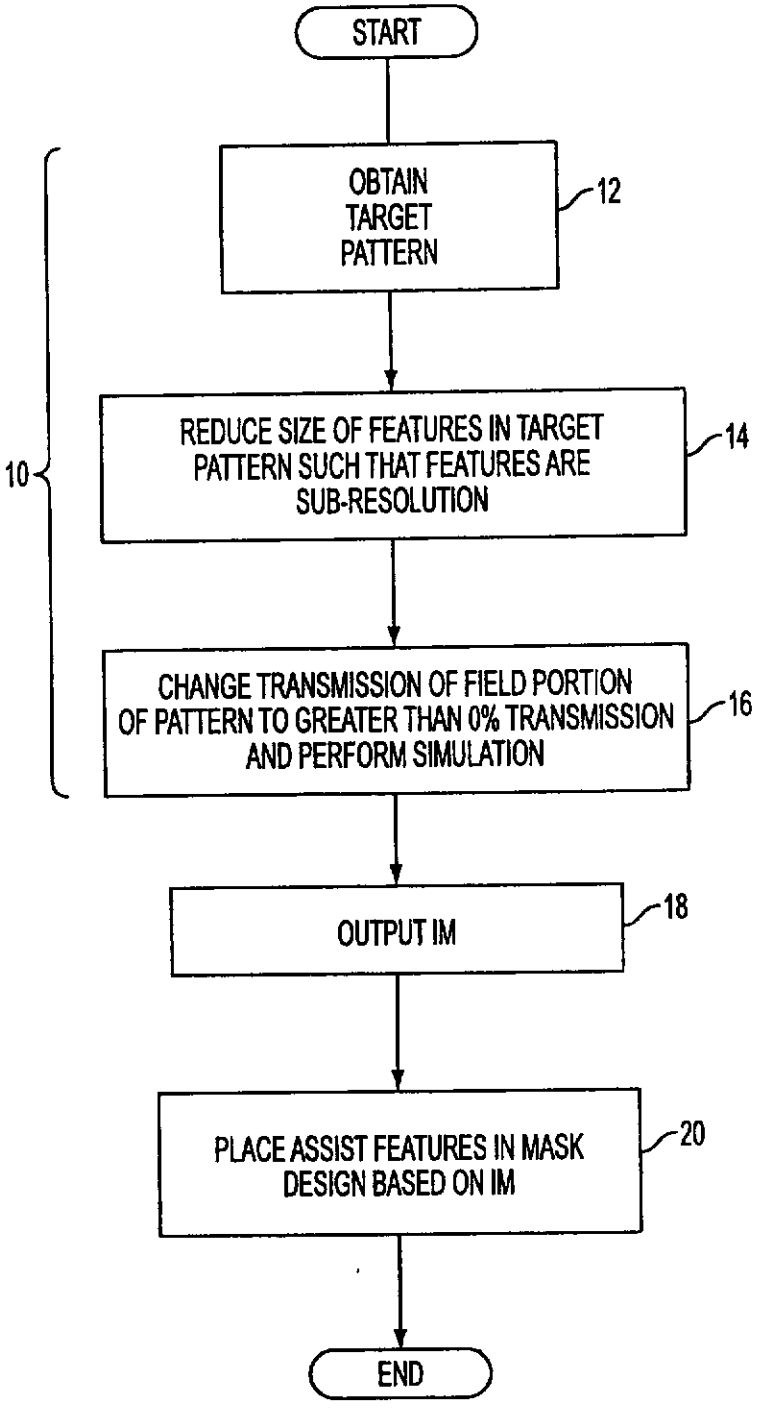

START
OBTAIN TARGET PATTERN
12
REDUCE SIZE OF FEATURES IN TARGET PATTERN SUCH THAT FEATURES ARE SUB-RESOLUTION
14
10
CHANGE TRANSMISSION OF FIELD PORTION OF PATTERN TO GREATER THAN 0% TRANSMISSION AND PERFORM SIMULATION
16
OUTPUT IM
18
PLACE ASSIST FEATURES IN MASK DESIGN BASED ON IM
20
END

