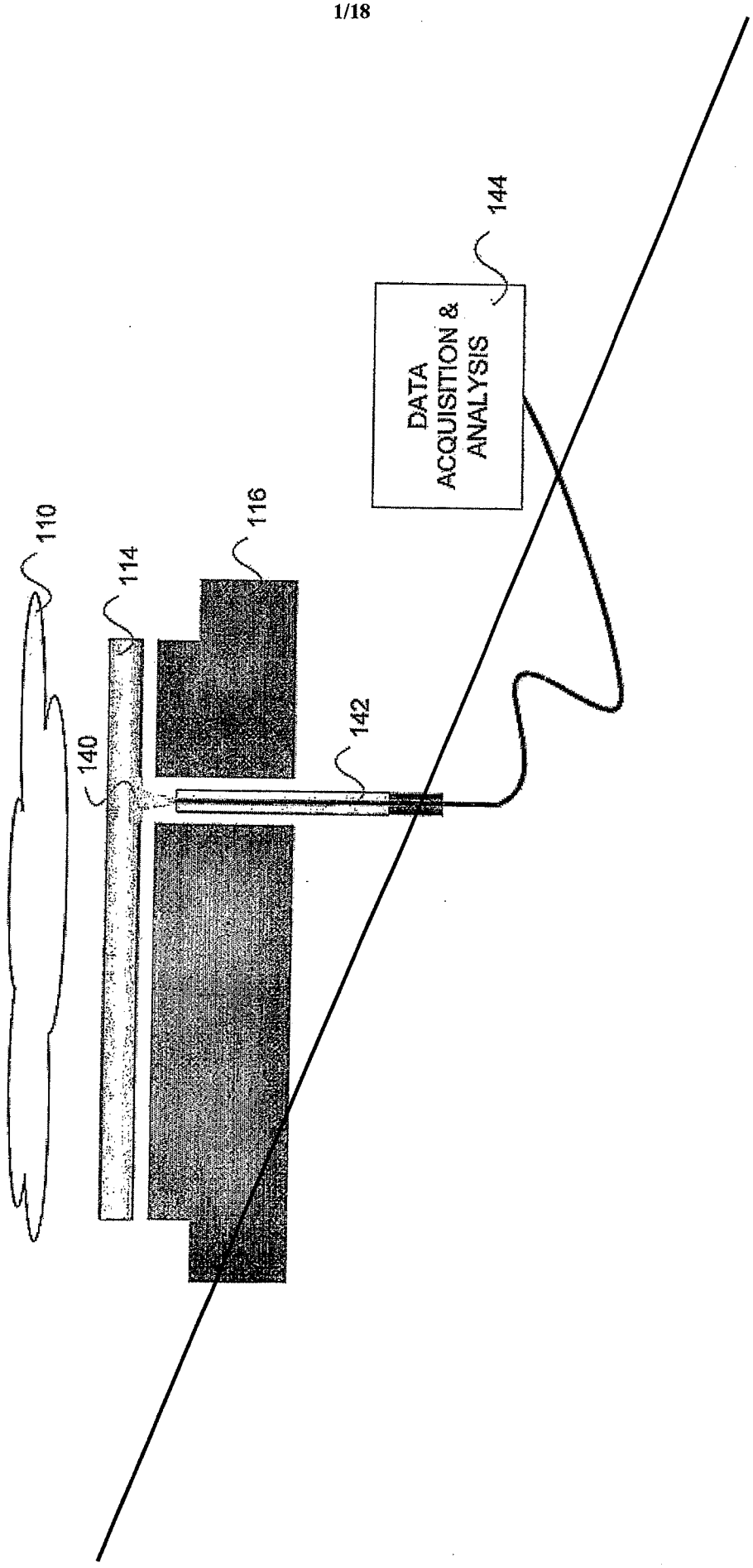


FIG. 1

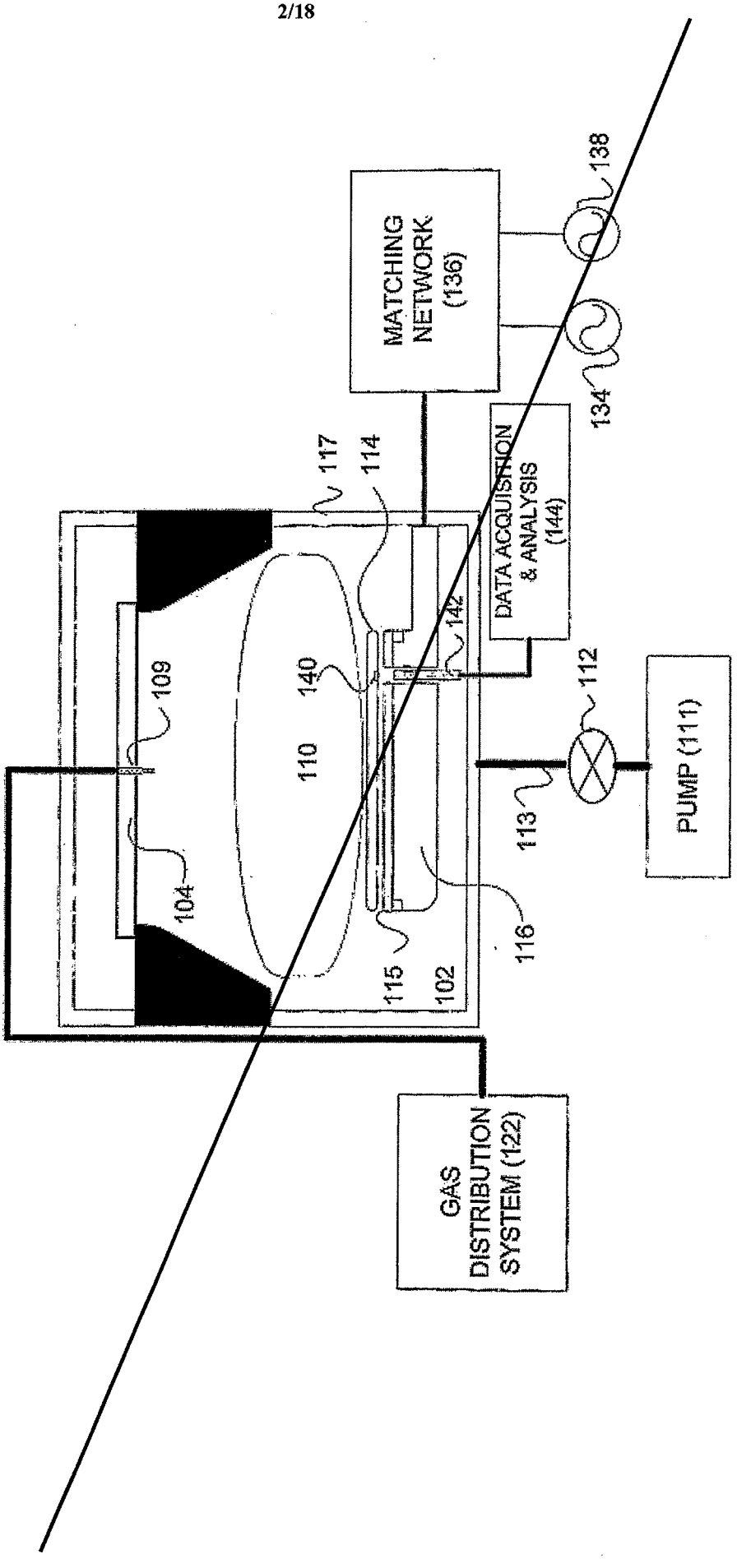

MATCHING NETWORK (136)
138
134
DATA ACQUISITION & ANALYSIS (144)
117
114
142
140
109
110
112
PUMP (111)
113
104
116
115
102
GAS DISTRIBUTION SYSTEM (122)

