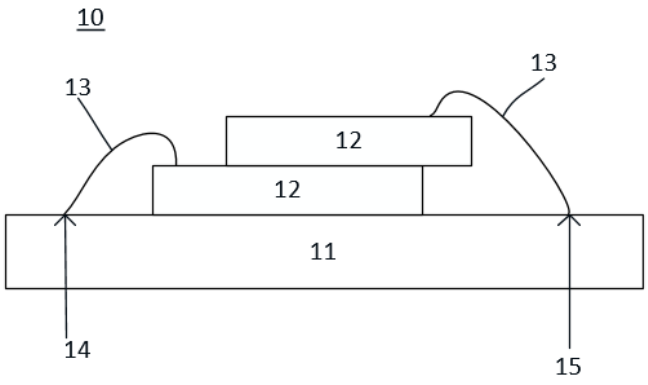

FIG. 1

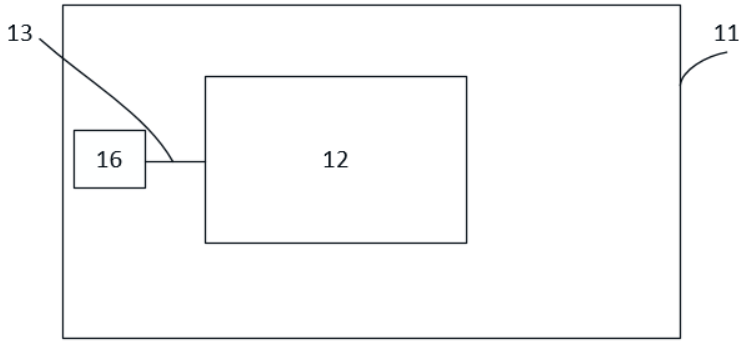

FIG. 2

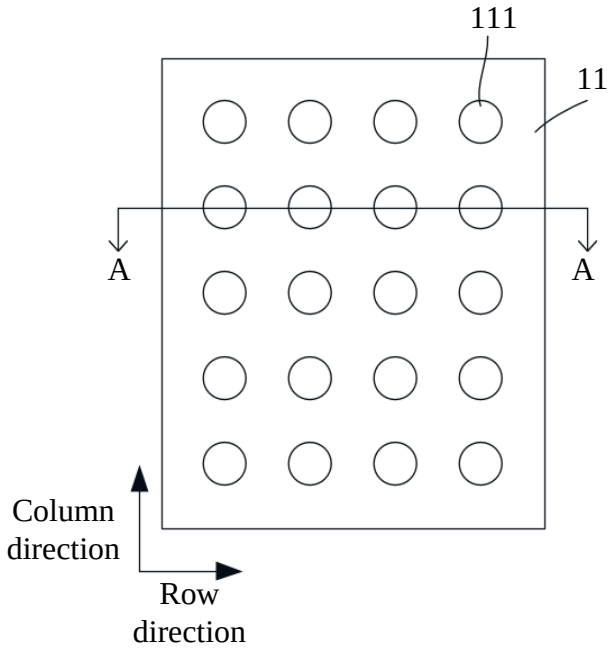

FIG. 3

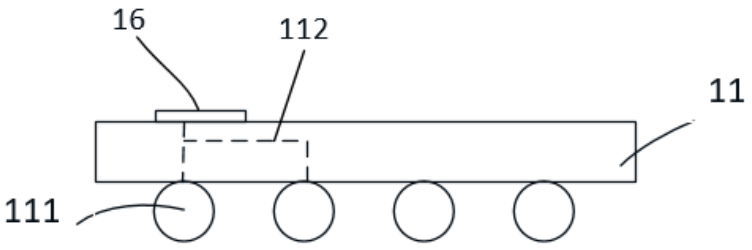
16
112
11
111

FIG. 4

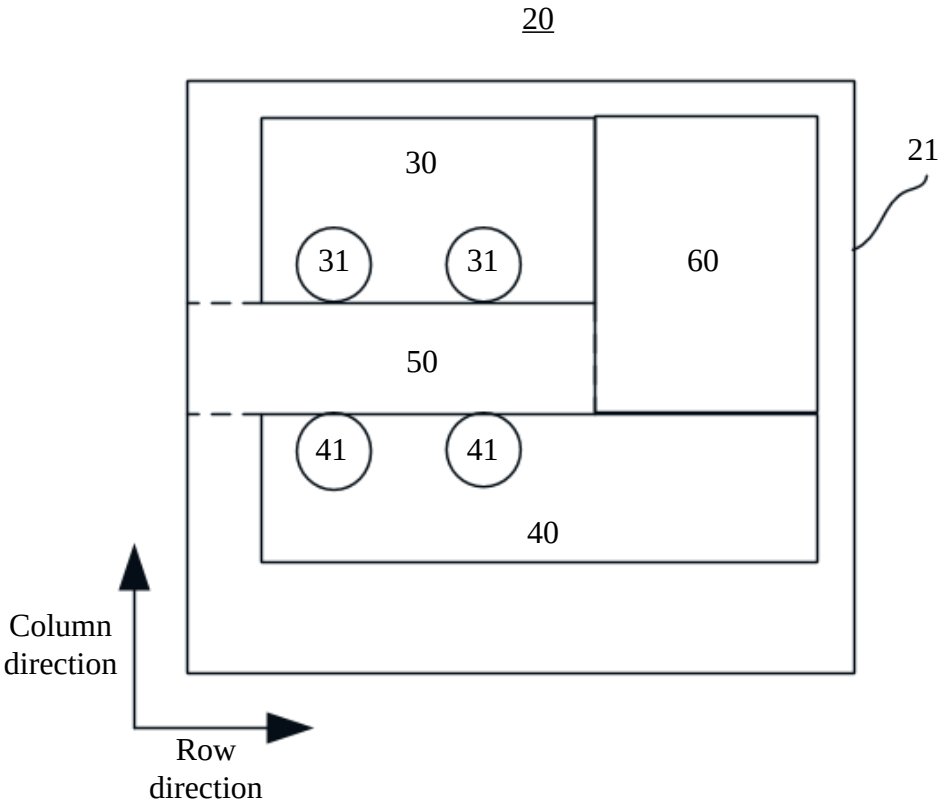