FIG. 1

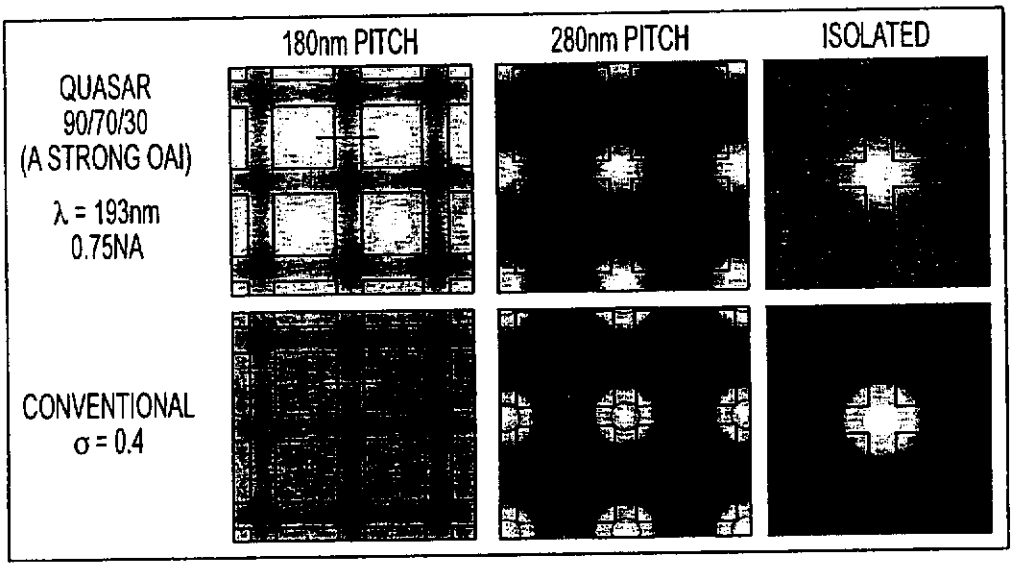

180nm PITCH
280nm PITCH
ISOLATED
QUASAR
90/70/30
(A STRONG OAI)
λ = 193nm
0.75NA
CONVENTIONAL
σ = 0.4

FIG. 2

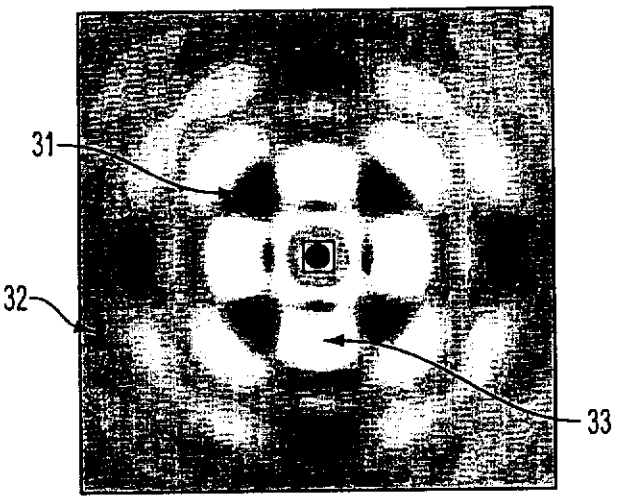

31
32
33

FIG. 3A

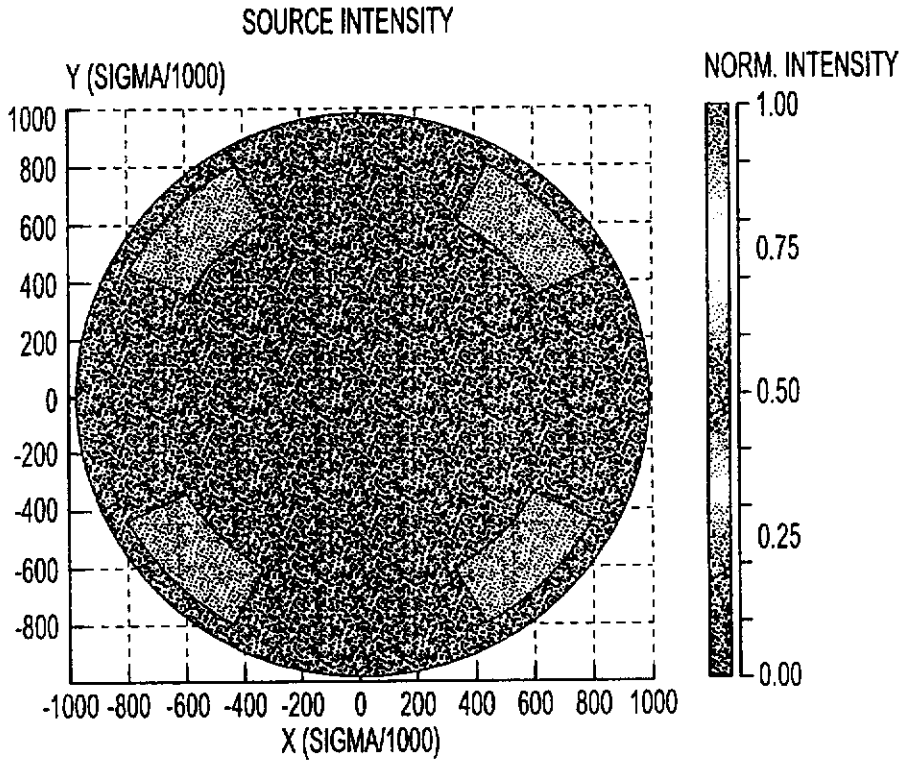

SOURCE INTENSITY
Y (SIGMA/1000)
1000
800
600
400
200
0
-200
-400
-600
-800
-1000 -800 -600 -400 -200 0 200 400 600 800 1000
X (SIGMA/1000)
NORM. INTENSITY
1.00
0.75
0.50
0.25
0.00

FIG. 3B

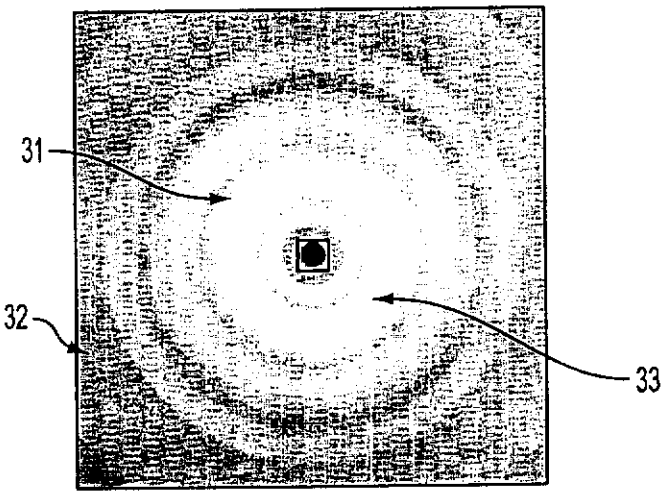

31
32
33

FIG. 3C

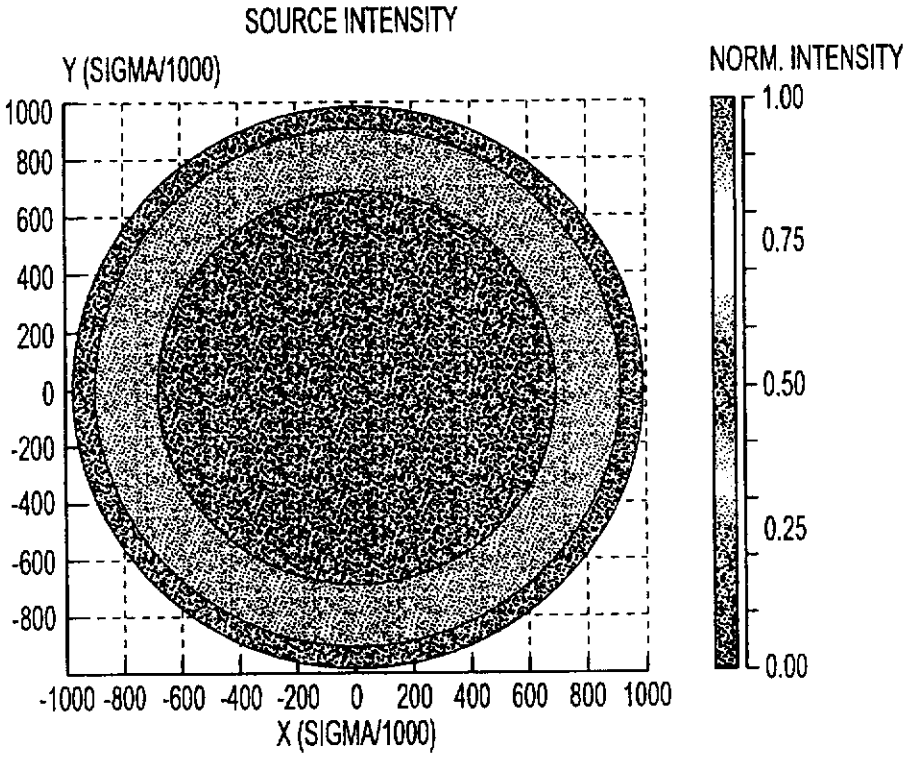

SOURCE INTENSITY
Y (SIGMA/1000)
1000
800
600
400
200
0
-200
-400
-600
-800
-1000 -800 -600 -400 -200 0 200 400 600 800 1000
X (SIGMA/1000)
NORM. INTENSITY
1.00
0.75
0.50
0.25
0.00

