

FIG. 1

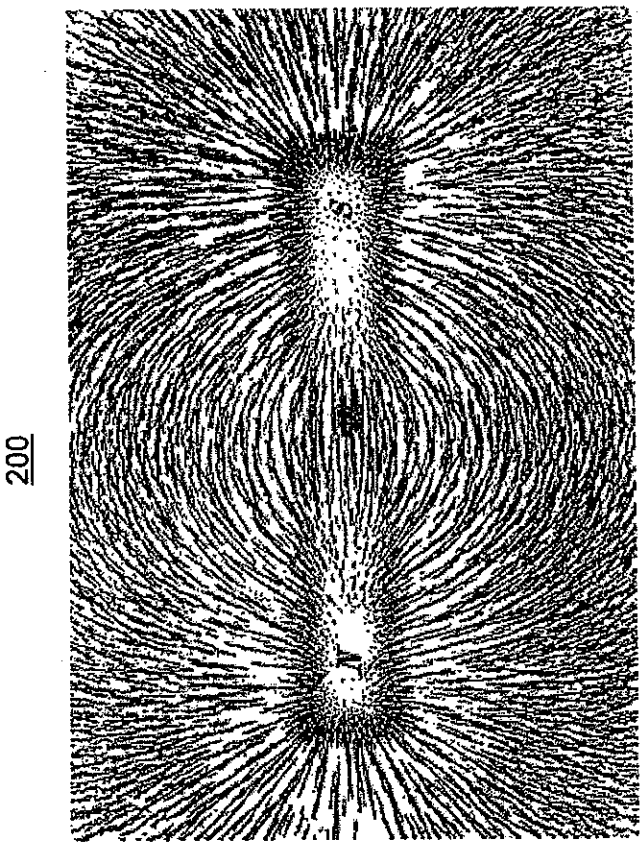


FIG. 2

FIG. 3A

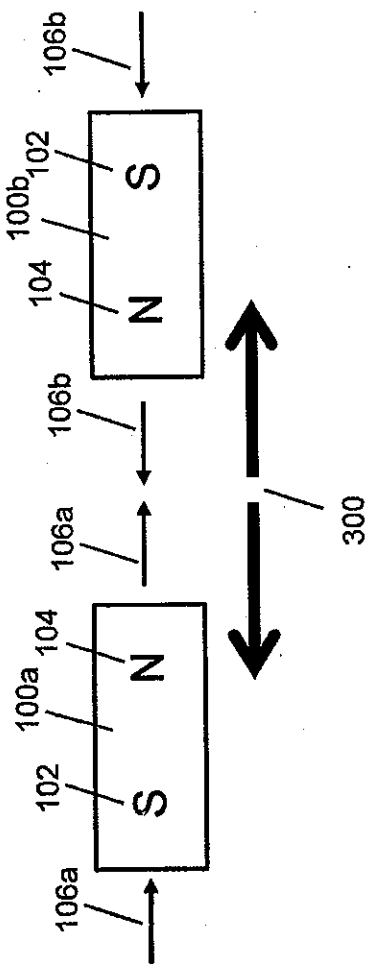
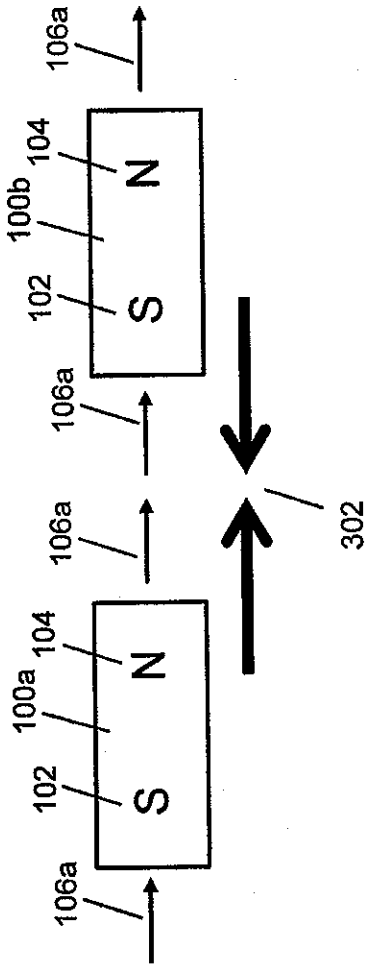

106b
100b
102
S
104
N
106b
106a
300
104
100a
N
102
S
106a

FIG. 3B


106a
100b
104
N
102
S
106a
106a
302
104
100a
N
102
S
106a

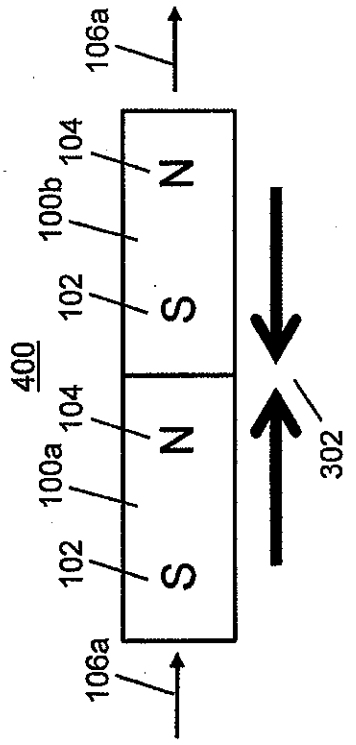


FIG. 4A

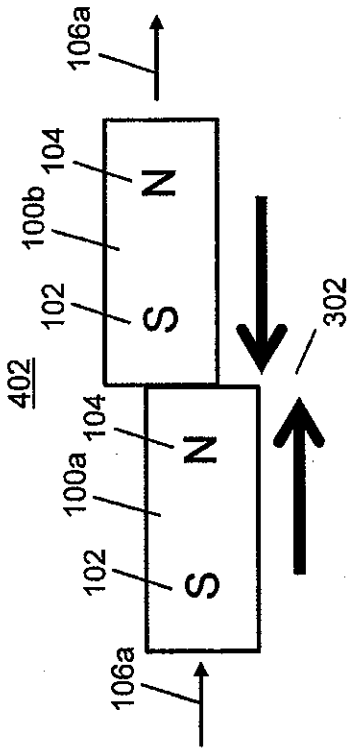


FIG. 4B

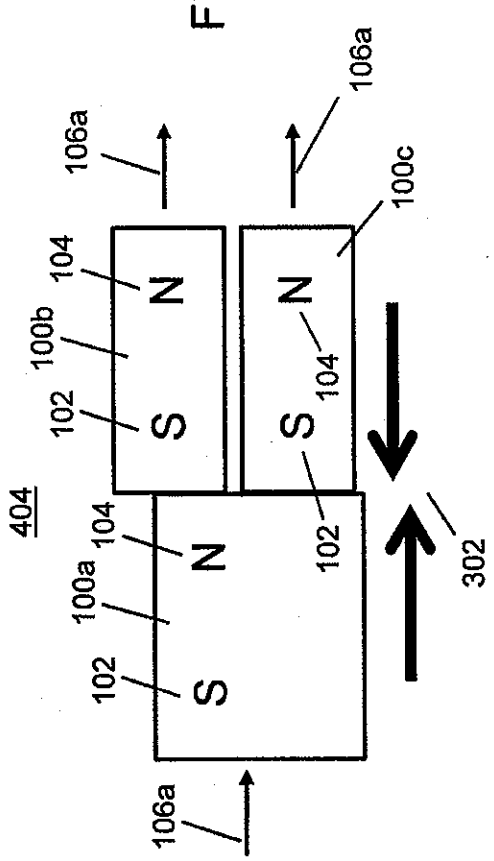


FIG. 4C

FIG. 5

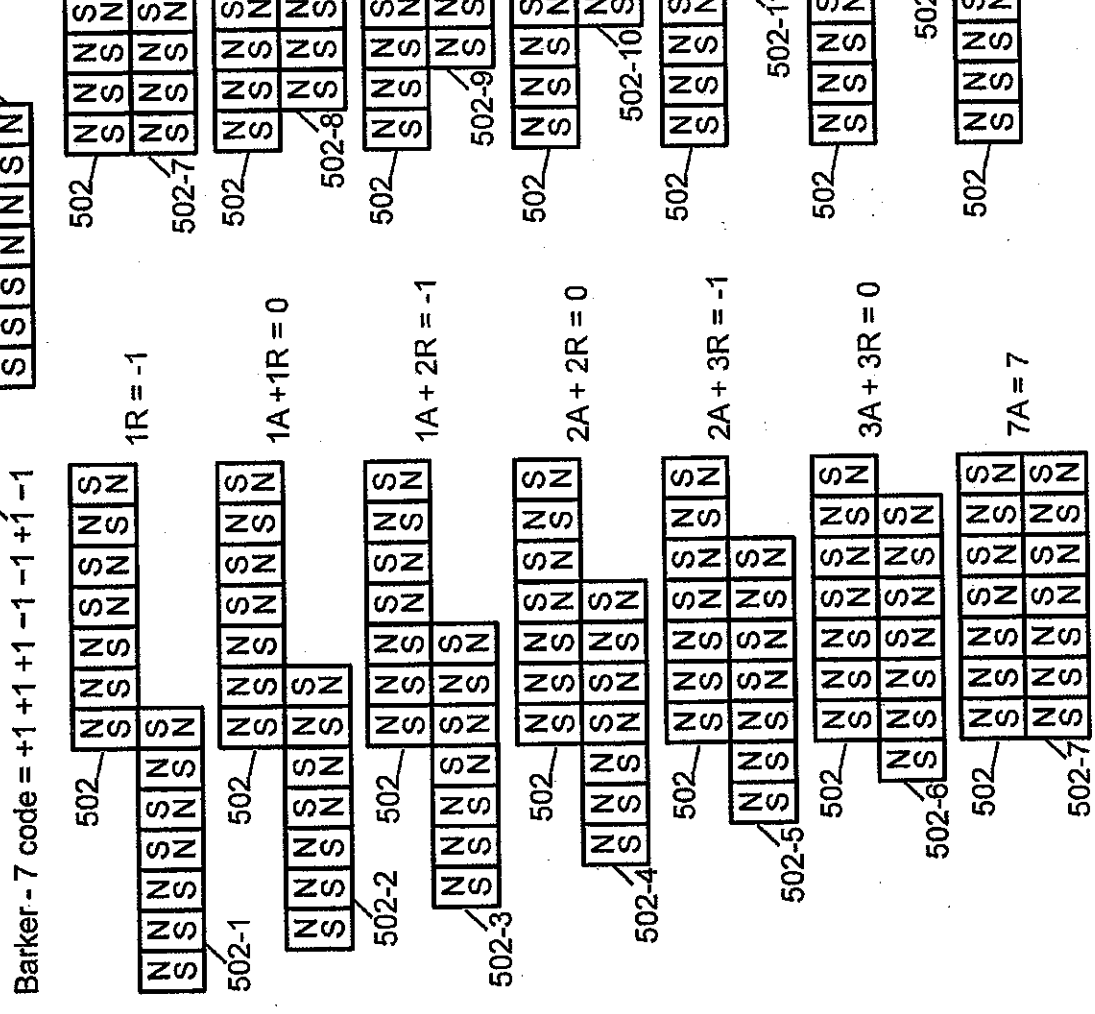

Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
7A = 7
3A + 3R = 0
2A + 3R = -1
2A + 2R = 0
1A + 2R = -1
1A +1R = 0
1R = -1
502-1
502-2
502-3
502-4
502-5
502-6
502-7
502-8
502-9
502-10
502-11
502-12
502-13

FIG. 6

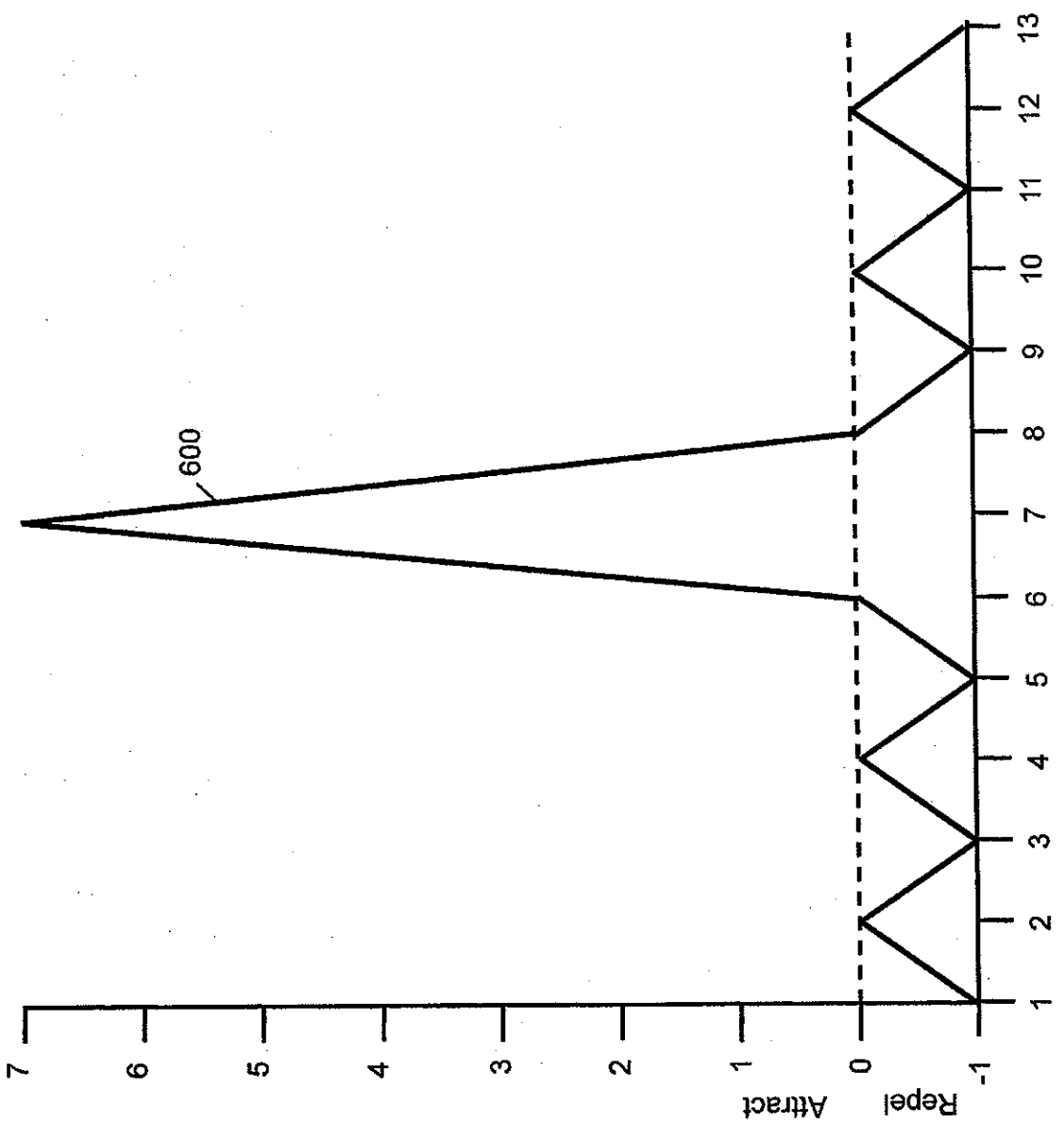


FIG. 7

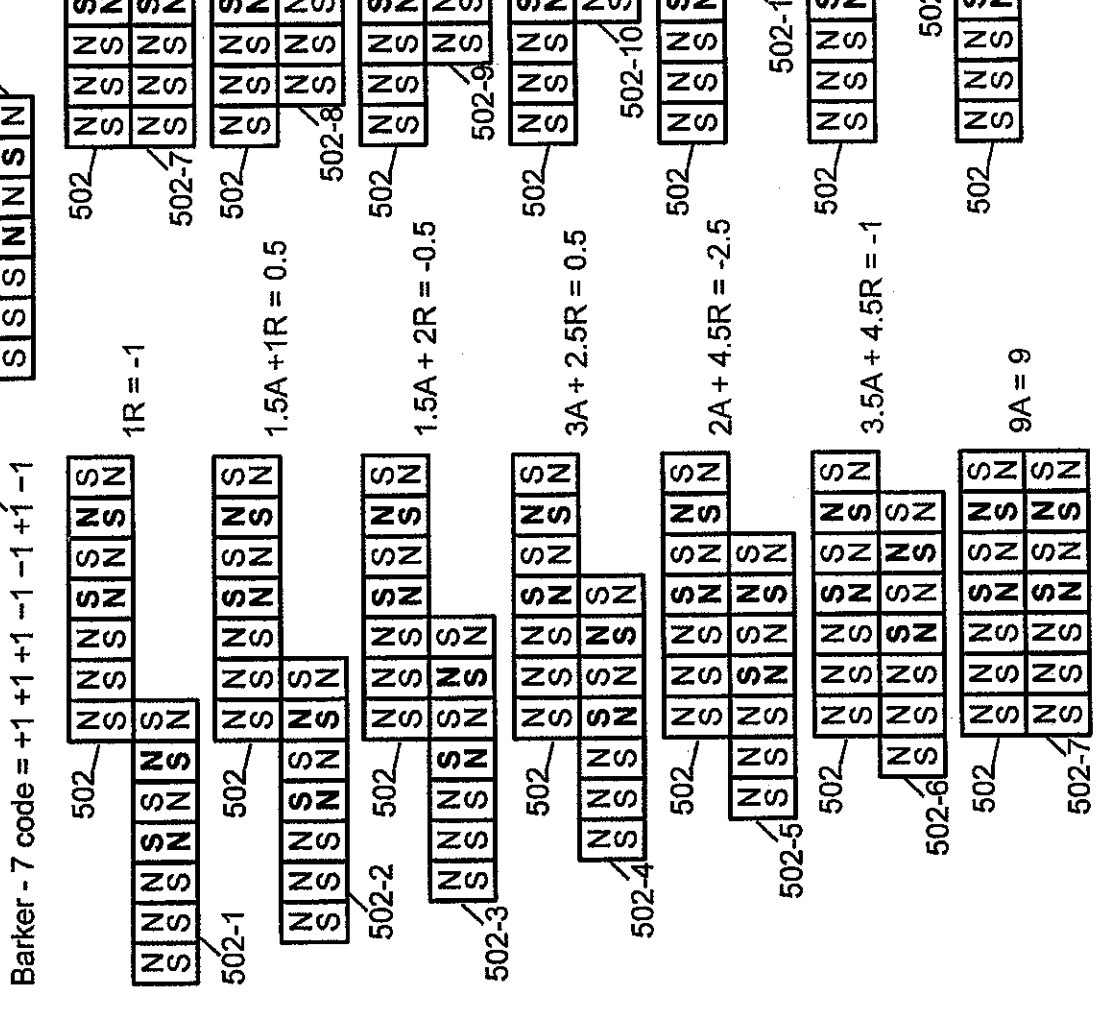

Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
9A = 9
3.5A + 4.5R = -1
2A + 4.5R = -2.5
3A + 2.5R = 0.5
1.5A + 2R = -0.5
1.5A +1R = 0.5
1R = -1
502-1
502-2
502-3
502-4
502-5
502-6
502-7
502-8
502-9
502-10
502-11
502-12
502-13

FIG. 8

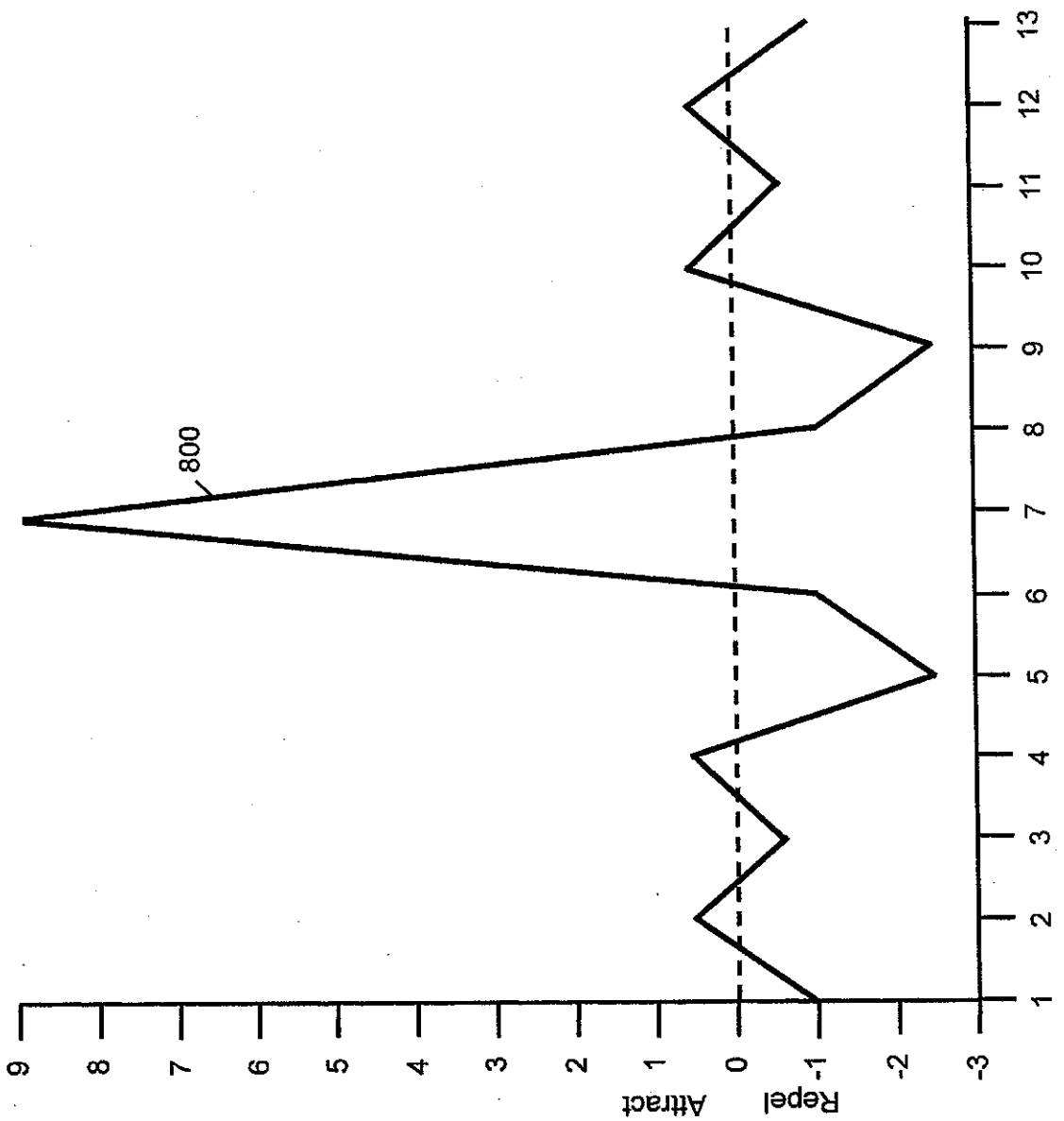


FIG. 9

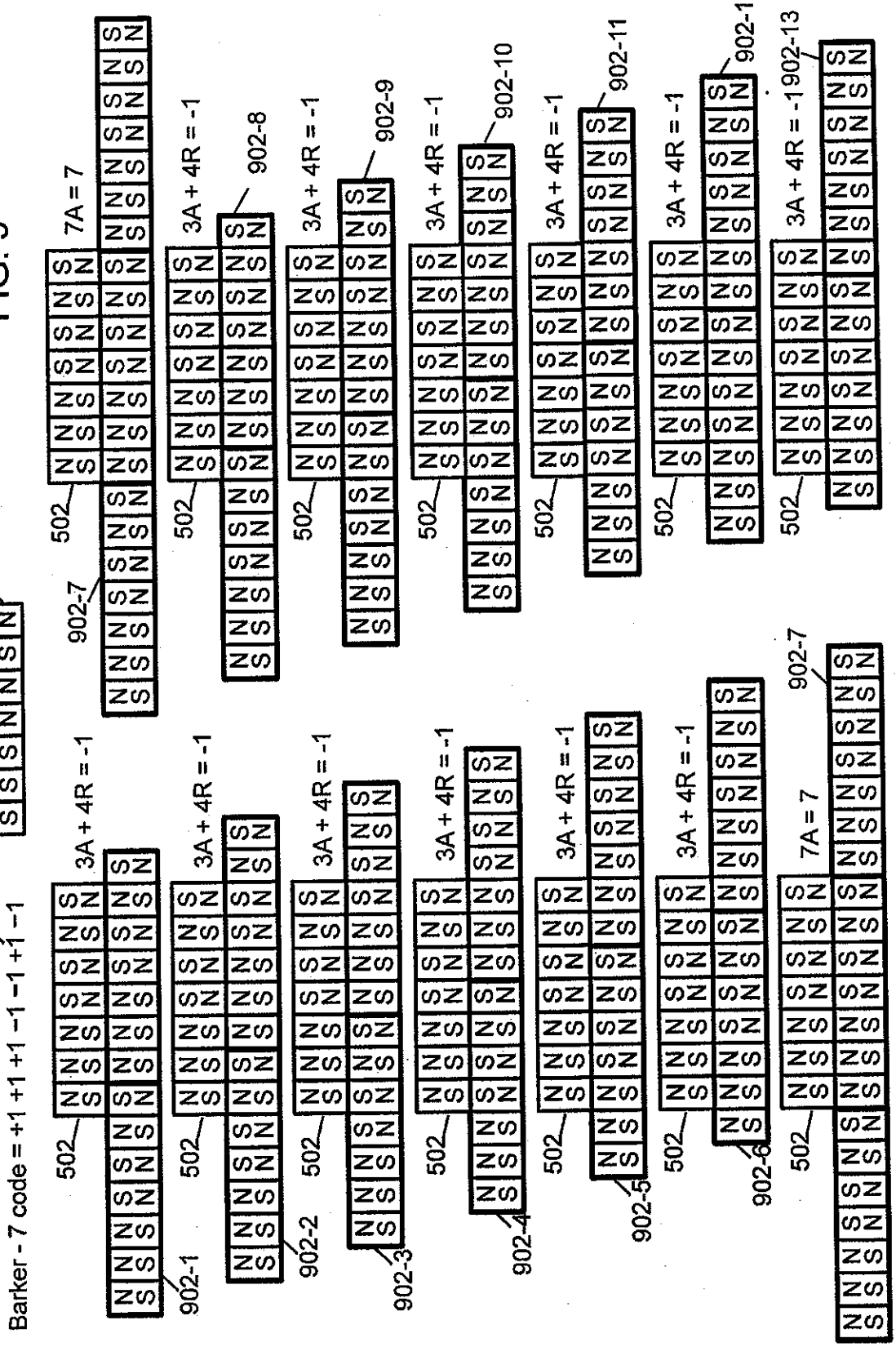

Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
902-1
902-2
902-3
902-4
902-5
902-6
902-7
902-8
902-9
902-10
902-11
902-12
902-13
3A + 4R = -1
7A = 7

FIG. 10

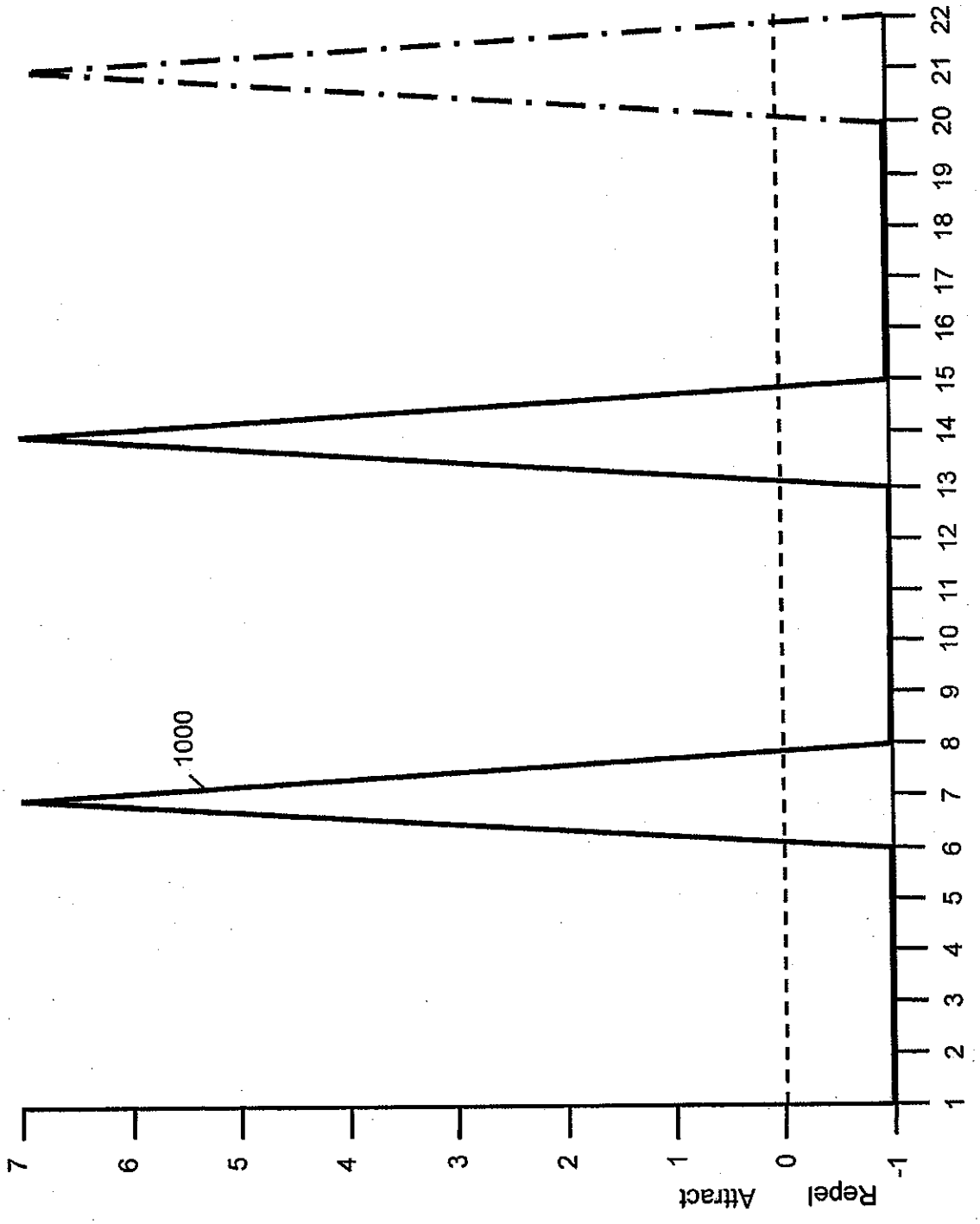

1000
Repel
Attract
-1
0
1
2
3
4
5
6
7
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22

FIG. 11A

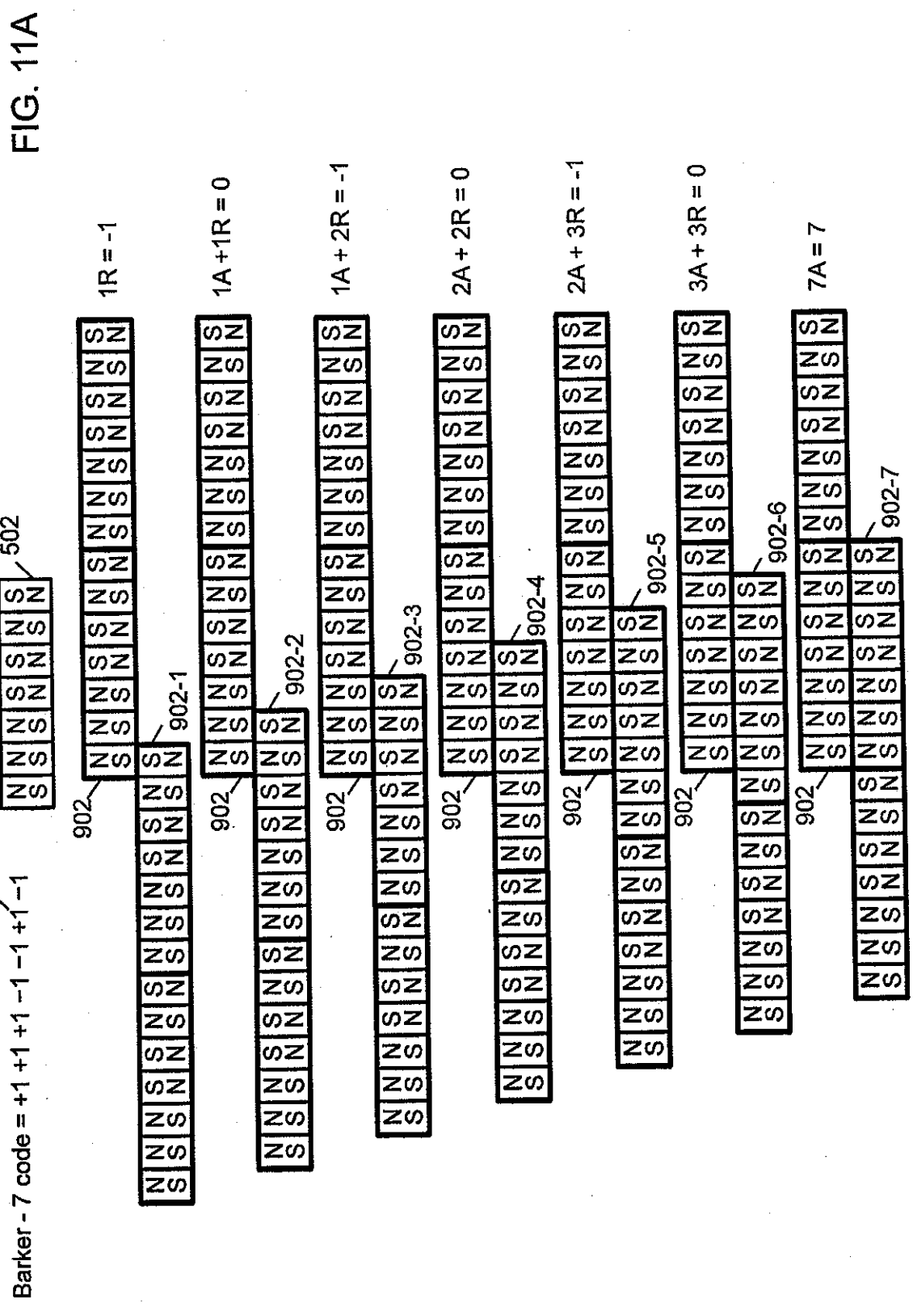

Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
902
902-1
902-2
902-3
902-4
902-5
902-6
902-7
1R = -1
1A +1R = 0
1A + 2R = -1
2A + 2R = 0
2A + 3R = -1
3A + 3R = 0
7A = 7

FIG. 11B

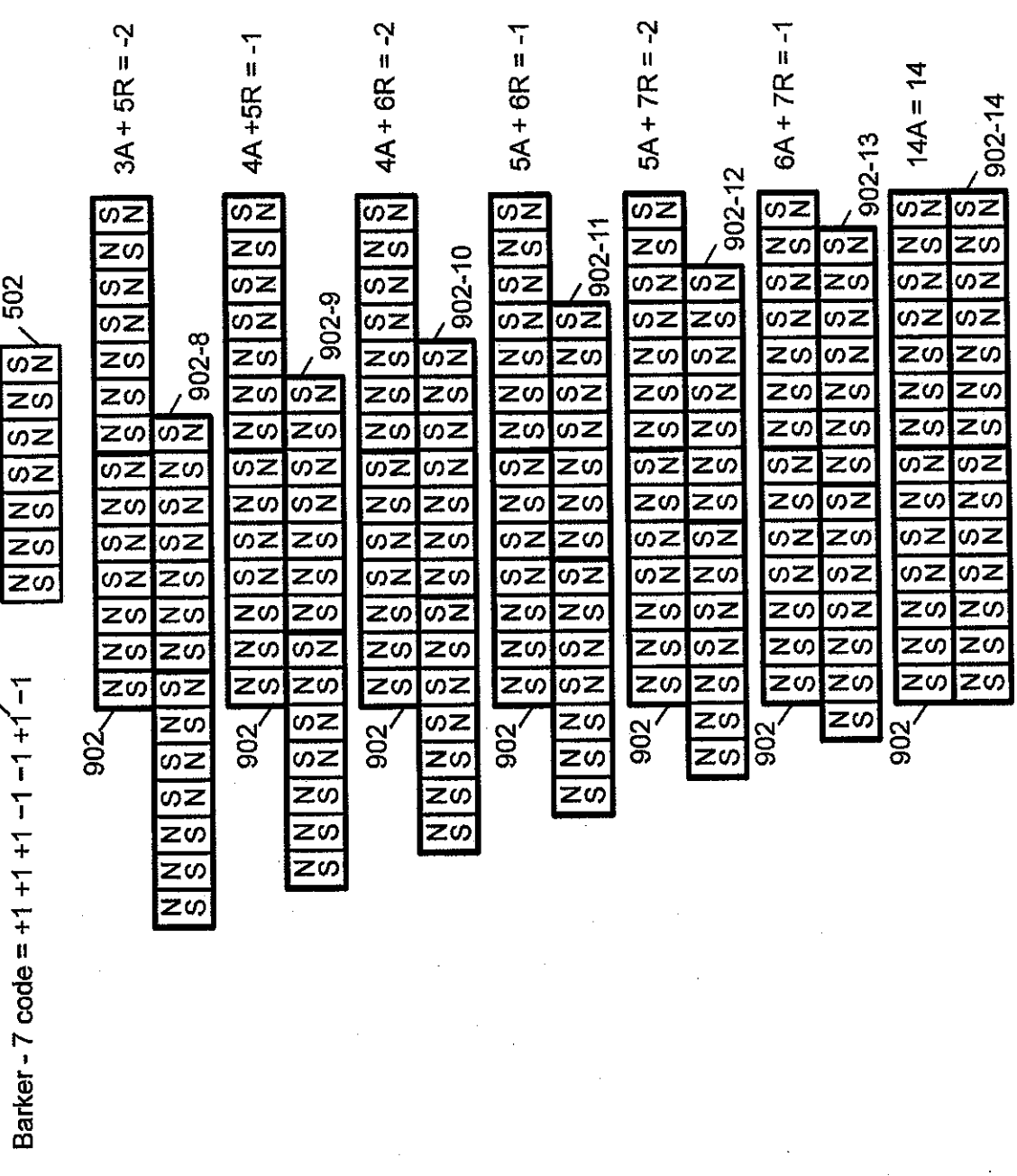

Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
902
902-8
902-9
902-10
902-11
902-12
902-13
902-14
3A + 5R = -2
4A +5R = -1
4A + 6R = -2
5A + 6R = -1
5A + 7R = -2
6A + 7R = -1
14A = 14

FIG. 11C

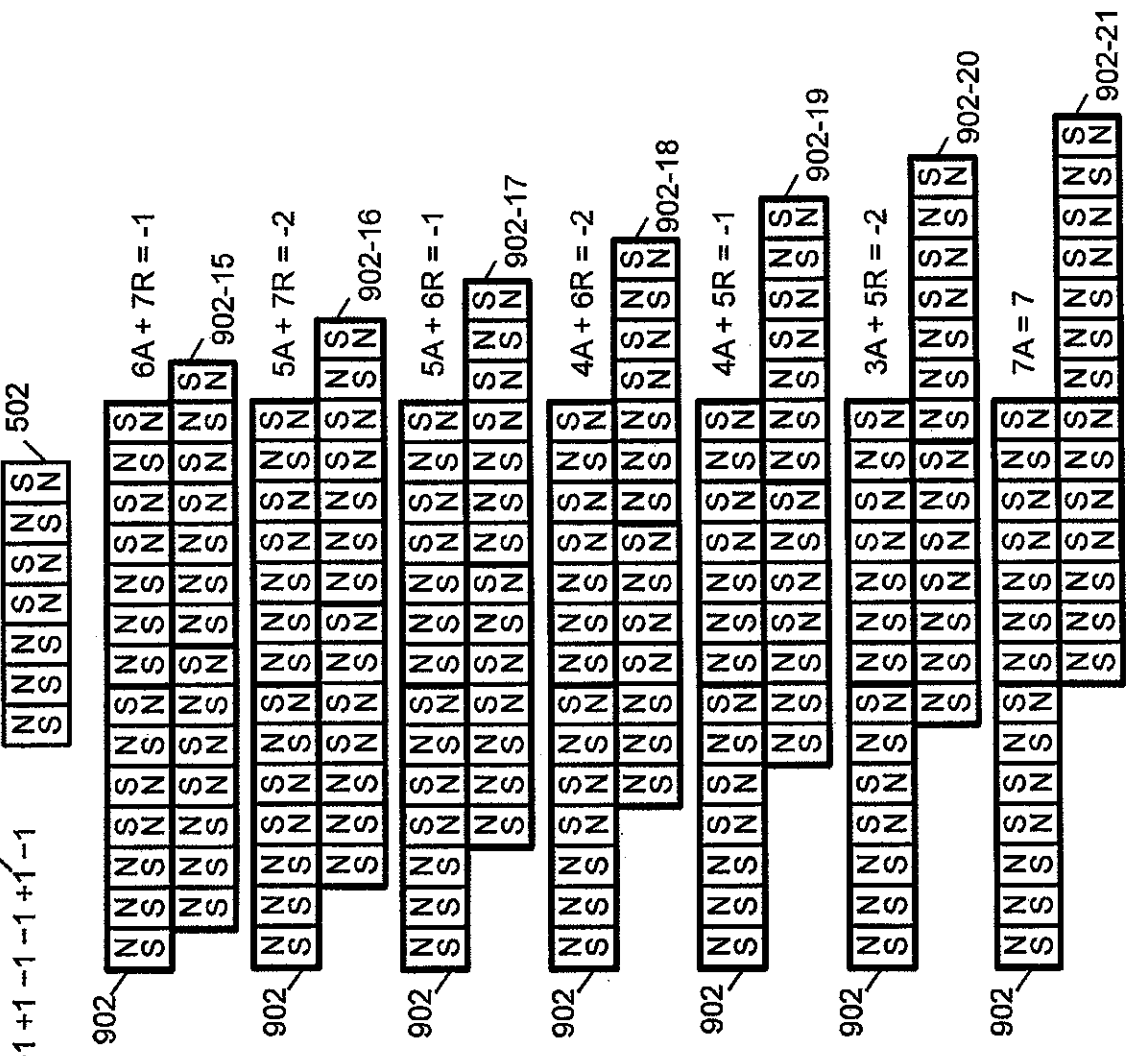
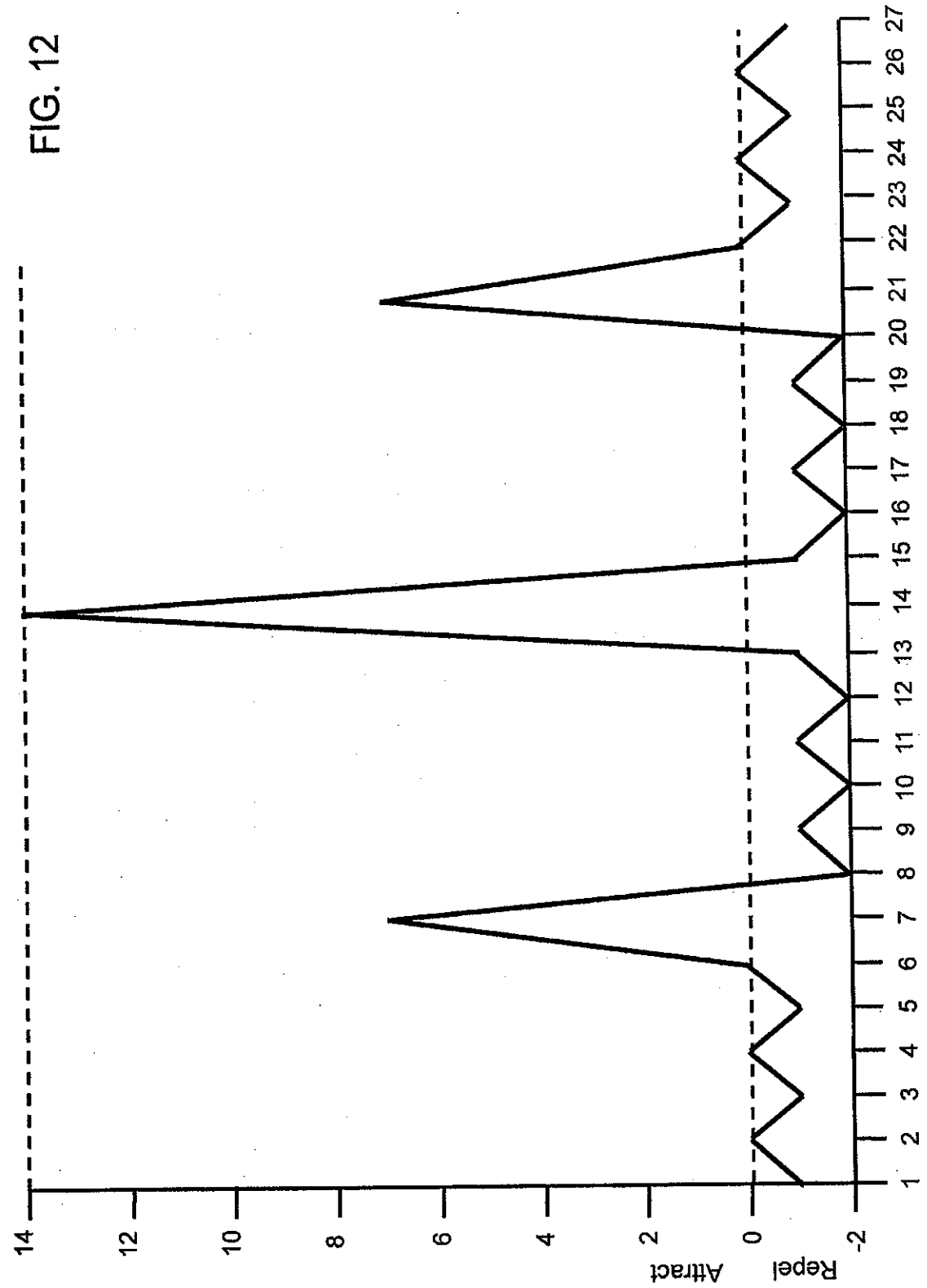

Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
902
6A + 7R = -1
902-15
5A + 7R = -2
902-16
5A + 6R = -1
902-17
4A + 6R = -2
902-18
4A + 5R = -1
902-19
3A + 5R = -2
902-20
7A = 7
902-21

FIG. 11D


Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
902
3A + 3R = 0
902-22
2A + 3R = -1
902-23
2A + 2R = 0
902-24
1A + 2R = -1
902-25
1A + 1R = 0
902-26
1R = -1
902-27

FIG. 12


14
12
10
8
6
4
2
0
-2
Repel
Attract
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

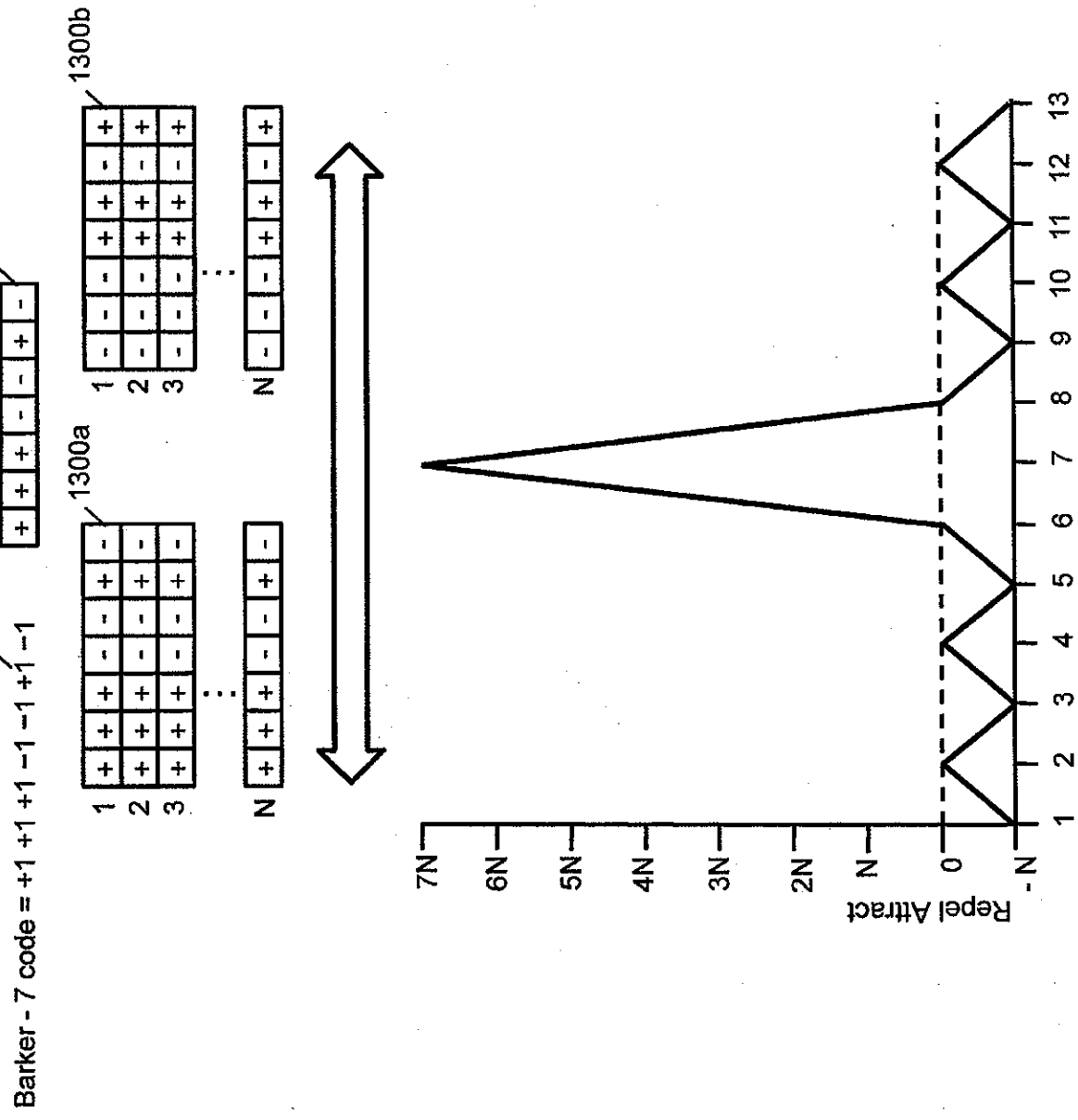
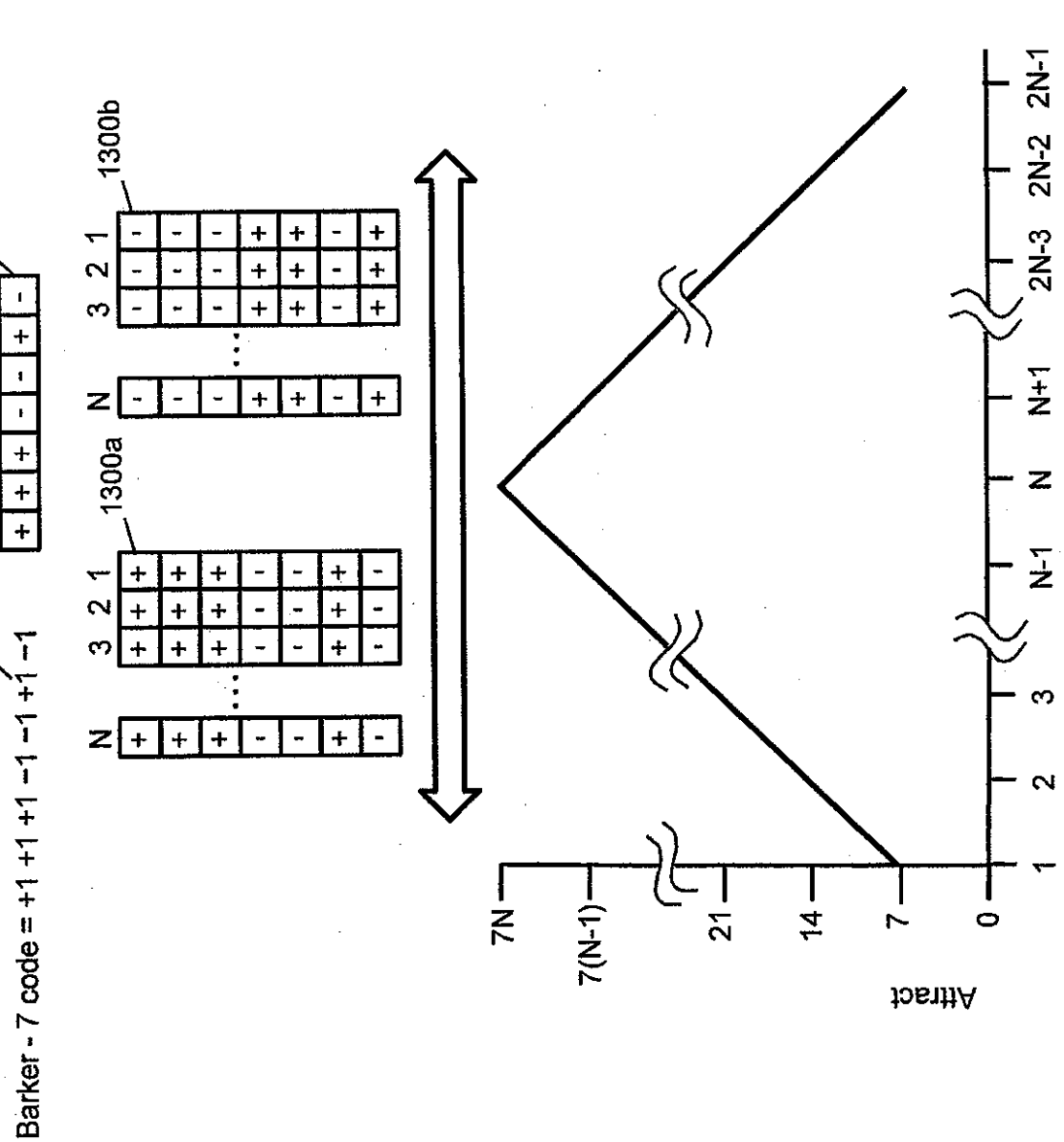

Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
1300a
1300b
1
2
3
N
7N
6N
5N
4N
3N
2N
N
0
- N
Repel Attract
1 2 3 4 5 6 7 8 9 10 11 12 13

FIG. 13A

FIG. 13B


Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
1300a
1300b
1 2 3 N
7N
7(N-1)
21
14
7
0
Attract
1 2 3 N-1 N N+1 2N-3 2N-2 2N-1

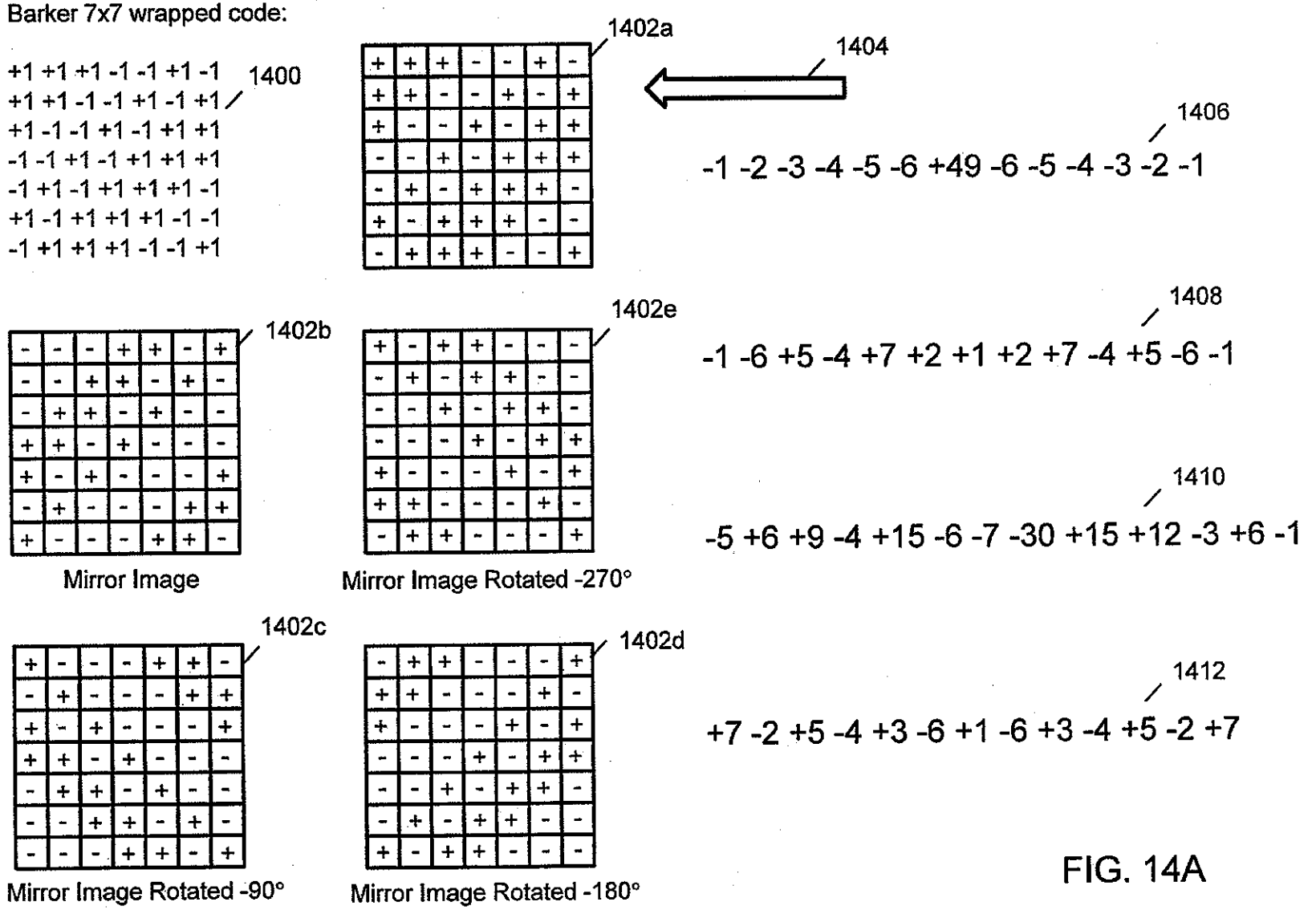

Barker 7x7 wrapped code:
+1 +1 +1 -1 -1 +1 -1
+1 +1 -1 -1 +1 -1 +1
+1 -1 -1 +1 -1 +1 +1
-1 -1 +1 -1 +1 +1 +1
-1 +1 -1 +1 +1 +1 -1
+1 -1 +1 +1 +1 -1 -1
-1 +1 +1 +1 -1 -1 +1
1400
1402a
1404
1406
-1 -2 -3 -4 -5 -6 +49 -6 -5 -4 -3 -2 -1
1402b
Mirror Image
1402e
Mirror Image Rotated -270°
1408
-1 -6 +5 -4 +7 +2 +1 +2 +7 -4 +5 -6 -1
1410
-5 +6 +9 -4 +15 -6 -7 -30 +15 +12 -3 +6 -1
1402c
Mirror Image Rotated -90°
1402d
Mirror Image Rotated -180°
1412
+7 -2 +5 -4 +3 -6 +1 -6 +3 -4 +5 -2 +7

FIG. 14A

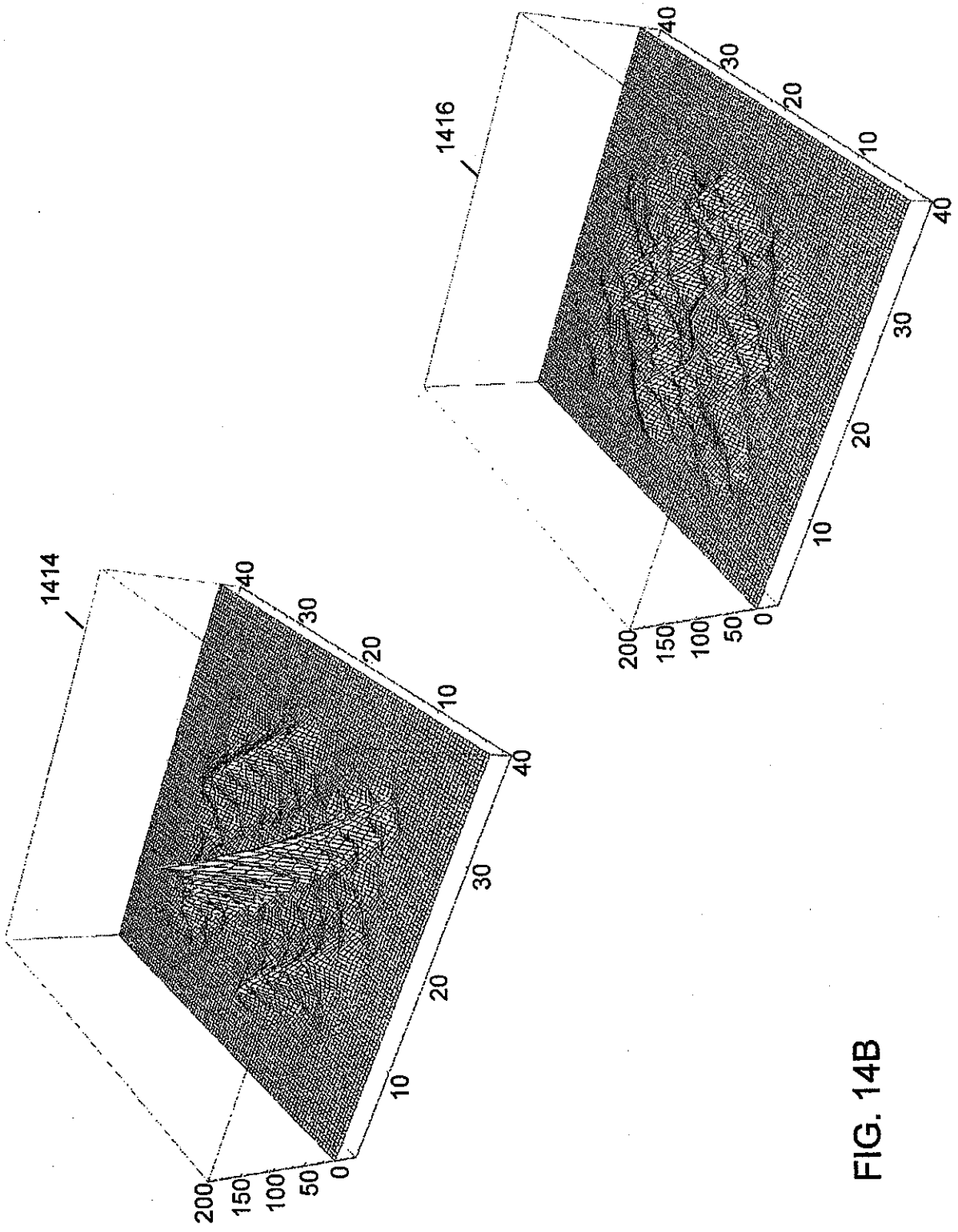


FIG. 14B

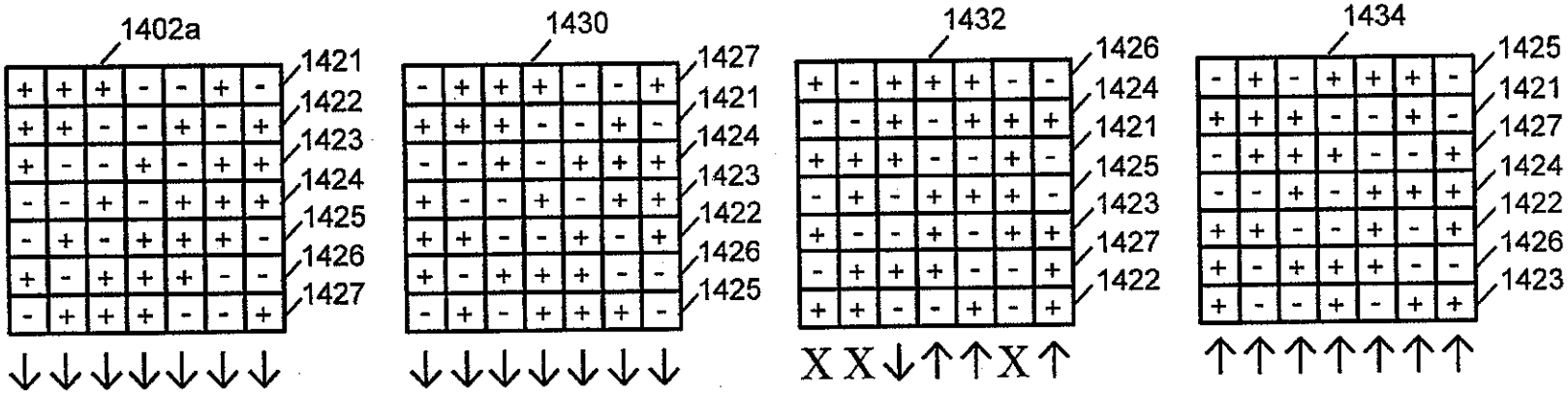

1402a
1421
1422
1423
1424
1425
1426
1427
1430
1427
1421
1424
1423
1422
1426
1425
1432
1426
1424
1421
1425
1423
1427
1422
1434
1425
1421
1427
1424
1422
1426
1423

FIG. 14C

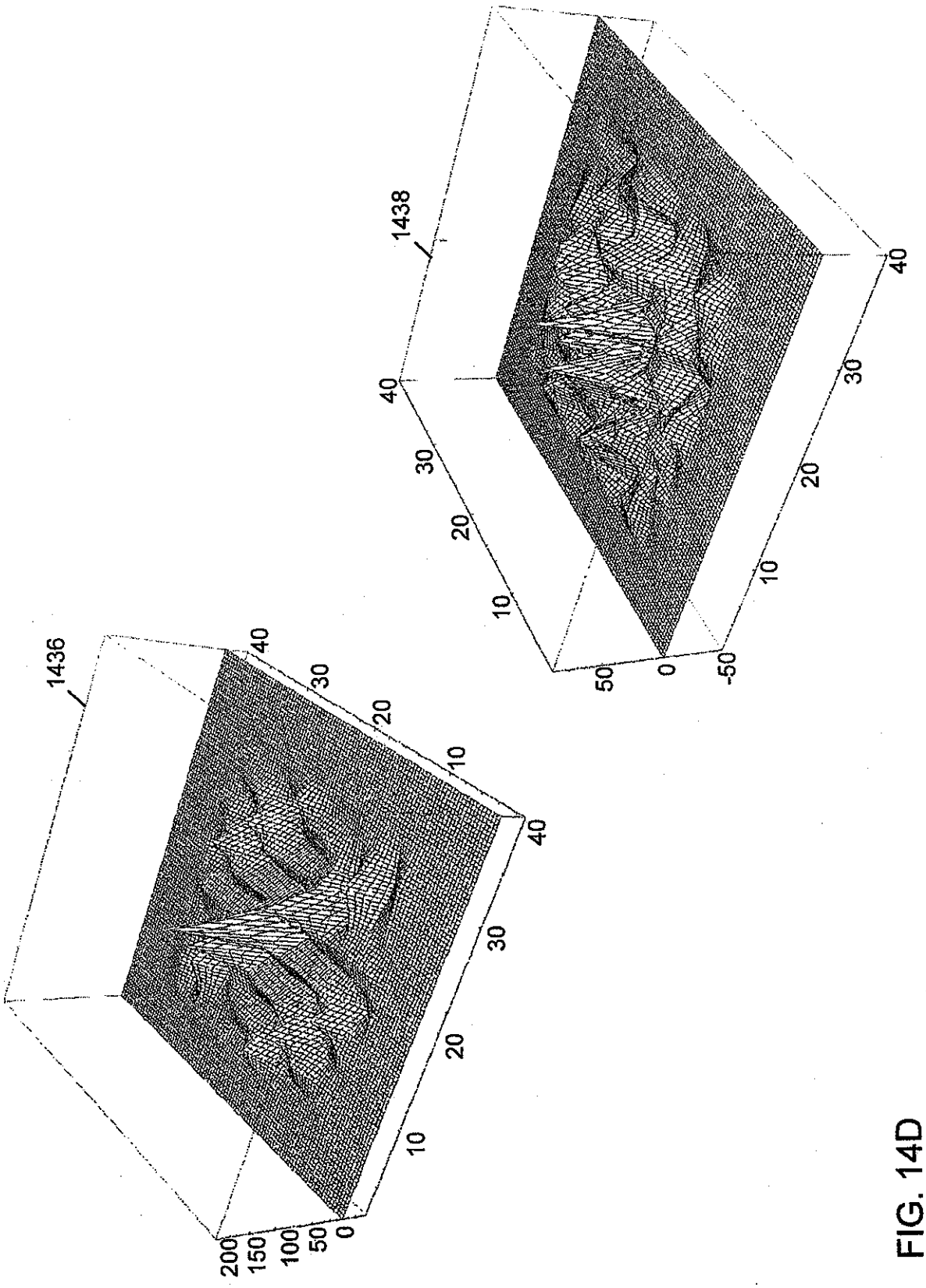


FIG. 14D

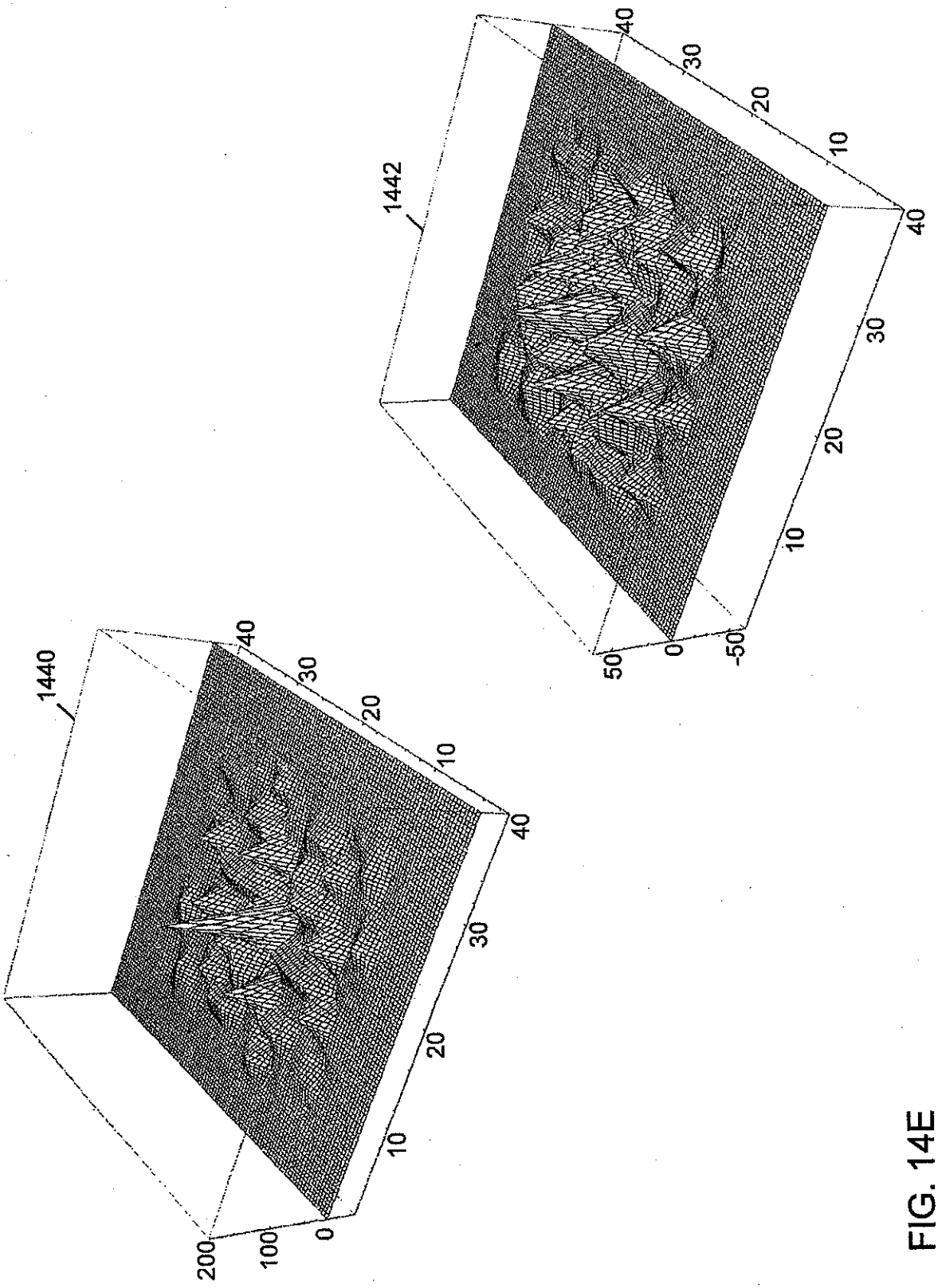


FIG. 14E

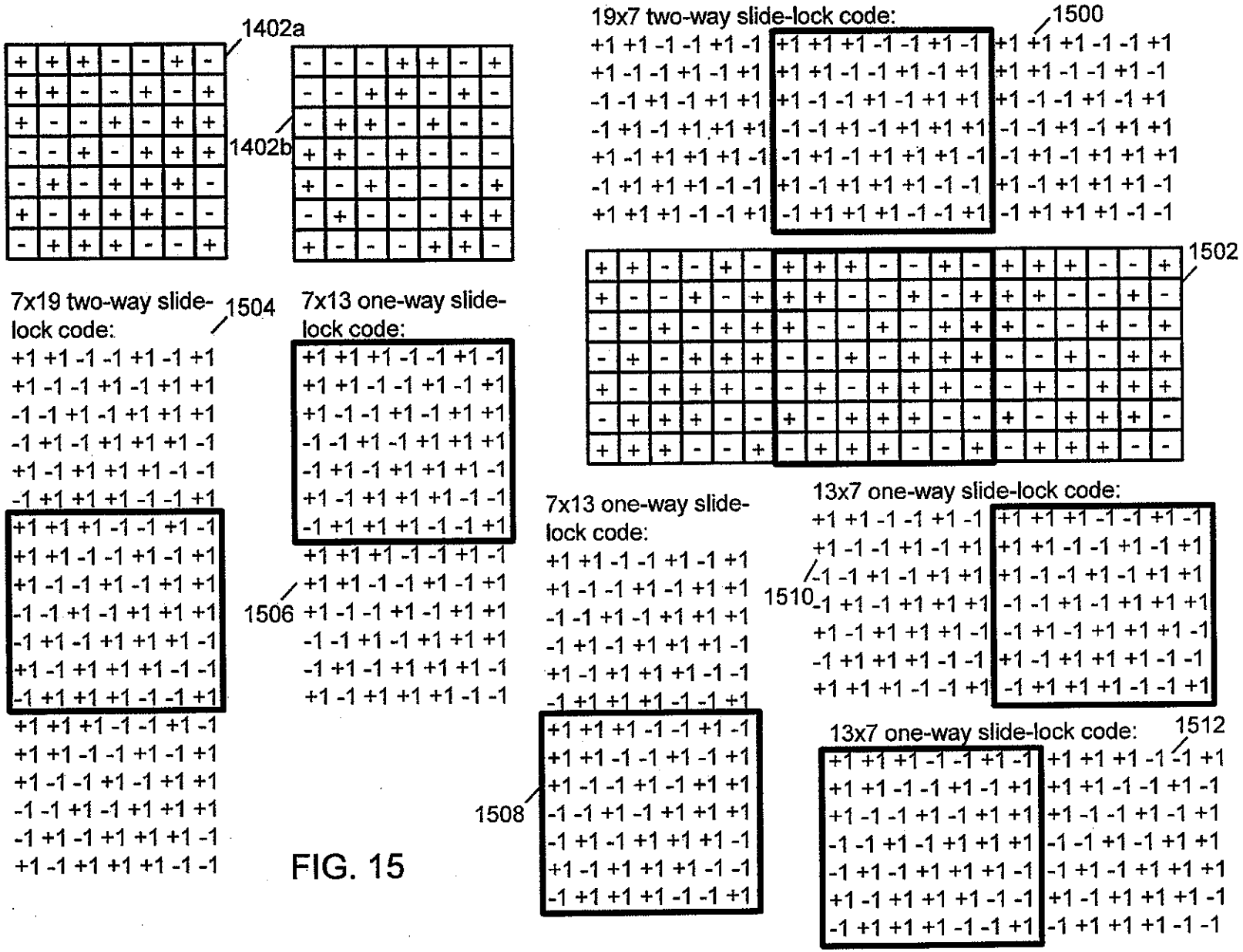
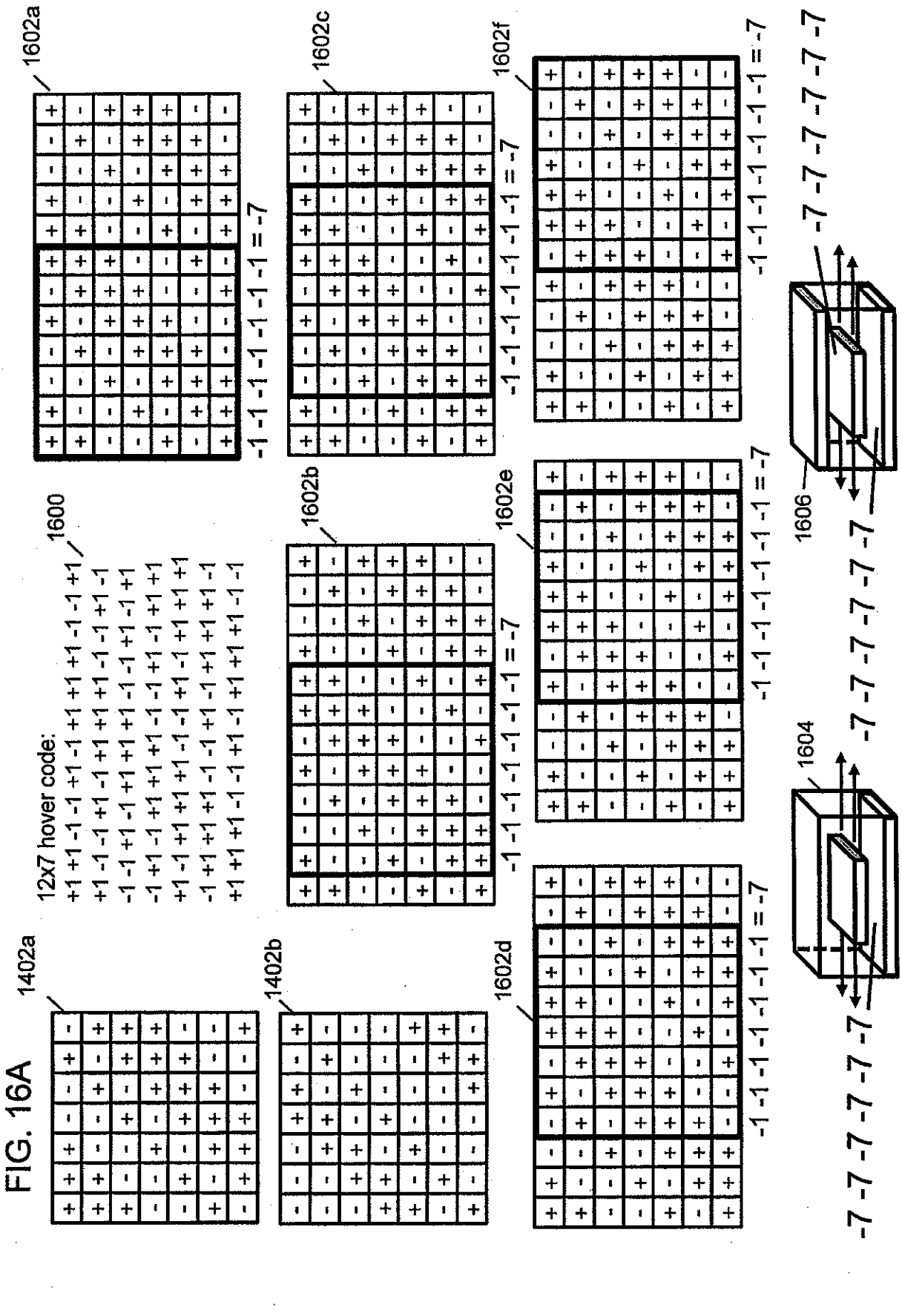

1402a
1402b
19x7 two-way slide-lock code:
1500
1502
7x19 two-way slide-lock code:
1504
7x13 one-way slide-lock code:
1506
7x13 one-way slide-lock code:
1508
13x7 one-way slide-lock code:
1510
13x7 one-way slide-lock code:
1512

FIG. 15

FIG. 16A


1402a
1402b
12x7 hover code:
+1 +1 -1 -1 +1 -1 +1 +1 +1 -1 -1 +1
+1 -1 -1 +1 -1 +1 +1 +1 -1 -1 +1 -1
-1 -1 +1 -1 +1 +1 +1 -1 +1 -1 +1 +1
-1 +1 -1 +1 +1 +1 -1 -1 +1 -1 +1 +1
+1 -1 +1 +1 +1 -1 -1 +1 -1 +1 +1 +1
-1 +1 +1 +1 -1 -1 +1 -1 +1 +1 -1 -1
+1 +1 +1 -1 -1 +1 -1 +1 +1 +1 -1 -1
1600
1602a
-1 -1 -1 -1 -1 -1 -1 = -7
1602b
-1 -1 -1 -1 -1 -1 -1 = -7
1602c
-1 -1 -1 -1 -1 -1 -1 = -7
1602d
-1 -1 -1 -1 -1 -1 -1 = -7
1602e
-1 -1 -1 -1 -1 -1 -1 = -7
1602f
-1 -1 -1 -1 -1 -1 -1 = -7
1604
1606
-7 -7 -7 -7 -7 -7 -7
-7 -7 -7 -7 -7 -7 -7
-7 -7 -7 -7 -7 -7 -7

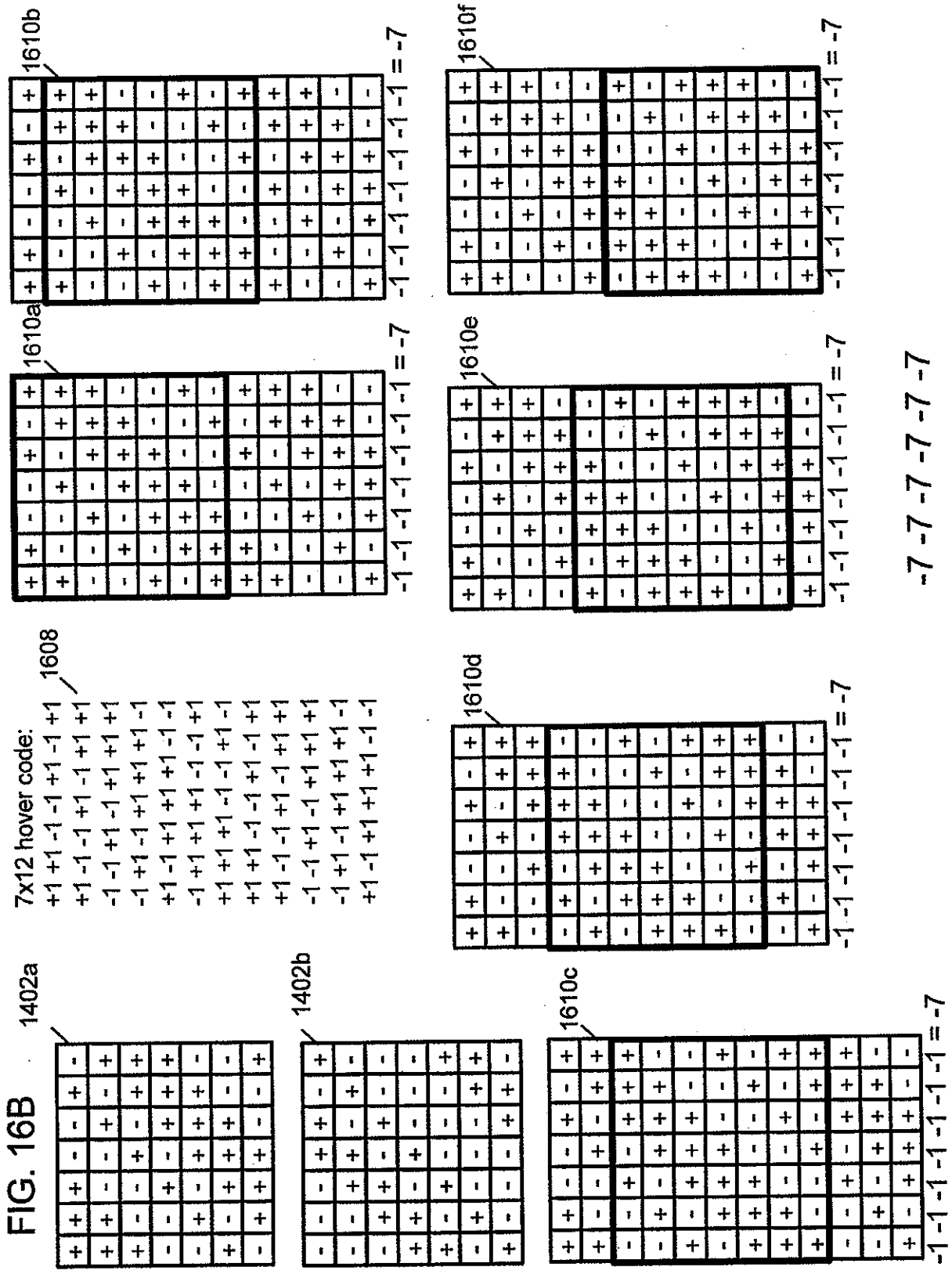
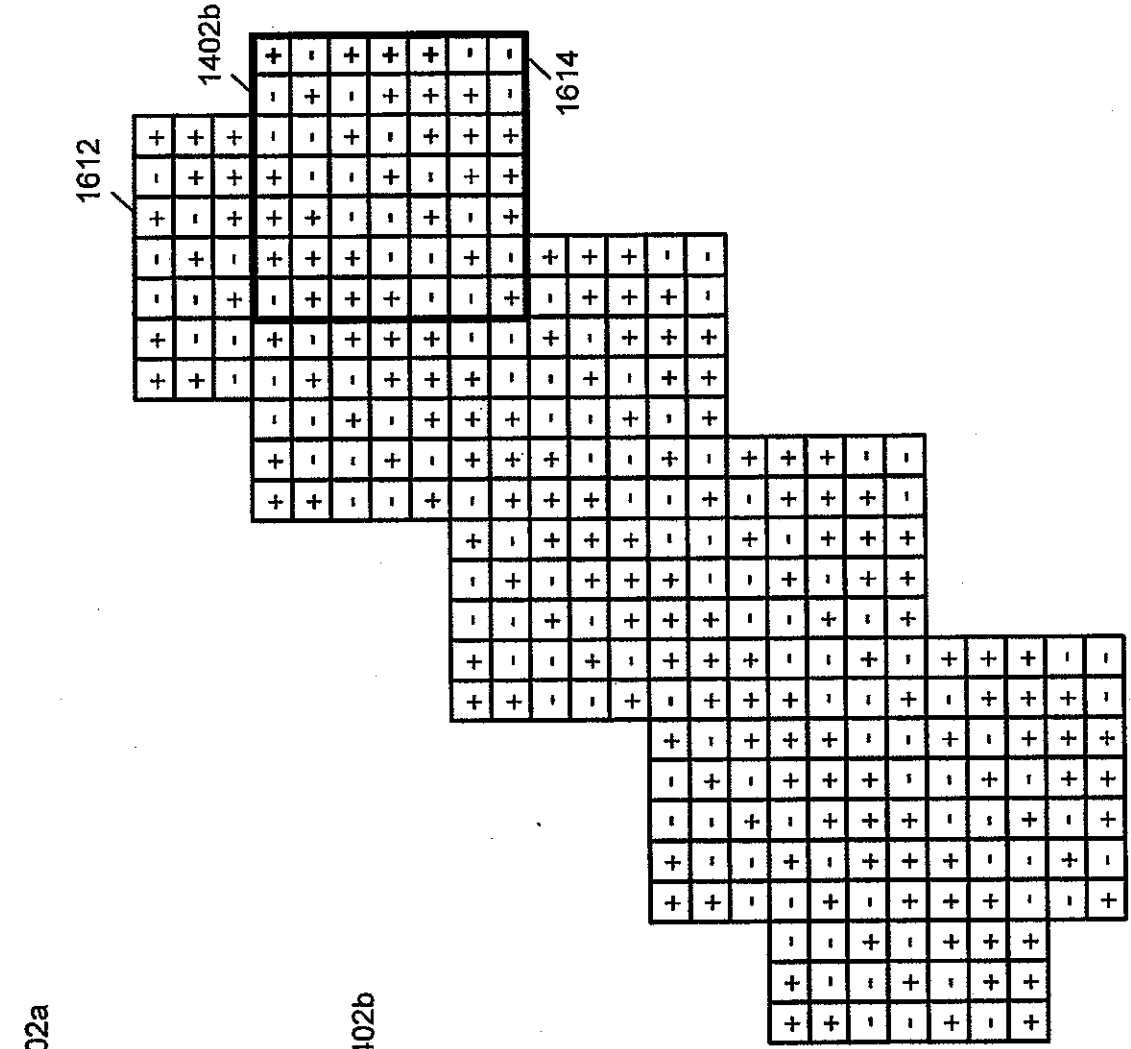


