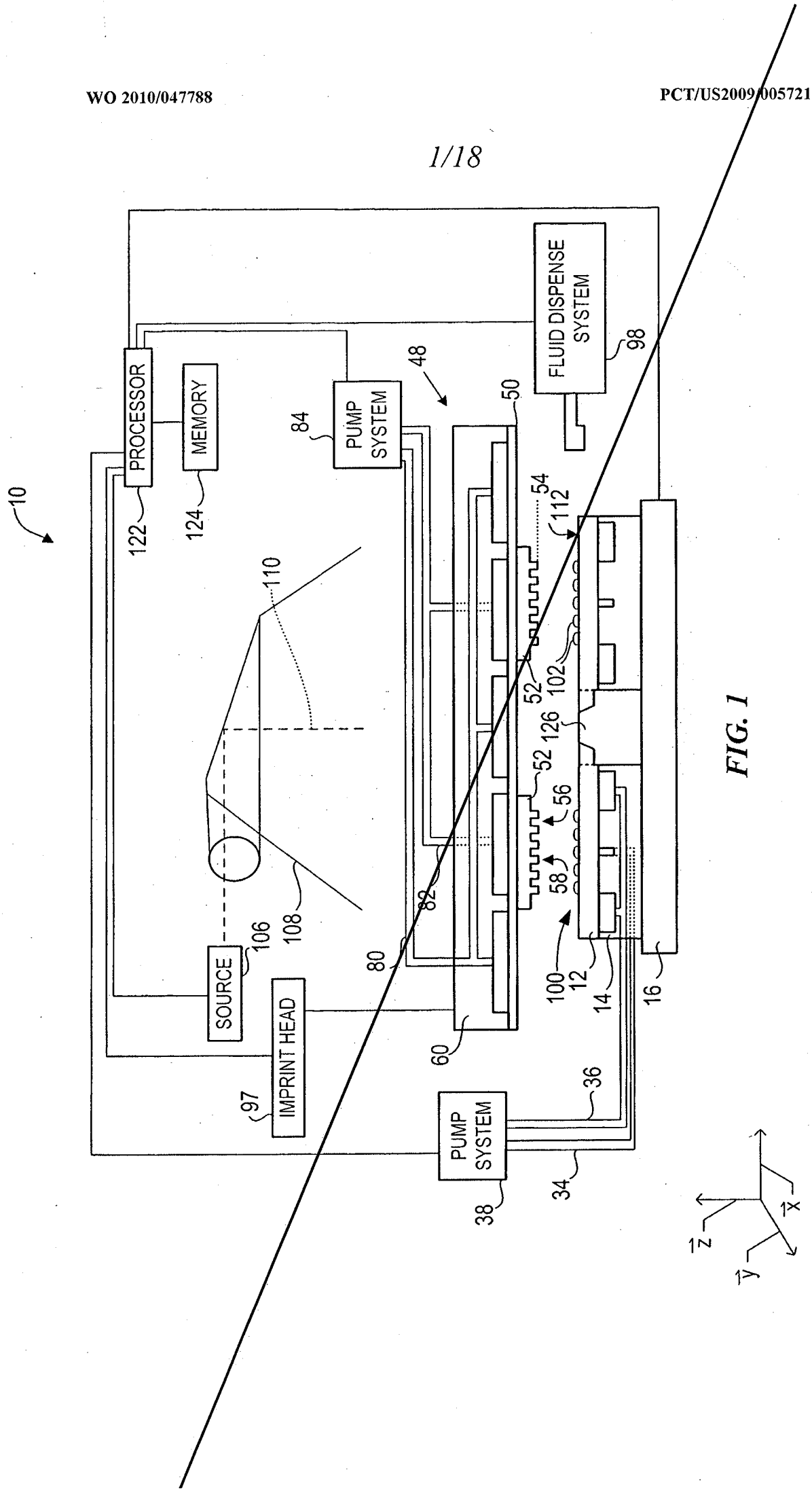

10
PROCESSOR
MEMORY
122
124
PUMP SYSTEM
84
48
50
FLUID DISPENSE SYSTEM
98
54
112
110
102
52
126
52
56
58
82
80
106
108
SOURCE
IMPRINT HEAD
97
60
100
12
14
16
36
PUMP SYSTEM
38
34
z
x
y

FIG. 1

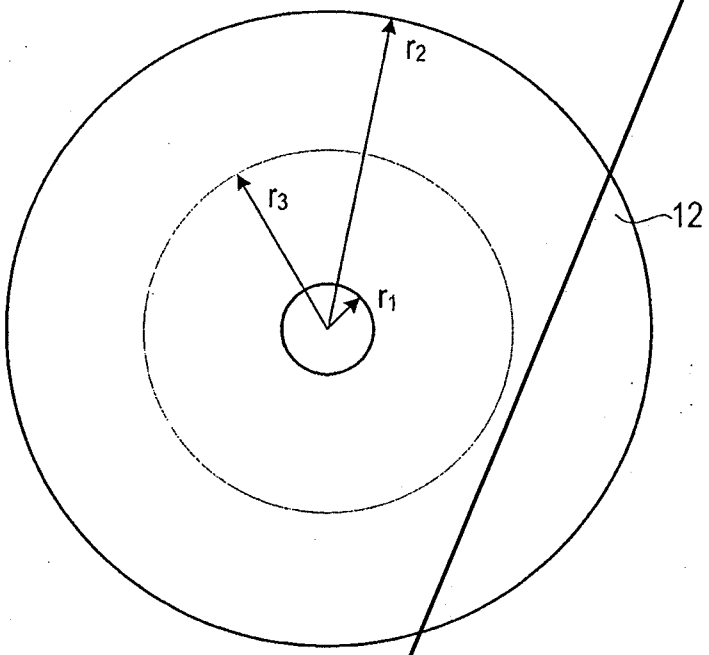

r2
r3
r1
12

FIG. 2

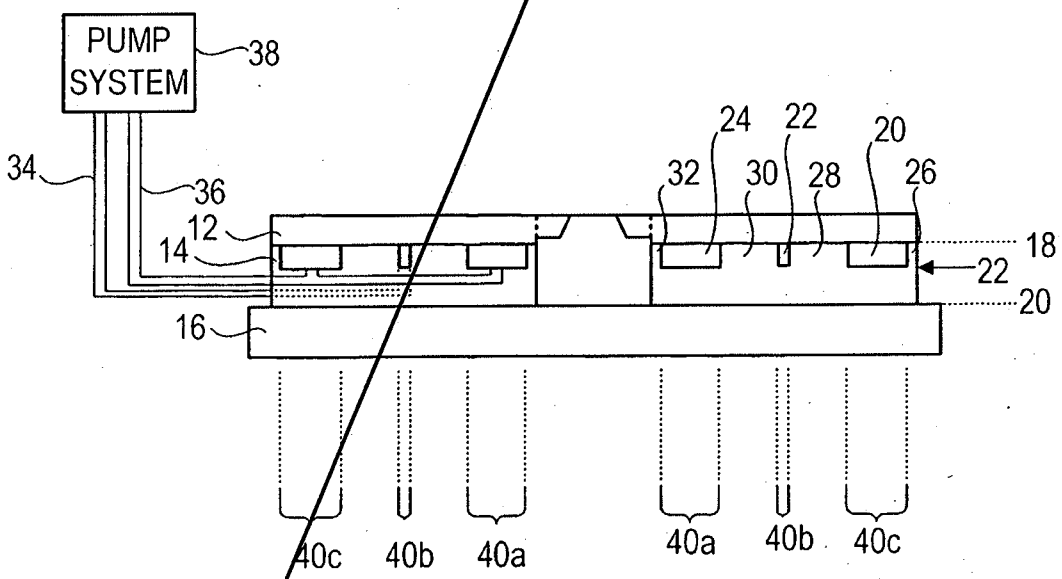

PUMP SYSTEM
38
34
36
12
14
16
24
22
20
32
30
28
26
18
22
20
40c
40b
40a
40a
40b
40c