FIG. 3D

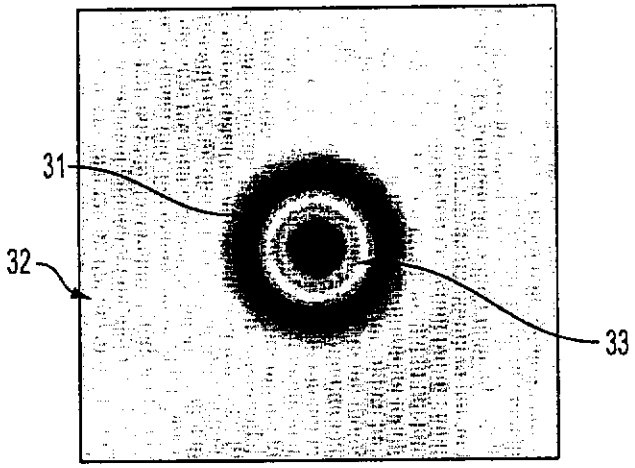

31
32
33

FIG. 3E

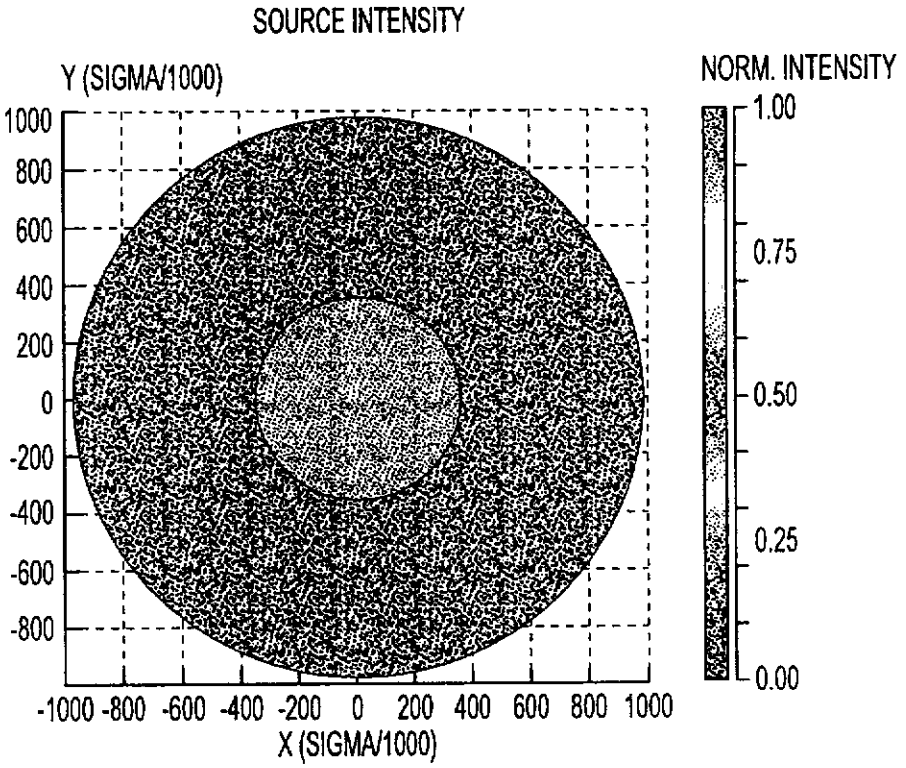

SOURCE INTENSITY
Y (SIGMA/1000)
1000
800
600
400
200
0
-200
-400
-600
-800
-1000 -800 -600 -400 -200 0 200 400 600 800 1000
X (SIGMA/1000)
NORM. INTENSITY
1.00
0.75
0.50
0.25
0.00

FIG. 3F

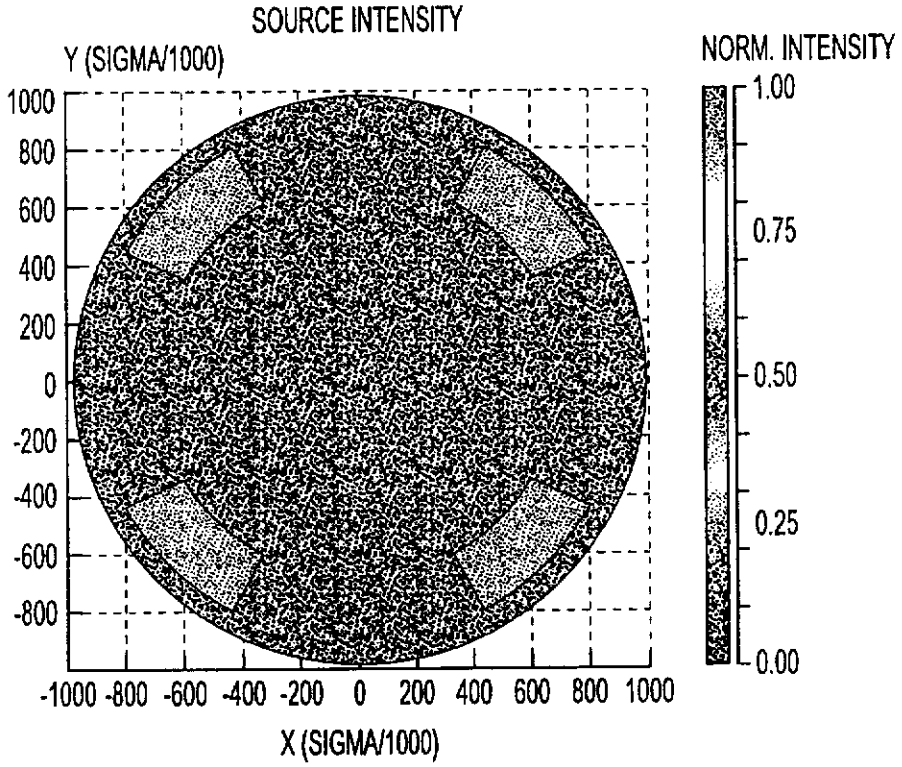

SOURCE INTENSITY
Y (SIGMA/1000)
1000
800
600
400
200
0
-200
-400
-600
-800
-1000 -800 -600 -400 -200 0 200 400 600 800 1000
X (SIGMA/1000)
NORM. INTENSITY
1.00
0.75
0.50
0.25
0.00

