FIG. 1

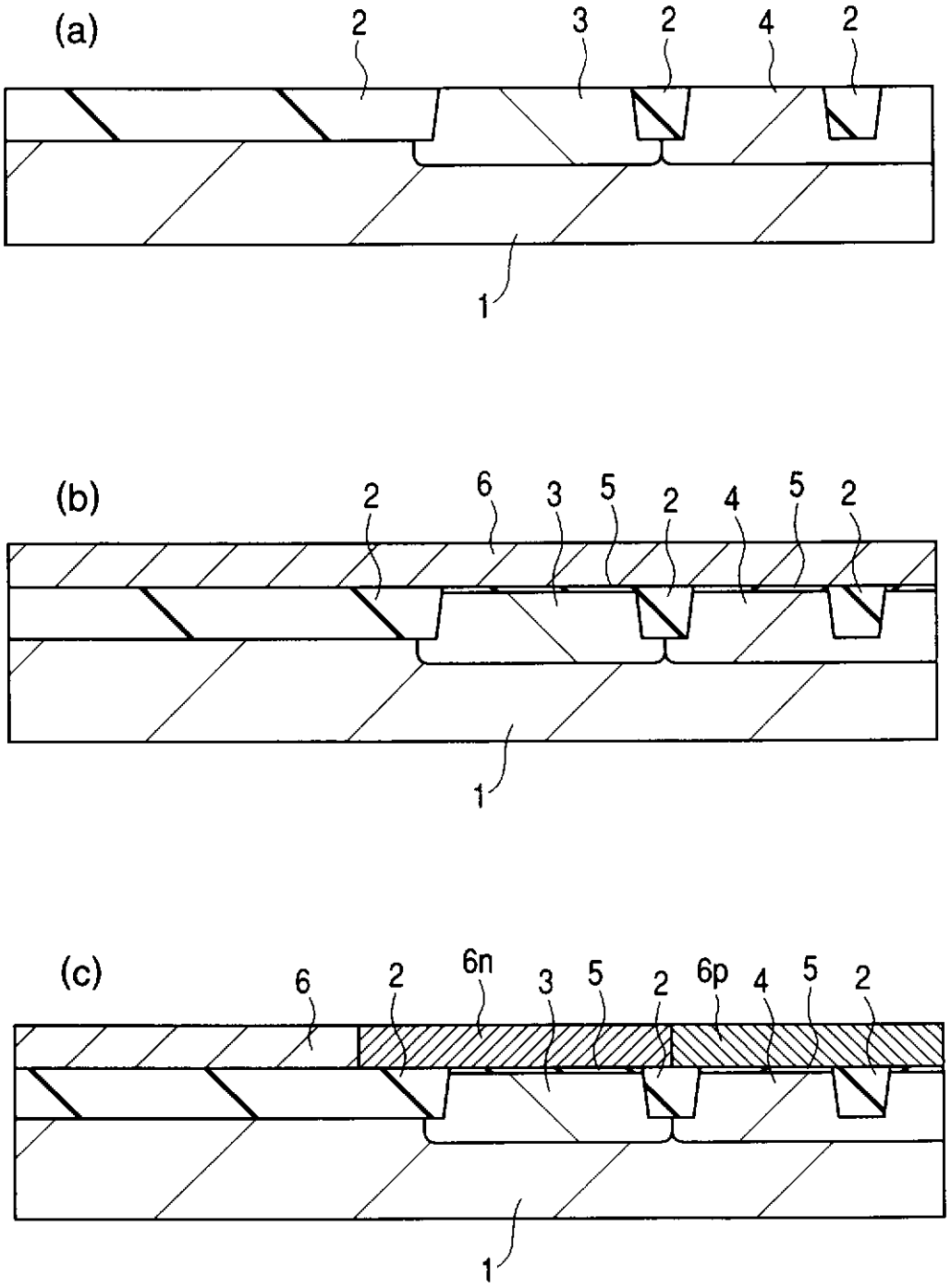


FIG. 2

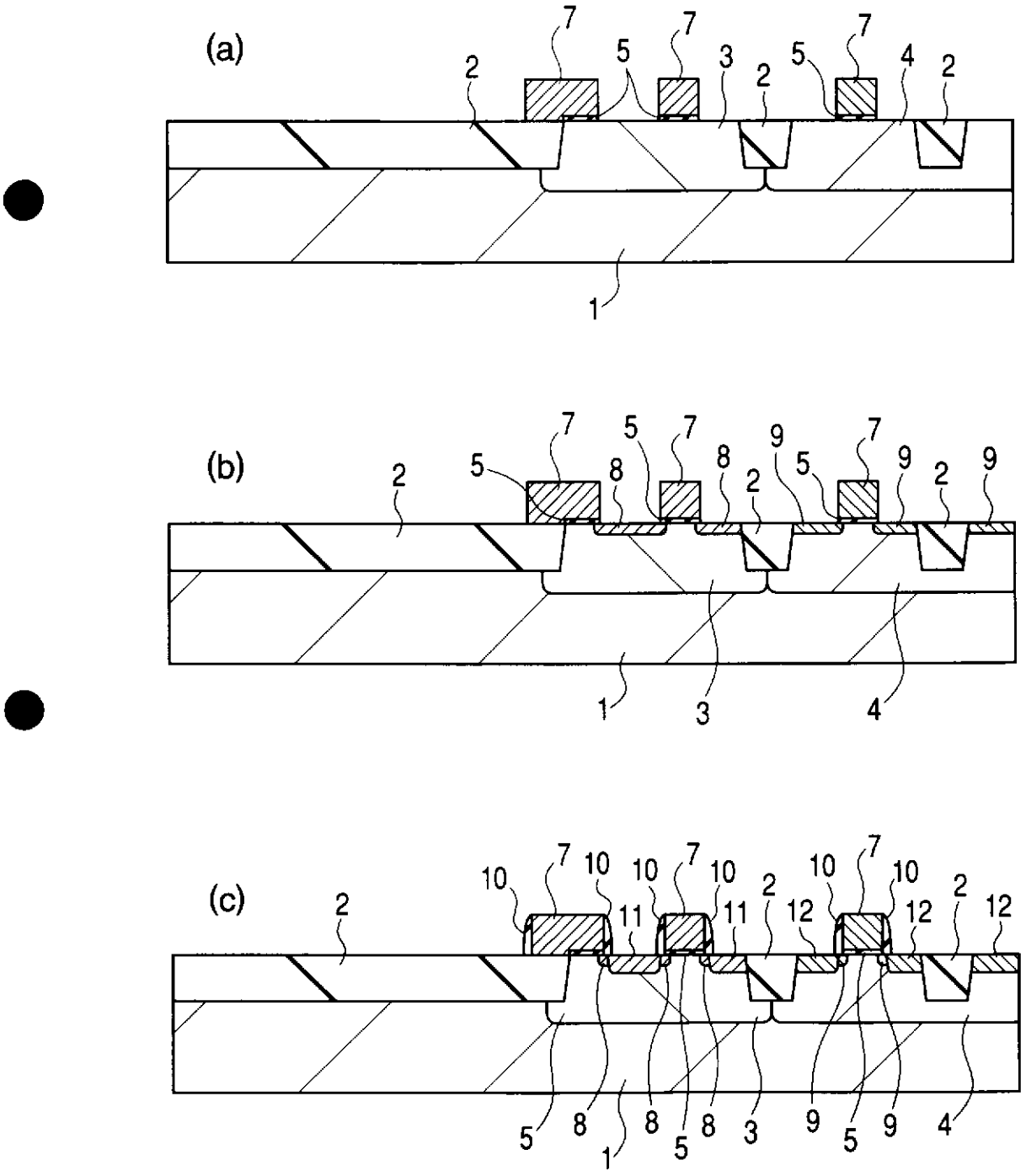

(a)
7
7
7
2
5
3
2
5
4
2
1
(b)
7
5
7
9
7
5
8
8
2
5
9
2
9
2
1
3
4
(c)
10
7
10
10
7
10
10
7
2
2
11
11
12
12
12
2
5
8
8
1
5
8
3
9
5
9
4

FIG. 3

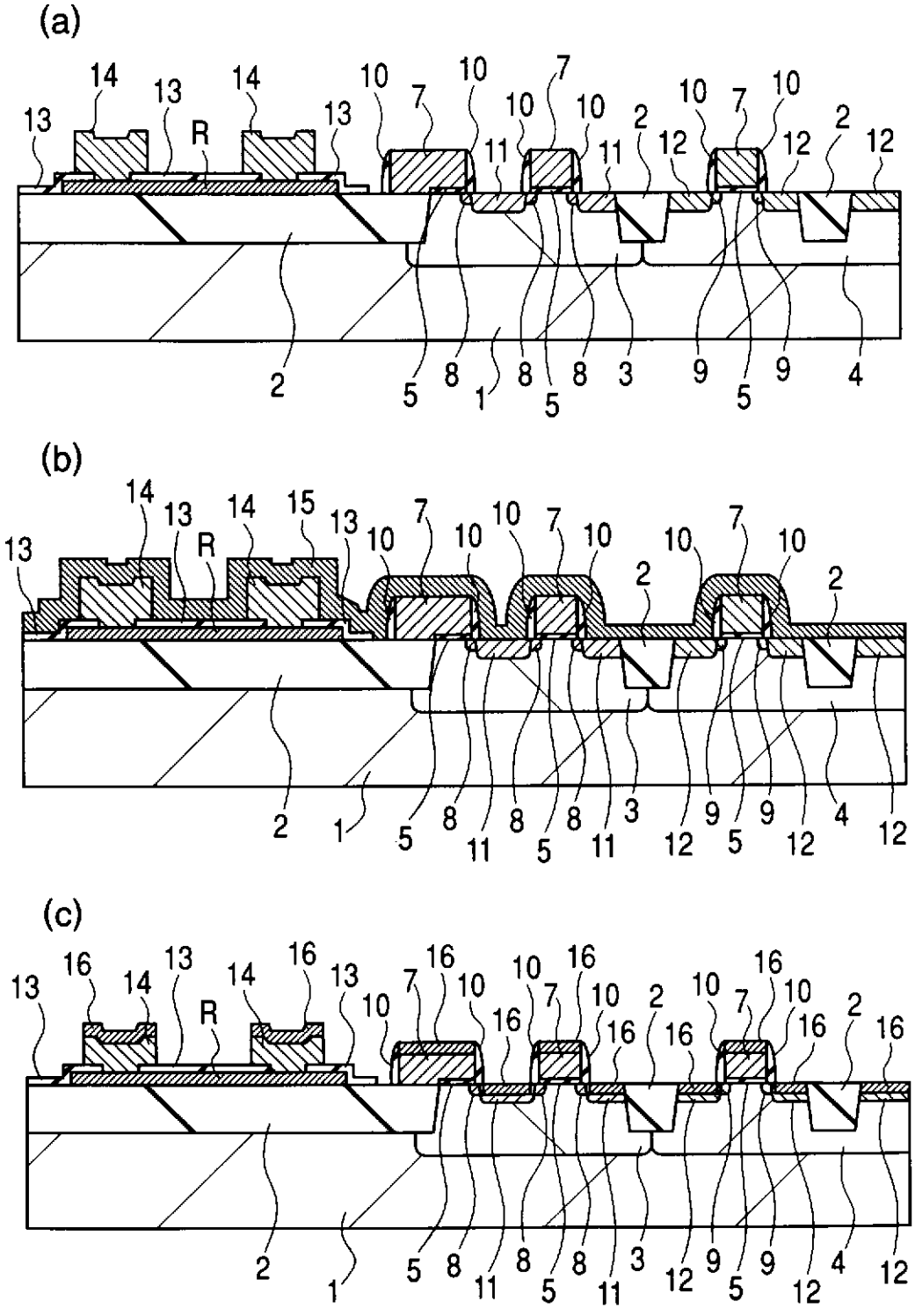
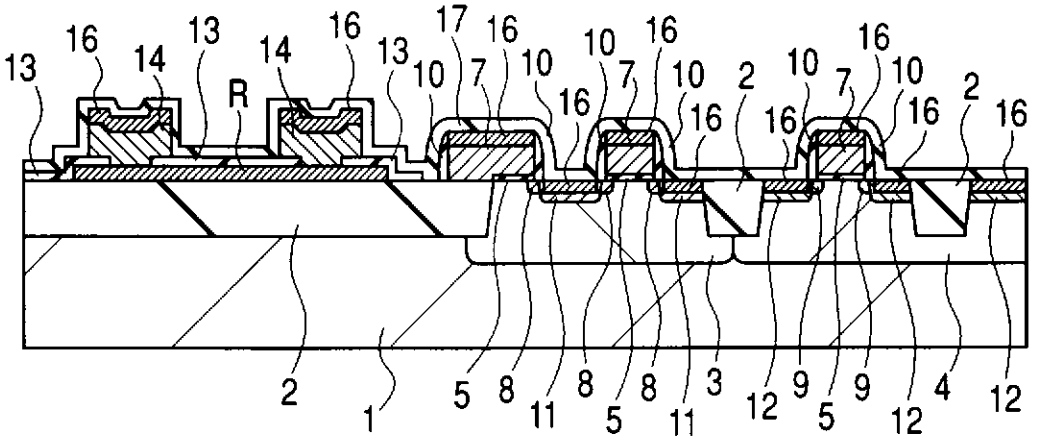


FIG. 4

(a)


13
16
14
13
R
14
16
13
17
16
10
7
10
10
7
16
10
16
2
10
7
16
10
16
2
16
16
16
2
1
5
8
11
8
5
8
11
3
12
9
5
9
12
4
12

(b)

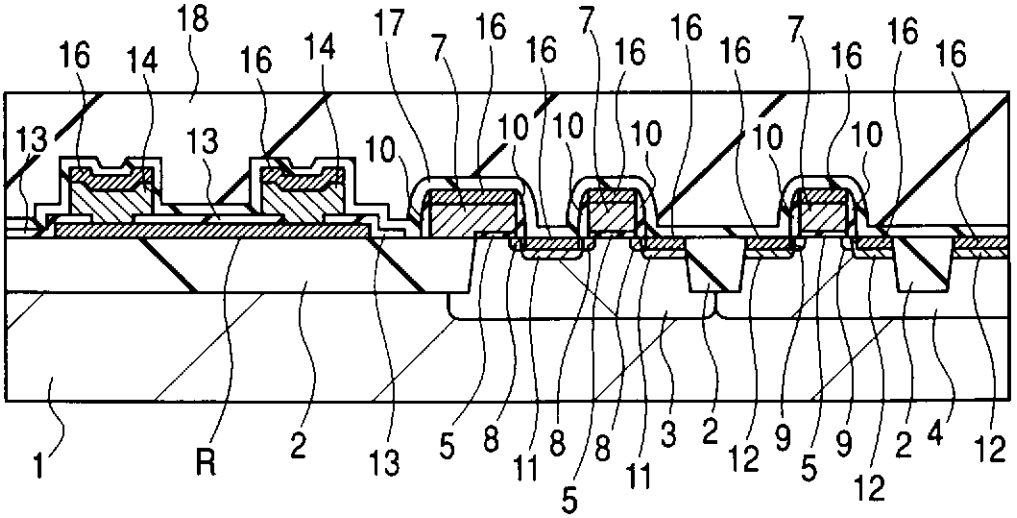
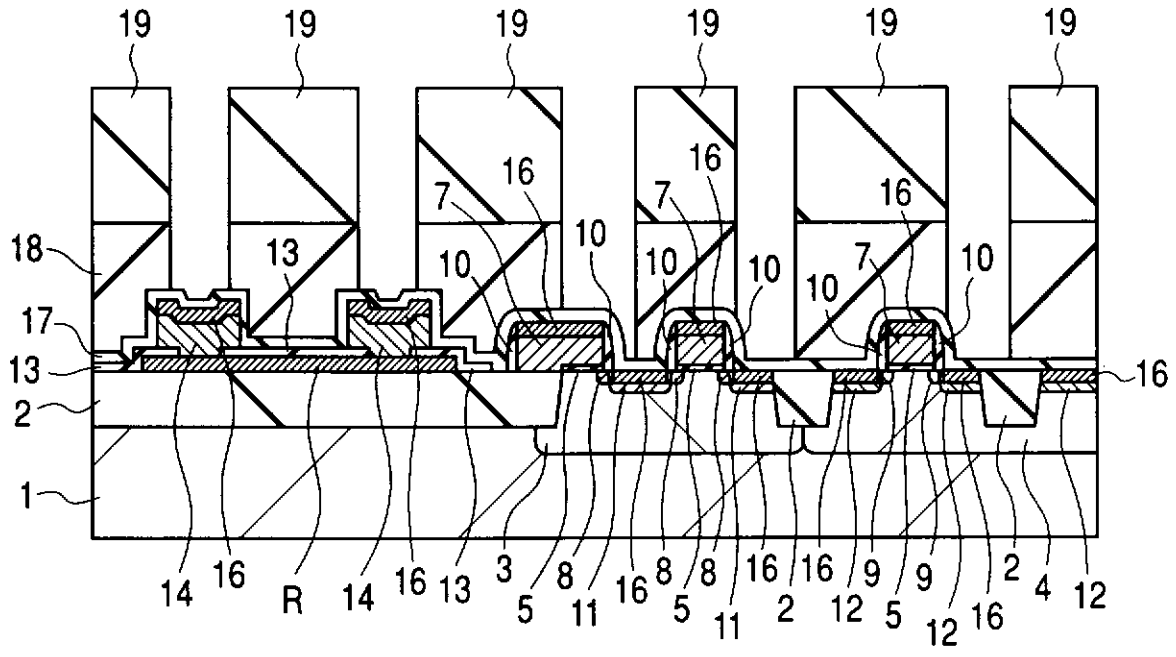