FIG. 3

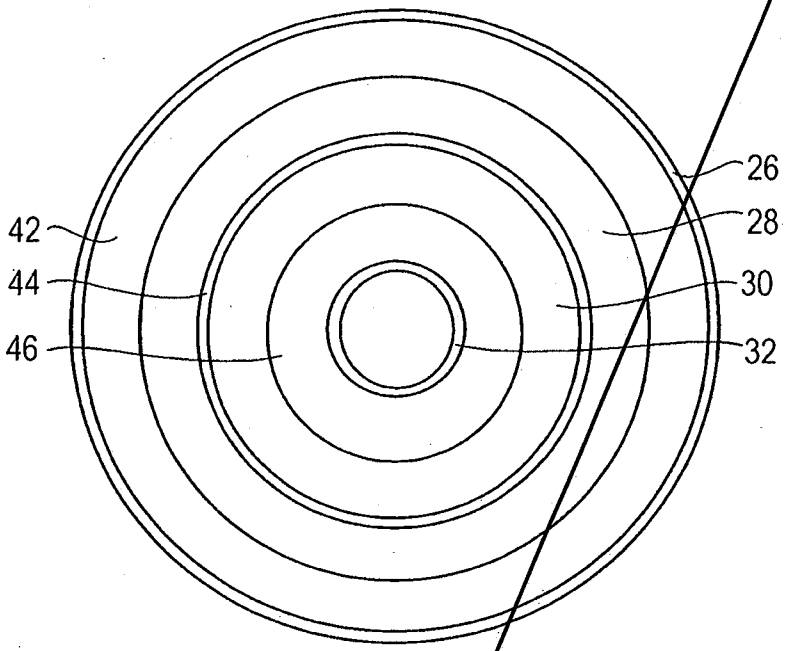


FIG. 4

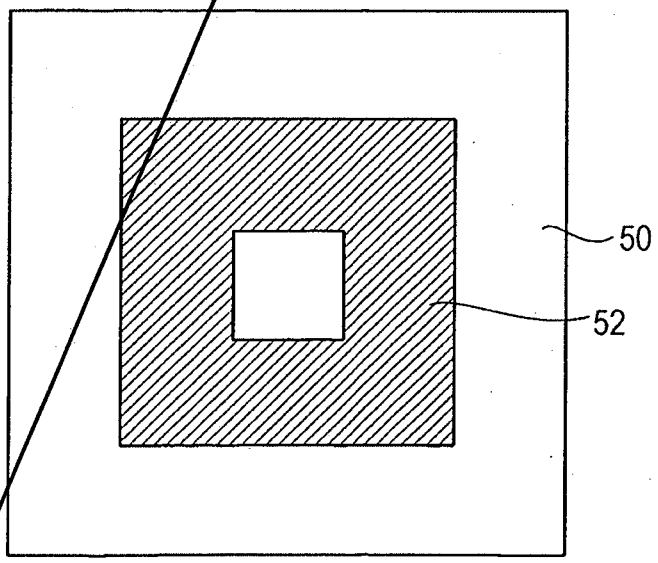


FIG. 5

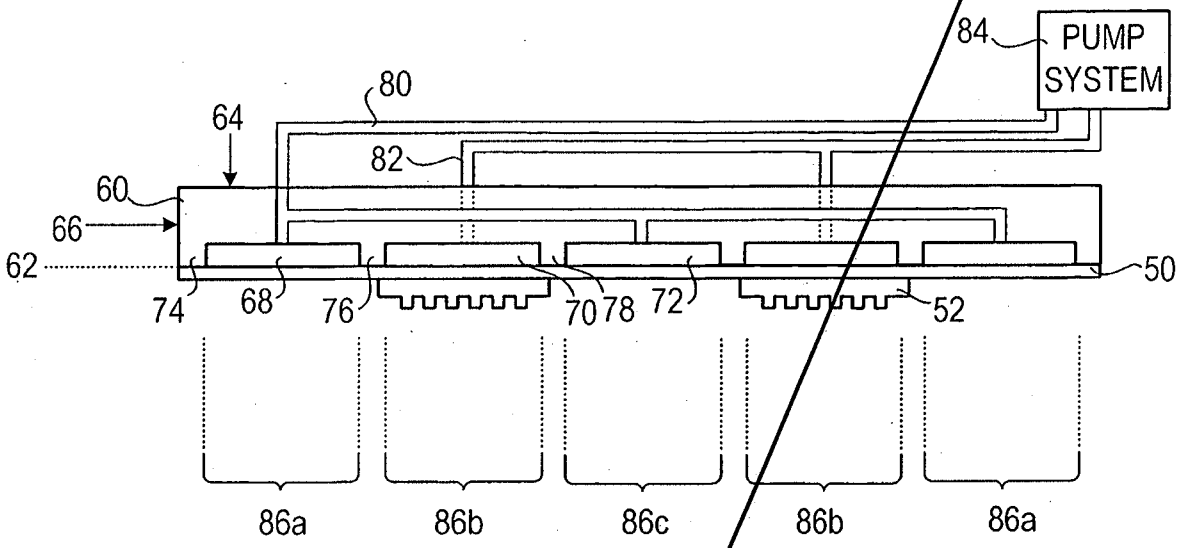

84
PUMP SYSTEM
80
64
82
60
66
62
50
74
68
76
70
78
72
52
86a
86b
86c
86b
86a

FIG. 6

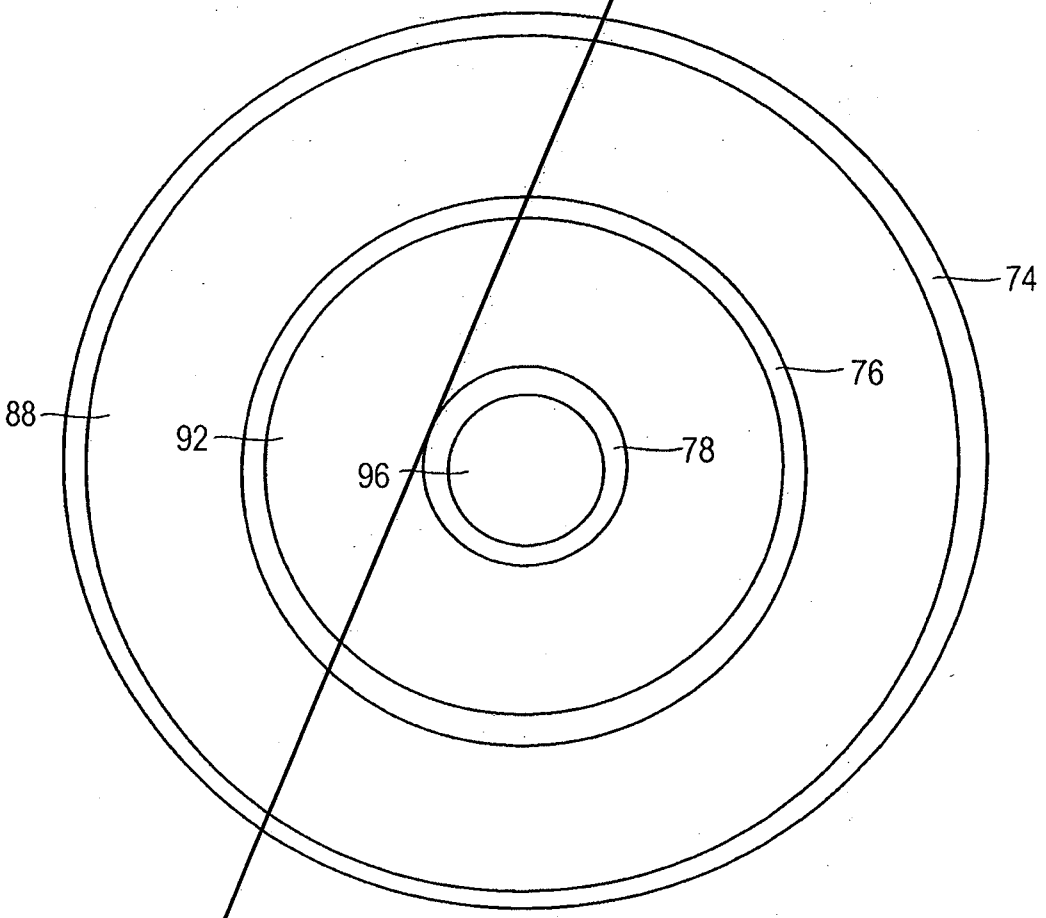

74
76
88
92
96
78

FIG. 7

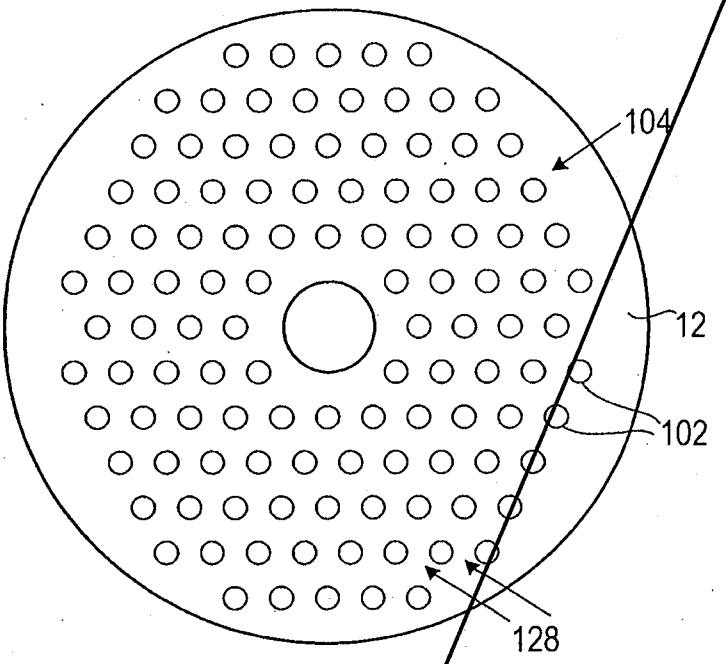


FIG. 8

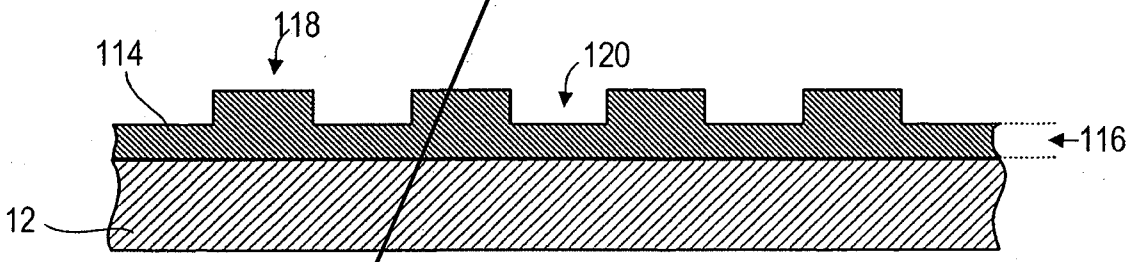


FIG. 9

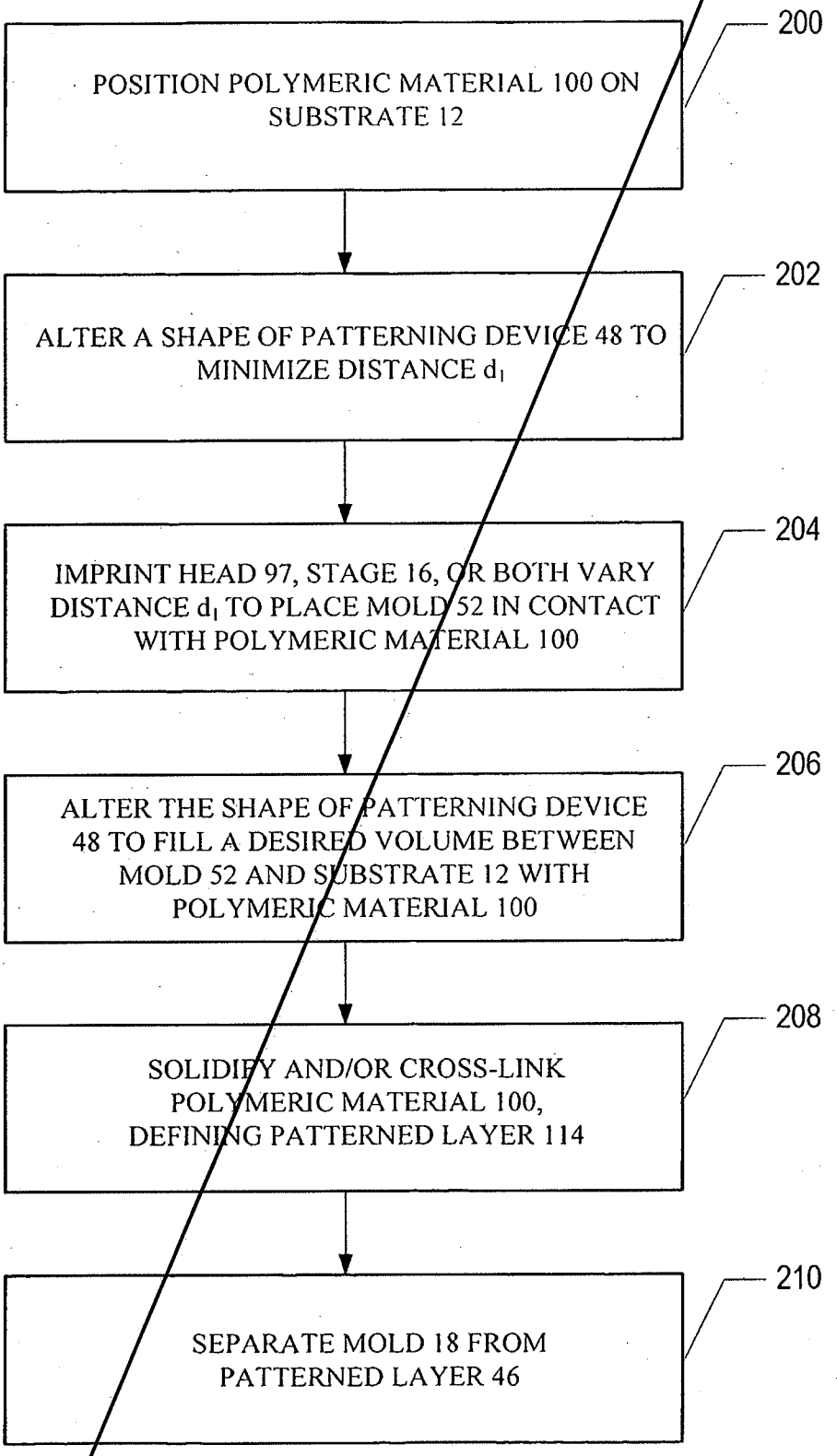

POSITION POLYMERIC MATERIAL 100 ON SUBSTRATE 12
200
ALTER A SHAPE OF PATTERNING DEVICE 48 TO MINIMIZE DISTANCE d_1
202
IMPRINT HEAD 97, STAGE 16, OR BOTH VARY DISTANCE d_1 TO PLACE MOLD 52 IN CONTACT WITH POLYMERIC MATERIAL 100
204
ALTER THE SHAPE OF PATTERNING DEVICE 48 TO FILL A DESIRED VOLUME BETWEEN MOLD 52 AND SUBSTRATE 12 WITH POLYMERIC MATERIAL 100
206
SOLIDIFY AND/OR CROSS-LINK POLYMERIC MATERIAL 100, DEFINING PATTERNED LAYER 114
208
SEPARATE MOLD 18 FROM PATTERNED LAYER 46
210