FIG. 4A

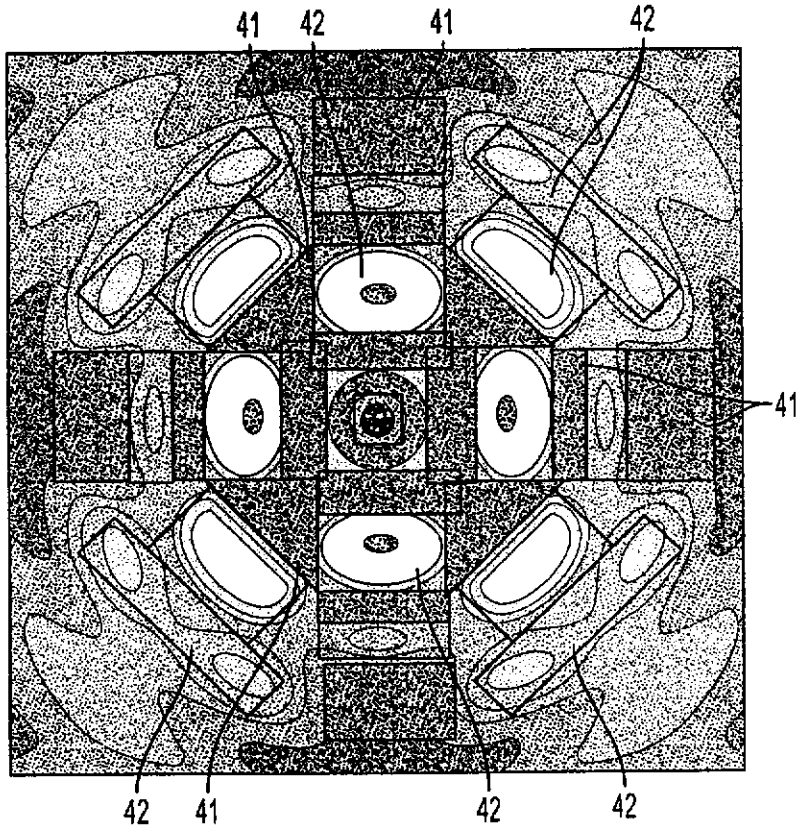

41
42
41
42
41
42
41
42
42

FIG. 4B

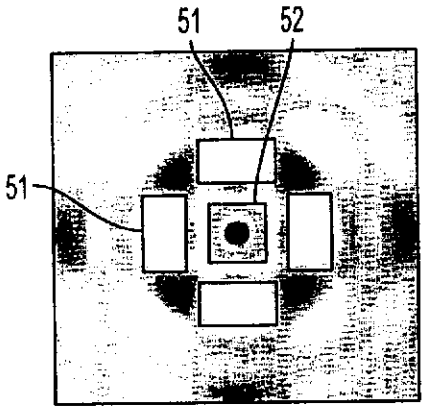


FIG. 5A

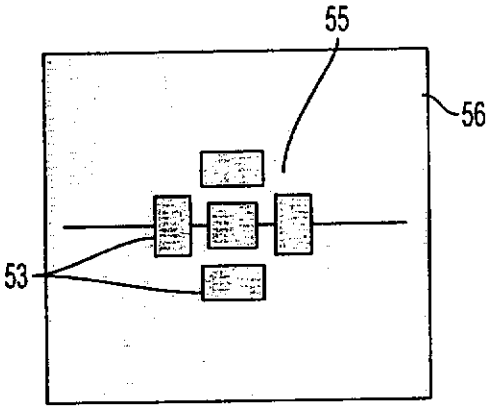


FIG. 5B

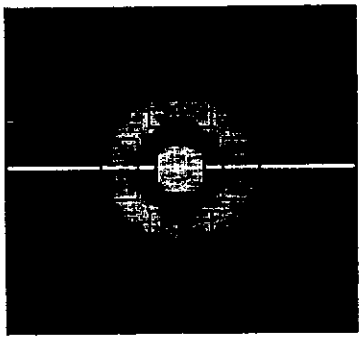


FIG. 5C

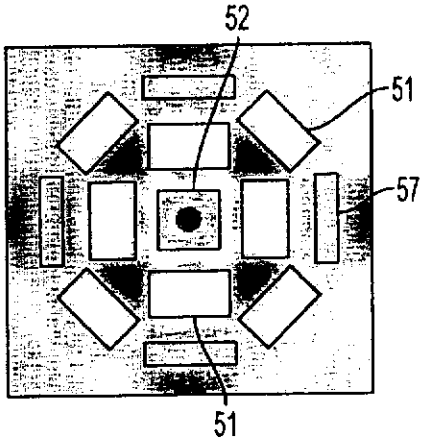


FIG. 5D

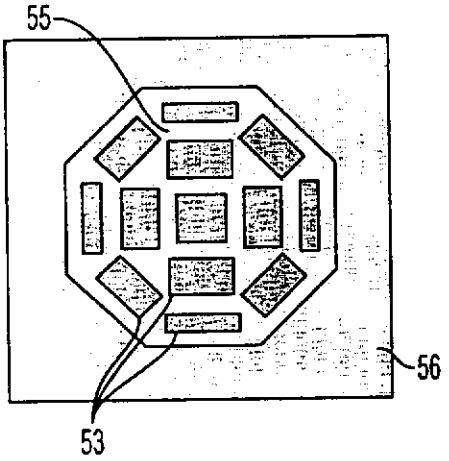


FIG. 5E

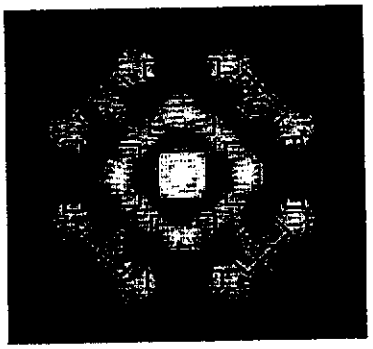


FIG. 5F

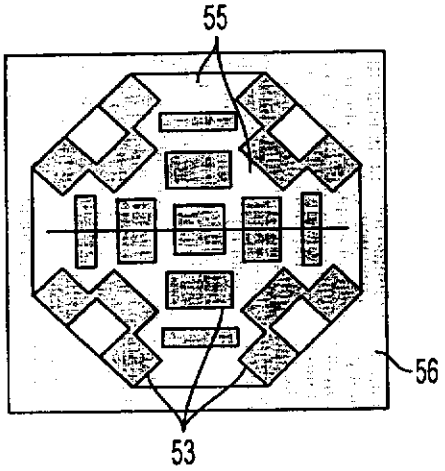


FIG. 5G

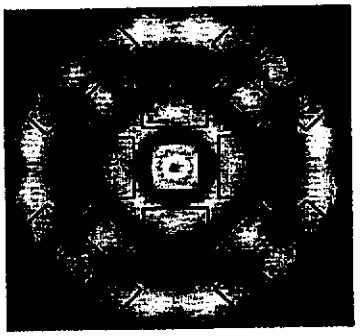


FIG. 5H

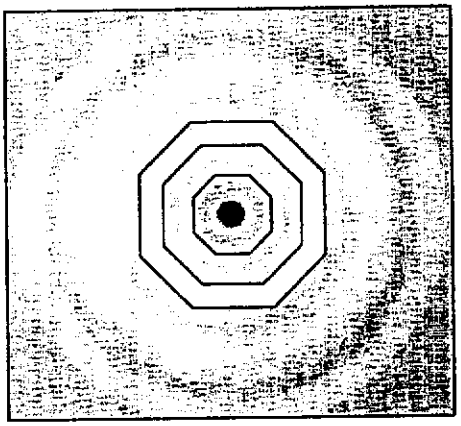


FIG. 6A