20
21
30
31
31
60
50
41
41
40
Column direction
Row direction

FIG. 5

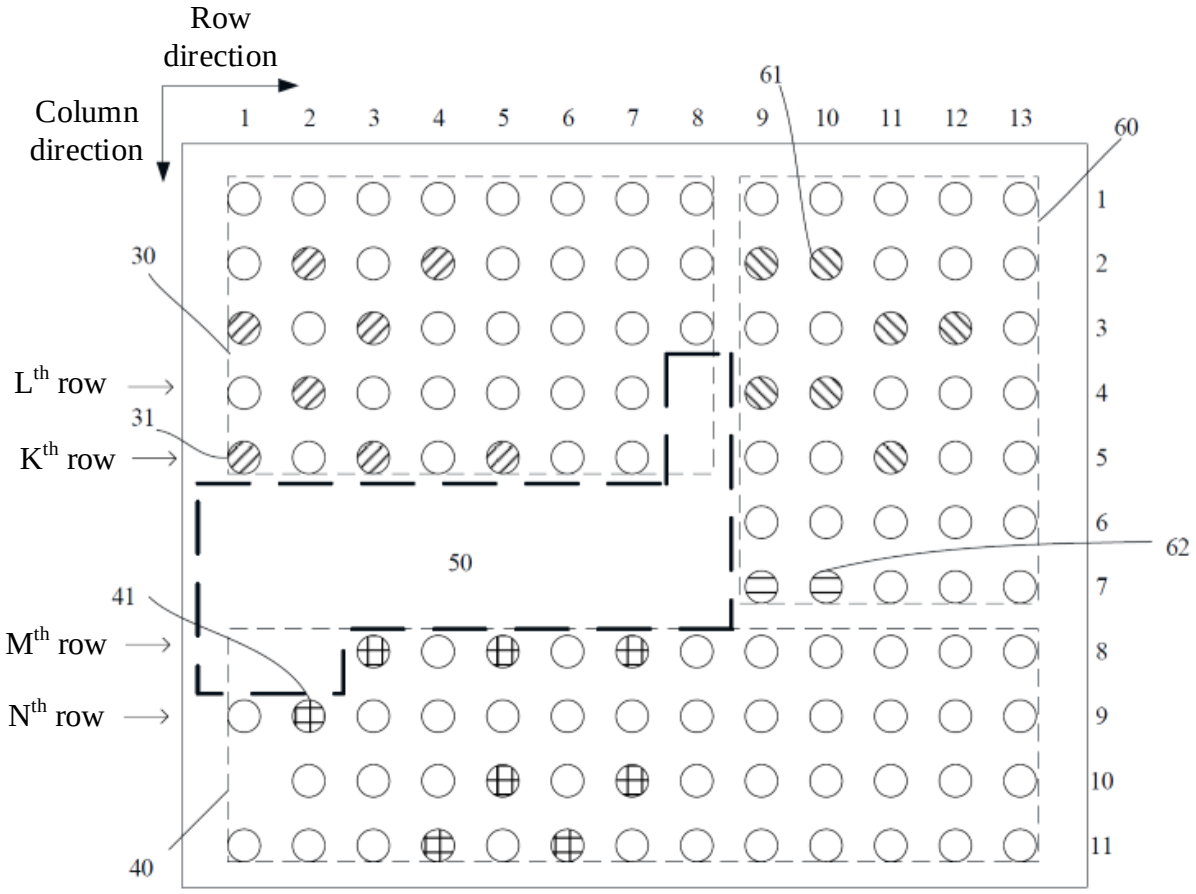
Row direction
Column direction
1
2
3
4
5
6
7
8
9
10
11
12
13
60
61
30
31
L^th row
K^th row
50
62
41
M^th row
N^th row
40