FIG. 10

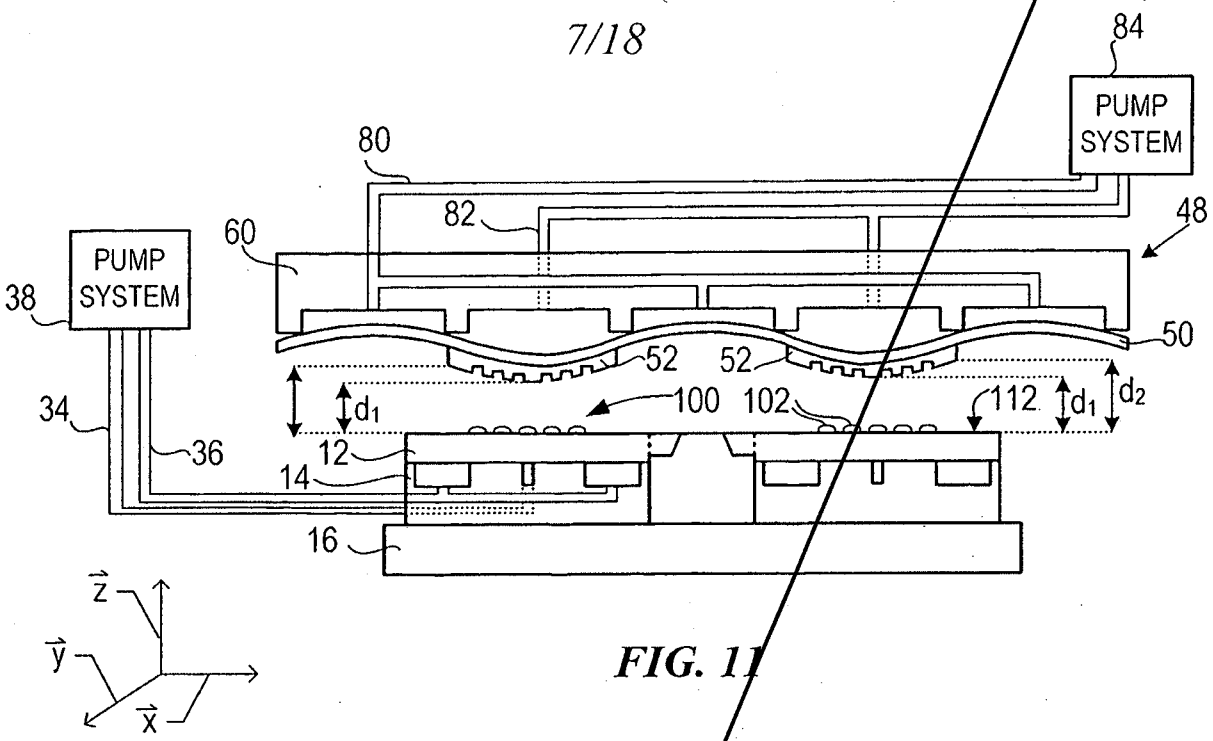

84
PUMP SYSTEM
80
82
48
60
PUMP SYSTEM
38
50
52
52
34
d1
100
102
112
d1
d2
36
12
14
16
z
y
x

FIG. 11

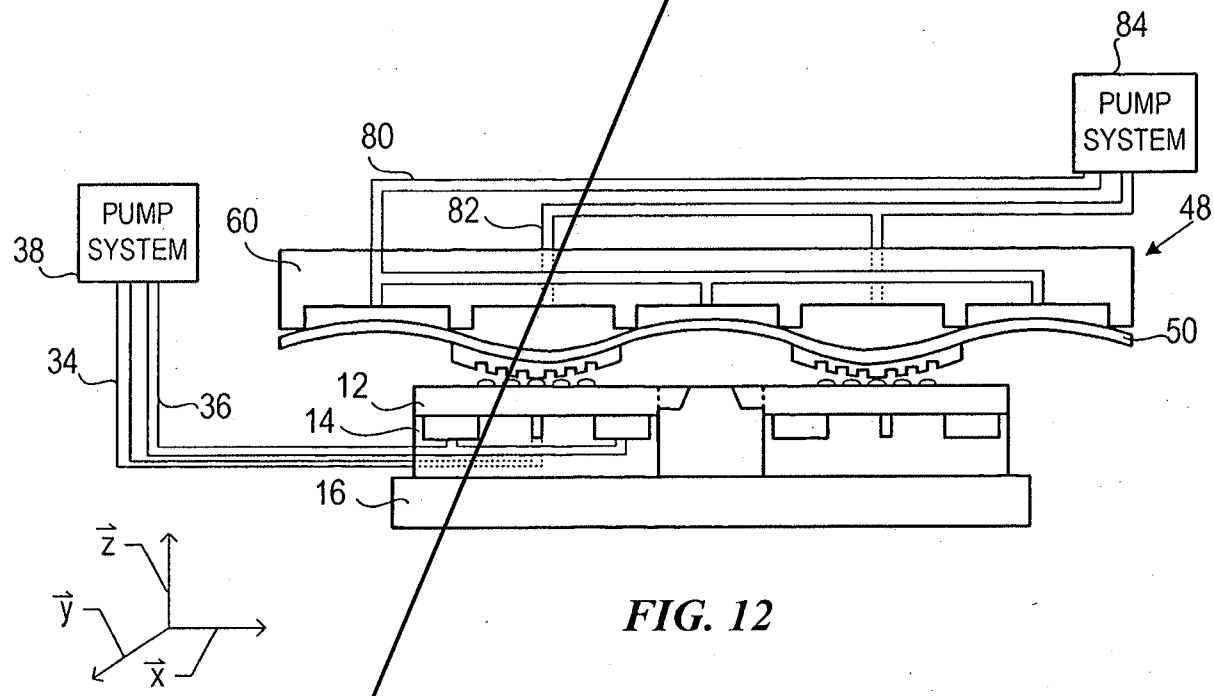

84
PUMP SYSTEM
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82
48
60
PUMP SYSTEM
38
50
34
12
36
14
16
z
y
x

FIG. 12

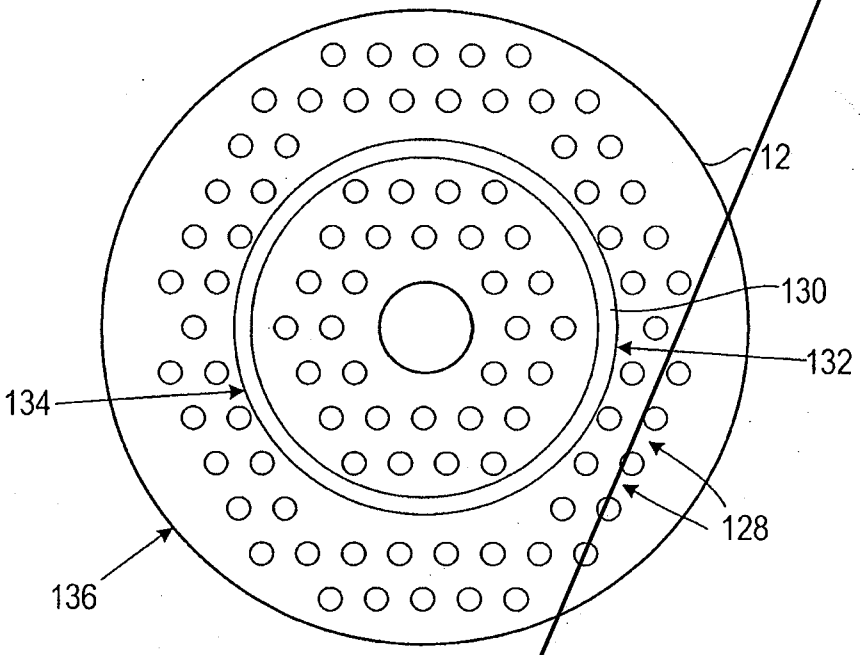


FIG. 13

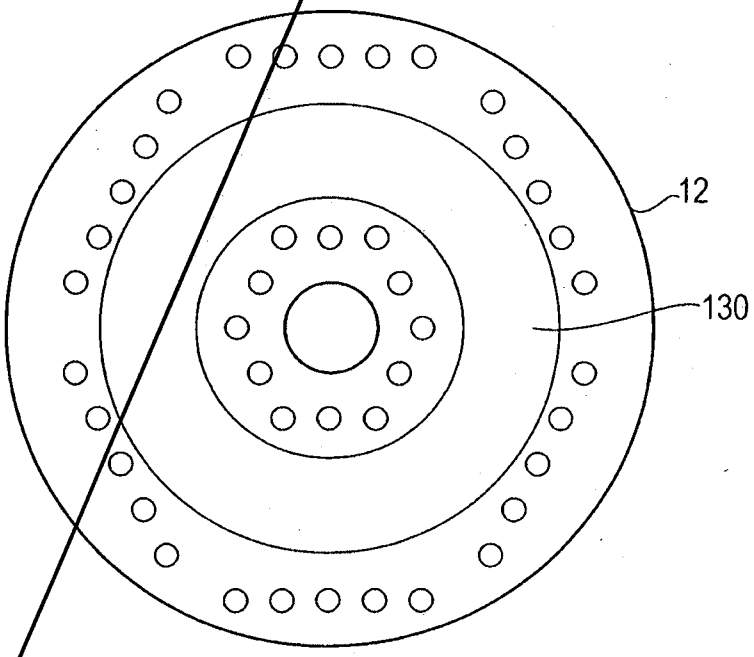


FIG. 14

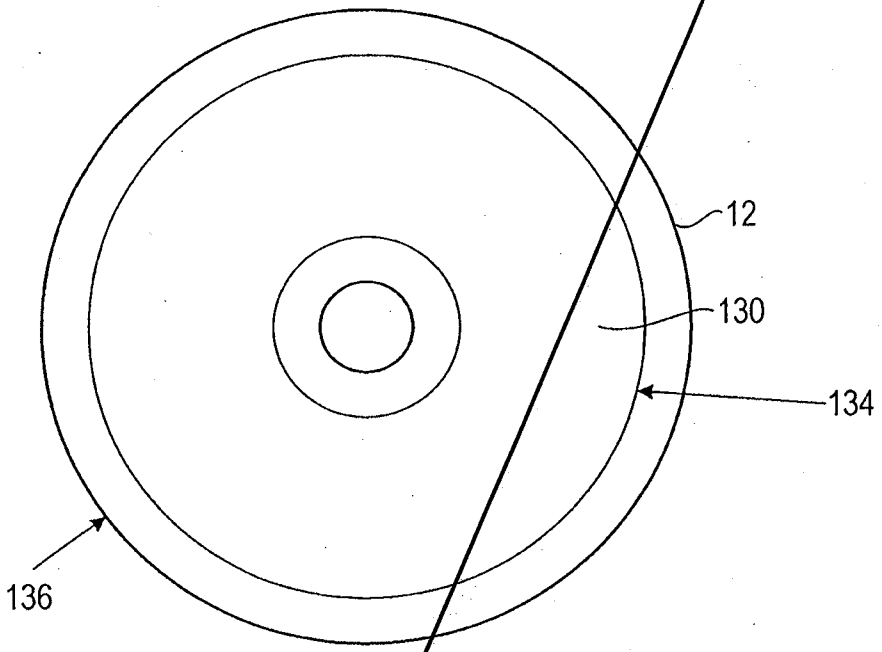

12
130
134
136

FIG. 15

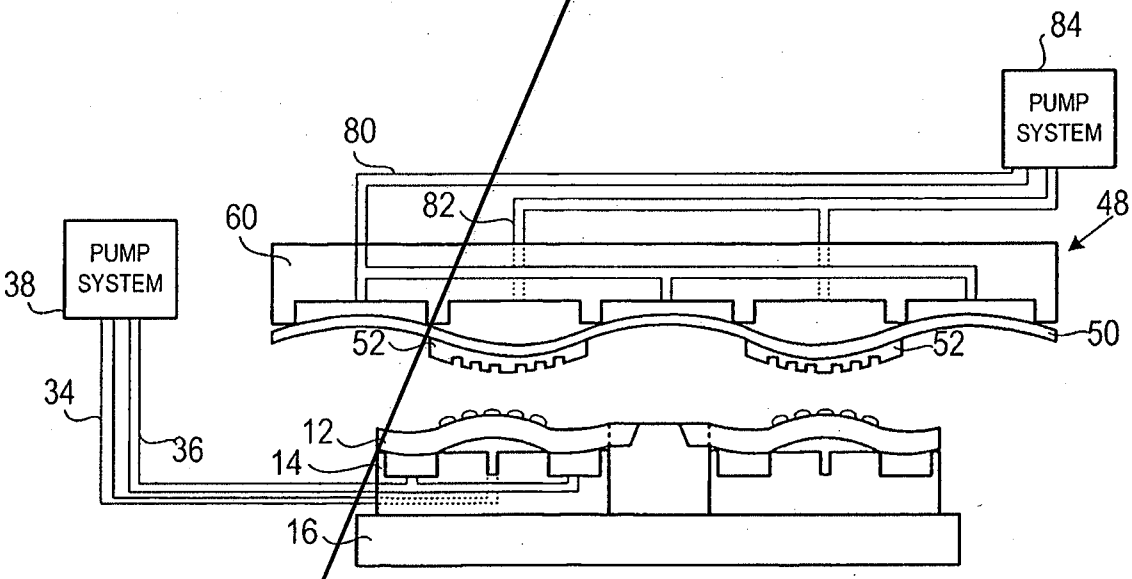

84
PUMP SYSTEM
80
82
60
48
PUMP SYSTEM
38
52
52
50
34
36
12
14
16

FIG. 17

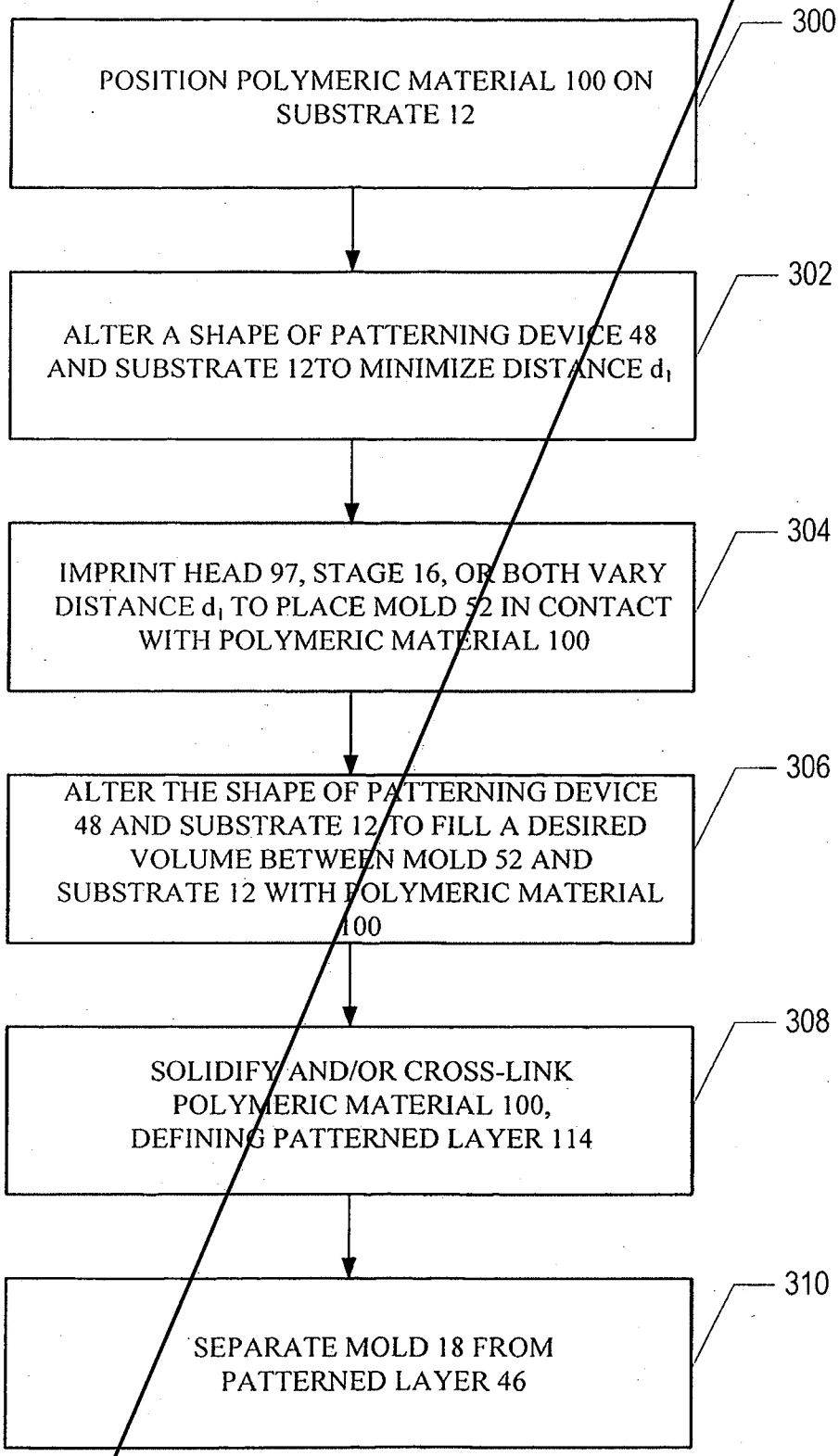

POSITION POLYMERIC MATERIAL 100 ON SUBSTRATE 12
300
ALTER A SHAPE OF PATTERNING DEVICE 48 AND SUBSTRATE 12TO MINIMIZE DISTANCE d_1
302
IMPRINT HEAD 97, STAGE 16, OR BOTH VARY DISTANCE d_1 TO PLACE MOLD 52 IN CONTACT WITH POLYMERIC MATERIAL 100
304
ALTER THE SHAPE OF PATTERNING DEVICE 48 AND SUBSTRATE 12 TO FILL A DESIRED VOLUME BETWEEN MOLD 52 AND SUBSTRATE 12 WITH POLYMERIC MATERIAL 100
306
SOLIDIFY AND/OR CROSS-LINK POLYMERIC MATERIAL 100, DEFINING PATTERNED LAYER 114
308
SEPARATE MOLD 18 FROM PATTERNED LAYER 46
310