18
16
14
16
14
17
7
16
16
7
16
16
16
7
16
16
16
13
13
10
10
10
10
10
10
10
1
R
2
13
5
8
11
8
5
8
11
3
2
12
9
5
9
12
2
4
12

FIG. 5

(a)


19
18
17
13
2
1
7
16
10
R
14
3
5
8
11
12
9
4

(b)

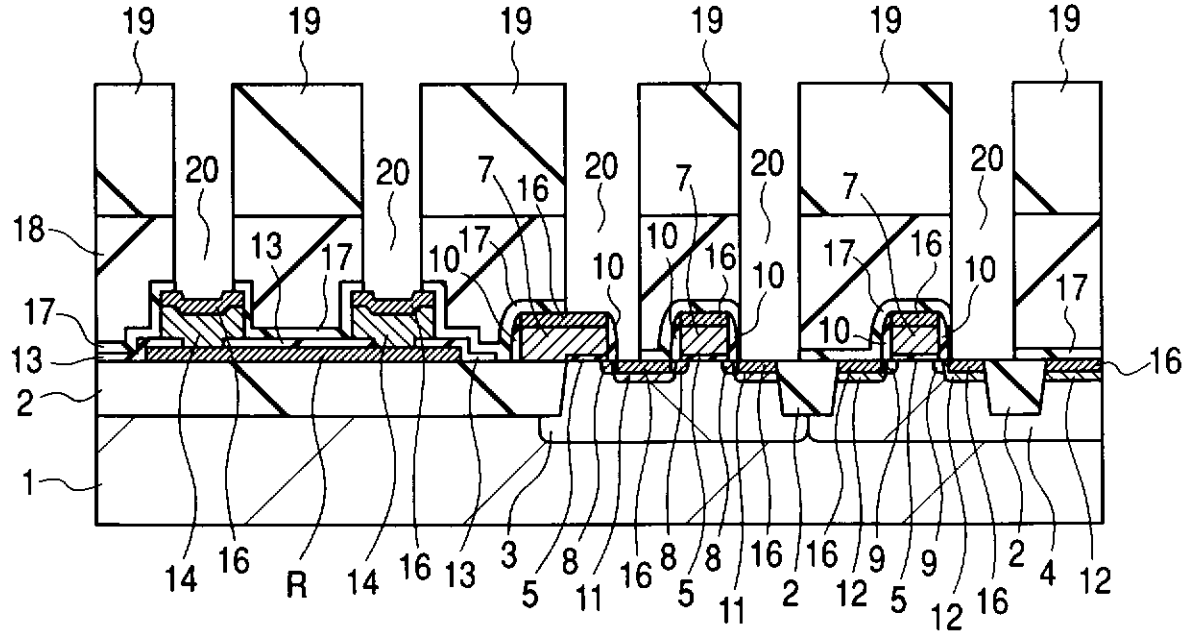

19
20
18
17
13
2
1
7
16
10
17
R
14
3
5
8
11
12
9
4

FIG. 6

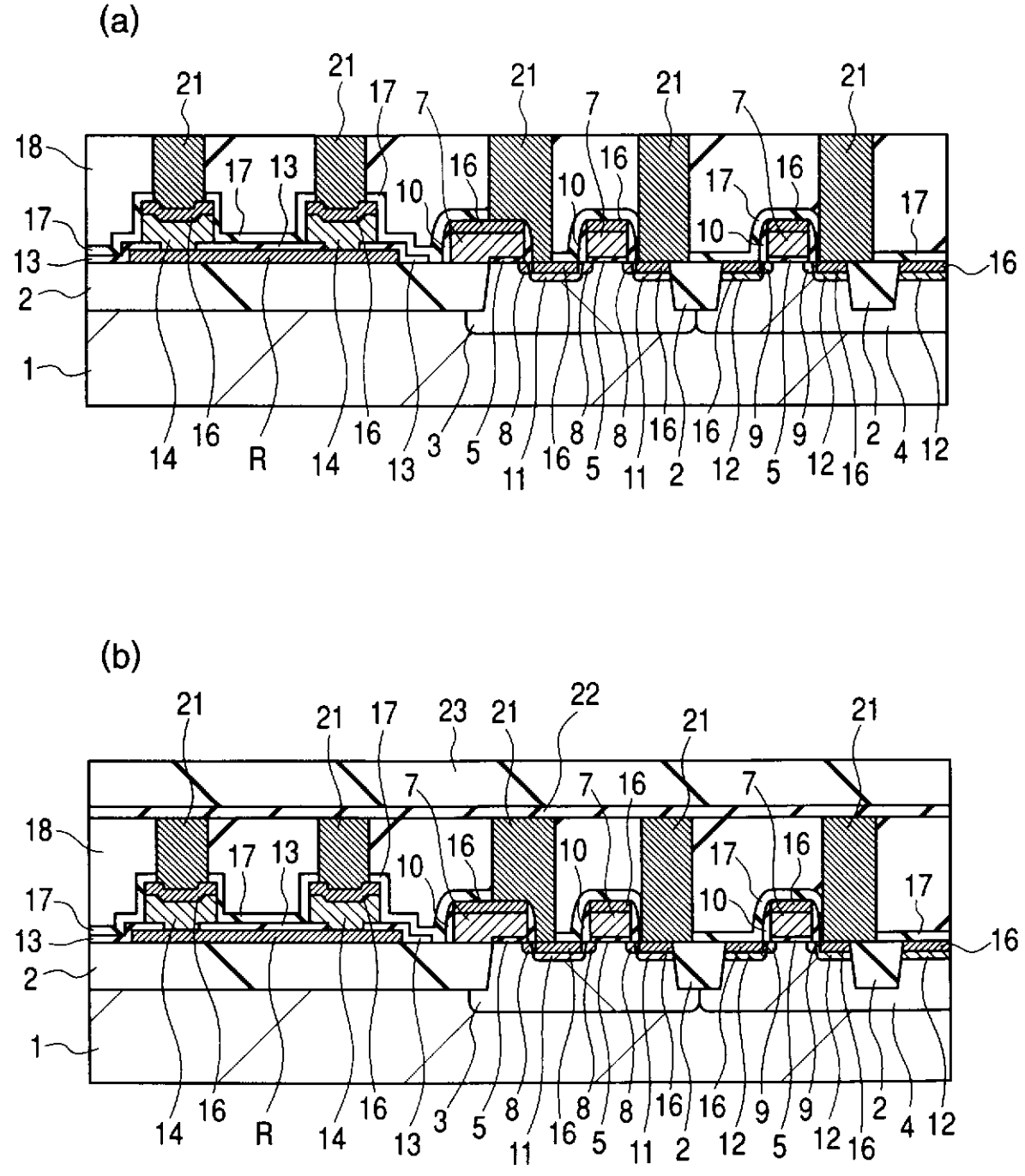
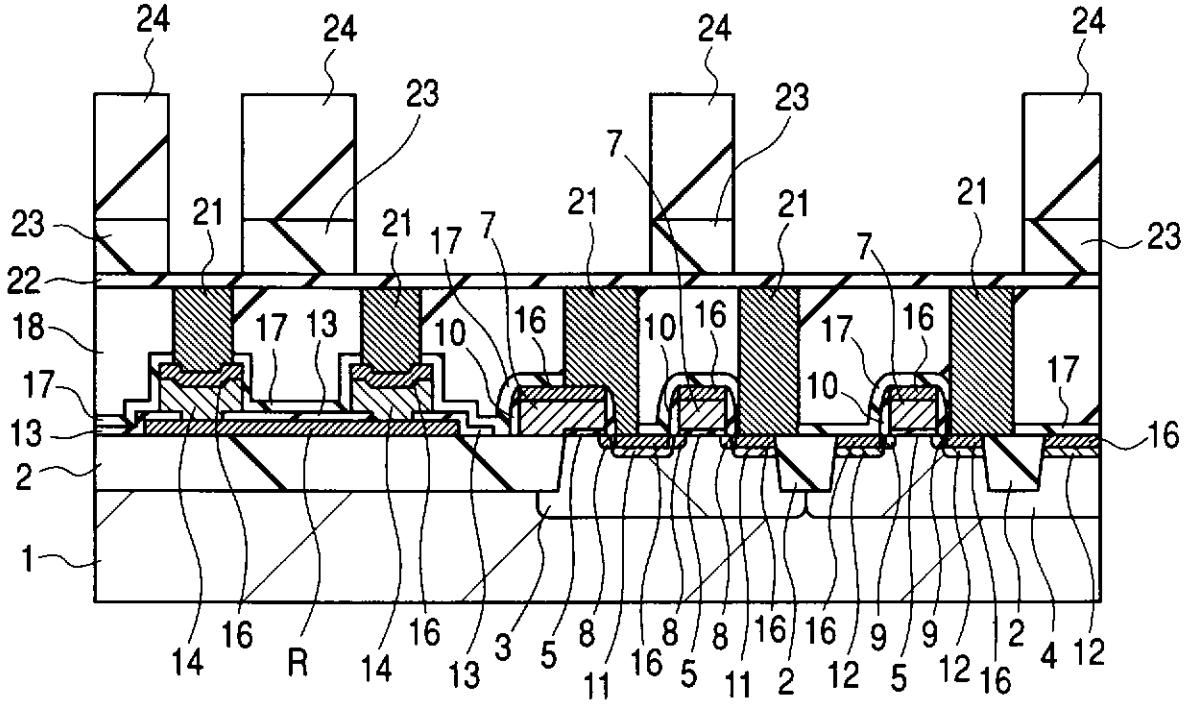


FIG. 7

(a)


24
23
21
22
18
17
13
2
1
7
10
16
R
14
3
5
8
11
12
9
4

(b)

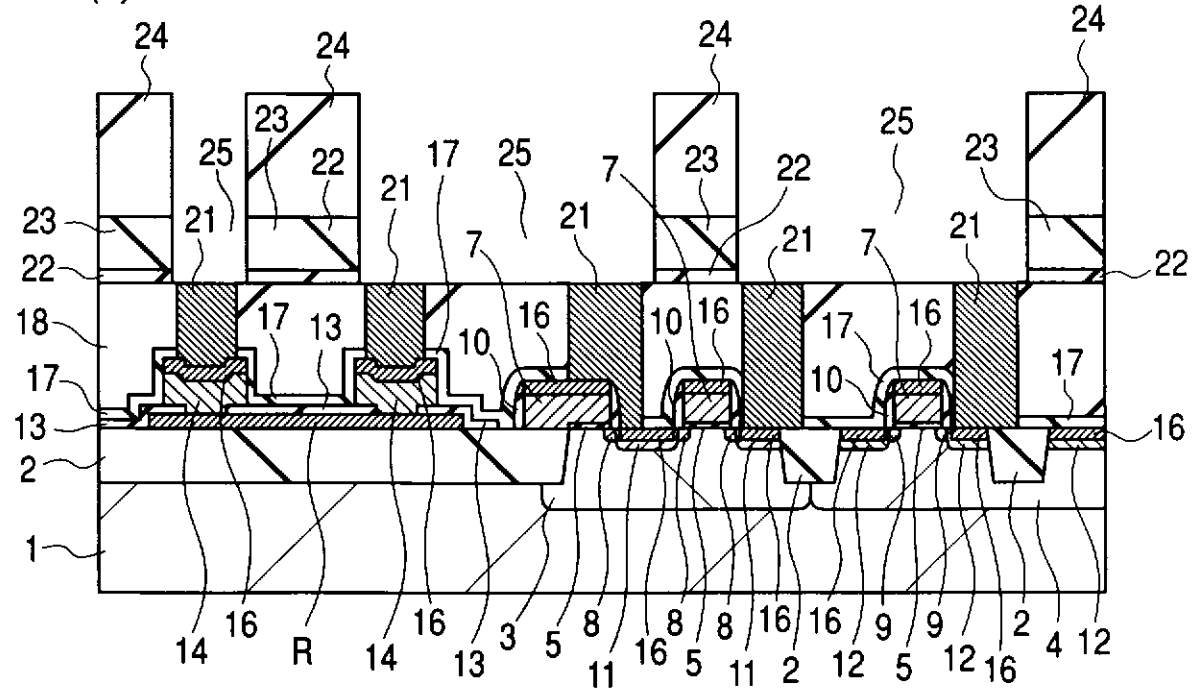
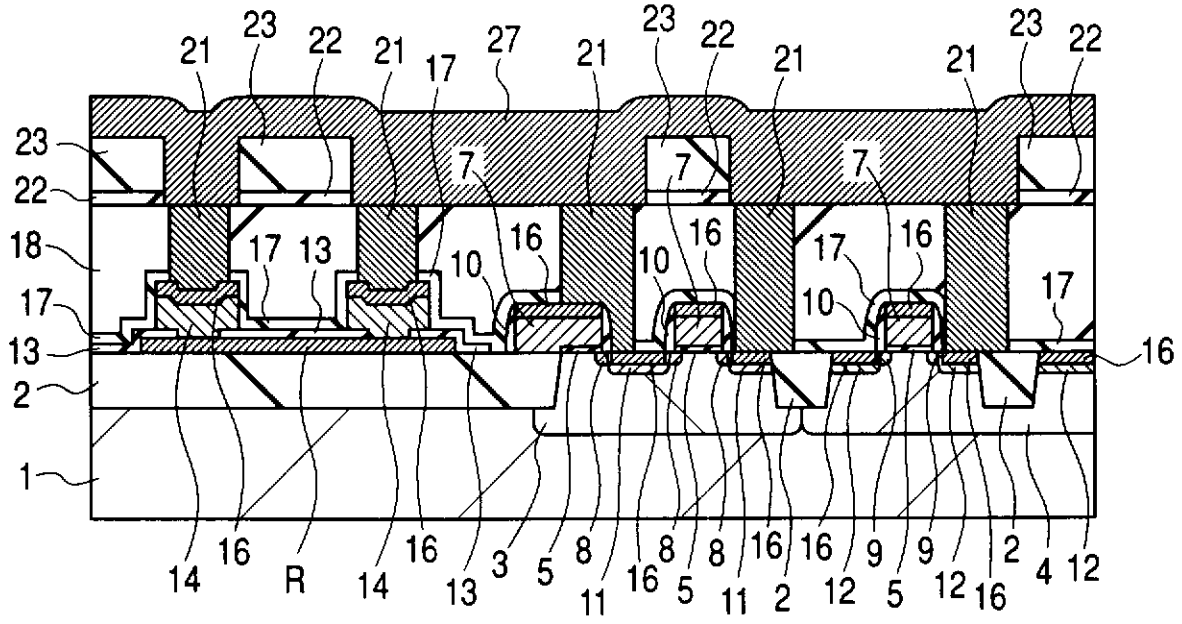

24
23
25
22
21
17
7
18
13
2
1
10
16
R
14
3
5
8
11
12
9
4

FIG. 8

(a)


21 23 22 21 17 27 21 23 22 21 21 23 22
23
22
18
17
13
2
1
7 7 7
17 13 10 16 10 16 17 16 10 17
16
14 16 R 14 16 13 3 5 8 11 16 8 5 8 11 16 2 16 12 9 5 9 12 16 2 4 12

(b)

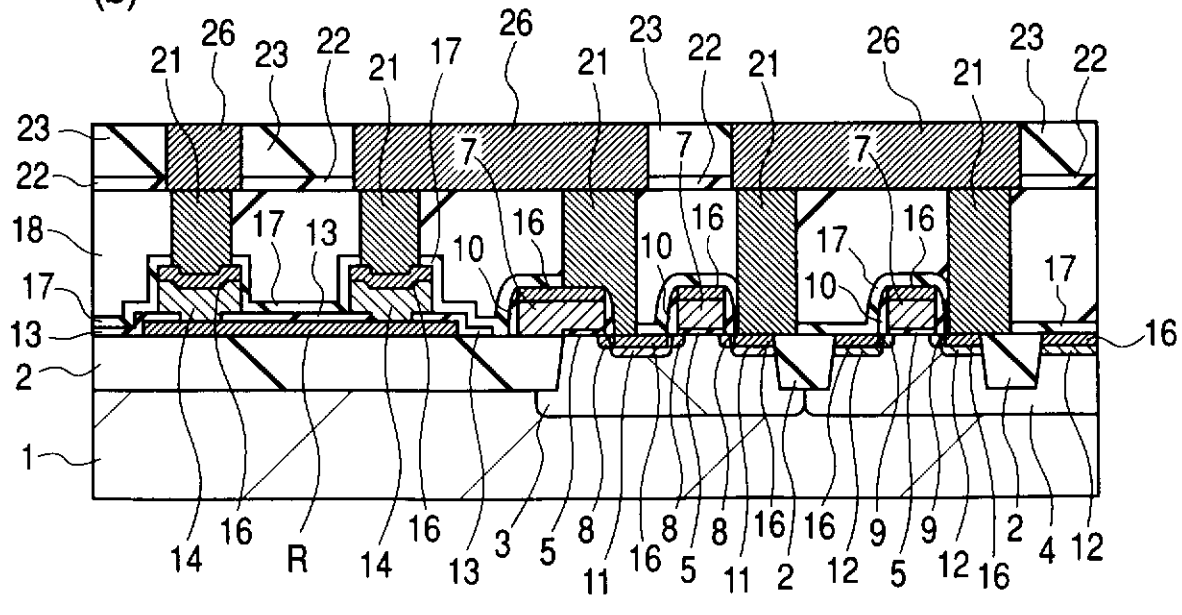

21 26 23 22 21 17 26 21 23 22 21 26 21 23 22
23
22
18
17
13
2
1
7 7 7
17 13 10 16 10 16 17 16 10 17
16
14 16 R 14 16 13 3 5 8 11 16 8 5 8 11 16 2 16 12 9 5 9 12 16 2 4 12