FIG. 6

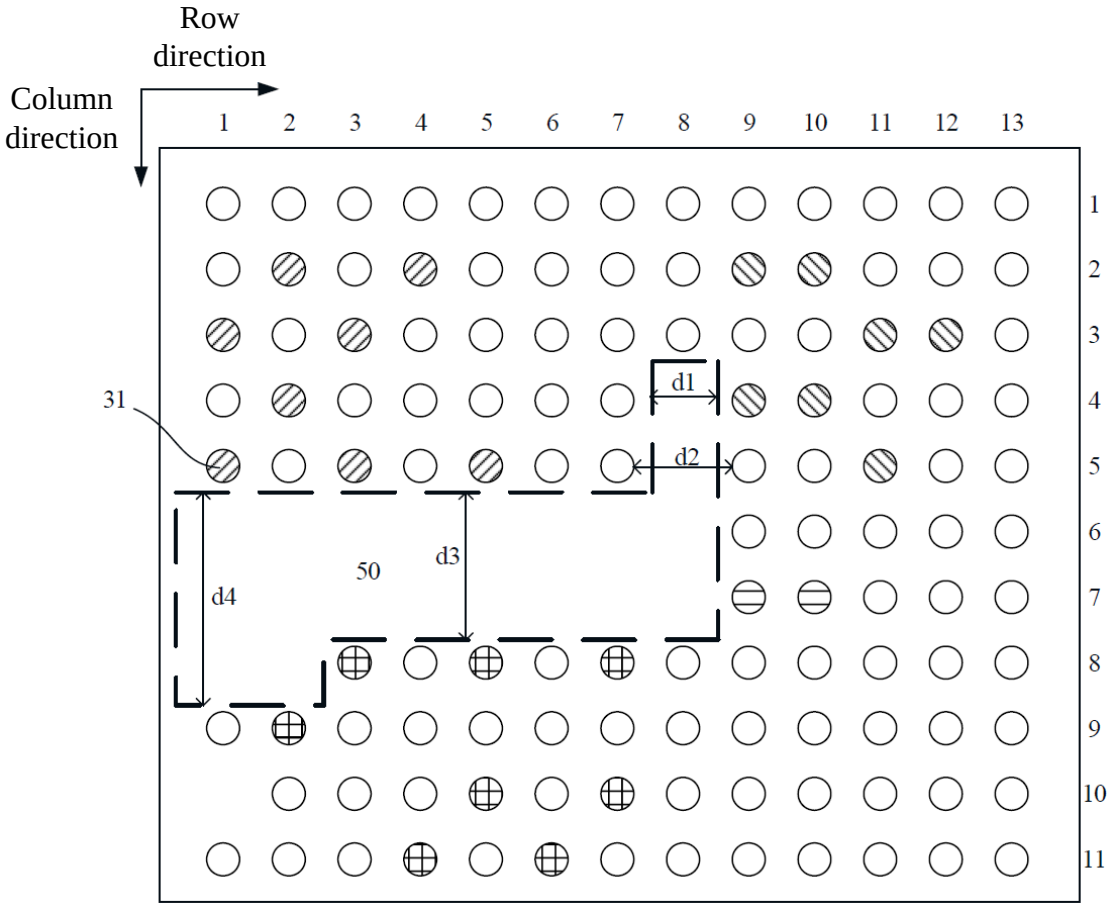
Row
direction
Column
direction
1
2
3
4
5
6
7
8
9
10
11
12
13
31
d1
d2
d3
d4
50