FIG. 16B
1402a
1402b
7x12 hover code:
+1 +1 -1 -1 +1 -1 +1
+1 -1 -1 +1 -1 +1 +1
-1 -1 +1 -1 +1 +1 +1
-1 +1 -1 +1 +1 +1 -1
+1 -1 +1 +1 +1 -1 -1
-1 +1 +1 +1 -1 -1 +1
+1 +1 +1 -1 -1 +1 -1
+1 +1 -1 -1 +1 -1 +1
+1 -1 -1 +1 -1 +1 +1
-1 -1 +1 -1 +1 +1 -1
-1 +1 -1 +1 +1 -1 -1
+1 -1 +1 +1 -1 -1 -1
1608
1610a
1610b
1610c
1610d
1610e
1610f
-1 -1 -1 -1 -1 -1 = -7
-1 -1 -1 -1 -1 -1 = -7
-1 -1 -1 -1 -1 -1 = -7
-1 -1 -1 -1 -1 -1 = -7
-1 -1 -1 -1 -1 -1 = -7
-1 -1 -1 -1 -1 -1 = -7
-7 -7 -7 -7 -7 -7



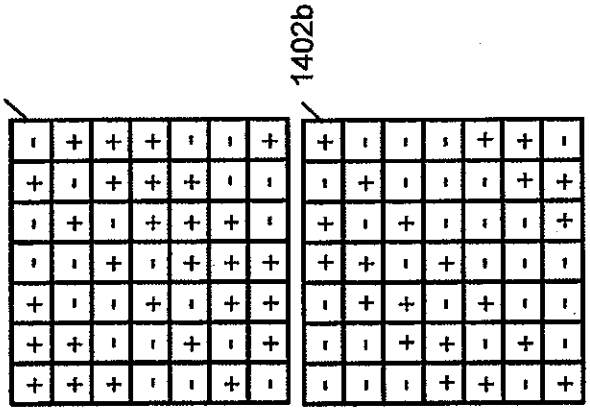


FIG. 16C

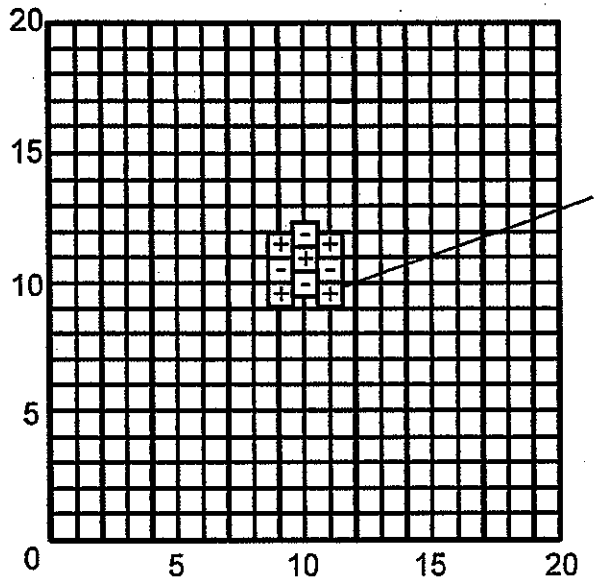


FIG. 17A

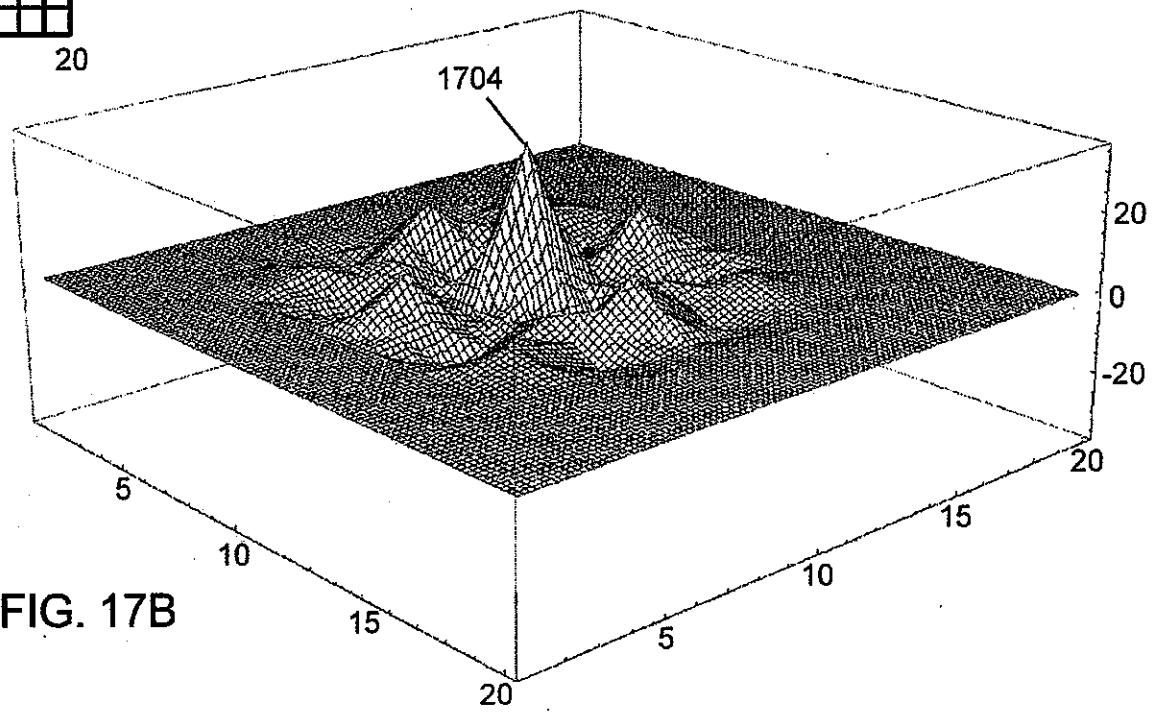


FIG. 17B

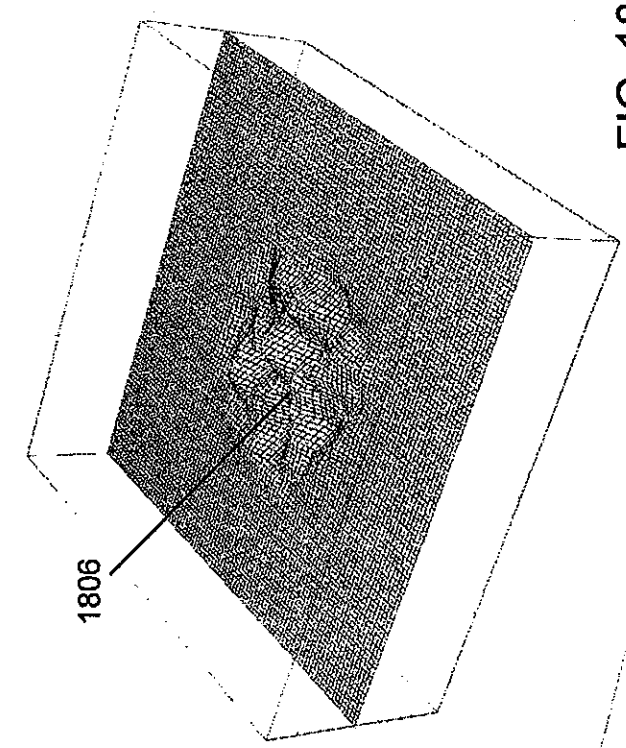


FIG. 18C

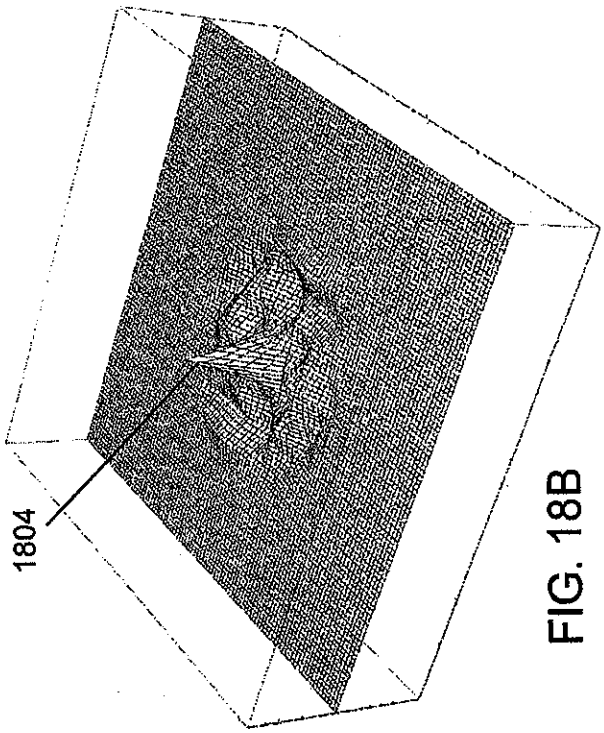


FIG. 18B

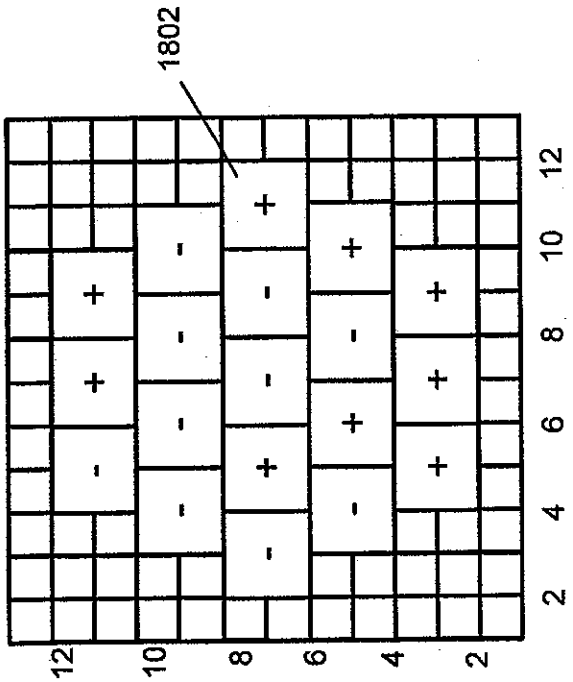


FIG. 18A

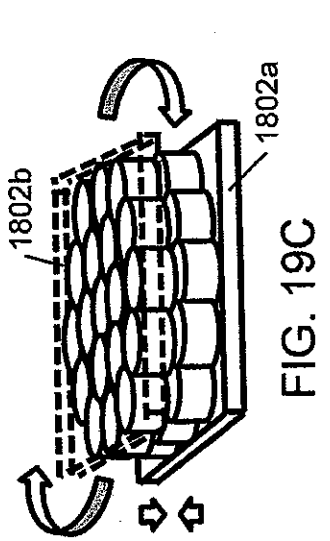


FIG. 19C

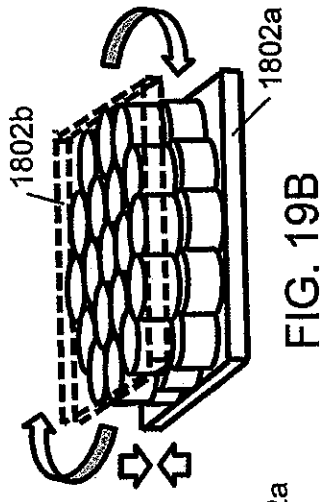


FIG. 19B

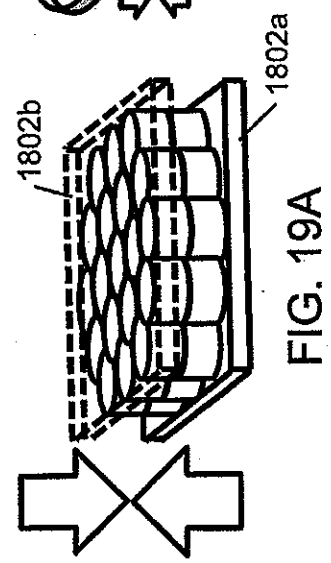


FIG. 19A

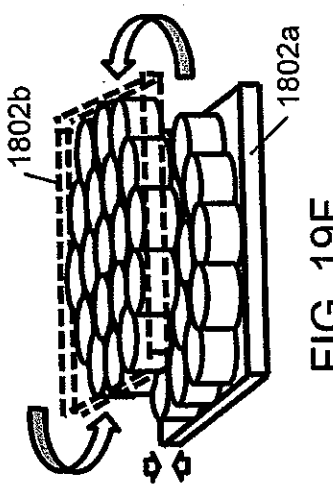


FIG. 19F

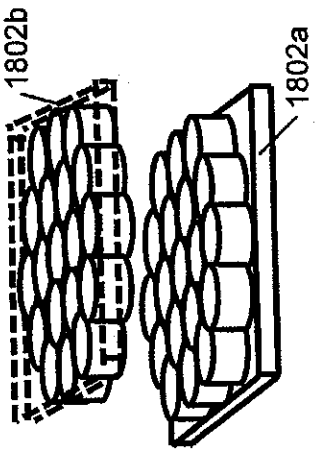


FIG. 19E

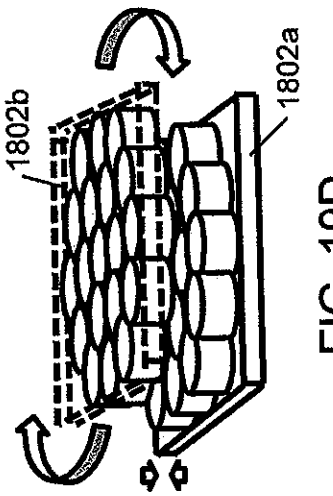


FIG. 19D

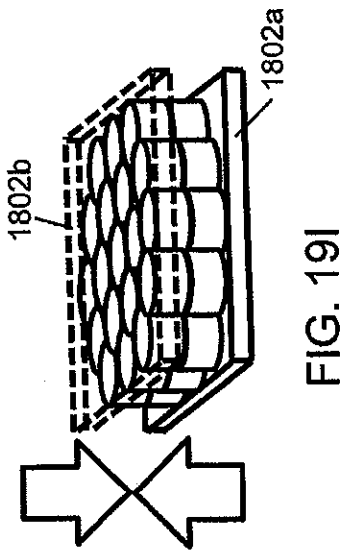


FIG. 19I

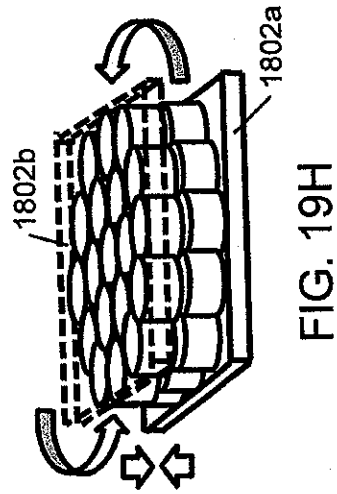


FIG. 19H

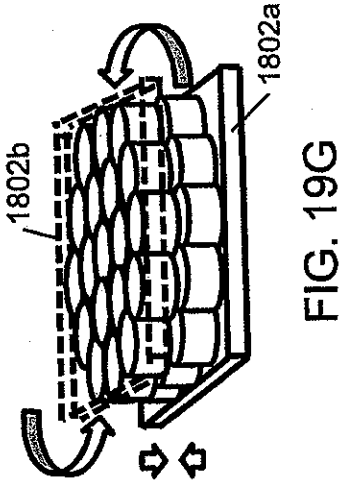


FIG. 19G

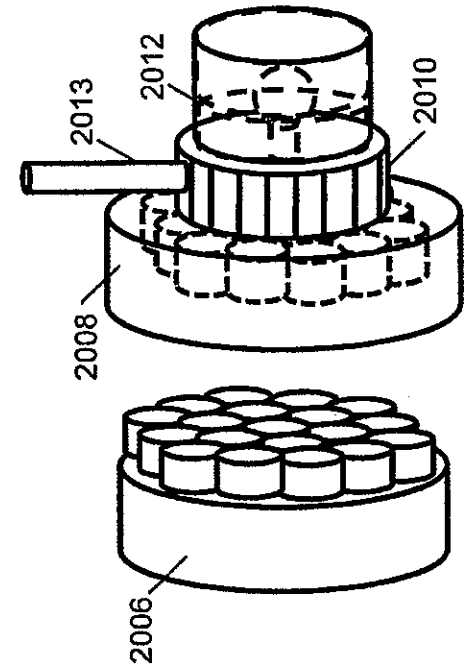


FIG. 20B

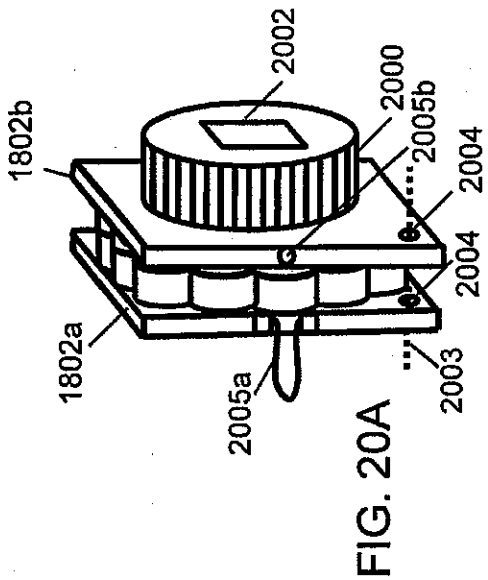


FIG. 20A

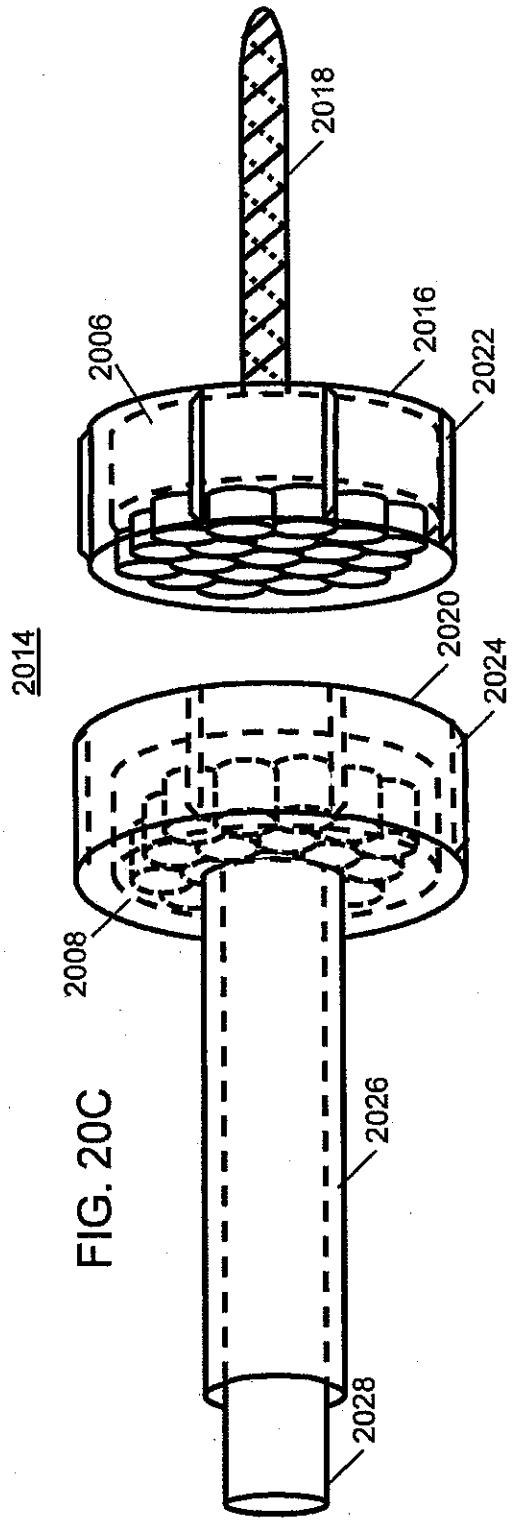


FIG. 20C

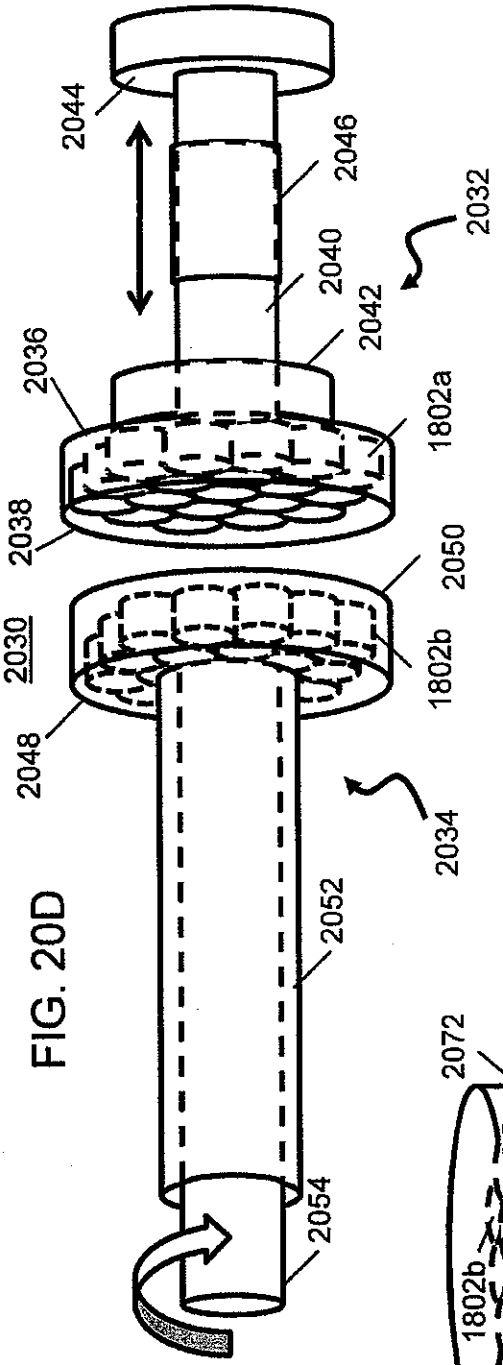


FIG. 20D

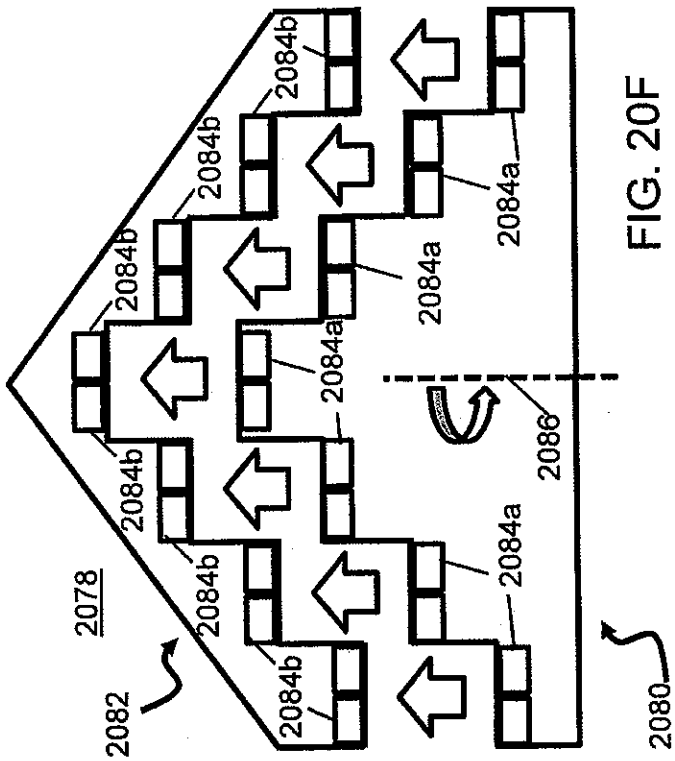


FIG. 20F

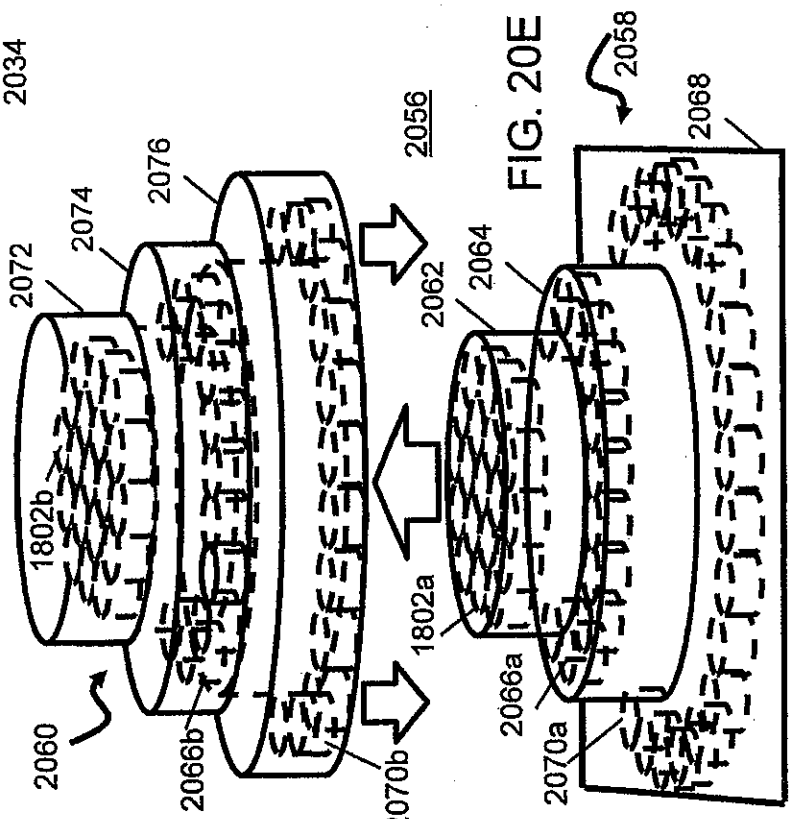
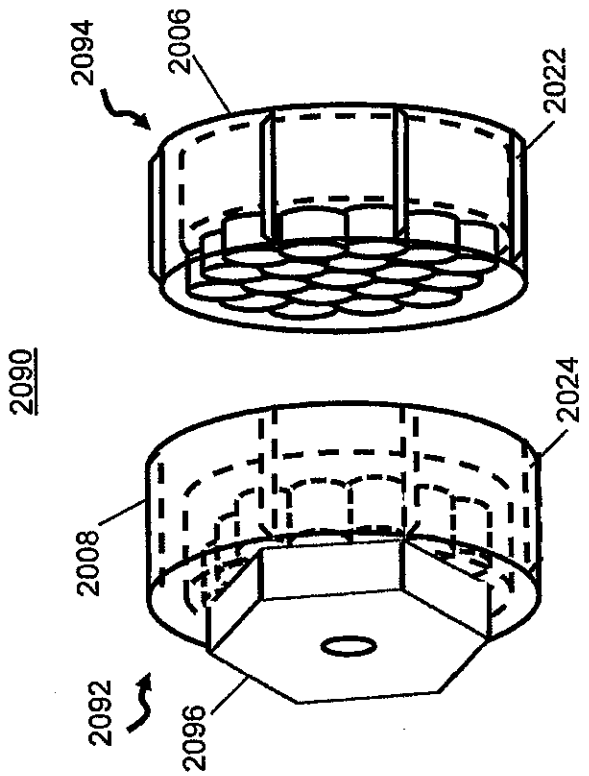


FIG. 20E

FIG. 20G



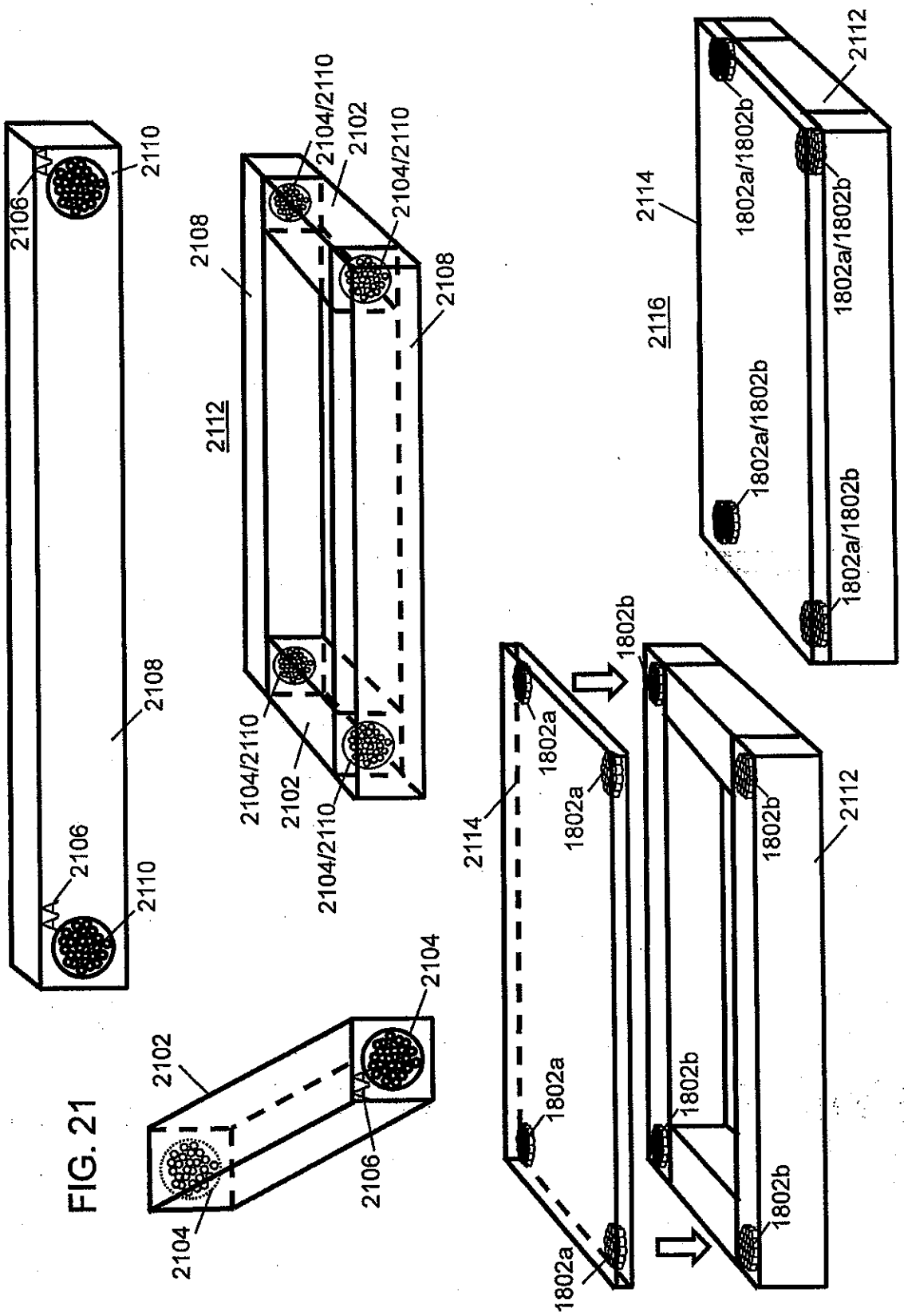

2106
2110
2108
2106
2110
2104/2110
2102
2104/2110
2108
2108
2112
2104/2110
2102
2104/2110
2102
2104
2104
2106
2114
1802a
1802a
1802a
1802a
1802b
1802b
1802b
1802b
2112
2114
2116
1802a/1802b
1802a/1802b
1802a/1802b
1802a/1802b
2112