FIG. 2

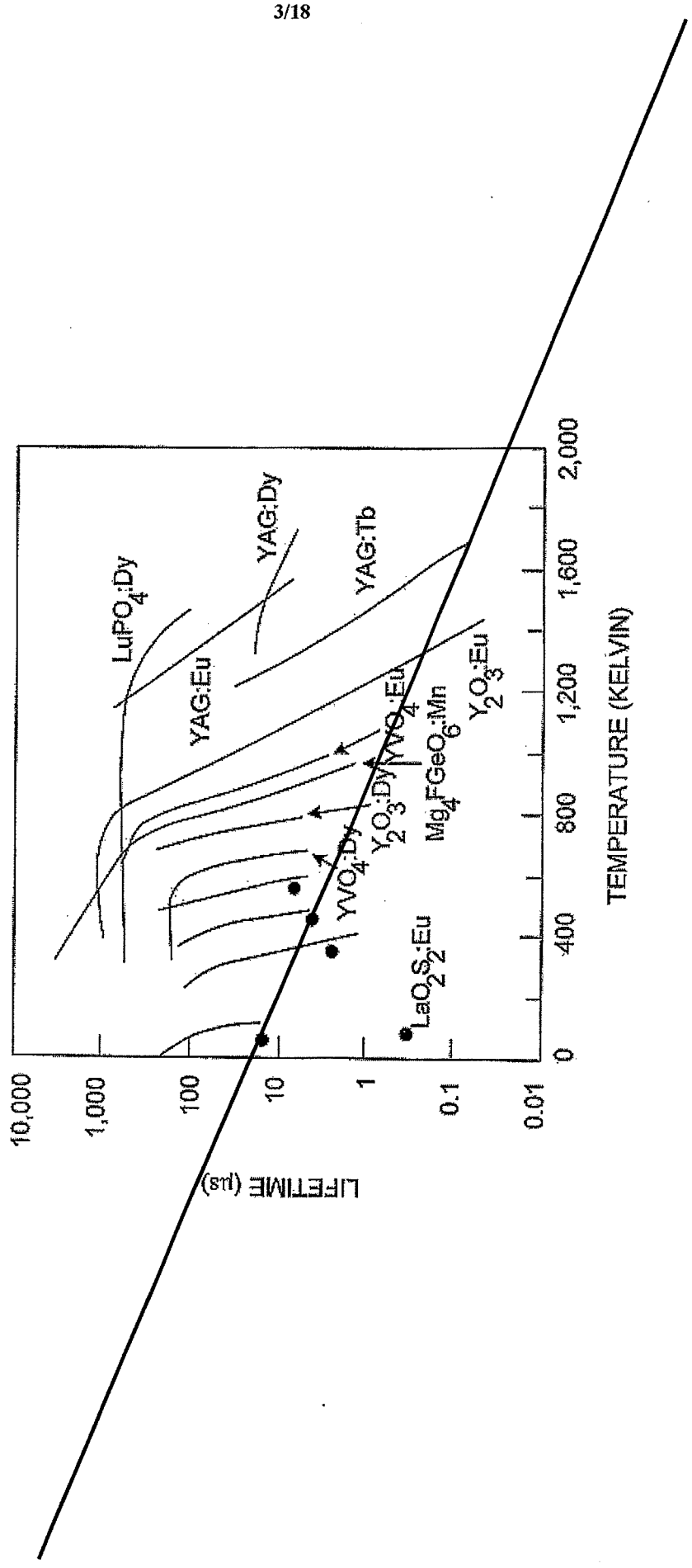

LIFETIME (μs)
10,000
1,000
100
10
1
0.1
0.01
0
400
800
1,200
1,600
2,000
TEMPERATURE (KELVIN)
LuPO4:Dy
YAG:Eu
YAG:Dy
YAG:Tb
YVO4:Dy
Y2O3:Dy
YVO4:Eu
Mg4FGeO6:Mn
Y2O3:Eu
La2O2S:Eu

