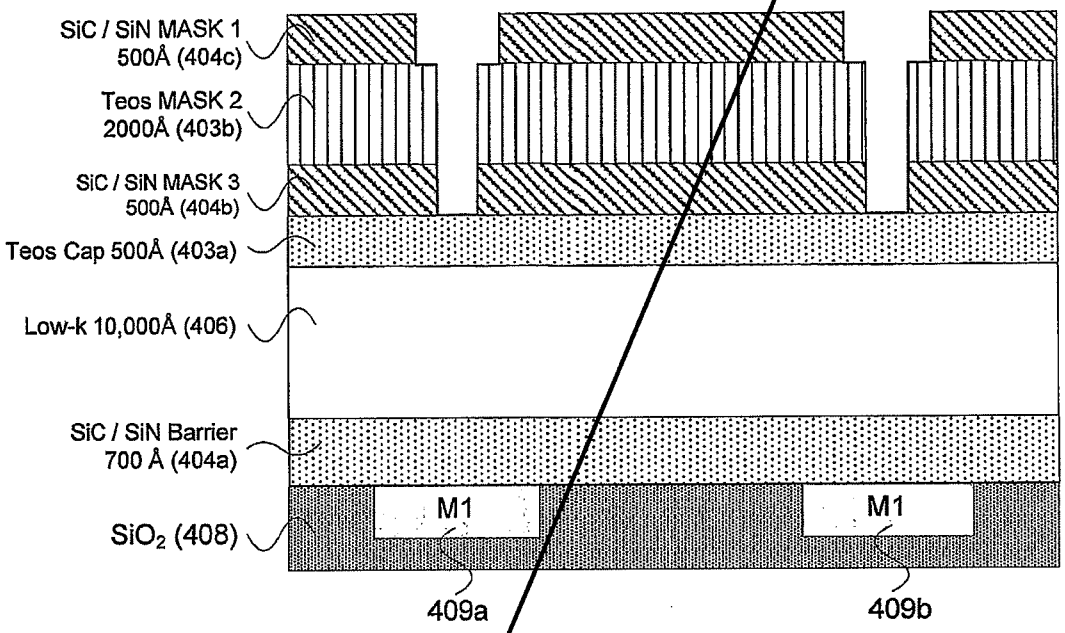

SiC / SiN MASK 1
500Å (404c)
Teos MASK 2
2000Å (403b)
SiC / SiN MASK 3
500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
SiC / SiN Barrier
700 Å (404a)
SiO2 (408)
M1
M1
409a
409b

FIG. 4A

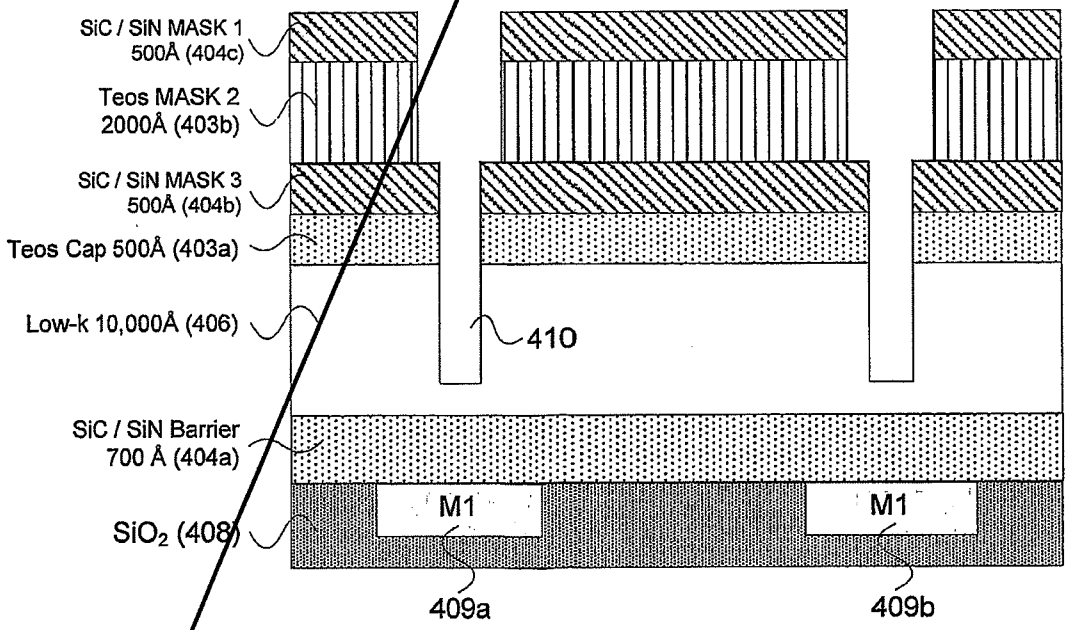

SiC / SiN MASK 1
500Å (404c)
Teos MASK 2
2000Å (403b)
SiC / SiN MASK 3
500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
410
SiC / SiN Barrier
700 Å (404a)
SiO2 (408)
M1
M1
409a
409b

FIG. 4B

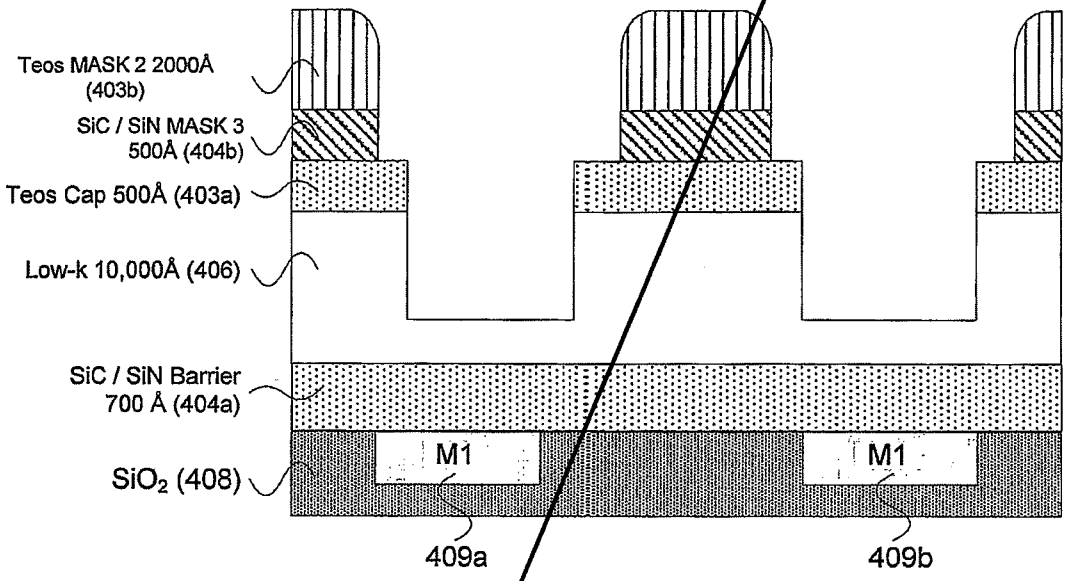

Teos MASK 2 2000Å (403b)
SiC / SiN MASK 3 500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
SiC / SiN Barrier 700 Å (404a)
SiO2 (408)
M1
M1
409a
409b

FIG. 4C

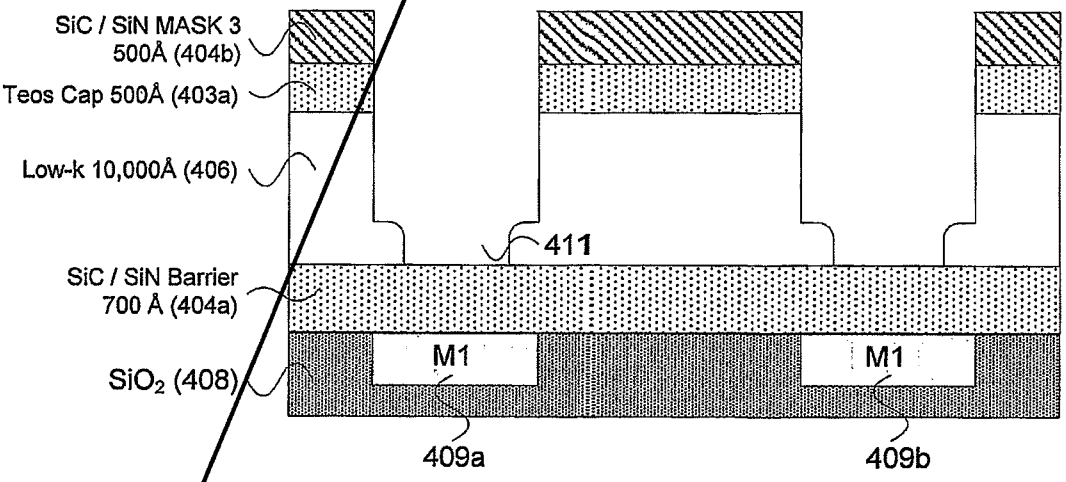

SiC / SiN MASK 3 500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
411
SiC / SiN Barrier 700 Å (404a)
SiO2 (408)
M1
M1
409a
409b