FIG. 16

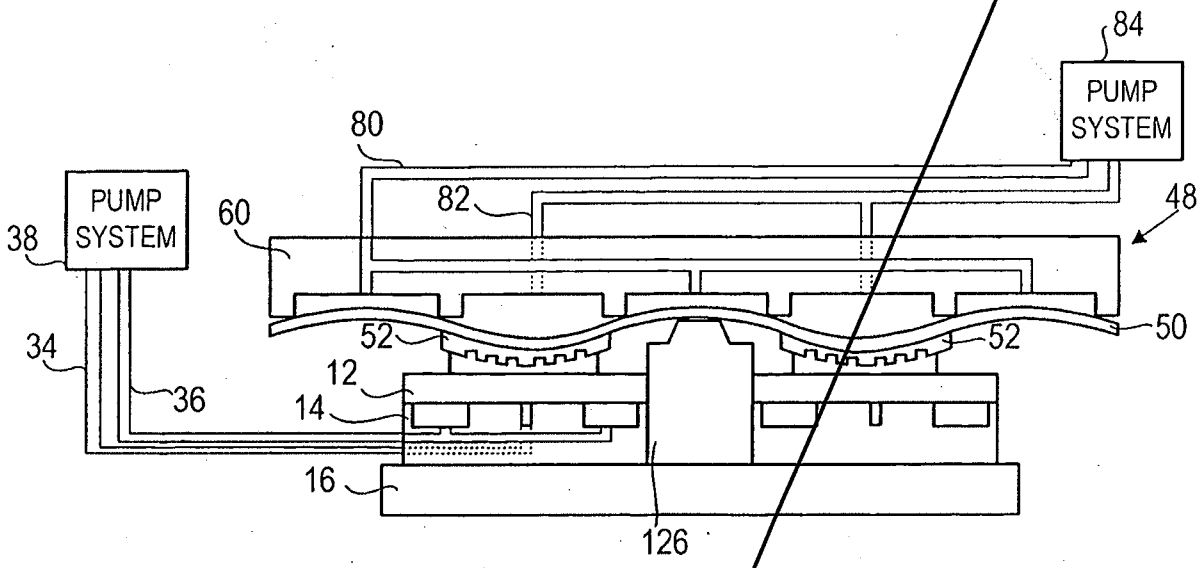

84
PUMP SYSTEM
80
82
48
PUMP SYSTEM
38
60
52
52
50
34
12
36
14
16
126

FIG. 18

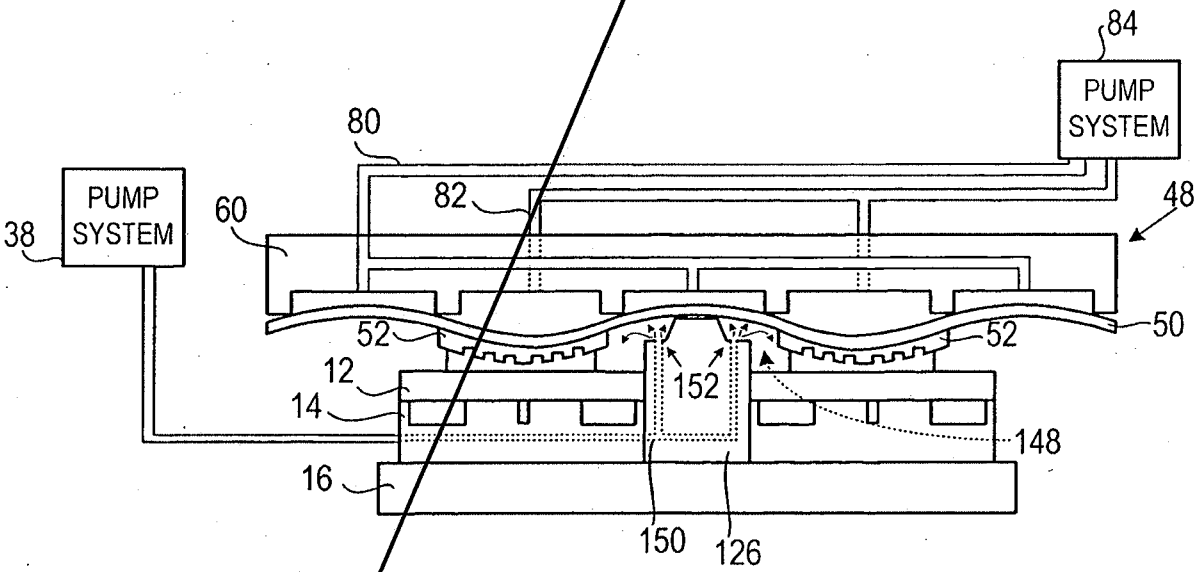

84
PUMP SYSTEM
80
82
48
PUMP SYSTEM
38
60
52
52
50
12
152
14
148
16
150
126

FIG. 19

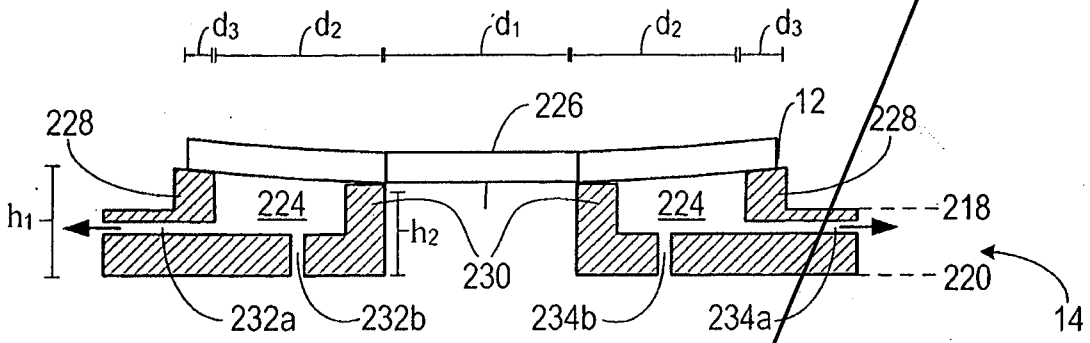


FIG. 20

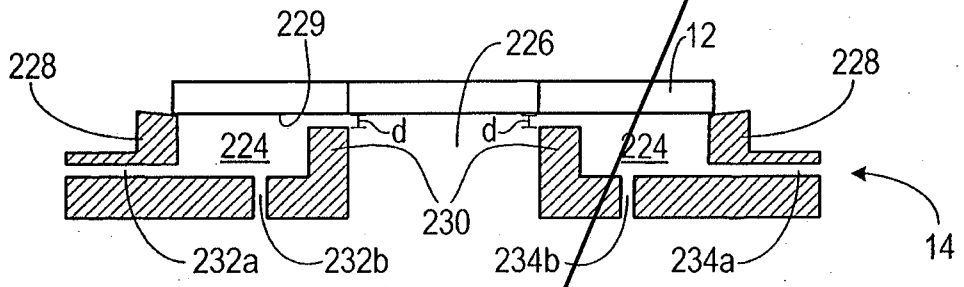


FIG. 21A

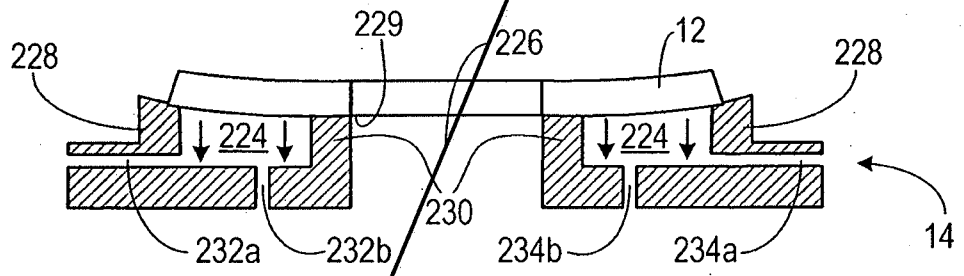


FIG. 21B

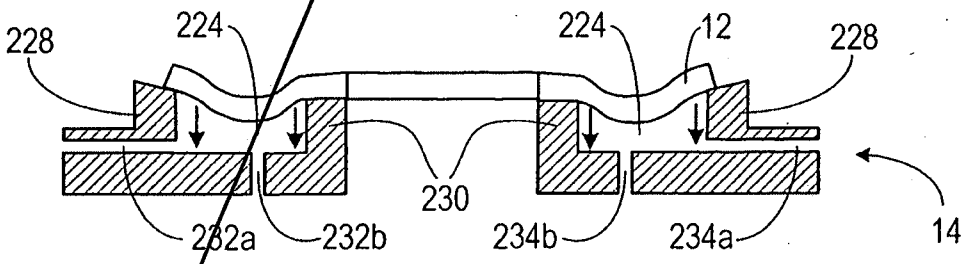


FIG. 21C

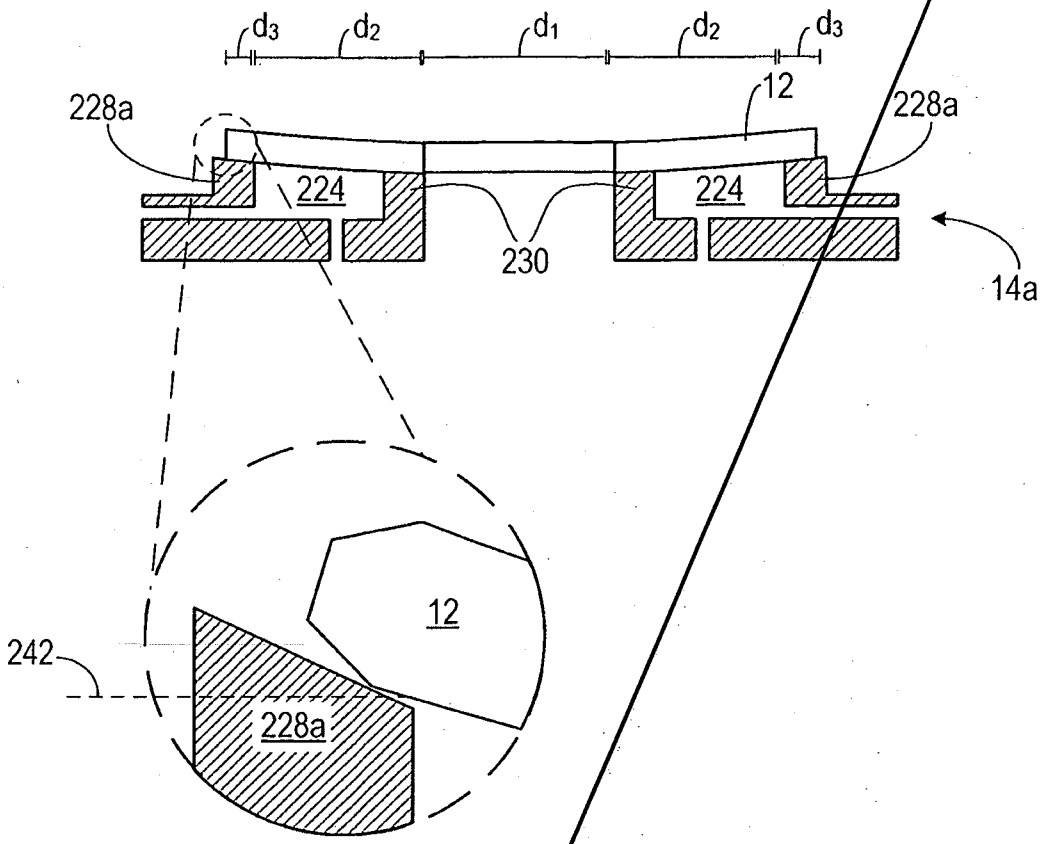


FIG. 22A

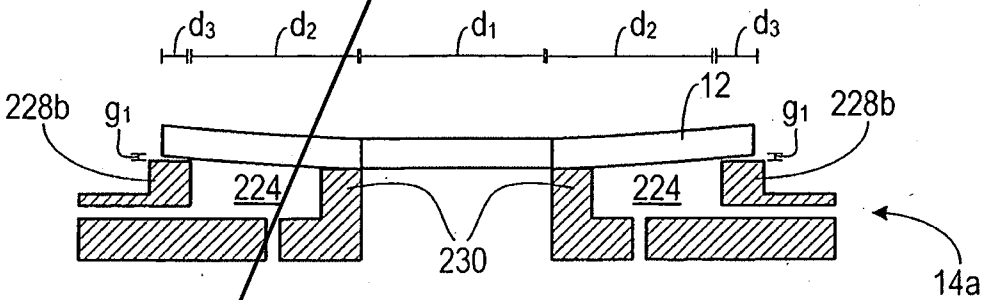


FIG. 22B

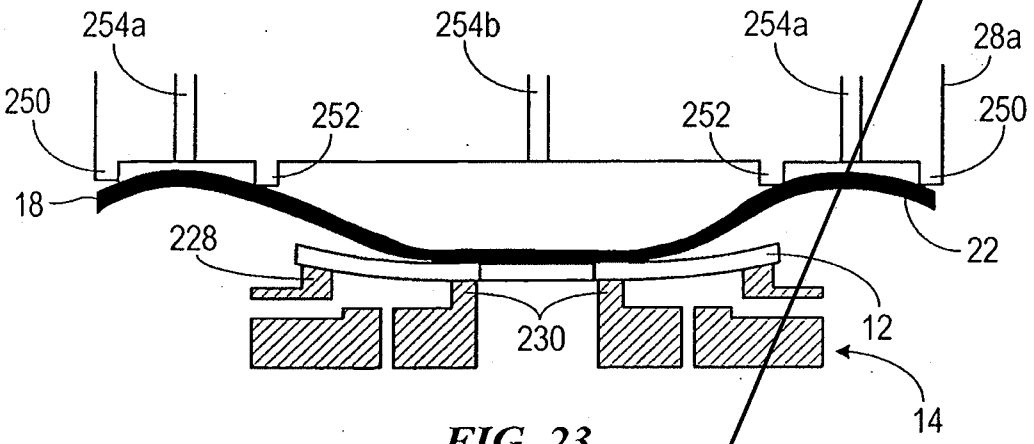


FIG. 23

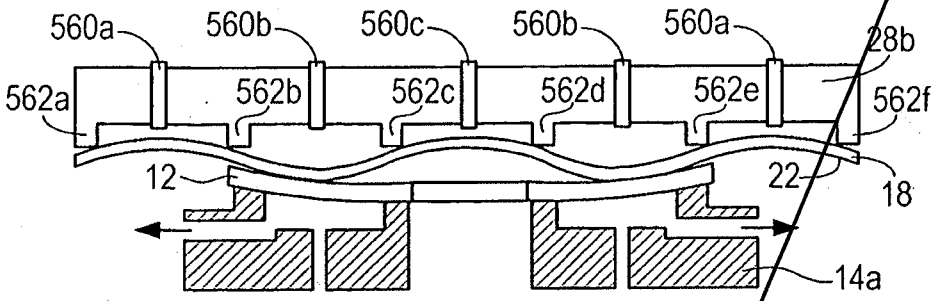


FIG. 24A

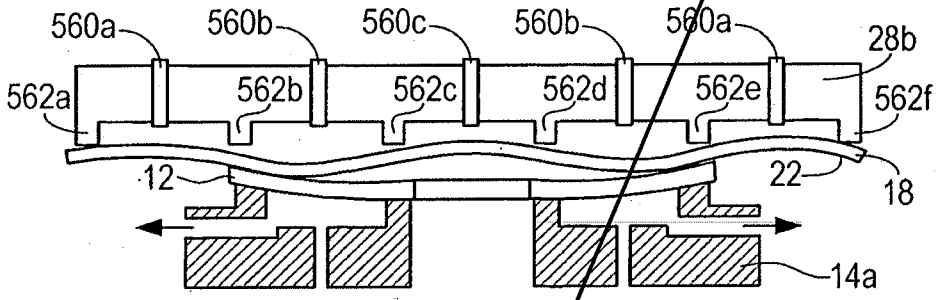


FIG. 24B

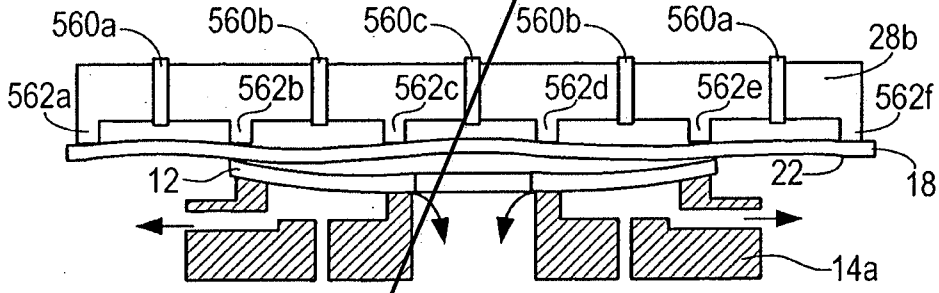


FIG. 24C

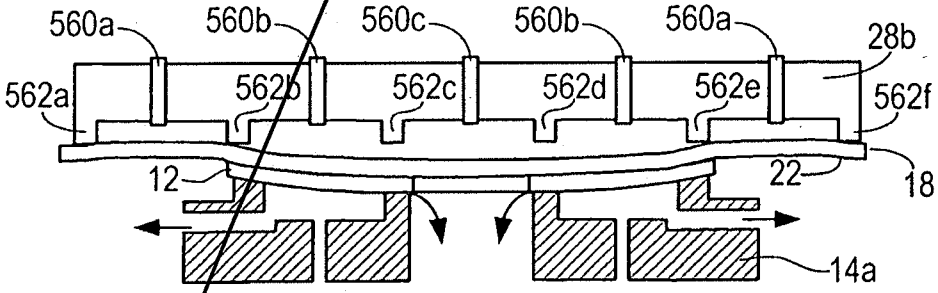


FIG. 24D

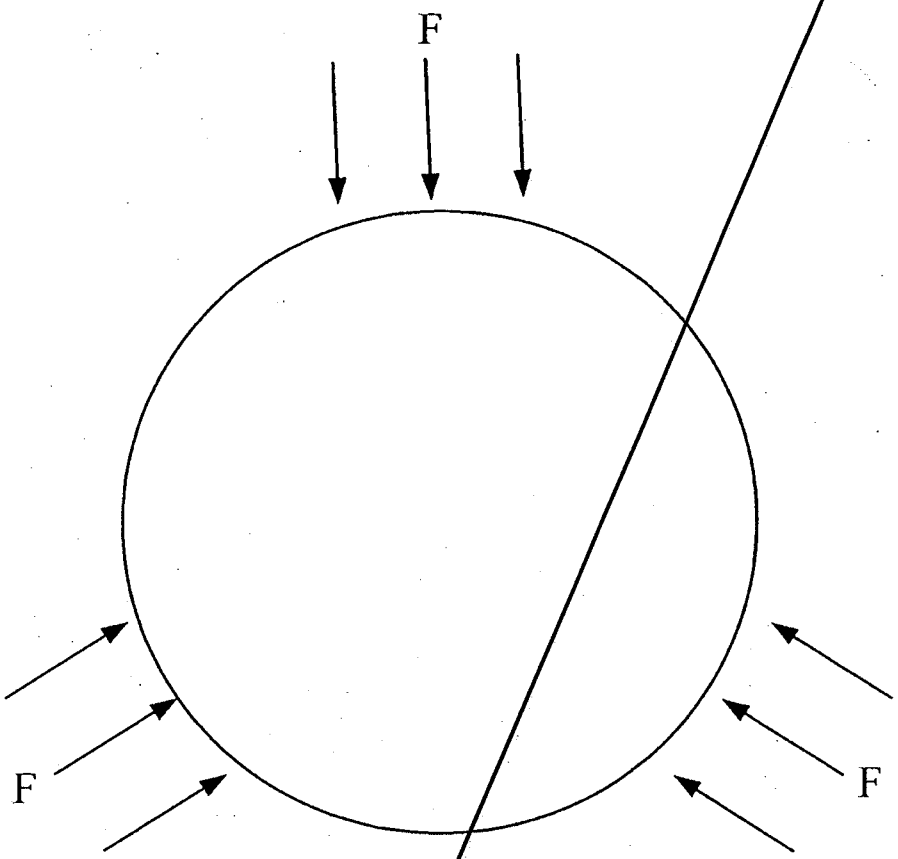


FIG. 25

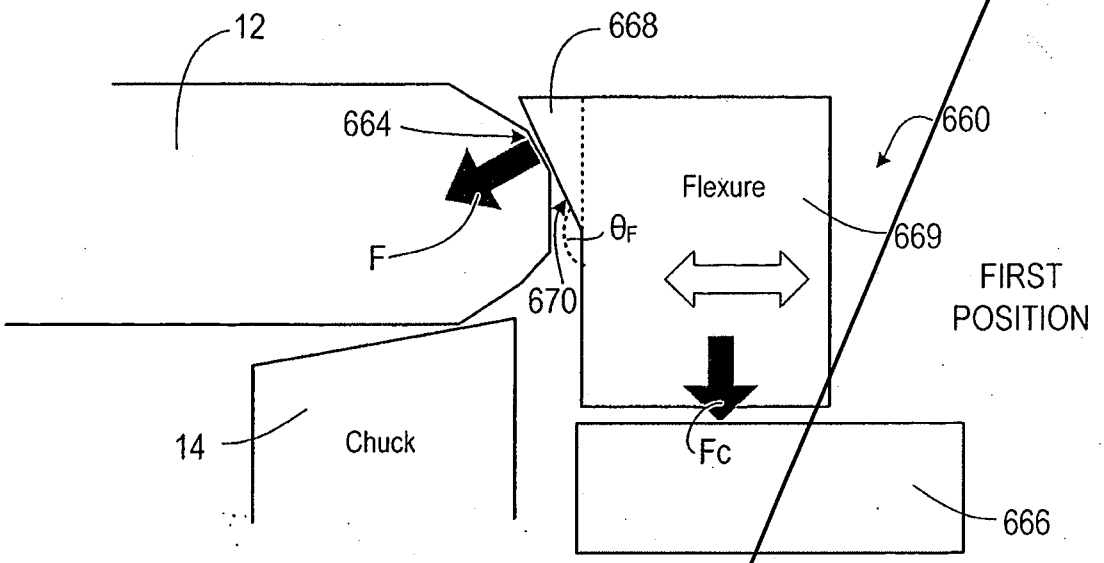

12
668
664
660
Flexure
F
θF
669
670
FIRST