FIG. 21

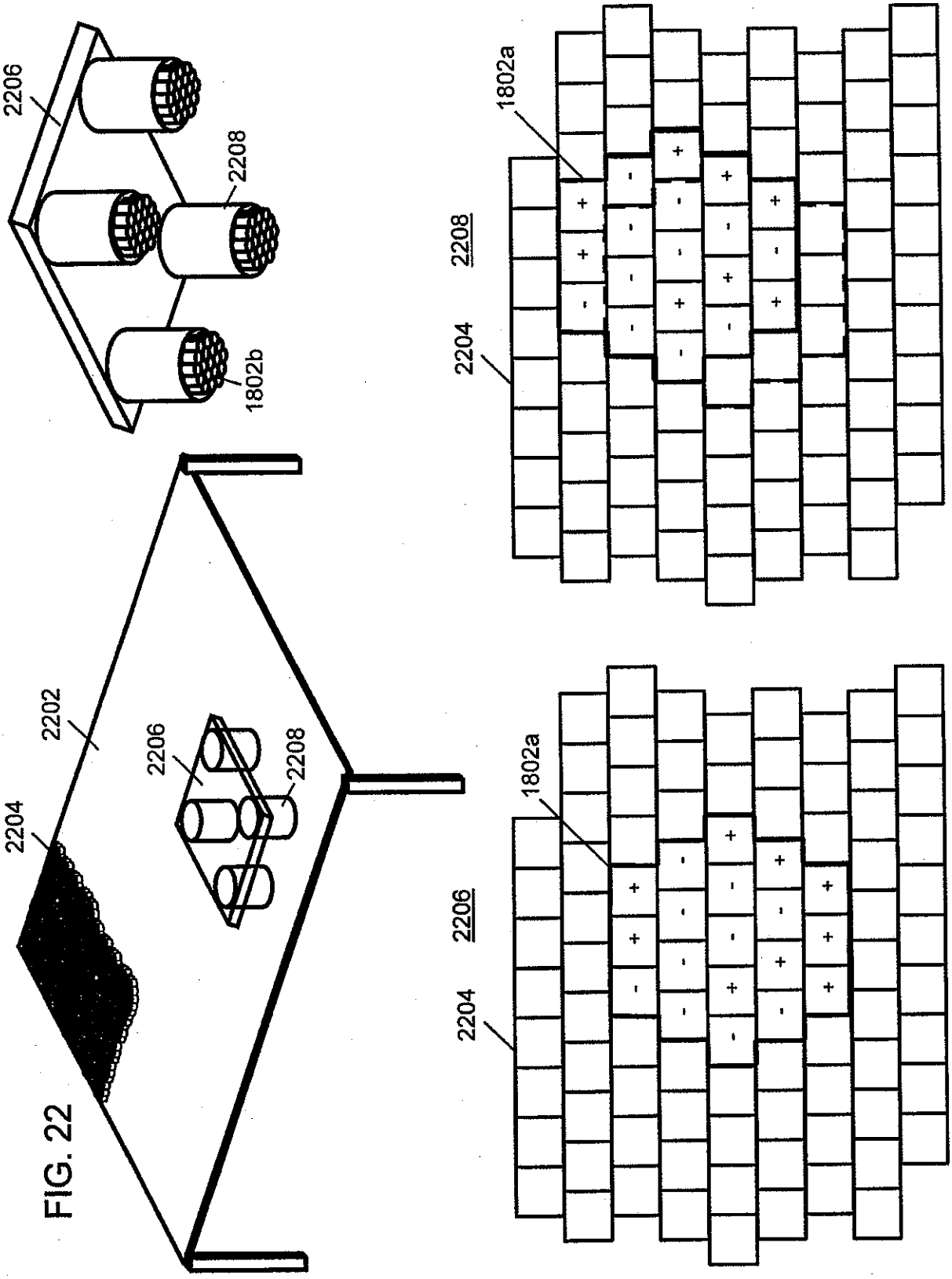

2206
2208
1802b
2202
2206
2208
2204
2204
2206
1802a
2208
1802a

FIG. 22

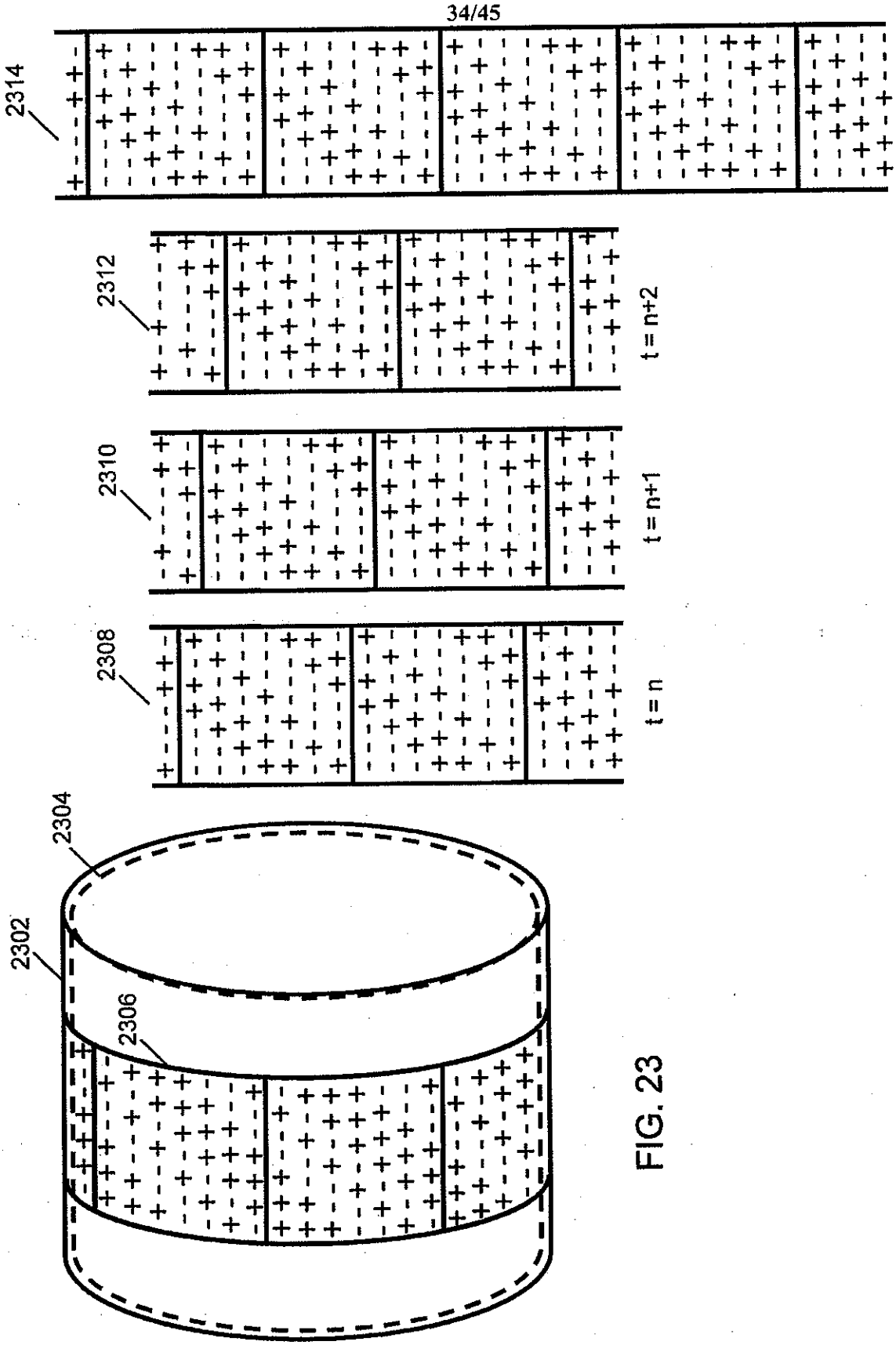


FIG. 23

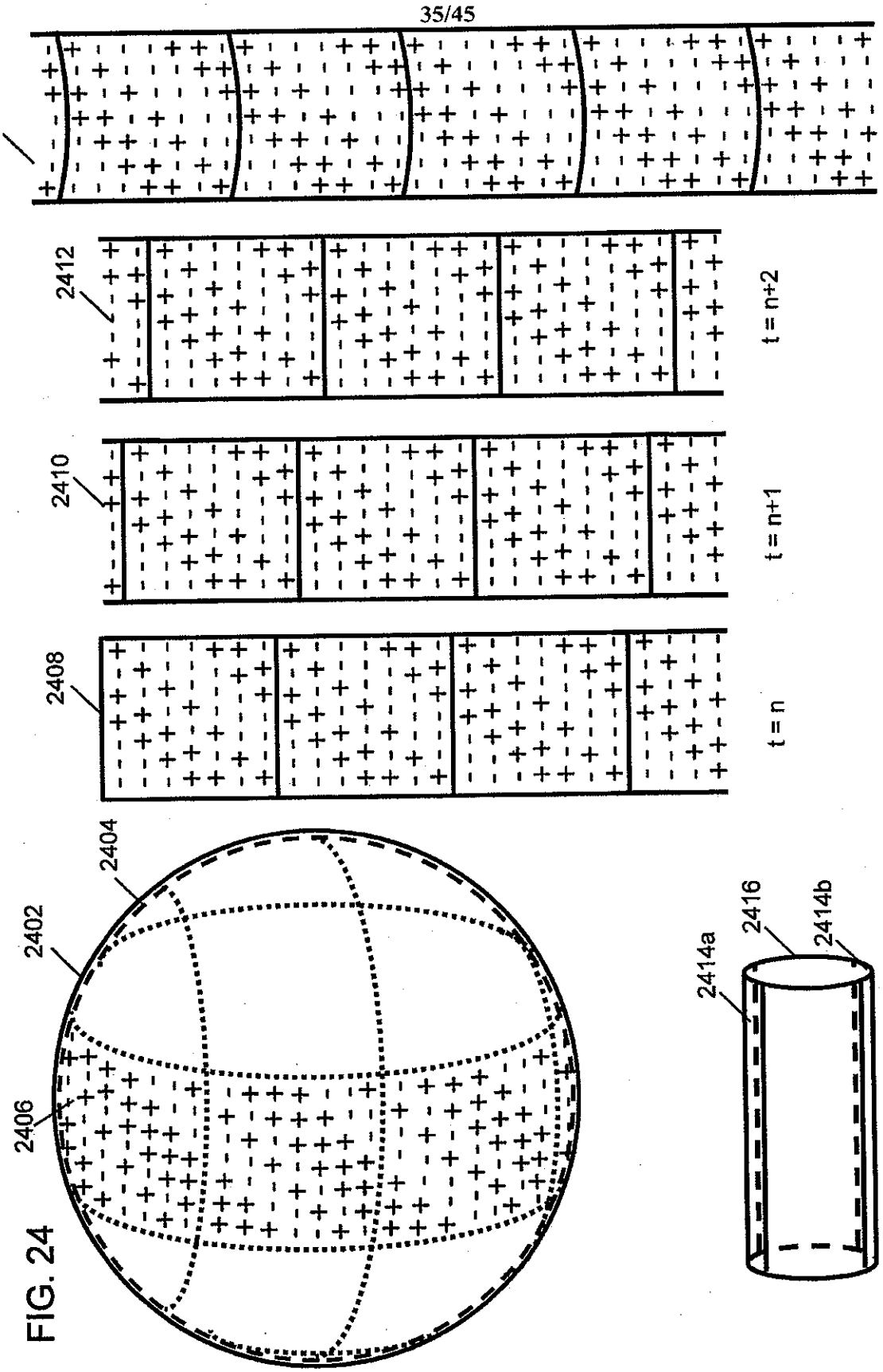

2414
2412
2410
2408
t = n+2
t = n+1
t = n
2404
2402
2406
2414a
2416
2414b

FIG. 24

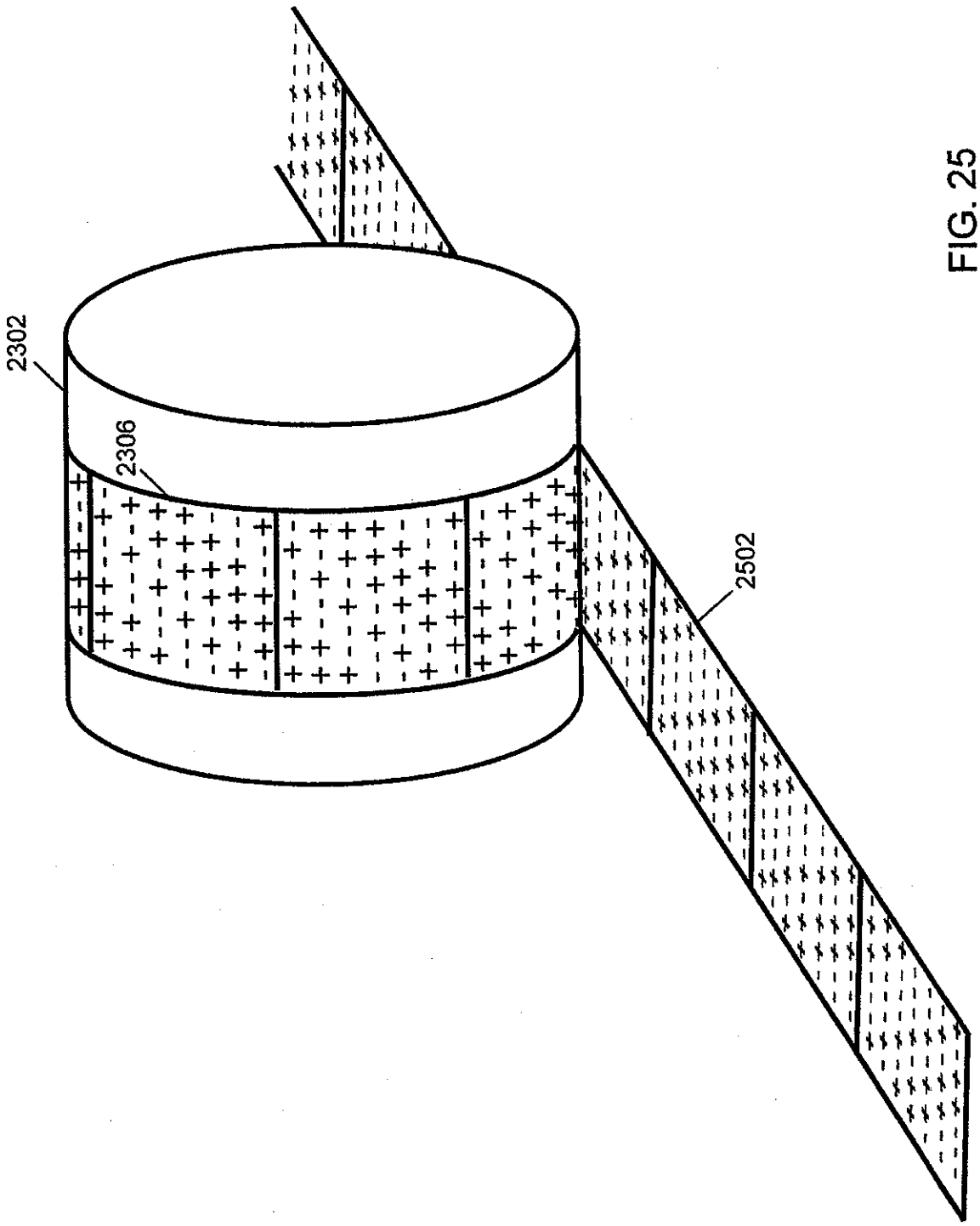


FIG. 25

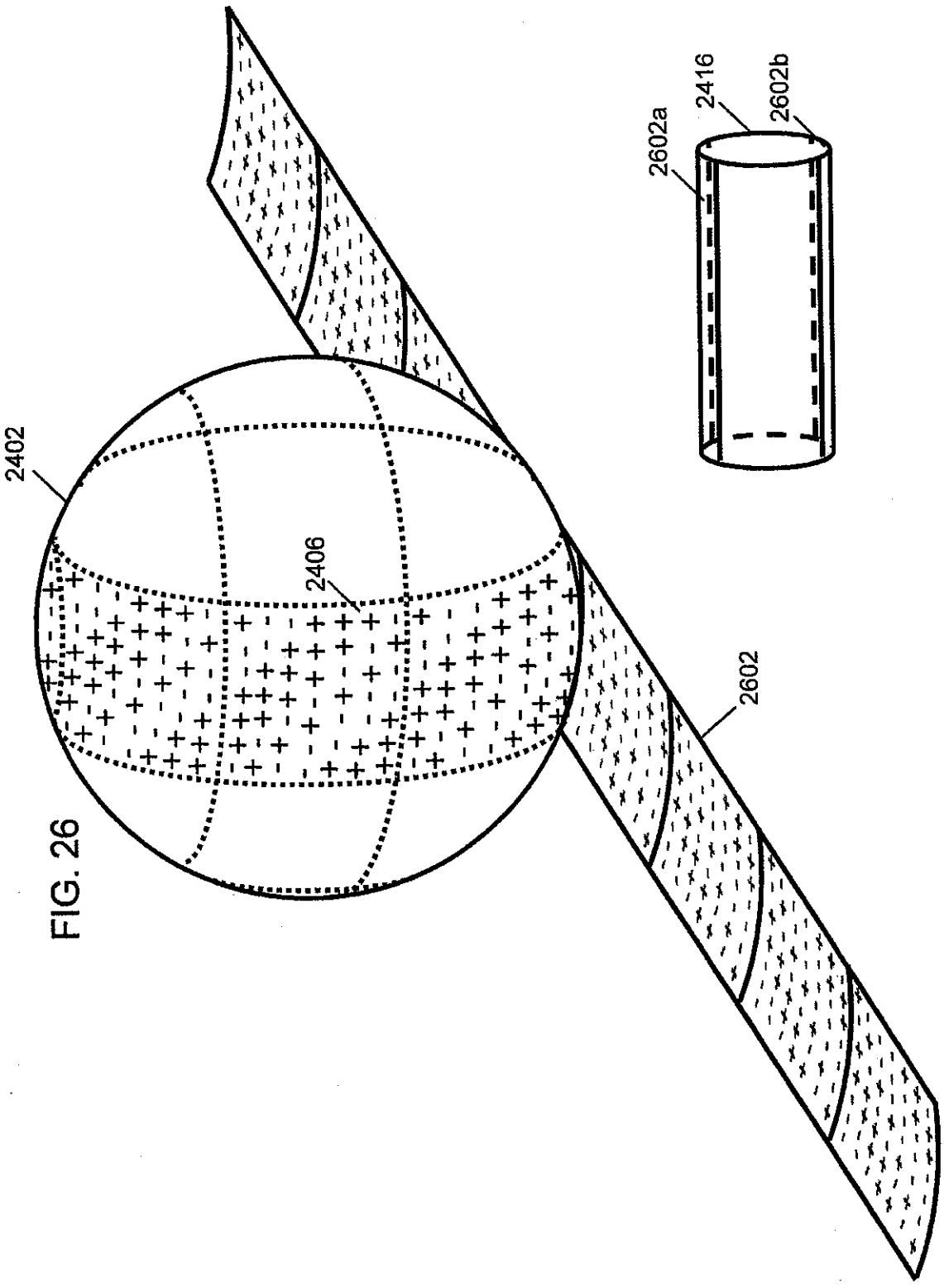


FIG. 26

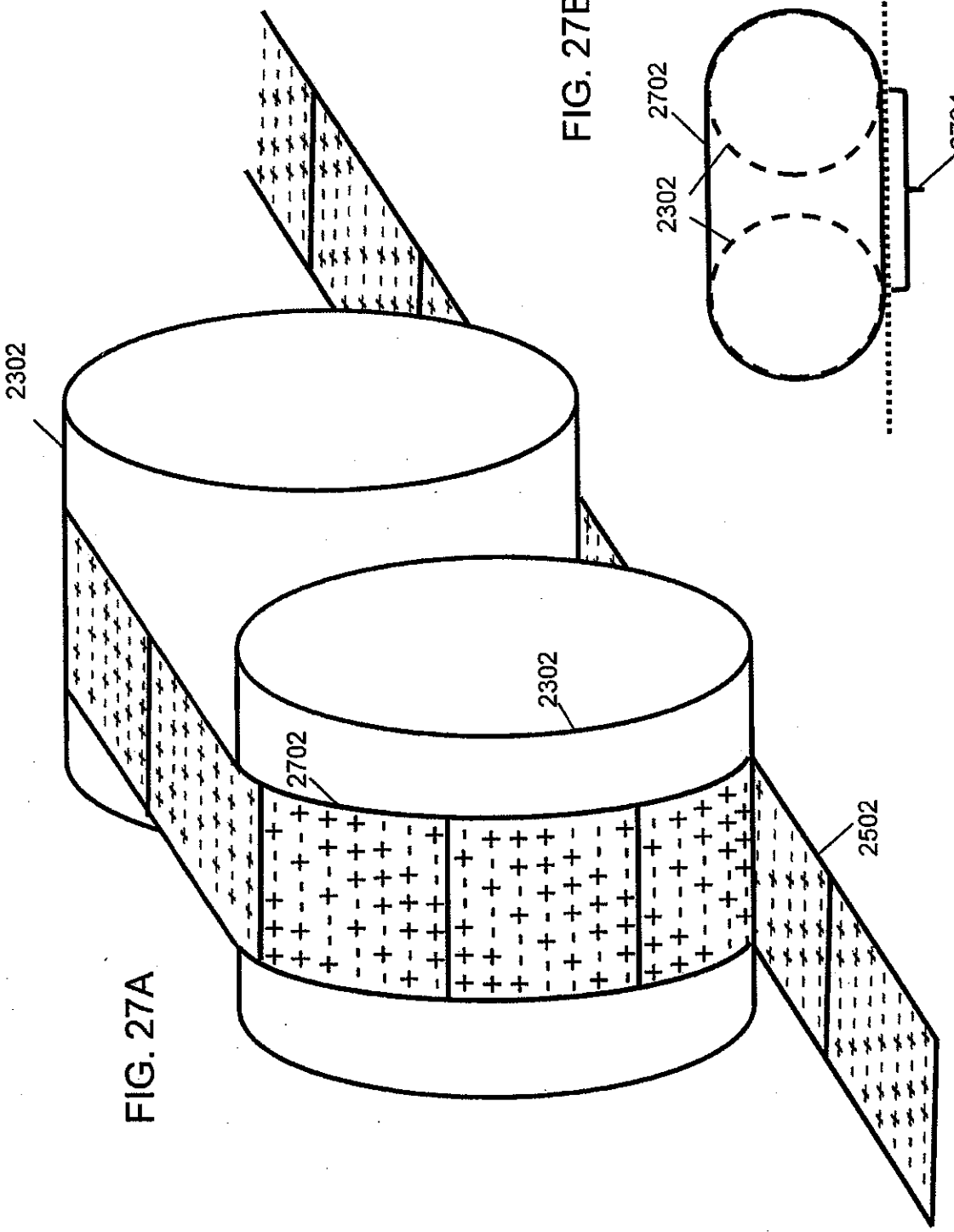


FIG. 27A

FIG. 27B

FIG. 28A

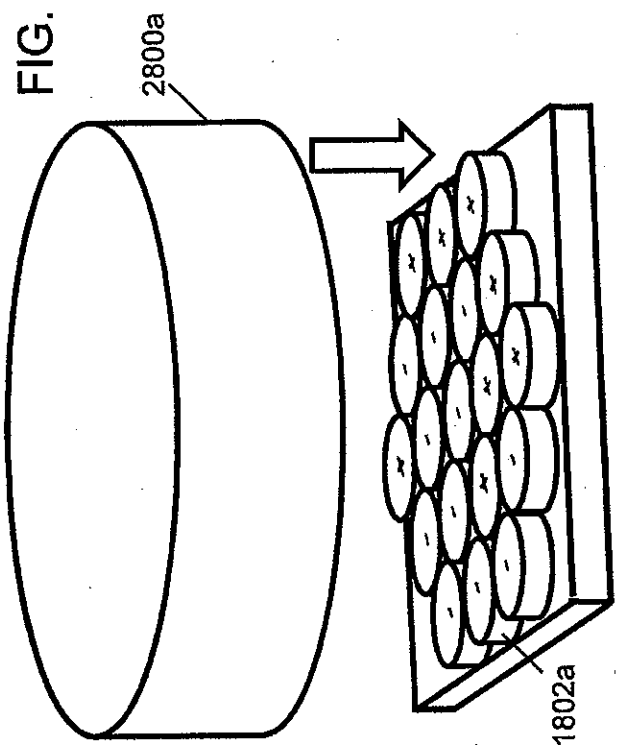


FIG. 28B

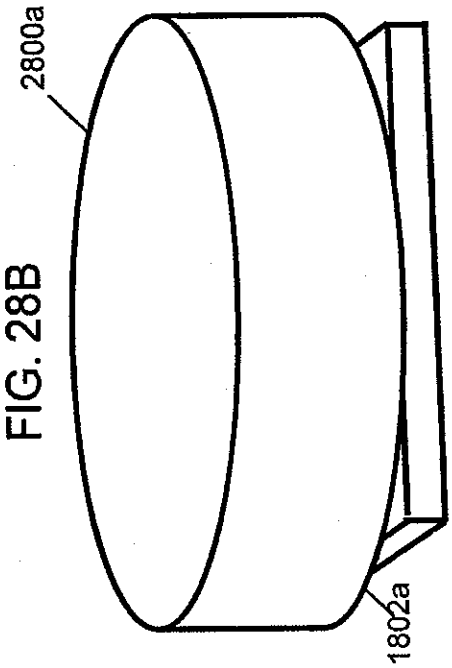


FIG. 28C

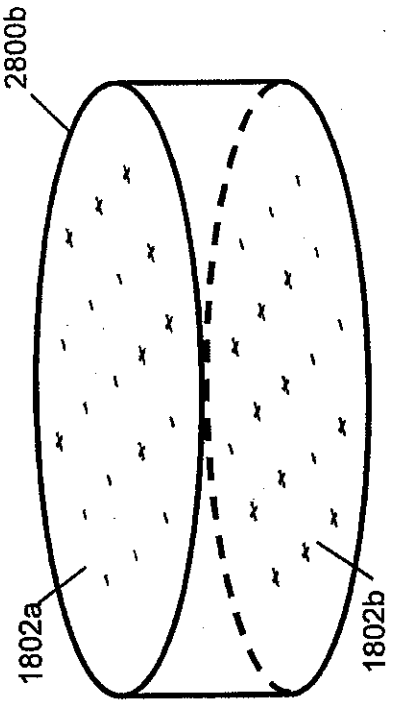
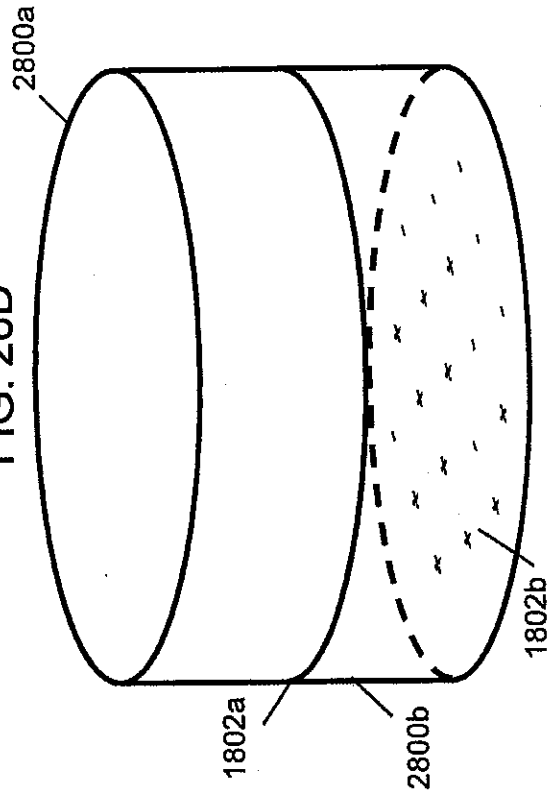


FIG. 28D



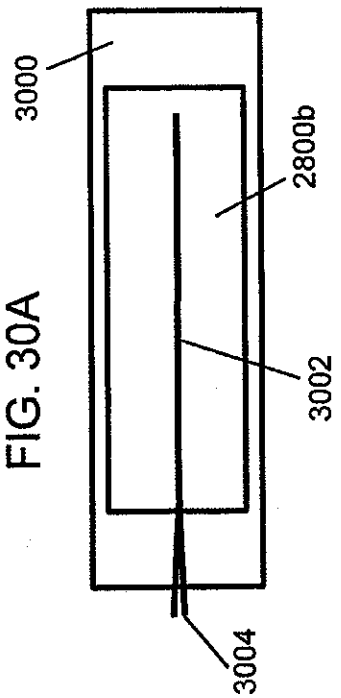


FIG. 30A

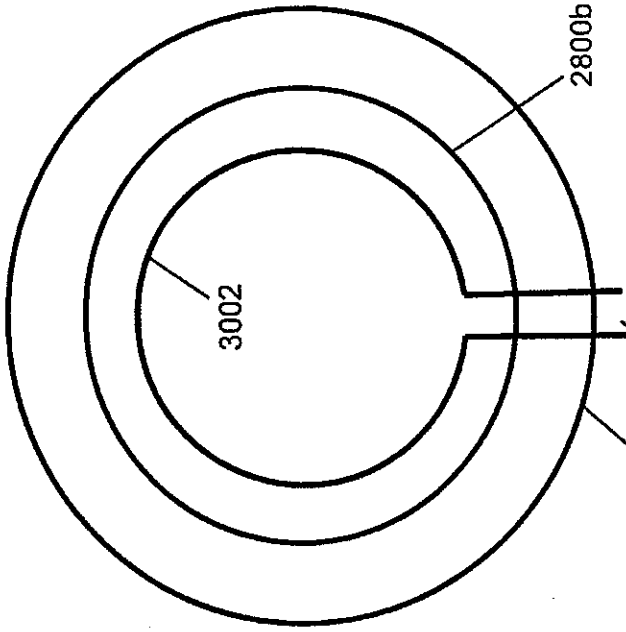


FIG. 30C

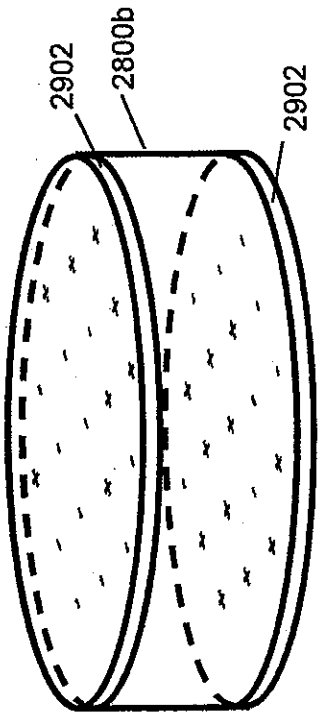


FIG. 29

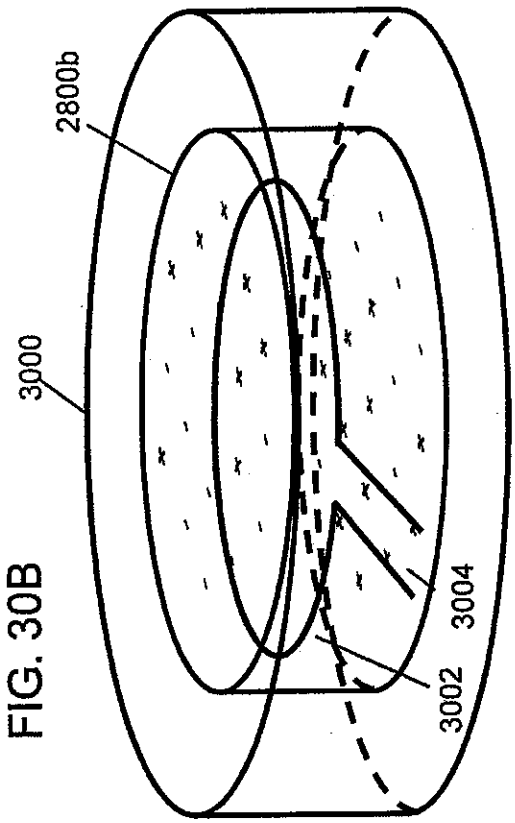


FIG. 30B

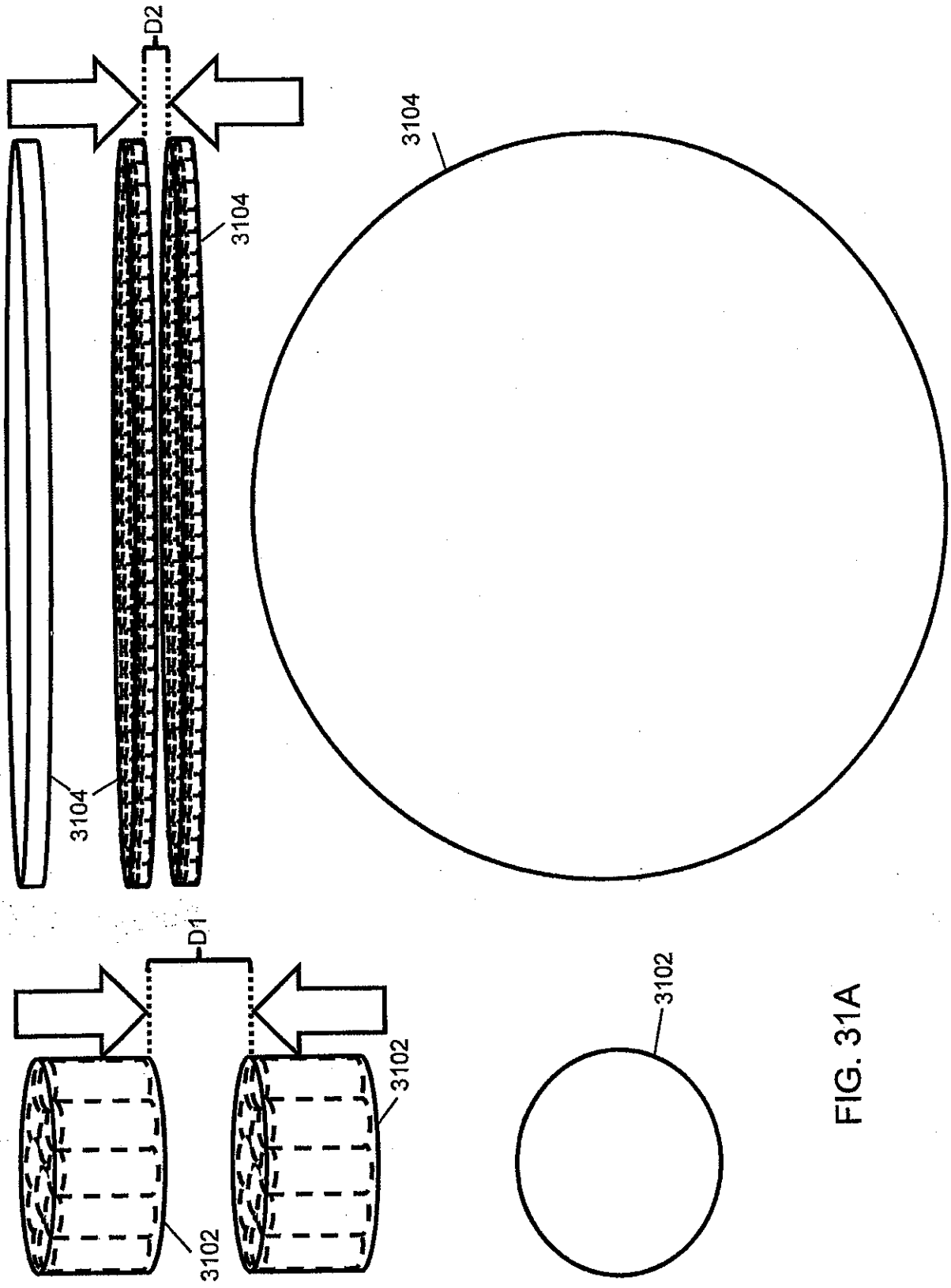


FIG. 31A

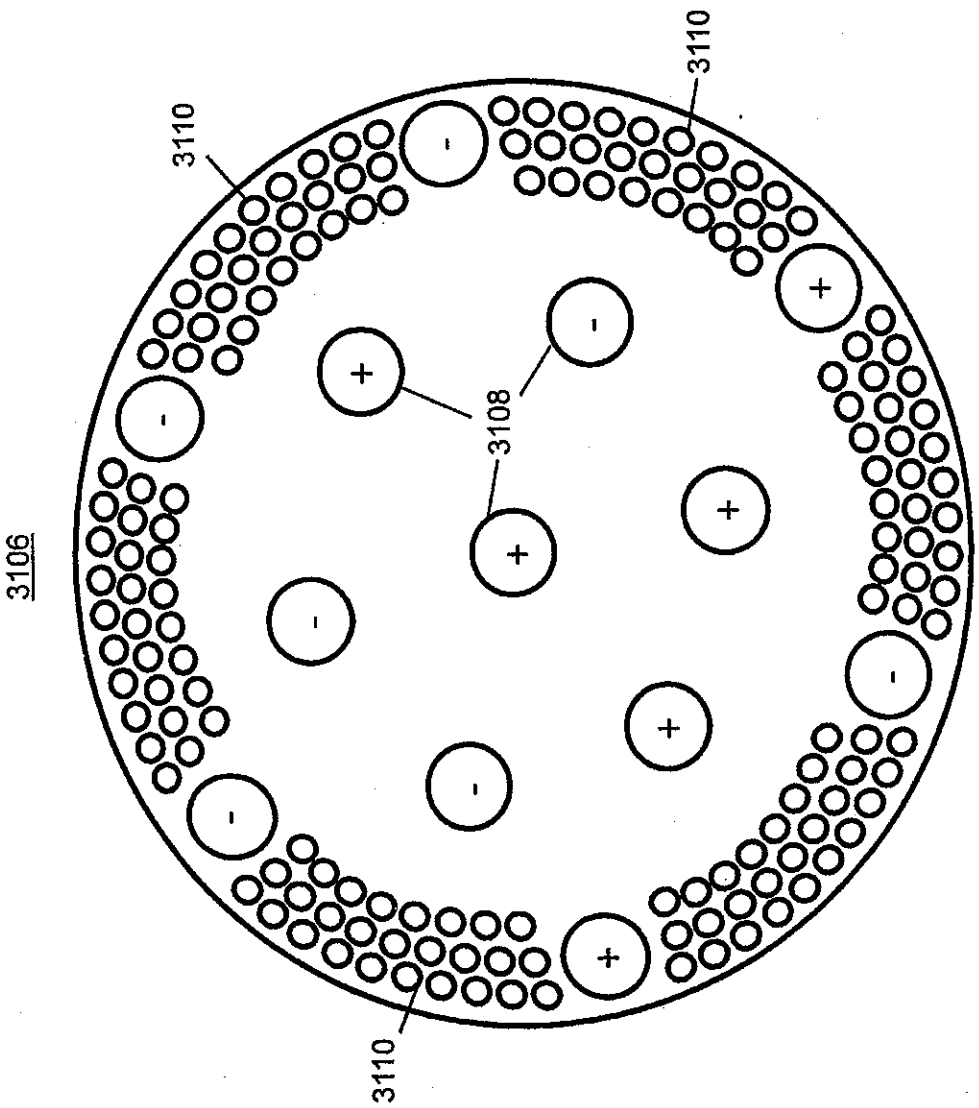


FIG. 31B

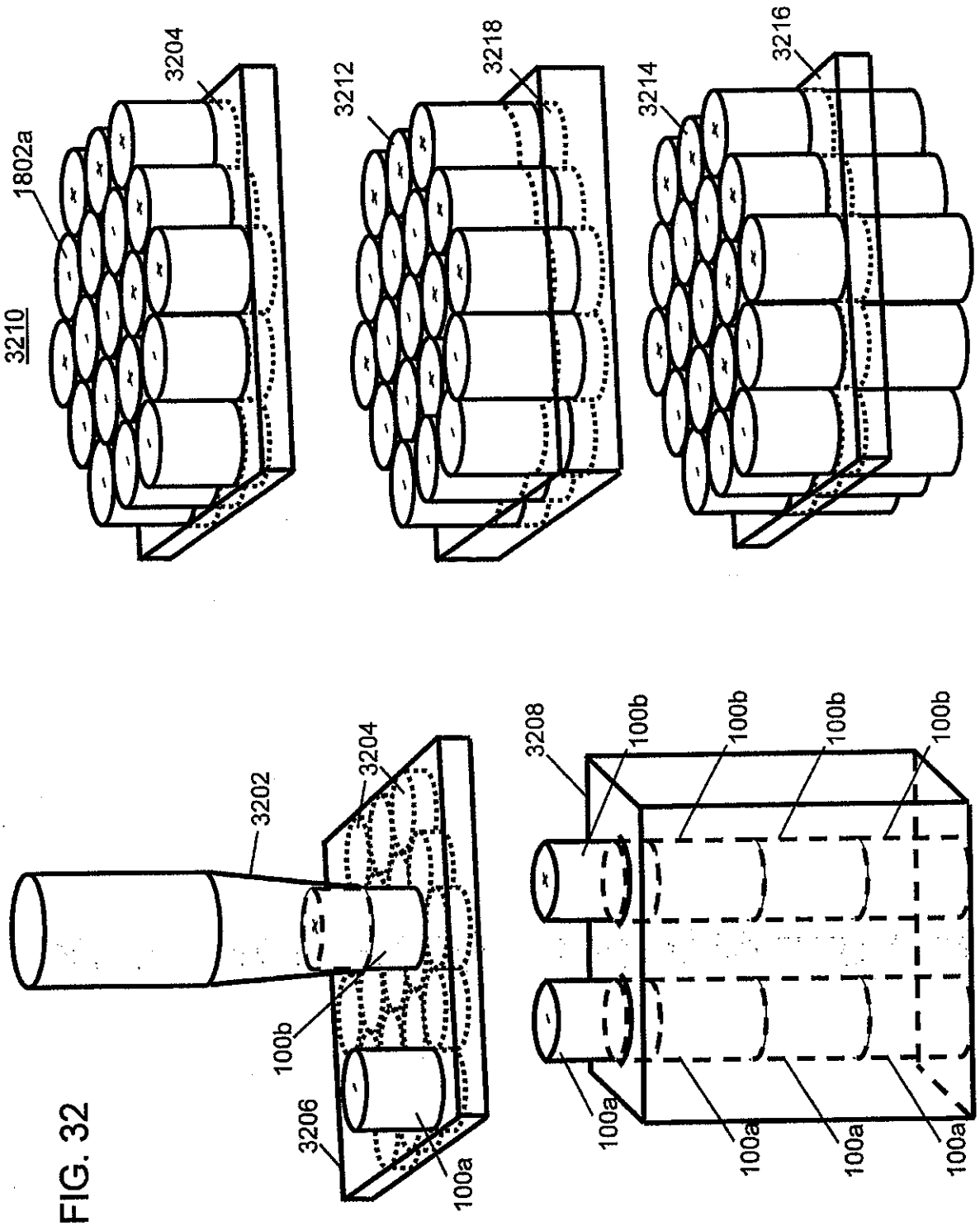

3210
1802a
3204
3212
3218
3214
3216
3202
3204
100b
3206
100a
3208
100b
100b
100b
100b
100a
100a
100a
100a