FIG. 4D

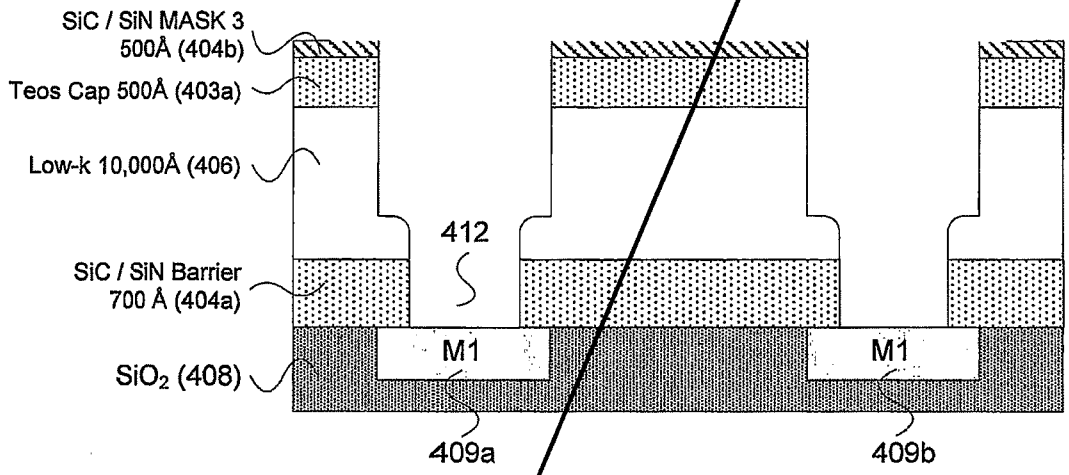

SiC / SiN MASK 3
500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
412
SiC / SiN Barrier
700 Å (404a)
M1
M1
SiO2 (408)
409a
409b

FIG. 4E

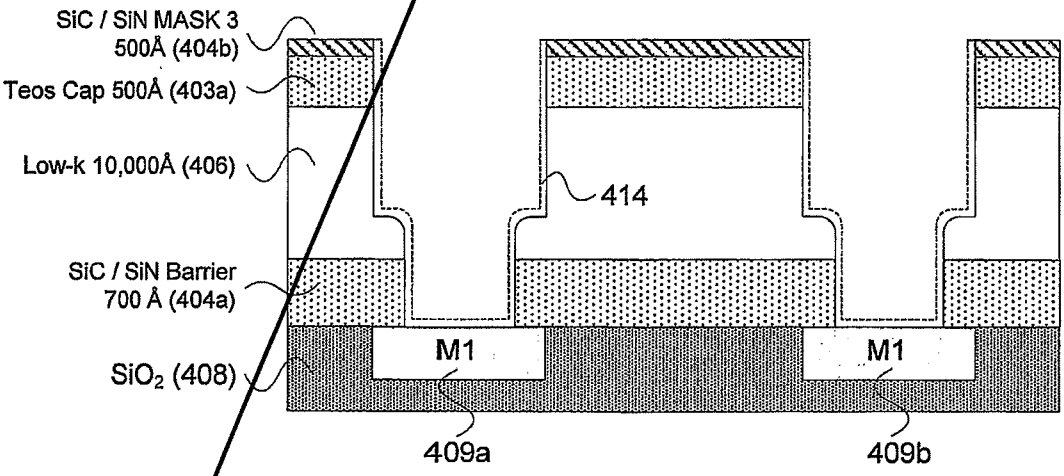

SiC / SiN MASK 3
500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
414
SiC / SiN Barrier
700 Å (404a)
M1
M1
SiO2 (408)
409a
409b

FIG. 4F

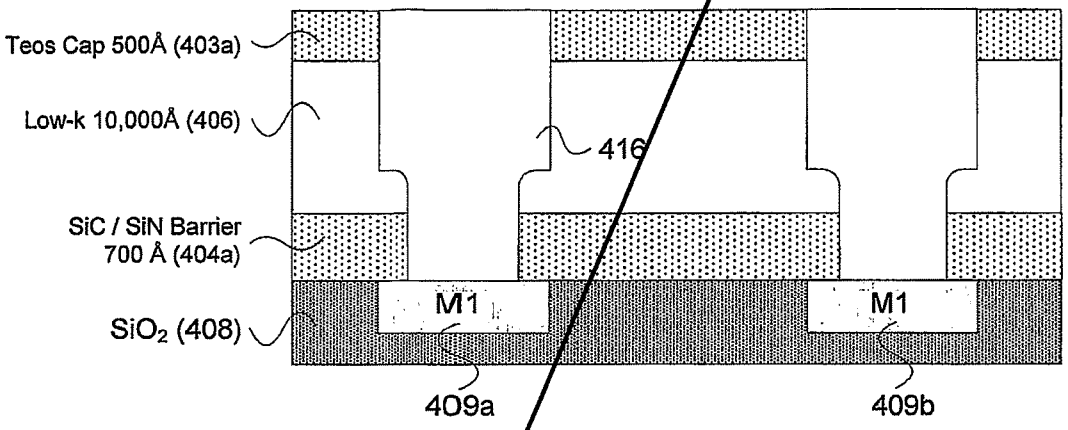

Teos Cap 500Å (403a)
Low-k 10,000Å (406)
416
SiC / SiN Barrier
700 Å (404a)
M1
M1
SiO2 (408)
409a
409b