POSITION
14
Chuck
Fc
666

FIG. 26

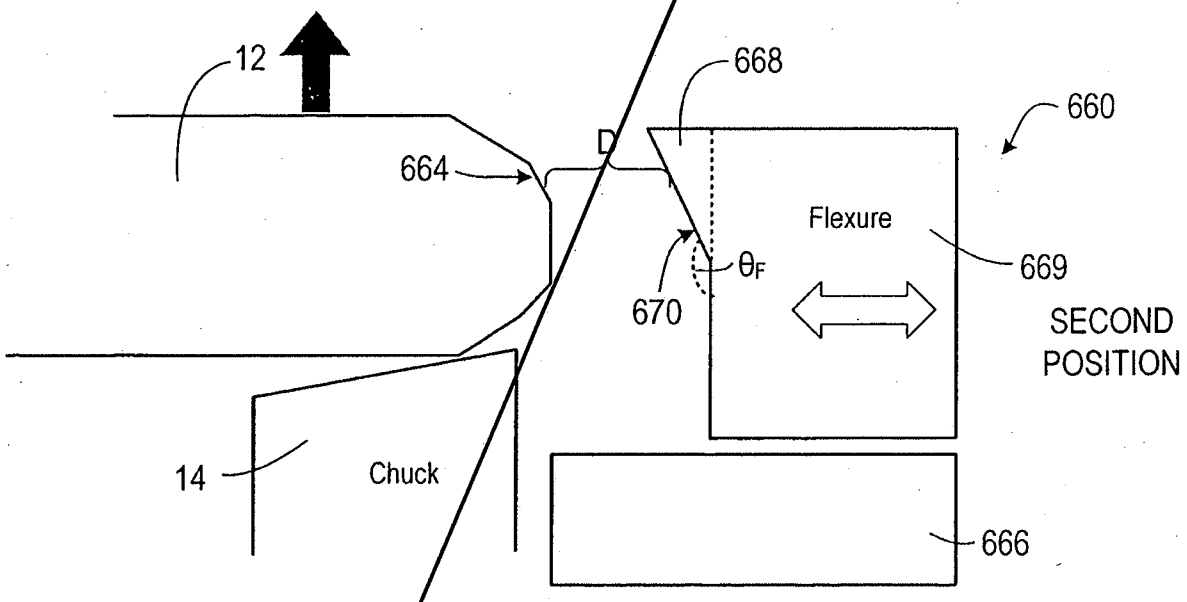

12
668
660
D
664
Flexure
θF
669
670
SECOND
POSITION
14
Chuck
666

FIG. 27

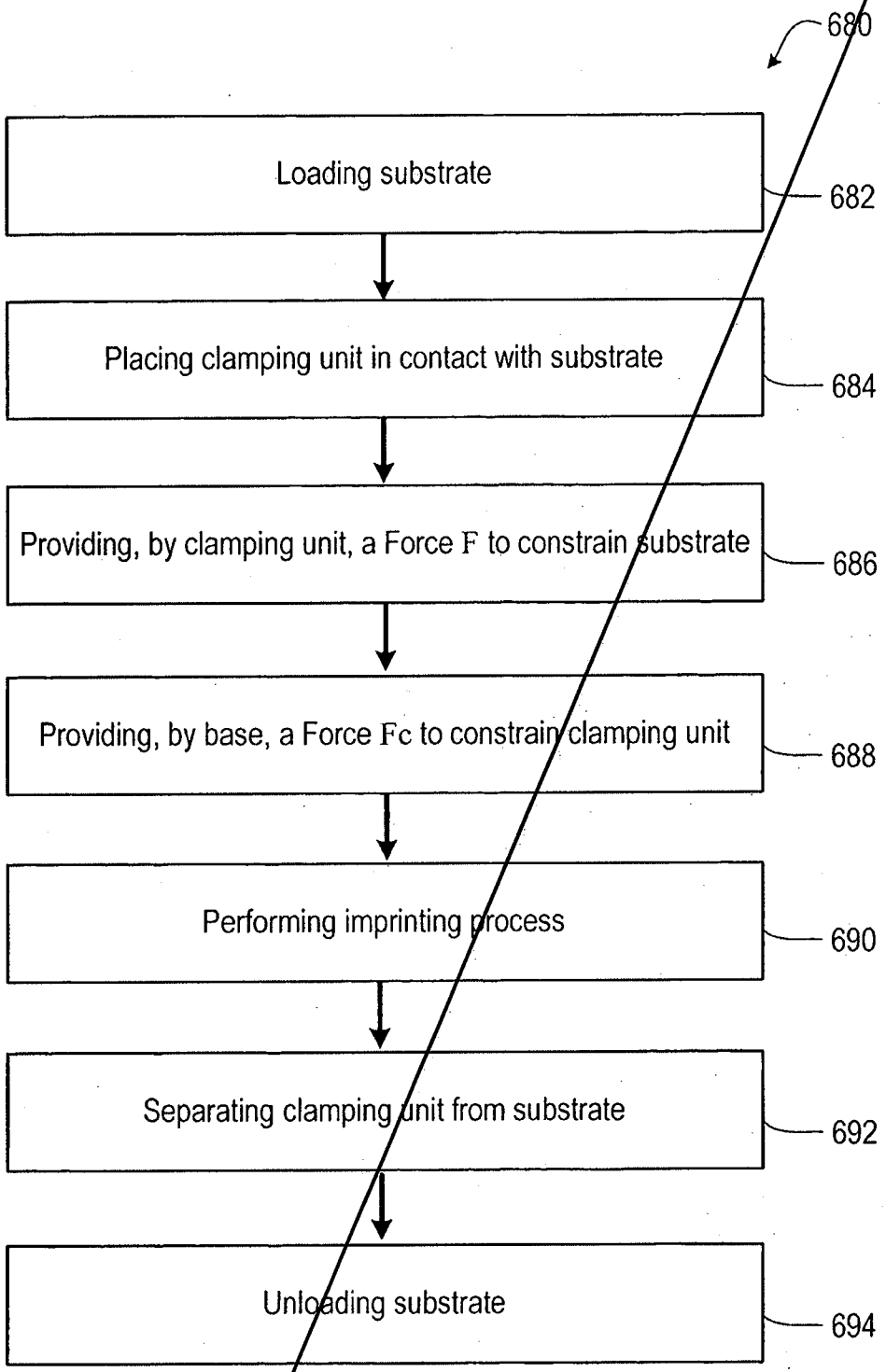

680
Loading substrate
682
Placing clamping unit in contact with substrate
684
Providing, by clamping unit, a Force F to constrain substrate
686
Providing, by base, a Force Fc to constrain clamping unit
688
Performing imprinting process
690
Separating clamping unit from substrate
692
Unloading substrate
694

FIG. 28

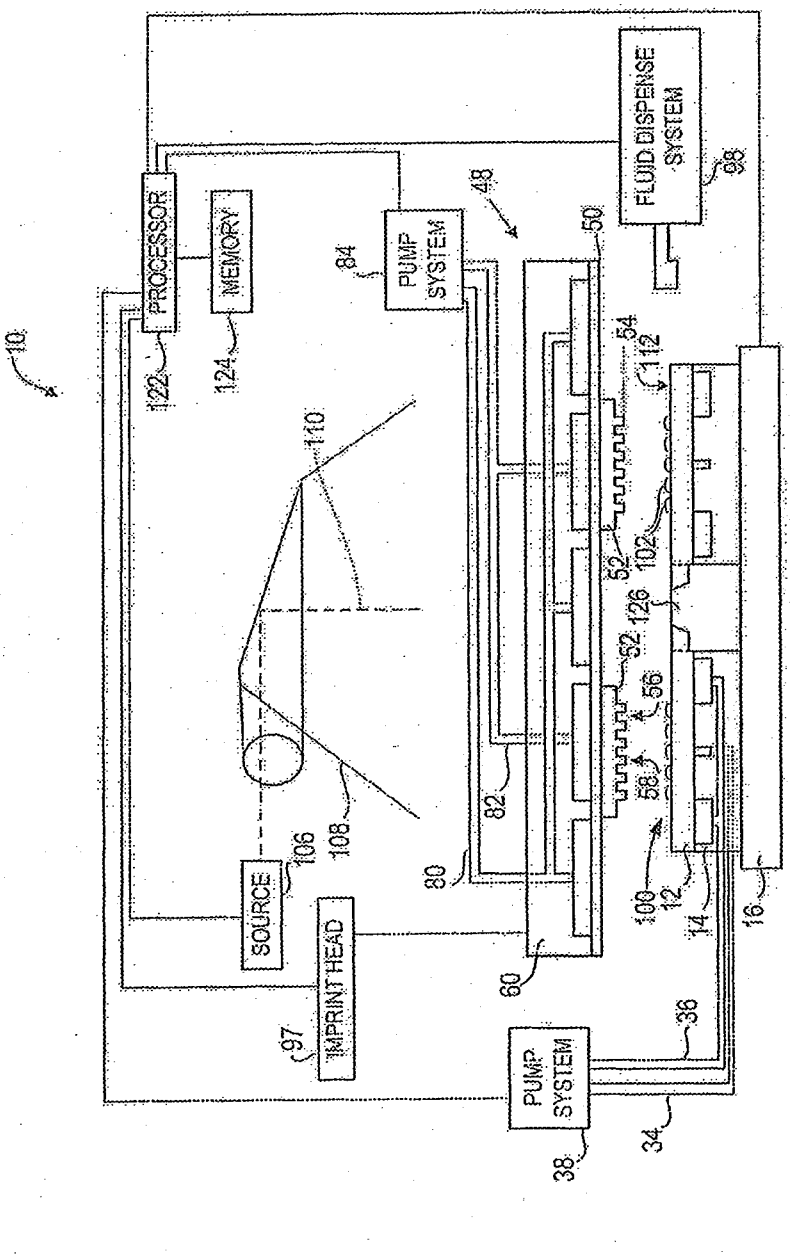

10
PROCESSOR
MEMORY
122
124
PUMP SYSTEM
84
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FLUID DISPENSE SYSTEM
98
54
112
52
102
126
52
56
58
82
110
106
108
80
SOURCE
IMPRINT HEAD
97
60
100
12
14
16
PUMP SYSTEM
38
34
36
Z
Y
X

FIG. 1

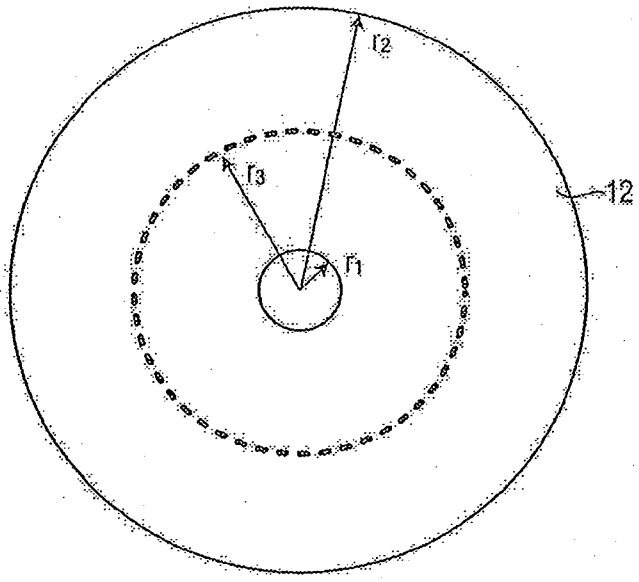

r2
r3
r1
12

FIG. 2

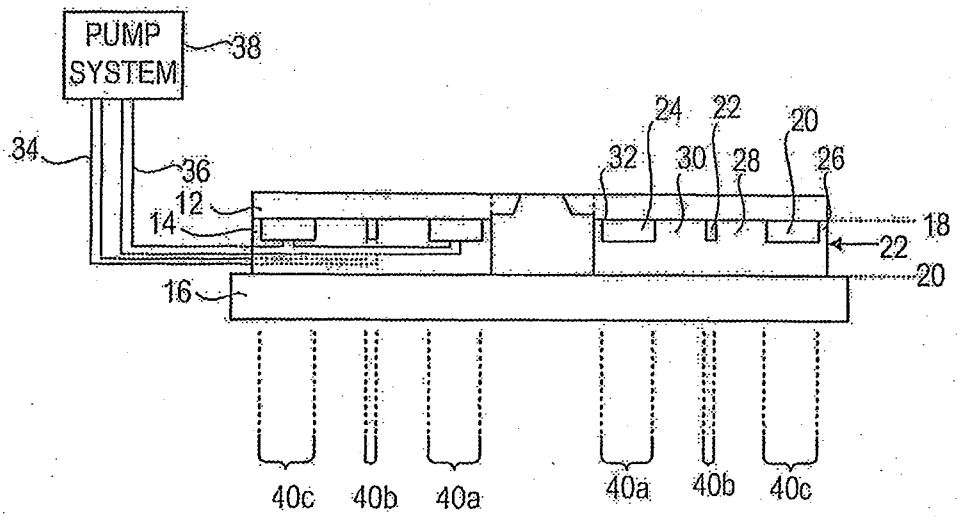

PUMP SYSTEM
38
34
36
12
14
16
24
22
20
32
30
28
26
18
22
20
40c
40b
40a
40a
40b
40c