FIG. 7

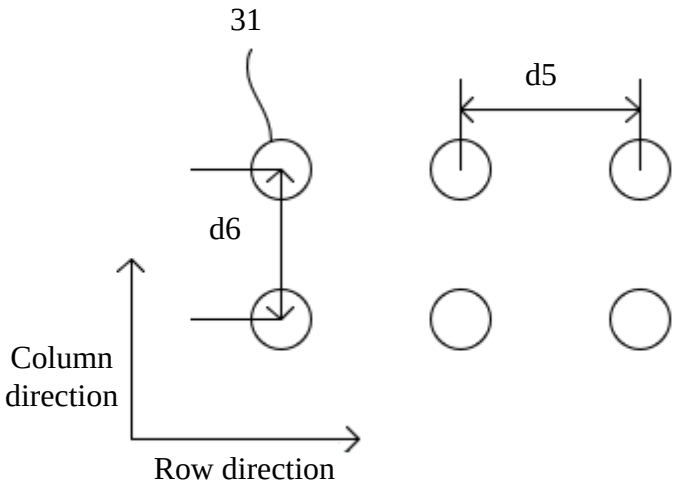
31
d5
d6
Column
direction
Row direction

FIG. 8

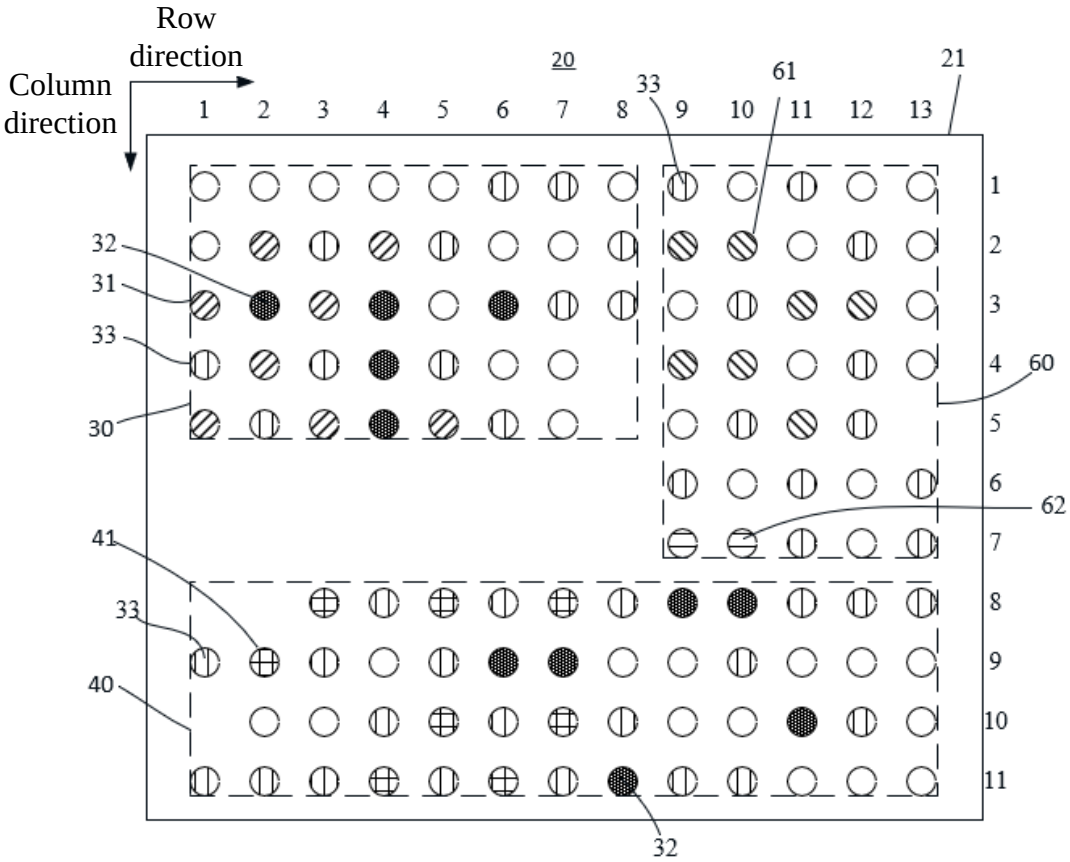
Row direction
Column direction
20
21
33
61
1 2 3 4 5 6 7 8 9 10 11 12 13
1 2 3 4 5 6 7 8 9 10 11
32
31
33
30
60
62
41
33
40
32