FIG. 3

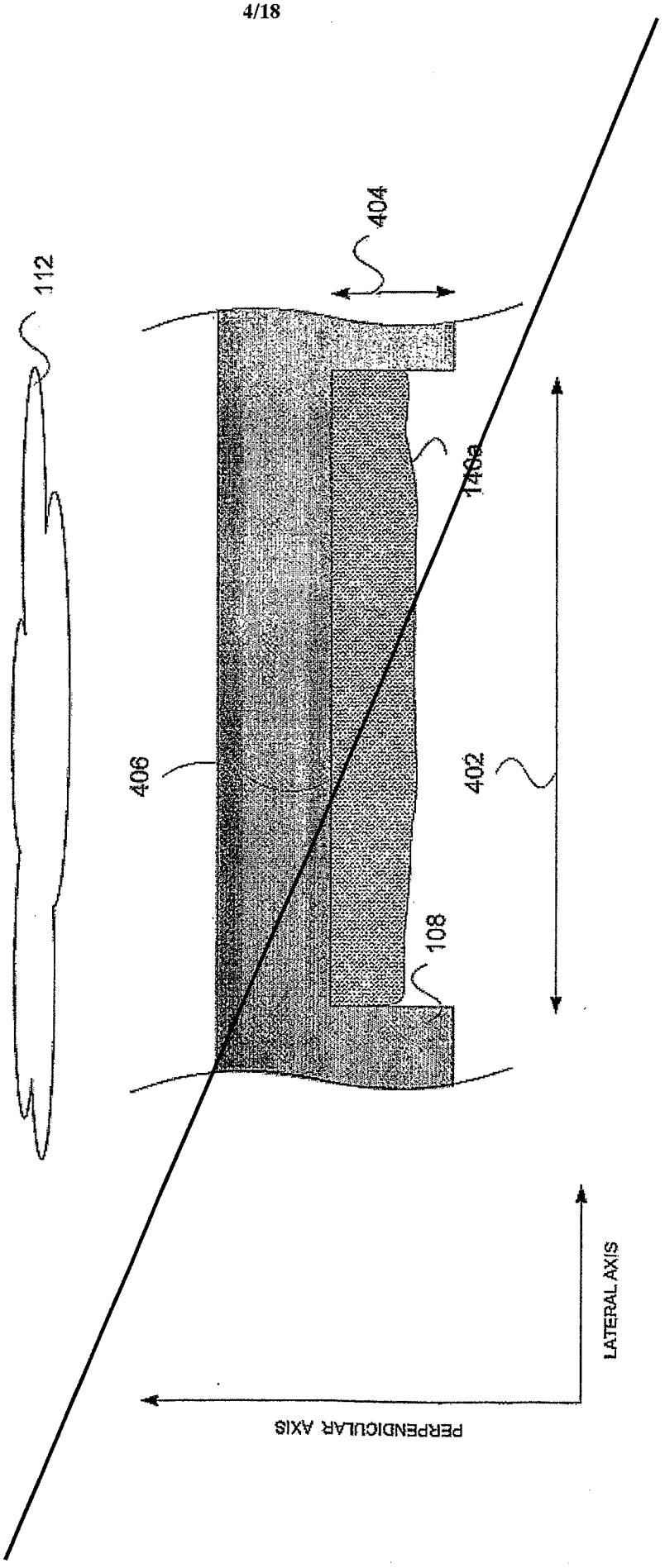


FIG. 4

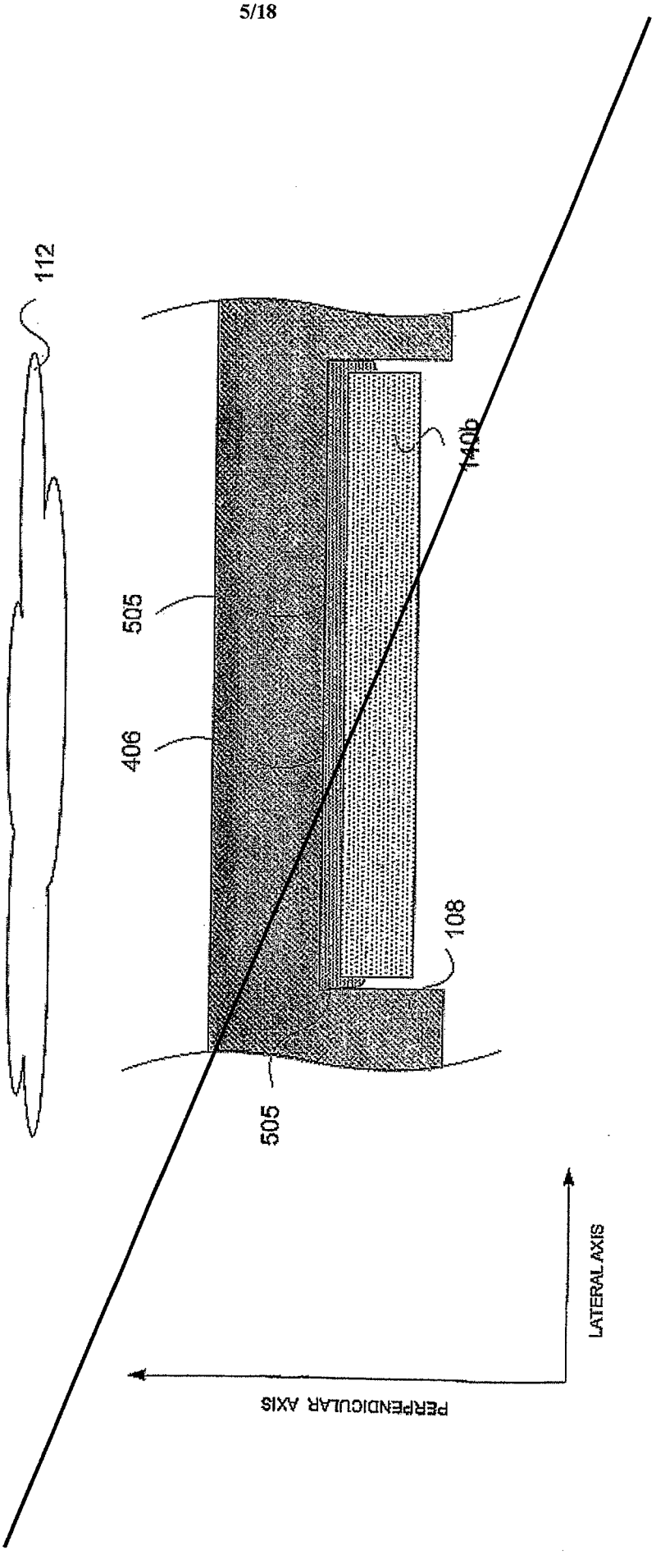


FIG. 5

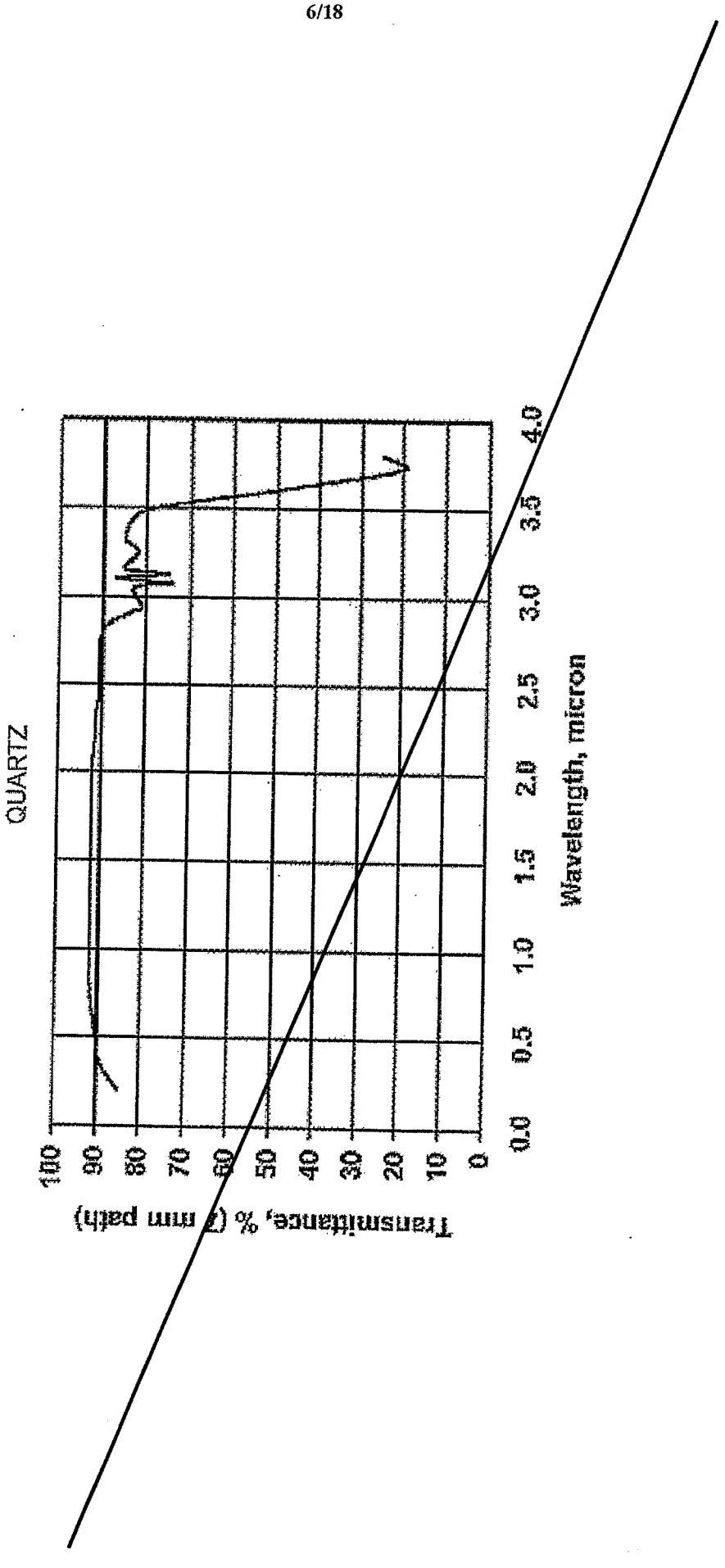

QUARTZ
Transmittance, % (2 mm path)
100
90
80
70
60
50
40
30
20
10
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Wavelength, micron