FIG. 3

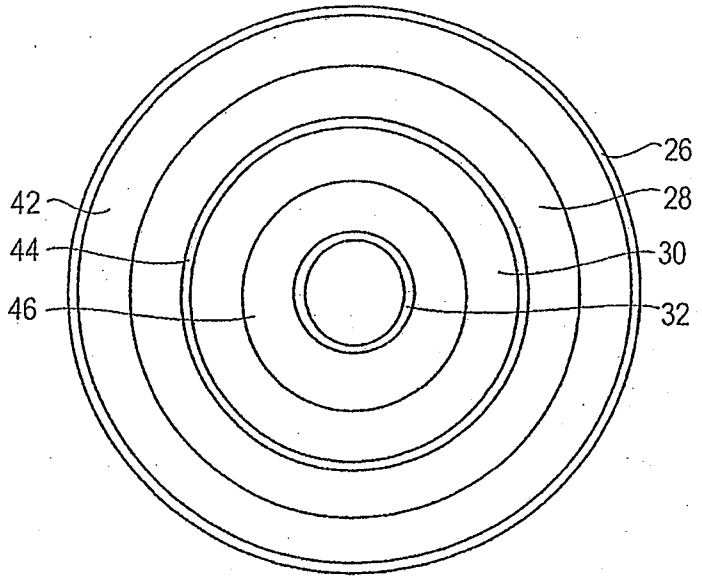


FIG. 4

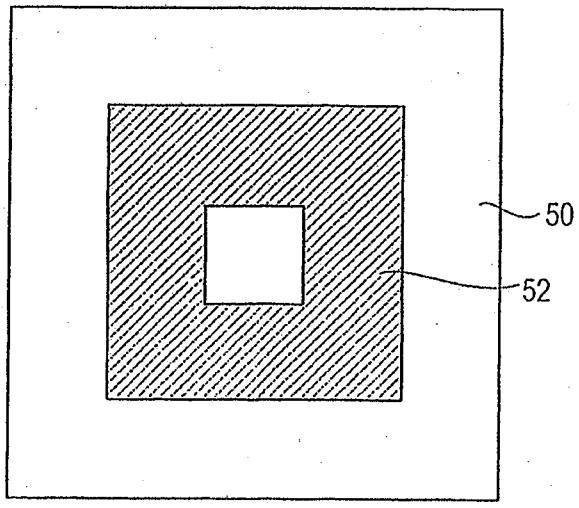


FIG. 5

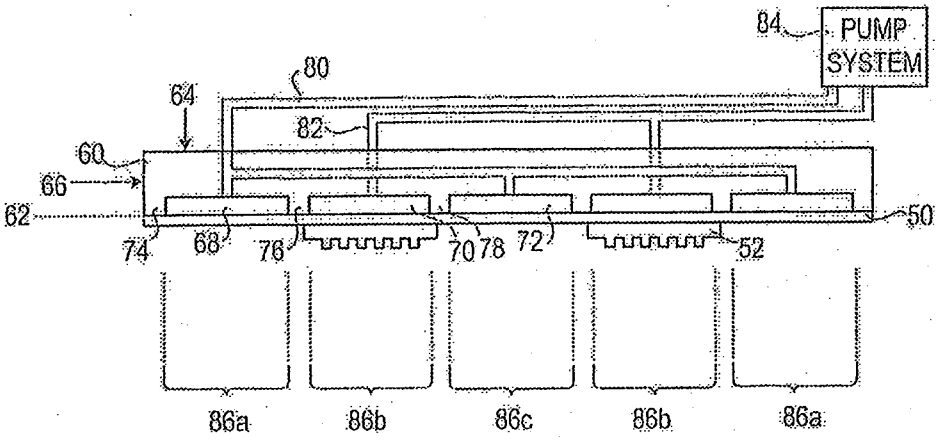

84
PUMP SYSTEM
80
64
82
60
66
62
50
74
68
76
70
78
72
52
86a
86b
86c
86b
86a

FIG. 6

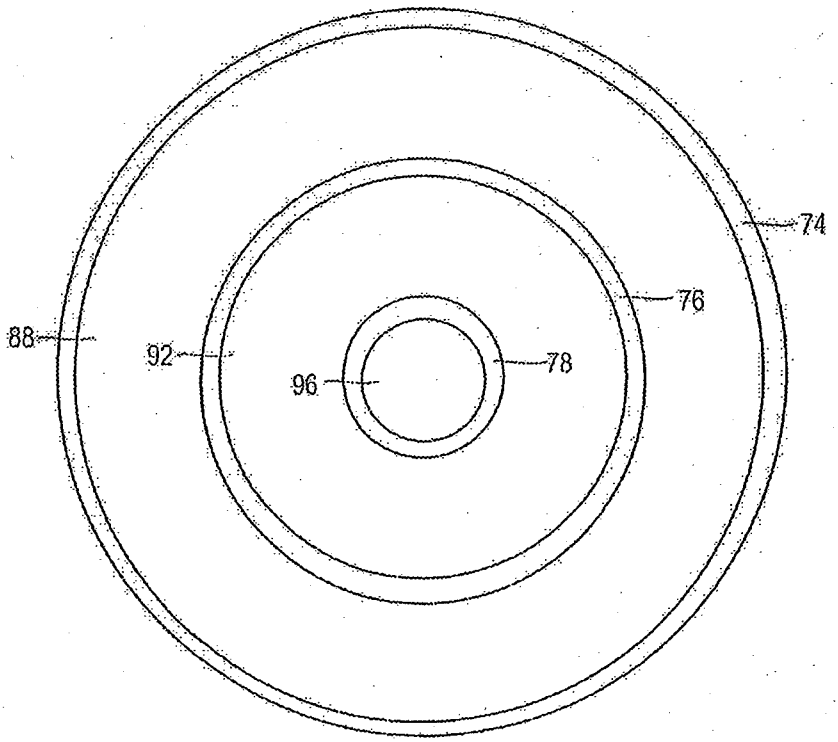

74
76
88
92
96
78

FIG. 7

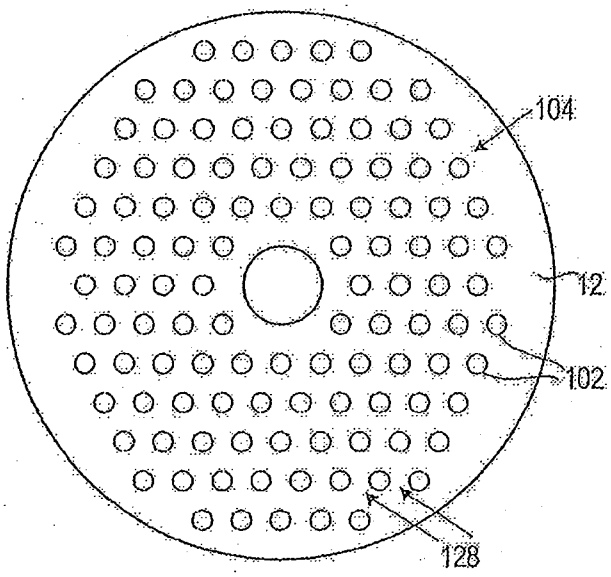


FIG. 8

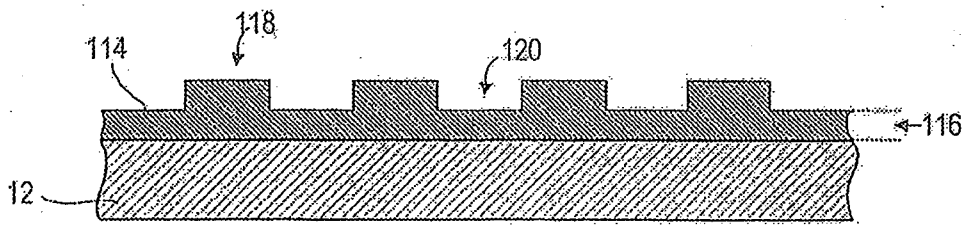


FIG. 9

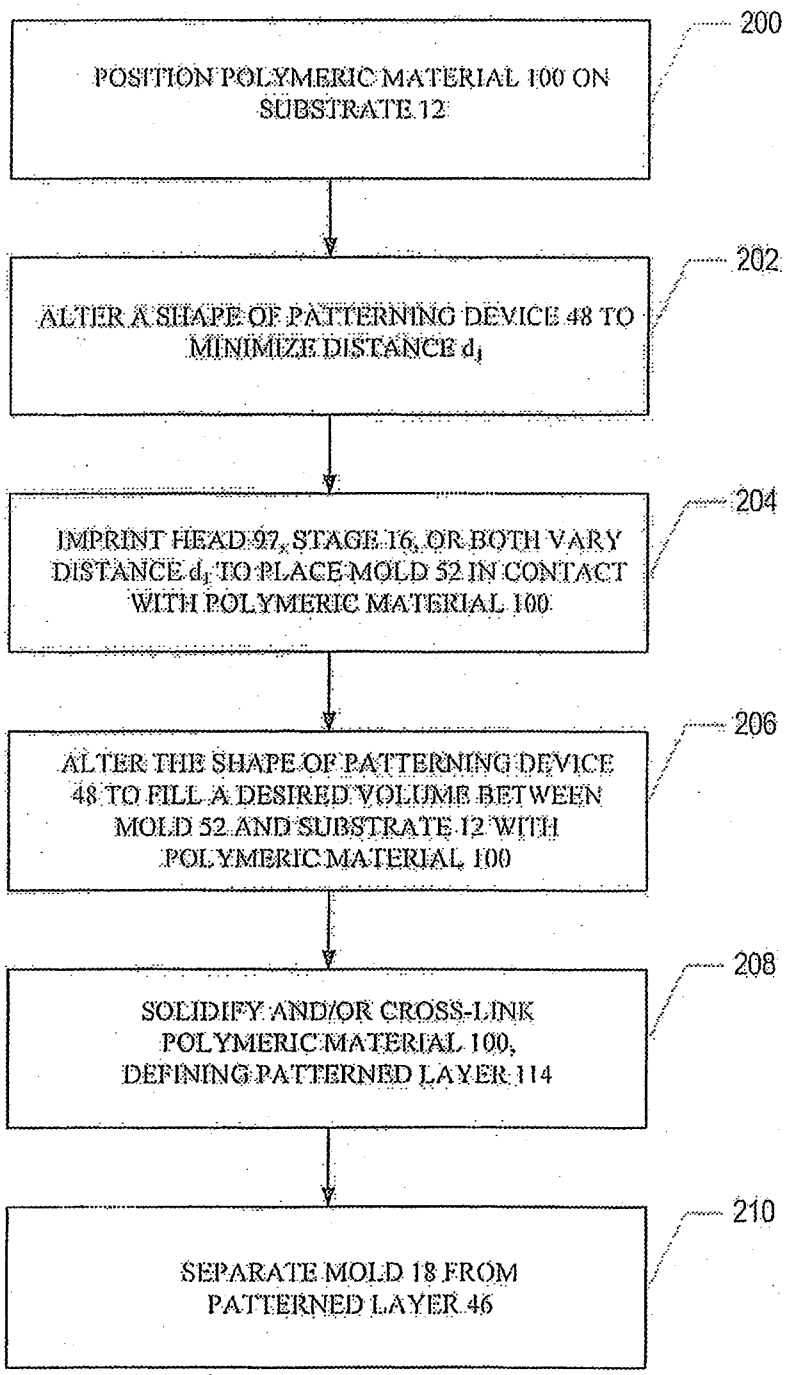

POSITION POLYMERIC MATERIAL 100 ON SUBSTRATE 12
200
ALTER A SHAPE OF PATTERNING DEVICE 48 TO MINIMIZE DISTANCE d_1
202
IMPRINT HEAD 97, STAGE 16, OR BOTH VARY DISTANCE d_1 TO PLACE MOLD 52 IN CONTACT WITH POLYMERIC MATERIAL 100
204
ALTER THE SHAPE OF PATTERNING DEVICE 48 TO FILL A DESIRED VOLUME BETWEEN MOLD 52 AND SUBSTRATE 12 WITH POLYMERIC MATERIAL 100
206
SOLIDIFY AND/OR CROSS-LINK POLYMERIC MATERIAL 100, DEFINING PATTERNED LAYER 114
208
SEPARATE MOLD 18 FROM PATTERNED LAYER 46
210