FIG. 4G

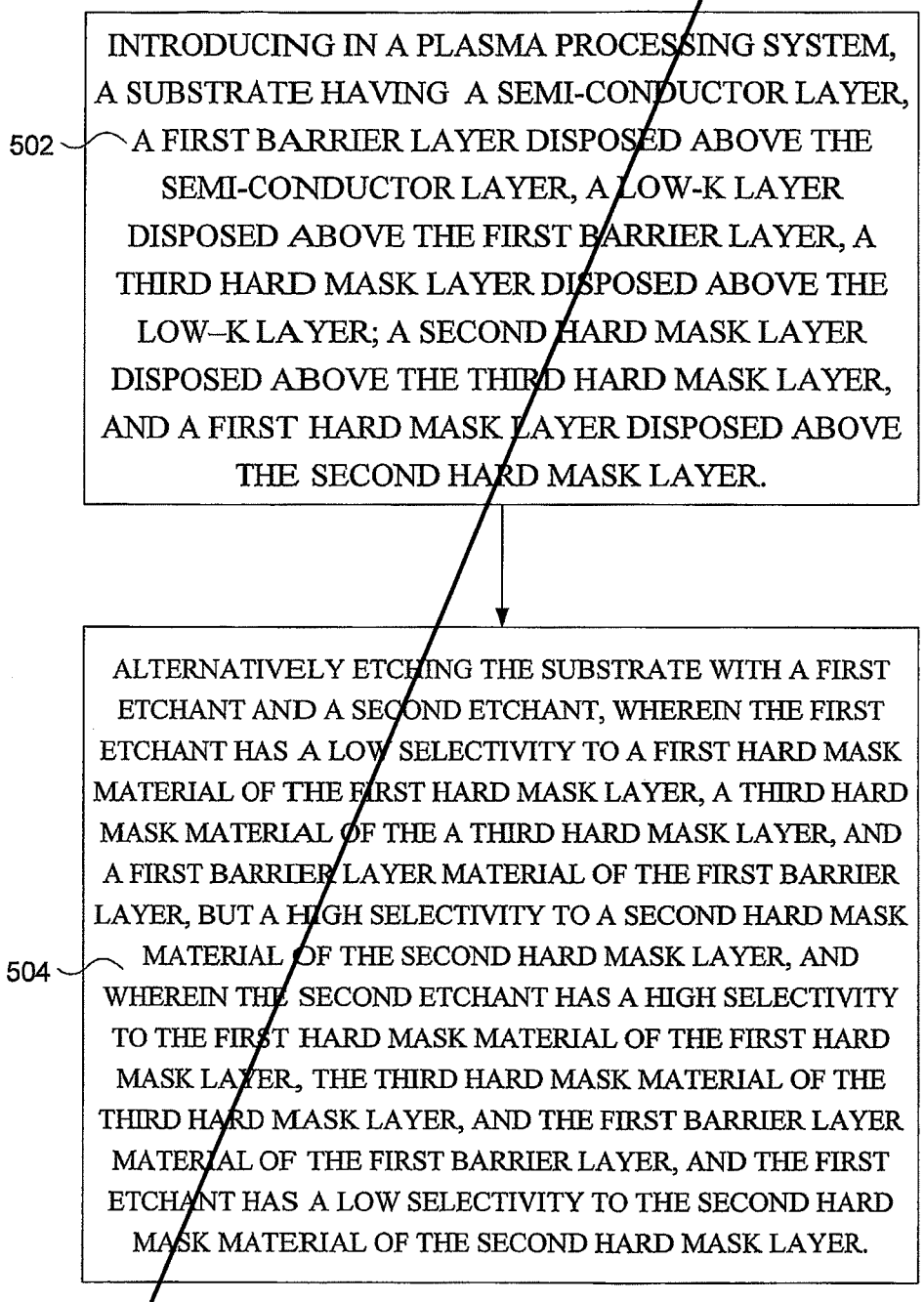

INTRODUCING IN A PLASMA PROCESSING SYSTEM, A SUBSTRATE HAVING A SEMI-CONDUCTOR LAYER, A FIRST BARRIER LAYER DISPOSED ABOVE THE SEMI-CONDUCTOR LAYER, A LOW-K LAYER DISPOSED ABOVE THE FIRST BARRIER LAYER, A THIRD HARD MASK LAYER DISPOSED ABOVE THE LOW–K LAYER; A SECOND HARD MASK LAYER DISPOSED ABOVE THE THIRD HARD MASK LAYER, AND A FIRST HARD MASK LAYER DISPOSED ABOVE THE SECOND HARD MASK LAYER.
502
ALTERNATIVELY ETCHING THE SUBSTRATE WITH A FIRST ETCHANT AND A SECOND ETCHANT, WHEREIN THE FIRST ETCHANT HAS A LOW SELECTIVITY TO A FIRST HARD MASK MATERIAL OF THE FIRST HARD MASK LAYER, A THIRD HARD MASK MATERIAL OF THE A THIRD HARD MASK LAYER, AND A FIRST BARRIER LAYER MATERIAL OF THE FIRST BARRIER LAYER, BUT A HIGH SELECTIVITY TO A SECOND HARD MASK MATERIAL OF THE SECOND HARD MASK LAYER, AND WHEREIN THE SECOND ETCHANT HAS A HIGH SELECTIVITY TO THE FIRST HARD MASK MATERIAL OF THE FIRST HARD MASK LAYER, THE THIRD HARD MASK MATERIAL OF THE THIRD HARD MASK LAYER, AND THE FIRST BARRIER LAYER MATERIAL OF THE FIRST BARRIER LAYER, AND THE FIRST ETCHANT HAS A LOW SELECTIVITY TO THE SECOND HARD MASK MATERIAL OF THE SECOND HARD MASK LAYER.
504

FIG. 5A

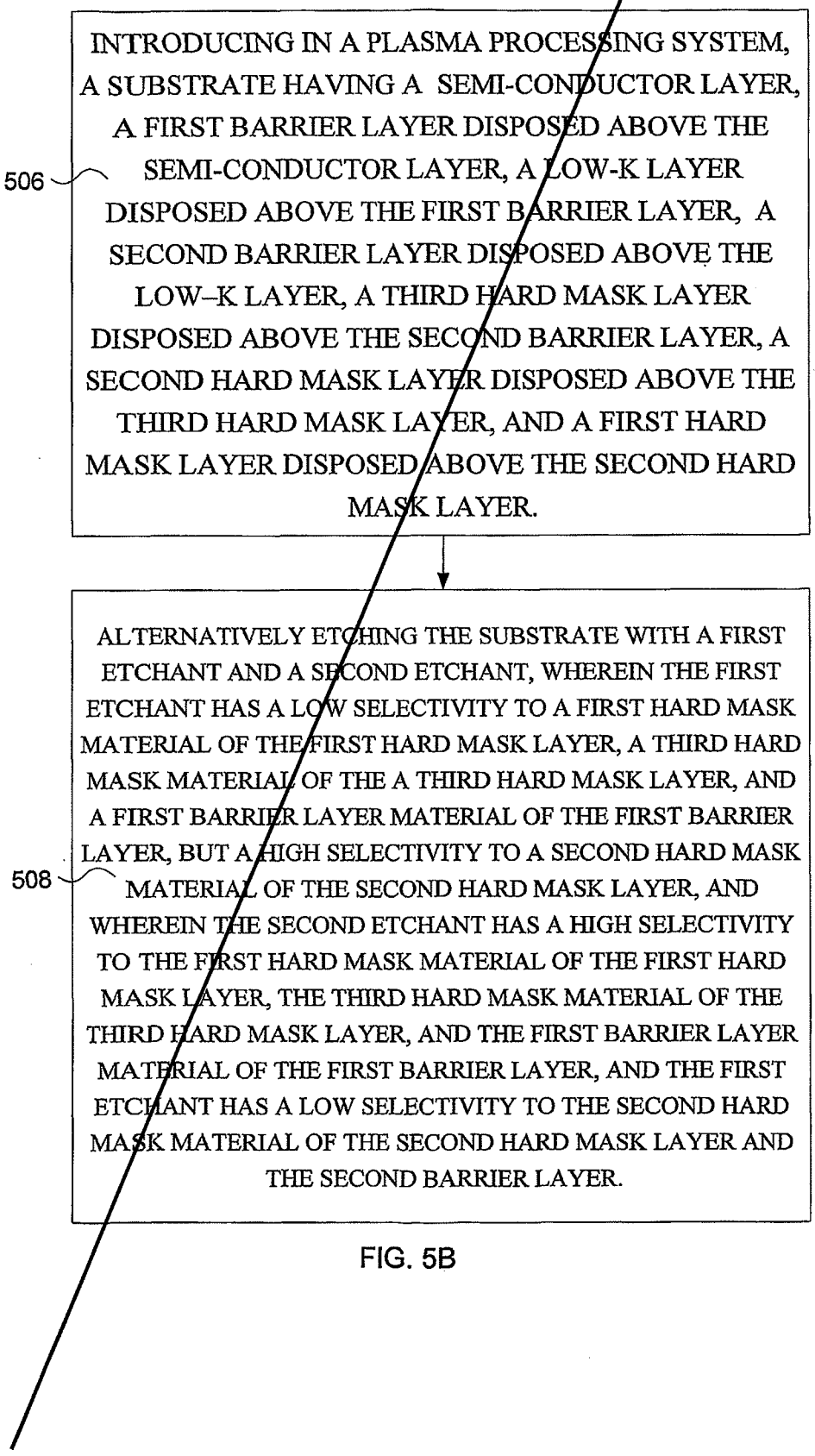

INTRODUCING IN A PLASMA PROCESSING SYSTEM, A SUBSTRATE HAVING A SEMI-CONDUCTOR LAYER, A FIRST BARRIER LAYER DISPOSED ABOVE THE SEMI-CONDUCTOR LAYER, A LOW-K LAYER DISPOSED ABOVE THE FIRST BARRIER LAYER, A SECOND BARRIER LAYER DISPOSED ABOVE THE LOW–K LAYER, A THIRD HARD MASK LAYER DISPOSED ABOVE THE SECOND BARRIER LAYER, A SECOND HARD MASK LAYER DISPOSED ABOVE THE THIRD HARD MASK LAYER, AND A FIRST HARD MASK LAYER DISPOSED ABOVE THE SECOND HARD MASK LAYER.
506
ALTERNATIVELY ETCHING THE SUBSTRATE WITH A FIRST ETCHANT AND A SECOND ETCHANT, WHEREIN THE FIRST ETCHANT HAS A LOW SELECTIVITY TO A FIRST HARD MASK MATERIAL OF THE FIRST HARD MASK LAYER, A THIRD HARD MASK MATERIAL OF THE A THIRD HARD MASK LAYER, AND A FIRST BARRIER LAYER MATERIAL OF THE FIRST BARRIER LAYER, BUT A HIGH SELECTIVITY TO A SECOND HARD MASK MATERIAL OF THE SECOND HARD MASK LAYER, AND WHEREIN THE SECOND ETCHANT HAS A HIGH SELECTIVITY TO THE FIRST HARD MASK MATERIAL OF THE FIRST HARD MASK LAYER, THE THIRD HARD MASK MATERIAL OF THE THIRD HARD MASK LAYER, AND THE FIRST BARRIER LAYER MATERIAL OF THE FIRST BARRIER LAYER, AND THE FIRST ETCHANT HAS A LOW SELECTIVITY TO THE SECOND HARD MASK MATERIAL OF THE SECOND HARD MASK LAYER AND THE SECOND BARRIER LAYER.
508