FIG. 32

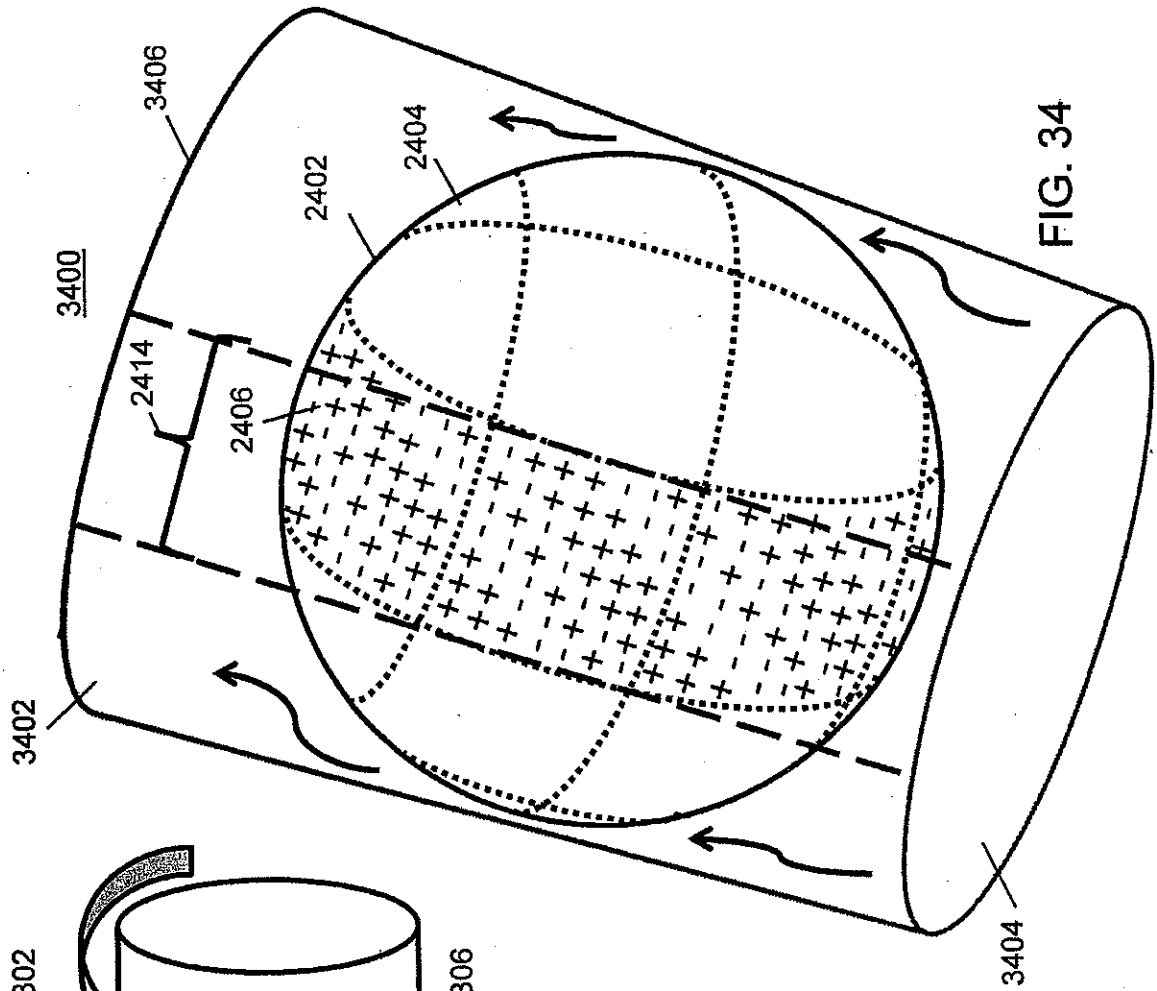


FIG. 34

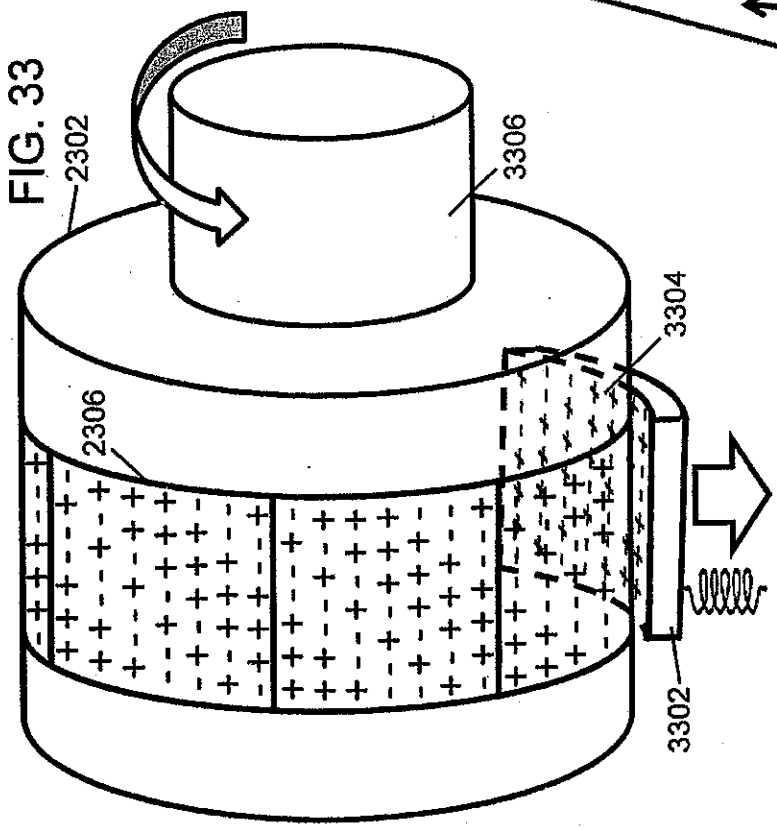


FIG. 33

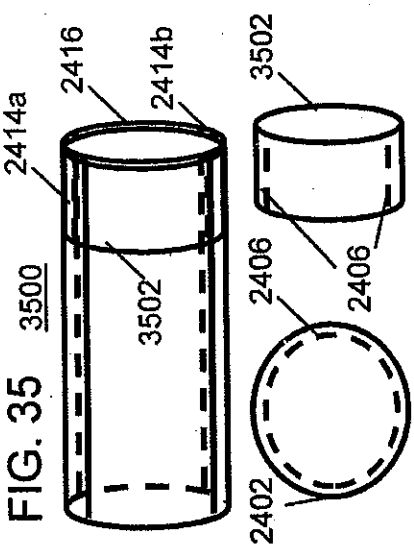


FIG. 35

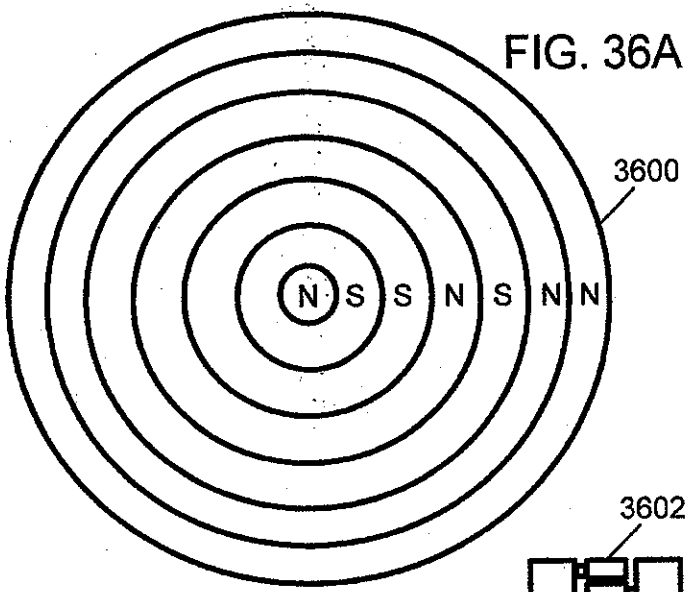


FIG. 36A

FIG. 36B

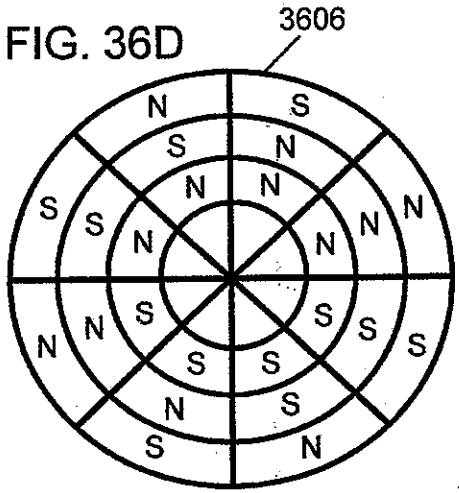


FIG. 36D

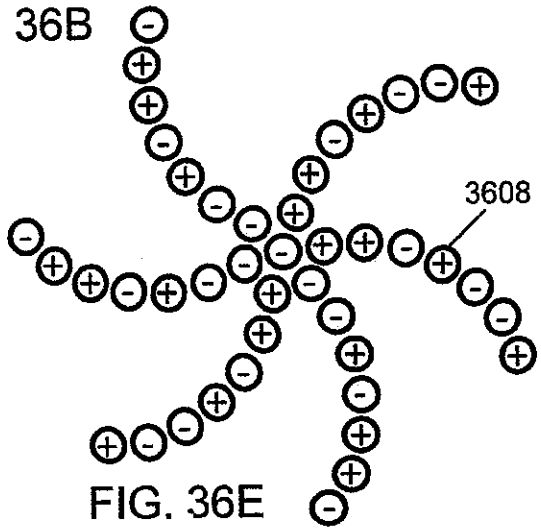


FIG. 36E

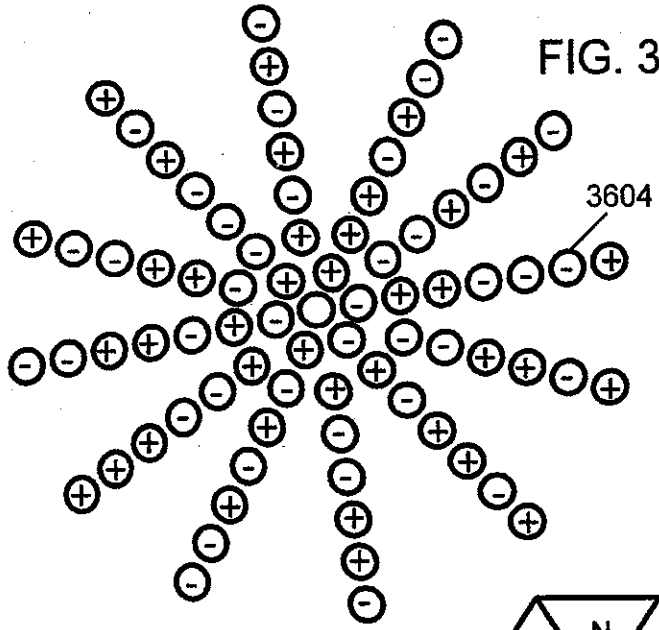


FIG. 36C

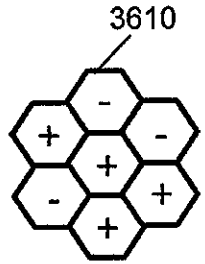


FIG. 36F

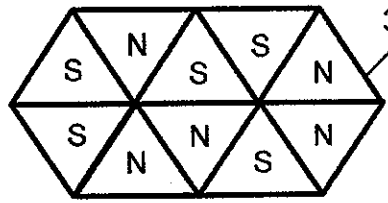


FIG. 36G

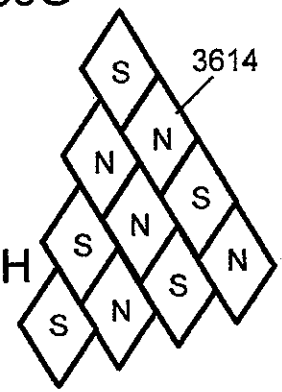


FIG. 36H

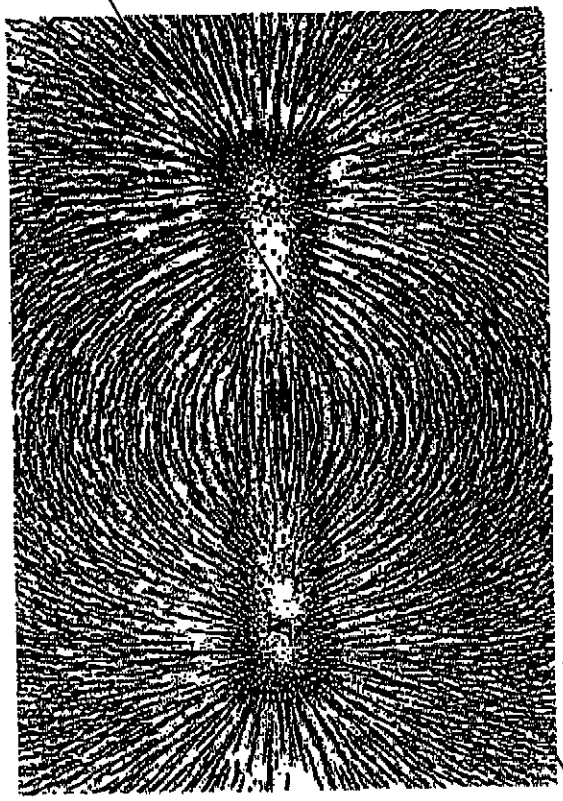


FIG. 2

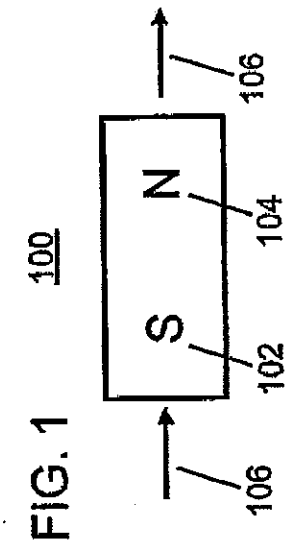


FIG. 1

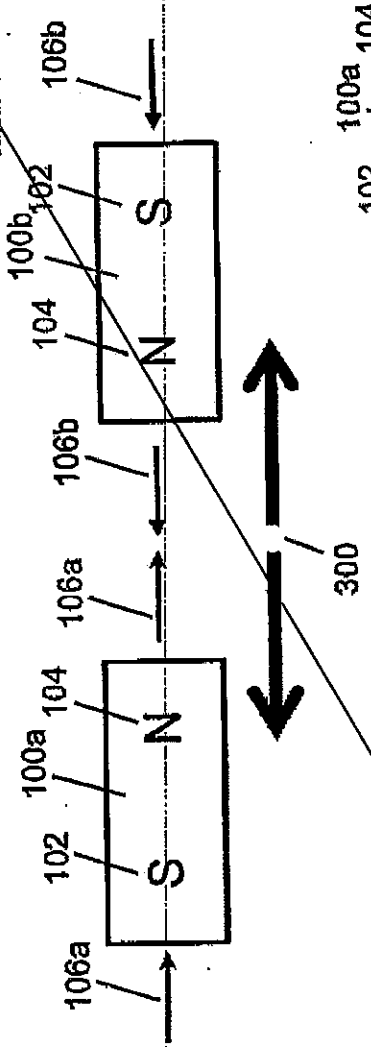


FIG. 3A

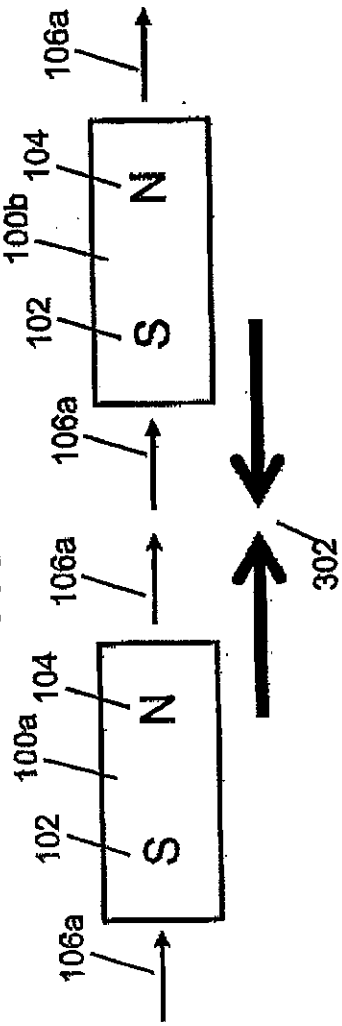


FIG. 3B

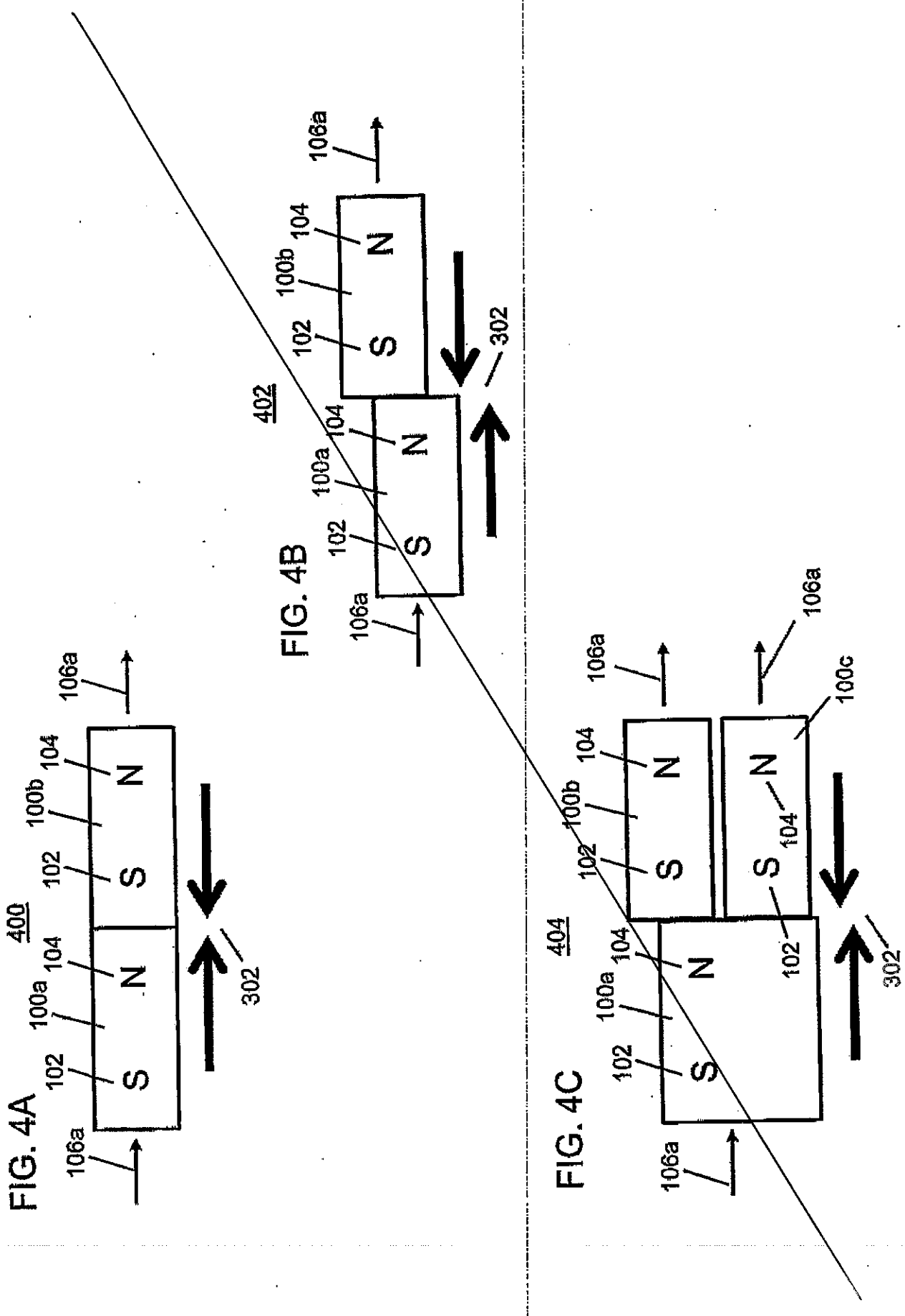

400
100a
100b
102
104
106a
N
S
302
FIG. 4A
402
FIG. 4B
404
100c
FIG. 4C

FIG. 5A Barker 7 code = +1 +1 +1 −1 −1 +1 −1 500



FIG. 5B

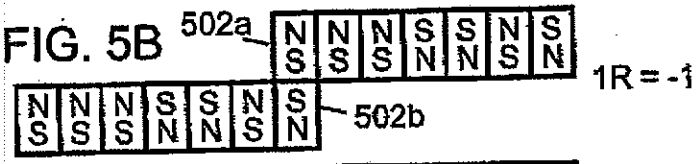


FIG. 5C

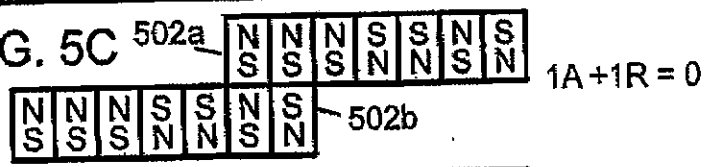


FIG. 5D

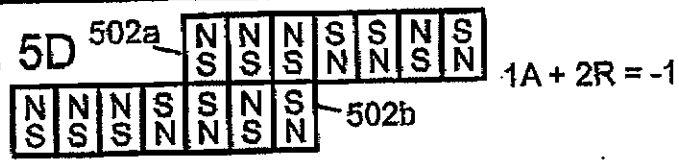


FIG. 5E

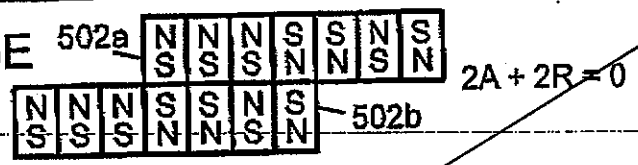


FIG. 5F

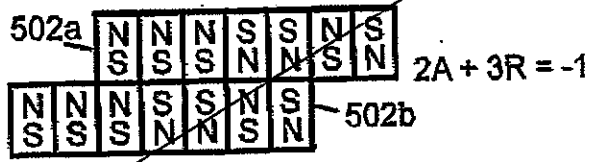


FIG. 5G

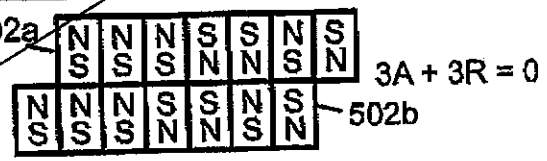


FIG. 5H

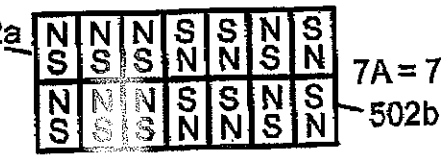


FIG. 5I

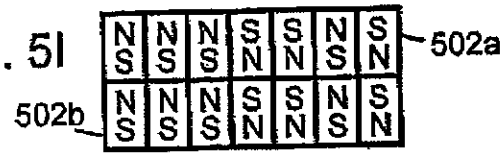


FIG. 5J

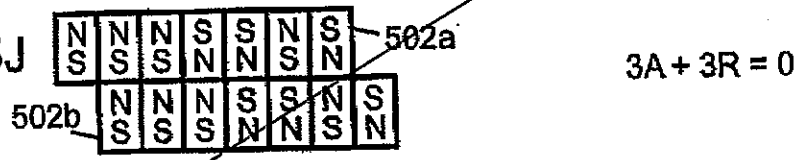


FIG. 5K

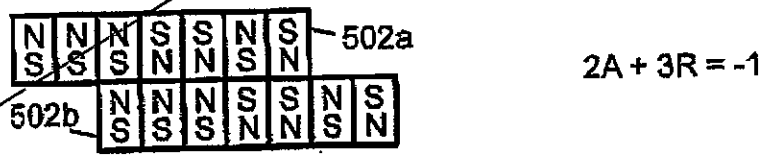


FIG. 5L

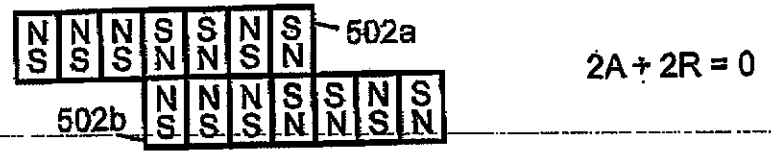


FIG. 5M

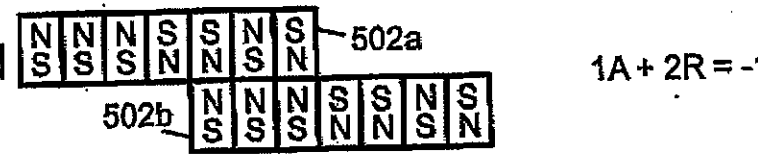


FIG. 5N

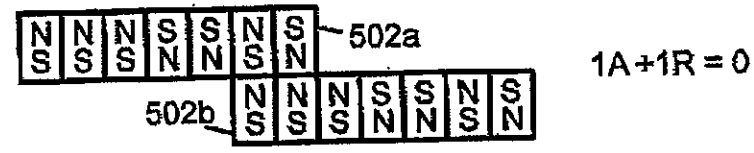
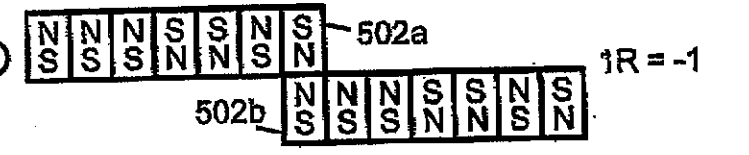


FIG. 5O



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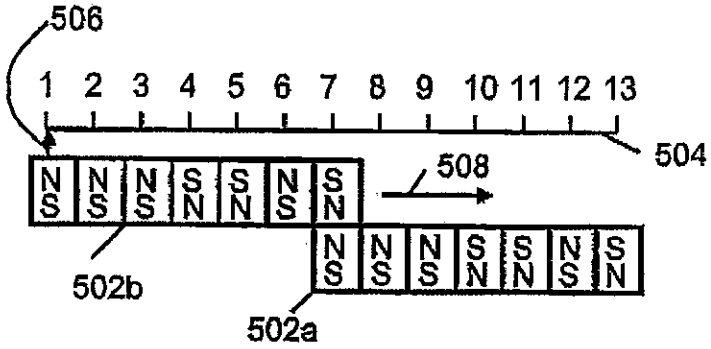

FIG. 5P

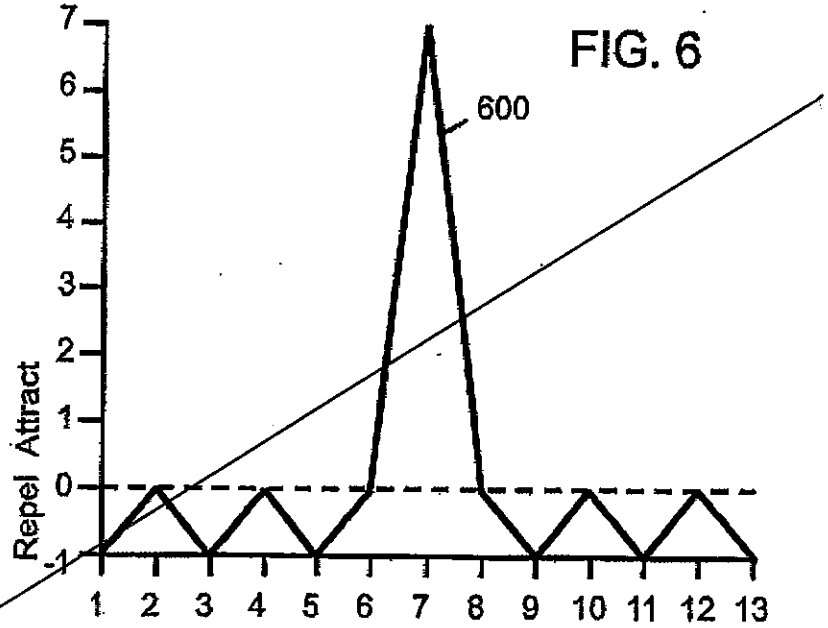

FIG. 6

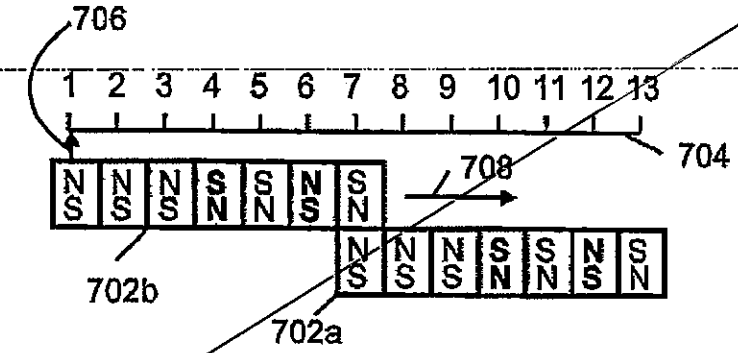

FIG. 7P

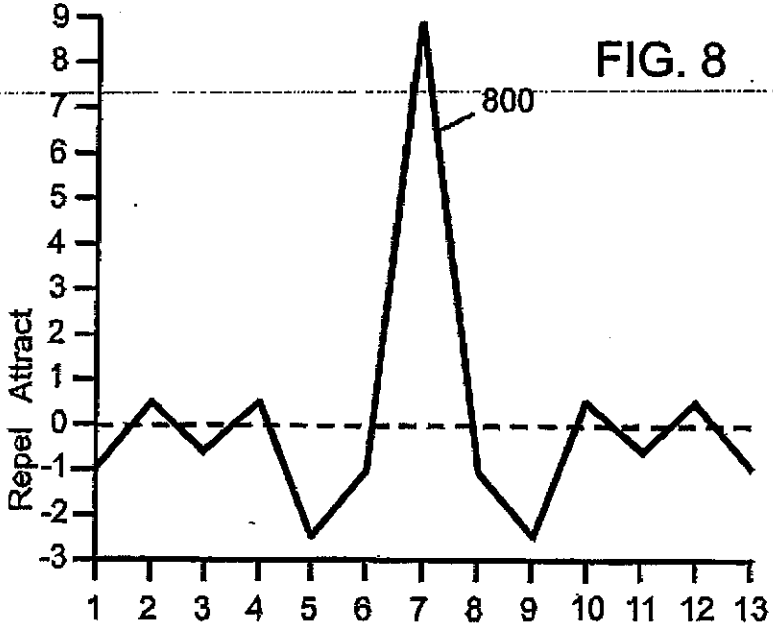

FIG. 8

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FIG. 7A Barker - 7 code = +1 +1 +1 −1 −1 +1 −1 500



FIG. 7B

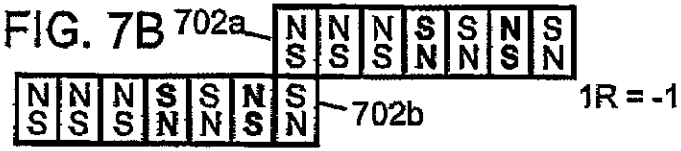


FIG. 7C

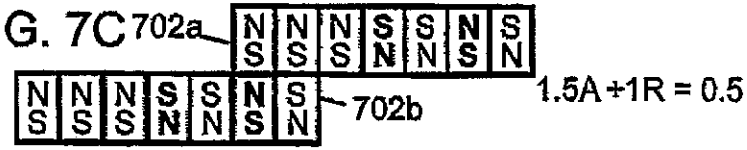


FIG. 7D

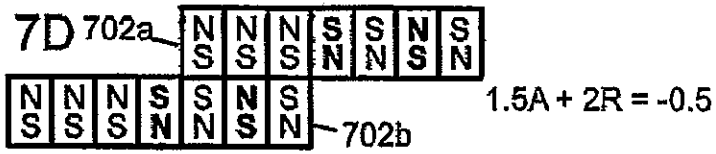


FIG. 7E

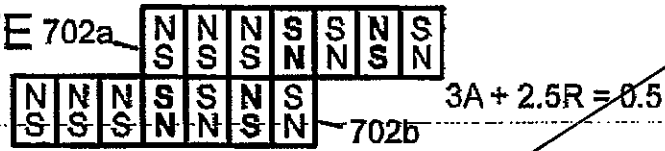


FIG. 7F

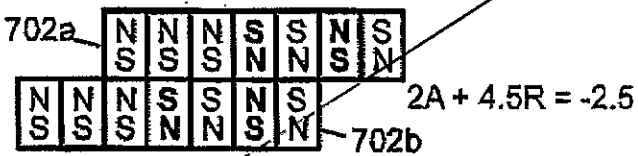


FIG. 7G

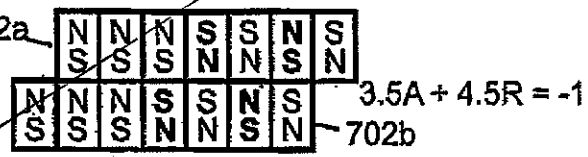


FIG. 7H

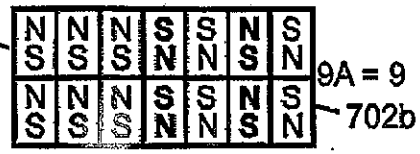


FIG. 7I

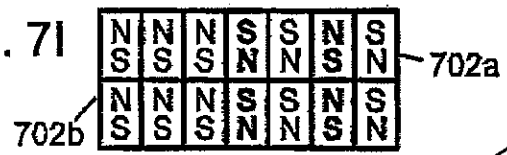


FIG. 7J

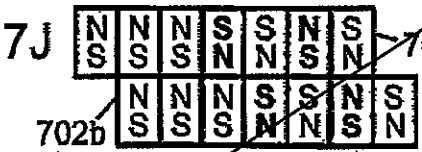


FIG. 7K

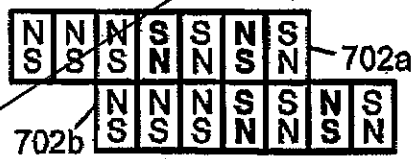


FIG. 7L

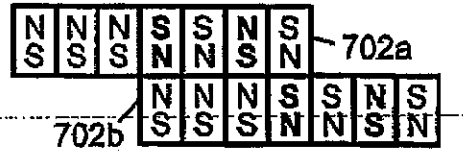


FIG. 7M

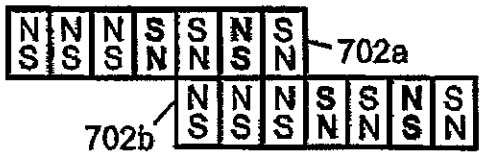


FIG. 7N

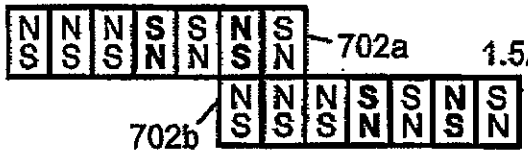
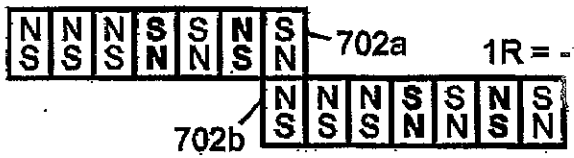


FIG. 7O



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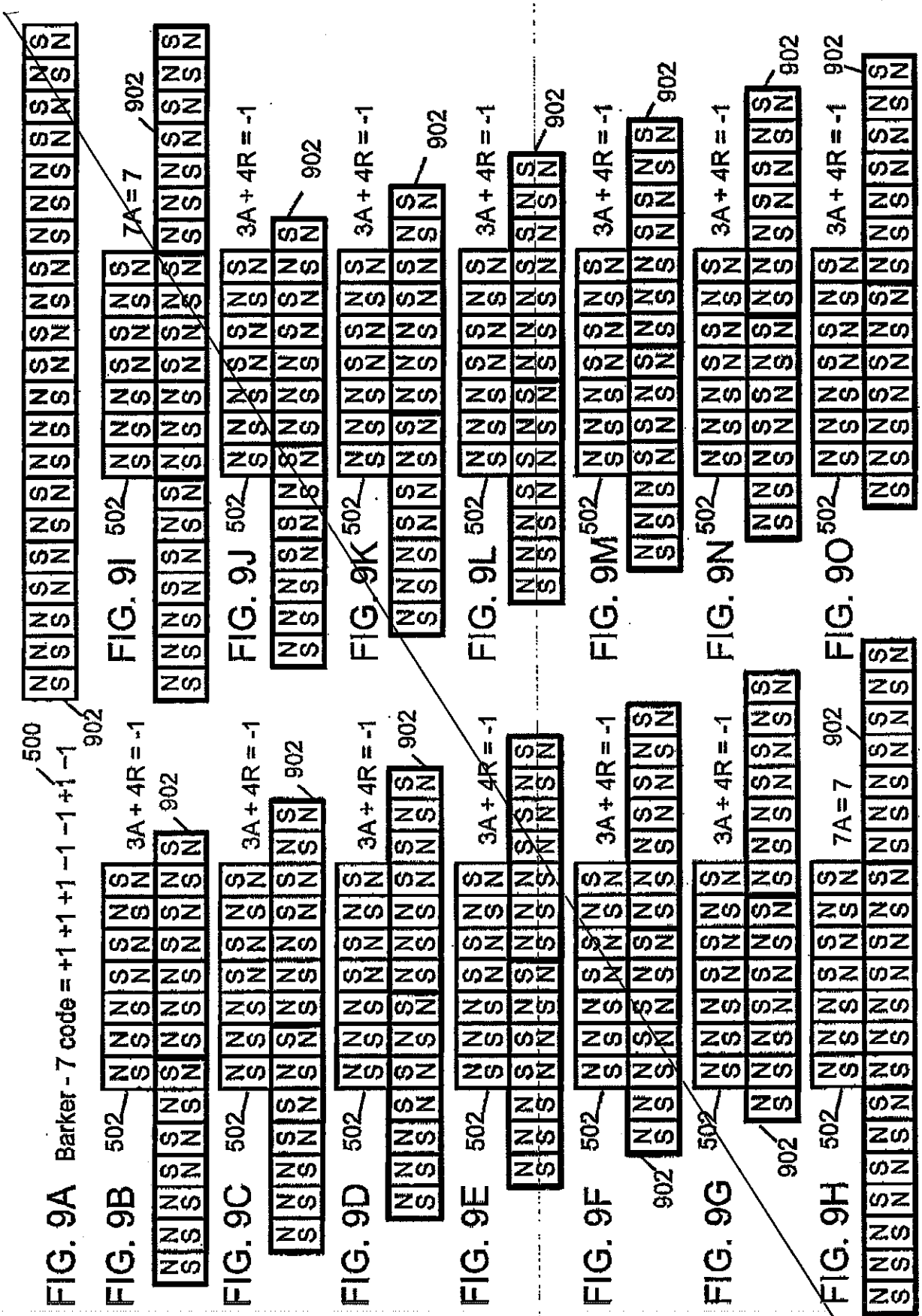


FIG. 9A Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
902
FIG. 9B
502
3A + 4R = -1
902
FIG. 9C
502
3A + 4R = -1
902
FIG. 9D
502
3A + 4R = -1
902
FIG. 9E
502
3A + 4R = -1
902
FIG. 9F
502
3A + 4R = -1
902
902
FIG. 9G
502
3A + 4R = -1
902
FIG. 9H
502
7A = 7
902
FIG. 9I
502
7A = 7
902
FIG. 9J
502
3A + 4R = -1
902
FIG. 9K
502
3A + 4R = -1
902
FIG. 9L
502
3A + 4R = -1
902
FIG. 9M
502
3A + 4R = -1
902
FIG. 9N
502
3A + 4R = -1
902
FIG. 9O
502
3A + 4R = -1
902

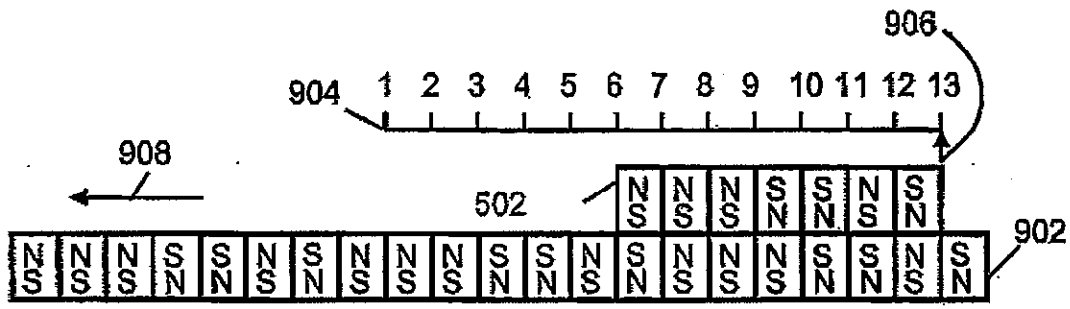

906
904
1 2 3 4 5 6 7 8 9 10 11 12 13
908
502
902

FIG. 9P

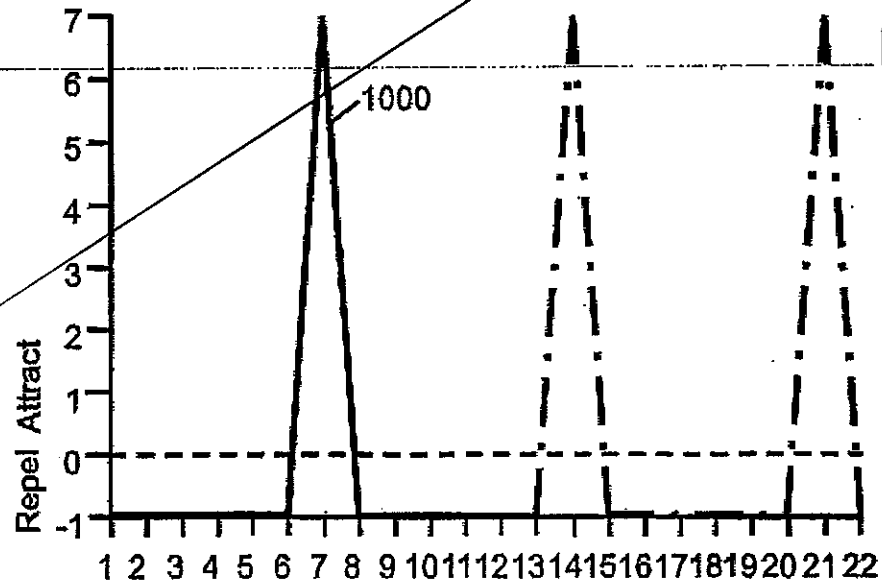

7
6
5
4
3
2
1
0
-1
Repel Attract
1000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

FIG. 10

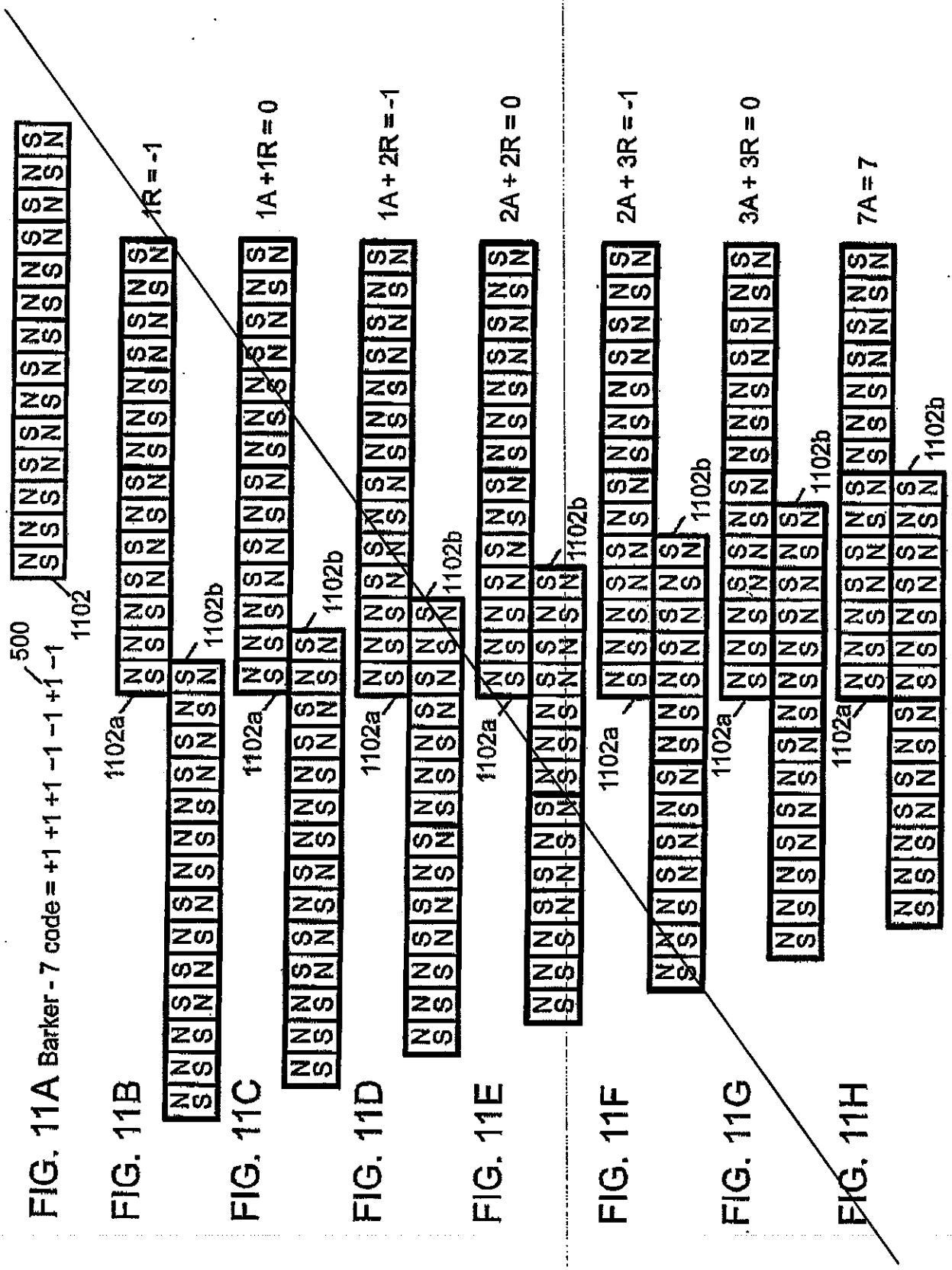


FIG. 11A Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
1102
FIG. 11B
1R = -1
1102a
1102b
FIG. 11C
1A +1R = 0
1102a
1102b
FIG. 11D
1A + 2R = -1
1102a
1102b
FIG. 11E
2A + 2R = 0
1102a
1102b
FIG. 11F
2A + 3R = -1
1102a
1102b
FIG. 11G
3A + 3R = 0
1102a
1102b
FIG. 11H
7A = 7
1102a
1102b