FIG. 10

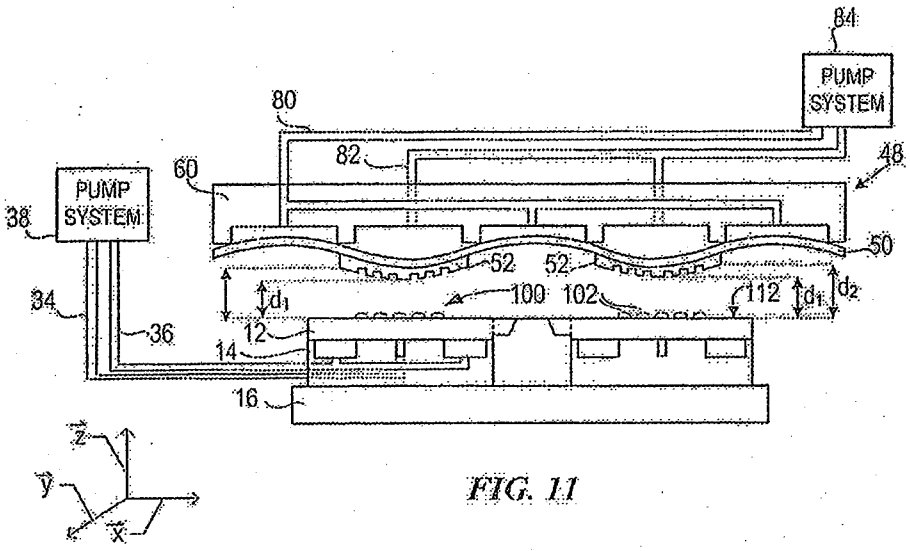

84
PUMP SYSTEM
80
82
48
60
PUMP SYSTEM
38
50
52
52
d_1
100
102
112
d_1
d_2
34
36
12
14
16
z
y
x

FIG. 11

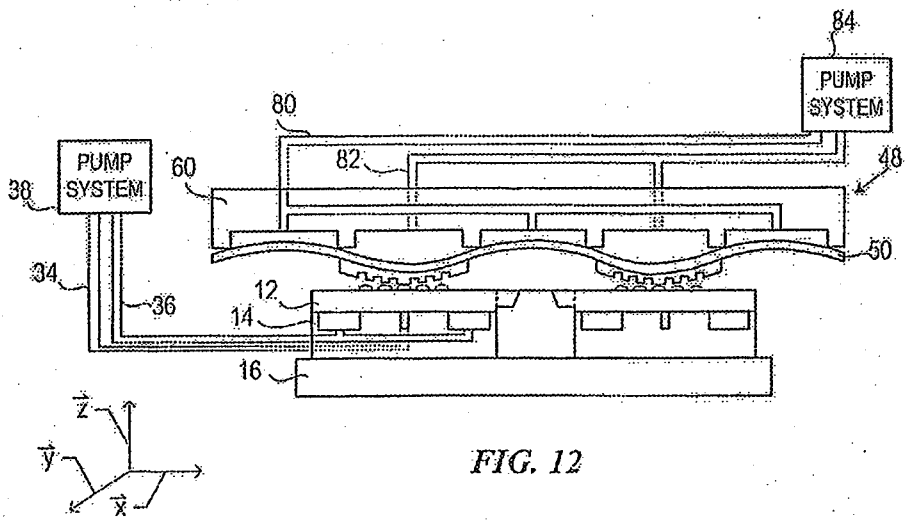

84
PUMP SYSTEM
80
82
48
60
PUMP SYSTEM
38
50
34
36
12
14
16
z
y
x

FIG. 12

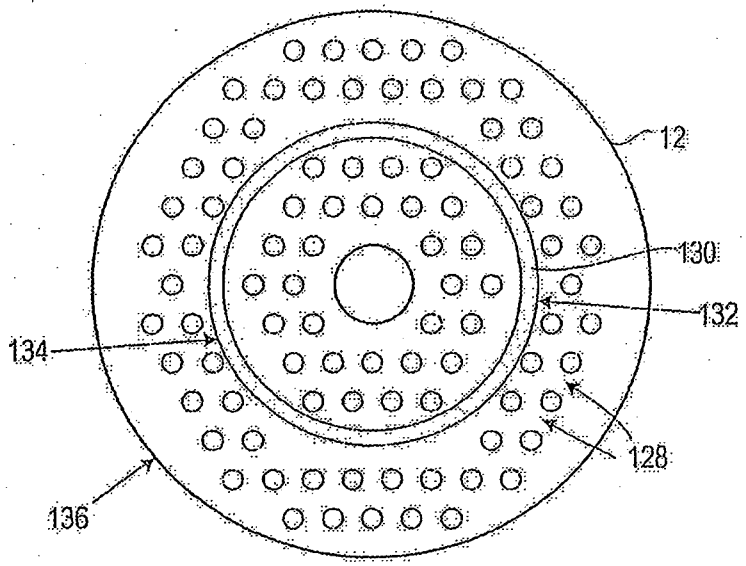


FIG. 13

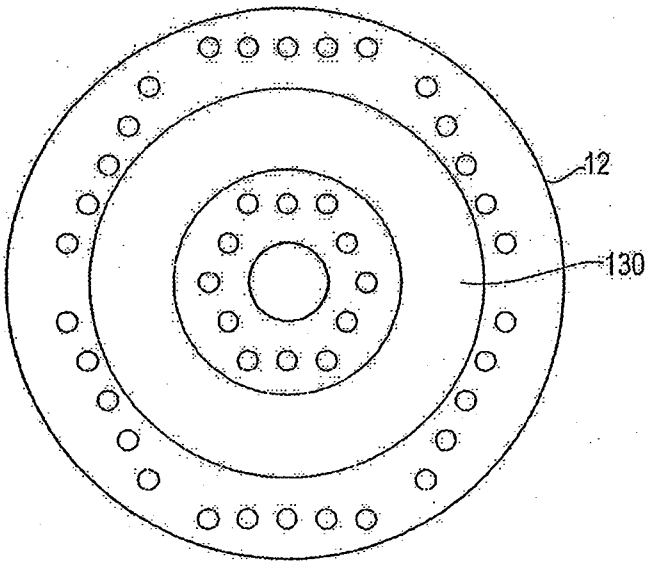


FIG. 14

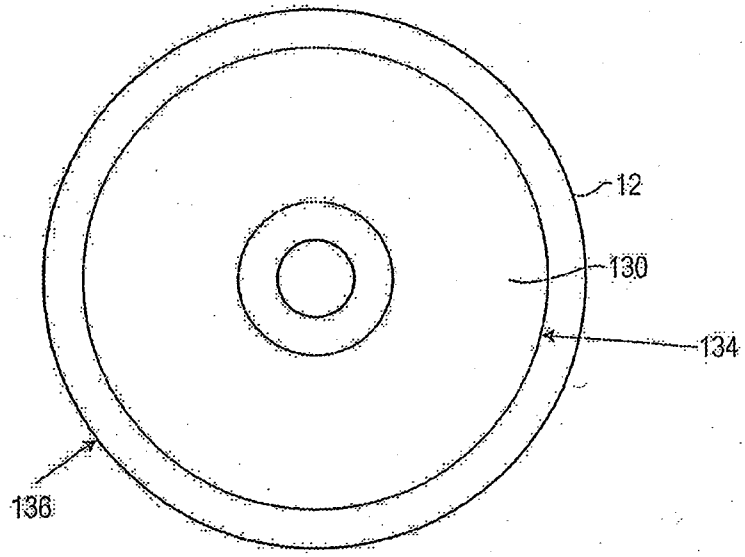

12
130
134
136

FIG. 15

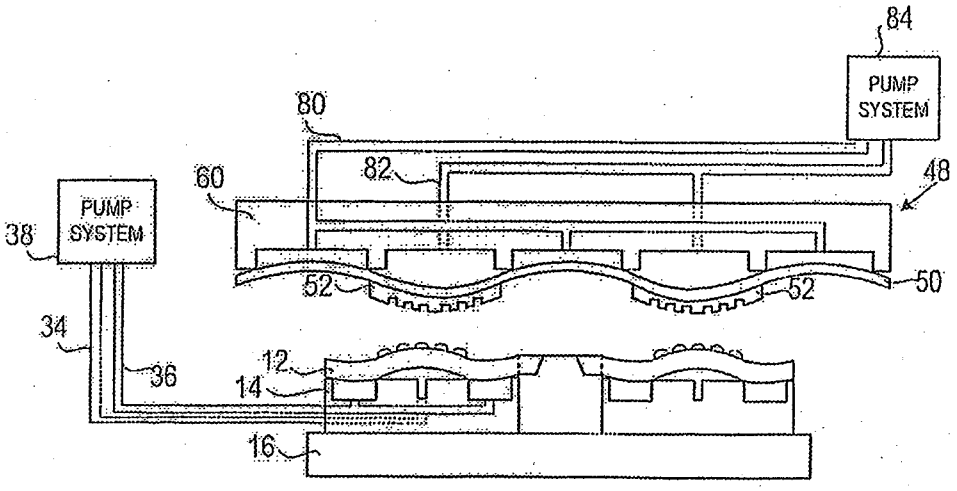

84
PUMP SYSTEM
80
82
60
48
PUMP SYSTEM
38
52
52
50
34
36
12
14
16

FIG. 17

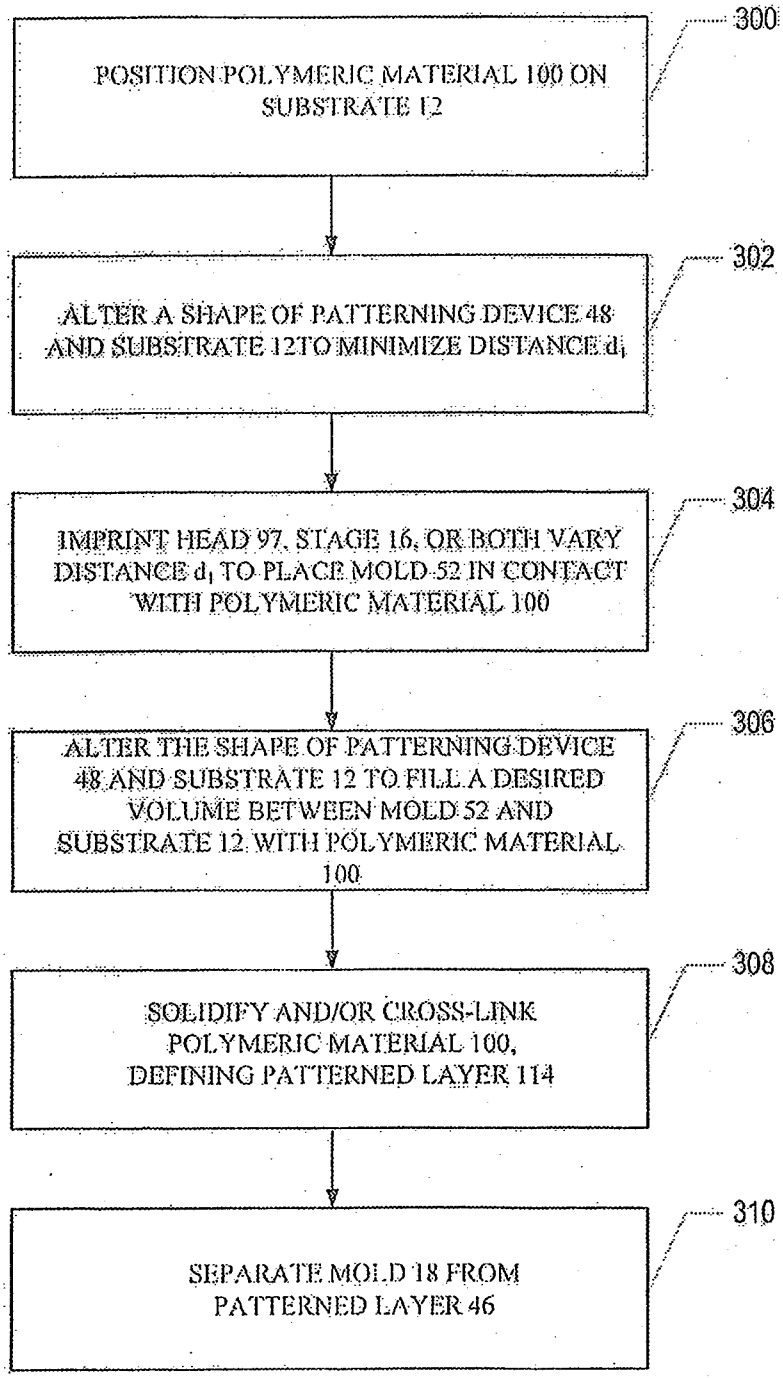

300
POSITION POLYMERIC MATERIAL 100 ON SUBSTRATE 12
302
ALTER A SHAPE OF PATTERNING DEVICE 48 AND SUBSTRATE 12TO MINIMIZE DISTANCE d_1
304
IMPRINT HEAD 97, STAGE 16, OR BOTH VARY DISTANCE d_1 TO PLACE MOLD 52 IN CONTACT WITH POLYMERIC MATERIAL 100
306
ALTER THE SHAPE OF PATTERNING DEVICE 48 AND SUBSTRATE 12 TO FILL A DESIRED VOLUME BETWEEN MOLD 52 AND SUBSTRATE 12 WITH POLYMERIC MATERIAL 100
308
SOLIDIFY AND/OR CROSS-LINK POLYMERIC MATERIAL 100, DEFINING PATTERNED LAYER 114
310
SEPARATE MOLD 18 FROM PATTERNED LAYER 46