FIG. 9

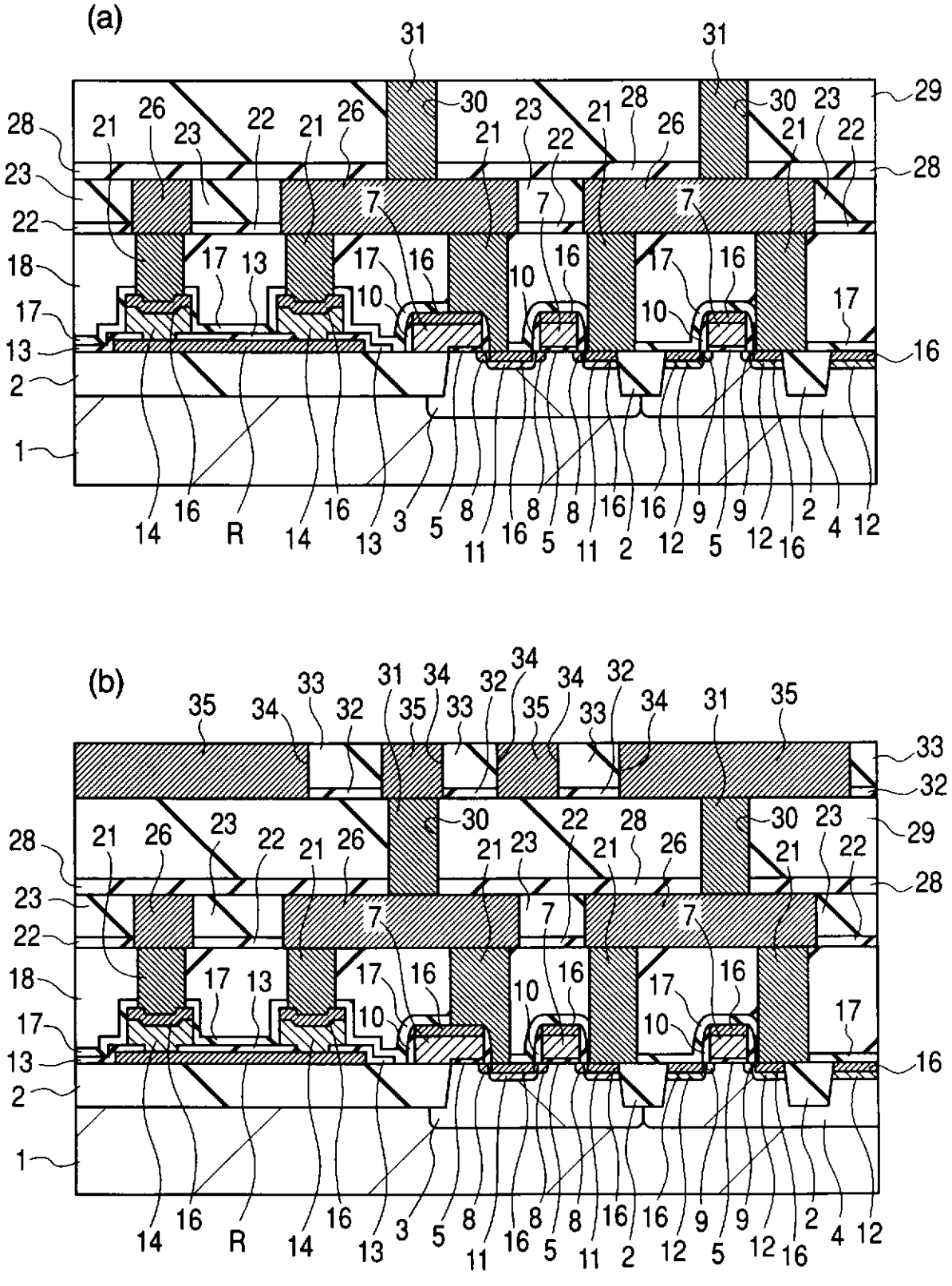


FIG. 10

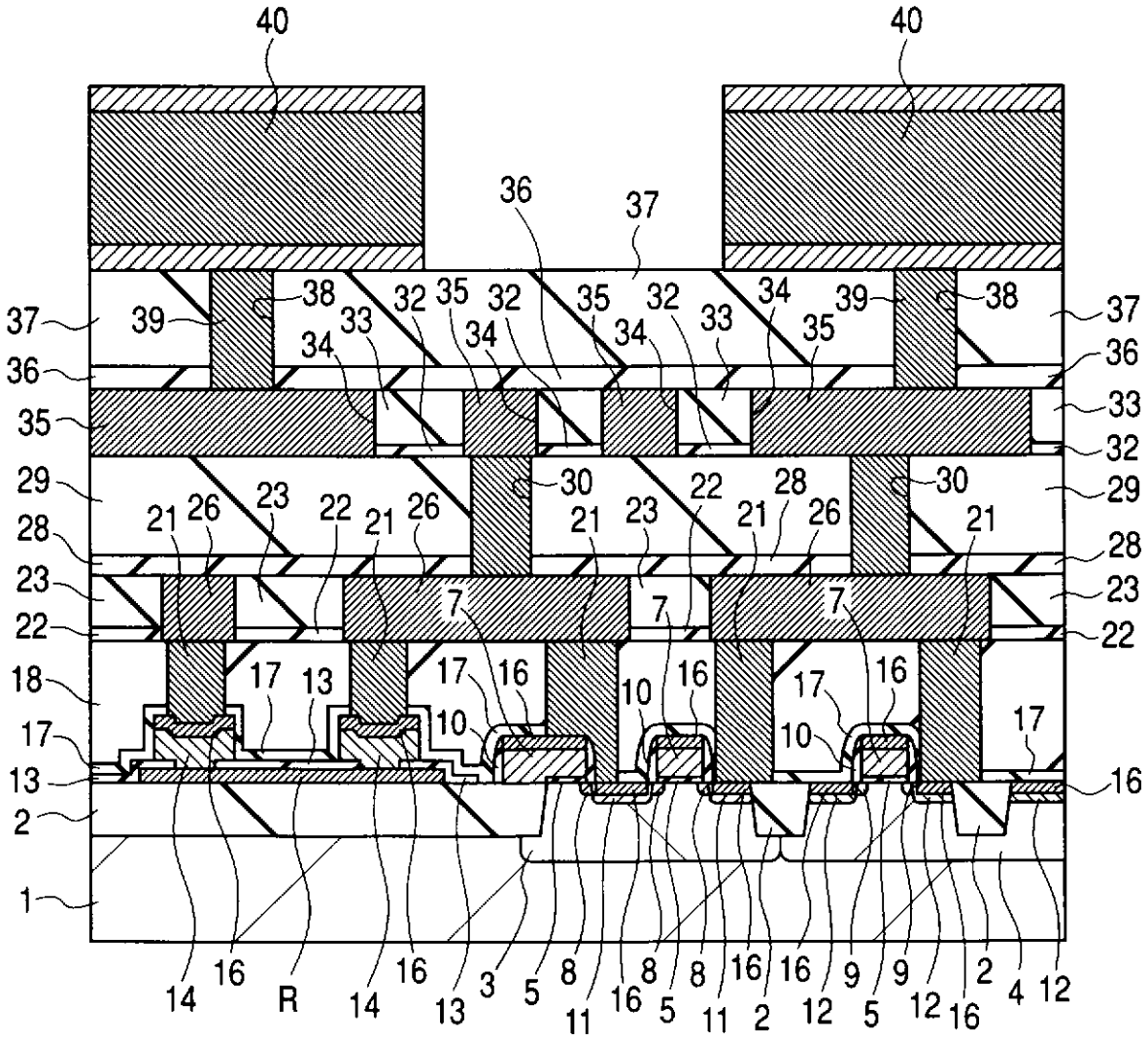

40
40
36
37
37
39
38
32
35
32
35
32
34
39
38
37
36
33
34
34
34
35
36
35
33
32
29
30
30
29
21
26
23
22
21
26
21
23
22
21
28
26
21
28
23
23
7
7
7
22
22
18
17
13
17
16
10
16
10
17
16
17
10
17
13
16
2
1
14
16
R
14
16
13
3
5
8
11
16
8
5
8
11
16
2
16
12
9
5
9
12
16
2
4
12