FIG. 5B

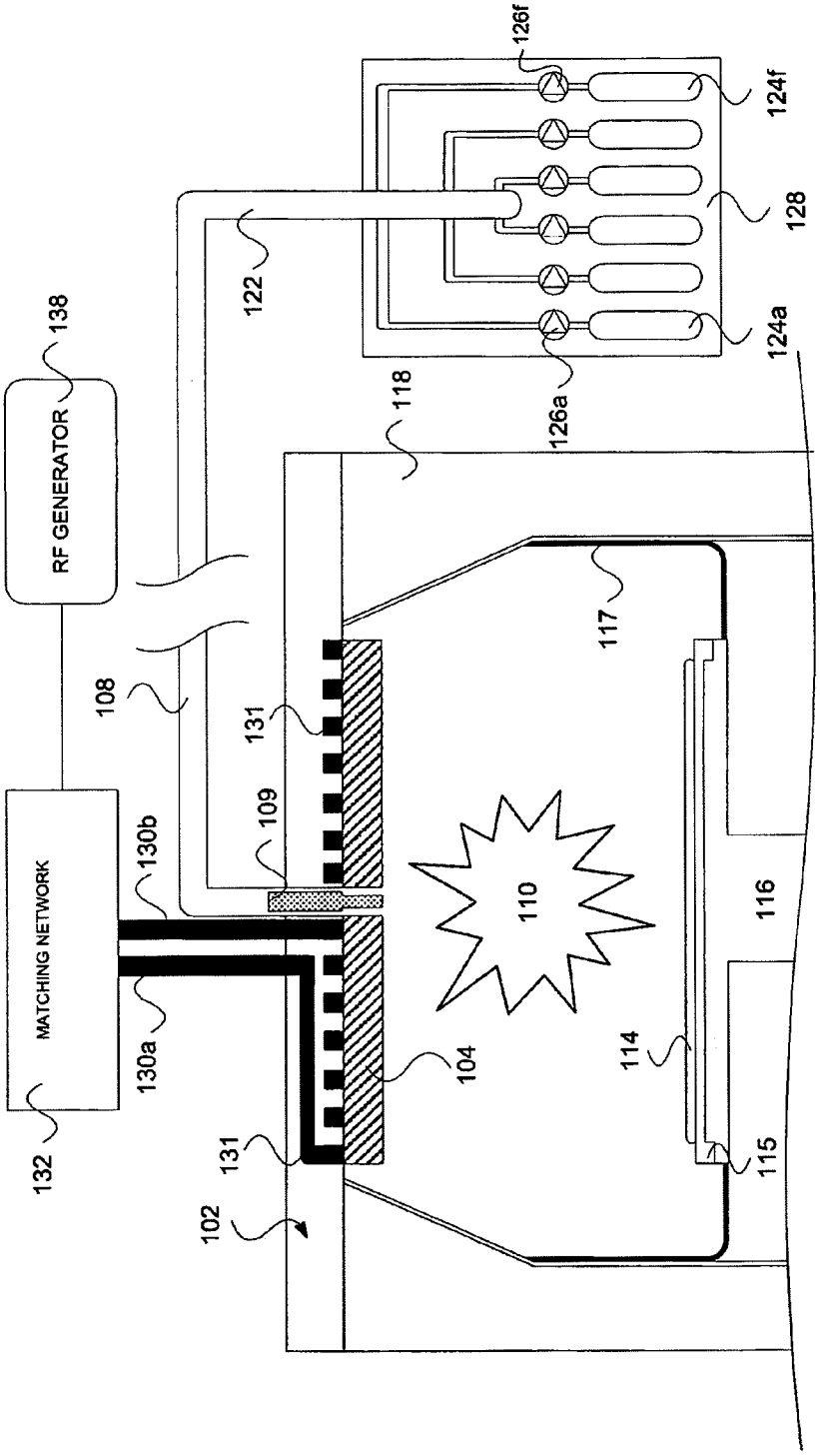

126f
124f
128
122
124a
126a
118
138
RF GENERATOR
117
108
131
109
130b
110
116
MATCHING NETWORK
130a
104
114
131
115
132
102