FIG. 6

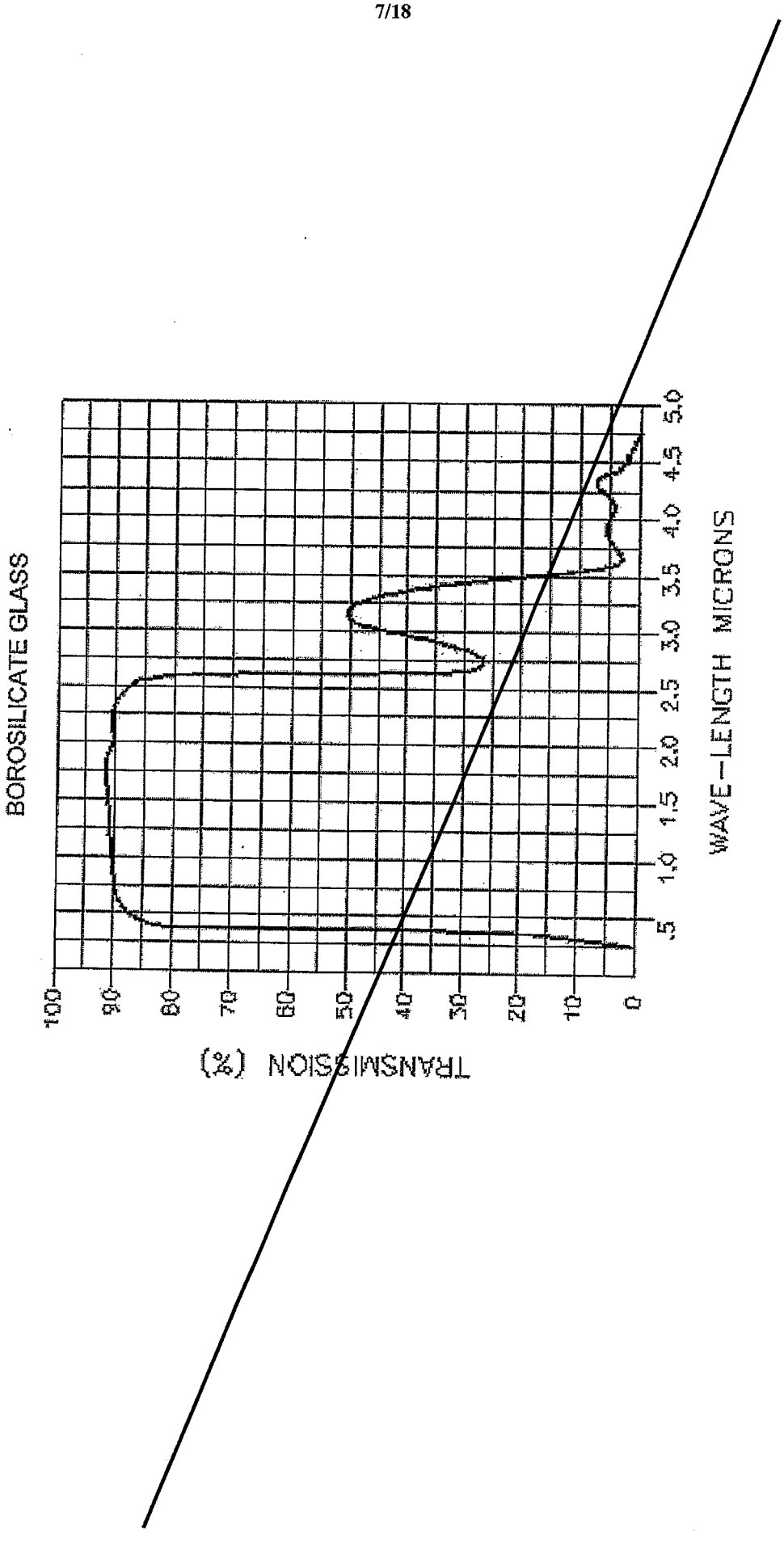

BOROSILICATE GLASS
TRANSMISSION (%)
100
90
80
70
60
50
40
30
20
10
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
WAVE-LENGTH MICRONS

FIG. 7

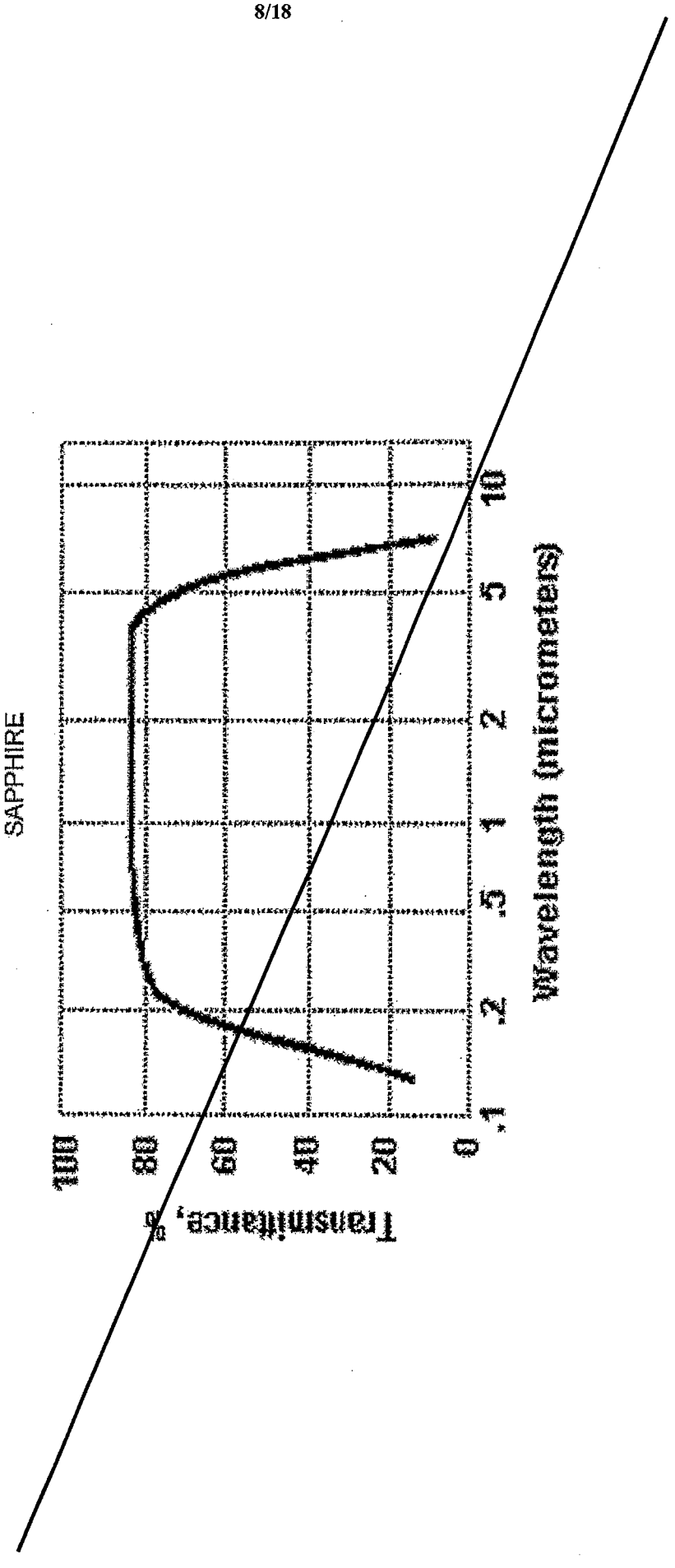

SAPPHIRE
Transmittance, %
100
80
60
40
20
0
.1
.2
.5
1
2
5
10
Wavelength (micrometers)