FIG. 11

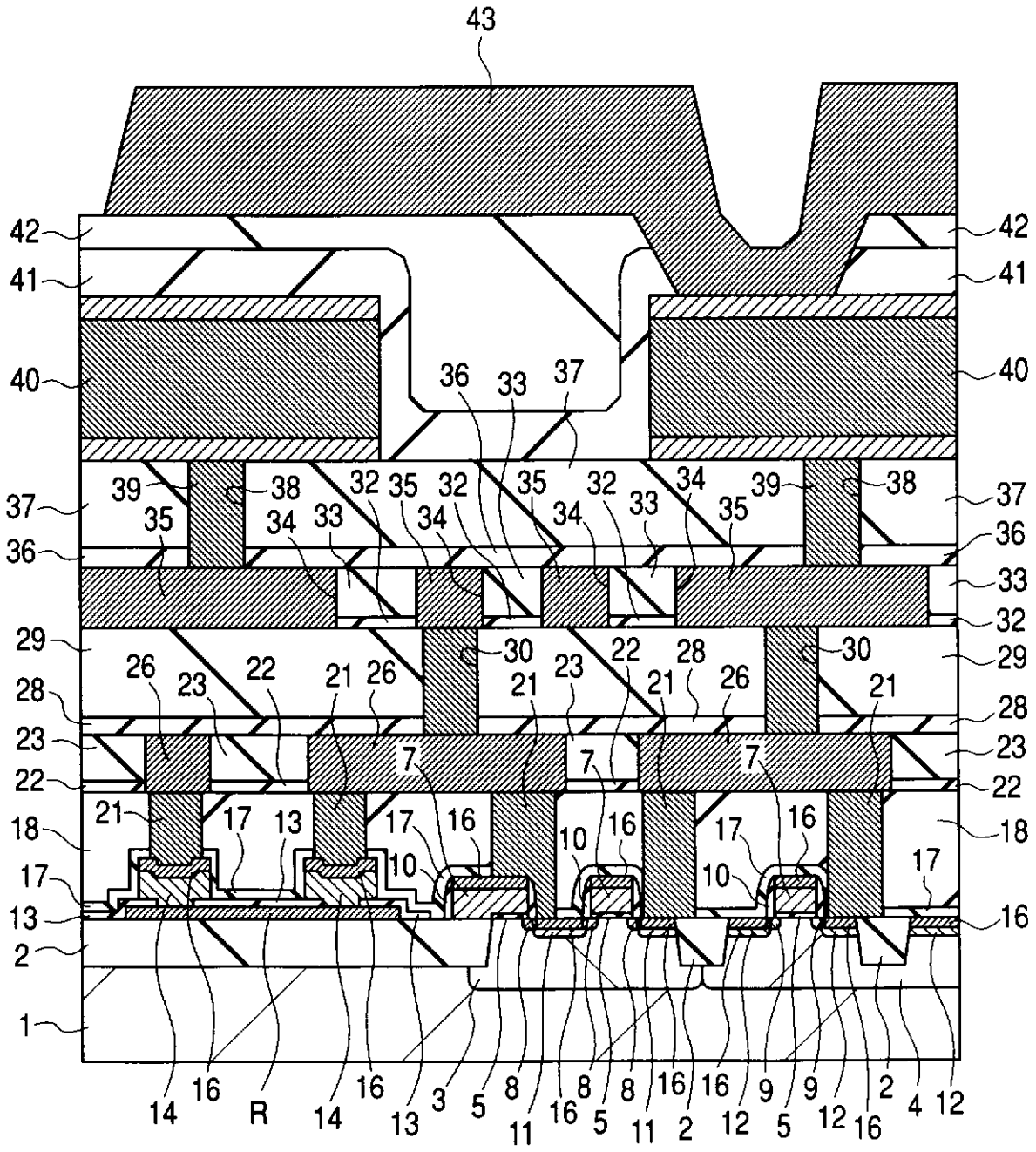


FIG. 12

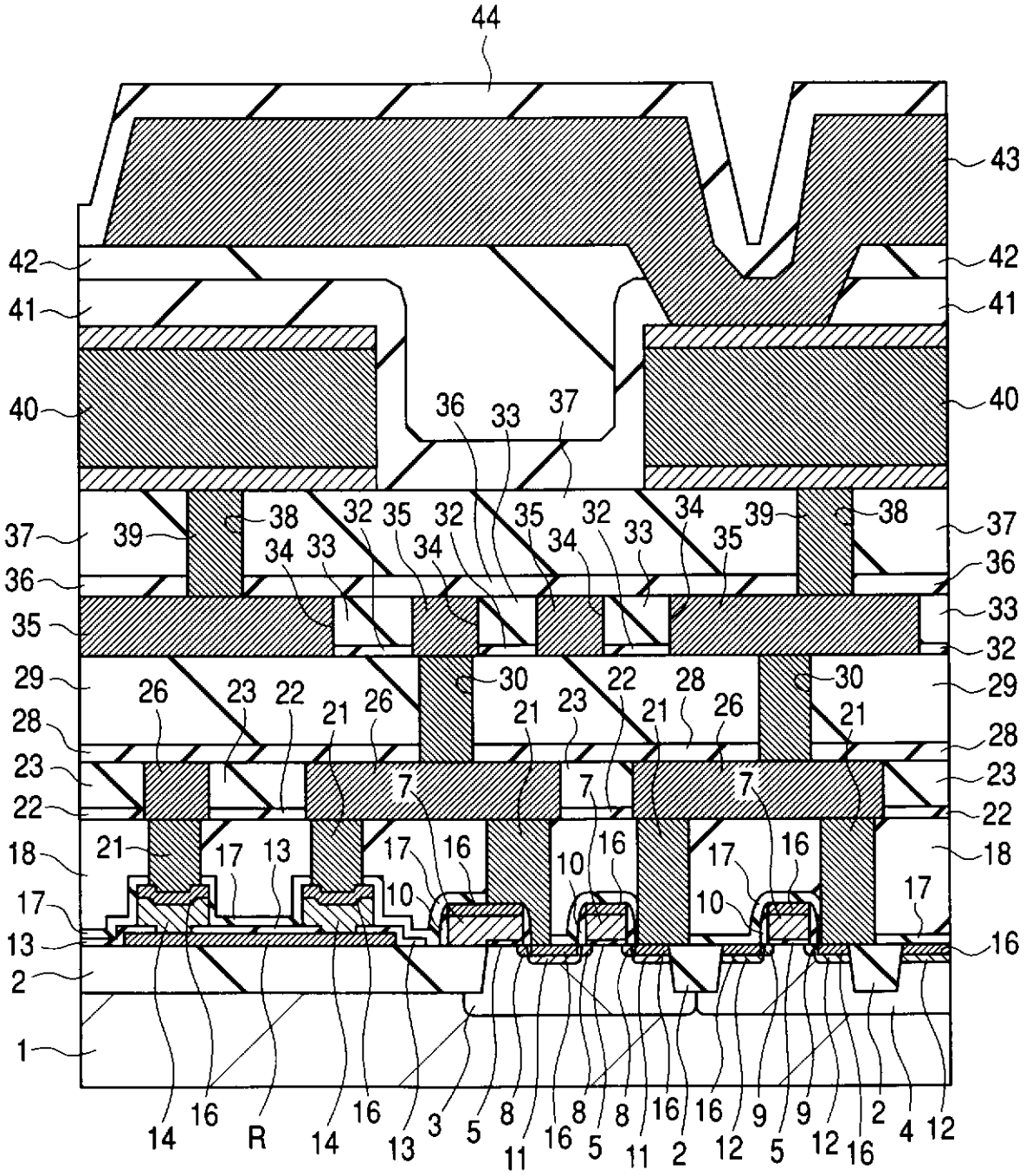

44
43
42
41
40
36
33
37
38
32
35
39
34
37
36
35
29
26
23
22
21
30
28
7
18
17
13
10
16
2
1
14
R
3
5
8
11
9
12
4

FIG. 13

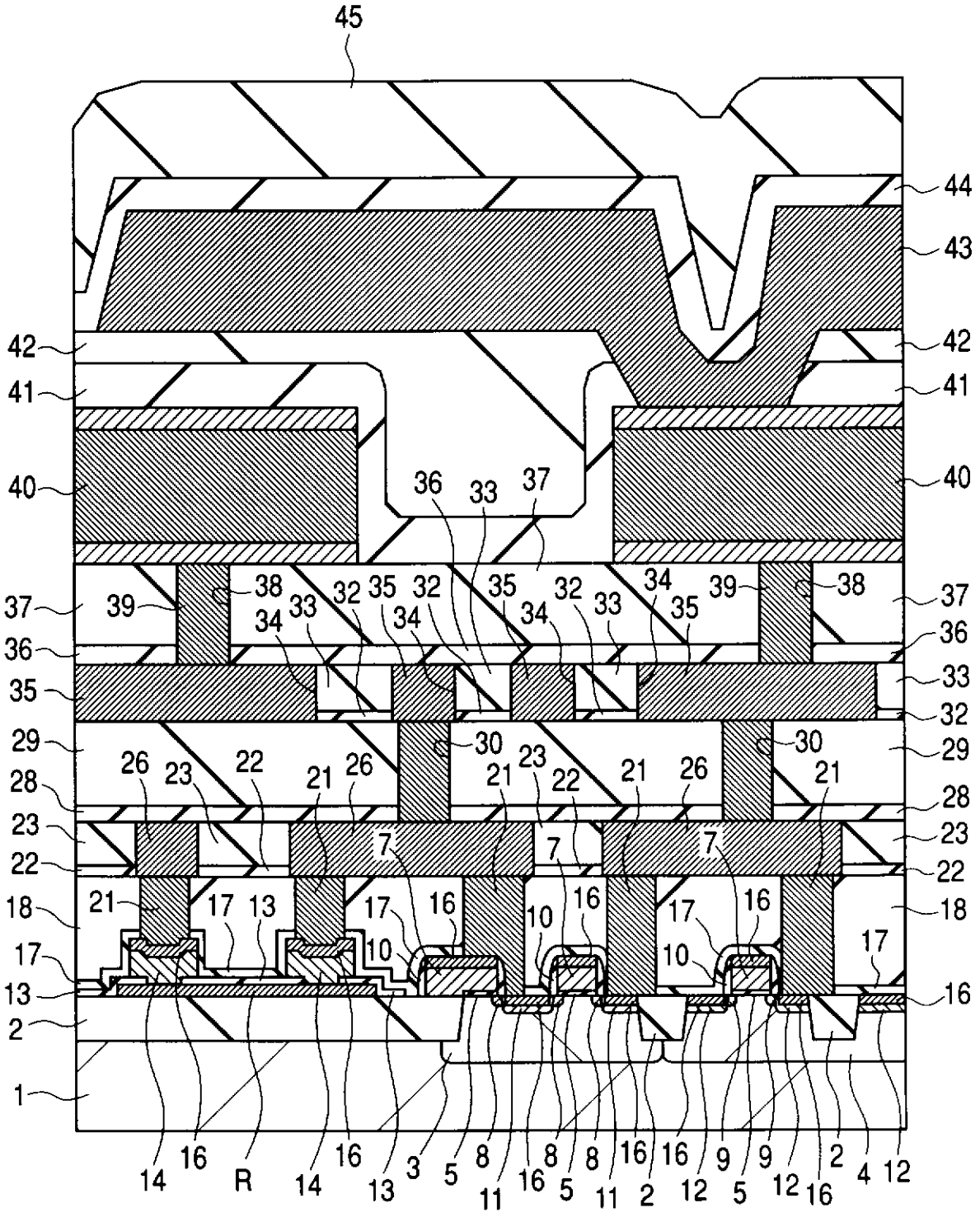

45
44
43
42
41
40
36
33
37
38
39
32
35
34
37
36
35
29
28
23
22
18
17
13
2
1
30
26
23
22
21
7
16
10
R
3
5
8
11
9
12
4

FIG. 14

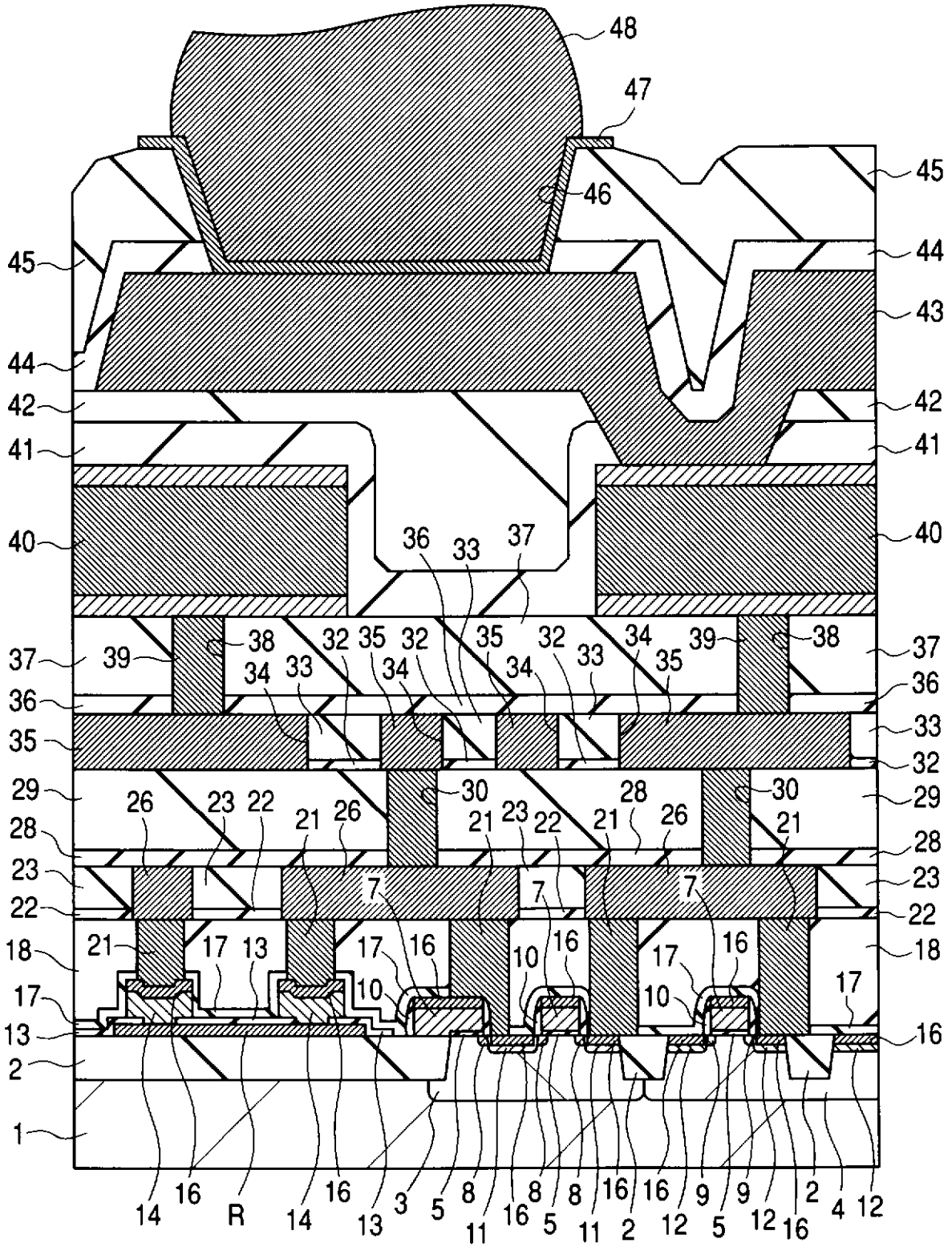

48
47
46
45
44
43
42
41
40
36
33
37
38
32
35
34
39
7
30
28
26
23
22
21
18
17
16
13
10
2
1
14
R
3
5
8
11
9
12
4

FIG. 15

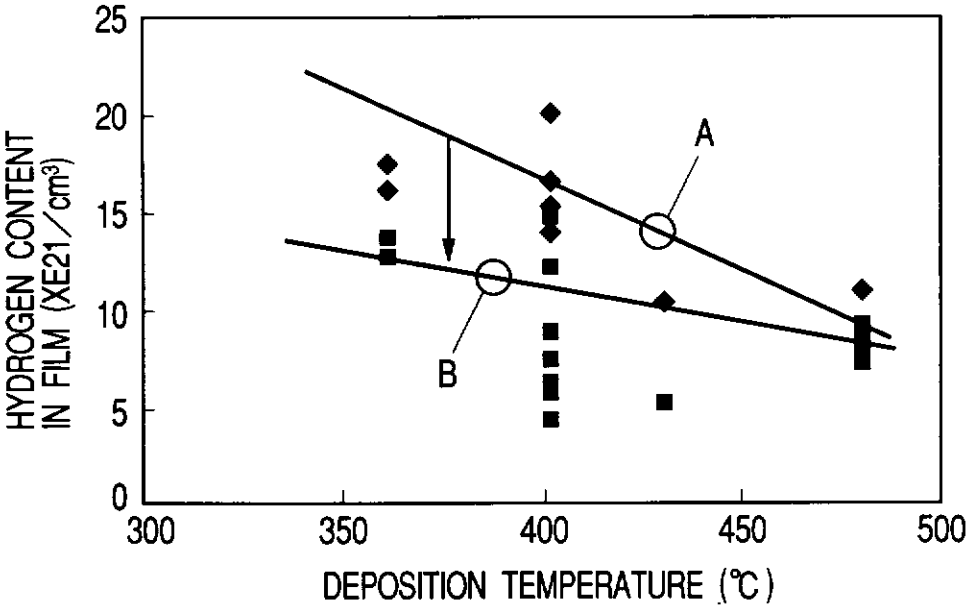

HYDROGEN CONTENT IN FILM (XE21/cm³)
25
20
15
10
5
0
300
350
400
450
500
DEPOSITION TEMPERATURE (℃)
A
B

FIG. 16

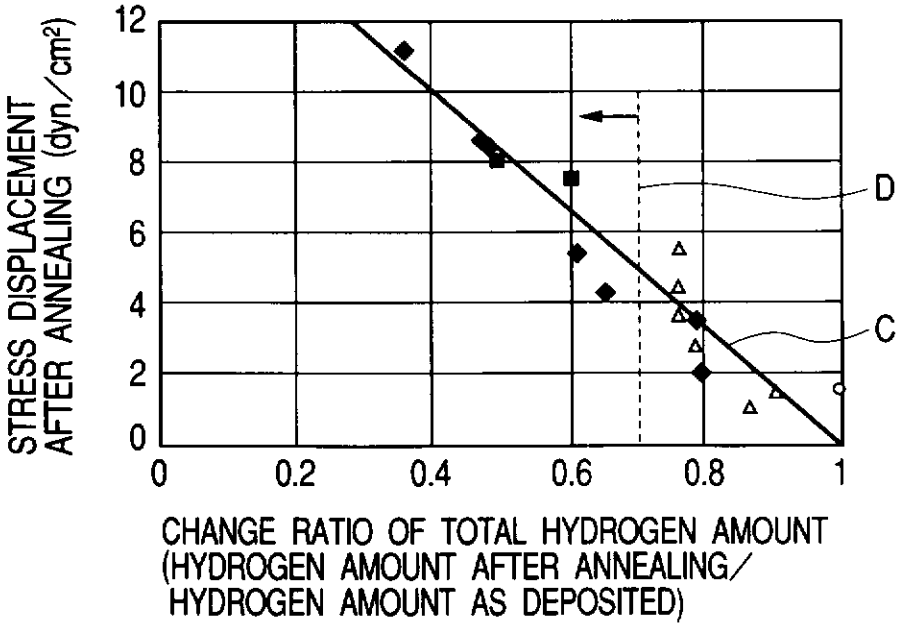

STRESS DISPLACEMENT AFTER ANNEALING (dyn/cm²)
12
10
8
6
4
2
0
0
0.2
0.4
0.6
0.8
1
CHANGE RATIO OF TOTAL HYDROGEN AMOUNT (HYDROGEN AMOUNT AFTER ANNEALING/ HYDROGEN AMOUNT AS DEPOSITED)
D
C

FIG. 17

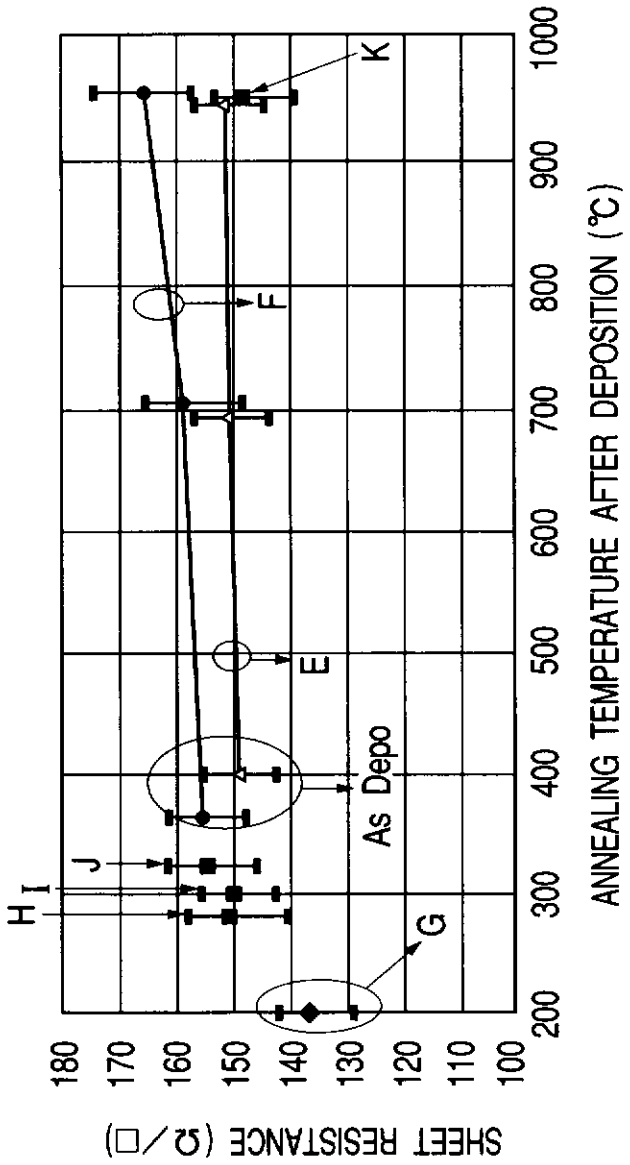

SHEET RESISTANCE (Ω/□)
180
170
160
150
140
130
120
110
100
200
300
400
500
600
700
800
900
1000
ANNEALING TEMPERATURE AFTER DEPOSITION (℃)
As Depo
H
I
J
E
F
G
K