FIG. 9

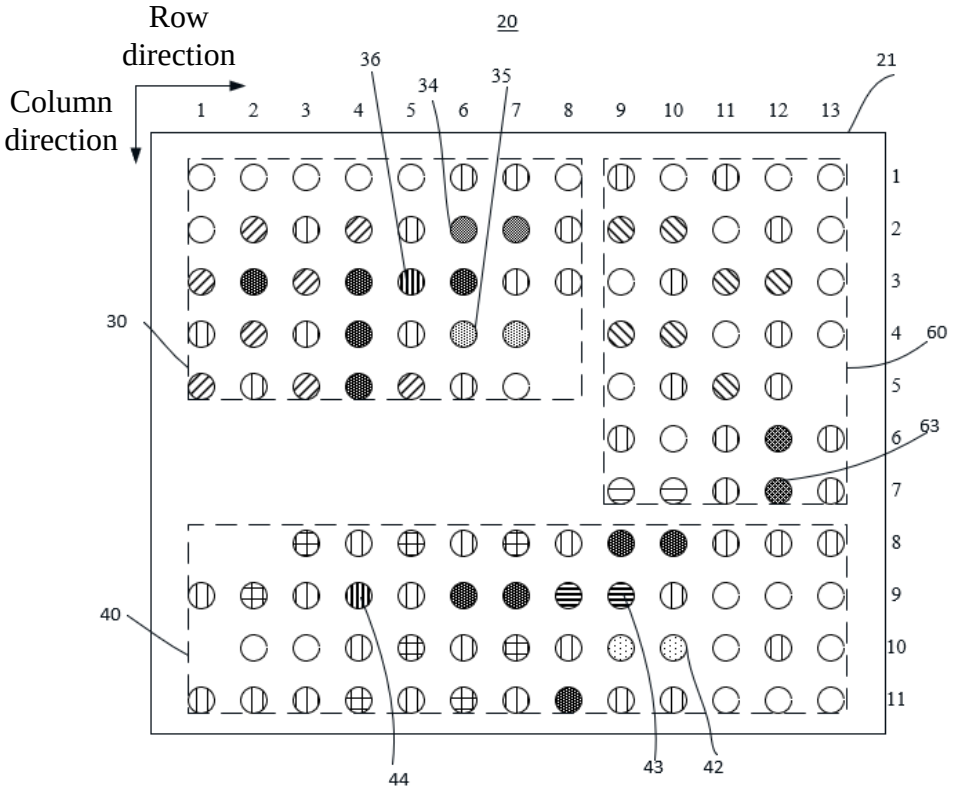
Row direction
Column direction
20
21
36
34
35
1 2 3 4 5 6 7 8 9 10 11 12 13
1 2 3 4 5 6 7 8 9 10 11
30
60
63
40
44
43
42

FIG. 10

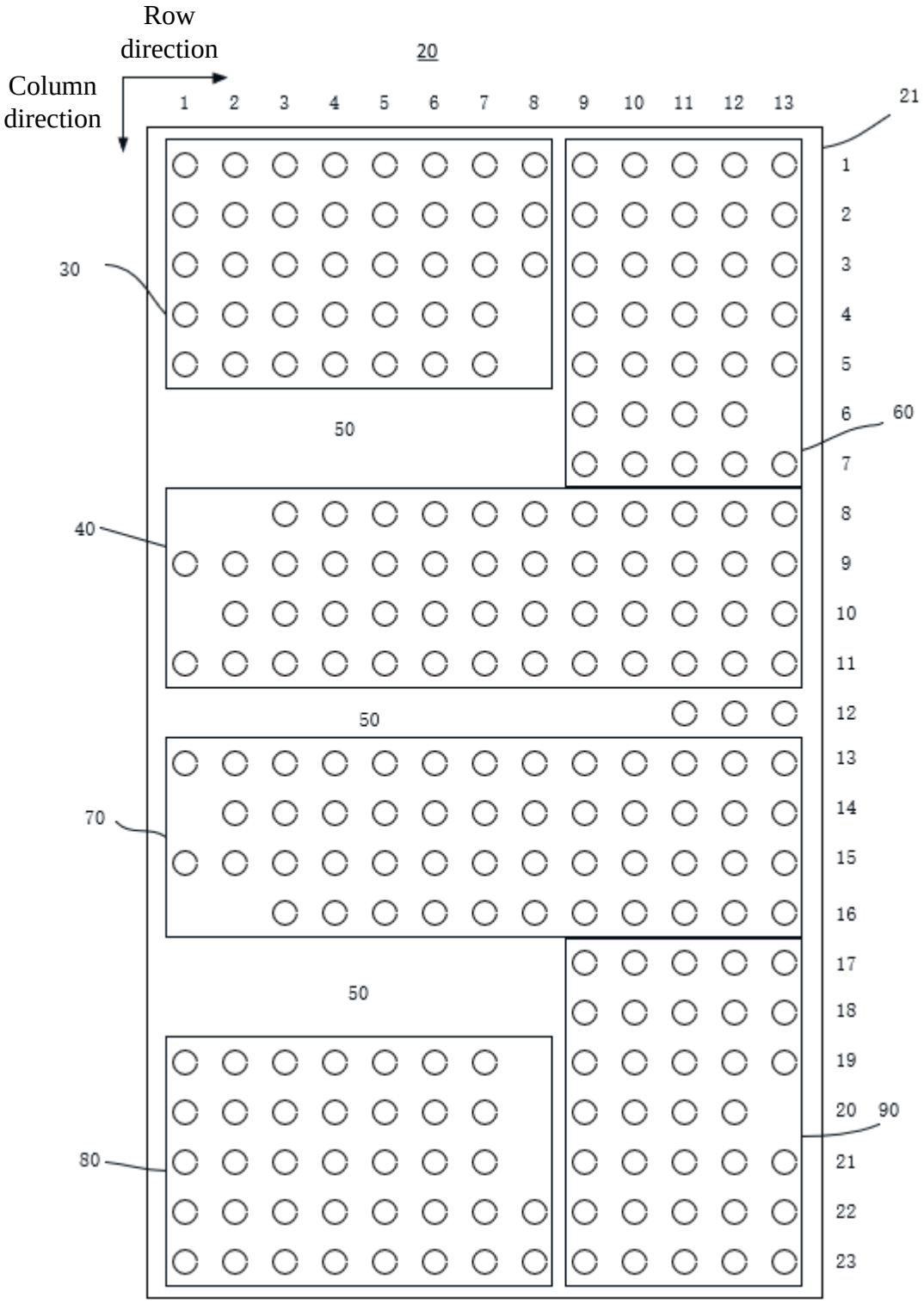
Row direction
Column direction
20
21
1 2 3 4 5 6 7 8 9 10 11 12 13
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
30
40
50
50
50
60
70
80
90