FIG. 8

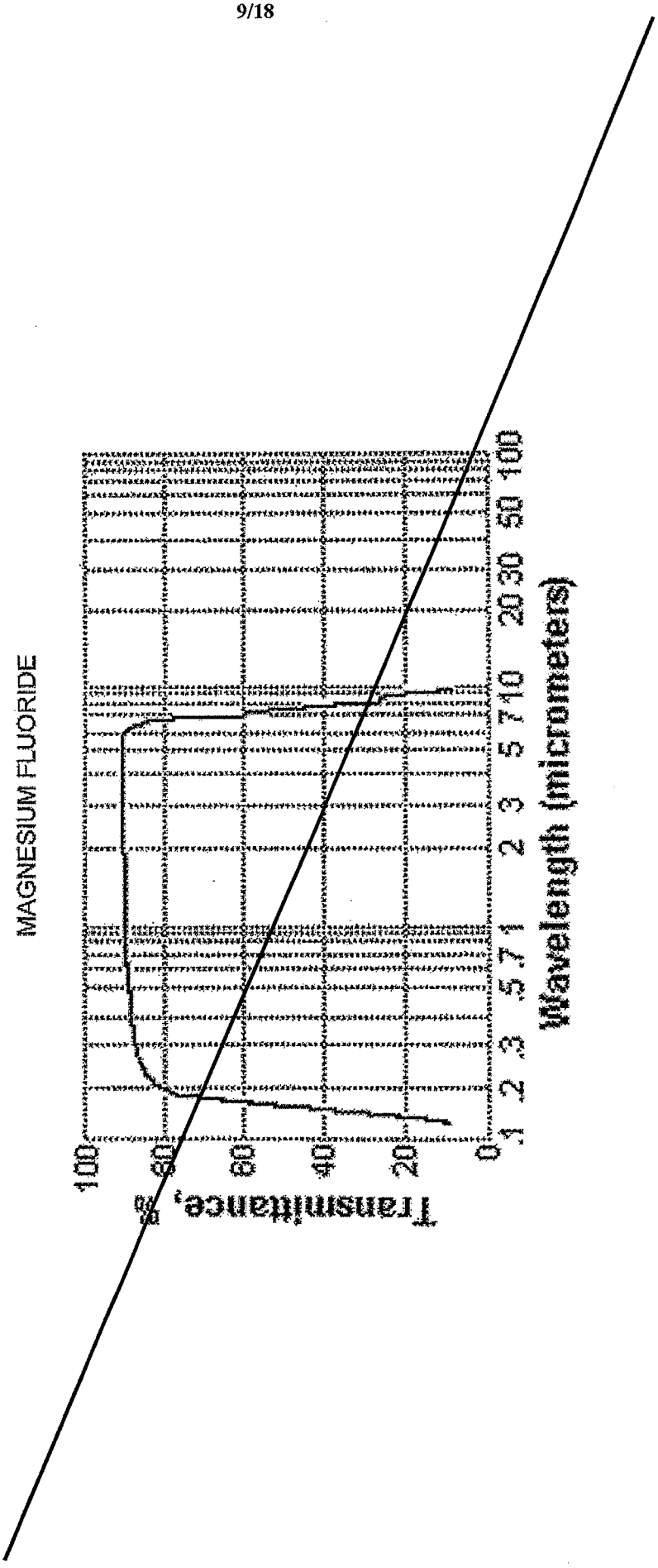

MAGNESIUM FLUORIDE
Transmittance, %
100
80
60
40
20
0
.1 .2 .3 .5 .7 1 2 3 5 7 10 20 30 50 100
Wavelength (micrometers)

FIG. 9

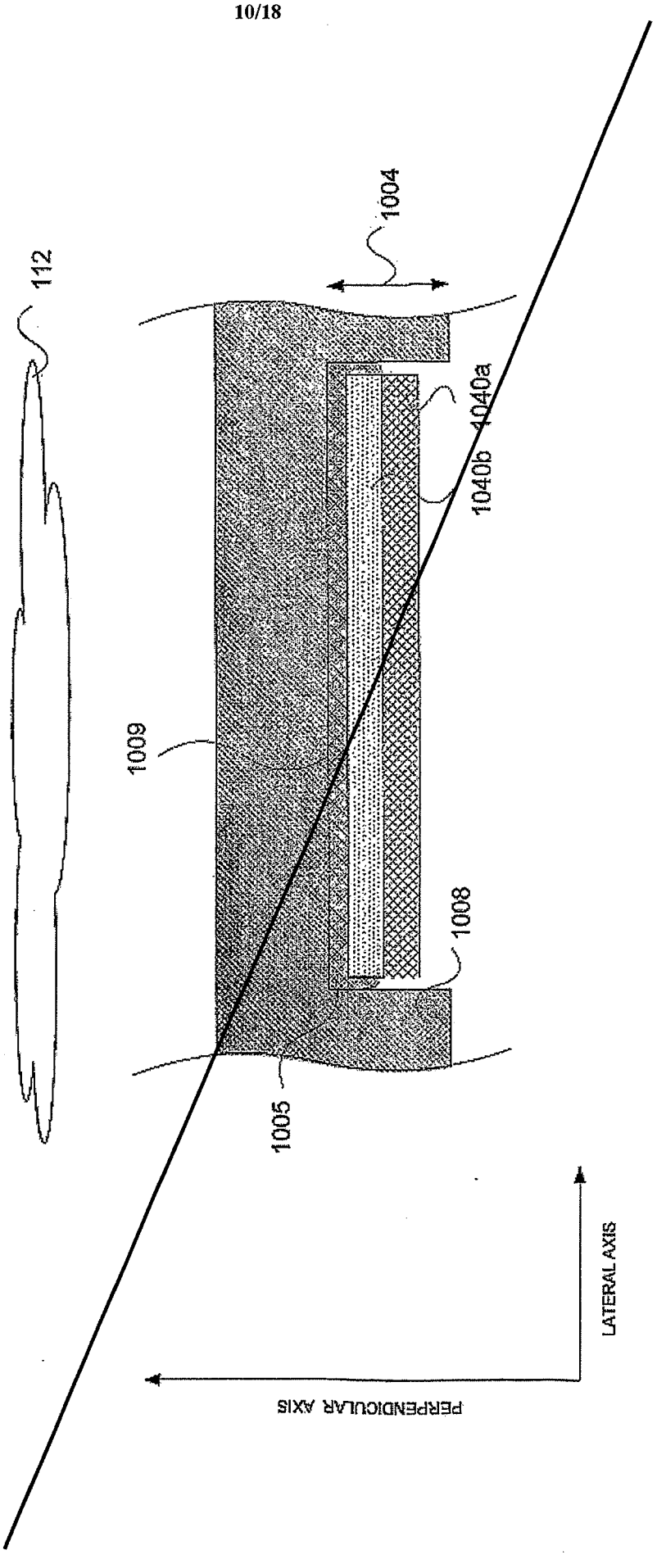

112
1004
1040a
1040b
1009
1008
1005
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 10A