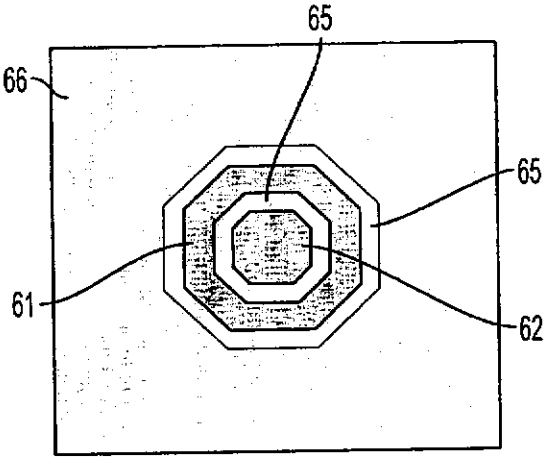


FIG. 6B

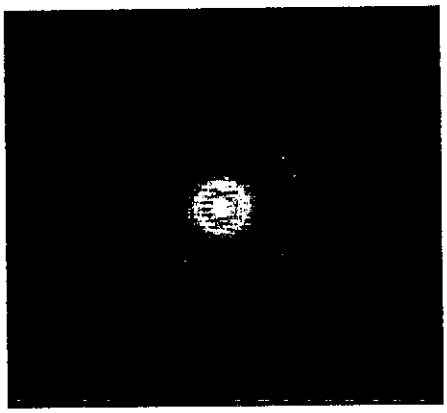


FIG. 6C

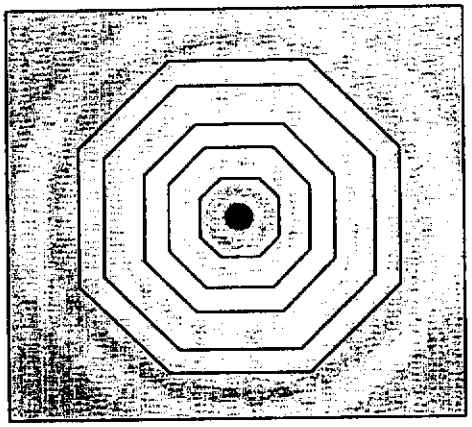


FIG. 6D

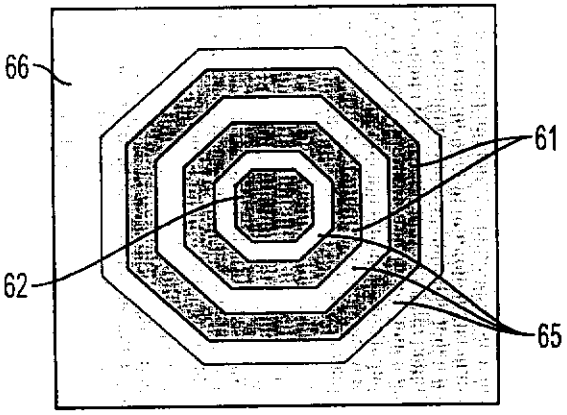


FIG. 6E

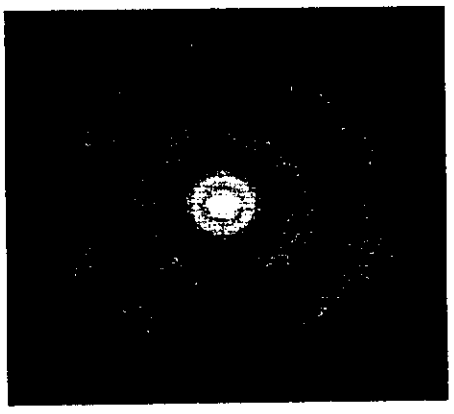


FIG. 6F

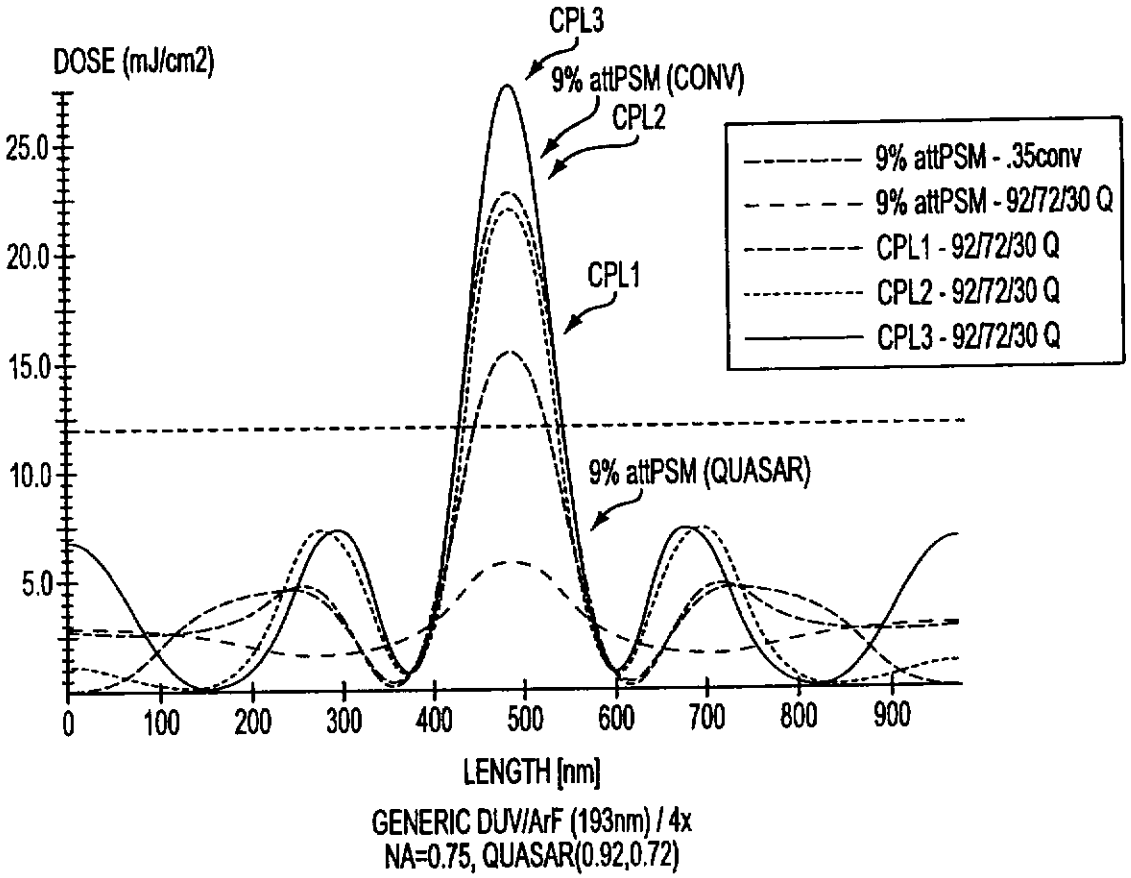

DOSE (mJ/cm2)
25.0
20.0
15.0
10.0
5.0
0
100
200
300
400
500
600
700
800
900
LENGTH [nm]
CPL3
9% attPSM (CONV)
CPL2
CPL1
9% attPSM (QUASAR)
9% attPSM - .35conv
9% attPSM - 92/72/30 Q
CPL1 - 92/72/30 Q
CPL2 - 92/72/30 Q
CPL3 - 92/72/30 Q
GENERIC DUV/ArF (193nm) / 4x
NA=0.75, QUASAR(0.92,0.72)