FIG. 11

Row direction →

Column direction ↓

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	DNU	DNU	VDD1	VDD2L	VDD2H	VSS	VSS	VDD2H	VSS	VDD2H	VSS	DNU	DNU
2	DNU	DQ8_A	VSS	DQ15_A	VSS	RDQS1_C_A	RDQS1_T_A	VSS	CA2_A	CA1_A	VDD2H	VSS	DNU
3	DQ10_A	VDDQ	DQ9_A	VDDQ	DMI1_A	VDDQ	VSS	VSS	VDD2H	VSS	CA6_A	CA4_A	VDD1
4	VSS	DQ12_A	VSS	VDDQ	VSS	WCK1_C_A	WCK1_T_A		CA0_A	CA5_A	VDD2H	VSS	VDD2L
5	DQ13_A	VSS	DQ14_A	VDDQ	DQ11_A	VSS	VDD2L		VDD2H	VSS	CA3_A	VSS	
6									VSS	RFU	VSS	CK_C_A	VSS
7									CS1_A	CS0_A	VSS	CK_T_A	VSS
8			DQ6_A	VSS	DQ5_A	VSS	DQ7_A	VSS	VDDQ	VDDQ	VSS	VSS	VSS
9	VSS	DQ0_A	VSS	DMI0_A	VSS	VDDQ	VDDQ	WCK0_C_A	WCK0_T_A	VSS	VDD2H	VDD2H	ZQ_A
10		VDD2H	VDD2H	VSS	DQ4_A	VSS	DQ3_A	VSS	RDQS0_C_A	RDQS0_T_A	VDDQ	VSS	VDD2L
11	VSS	VSS	VSS	DQ1_A	VSS	DQ2_A	VSS	VDDQ	VSS	VSS	VDD2H	VDD2H	VDD1
12											VSS	VSS	VSS
13	VSS	VSS	VSS	DQ9_B	VSS	DQ10_B	VSS	VDDQ	VSS	VSS	VDD2H	VDD2H	VDD1
14		VDD2H	VDD2H	VSS	DQ12_B	VSS	DQ11_B	VSS	RDQS1_C_B	RDQS1_T_B	VDDQ	VSS	VDD2L
15	VSS	DQ8_B	VSS	DMI1_B	VSS	VDDQ	VDDQ	WCK1_C_B	WCK1_T_B	VSS	VDD2H	VDD2H	RESET
16			DQ14_B	VSS	DQ13_B	VSS	DQ15_B	VSS	VDDQ	VDDQ	VSS	VSS	VSS
17									CS1_B	CS0_B	VSS	CK_C_B	VSS
18									VSS	RFU	VSS	CK_T_B	VSS
19	DQ5_B	VSS	DQ6_B	VDDQ	DQ3_B	VSS	VDD2L		VDD2H	VSS	CA6_B	VSS	
20	VSS	DQ4_B	VSS	VDDQ	VSS	WCK0_C_B	WCK0_T_B		CA0_B	CA2_B	VDD2H	VSS	VDD2L
21	DQ2_B	VDDQ	DQ1_B	VDDQ	DMI0_B	VDDQ	VSS	VSS	VDD2H	VSS	CA5_B	CA4_B	VDD1
22	DNU	DQ0_B	VSS	DQ7_B	VSS	RDQS0_C_B	RDQS0_T_B	VSS	CA3_B	CA1_B	VDD2H	VSS	DNU
23	DNU	DNU	VDD1	VDD2L	VDD2H	VSS	VSS	VDD2H	VSS	VDD2H	VSS	DNU	DNU