FIG. 18

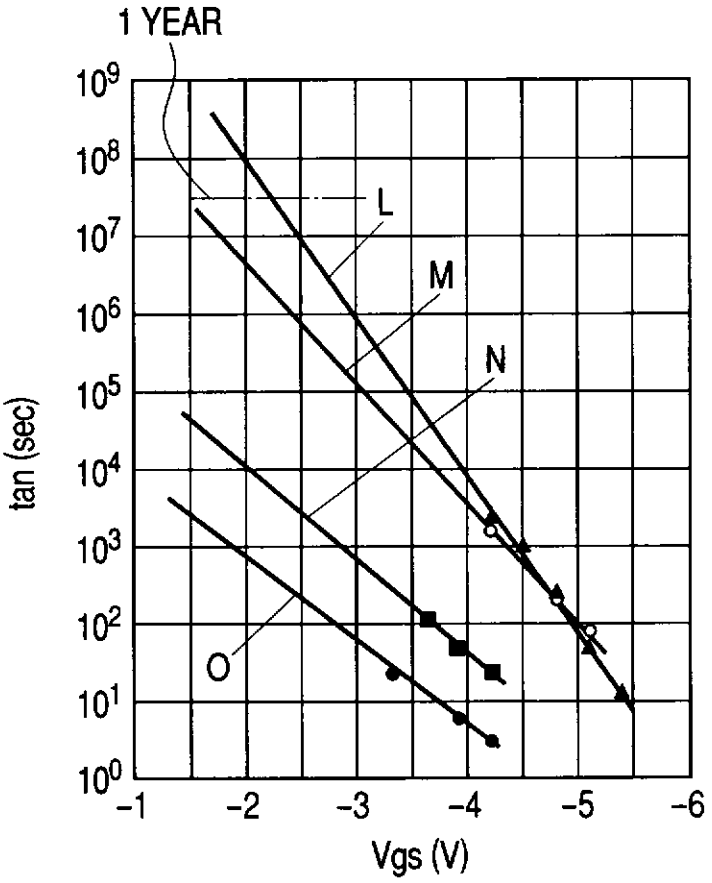

1 YEAR
10^9
10^8
10^7
10^6
10^5
10^4
10^3
10^2
10^1
10^0
tan (sec)
L
M
N
O
-1
-2
-3
-4
-5
-6
Vgs (V)

FIG. 19

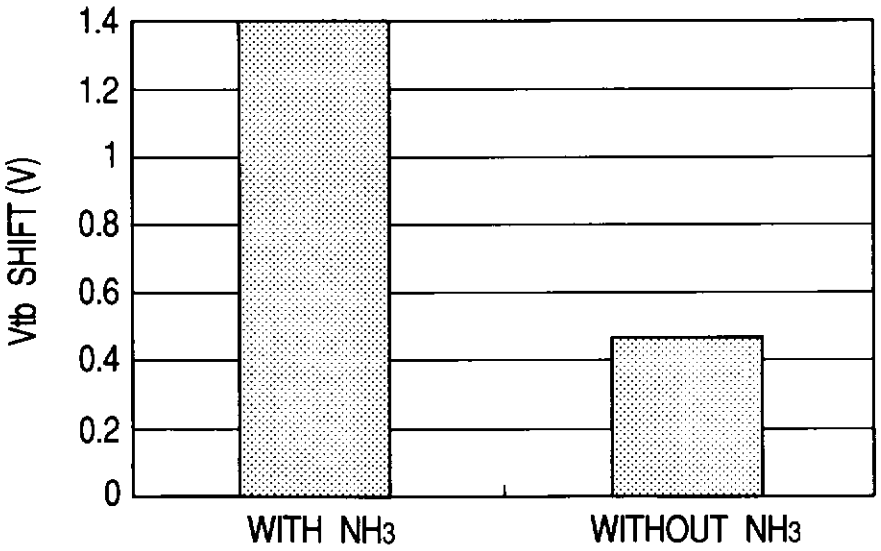

1.4
1.2
1
0.8
0.6
0.4
0.2
0
Vfb SHIFT (V)
WITH NH_3
WITHOUT NH_3

FIG. 20

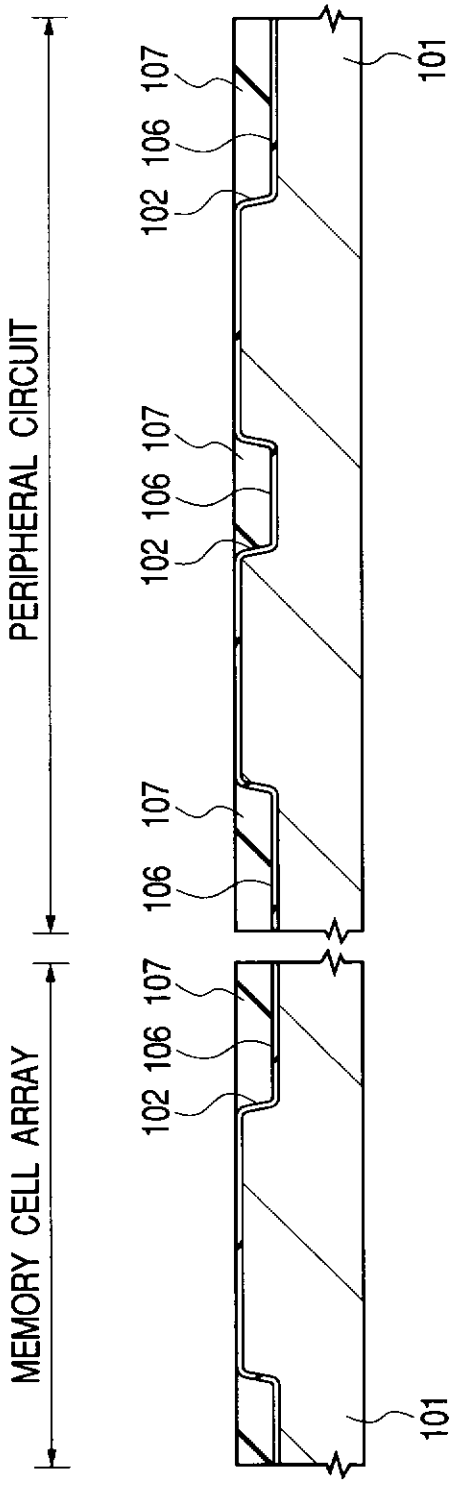

PERIPHERAL CIRCUIT
MEMORY CELL ARRAY
101
107
106
102
107
106
102
107
106
107
106
102
101

FIG. 21

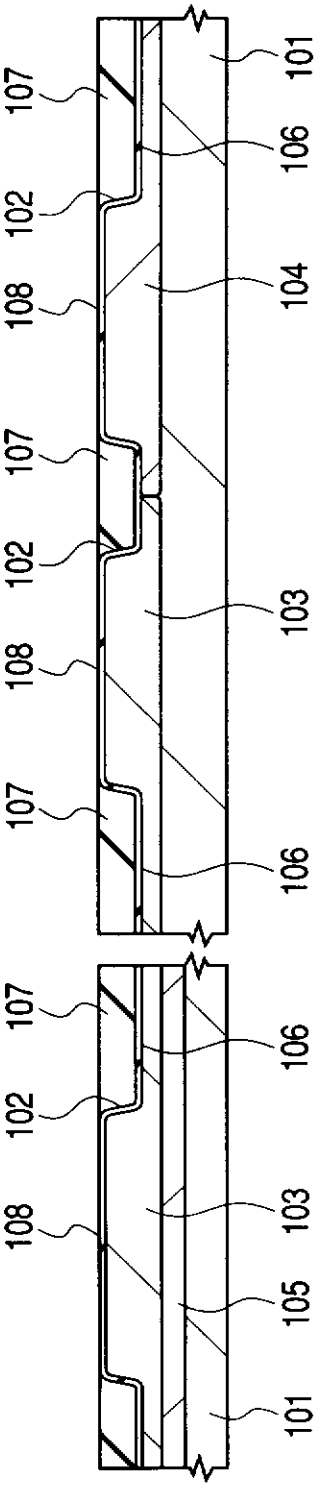

107
101
106
102
104
108
107
102
103
108
107
106
107
106
102
103
108
105
101

FIG. 22

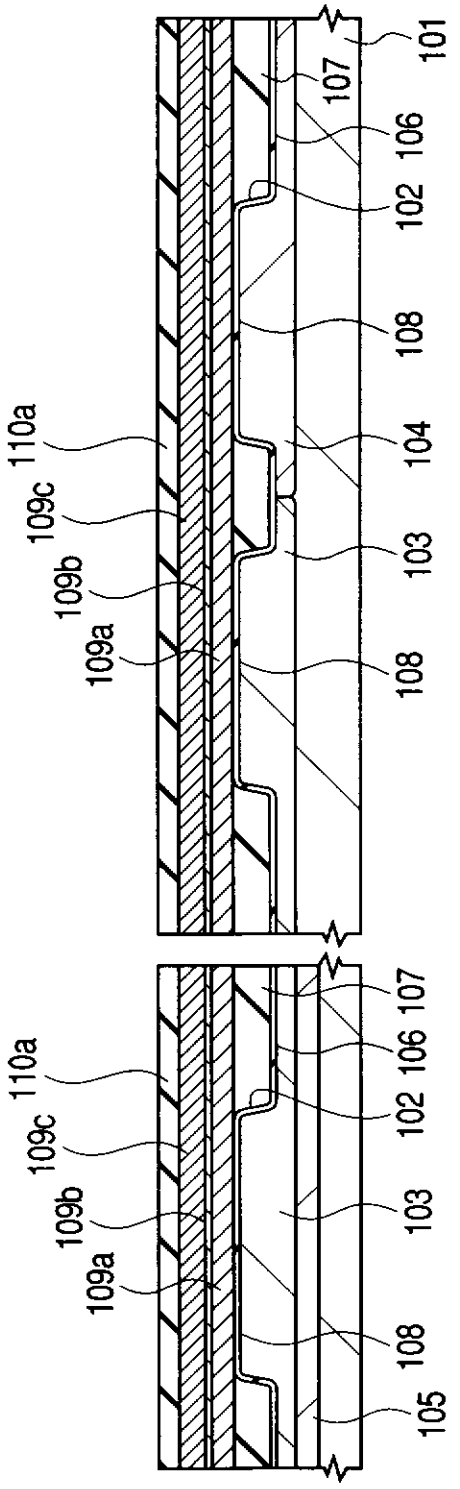

101
107
106
102
108
110a
104
109c
103
109b
108
109a
107
106
110a
102
109c
103
109b
108
109a
105

FIG. 23

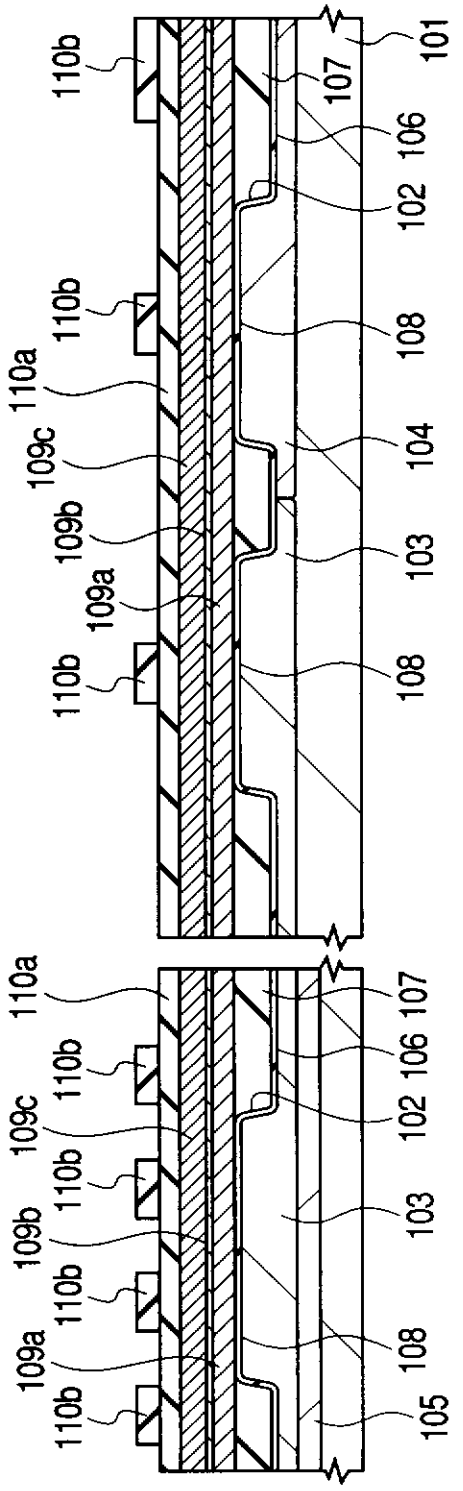

110b
101
107
106
102
110b
108
110a
109c
104
109b
103
109a
110b
108
110a
107
110b
106
109c
102
110b
109b
103
110b
109a
108
110b
105

FIG. 24

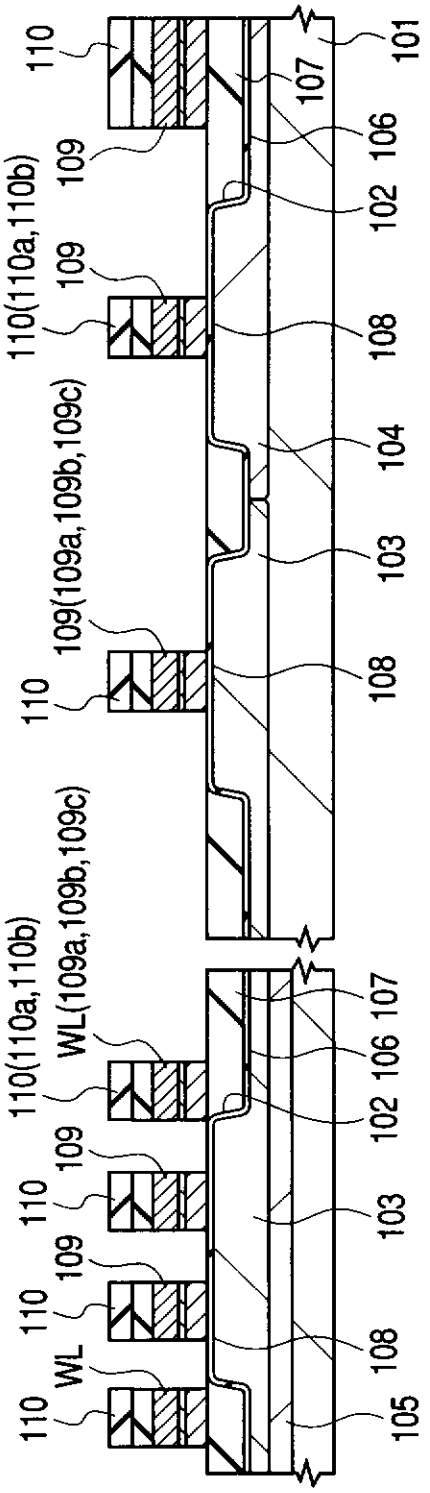

110
109
110(110a,110b)
109
110
109(109a,109b,109c)
110
WL(109a,109b,109c)
110(110a,110b)
109
110
109
110
WL
110
101
107
106
102
108
104
103
108
107
106
102
103
108
105