FIG. 7

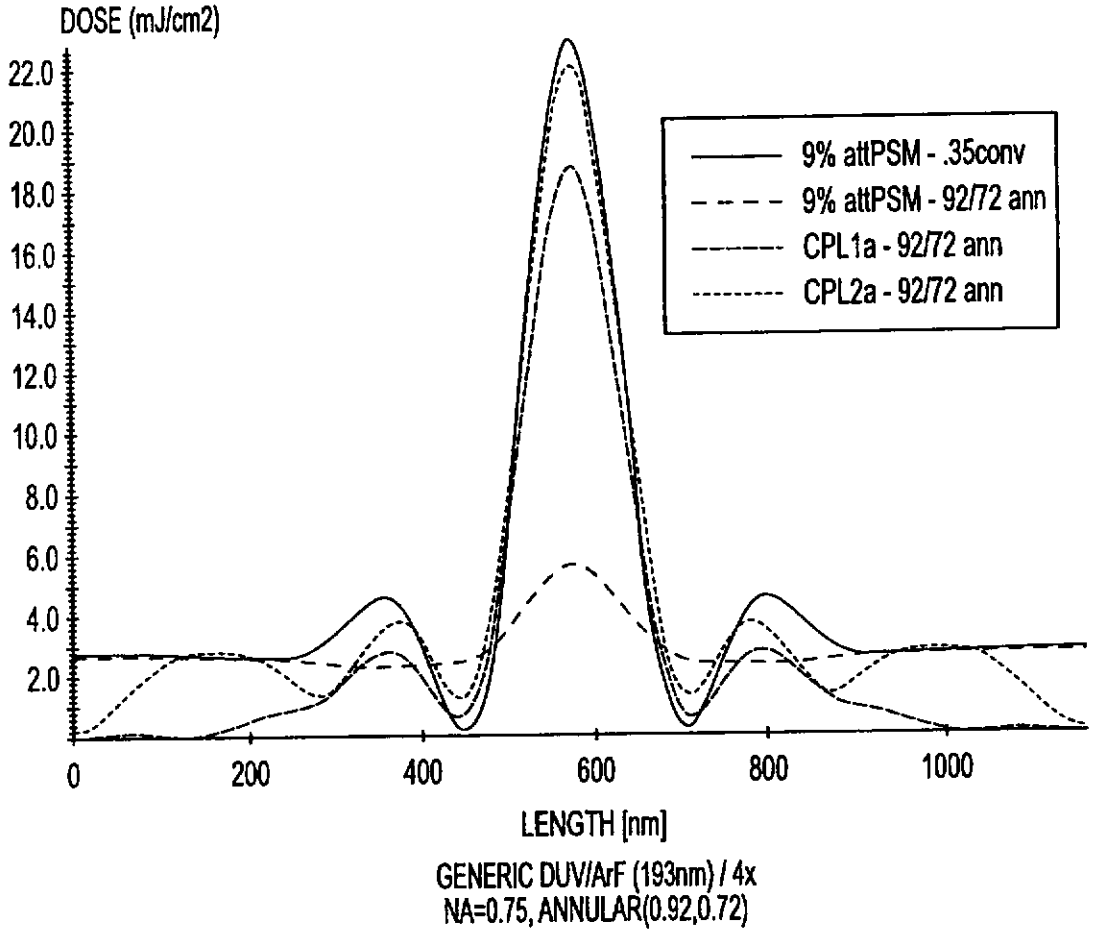

DOSE (mJ/cm2)
22.0
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0
200
400
600
800
1000
LENGTH [nm]
9% attPSM - .35conv
9% attPSM - 92/72 ann
CPL1a - 92/72 ann
CPL2a - 92/72 ann
GENERIC DUV/ArF (193nm) / 4x
NA=0.75, ANNULAR(0.92,0.72)

FIG. 8

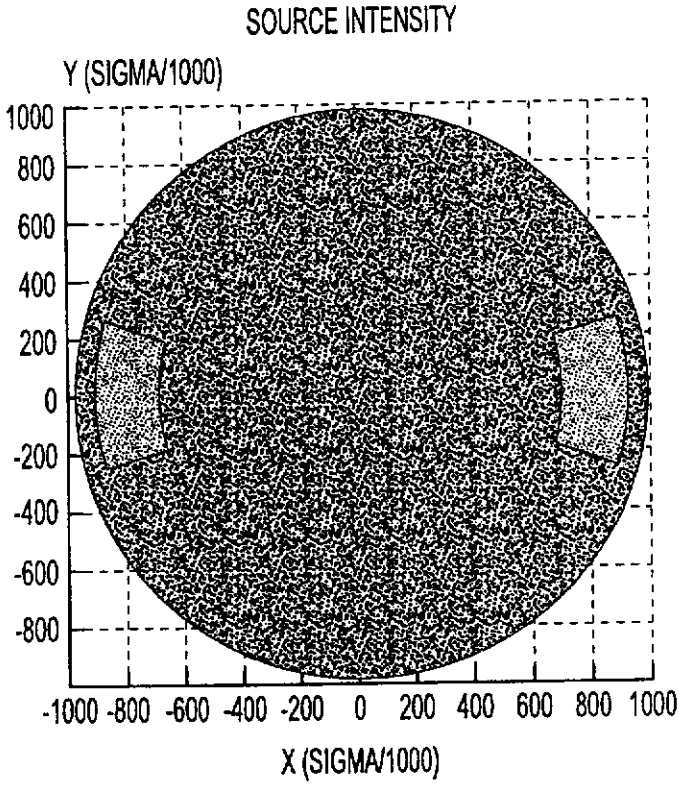

SOURCE INTENSITY
Y (SIGMA/1000)
1000
800
600
400
200
0
-200
-400
-600
-800
-1000 -800 -600 -400 -200 0 200 400 600 800 1000
X (SIGMA/1000)