VDD1	6
VDD2H	26
VDD2L	8
VDDQ	22
VSS	93

FIG. 12

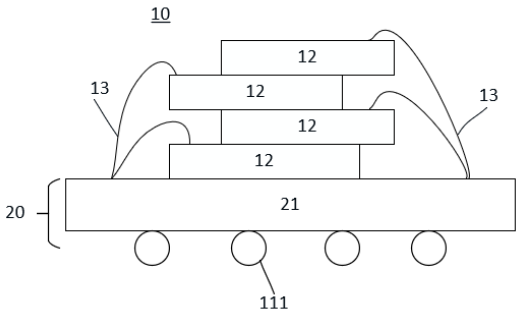

FIG. 13

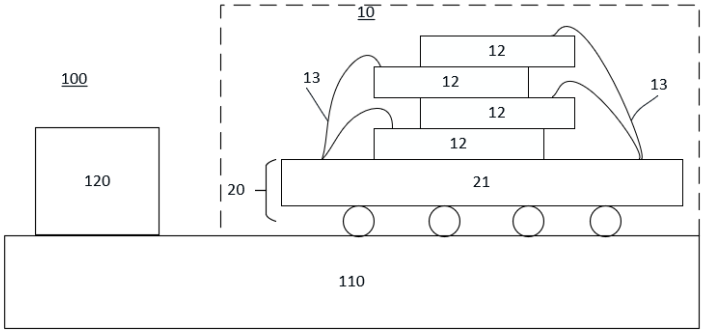
10
100
12
12
12
12
13
13
120
20
21
110

FIG. 14

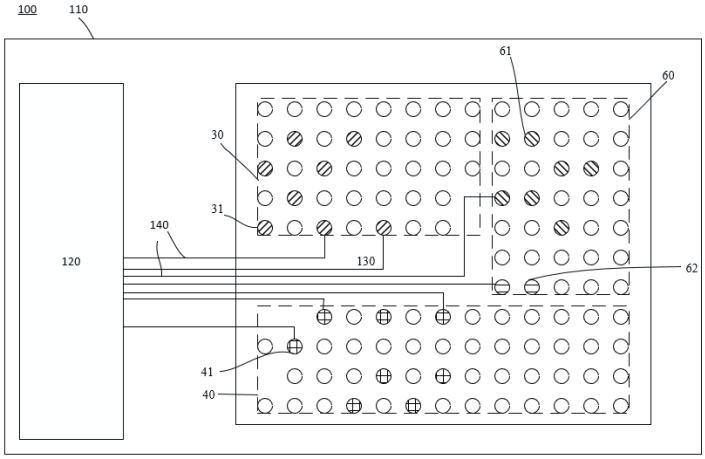
100
110
61
60
30
31
140
120
130
62
41
40