FIG. 25

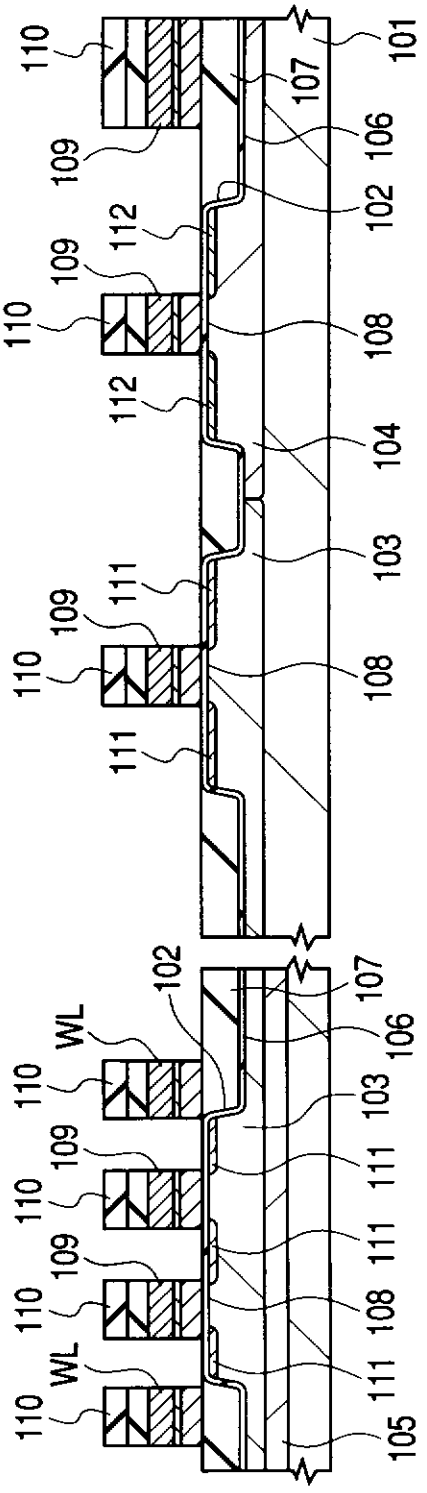


FIG. 26

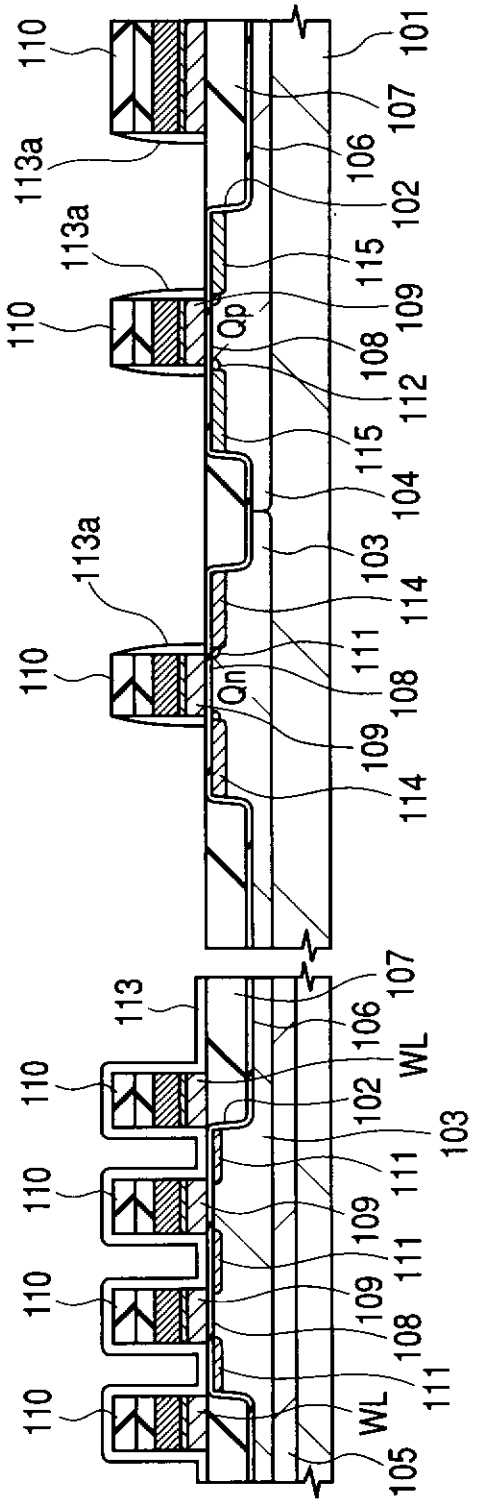

110
101
107
113a
106
102
115
109
Qp
108
112
104
103
114
111
Qn
113
WL
105

FIG. 27

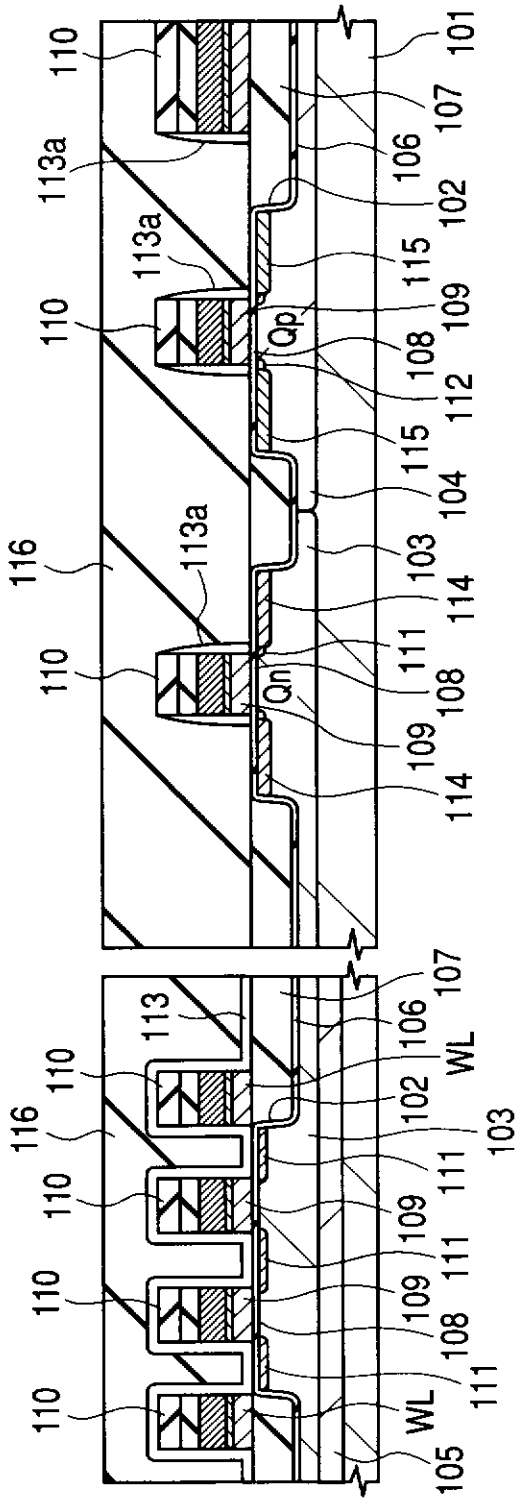

101
107
106
102
115
109
108
112
104
103
114
111
108
109
114
110
113a
116
Qp
Qn
113
WL
105

FIG. 28

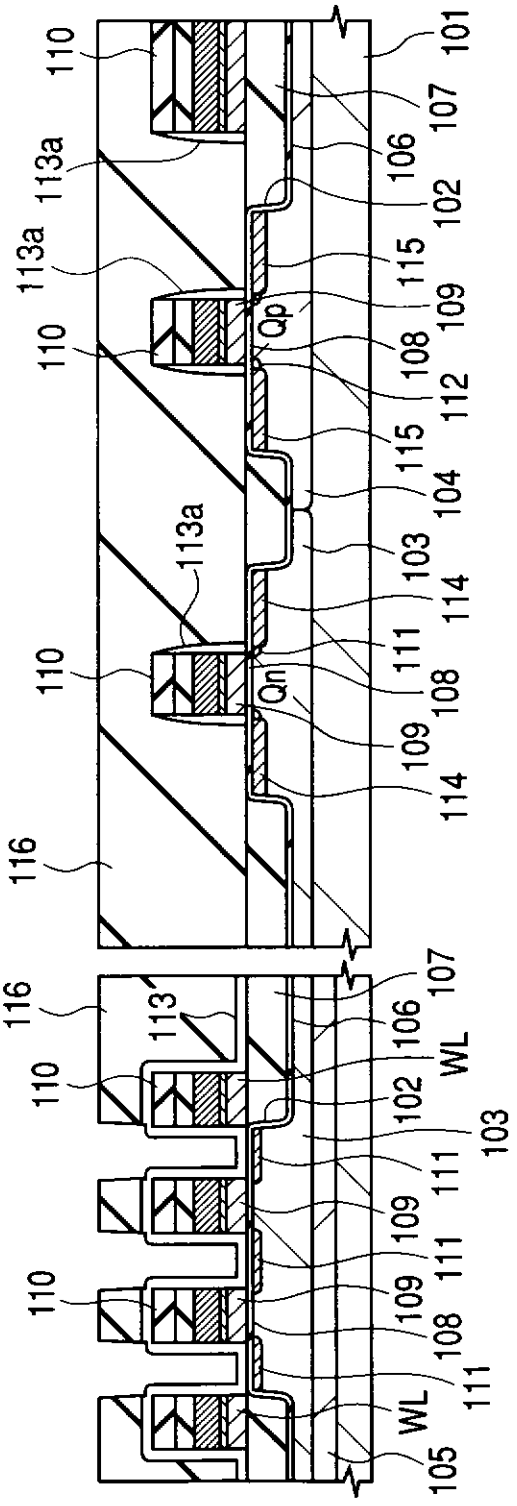

101
107
106
102
115
109
108
112
104
103
114
111
108
109
114
116
107
106
WL
102
103
111
109
111
109
108
111
WL
105
110
113a
113a
110
Qp
113a
110
Qn
110
116
113
110

FIG. 29

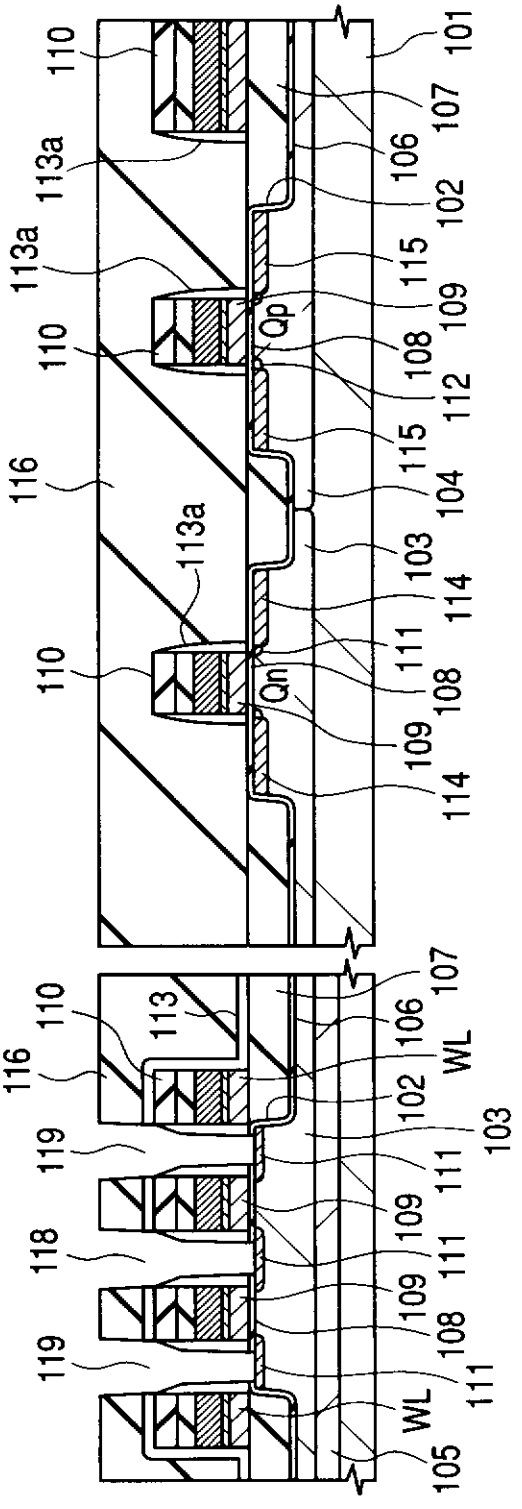

101
107
106
102
115
109
108
112
104
103
114
111
108
109
114
110
113a
116
Qp
Qn
113
WL
105
119
118
111

FIG. 30

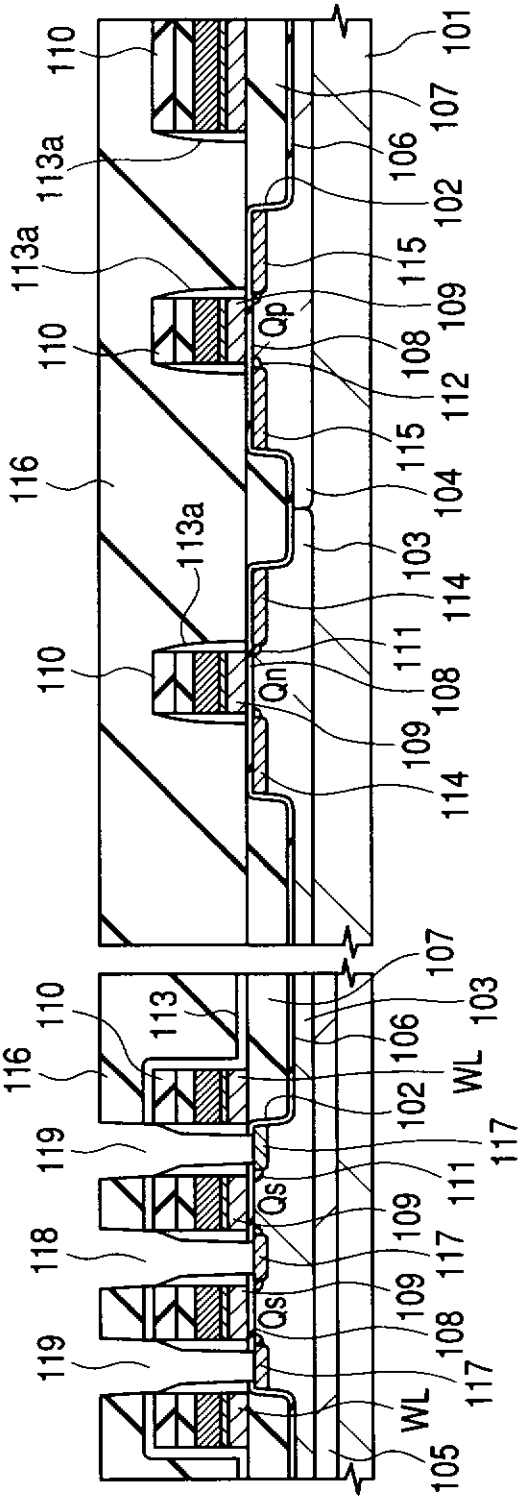

101
107
106
102
115
109
108
112
104
103
114
111
Qp
Qn
Qs
WL
105
110
113a
116
113
117
118
119

FIG. 31

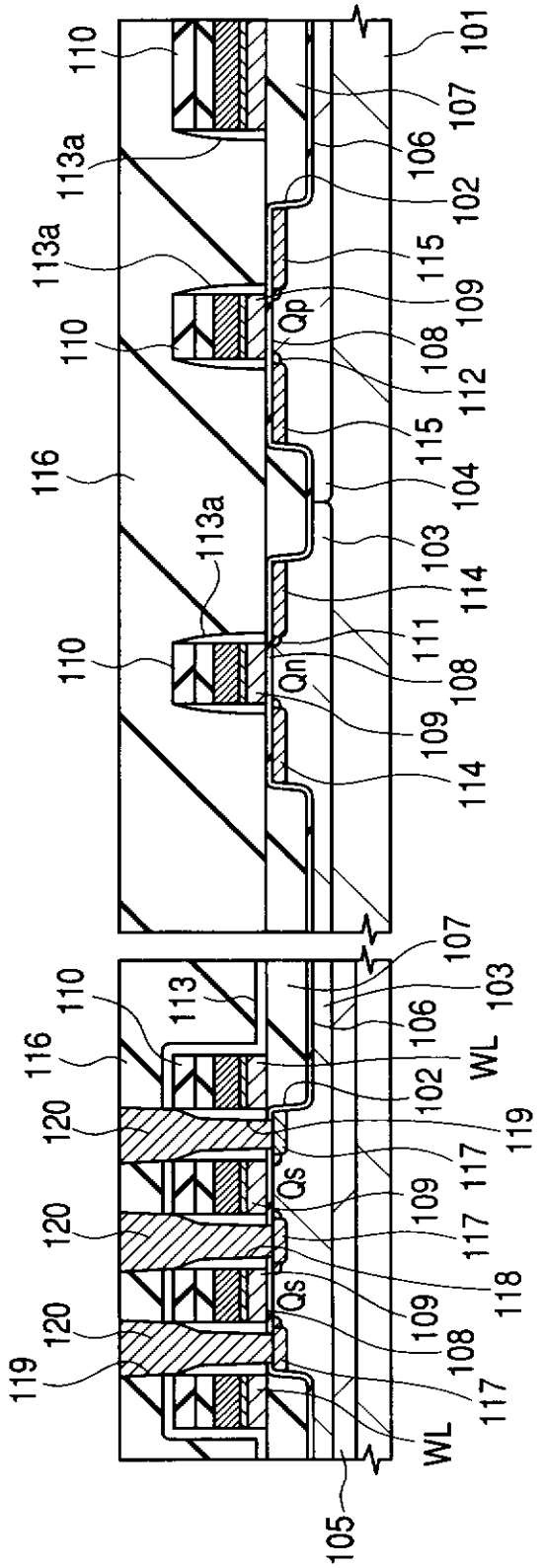

101
107
106
102
115
109
108
112
104
103
114
111
108
109
114
110
113a
116
Qp
Qn
Qs
113
WL
103
119
117
118
105

FIG. 32

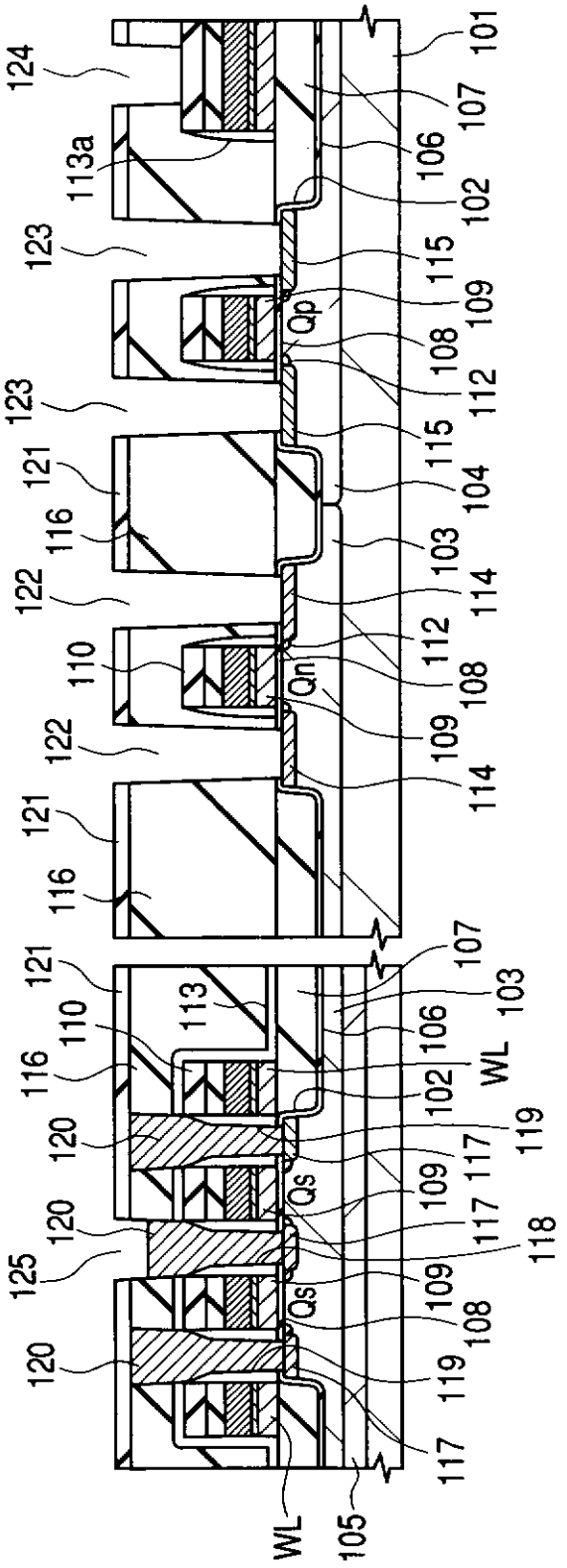

124
113a
123
123
121
116
122
110
122
121
116
121
110
116
120
120
125
120
WL
105
101
107
106
102
115
109
Qp
108
112
104
103
114
112
108
Qn
109
114
107
103
106
WL
102
119
117
109
Qs
117
118
109
108
119
117