FIG. 9A

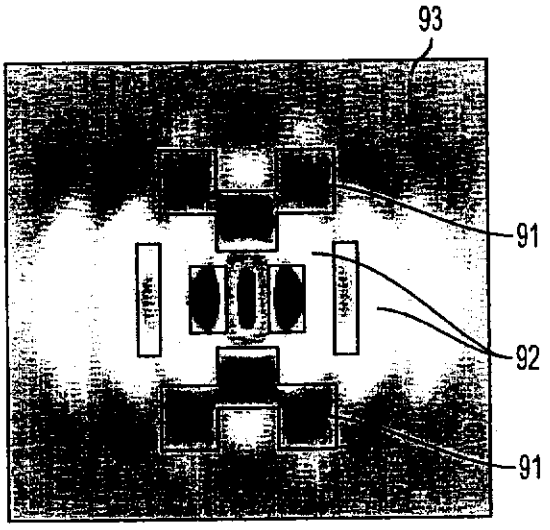

93
91
92
91

FIG. 9B

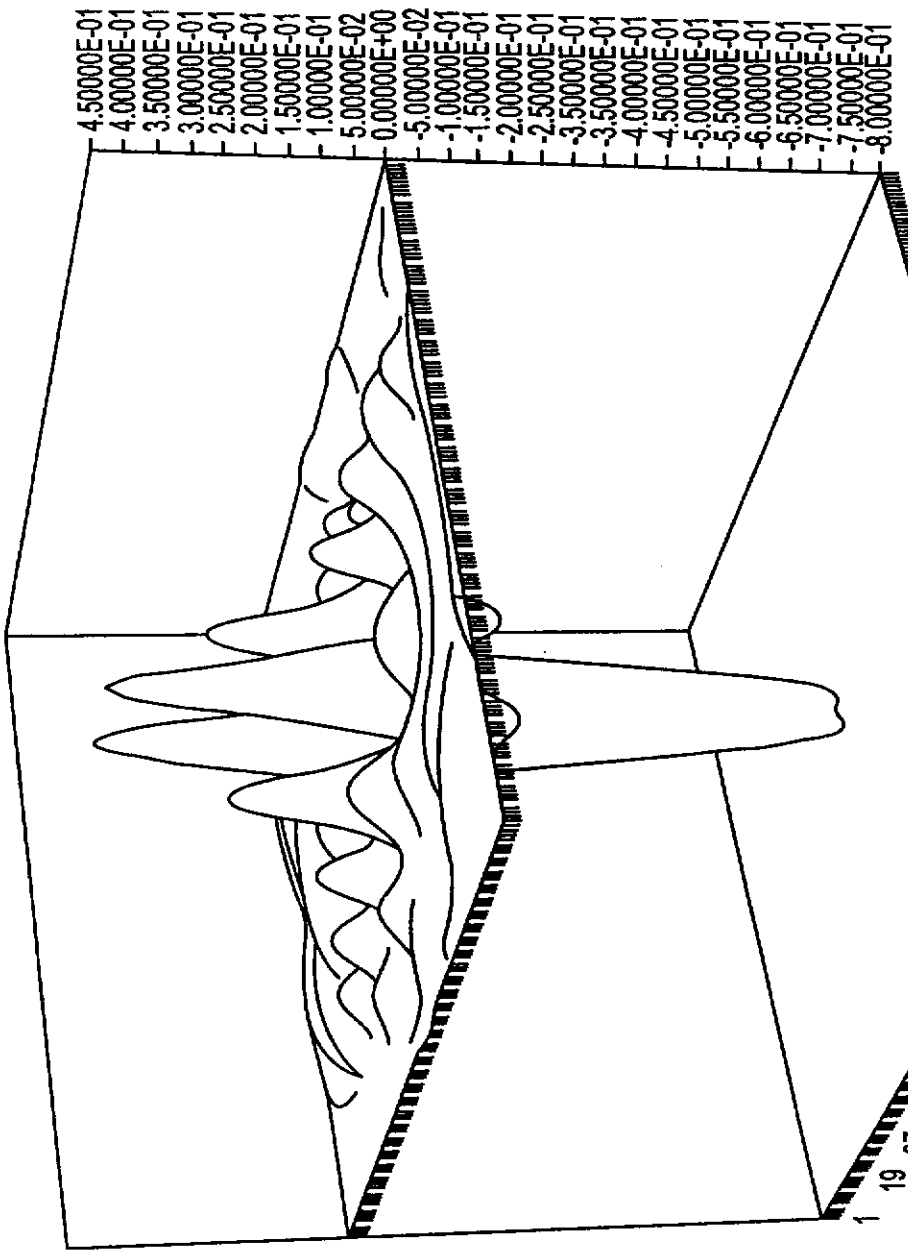

4.50000E-01
4.00000E-01
3.50000E-01
3.00000E-01
2.50000E-01
2.00000E-01
1.50000E-01
1.00000E-01
5.00000E-02
0.00000E+00
-5.00000E-02
-1.00000E-01
-1.50000E-01
-2.00000E-01
-2.50000E-01
-3.00000E-01
-3.50000E-01
-4.00000E-01
-4.50000E-01
-5.00000E-01
-5.50000E-01
-6.00000E-01
-6.50000E-01
-7.00000E-01
-7.50000E-01
-8.00000E-01
1
19
37
55
73
91
109
127
145
S1
S12
S23
S34
S45
S56
S67
S78
S89
S100
S111
S122
S133
S144
S155