FIG. 1

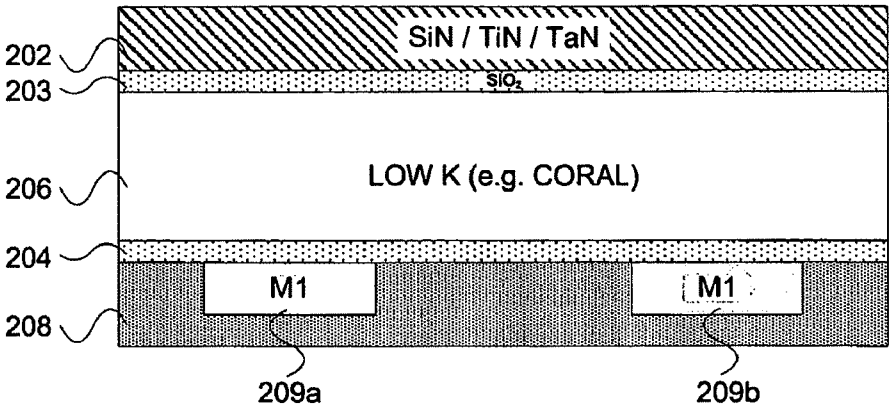

SiN / TiN / TaN
202
203
SiO2
LOW K (e.g. CORAL)
206
204
M1
M1
208
209a
209b

FIG. 2A

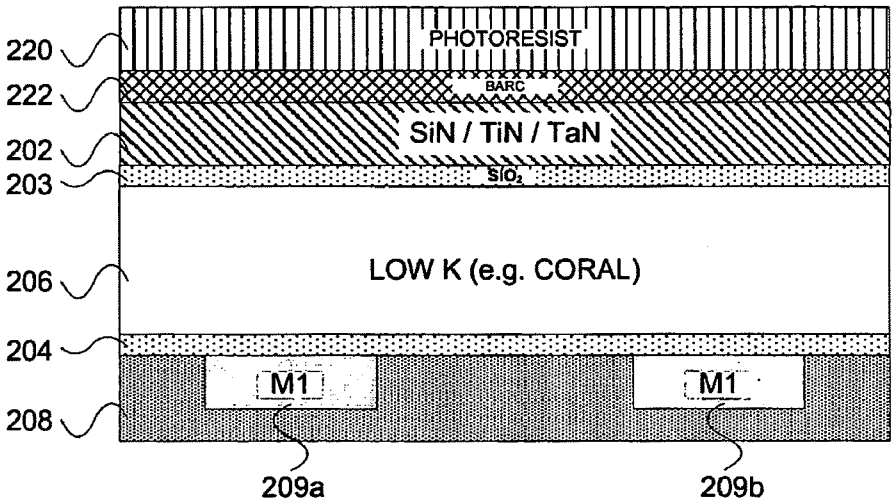

PHOTORESIST
220
BARC
222
SiN / TiN / TaN
202
203
SiO2
LOW K (e.g. CORAL)
206
204
M1
M1
208
209a
209b

FIG. 2B

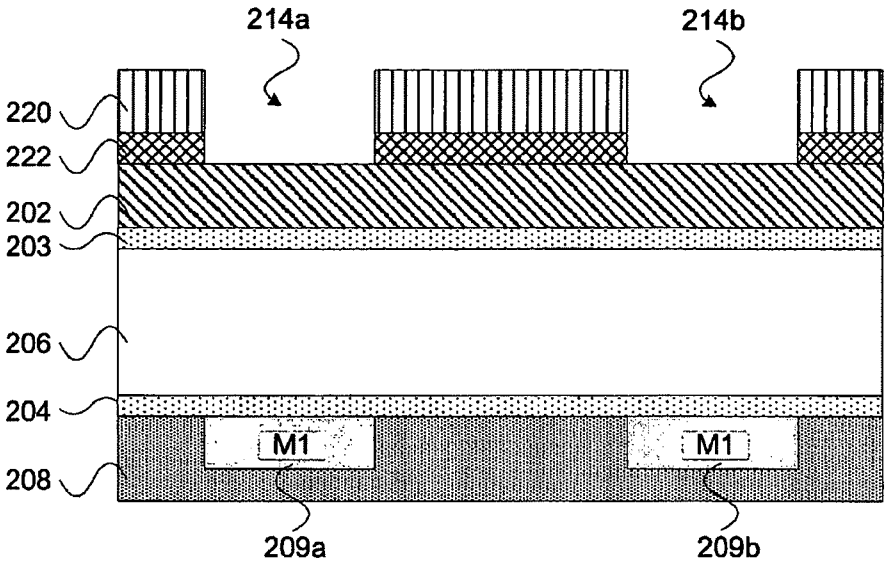

214a
214b
220
222
202
203
206
204
208
M1
M1
209a
209b

FIG. 2C

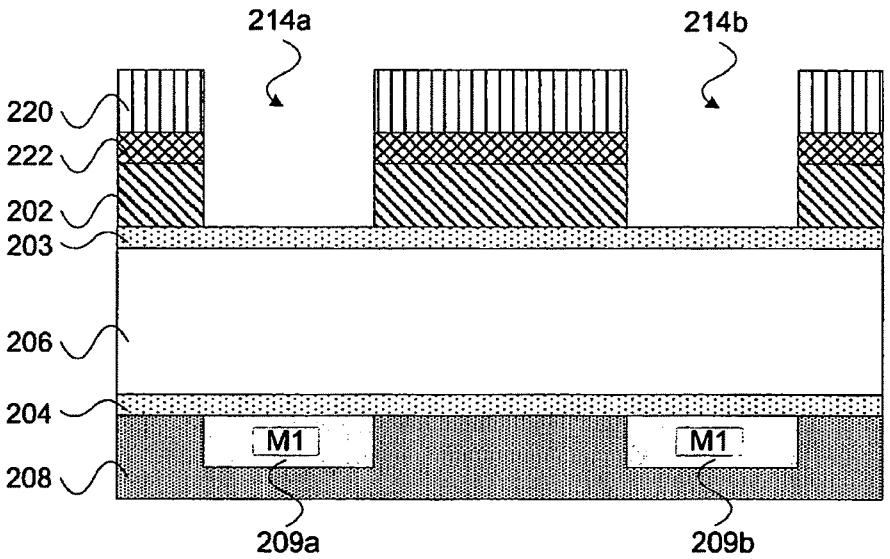

214a
214b
220
222
202
203
206
204
208
M1
M1
209a
209b

FIG. 2D

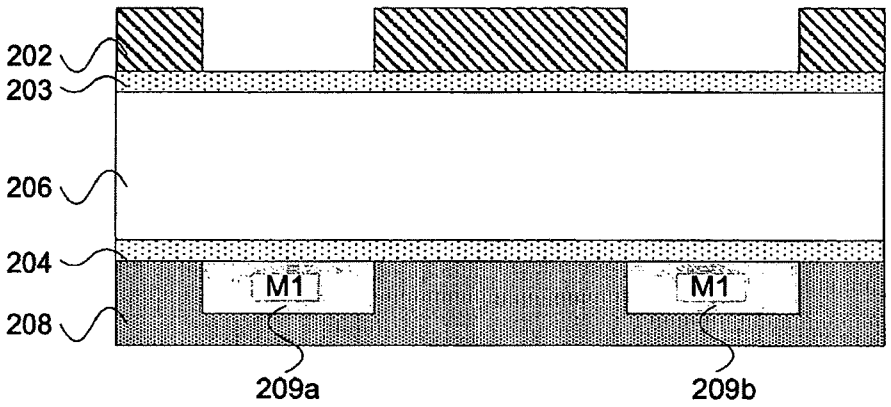

202
203
206
204
208
M1
M1
209a
209b

FIG. 2E

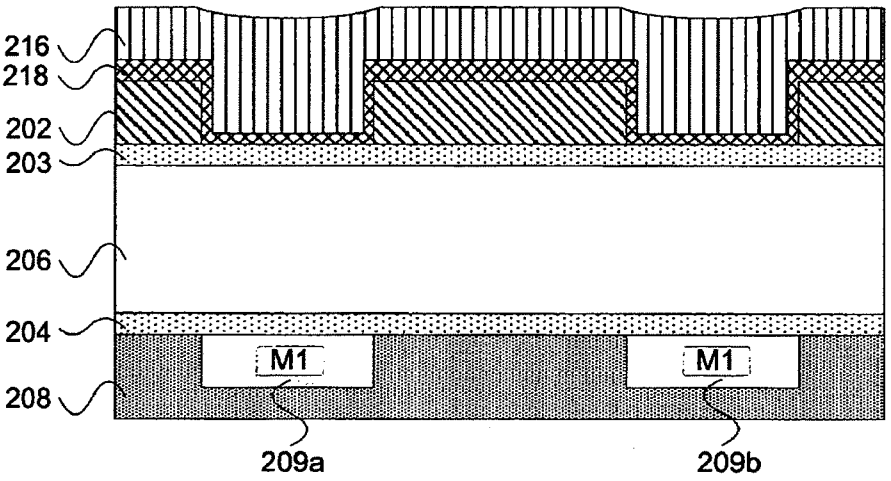

216
218
202
203
206
204
208
M1
M1
209a
209b

FIG. 2F

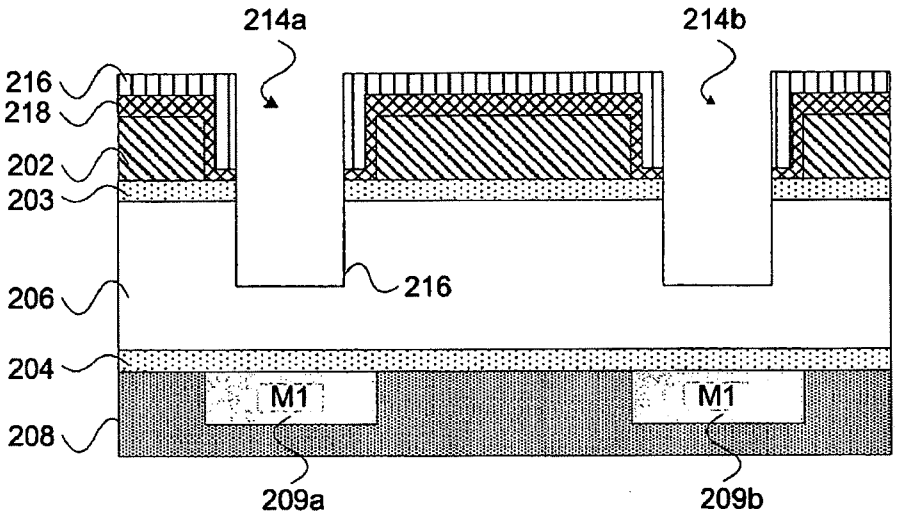

214a
214b
216
218
202
203
206
216
204
M1
M1
208
209a
209b

FIG. 2G

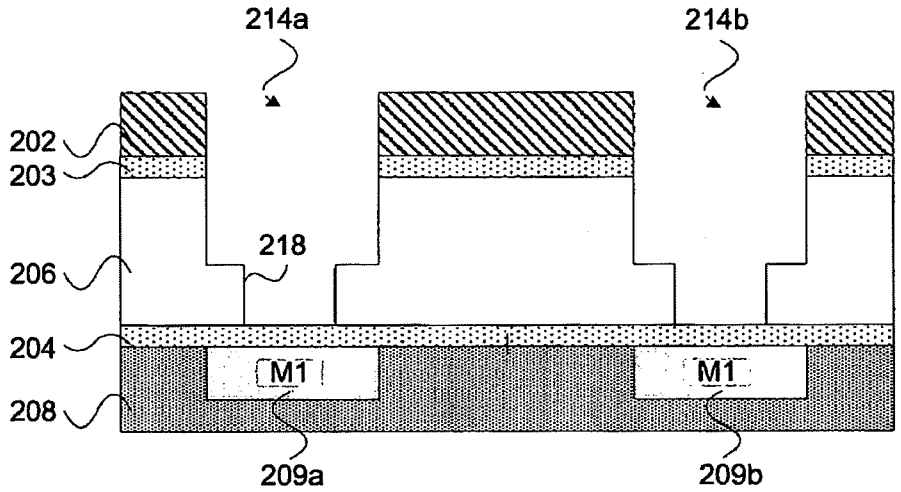

214a
214b
202
203
218
206
204
M1
M1
208
209a
209b