FIG. 16

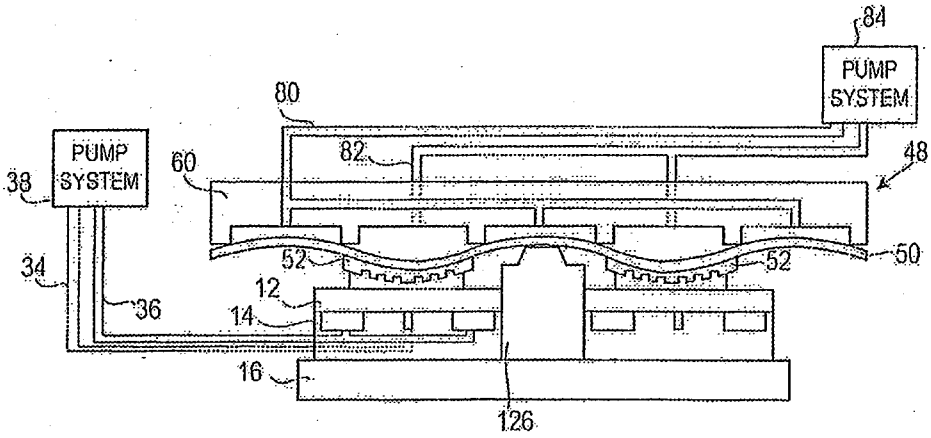

84
PUMP SYSTEM
80
82
48
PUMP SYSTEM
38
60
52
52
50
34
12
36
14
16
126

FIG. 18

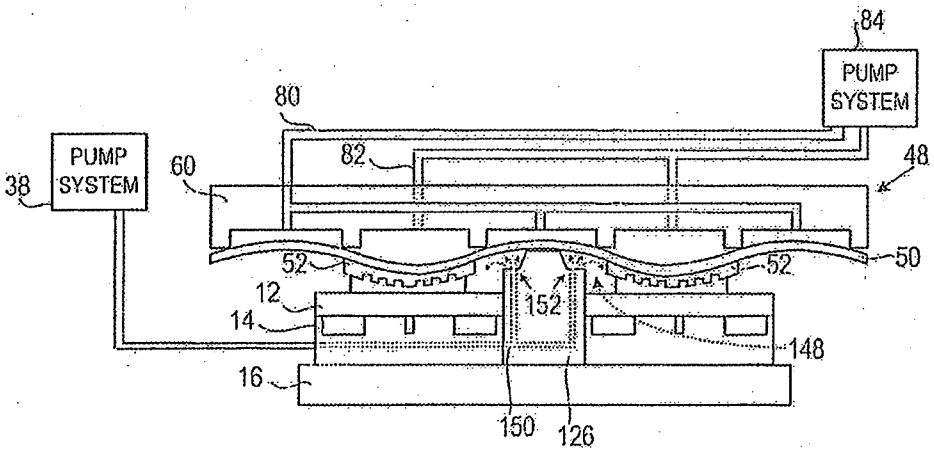

84
PUMP SYSTEM
80
82
48
PUMP SYSTEM
38
60
52
52
50
12
152
14
148
16
150
126

FIG. 19

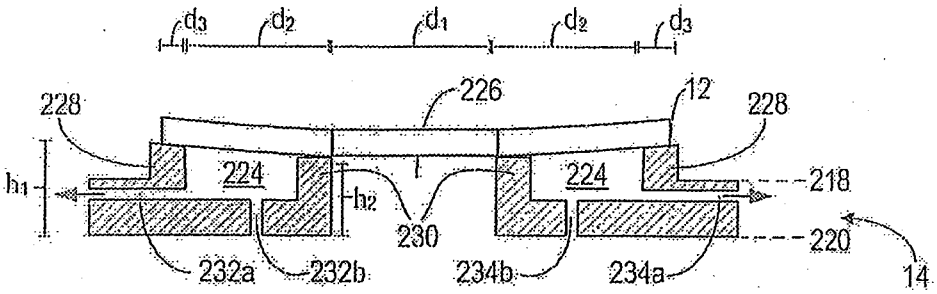


FIG. 20

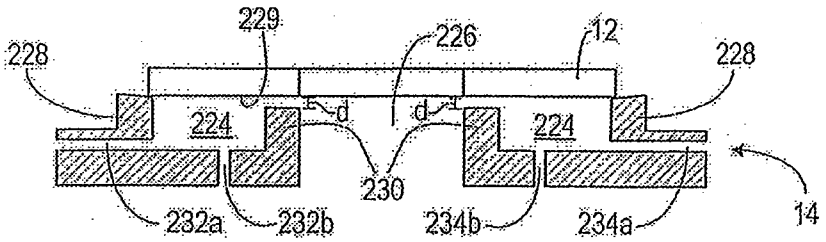


FIG. 21A

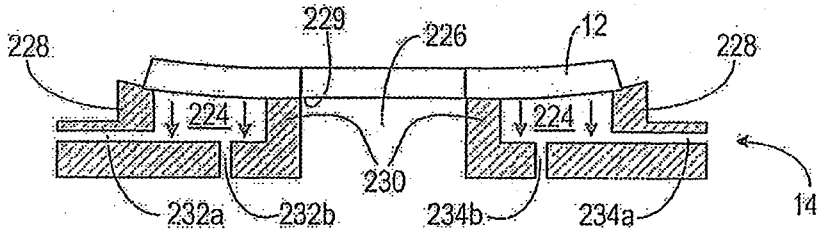


FIG. 21B

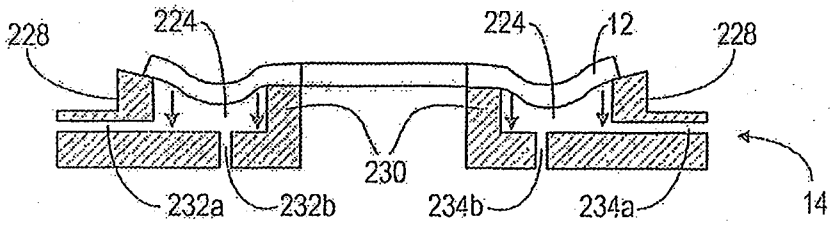


FIG. 21C

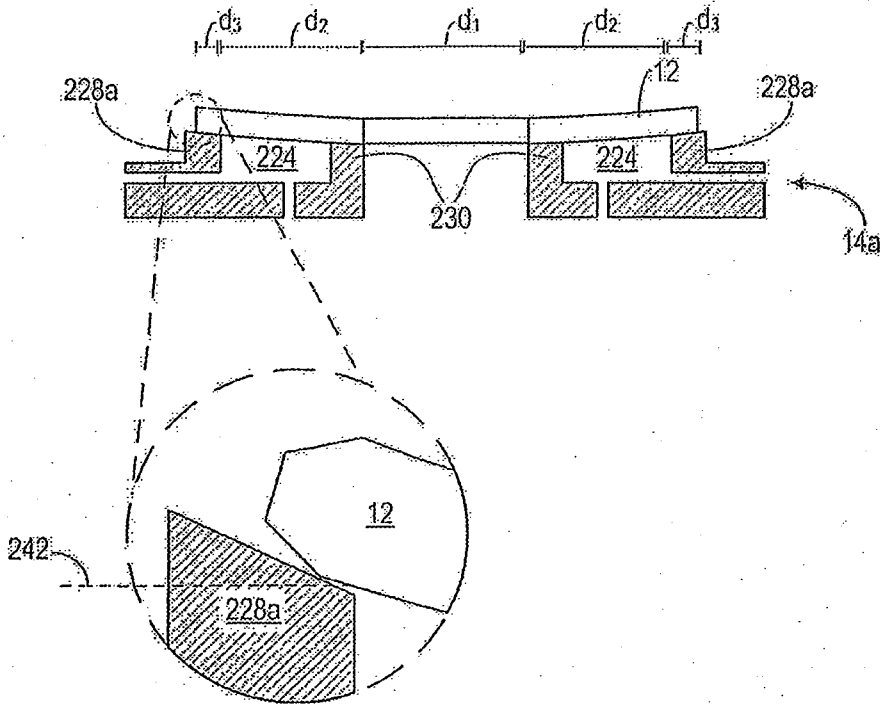


FIG. 22A

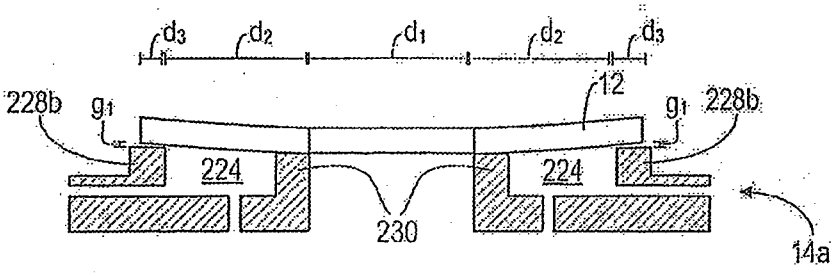


FIG. 22B

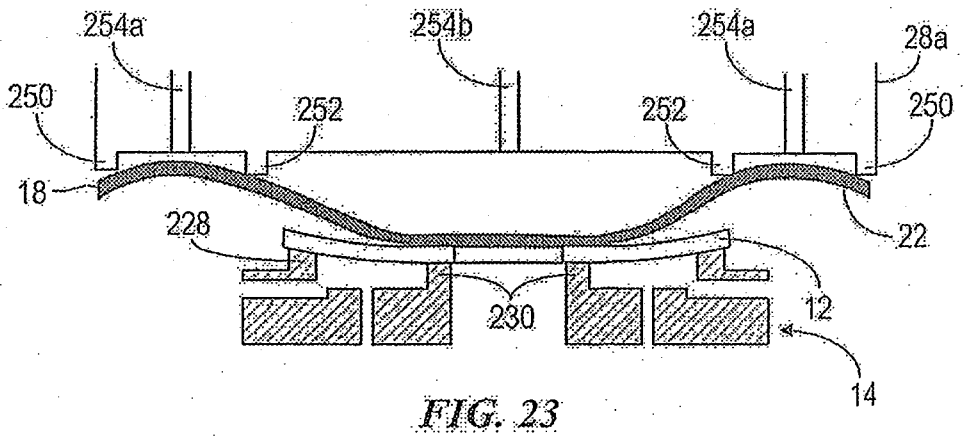


FIG. 23

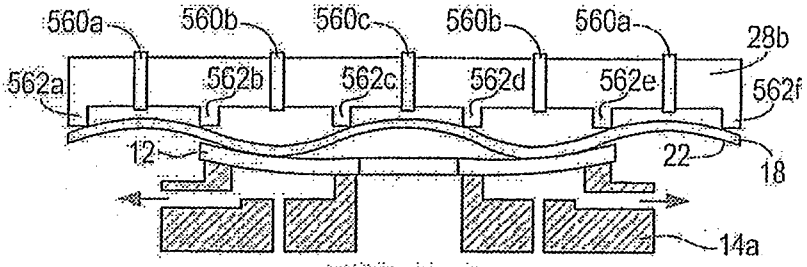


FIG. 24A

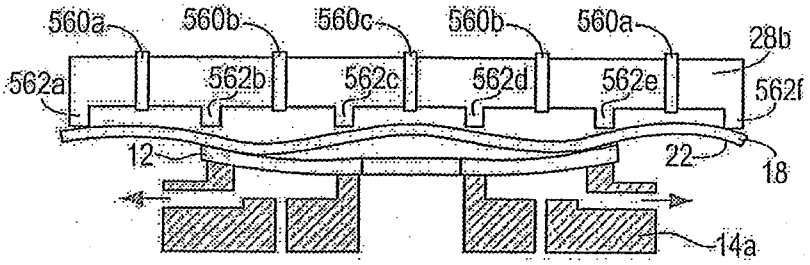


FIG. 24B

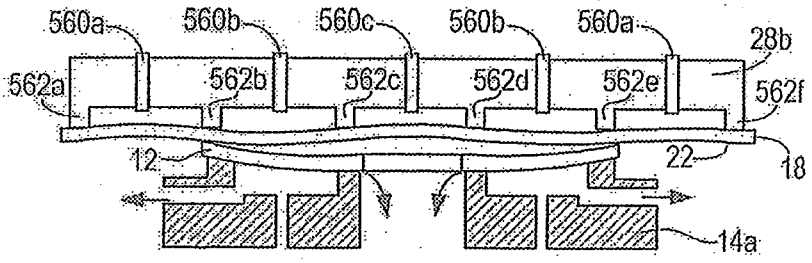


FIG. 24C

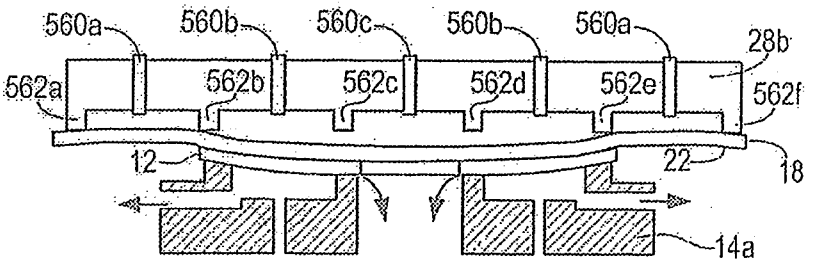


FIG. 24D

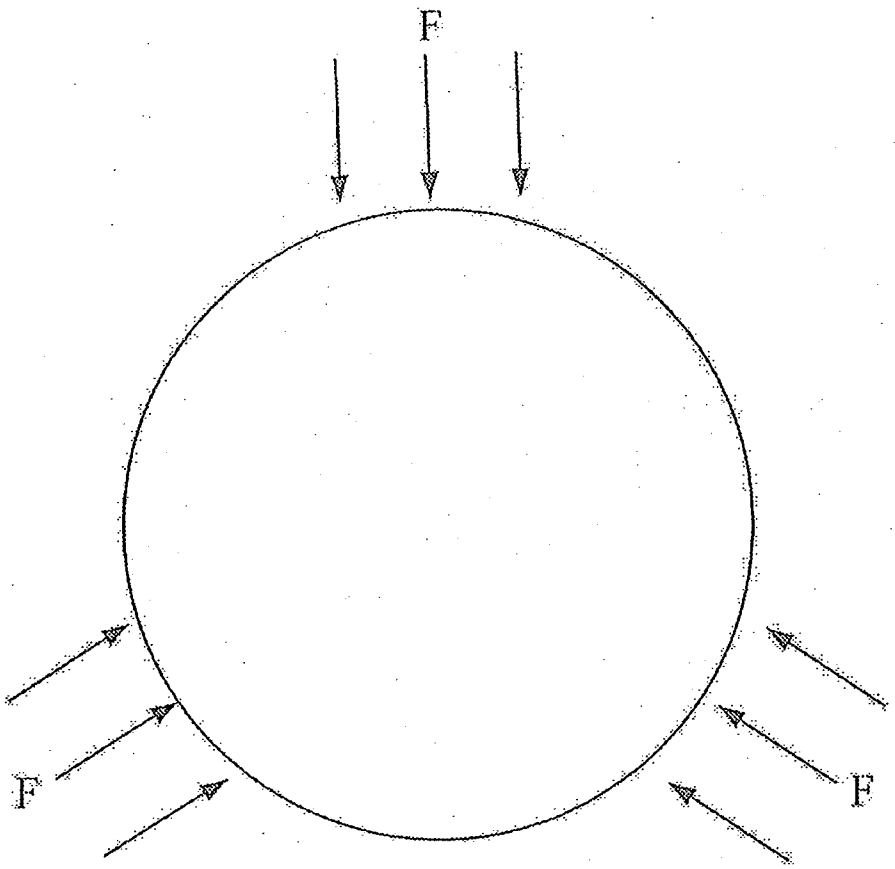


FIG. 25

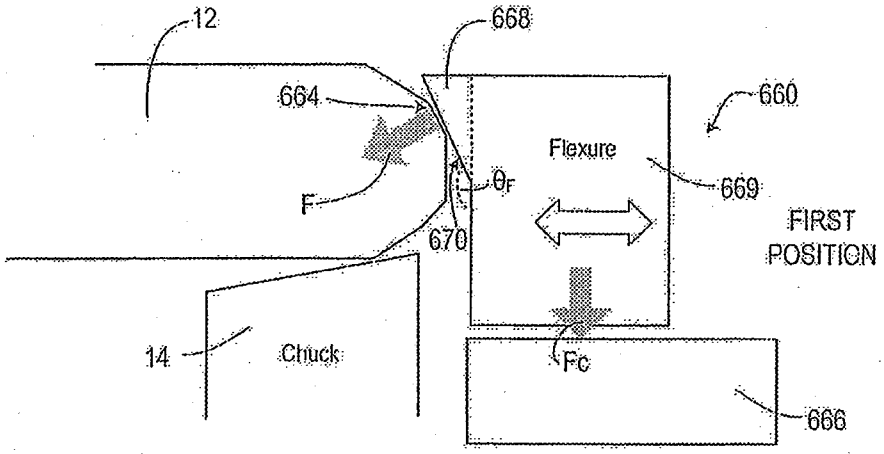

12
668
664
660
Flexure
F
θ_F
669
FIRST
POSITION
670
14
Chuck
Fc
666

FIG. 26

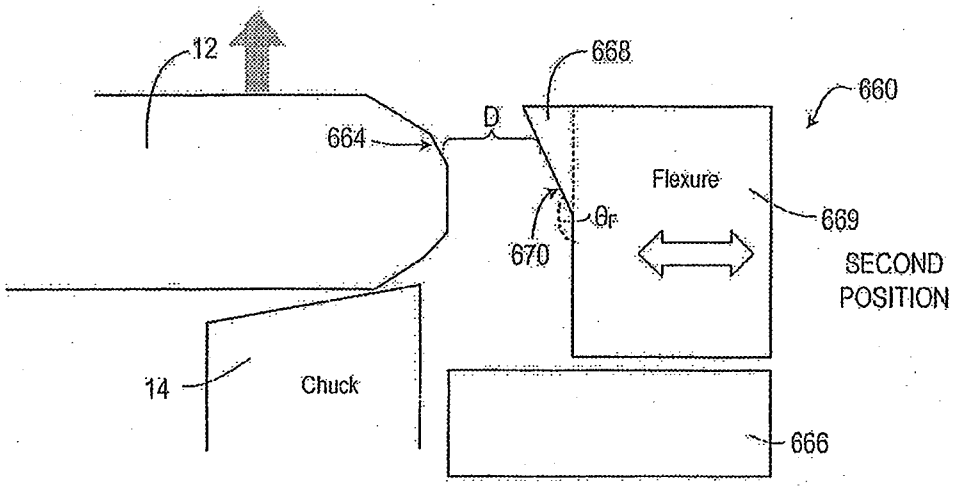

12
668
660
D
664
Flexure
θ_F
669
670
SECOND
POSITION
14
Chuck
666

FIG. 27

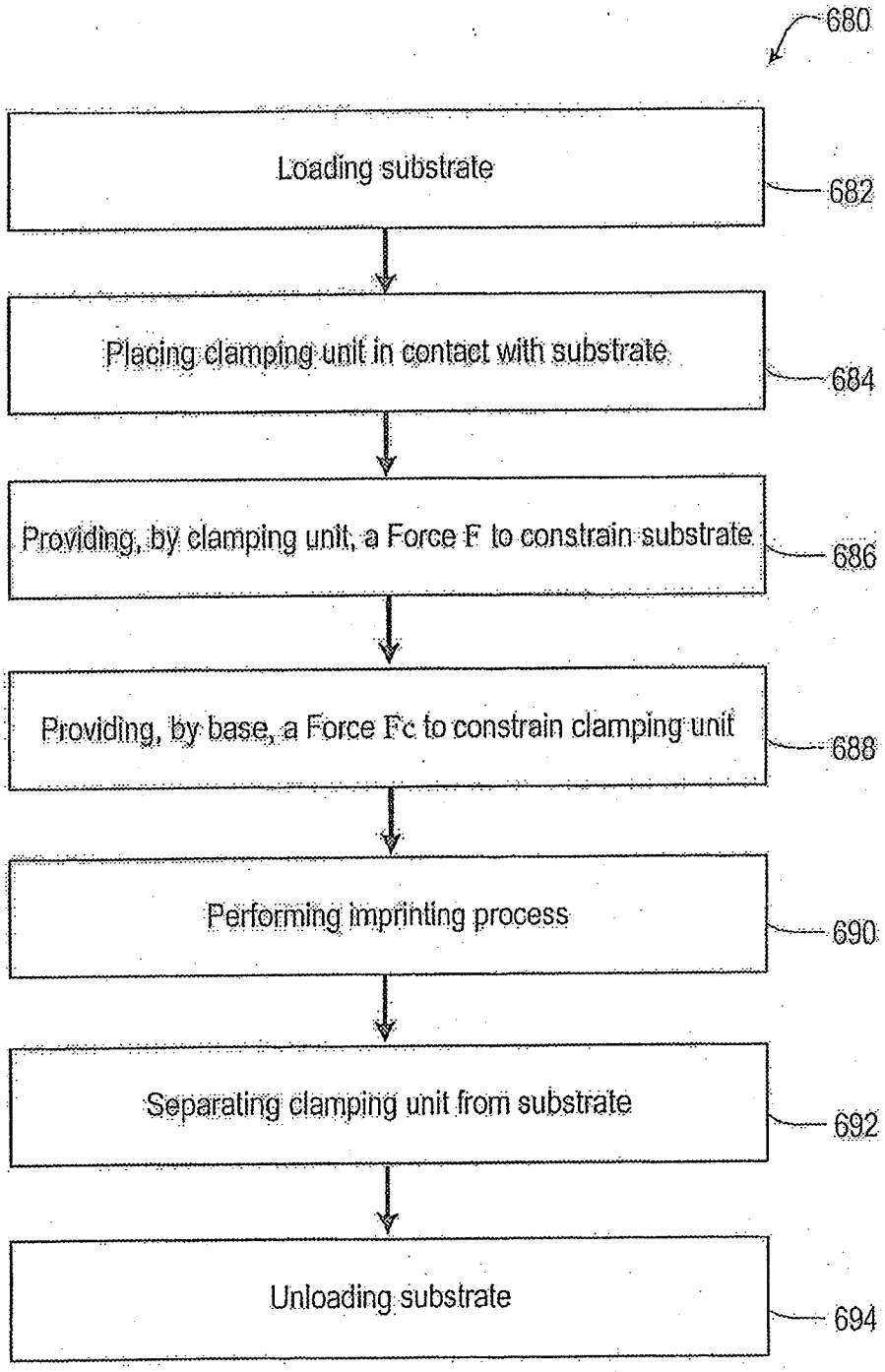

680
Loading substrate
682
Placing clamping unit in contact with substrate
684
Providing, by clamping unit, a Force F to constrain substrate
686
Providing, by base, a Force Fc to constrain clamping unit
688
Performing imprinting process
690
Separating clamping unit from substrate
692
Unloading substrate
694

FIG. 28