FIG. 33

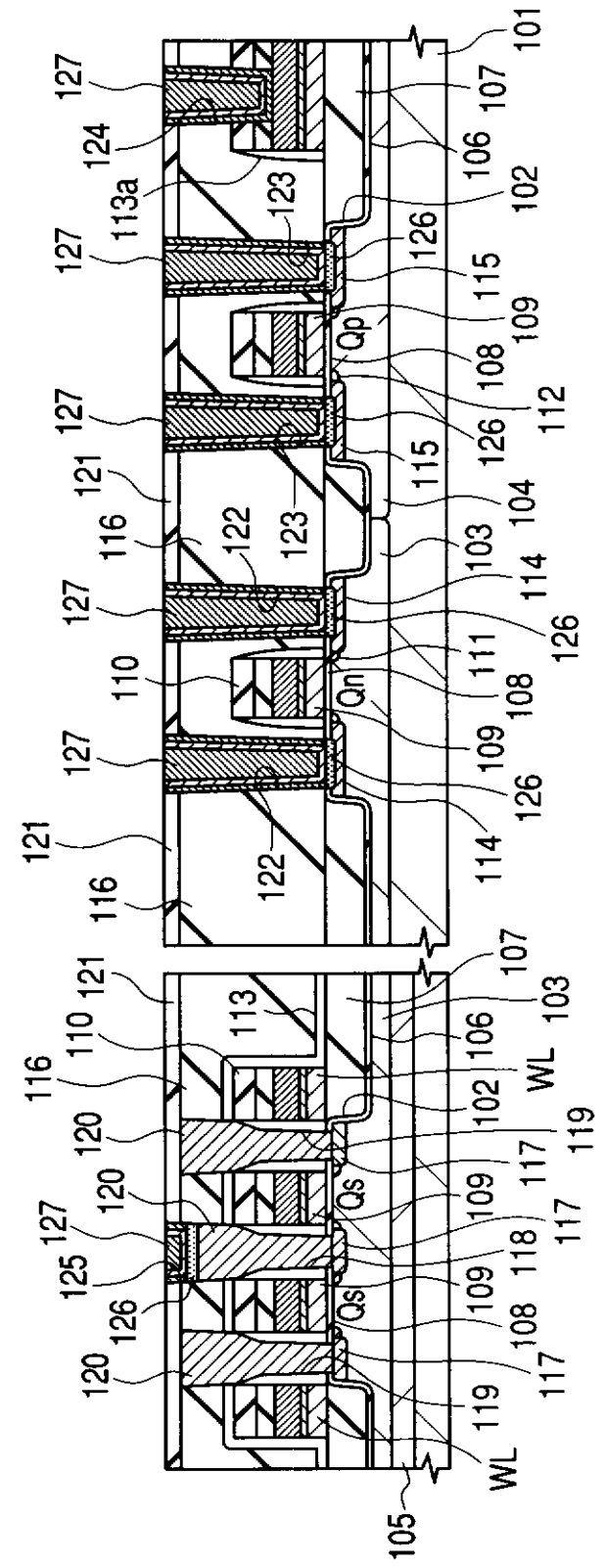

101
107
106
102
126
115
109
108
112
104
103
114
111
110
Qn
Qp
Qs
113a
123
124
127
121
116
122
113
120
125
118
117
119
WL
105