FIG. 2H

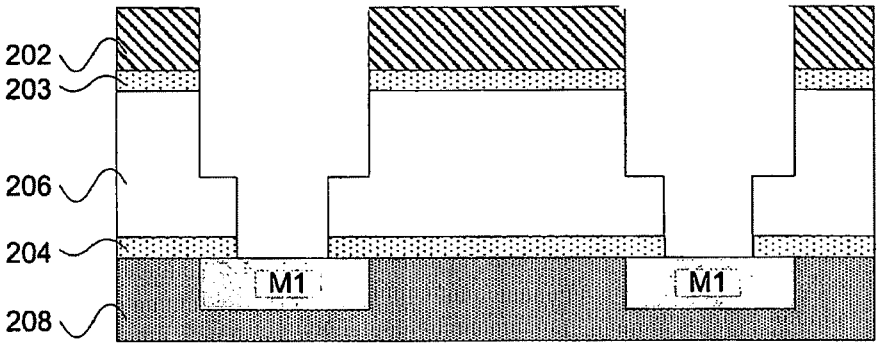


FIG. 2I

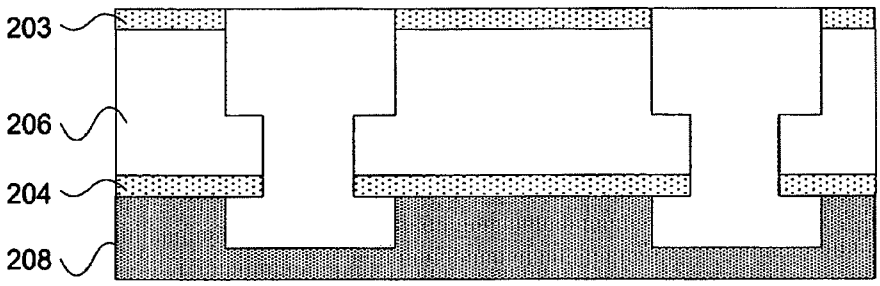


FIG. 2J

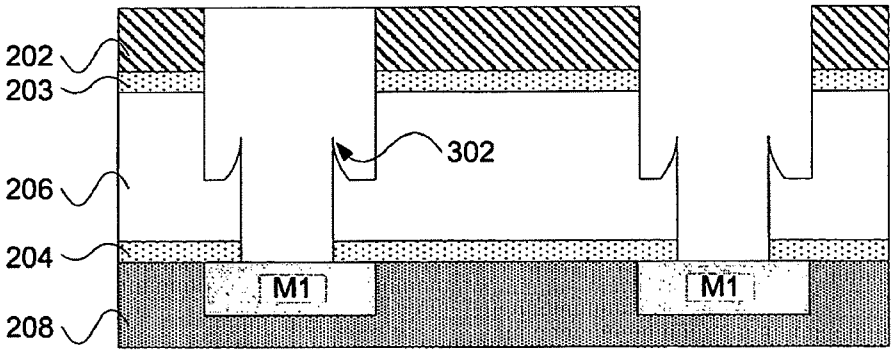


FIG. 3A

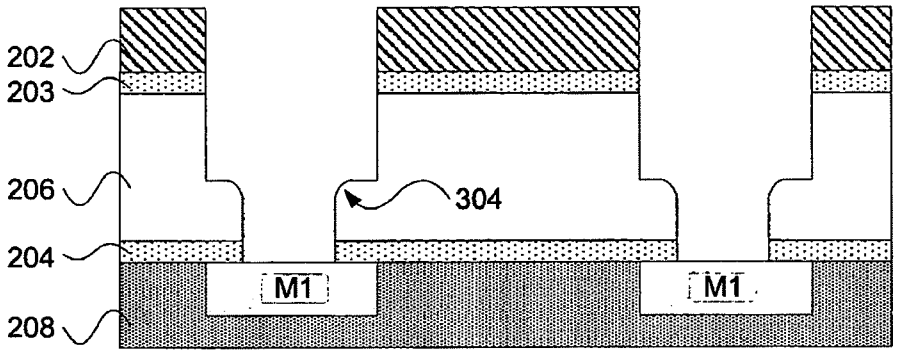


FIG. 3B

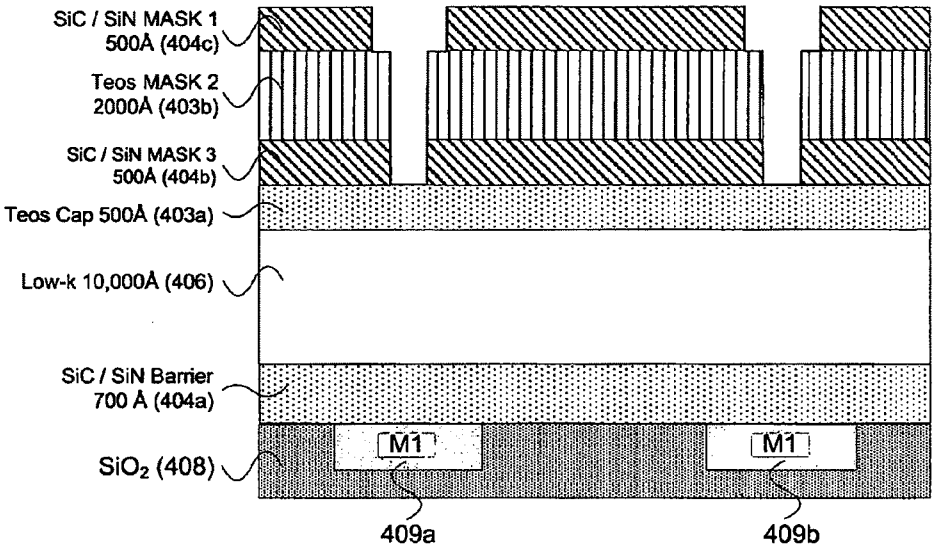

SiC / SiN MASK 1
500Å (404c)
Teos MASK 2
2000Å (403b)
SiC / SiN MASK 3
500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
SiC / SiN Barrier
700 Å (404a)
SiO2 (408)
M1
M1
409a
409b

FIG. 4A

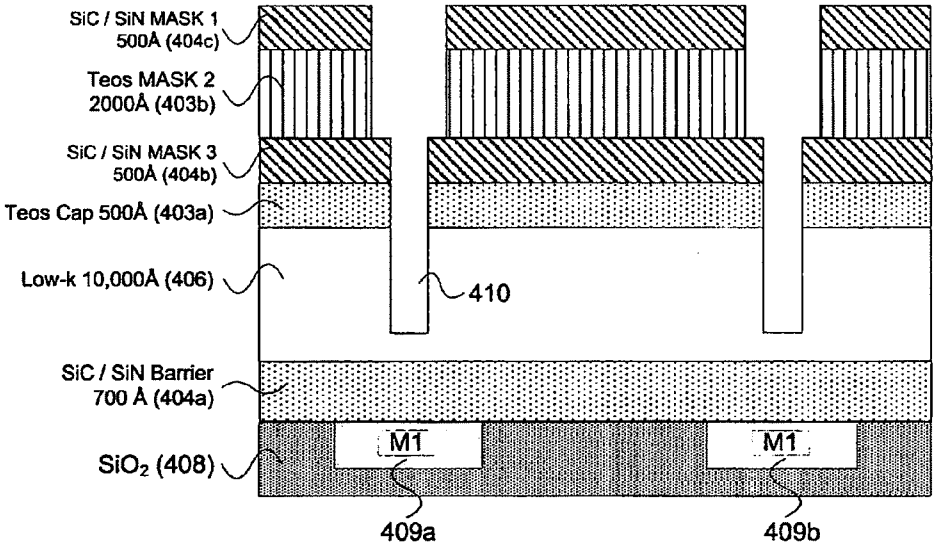

SiC / SiN MASK 1
500Å (404c)
Teos MASK 2
2000Å (403b)
SiC / SiN MASK 3
500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
410
SiC / SiN Barrier
700 Å (404a)
SiO2 (408)
M1
M1
409a
409b

FIG. 4B

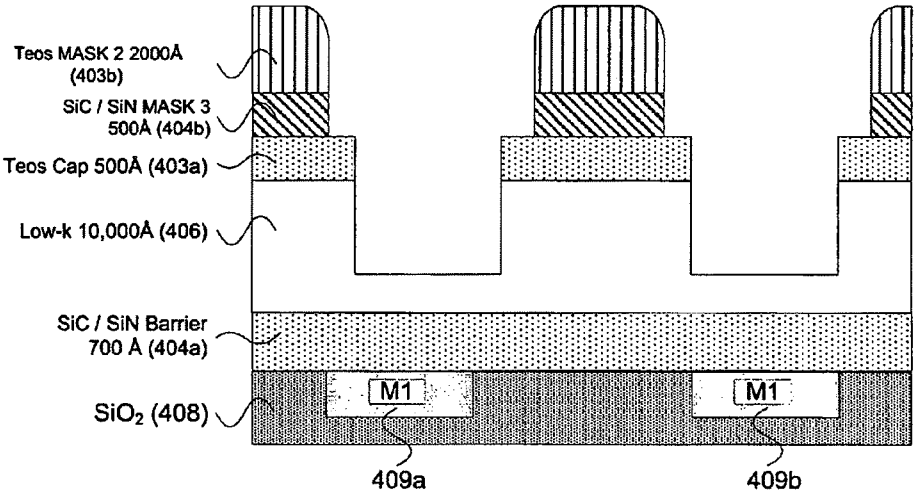

Teos MASK 2 2000Å
(403b)
SiC / SiN MASK 3
500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
SiC / SiN Barrier
700 Å (404a)
SiO2 (408)
M1
M1
409a
409b