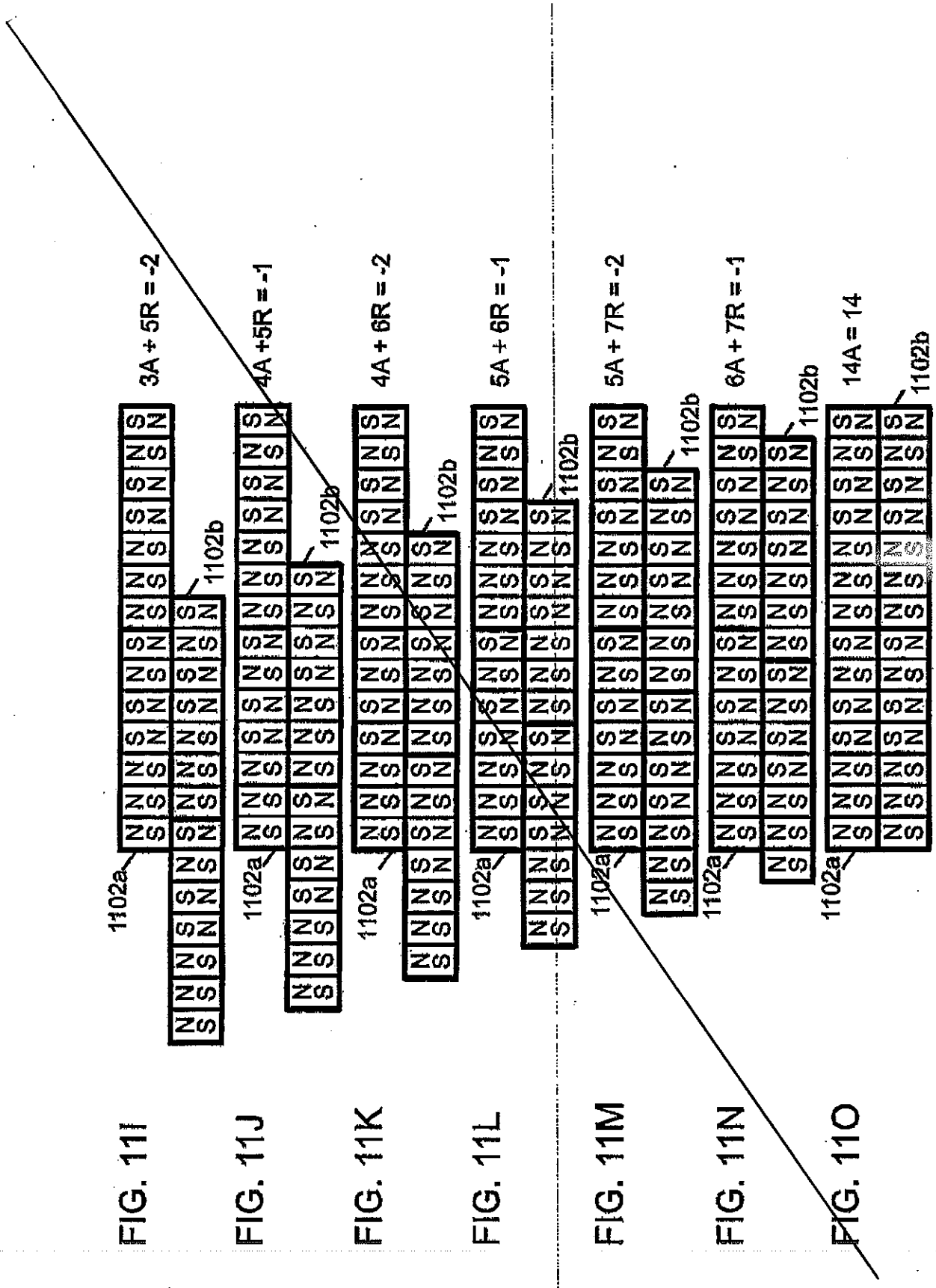


FIG. 11I FIG. 11J FIG. 11K FIG. 11L FIG. 11M FIG. 11N FIG. 11O

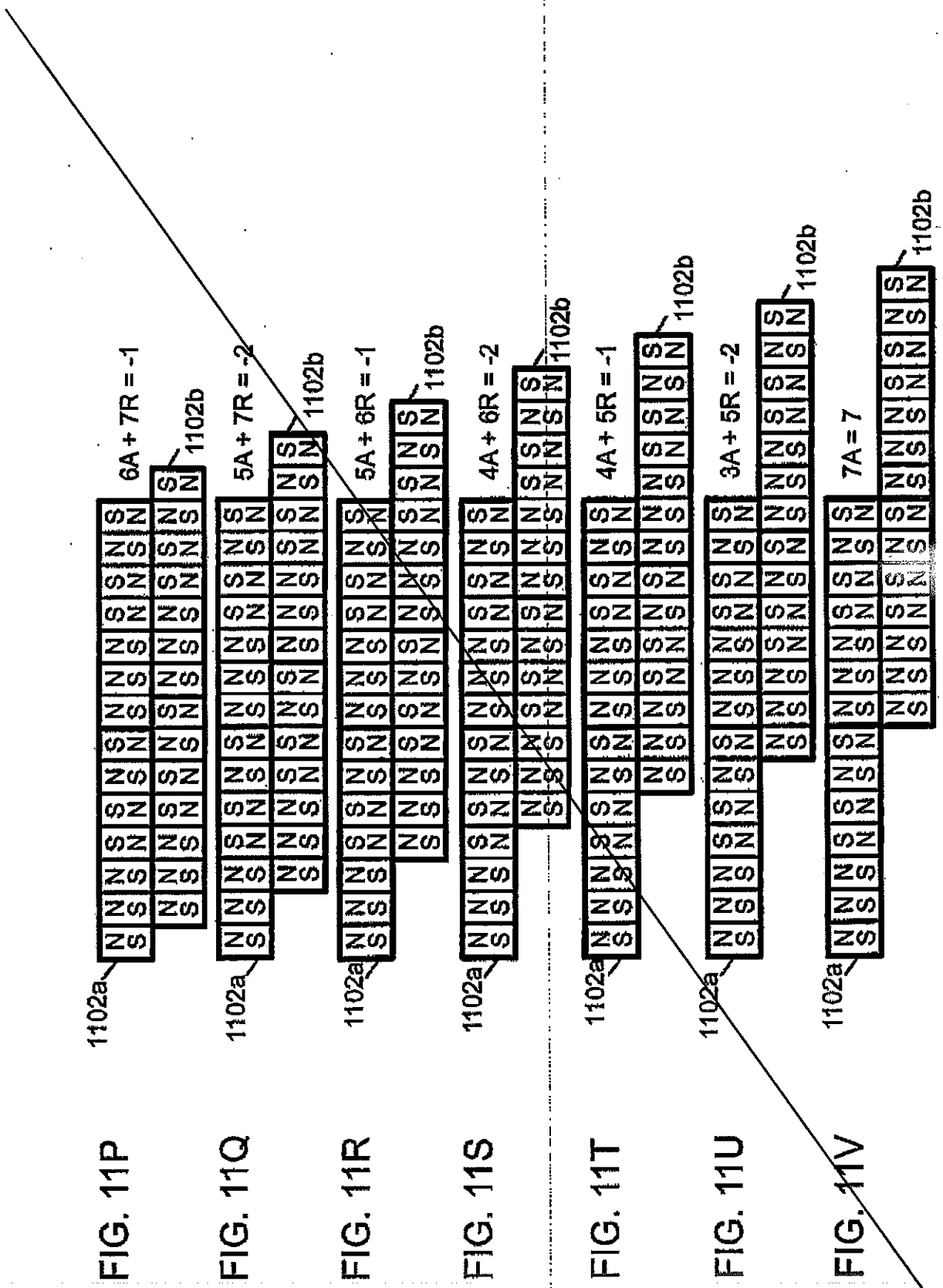


FIG. 11P

FIG. 11Q

FIG. 11R

FIG. 11S

FIG. 11T

FIG. 11U

FIG. 11V

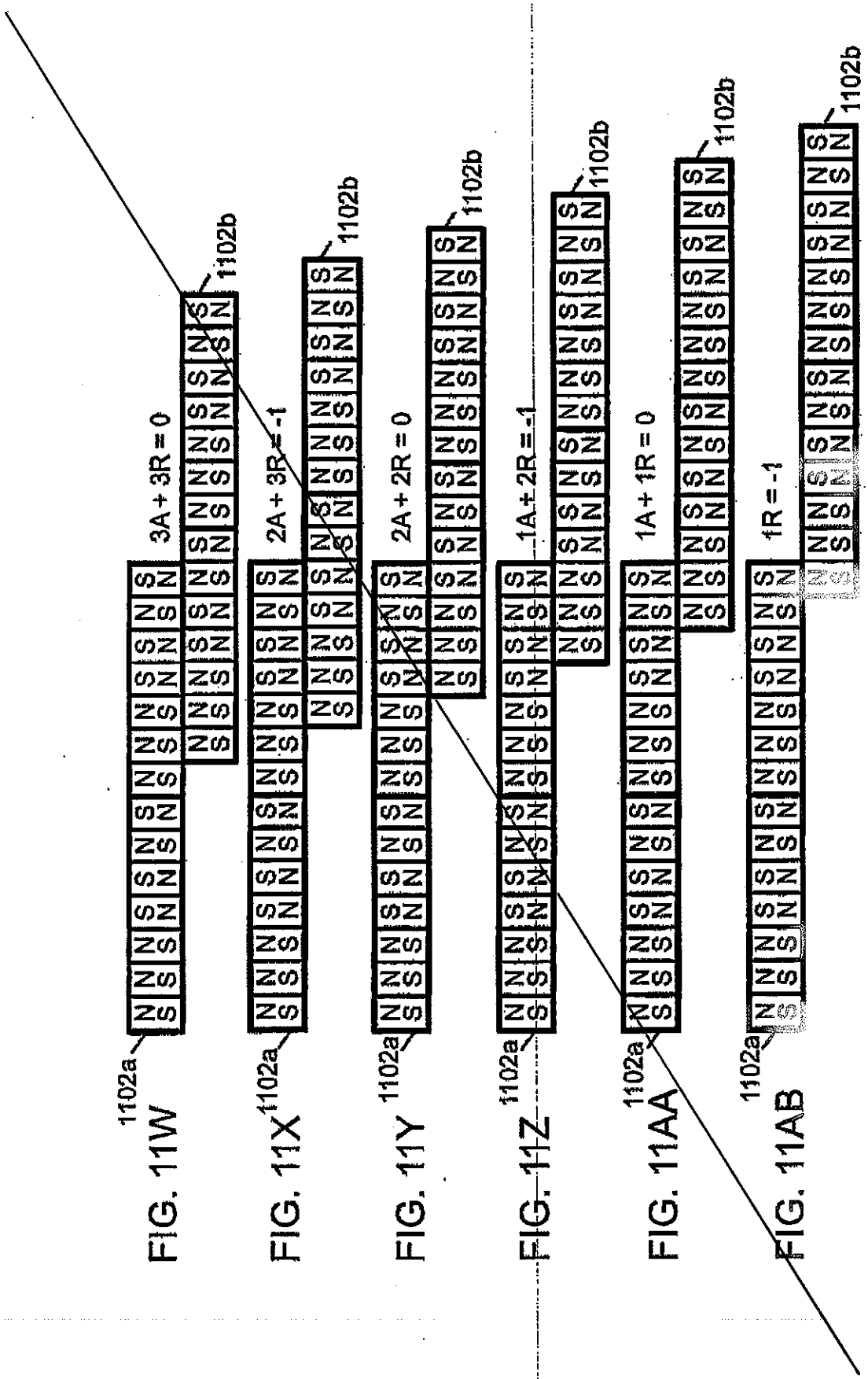


FIG. 11W

FIG. 11X

FIG. 11Y

FIG. 11Z

FIG. 11AA

FIG. 11AB

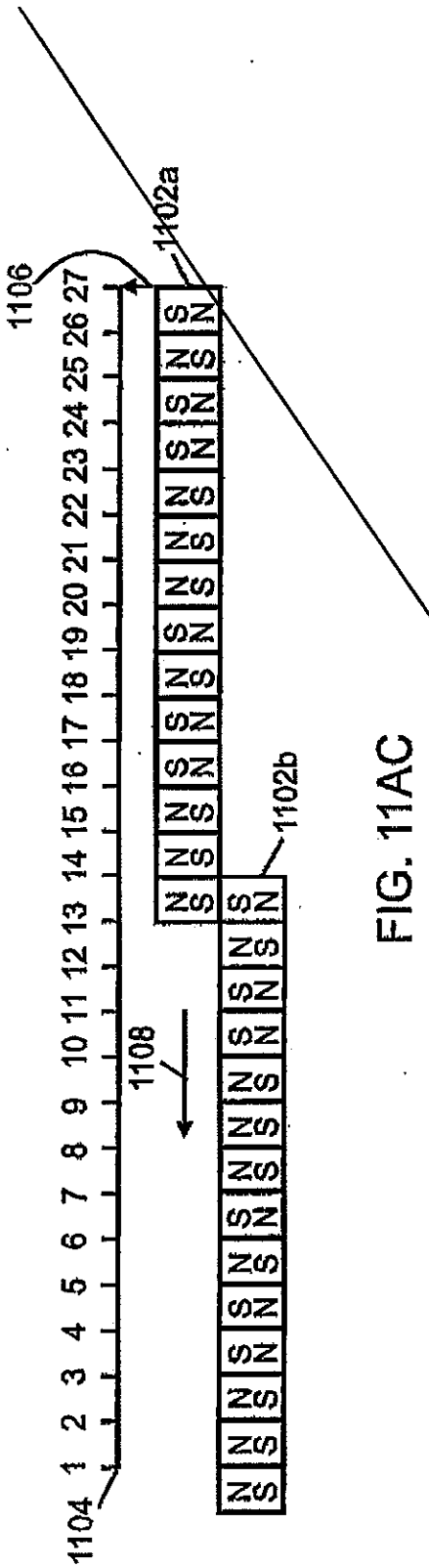


FIG. 11AC

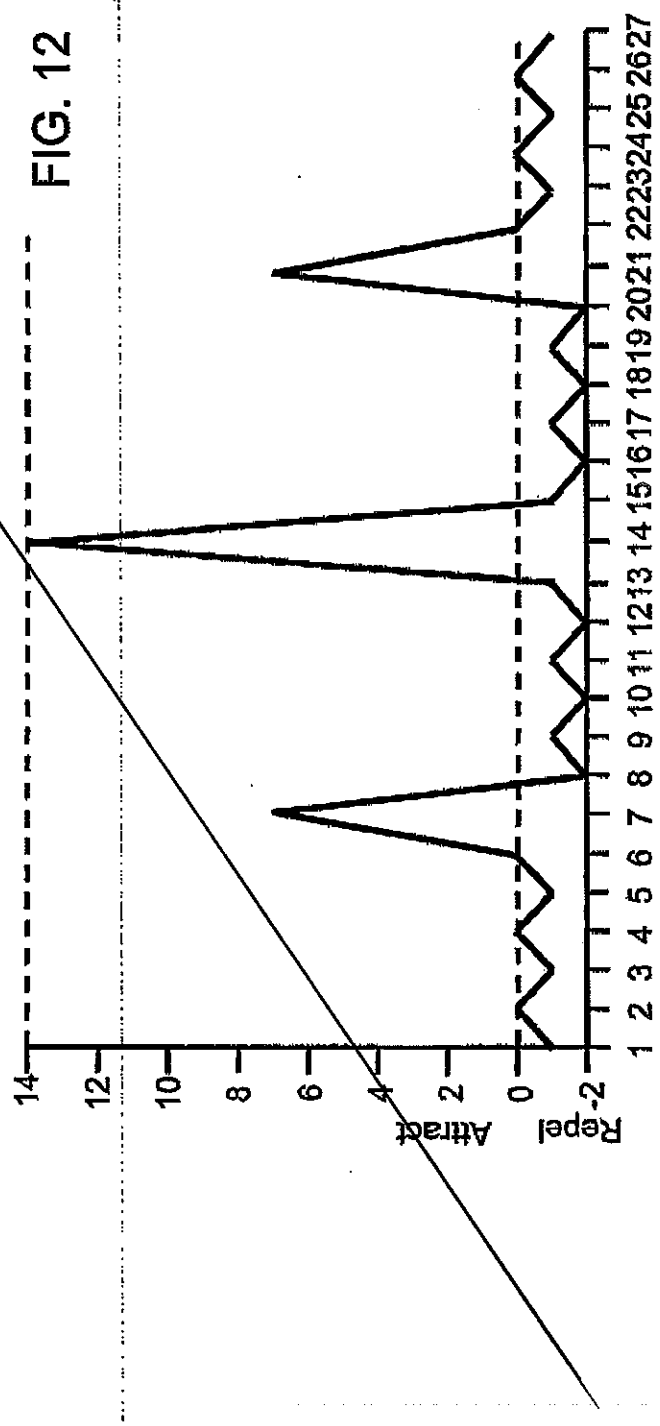


FIG. 12

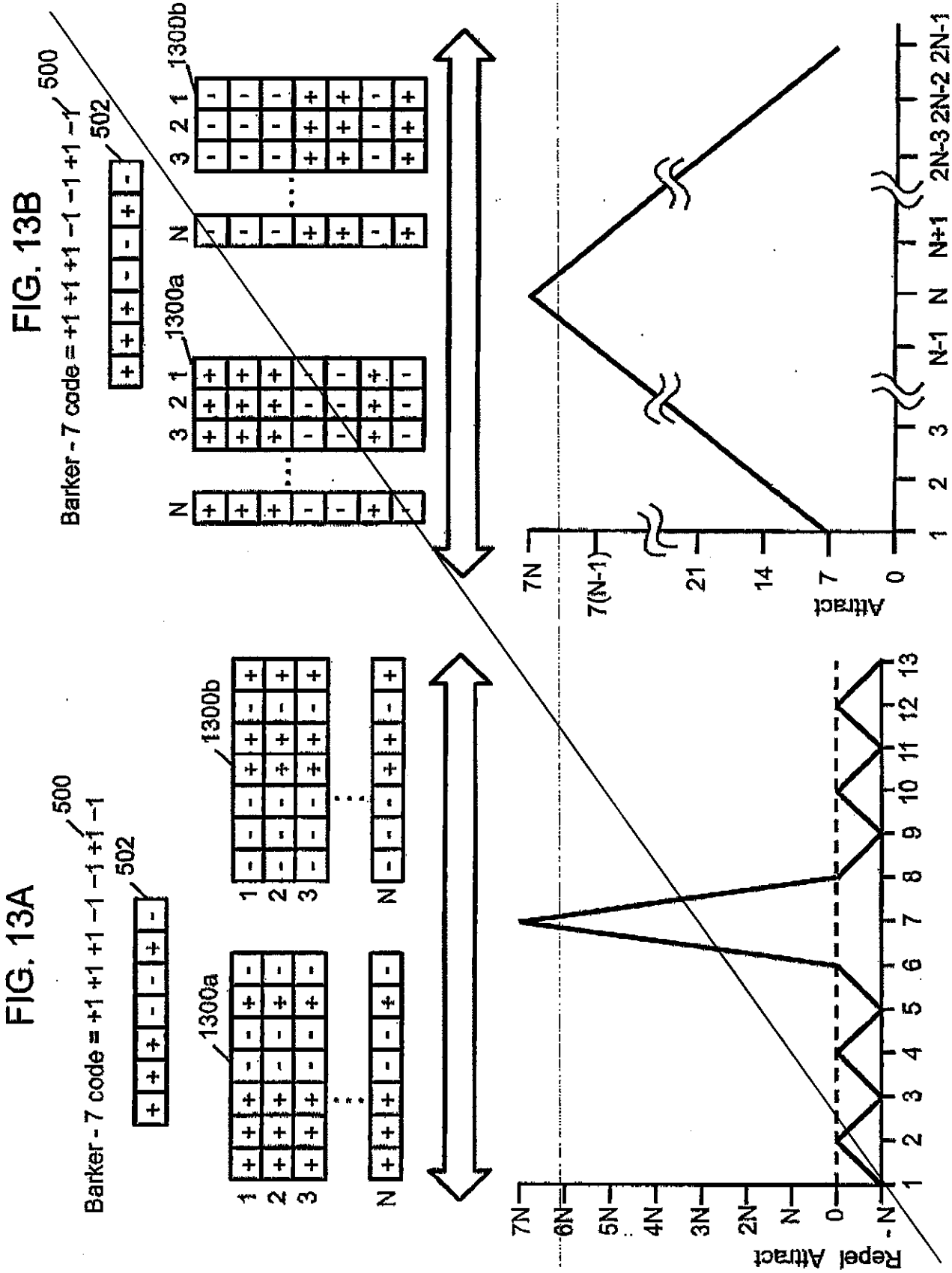


FIG. 13A
Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
1300a
1300b
1 2 3 N
Repel Attract
7N 6N 5N 4N 3N 2N N 0 -N
1 2 3 4 5 6 7 8 9 10 11 12 13
FIG. 13B
Barker - 7 code = +1 +1 +1 −1 −1 +1 −1
500
502
1300a
1300b
1 2 3 N
Attract
7N 7(N-1) 21 14 7 0
1 2 3 N-1 N N+1 2N-3 2N-2 2N-1

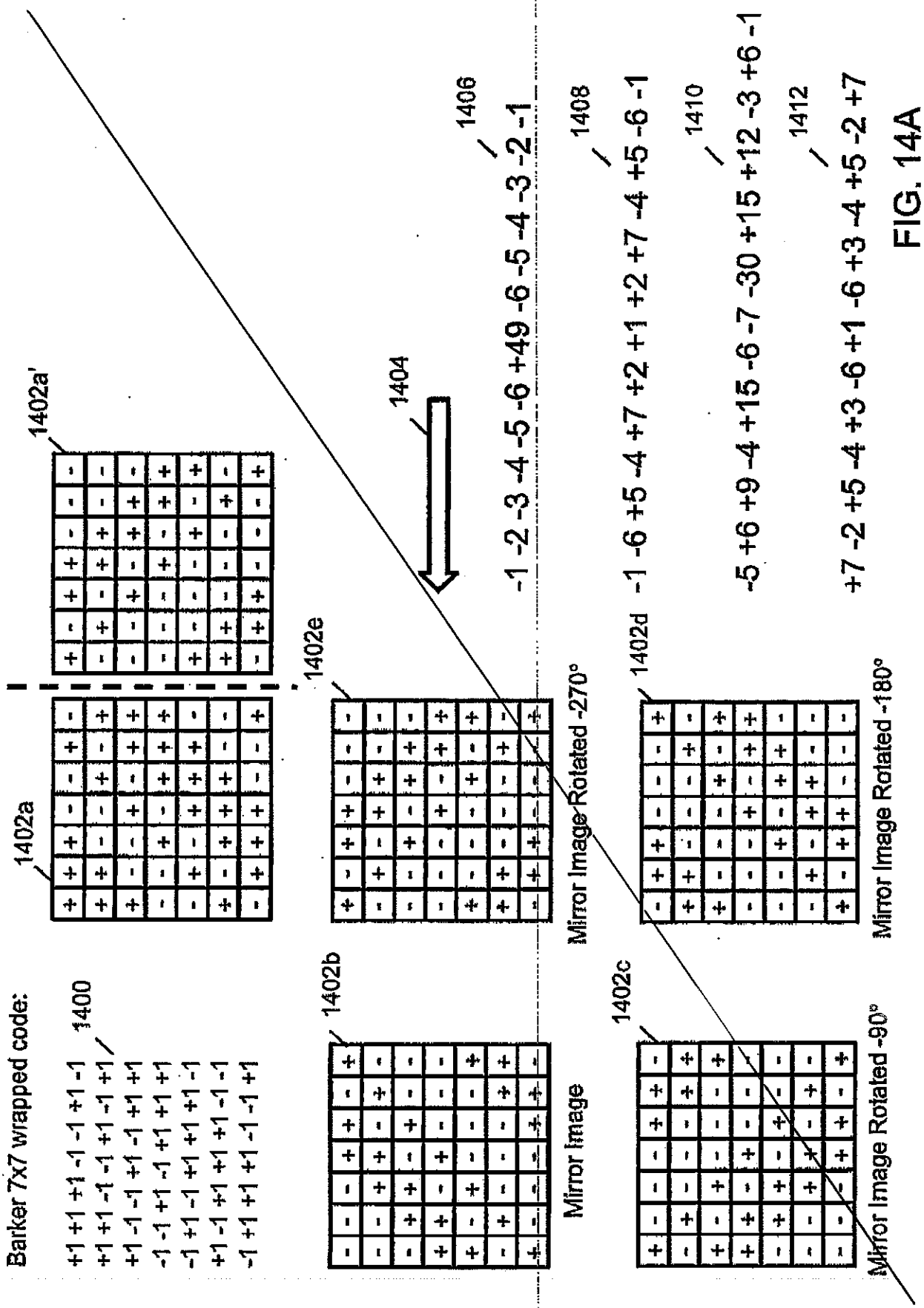

Barker 7x7 wrapped code:
+1 +1 +1 -1 -1 +1 -1
+1 +1 -1 -1 +1 -1 +1
+1 -1 -1 +1 -1 +1 +1
-1 -1 +1 -1 +1 +1 +1
-1 +1 -1 +1 +1 +1 -1
+1 -1 +1 +1 +1 -1 -1
-1 +1 +1 -1 -1 +1
1400
1402a
1402a'
1402b
1402c
1402d
1402e
1404
1406
1408
1410
1412
-1 -2 -3 -4 -5 -6 +49 -6 -5 -4 -3 -2 -1
-1 -6 +5 -4 +7 +2 +1 +2 +7 -4 +5 -6 -1
-5 +6 +9 -4 +15 -6 -7 -30 +15 +12 -3 +6 -1
+7 -2 +5 -4 +3 -6 +1 -6 +3 -4 +5 -2 +7
Mirror Image
Mirror Image Rotated -90°
Mirror Image Rotated -270°
Mirror Image Rotated -180°

FIG. 14A

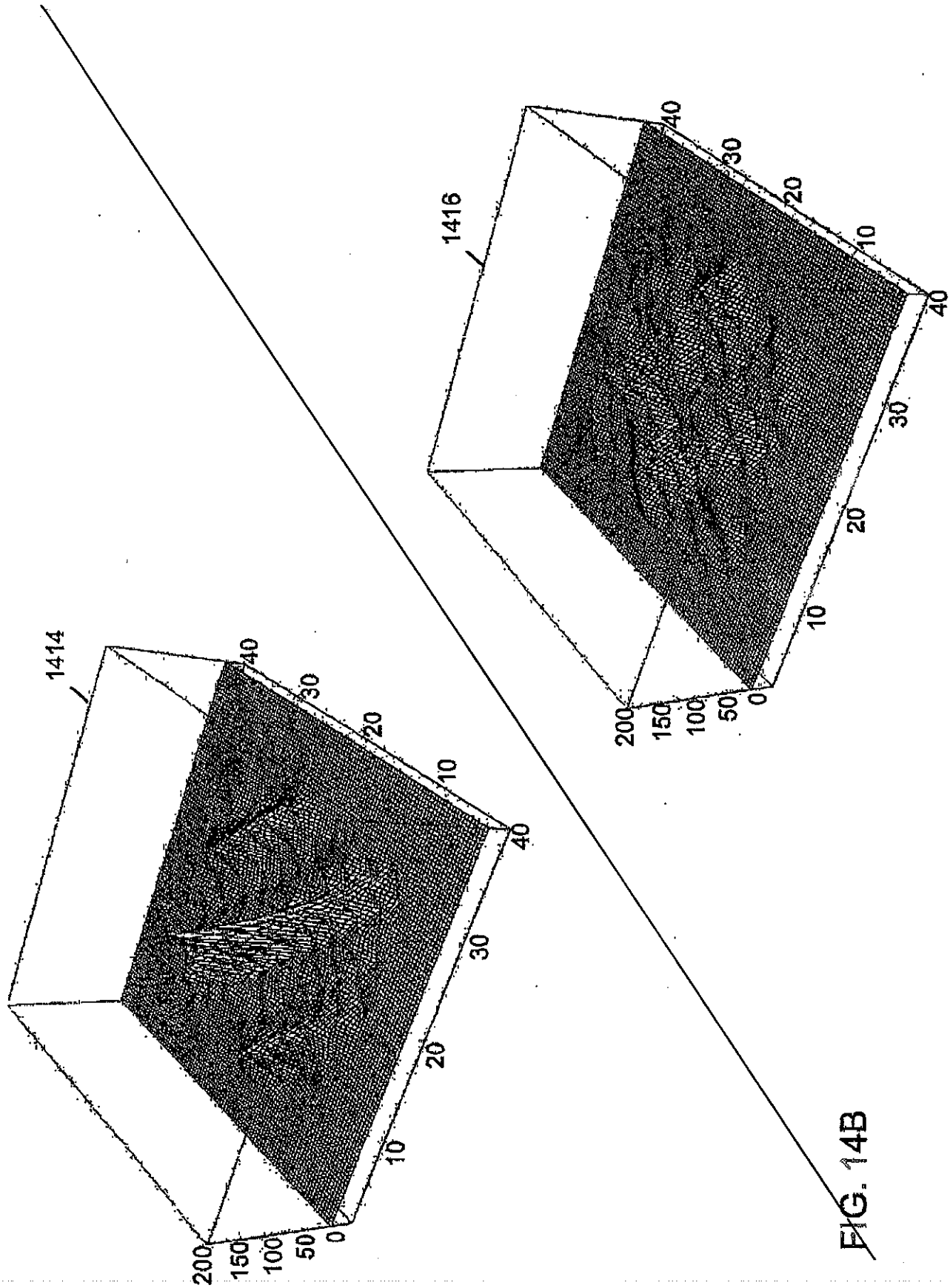


FIG. 14B

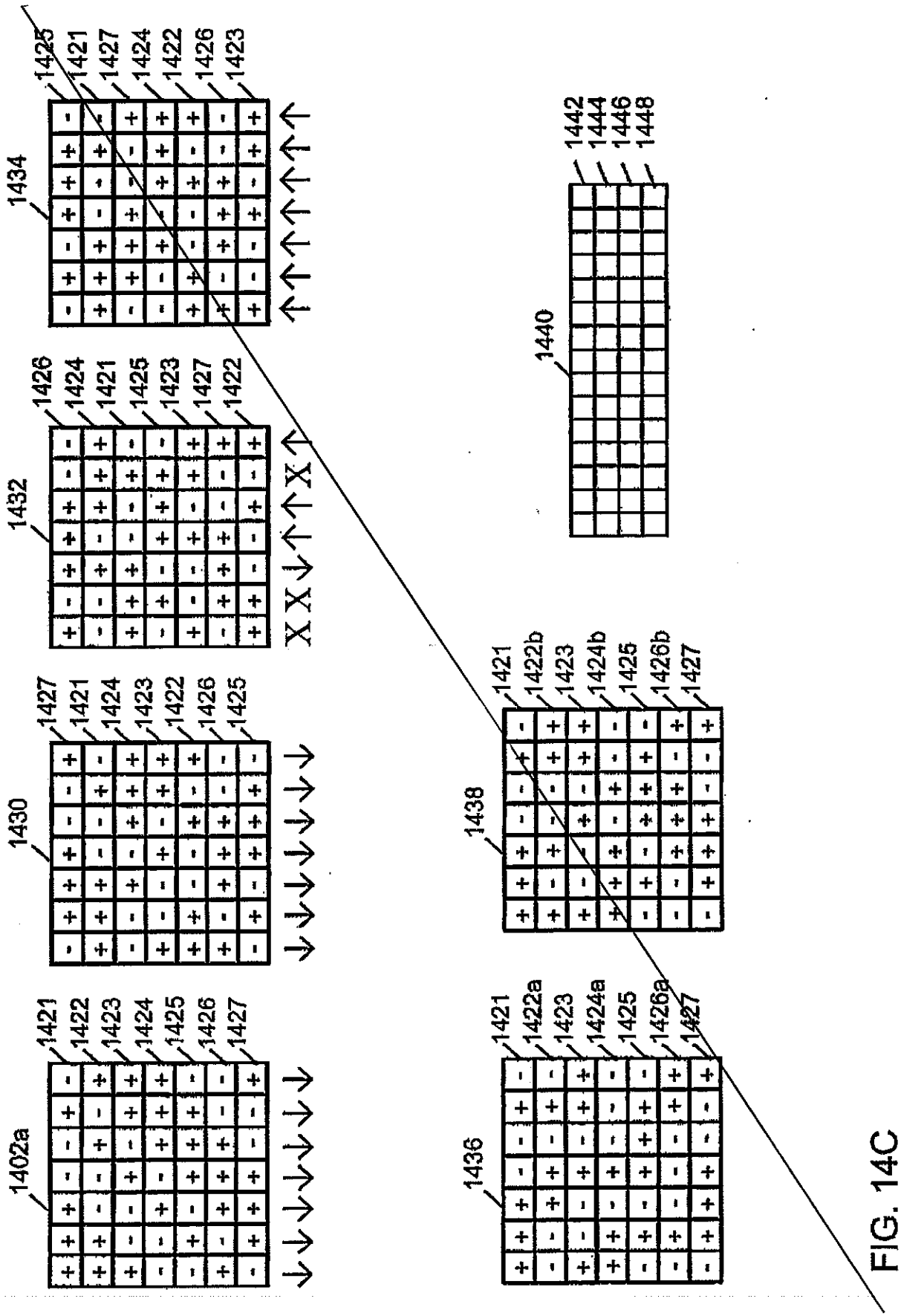

1402a
1421 1422 1423 1424 1425 1426 1427
1430
1427 1421 1424 1423 1422 1426 1425
1432
1426 1424 1421 1425 1423 1427 1422
1434
1425 1421 1427 1424 1422 1426 1423
1436
1421 1422a 1423 1424a 1425 1426a 1427
1438
1421 1422b 1423 1424b 1425 1426b 1427
1440
1442 1444 1446 1448

FIG. 14C

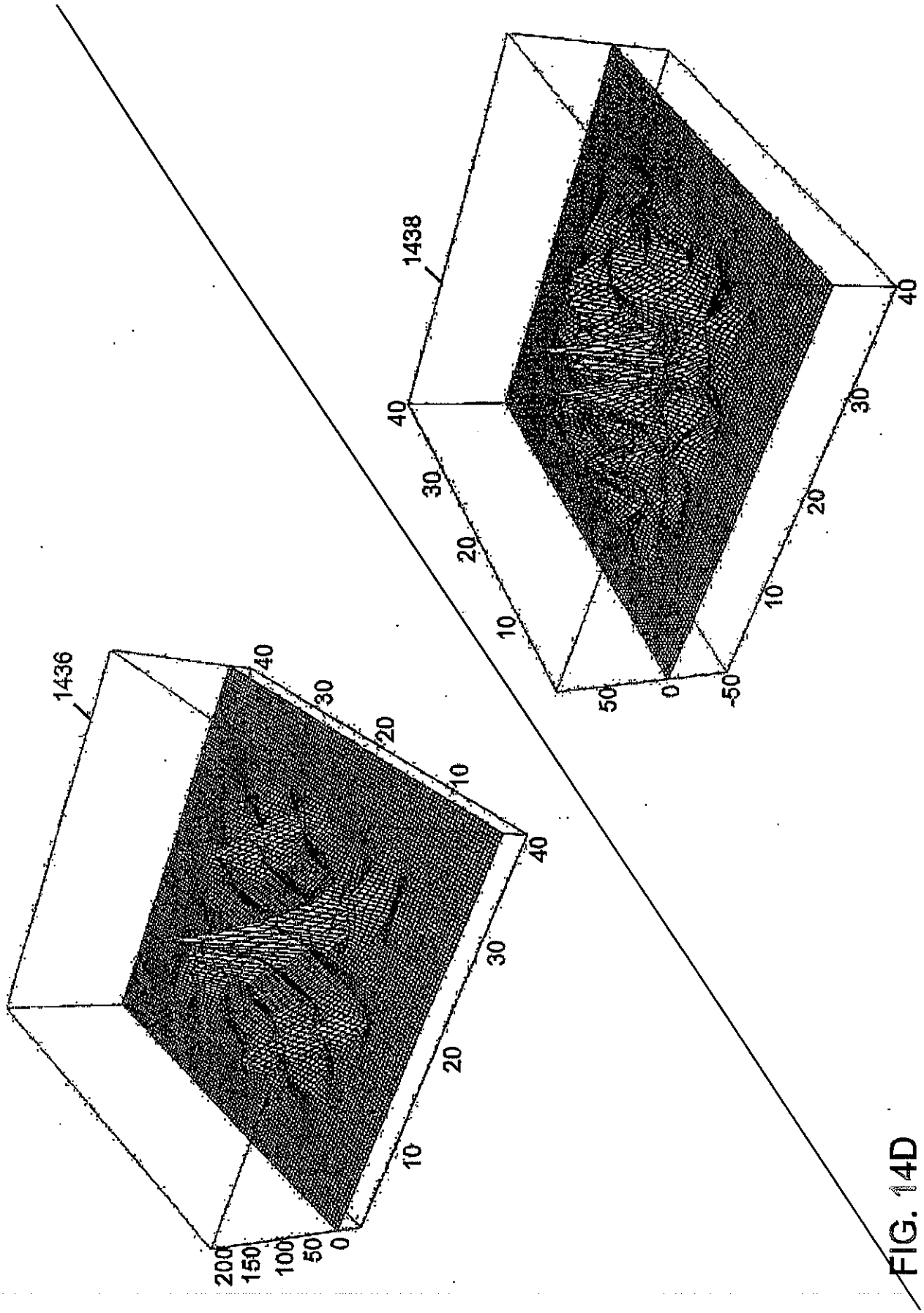

1438
40
30
20
10
50
0
-50
10
20
30
40
1436
40
30
20
10
200
150
100
50
0
10
20
30
40

FIG. 14D

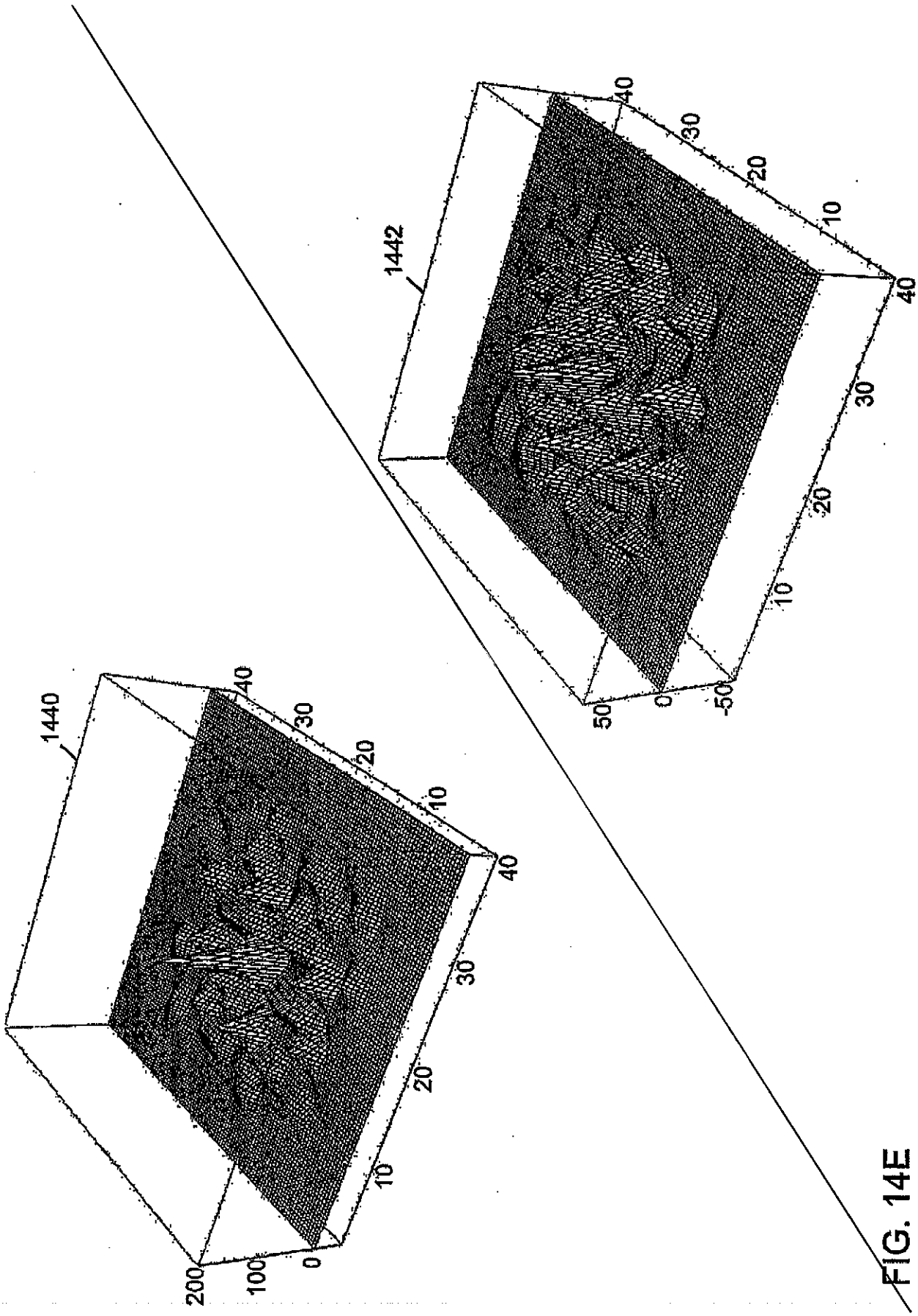


FIG. 14E

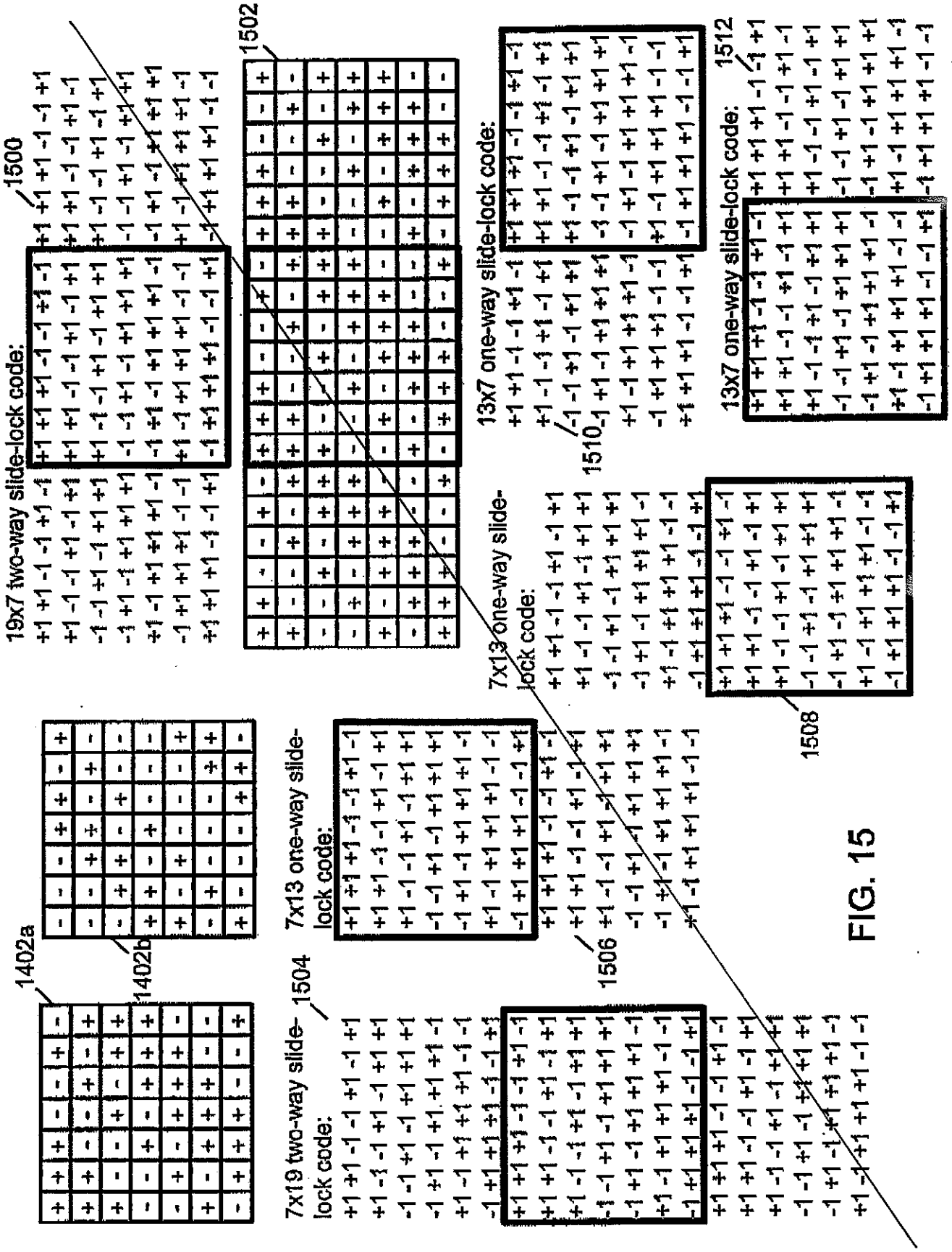

1500
19x7 two-way slide-lock code:
1502
1402a
1402b
7x19 two-way slide-lock code:
1504
7x13 one-way slide-lock code:
1506
7x13 one-way slide-lock code:
1508
13x7 one-way slide-lock code:
1510
13x7 one-way slide-lock code:
1512

FIG. 15

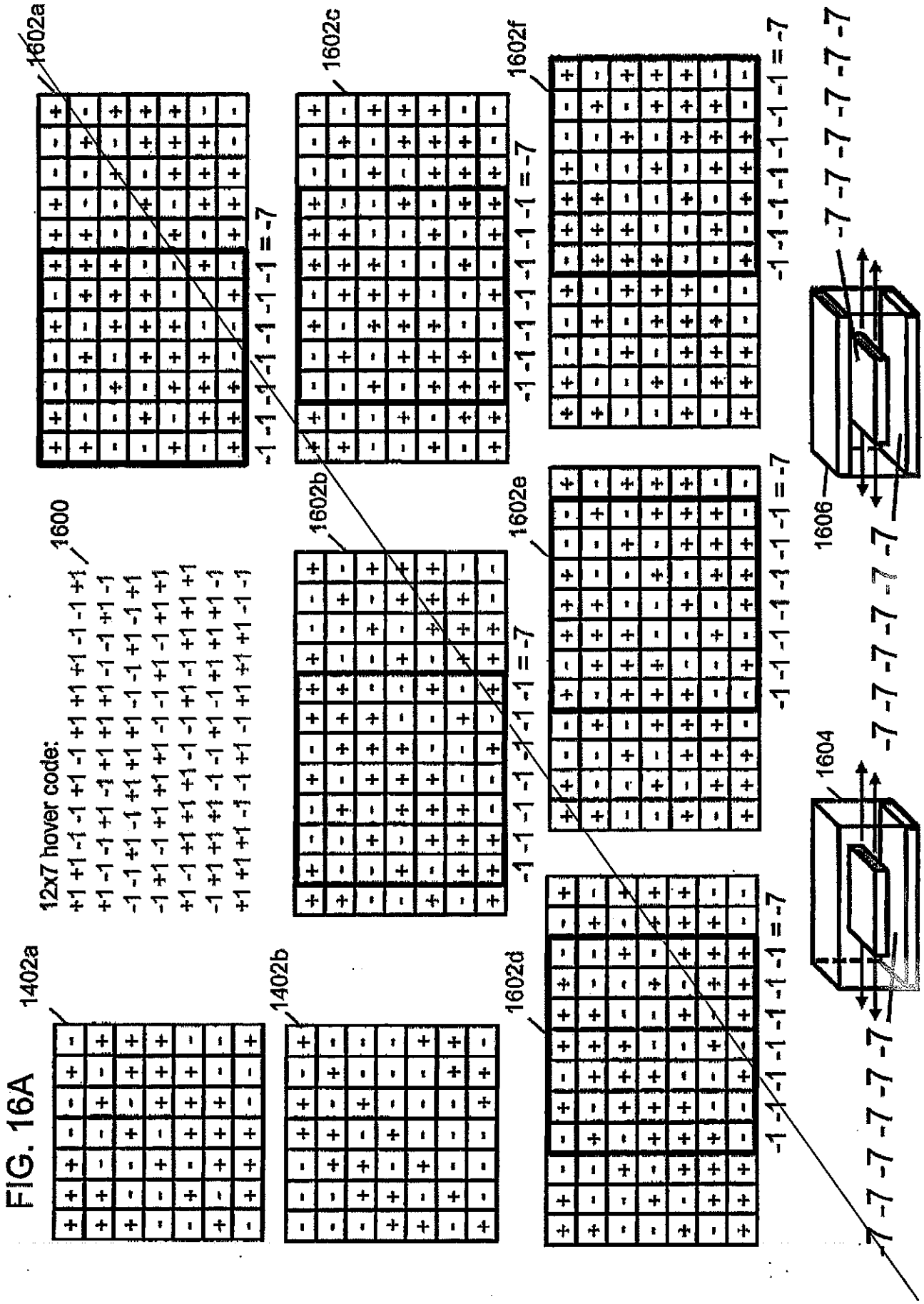
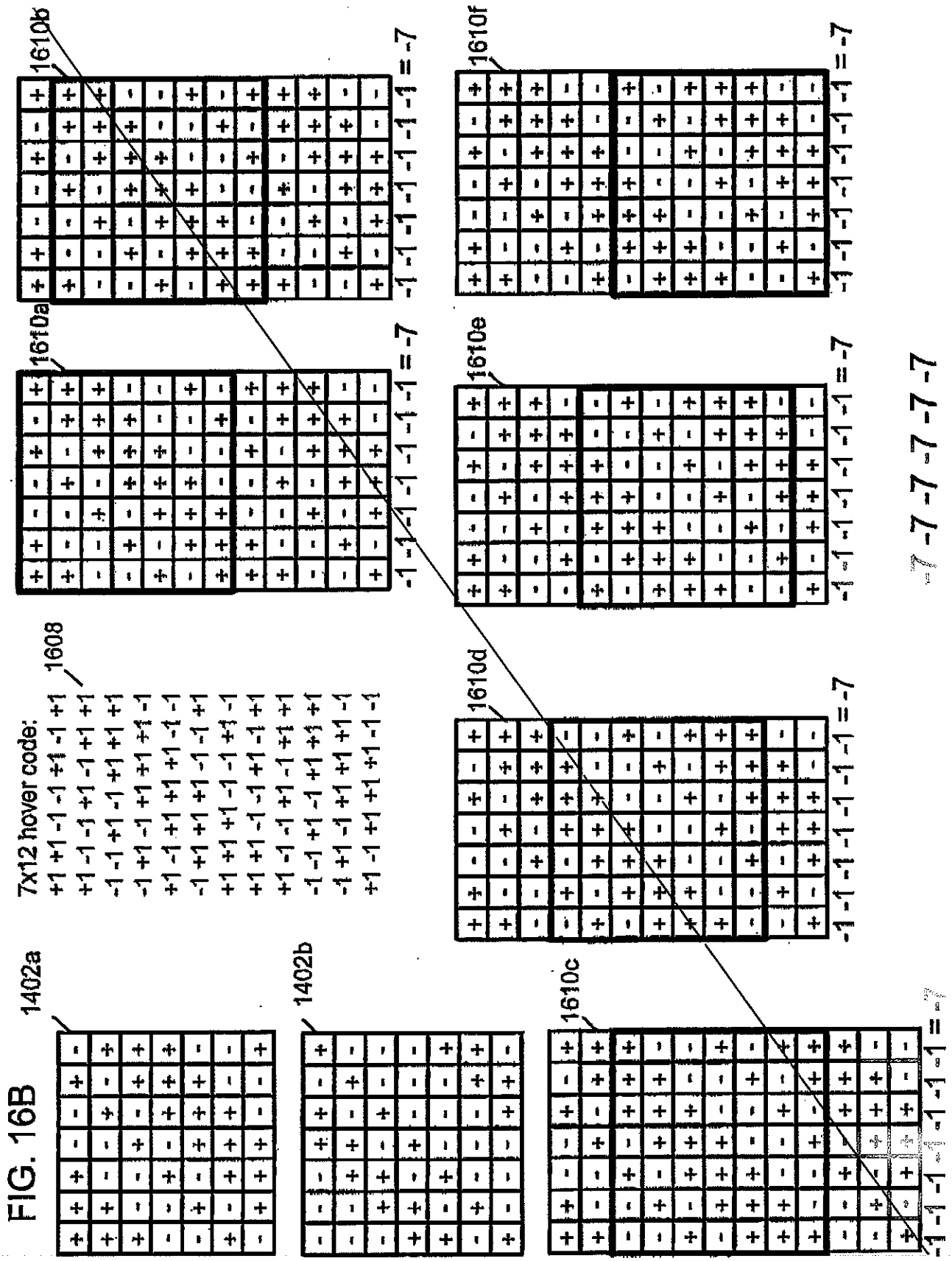