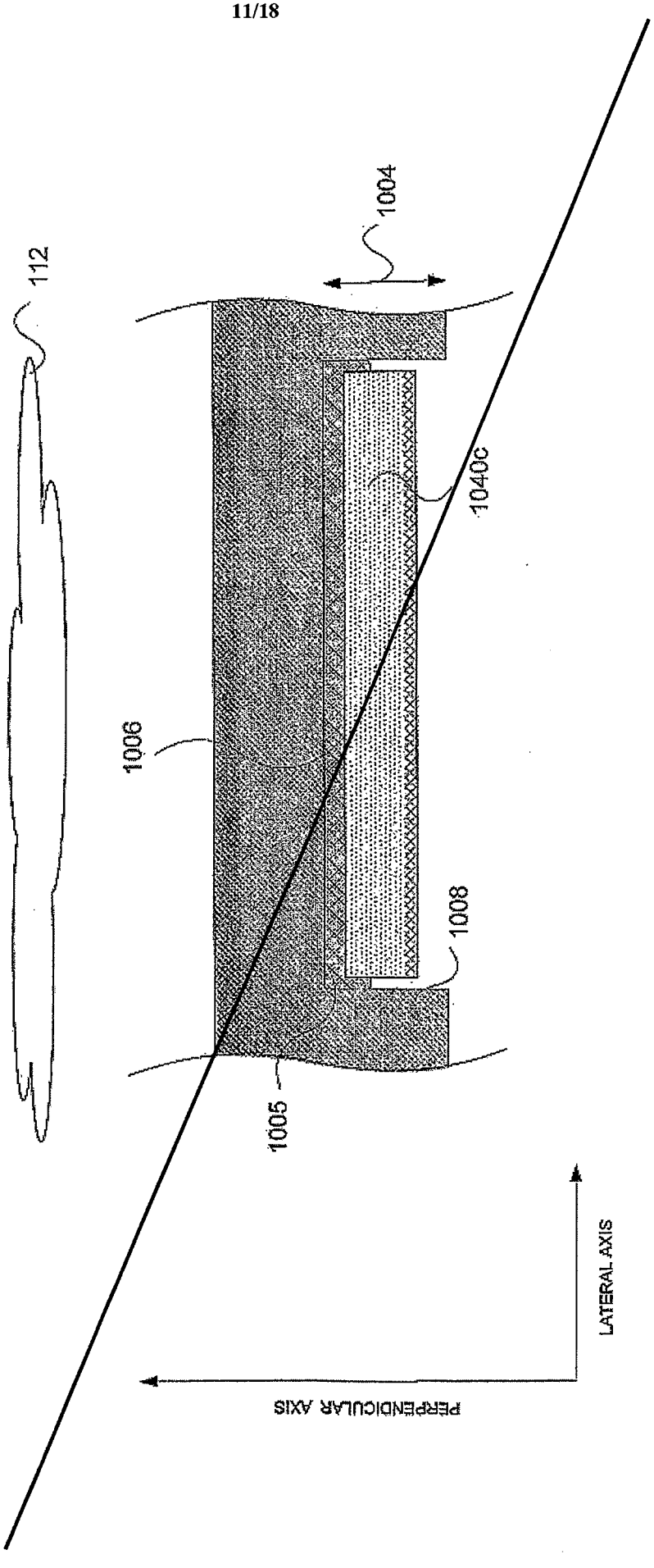

112
1004
1040c
1006
1008
1005
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 10B

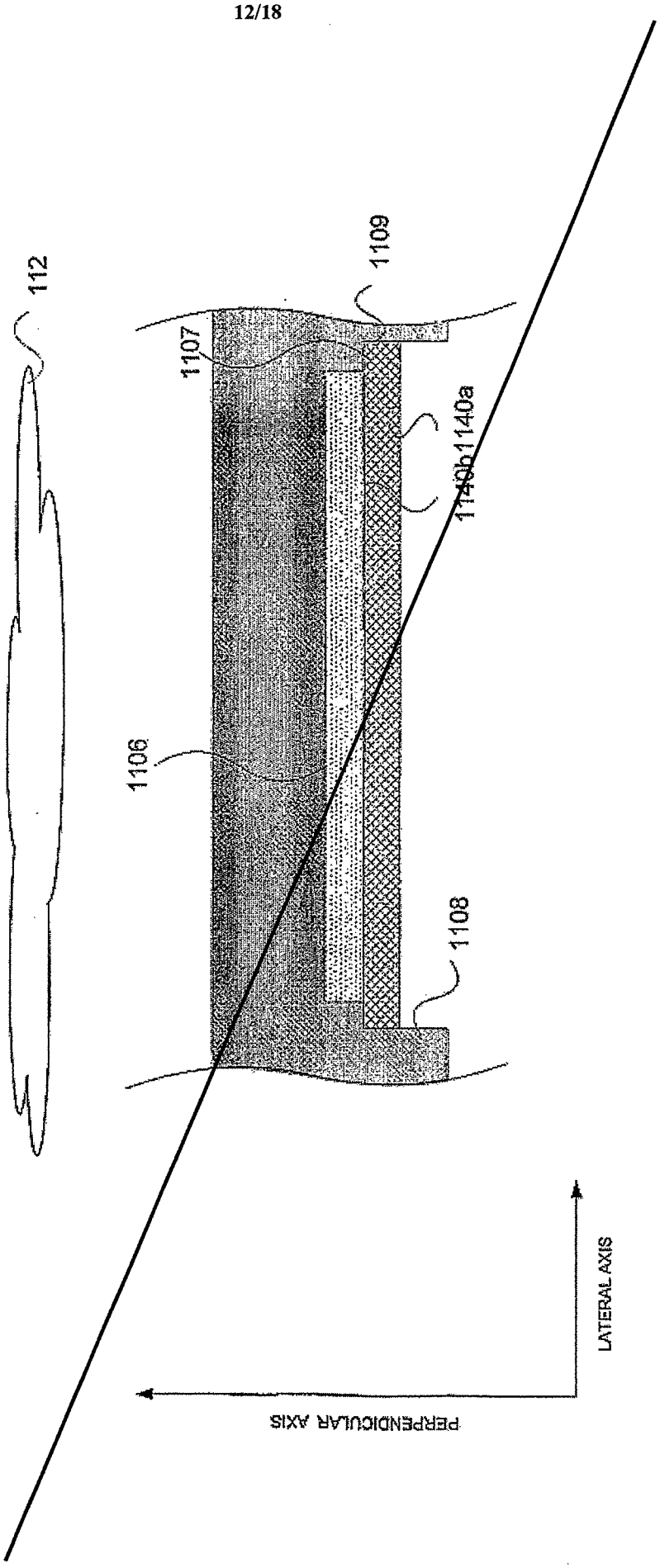

112
1109
1107
1140a
1140b
1106
1108
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 11A