FIG. 4C

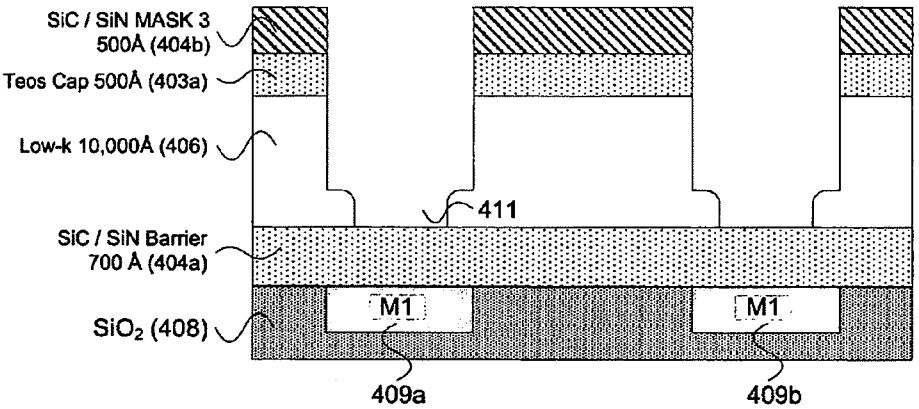

SiC / SiN MASK 3
500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
411
SiC / SiN Barrier
700 Å (404a)
SiO2 (408)
M1
M1
409a
409b

FIG. 4D

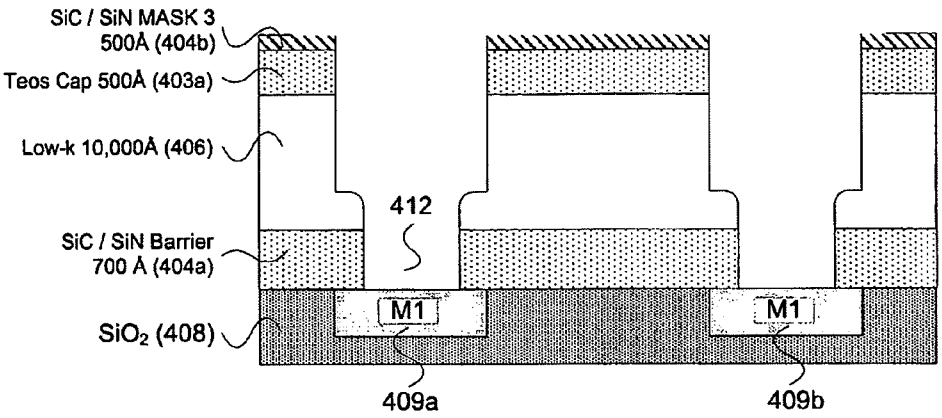

SiC / SiN MASK 3
500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
412
SiC / SiN Barrier
700 Å (404a)
M1
M1
SiO2 (408)
409a
409b

FIG. 4E

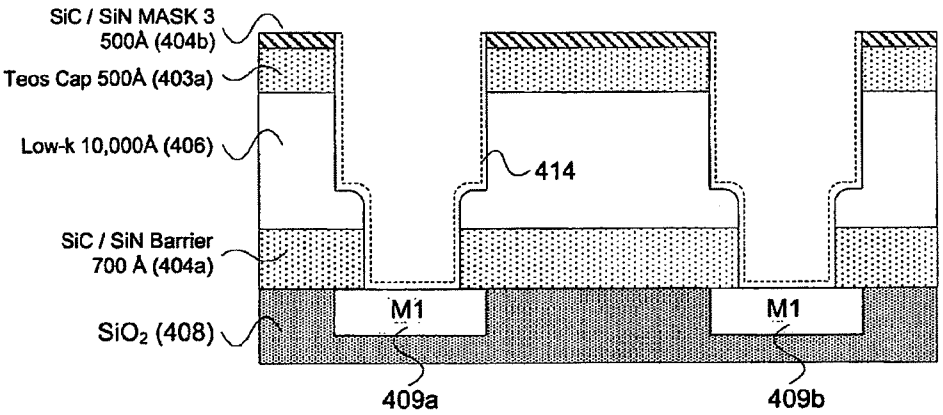

SiC / SiN MASK 3
500Å (404b)
Teos Cap 500Å (403a)
Low-k 10,000Å (406)
414
SiC / SiN Barrier
700 Å (404a)
M1
M1
SiO2 (408)
409a
409b

FIG. 4F

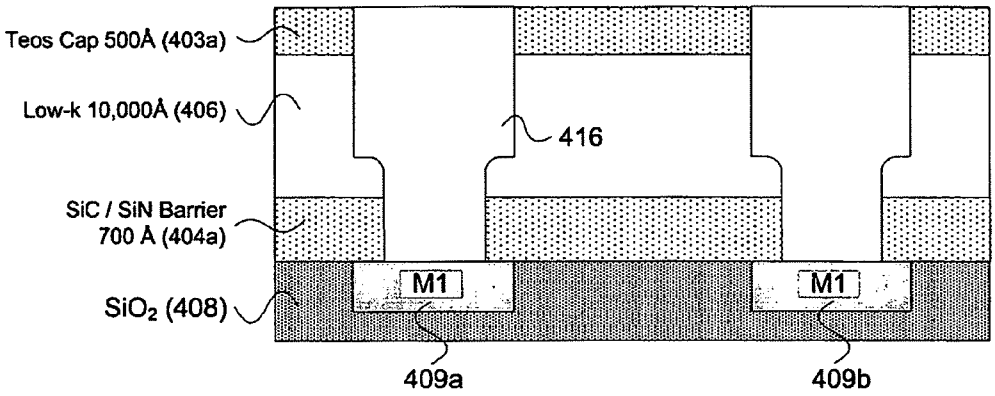

Teos Cap 500Å (403a)
Low-k 10,000Å (406)
416
SiC / SiN Barrier
700 Å (404a)
M1
M1
SiO2 (408)
409a
409b