FIG. 15

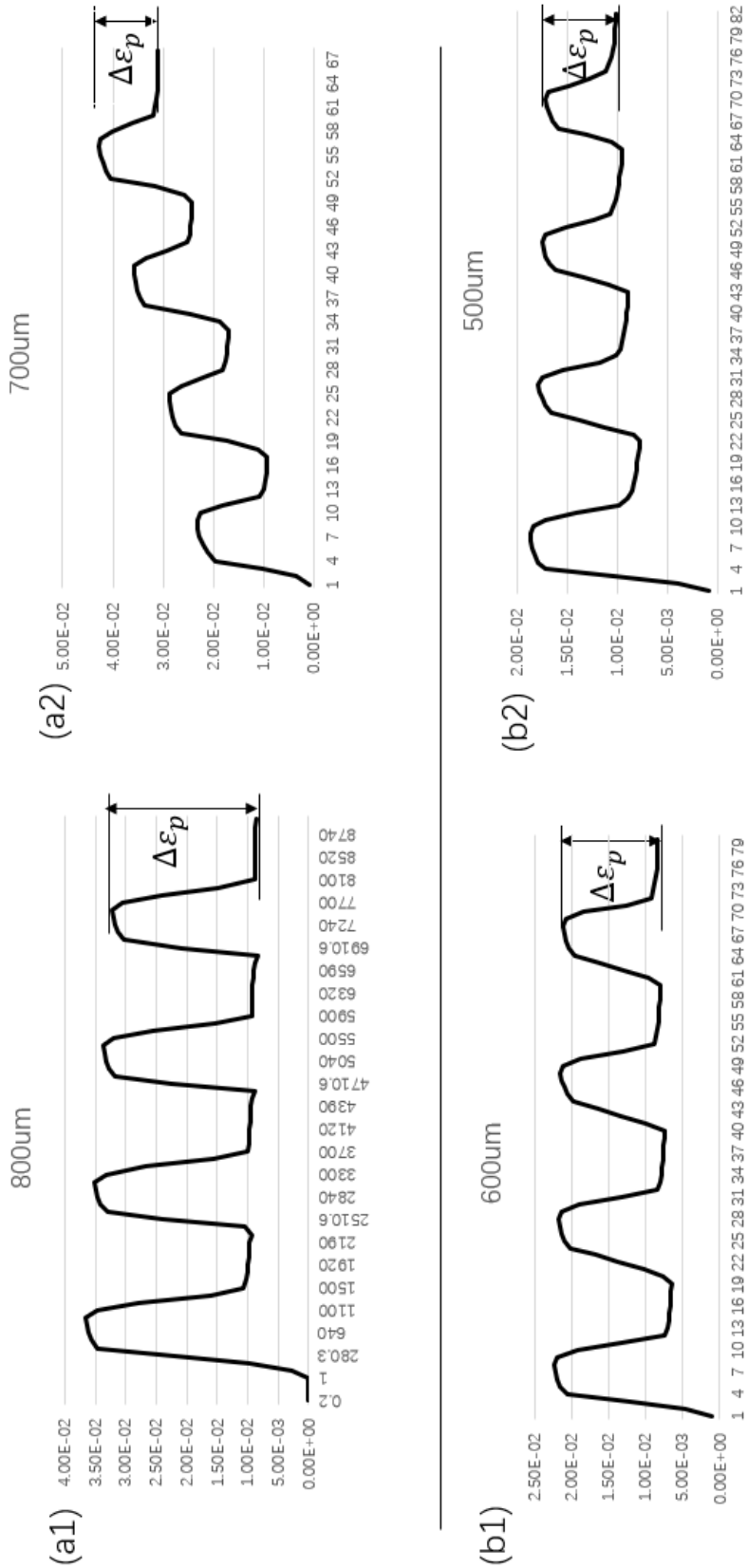
(a1)
800um
$\Delta\varepsilon_p$
(a2)
700um
$\Delta\varepsilon_p$
(b1)
600um
$\Delta\varepsilon_p$
(b2)
500um
$\Delta\varepsilon_p$

FIG. 16

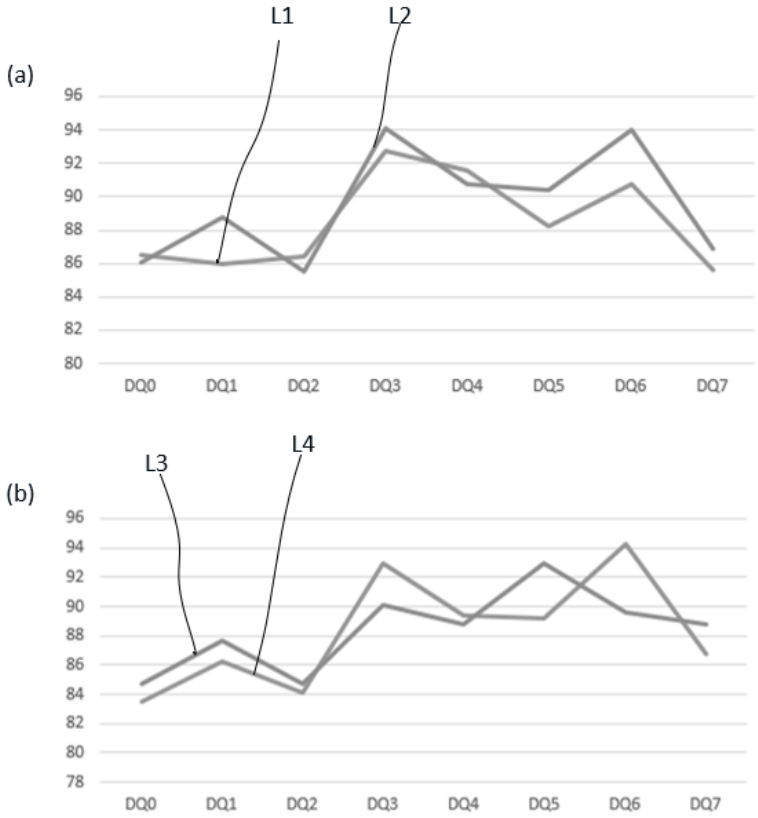
(a)
L1
L2
96
94
92
90
88
86
84
82
80
DQ0
DQ1
DQ2
DQ3
DQ4
DQ5
DQ6
DQ7
(b)
L3
L4
96
94
92
90
88
86
84
82
80
78
DQ0
DQ1
DQ2
DQ3
DQ4
DQ5
DQ6
DQ7

FIG. 17