FIG. 16A
1402a
1402b
12x7 hover code:
+1 +1 -1 -1 +1 -1 +1 +1 +1 -1 -1 +1
+1 -1 -1 +1 -1 +1 +1 +1 -1 +1 -1
-1 -1 +1 -1 +1 +1 +1 -1 -1 +1 +1
-1 +1 -1 +1 +1 +1 -1 -1 +1 -1 +1 +1
+1 -1 +1 +1 -1 -1 +1 -1 -1 +1 +1 +1
-1 +1 +1 +1 -1 -1 +1 +1 +1 +1 -1
+1 +1 +1 -1 -1 +1 -1 +1 +1 -1 -1
1600
1602a
1602b
1602c
1602d
1602e
1602f
-1 -1 -1 -1 -1 -1 -1 = -7
1604
1606
-7 -7 -7 -7 -7 -7 -7

FIG. 16B


1402a
1402b
7x12 hover code:
+1 +1 -1 -1 +1 -1 +1
+1 -1 -1 +1 -1 +1 +1
-1 -1 +1 -1 +1 +1 +1
-1 +1 -1 +1 +1 +1 -1
+1 -1 +1 +1 +1 -1 -1
-1 +1 +1 +1 -1 -1 +1
+1 +1 +1 -1 -1 +1 -1
+1 +1 -1 -1 +1 -1 +1
+1 -1 -1 +1 -1 +1 +1
-1 -1 +1 -1 +1 +1 -1
+1 -1 +1 +1 +1 -1 -1
1608
1610a
1610b
1610c
1610d
1610e
1610f
-1 -1 -1 -1 -1 -1 = -7
-1 -1 -1 -1 -1 -1 = -7
-1 -1 -1 -1 -1 -1 = -7
-1 -1 -1 -1 -1 -1 = -7
-1 -1 -1 -1 -1 -1 = -7
-1 -1 -1 -1 -1 -1 = -7
-7 -7 -7 -7 -7 -7

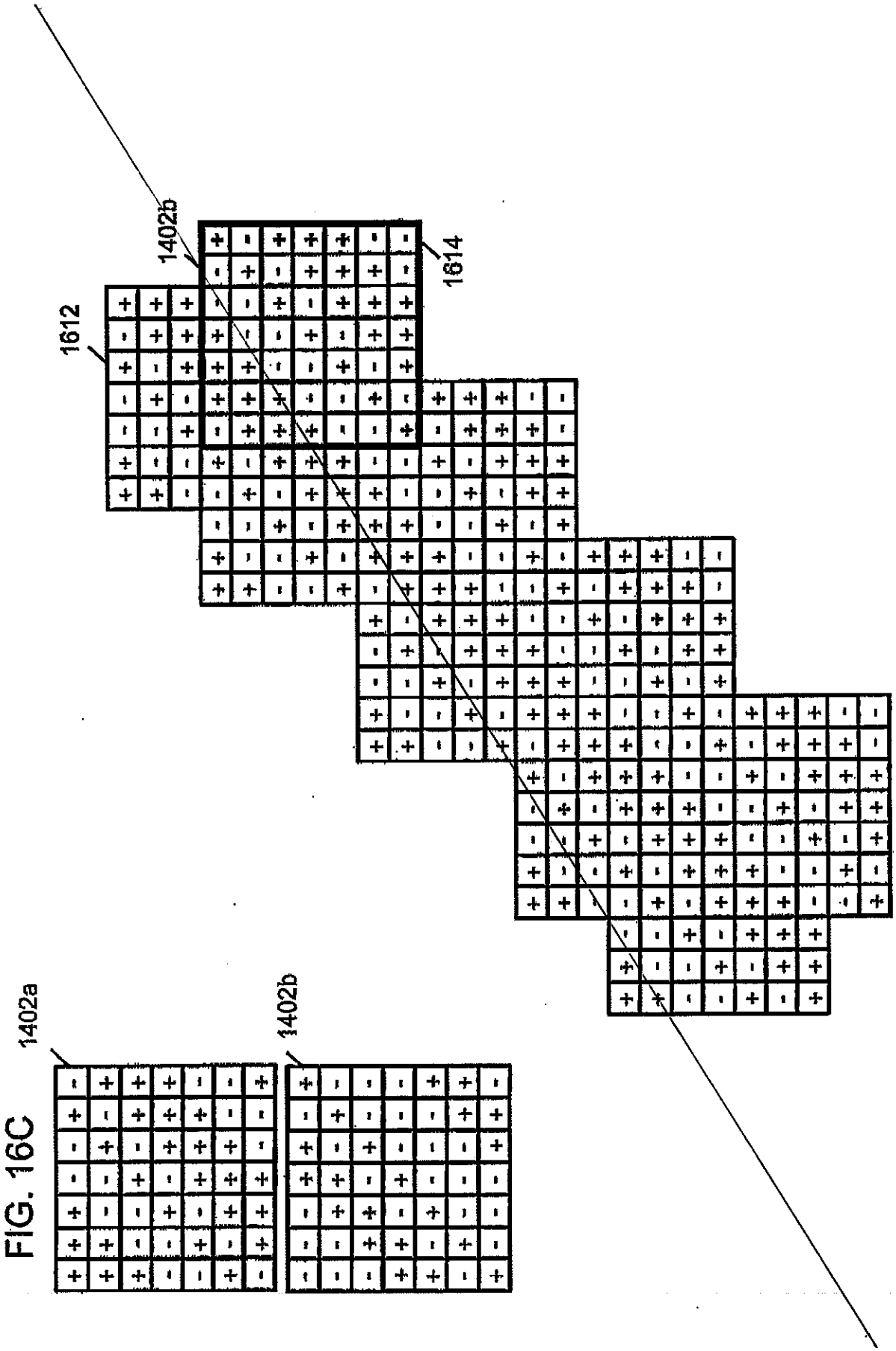


FIG. 16C

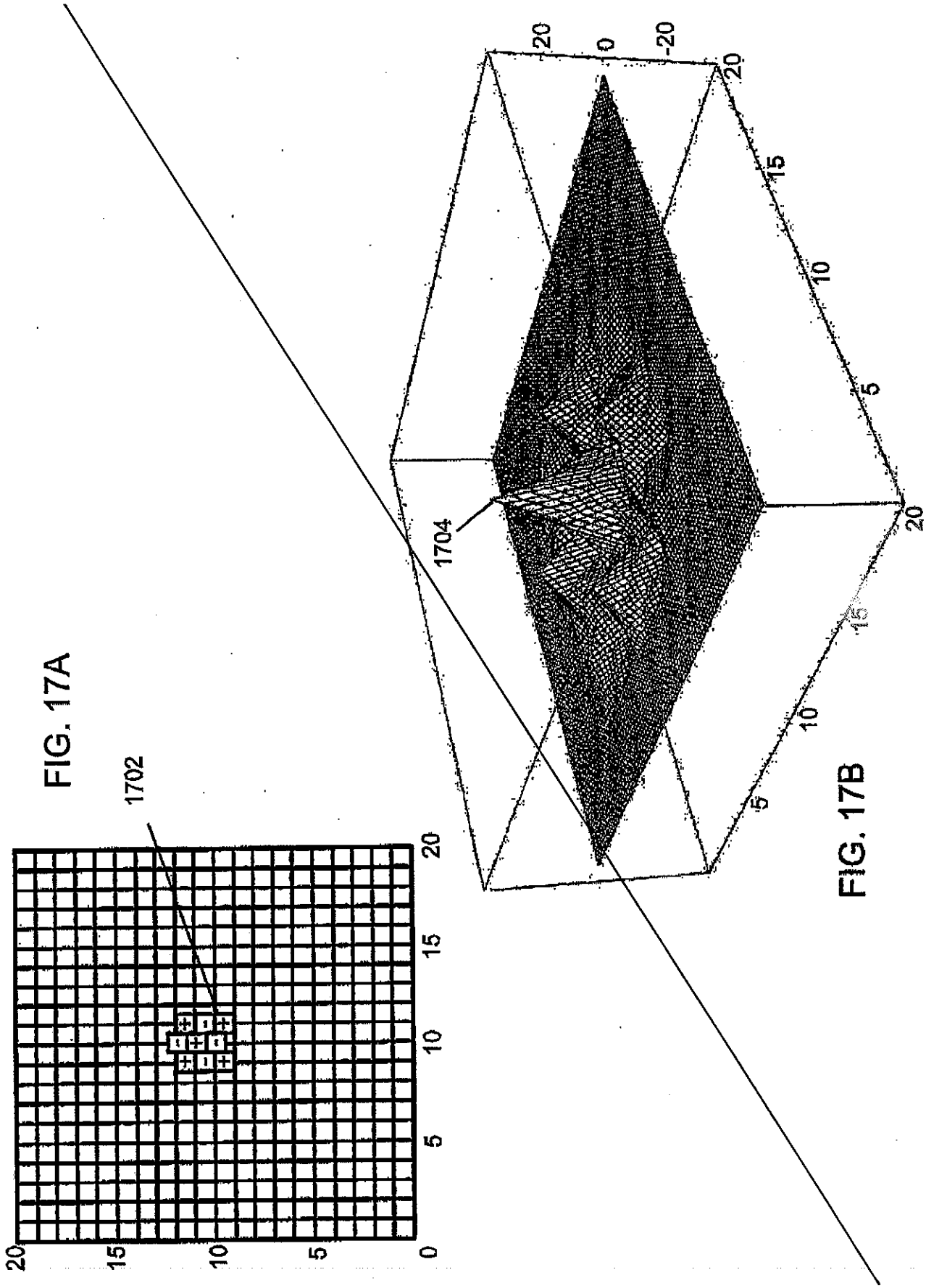


FIG. 17A

FIG. 17B

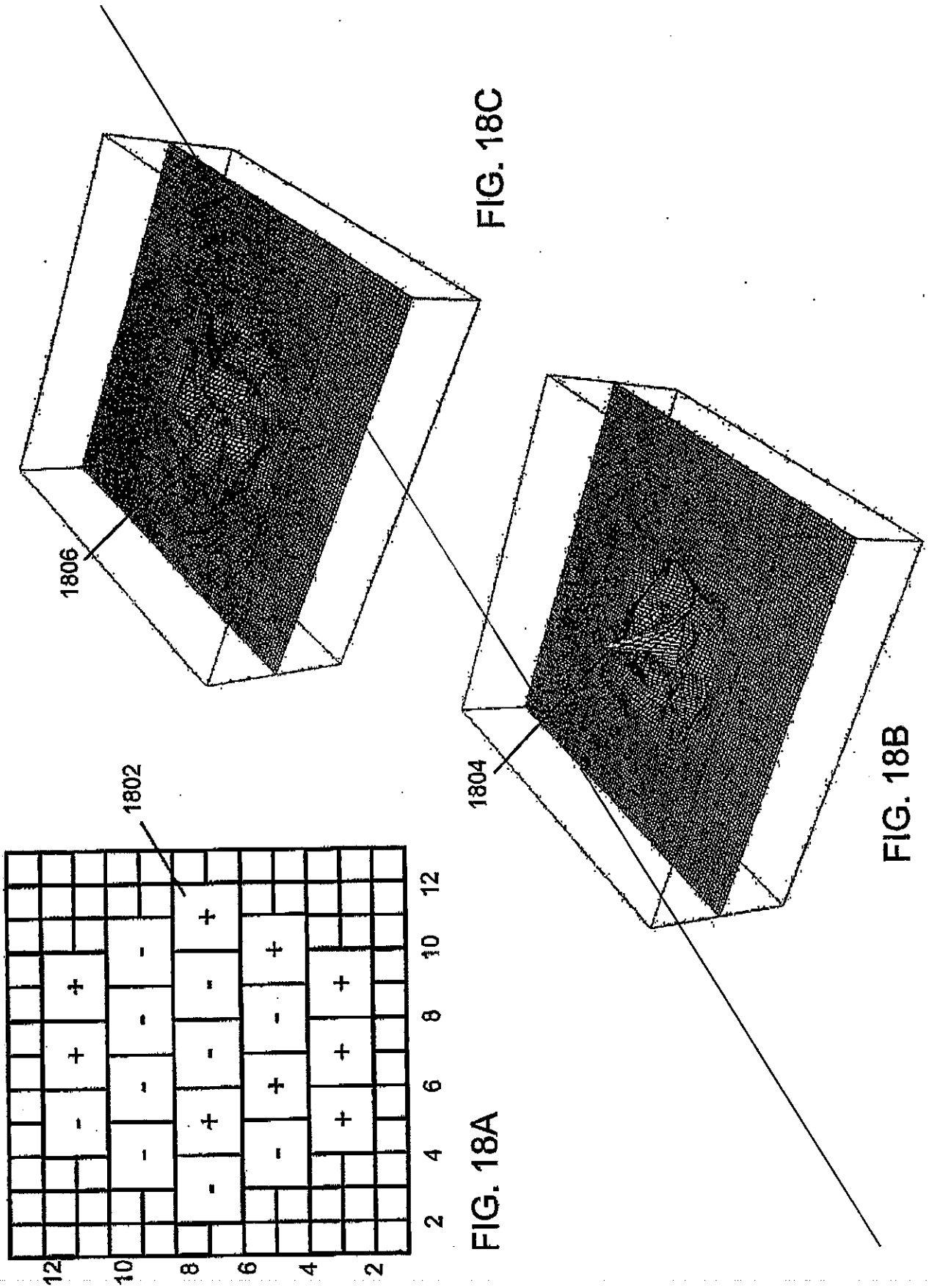


FIG. 18C

FIG. 18B

FIG. 18A

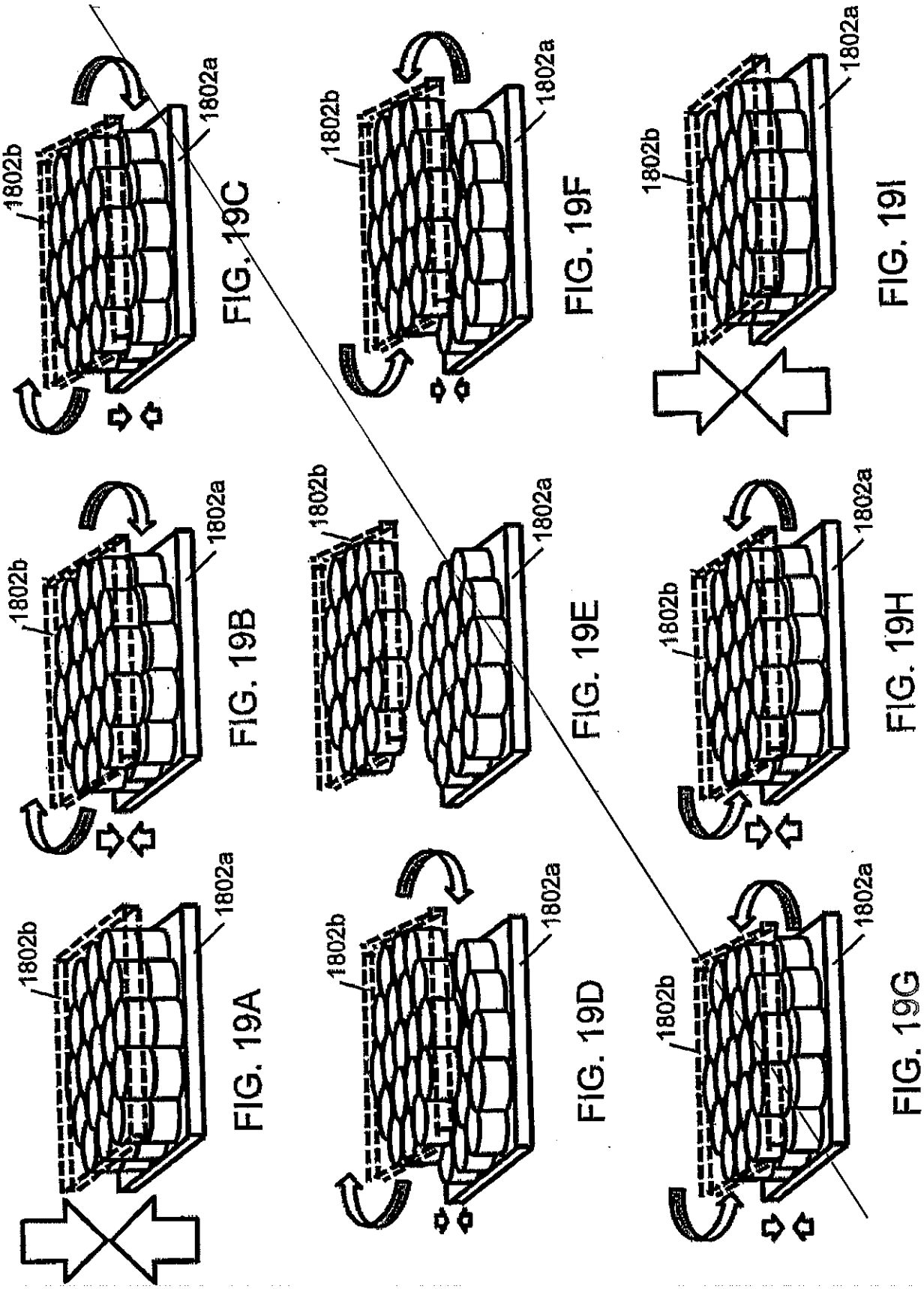


FIG. 19A FIG. 19B FIG. 19C FIG. 19D FIG. 19E FIG. 19F FIG. 19G FIG. 19H FIG. 19I

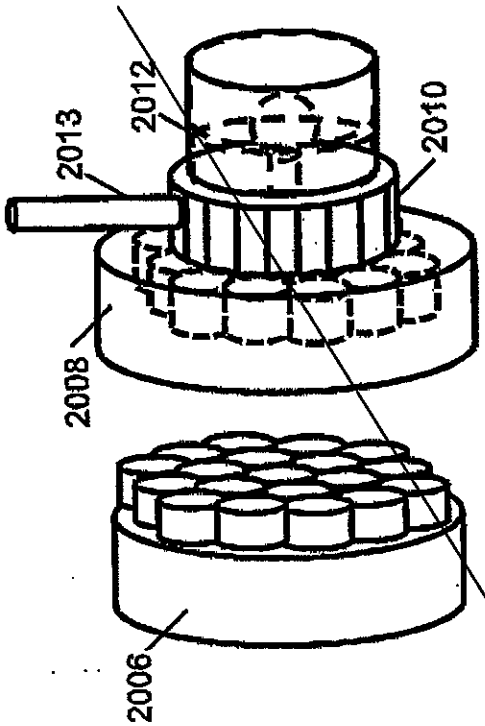


FIG. 20B

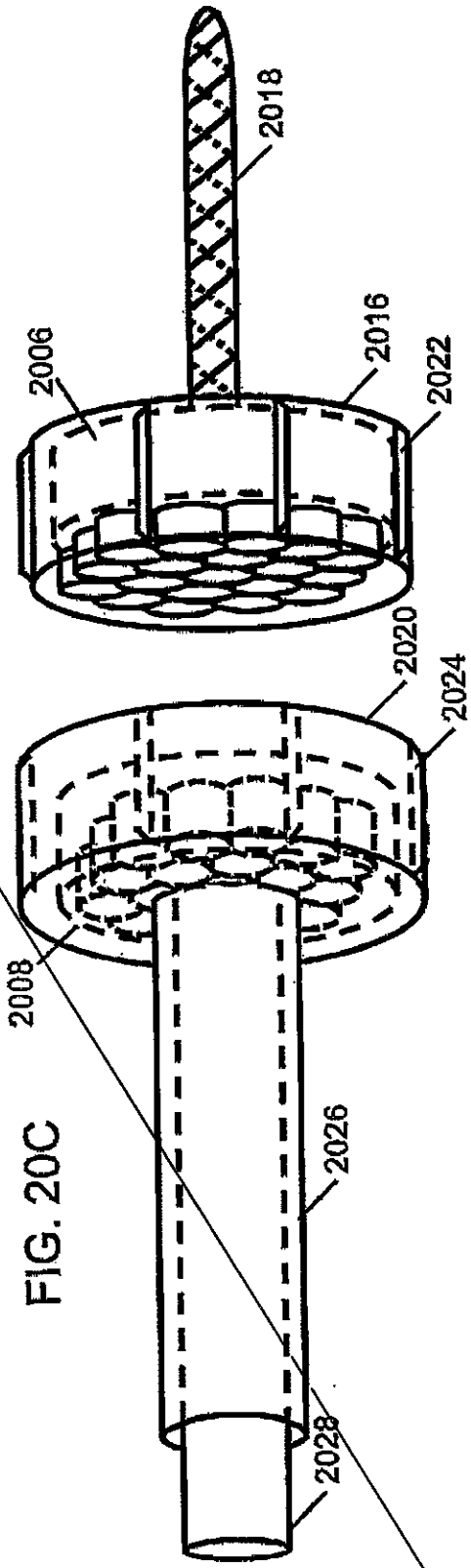


FIG. 20C

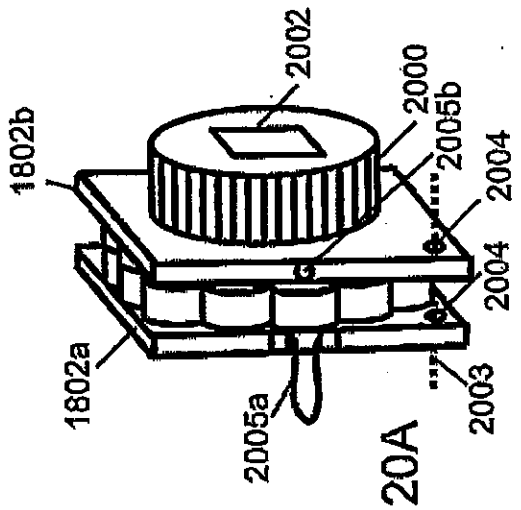


FIG. 20A

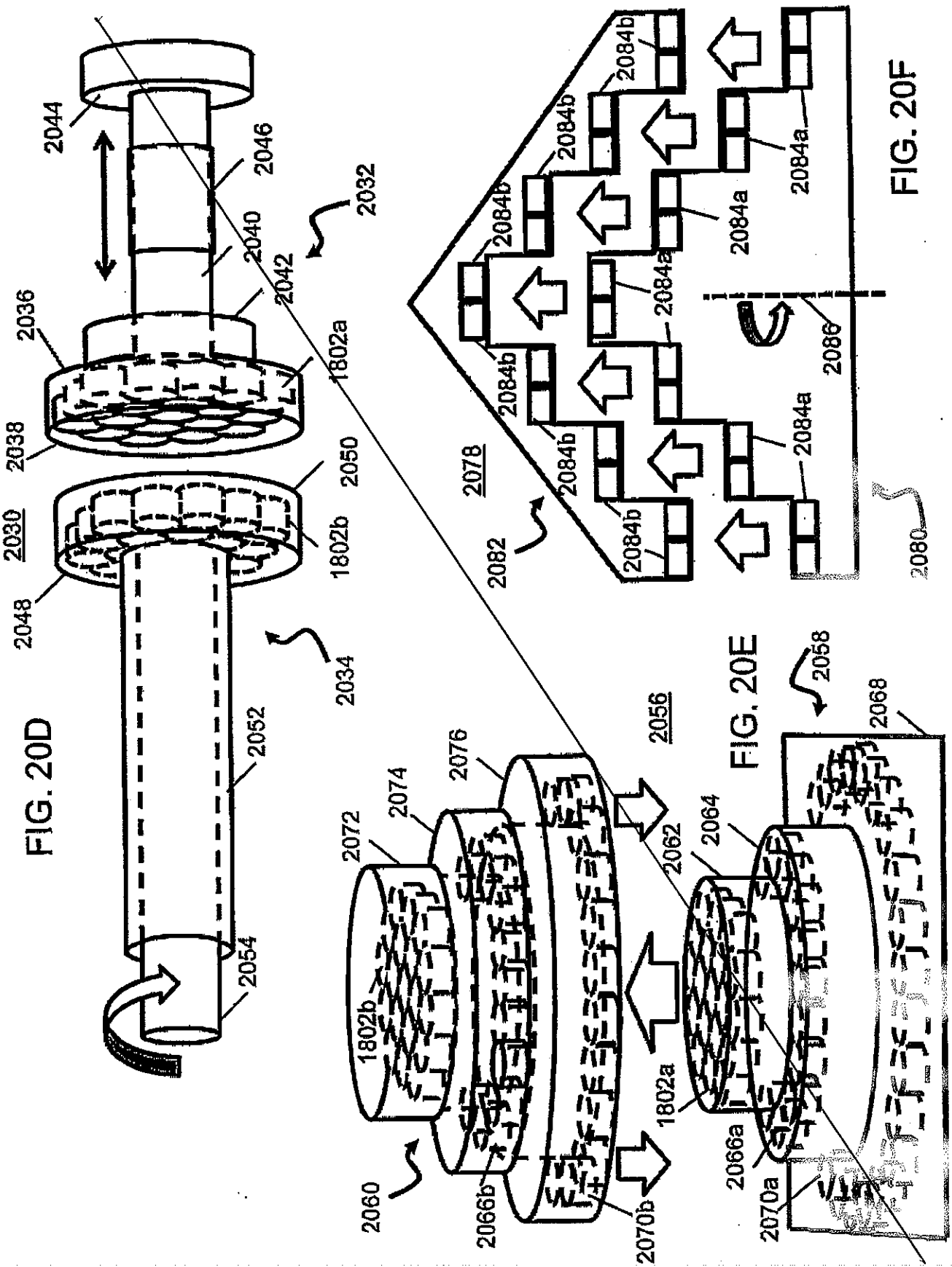
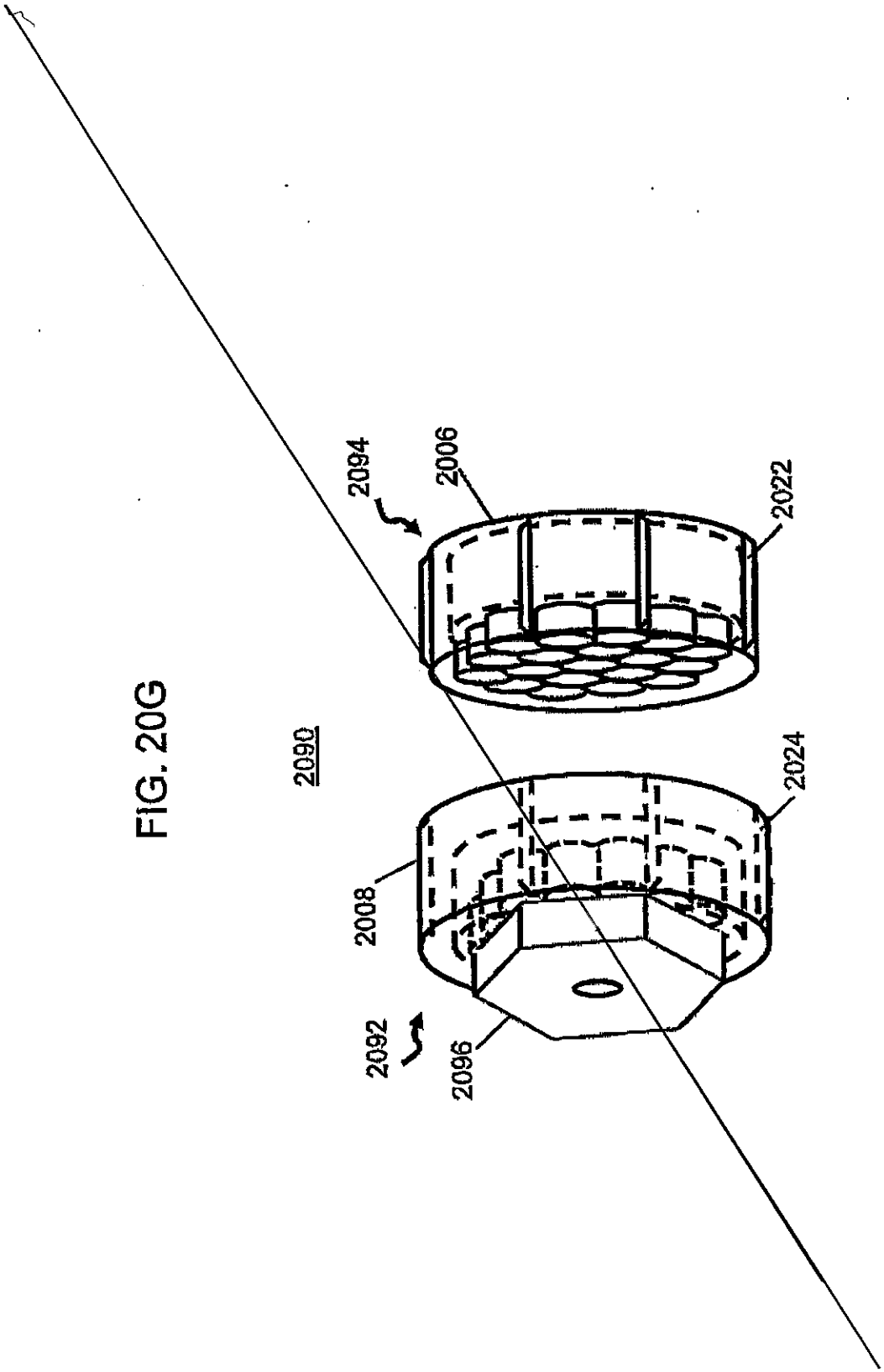


FIG. 20D

FIG. 20E

FIG. 20F

FIG. 20G



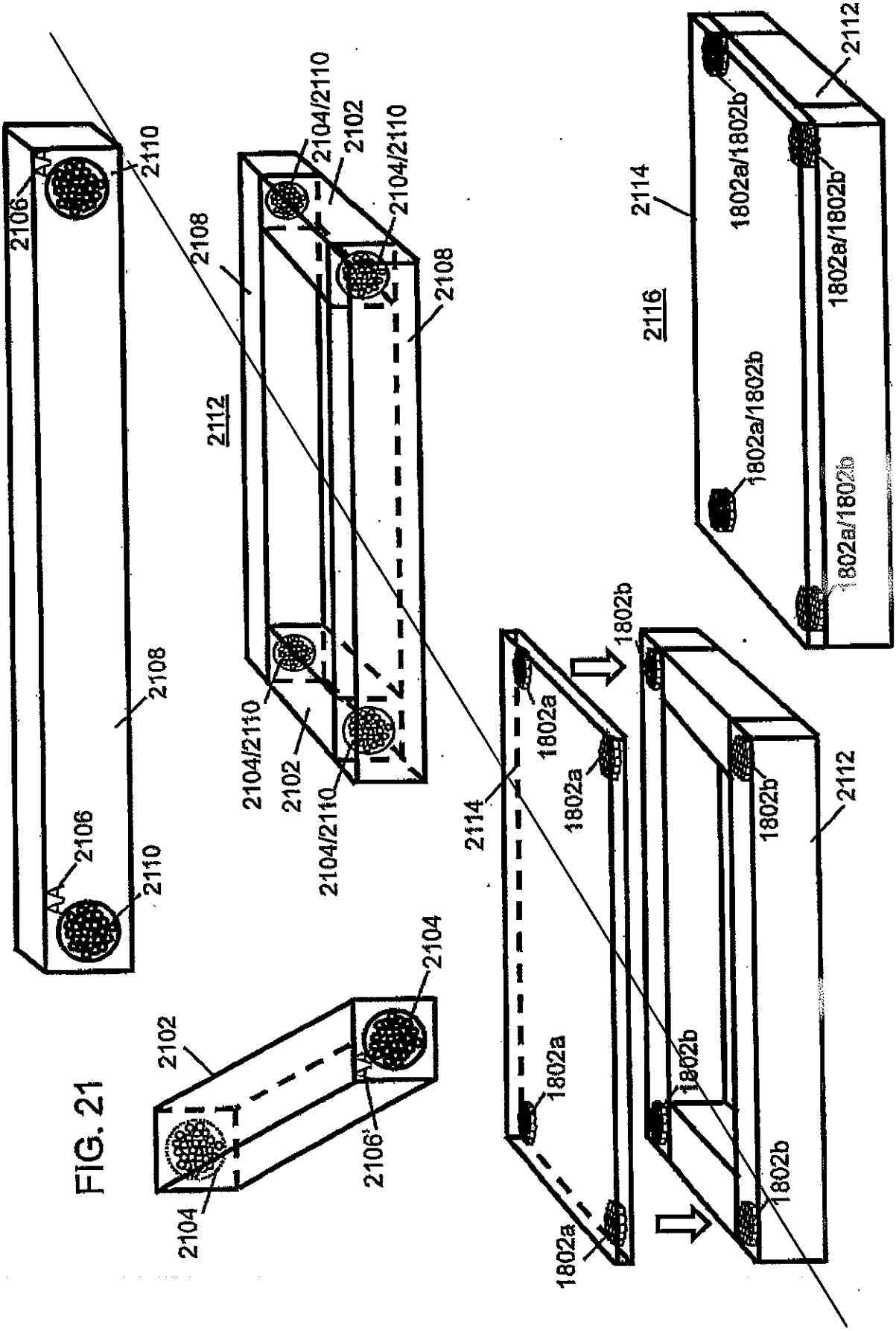

2106
2110
2108
2106
2110
2104/2110
2102
2104/2110
2108
2108
2112
2104/2110
2102
2104/2110
2114
1802a
1802a
1802a
1802a
1802b
1802b
1802b
1802b
2112
2114
2116
1802a/1802b
1802a/1802b
1802a/1802b
1802a/1802b
2112
2102
2104
2104
2106'