FIG. 4G

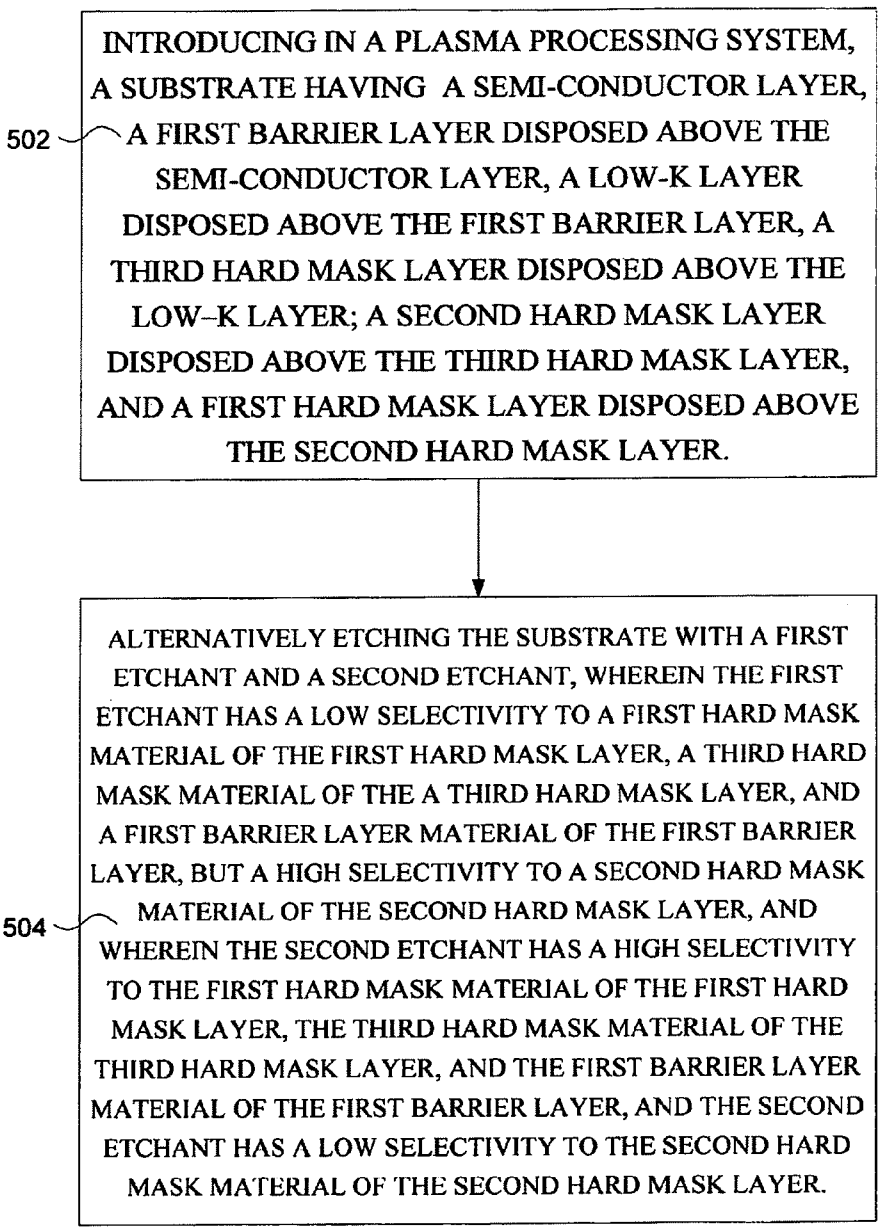

INTRODUCING IN A PLASMA PROCESSING SYSTEM, A SUBSTRATE HAVING A SEMI-CONDUCTOR LAYER,
502
A FIRST BARRIER LAYER DISPOSED ABOVE THE SEMI-CONDUCTOR LAYER, A LOW-K LAYER DISPOSED ABOVE THE FIRST BARRIER LAYER, A THIRD HARD MASK LAYER DISPOSED ABOVE THE LOW-K LAYER; A SECOND HARD MASK LAYER DISPOSED ABOVE THE THIRD HARD MASK LAYER, AND A FIRST HARD MASK LAYER DISPOSED ABOVE THE SECOND HARD MASK LAYER.
ALTERNATIVELY ETCHING THE SUBSTRATE WITH A FIRST ETCHANT AND A SECOND ETCHANT, WHEREIN THE FIRST ETCHANT HAS A LOW SELECTIVITY TO A FIRST HARD MASK MATERIAL OF THE FIRST HARD MASK LAYER, A THIRD HARD MASK MATERIAL OF THE A THIRD HARD MASK LAYER, AND A FIRST BARRIER LAYER MATERIAL OF THE FIRST BARRIER LAYER, BUT A HIGH SELECTIVITY TO A SECOND HARD MASK
504
MATERIAL OF THE SECOND HARD MASK LAYER, AND WHEREIN THE SECOND ETCHANT HAS A HIGH SELECTIVITY TO THE FIRST HARD MASK MATERIAL OF THE FIRST HARD MASK LAYER, THE THIRD HARD MASK MATERIAL OF THE THIRD HARD MASK LAYER, AND THE FIRST BARRIER LAYER MATERIAL OF THE FIRST BARRIER LAYER, AND THE SECOND ETCHANT HAS A LOW SELECTIVITY TO THE SECOND HARD MASK MATERIAL OF THE SECOND HARD MASK LAYER.

FIG. 5A

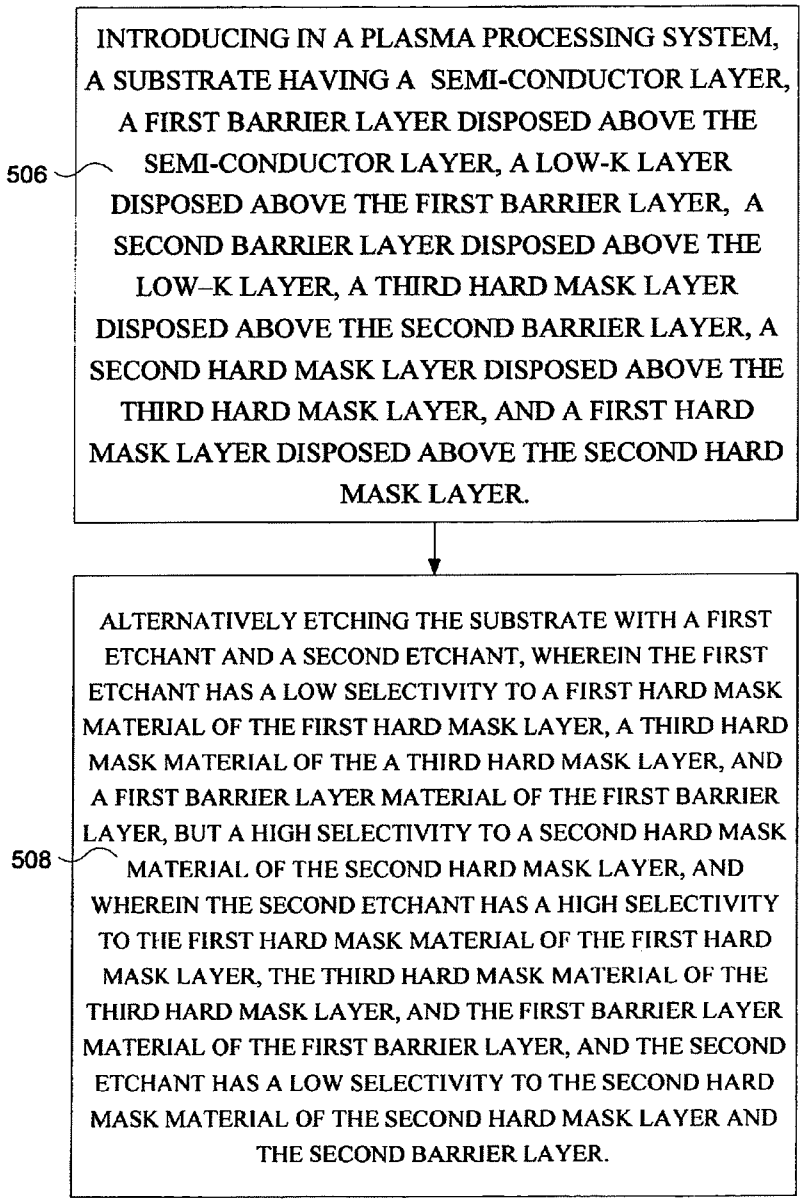

INTRODUCING IN A PLASMA PROCESSING SYSTEM, A SUBSTRATE HAVING A SEMI-CONDUCTOR LAYER, A FIRST BARRIER LAYER DISPOSED ABOVE THE SEMI-CONDUCTOR LAYER, A LOW-K LAYER DISPOSED ABOVE THE FIRST BARRIER LAYER, A SECOND BARRIER LAYER DISPOSED ABOVE THE LOW–K LAYER, A THIRD HARD MASK LAYER DISPOSED ABOVE THE SECOND BARRIER LAYER, A SECOND HARD MASK LAYER DISPOSED ABOVE THE THIRD HARD MASK LAYER, AND A FIRST HARD MASK LAYER DISPOSED ABOVE THE SECOND HARD MASK LAYER.
506
ALTERNATIVELY ETCHING THE SUBSTRATE WITH A FIRST ETCHANT AND A SECOND ETCHANT, WHEREIN THE FIRST ETCHANT HAS A LOW SELECTIVITY TO A FIRST HARD MASK MATERIAL OF THE FIRST HARD MASK LAYER, A THIRD HARD MASK MATERIAL OF THE A THIRD HARD MASK LAYER, AND A FIRST BARRIER LAYER MATERIAL OF THE FIRST BARRIER LAYER, BUT A HIGH SELECTIVITY TO A SECOND HARD MASK MATERIAL OF THE SECOND HARD MASK LAYER, AND WHEREIN THE SECOND ETCHANT HAS A HIGH SELECTIVITY TO THE FIRST HARD MASK MATERIAL OF THE FIRST HARD MASK LAYER, THE THIRD HARD MASK MATERIAL OF THE THIRD HARD MASK LAYER, AND THE FIRST BARRIER LAYER MATERIAL OF THE FIRST BARRIER LAYER, AND THE SECOND ETCHANT HAS A LOW SELECTIVITY TO THE SECOND HARD MASK MATERIAL OF THE SECOND HARD MASK LAYER AND THE SECOND BARRIER LAYER.
508

FIG. 5B