FIG. 34

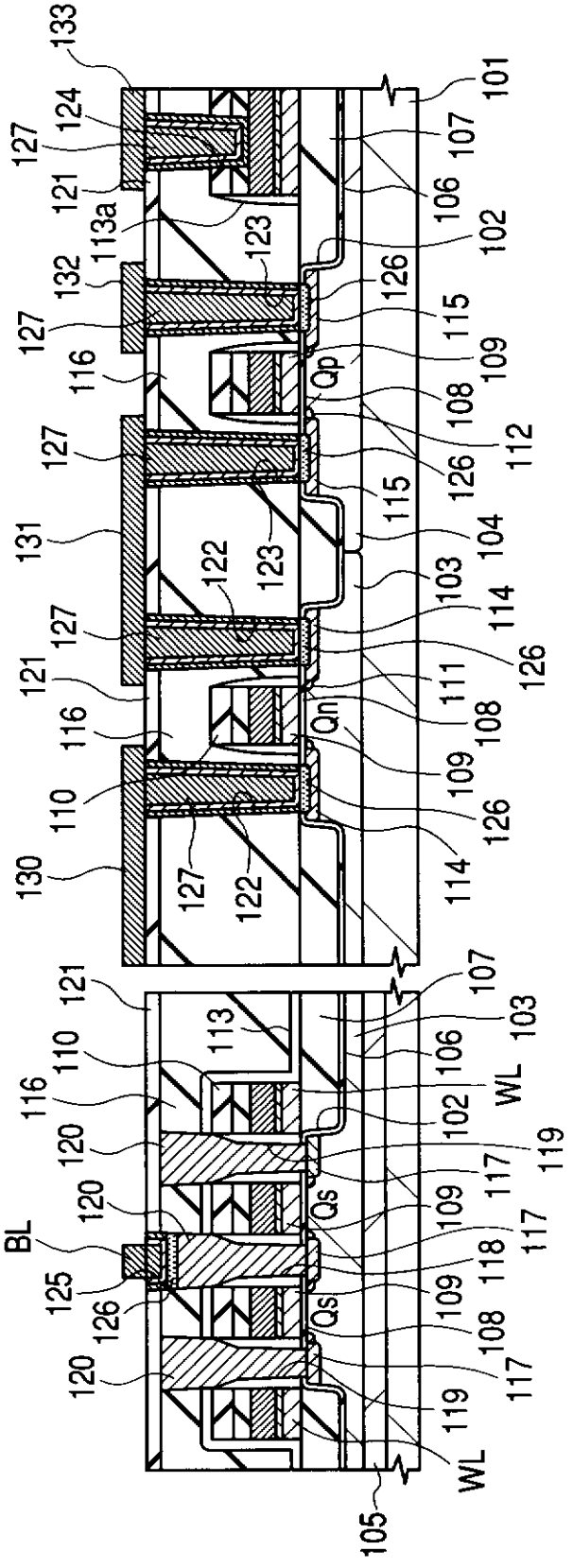

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FIG. 35

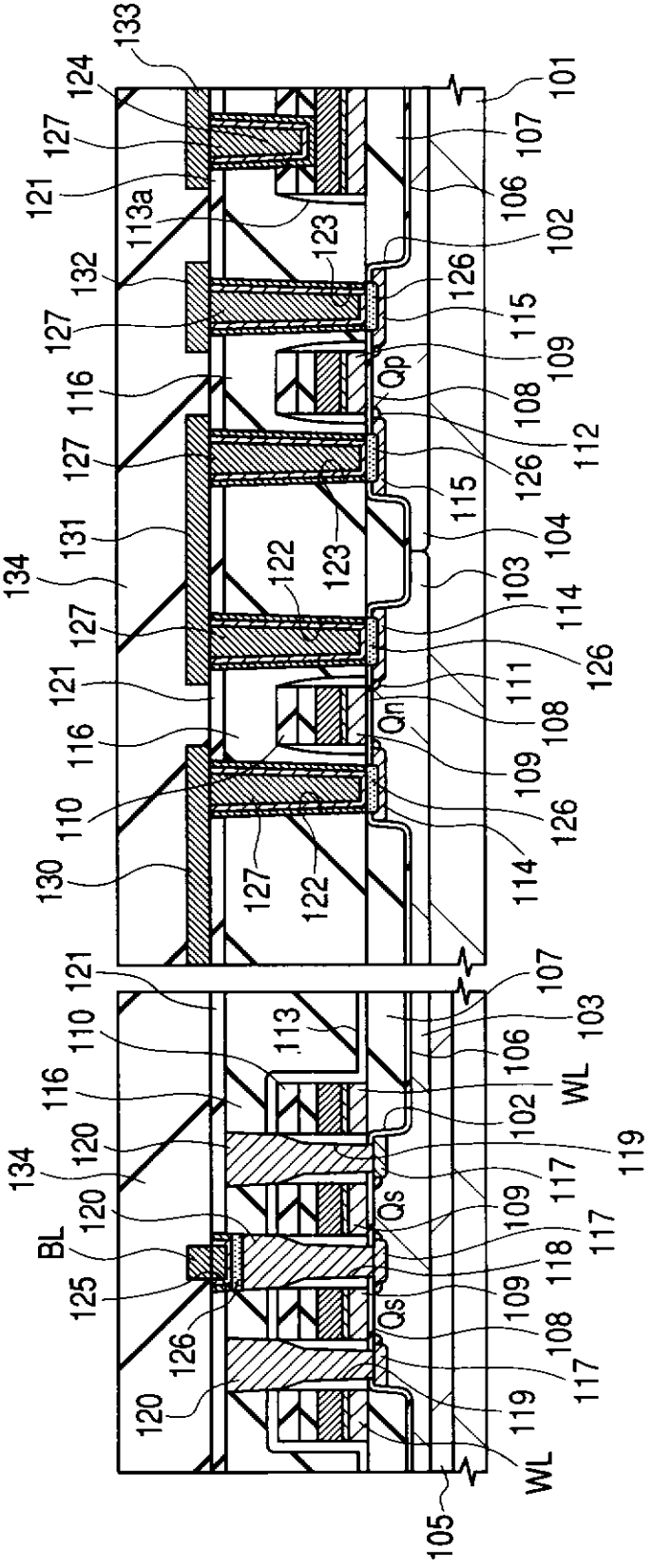

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FIG. 36

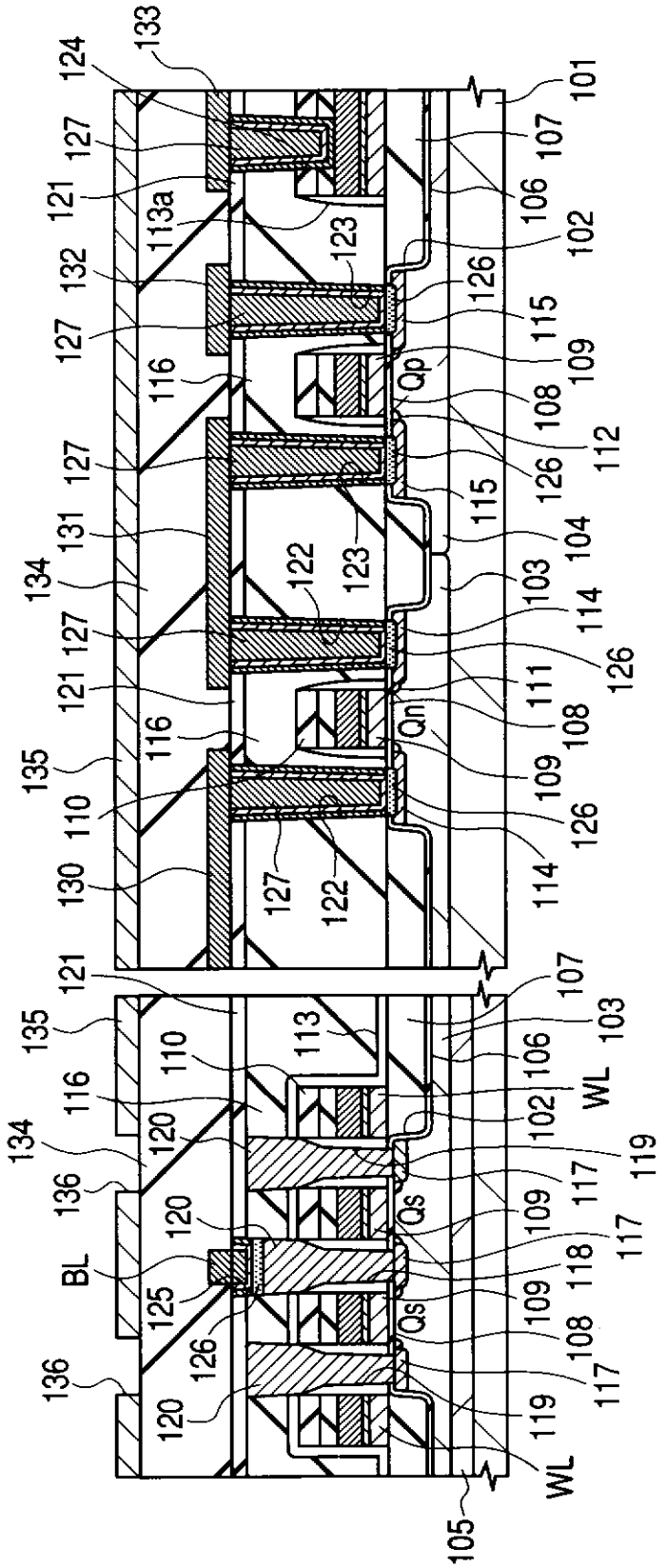

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FIG. 37

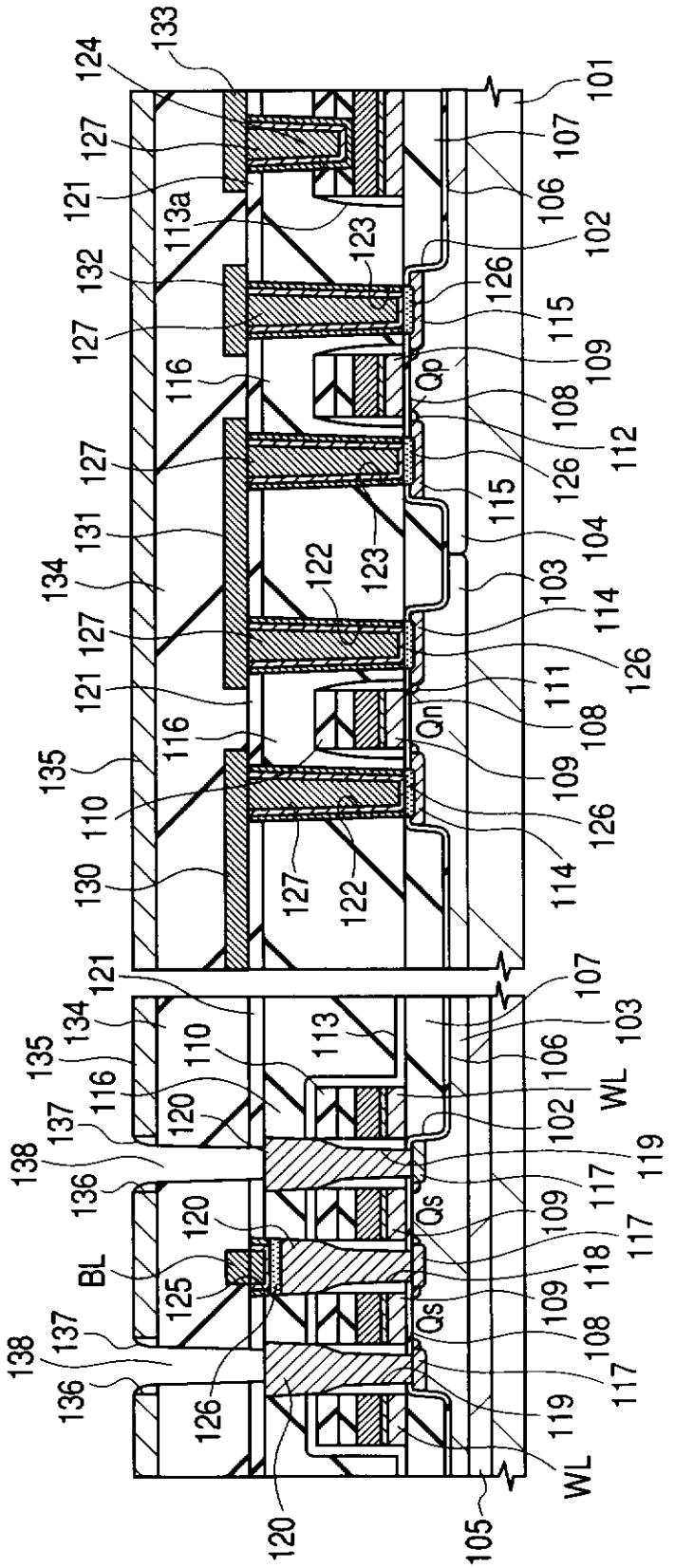

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FIG. 38

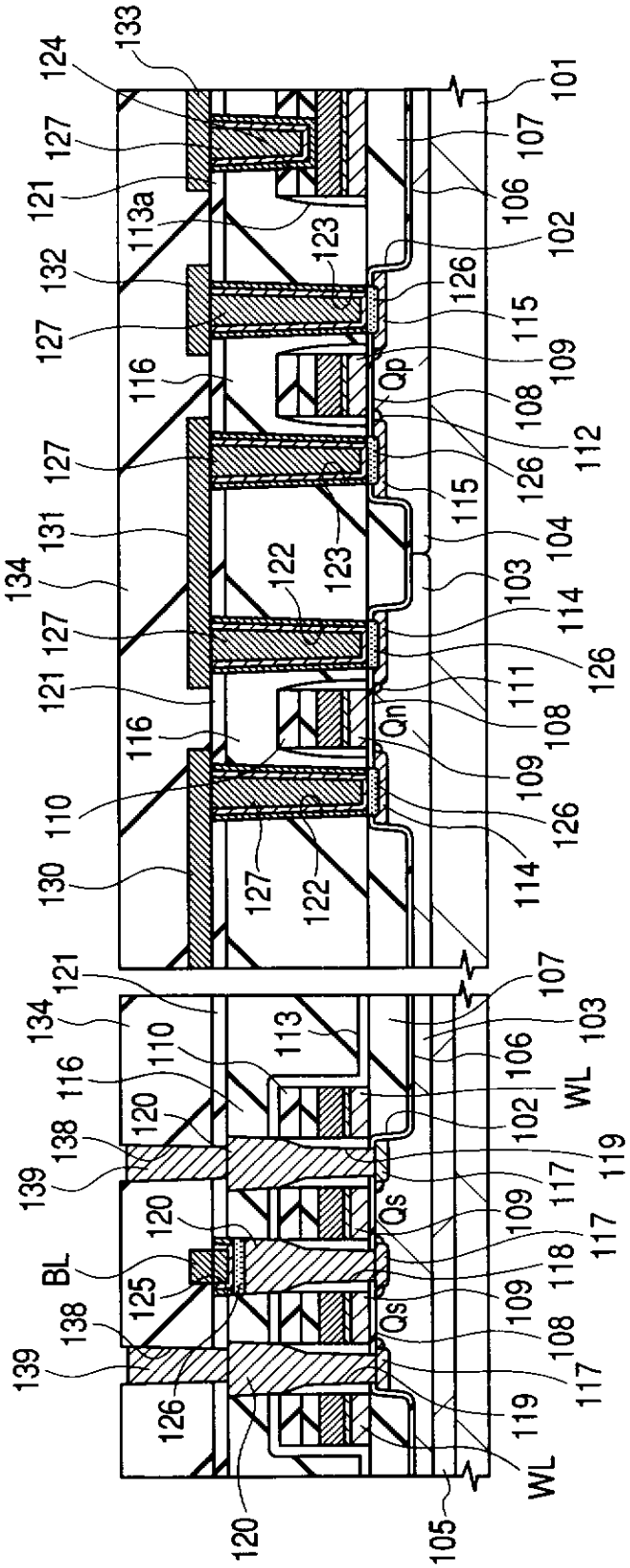

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FIG. 39

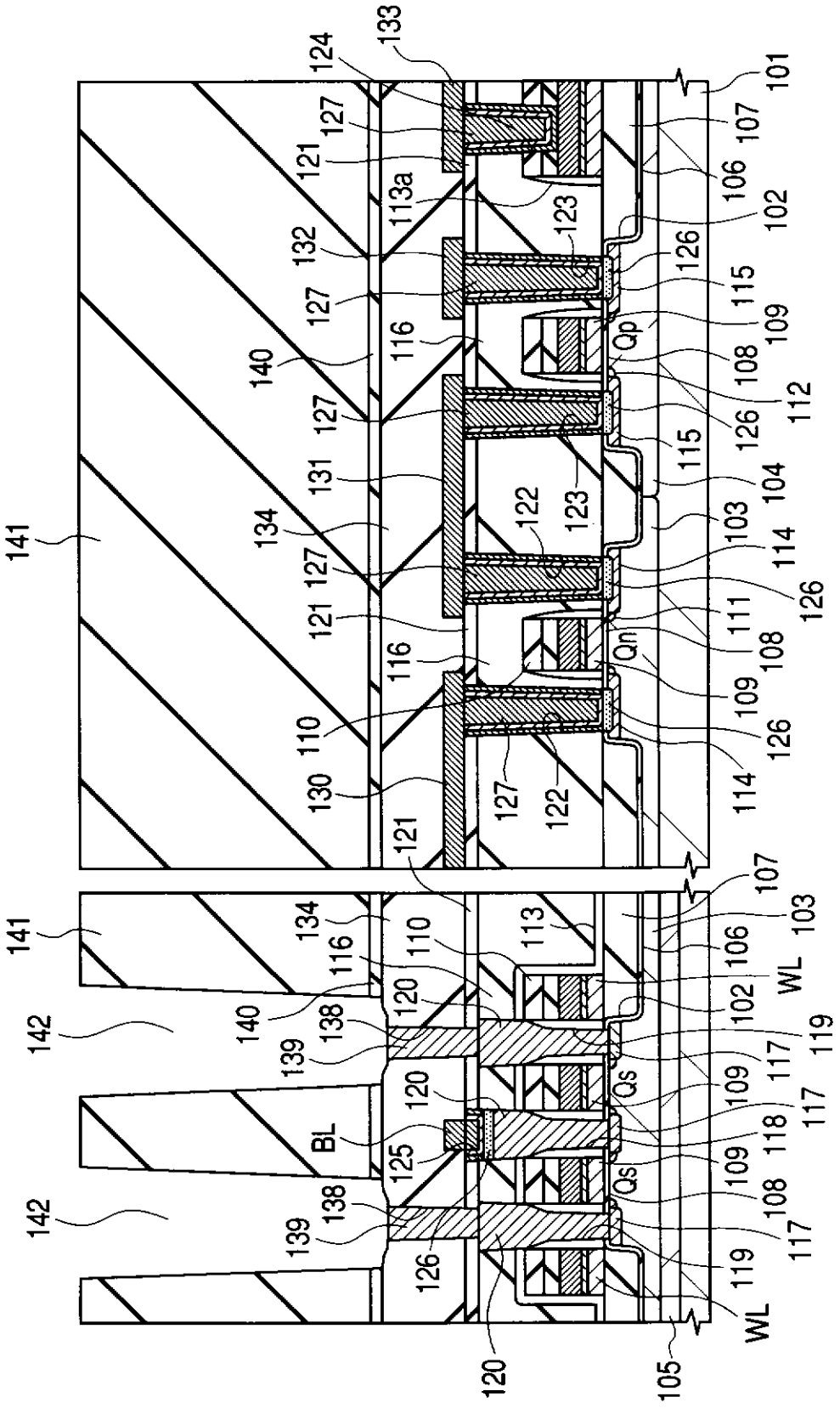

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FIG. 40

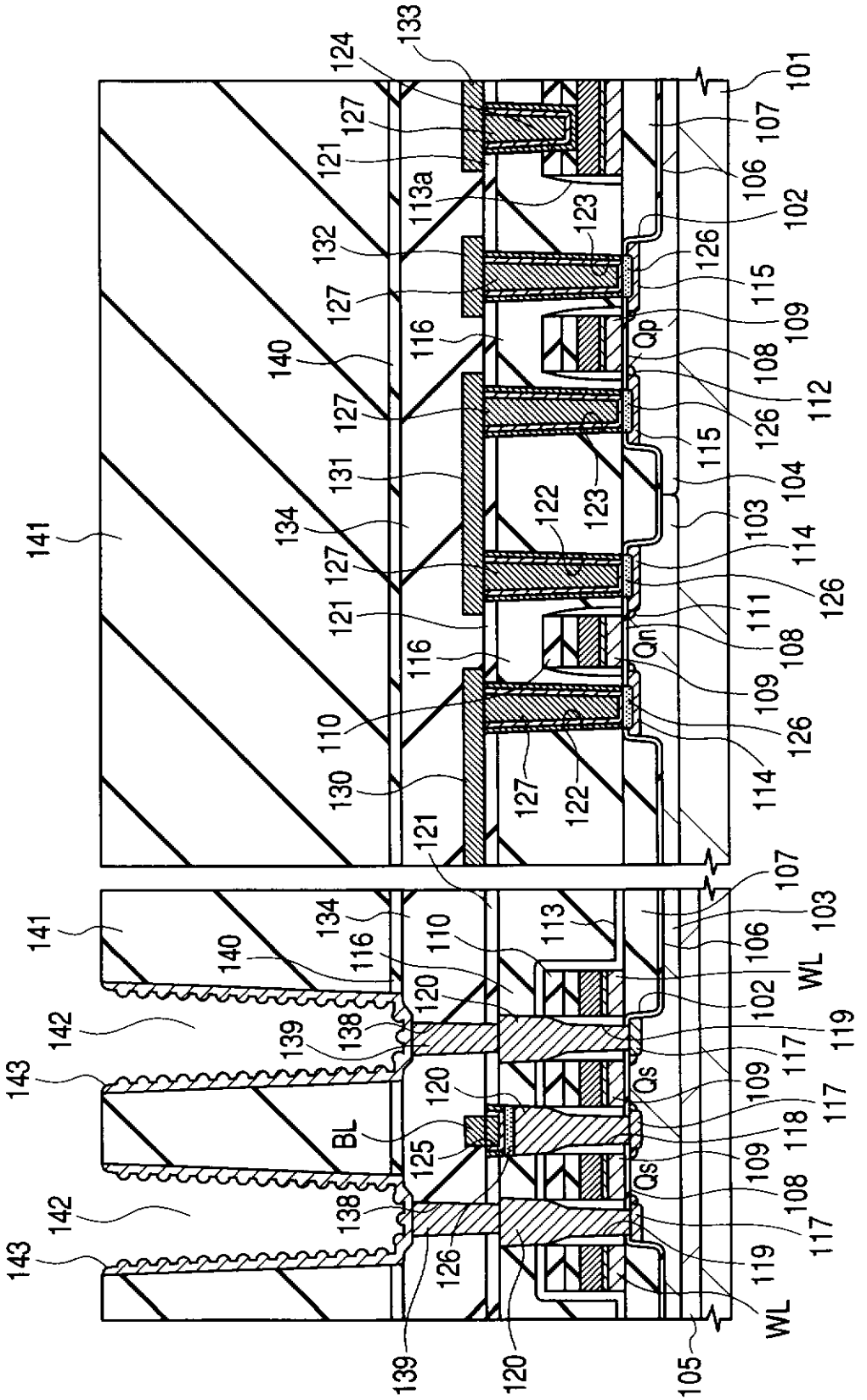

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FIG. 41

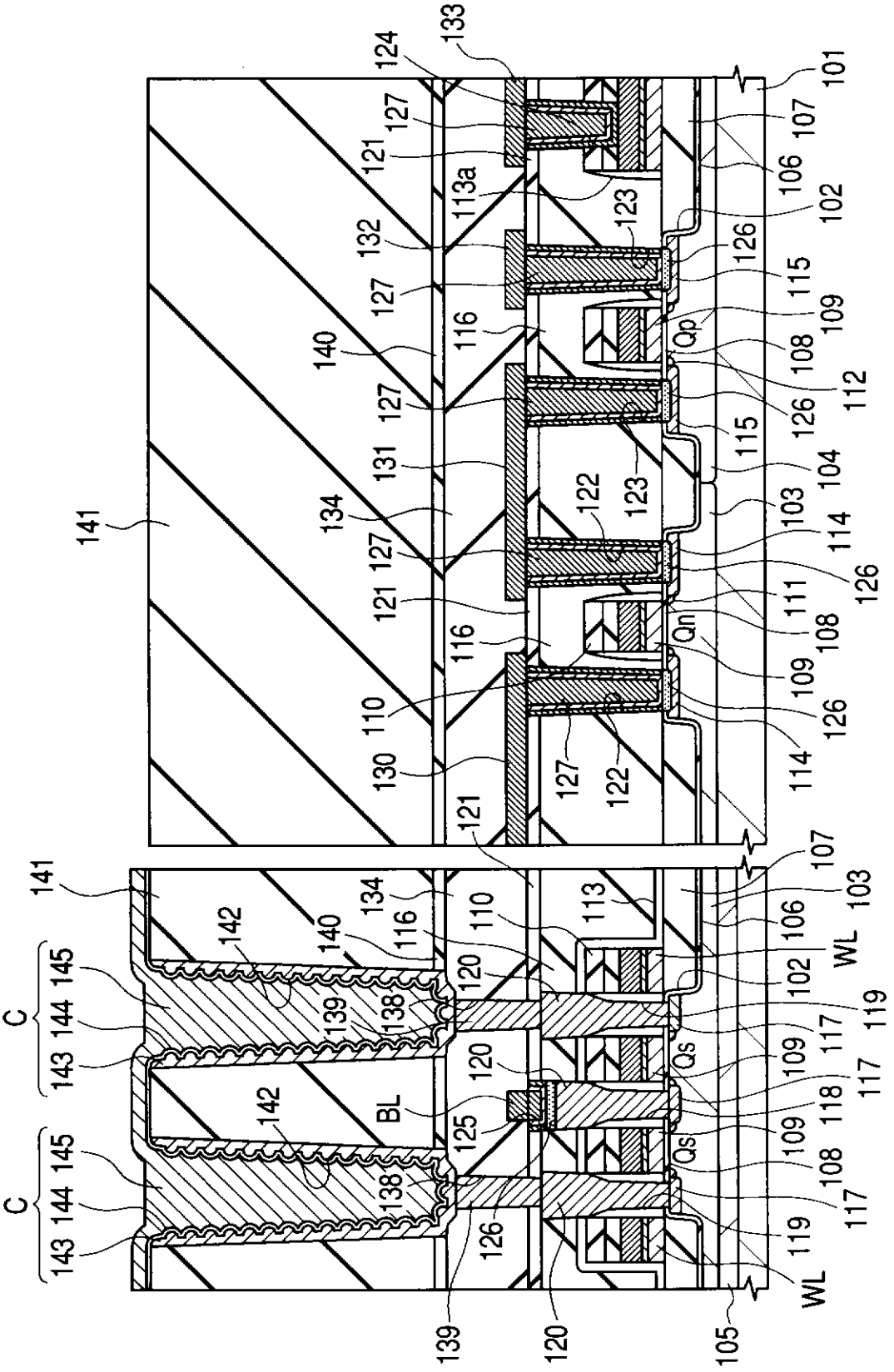
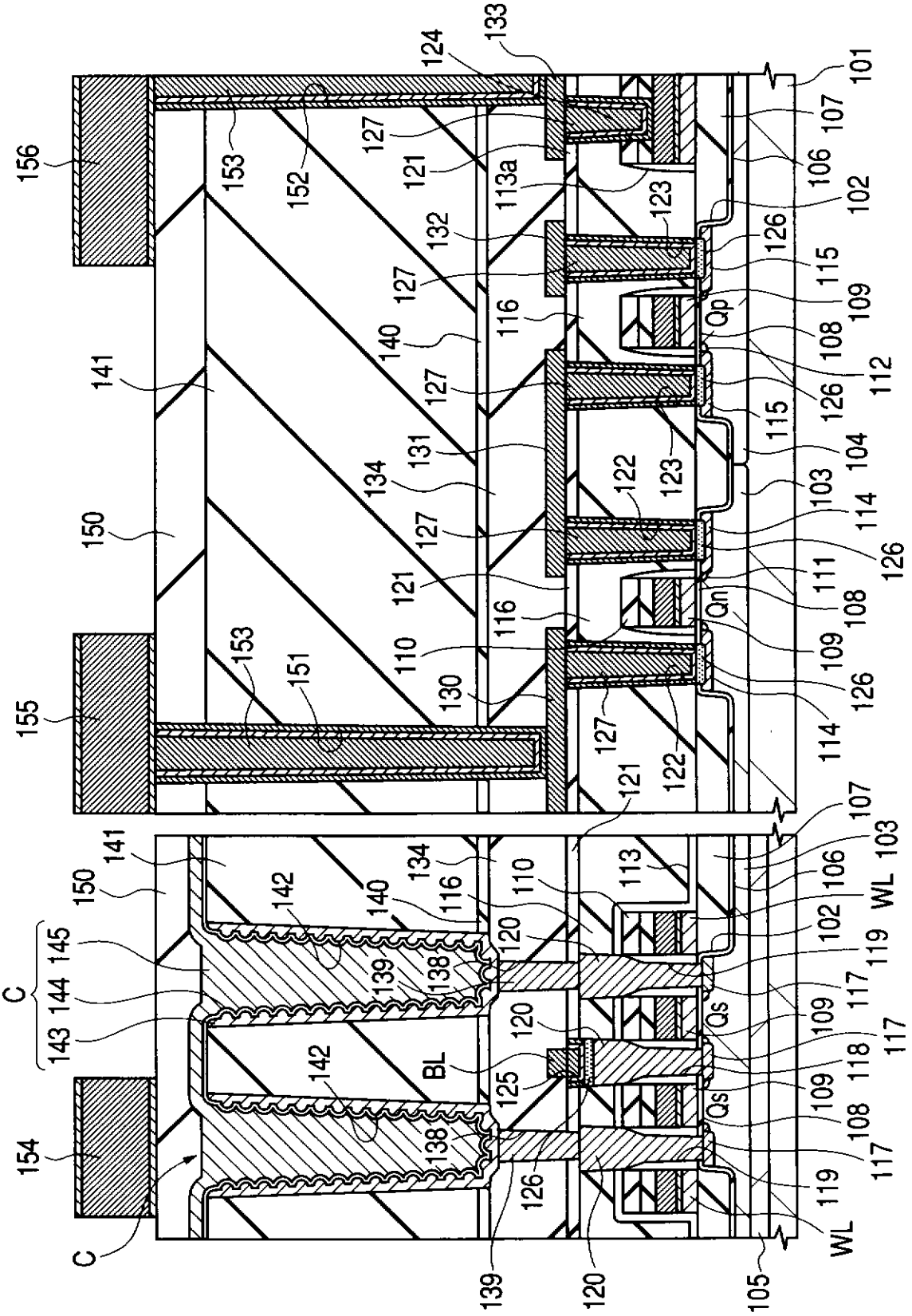

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FIG. 42


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