FIG. 21

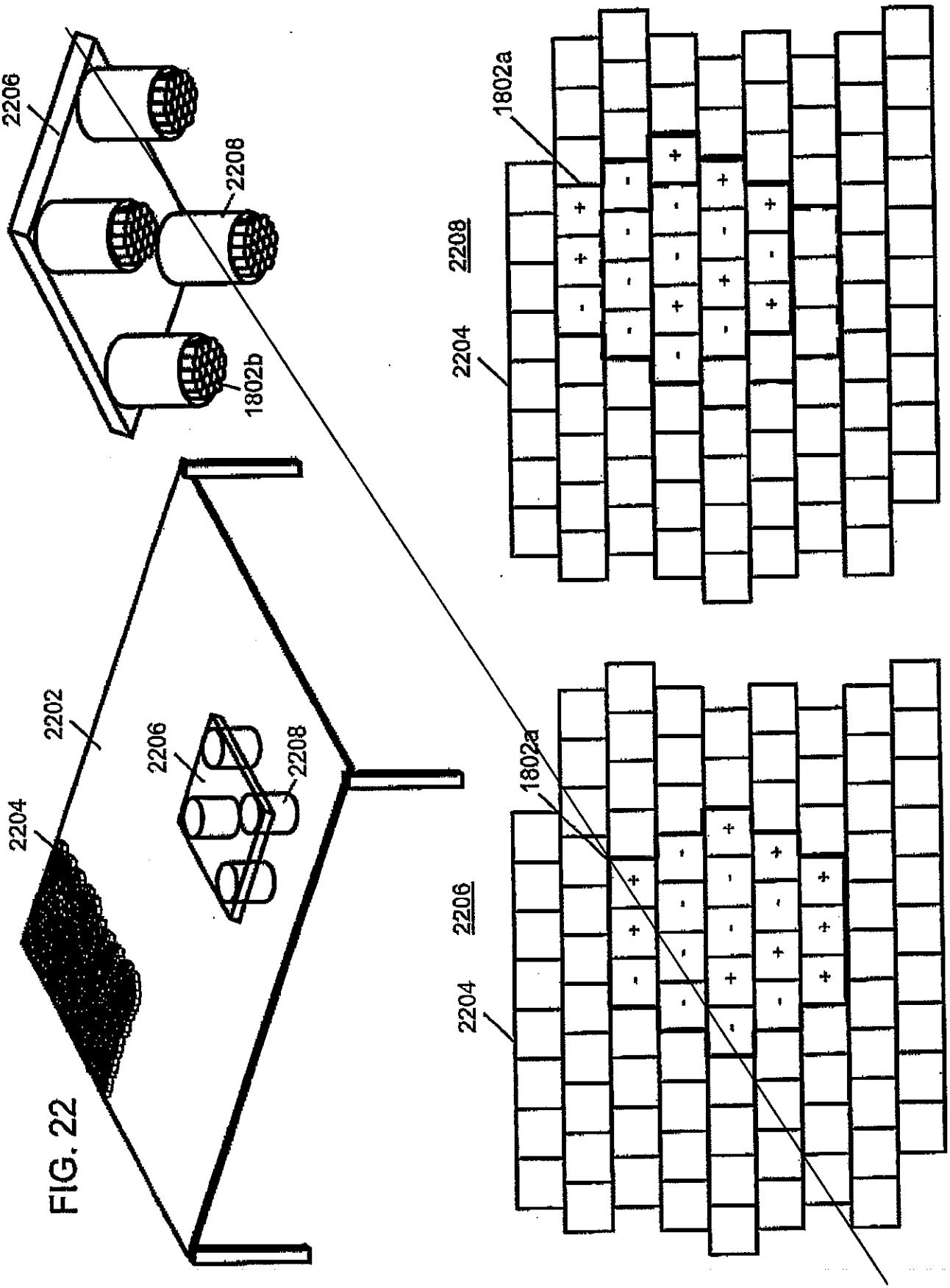

2206
2208
1802b
2202
2206
2208
2204
1802a
2208
2204
1802a
2206
2204

FIG. 22

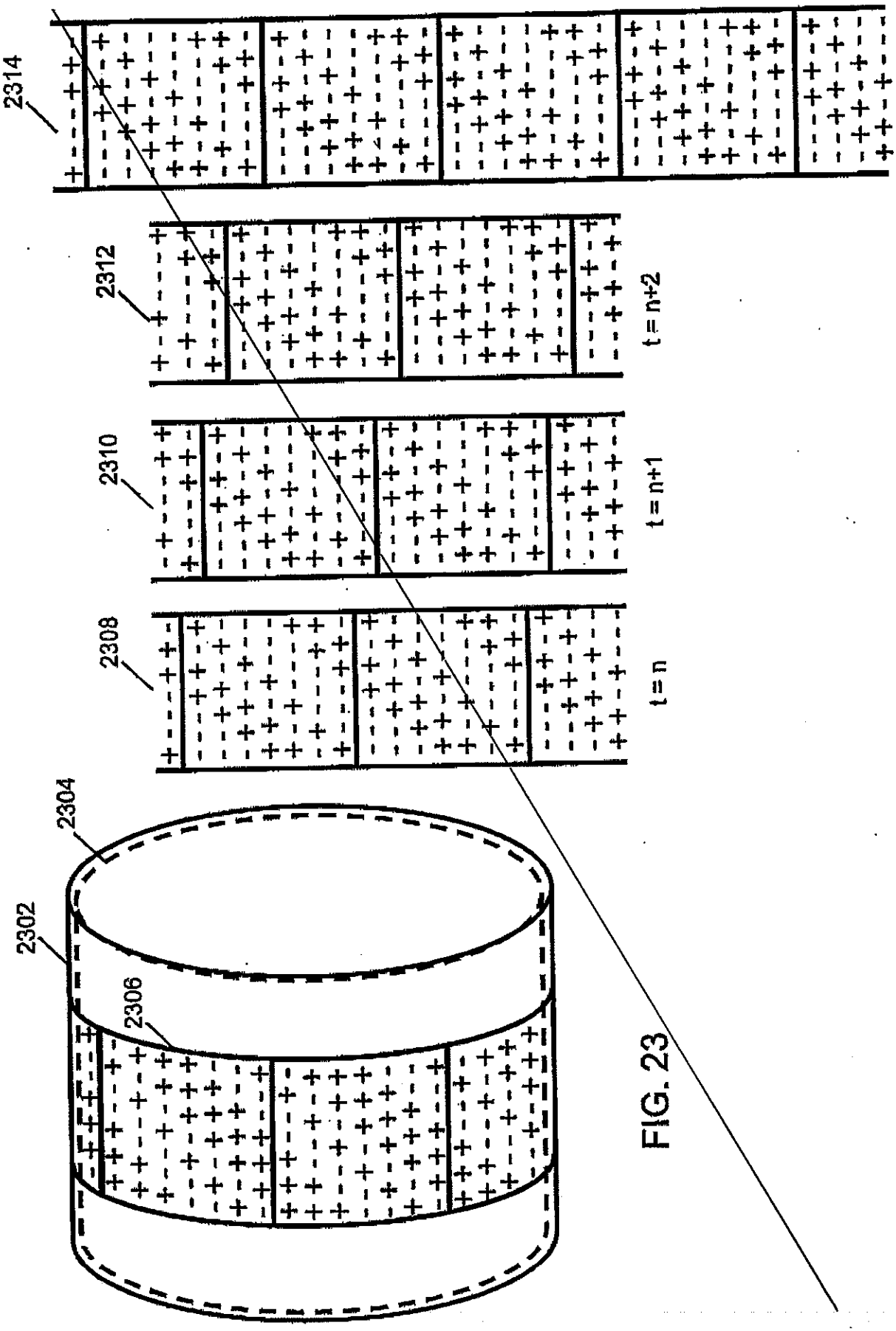


FIG. 23

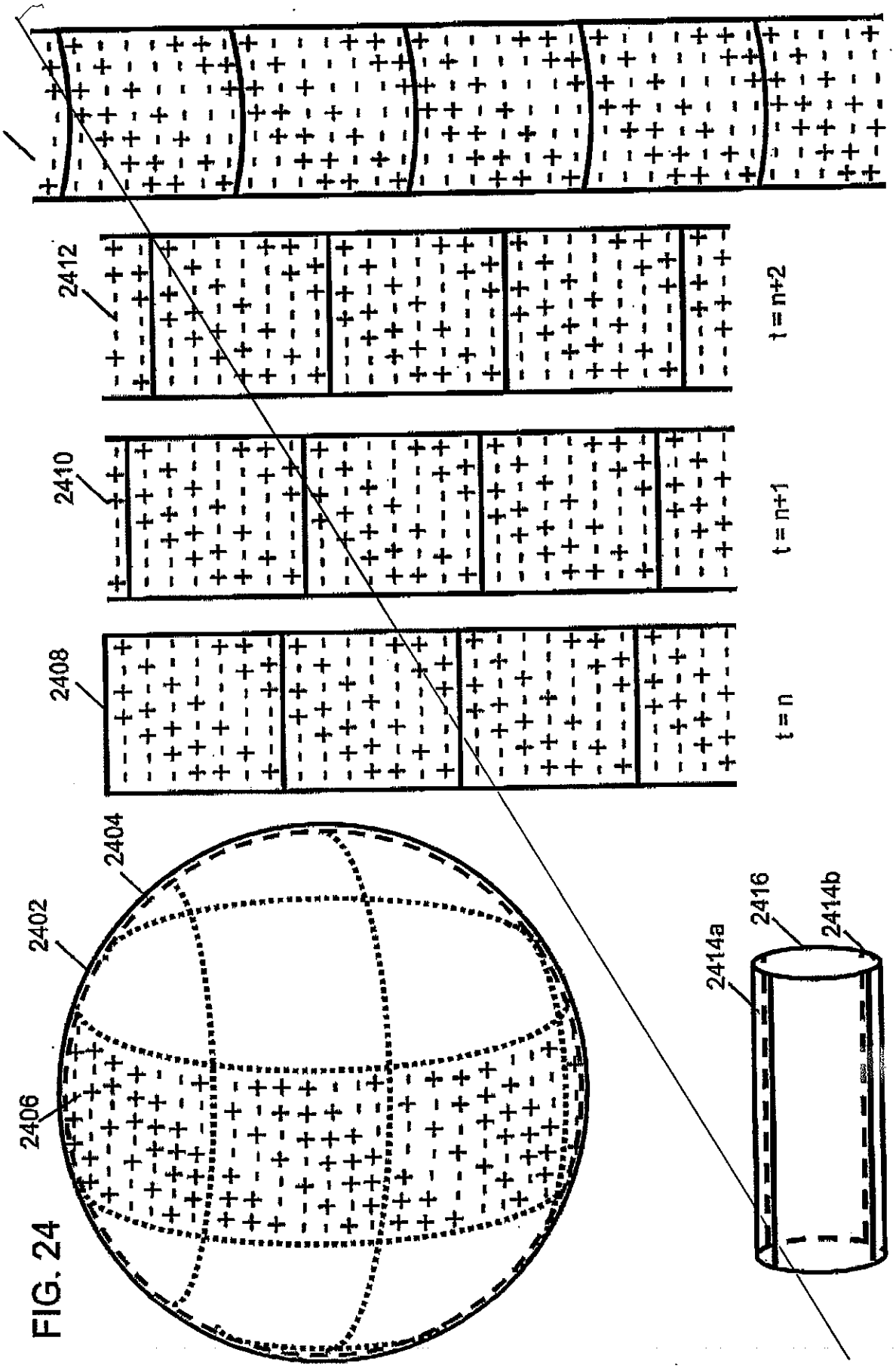

2414
2412
2410
2408
t = n+2
t = n+1
t = n
2404
2402
2406
2416
2414b
2414a

FIG. 24

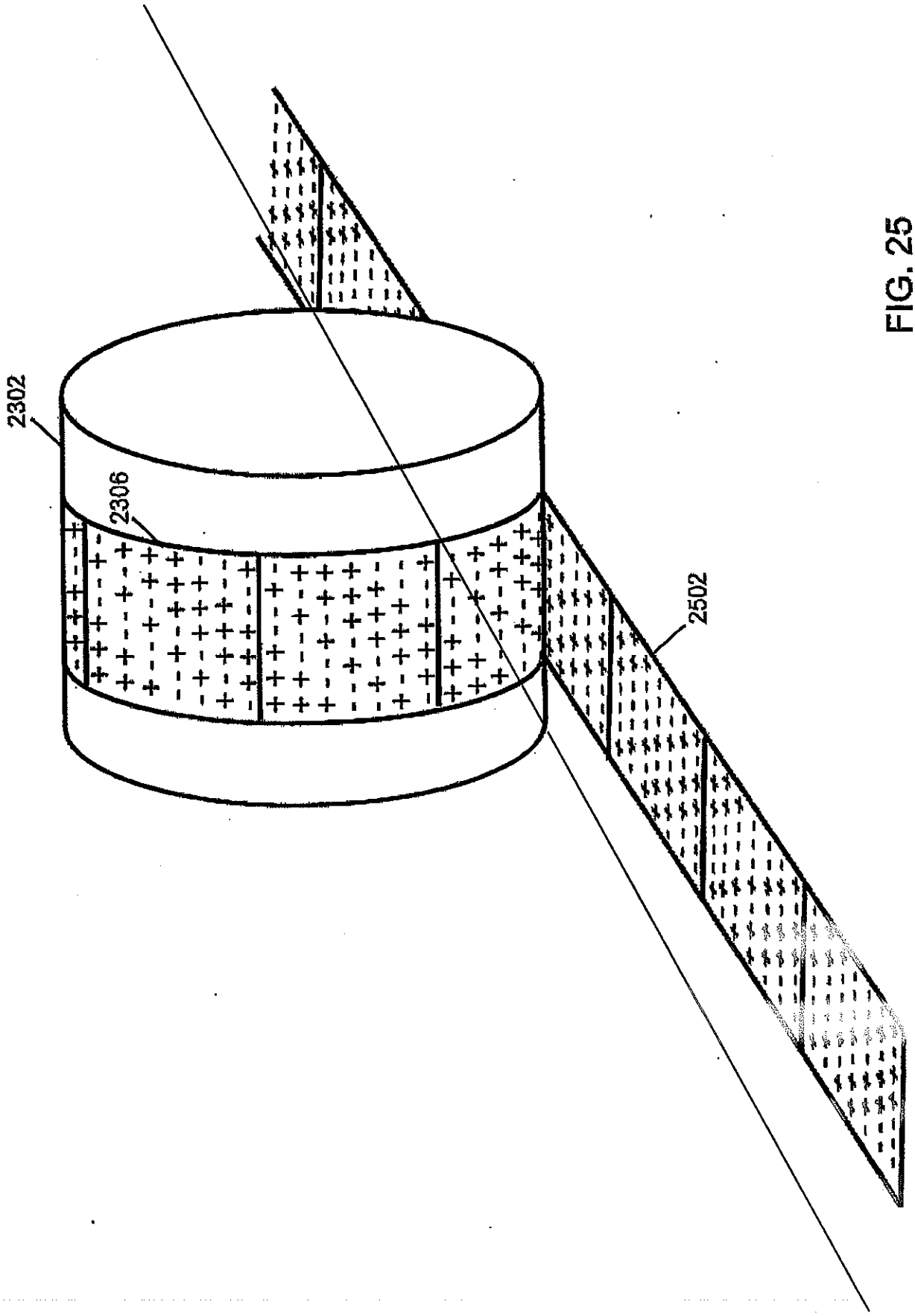


FIG. 25

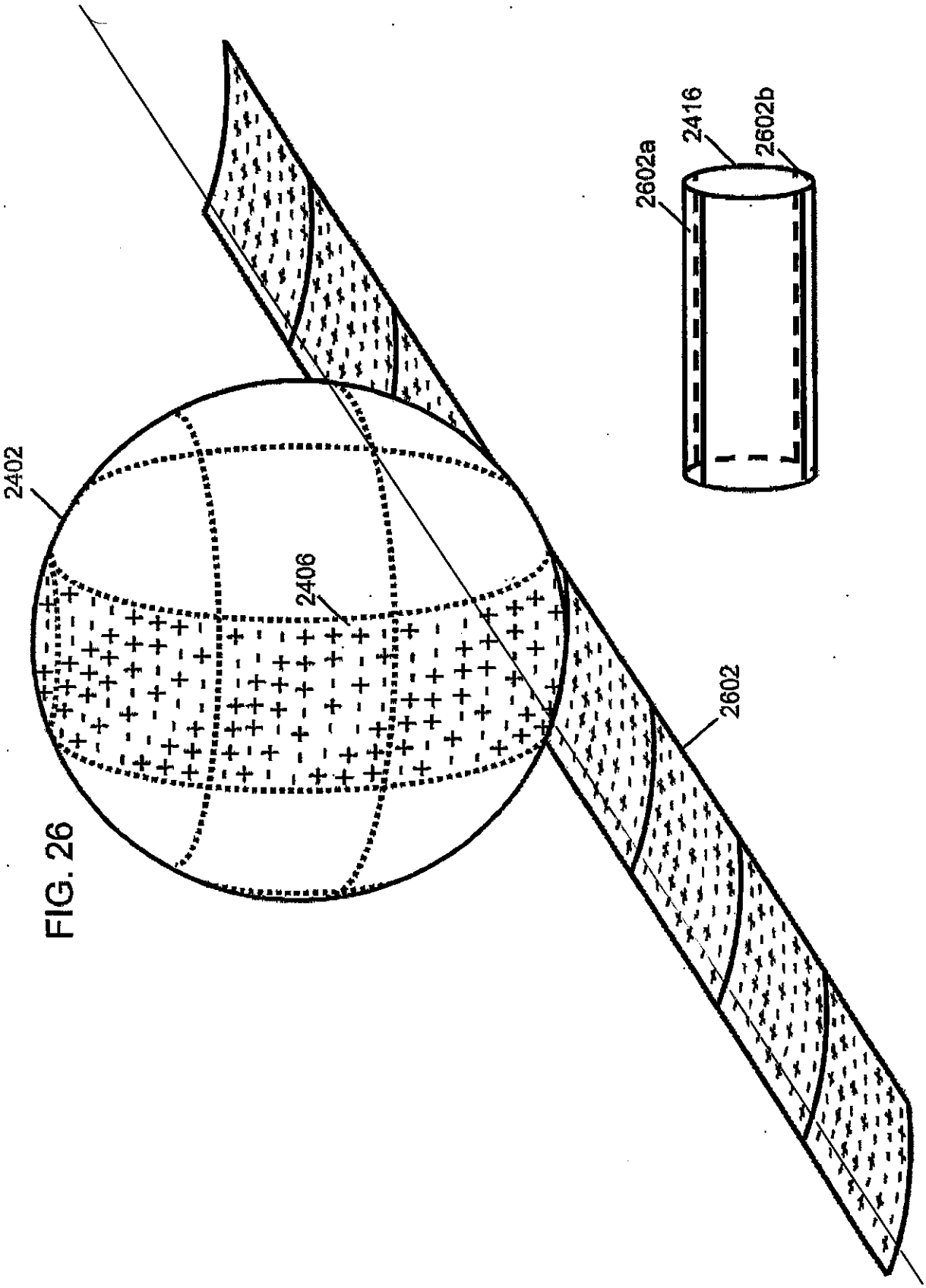


FIG. 26

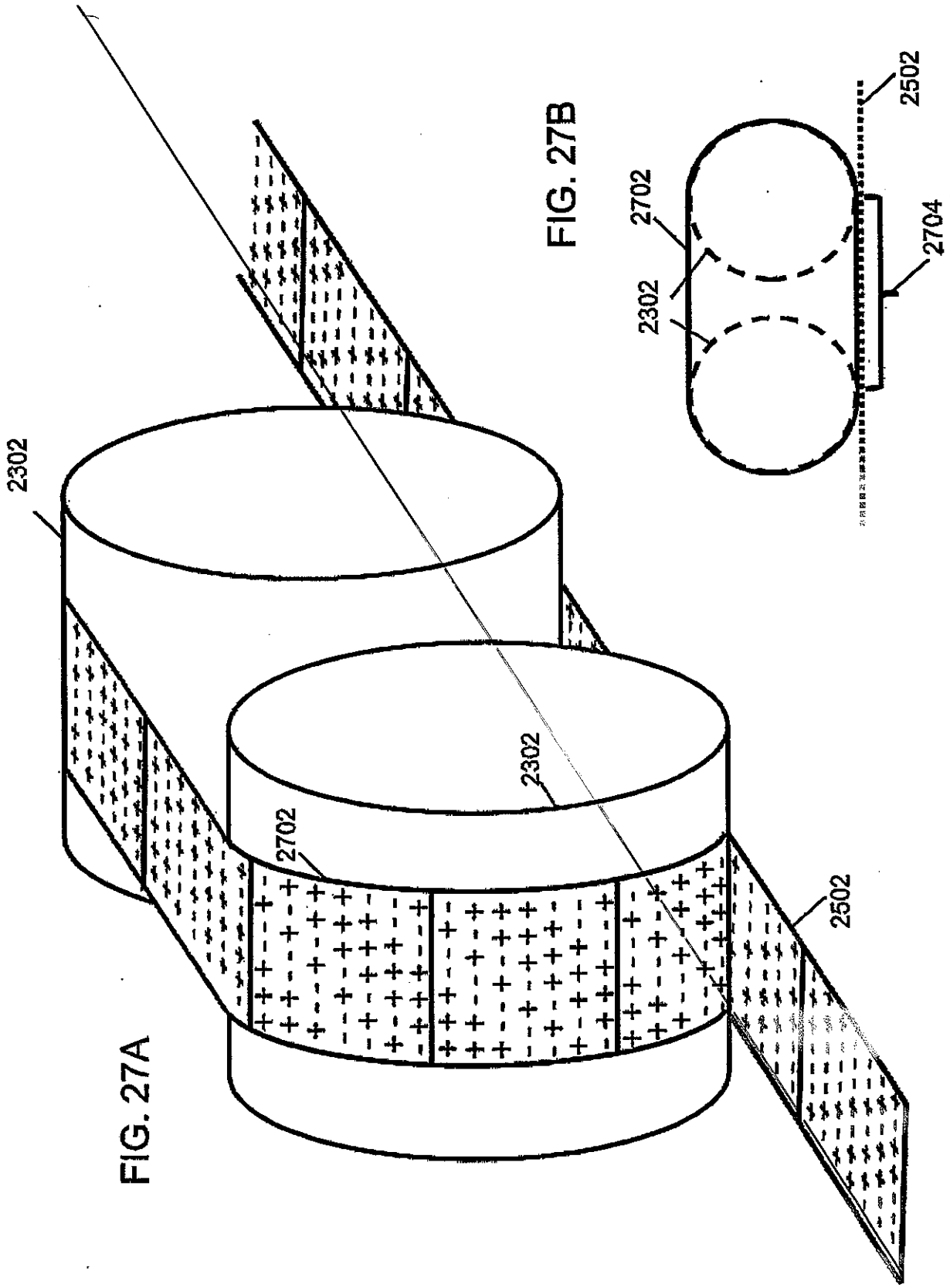


FIG. 27A

FIG. 27B

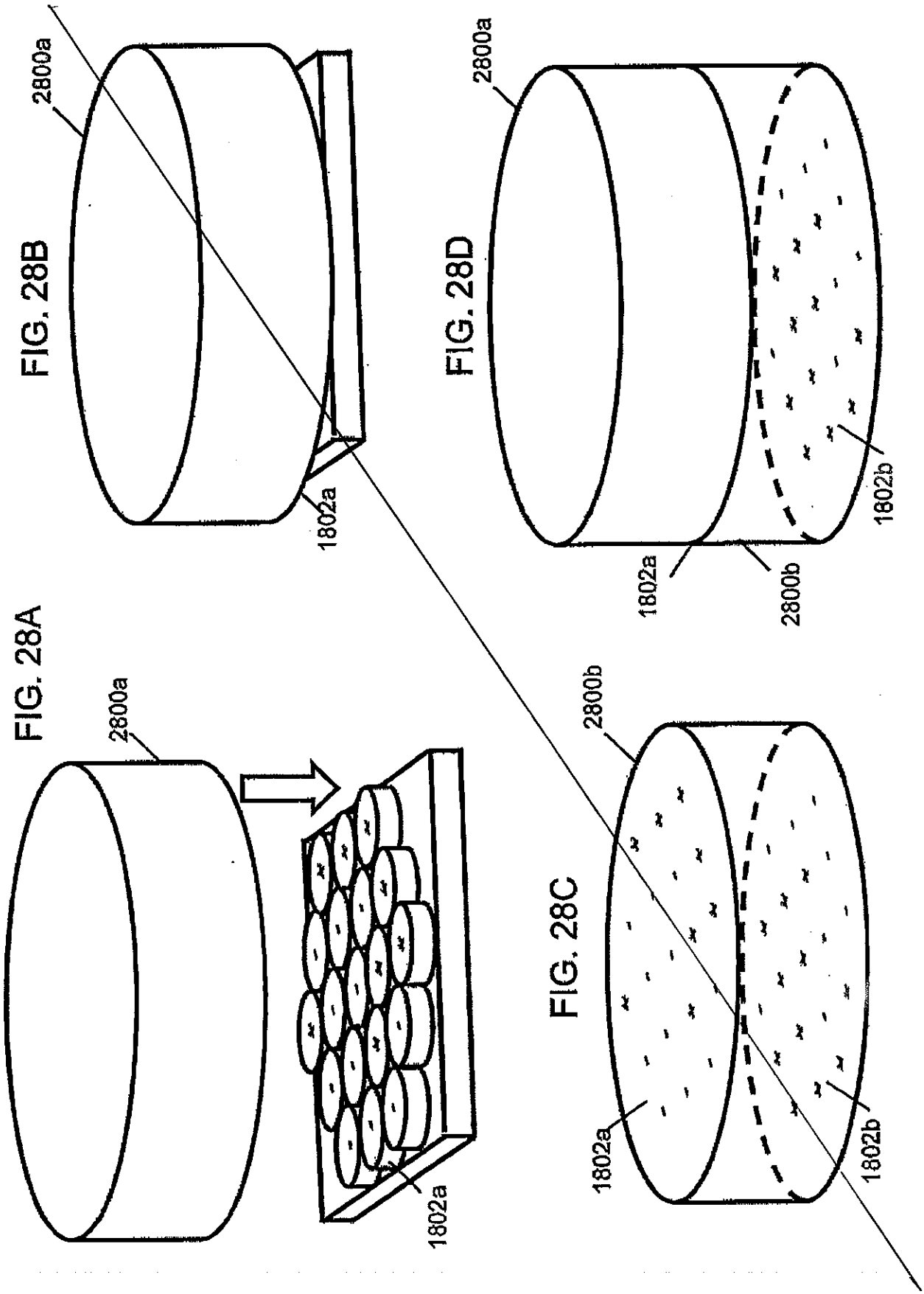


FIG. 28A
2800a
1802a
FIG. 28B
2800a
1802a
FIG. 28C
2800b
1802a
1802b
FIG. 28D
2800a
1802a
2800b
1802b

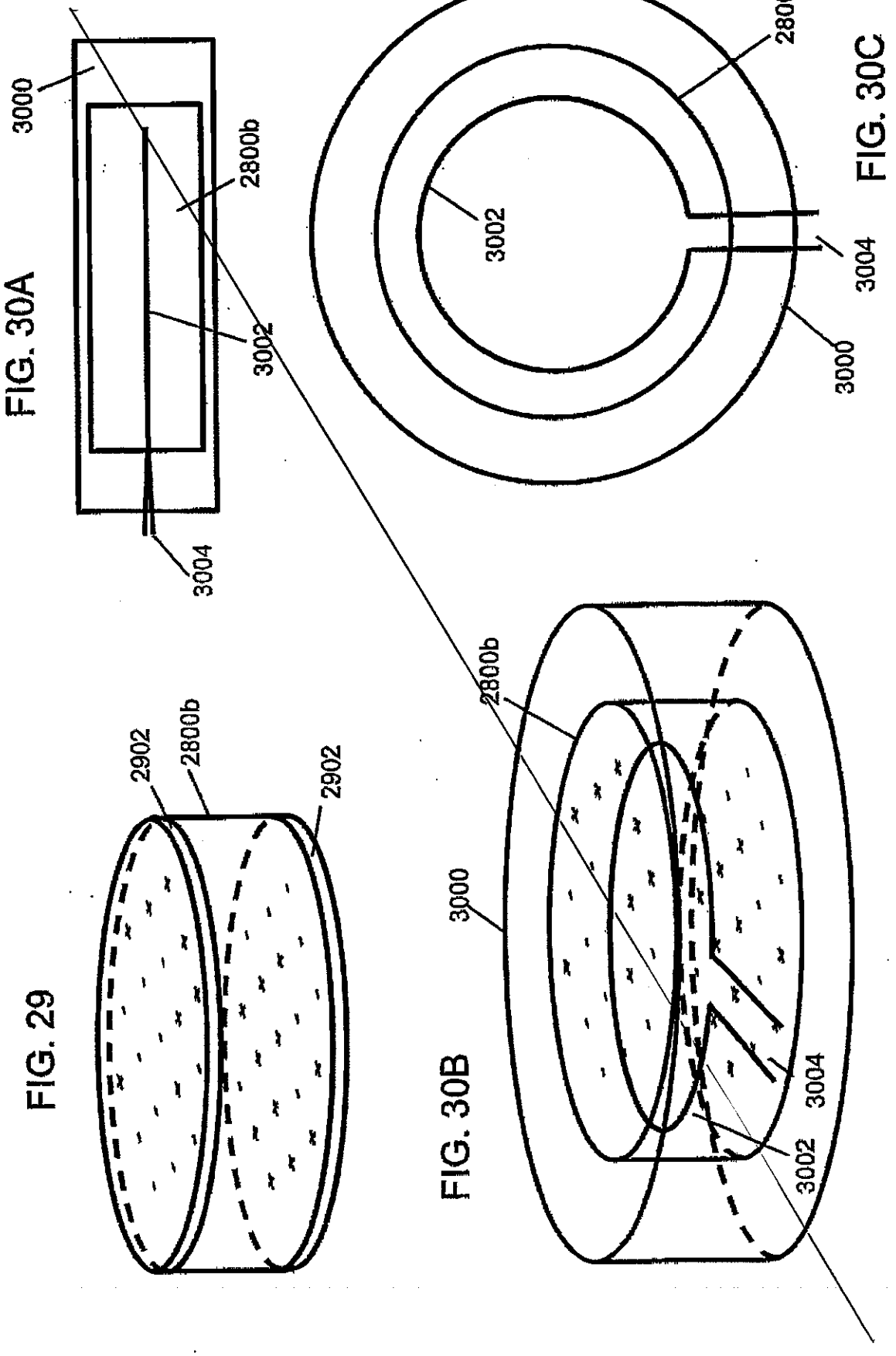


FIG. 30A

FIG. 30C

FIG. 29

FIG. 30B

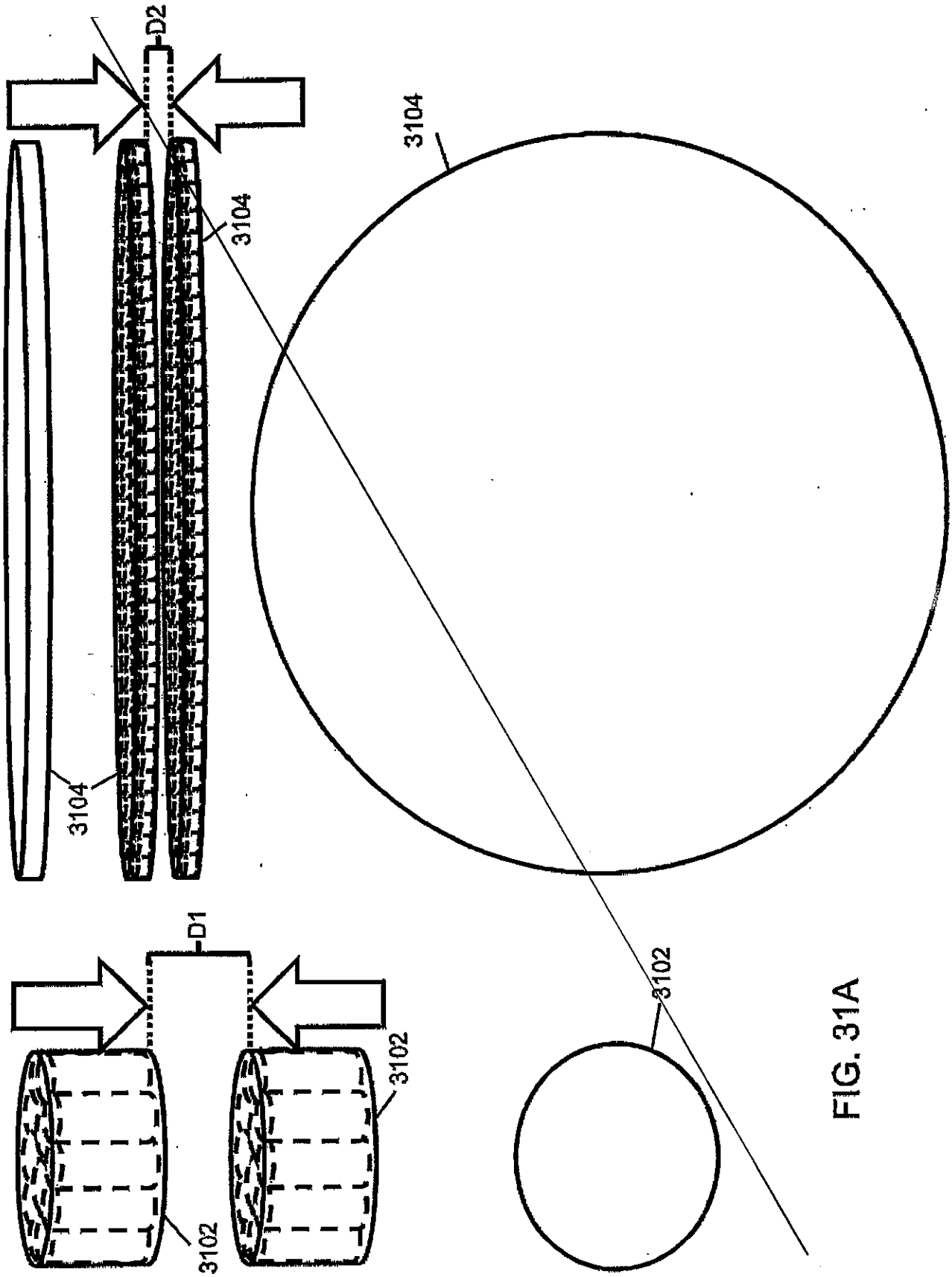


FIG. 31A

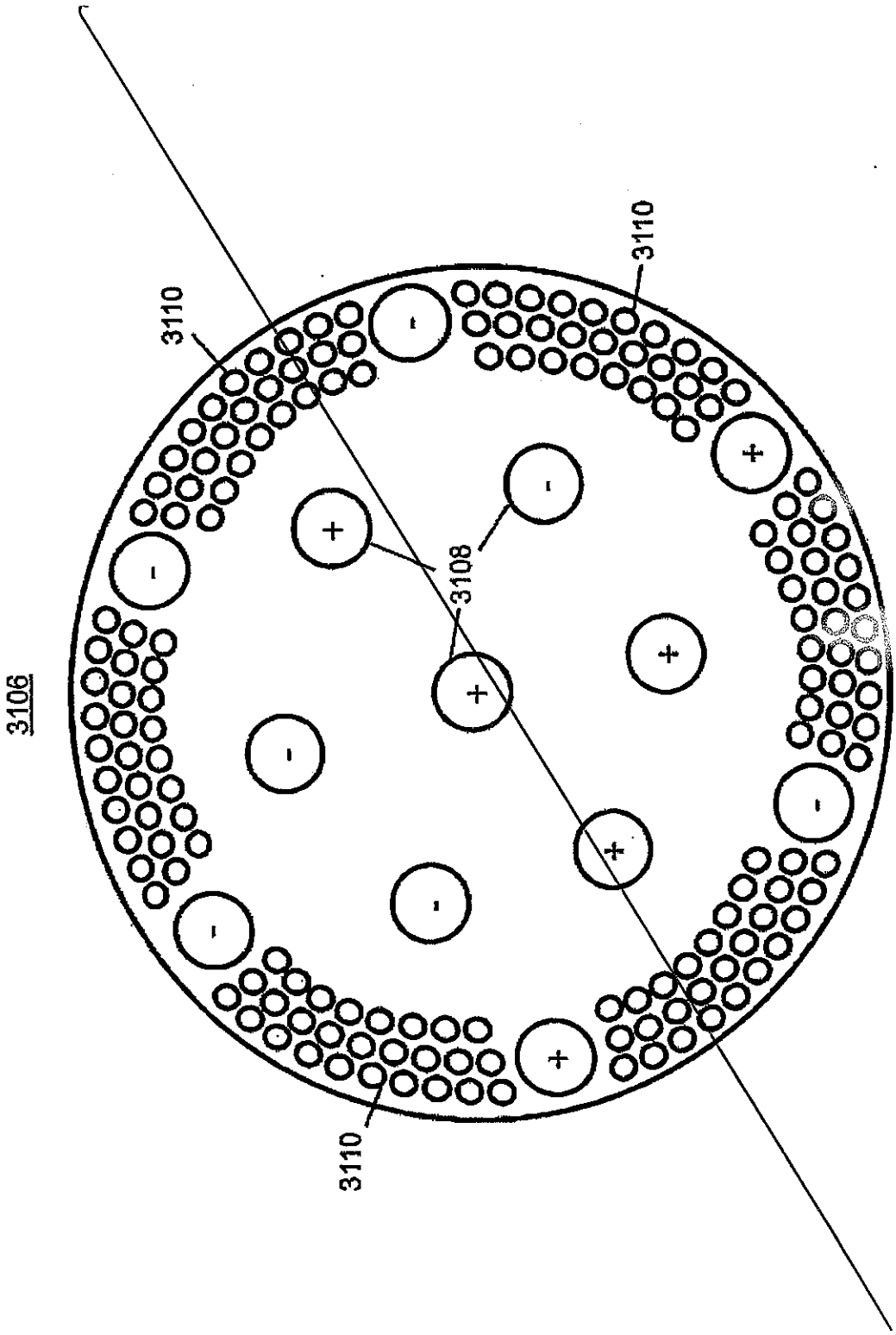


FIG. 31B

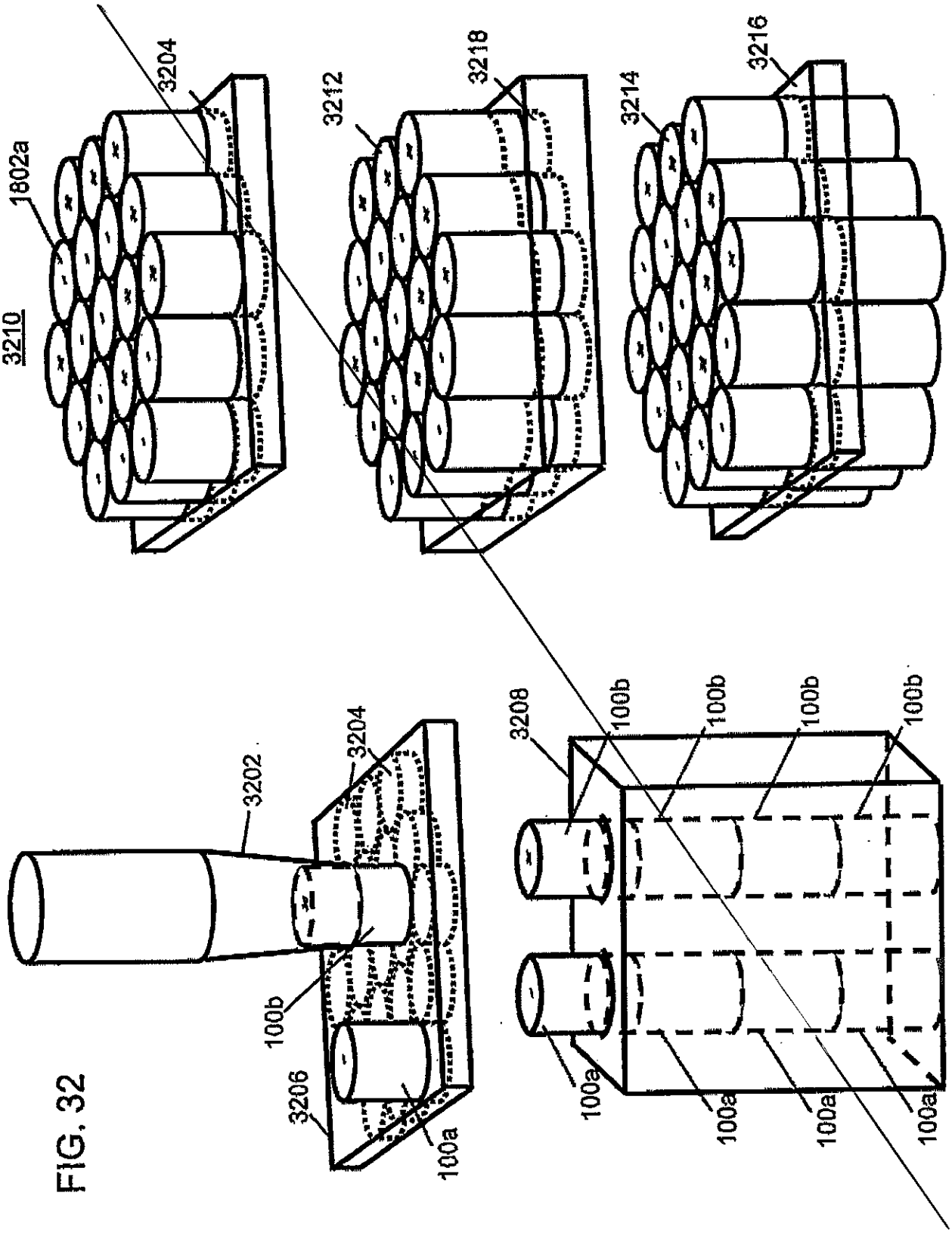

3210
1802a
3204
3212
3218
3214
3216
3202
3204
100b
3206
100a
3208
100b
100b
100b
100b
100a
100a
100a
100a

FIG. 32

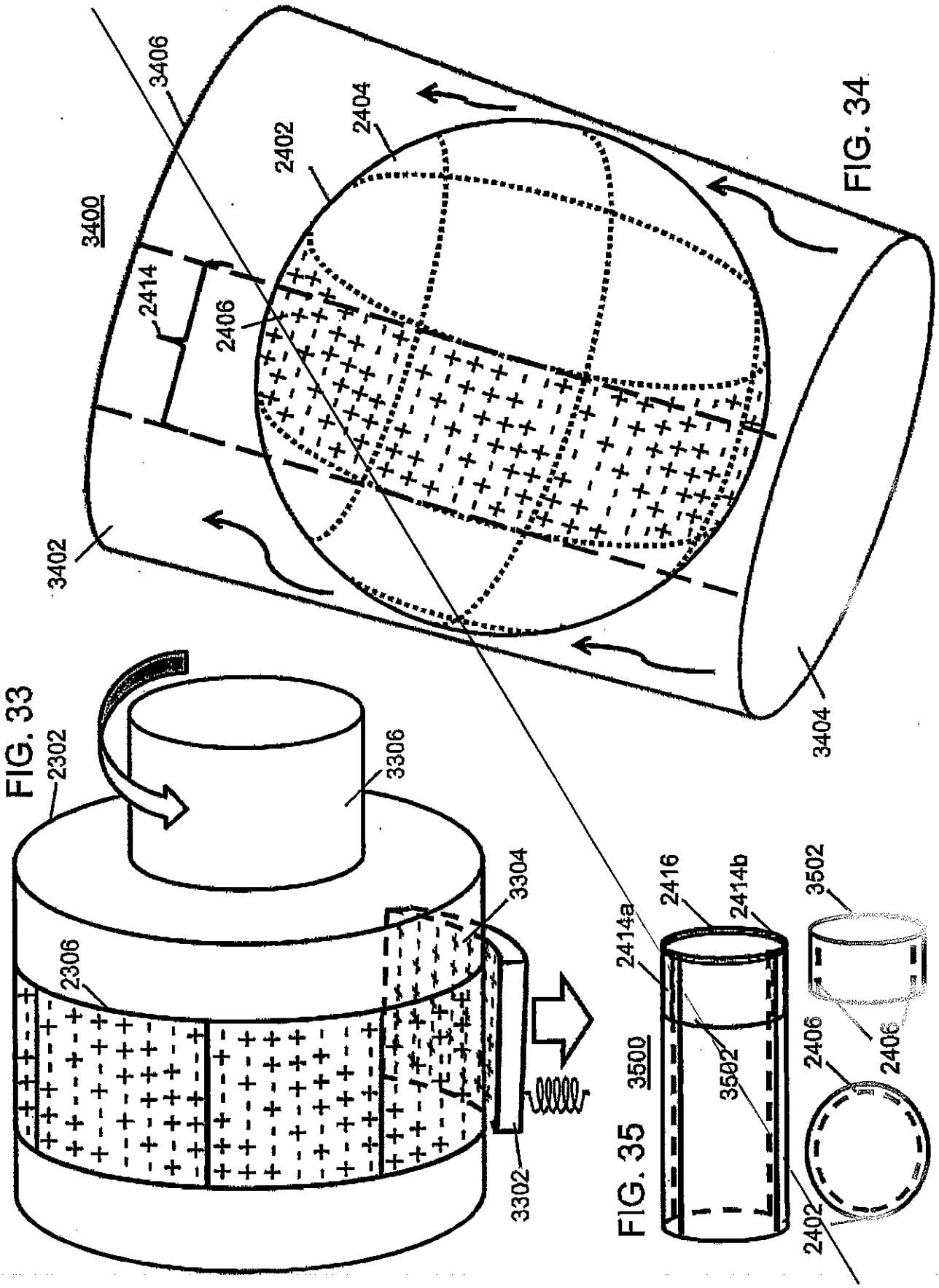
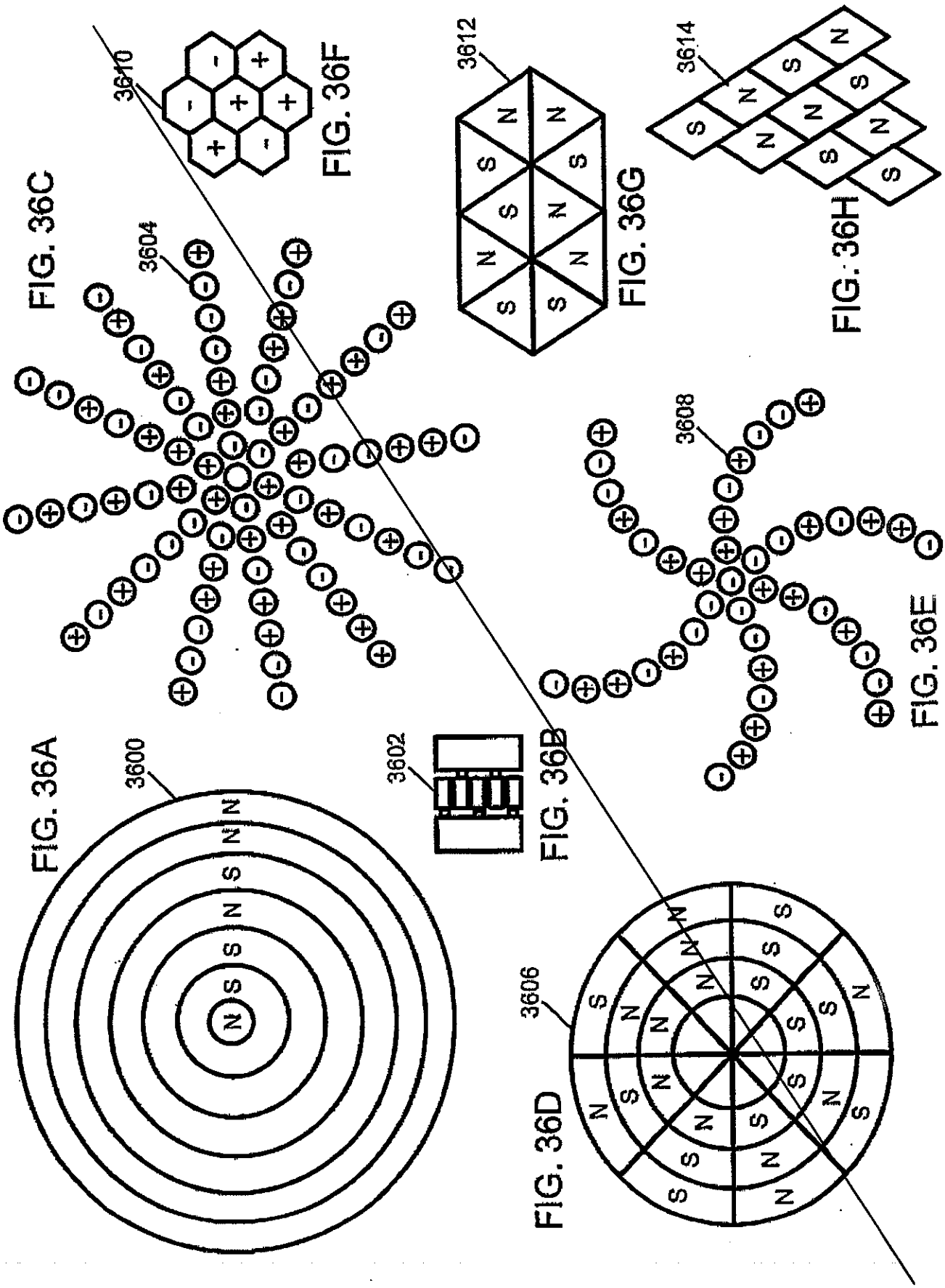


FIG. 34

FIG. 33

FIG. 35


3600
3602
3604
3606
3608
3610
3612
3614
FIG. 36A
FIG. 36B
FIG. 36C
FIG. 36D
FIG. 36E
FIG. 36F
FIG. 36G
FIG. 36H