FIG. 9C

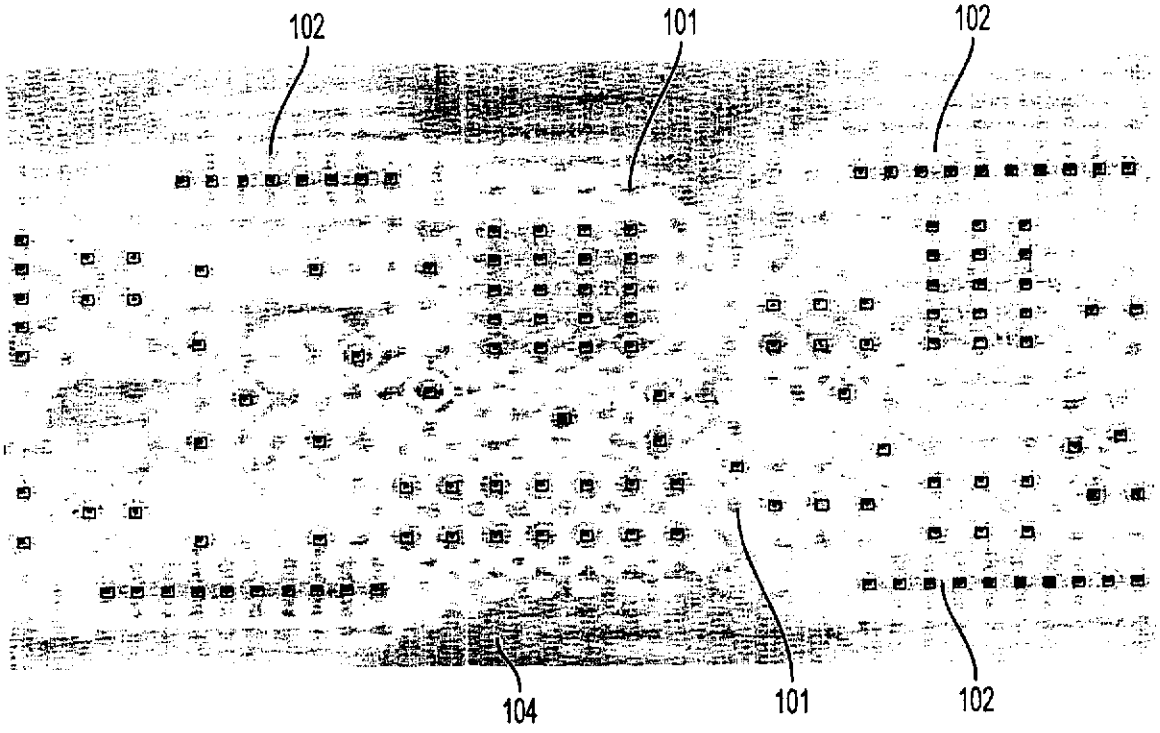


FIG. 10A

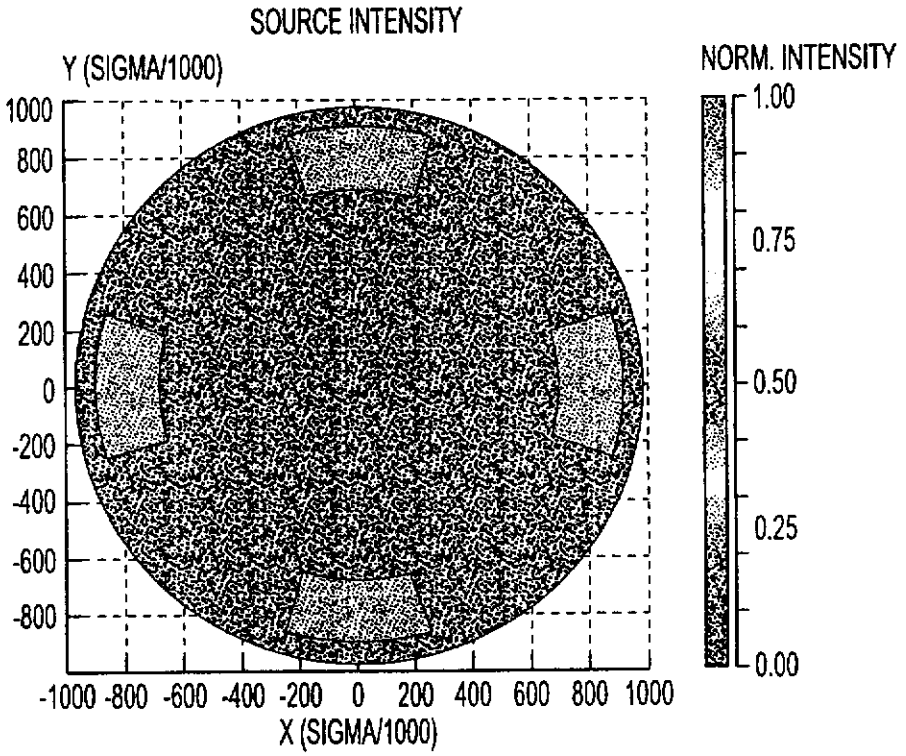


FIG. 10B

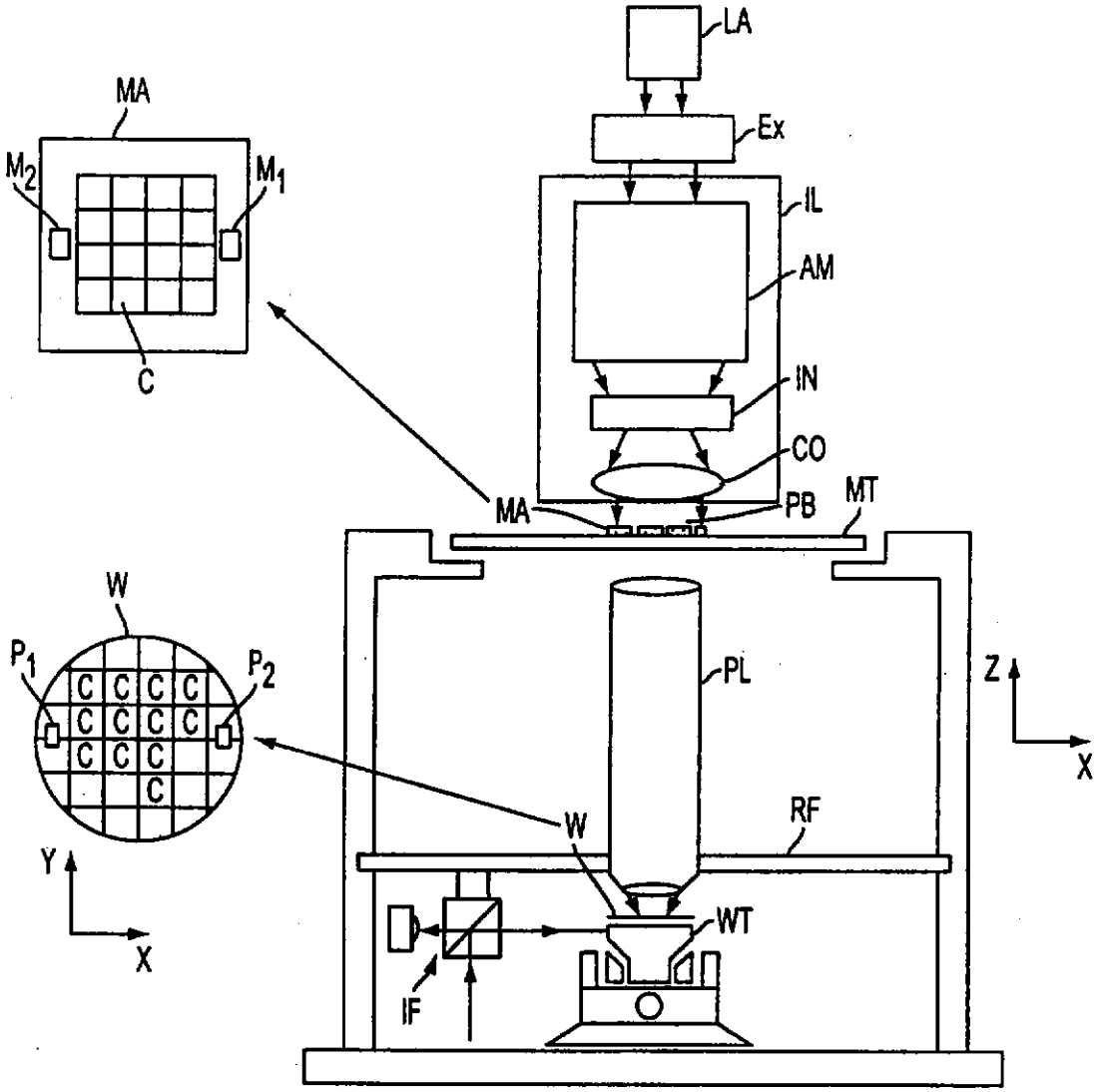


FIG. 11