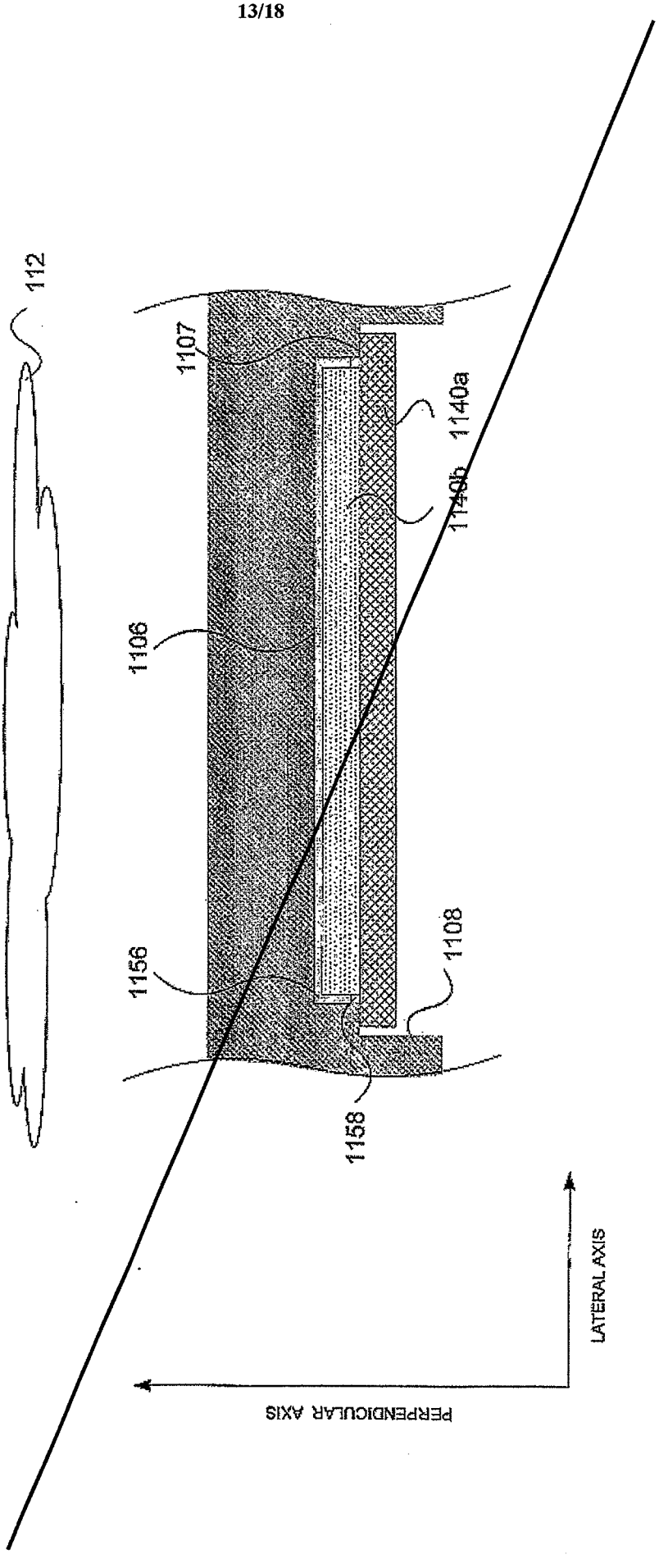

112
1107
1140a
1140b
1106
1156
1108
1158
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 11B

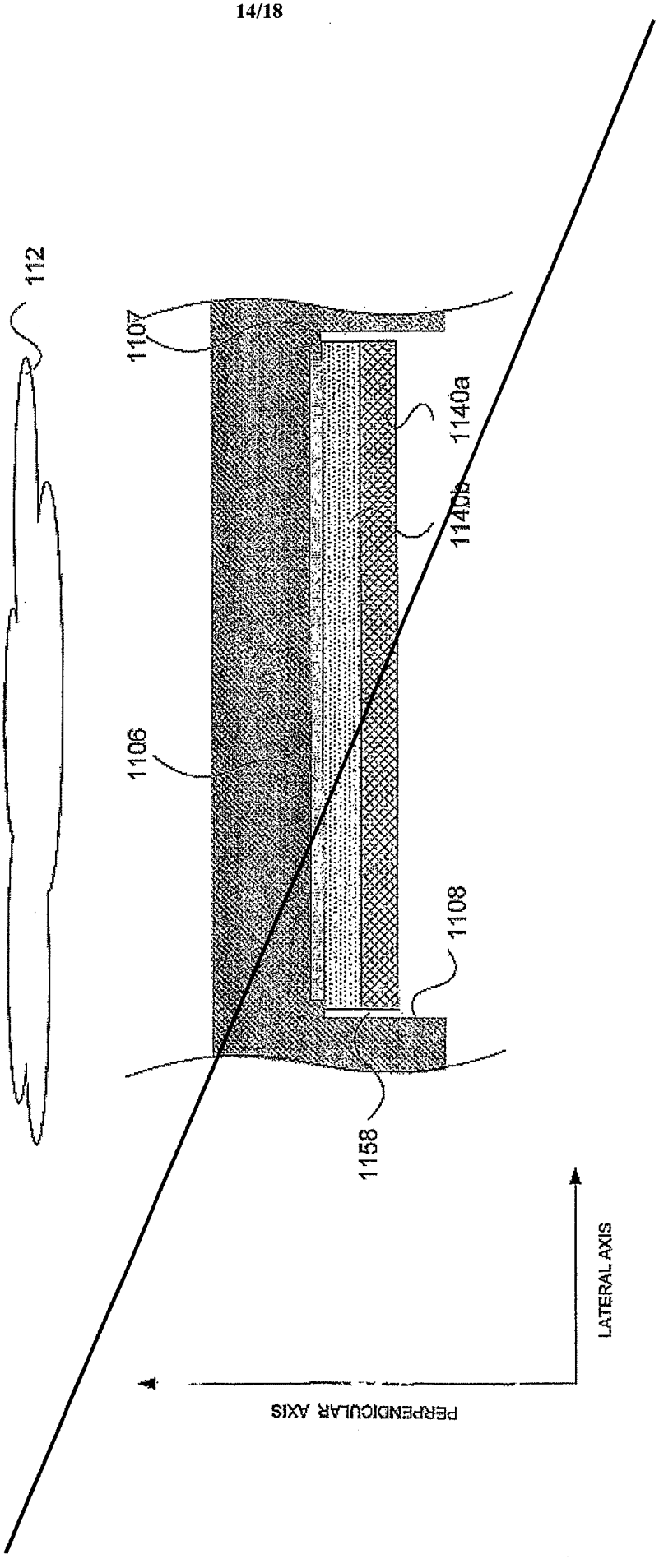

112
1107
1140a
1140b
1106
1108
1158
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 11C

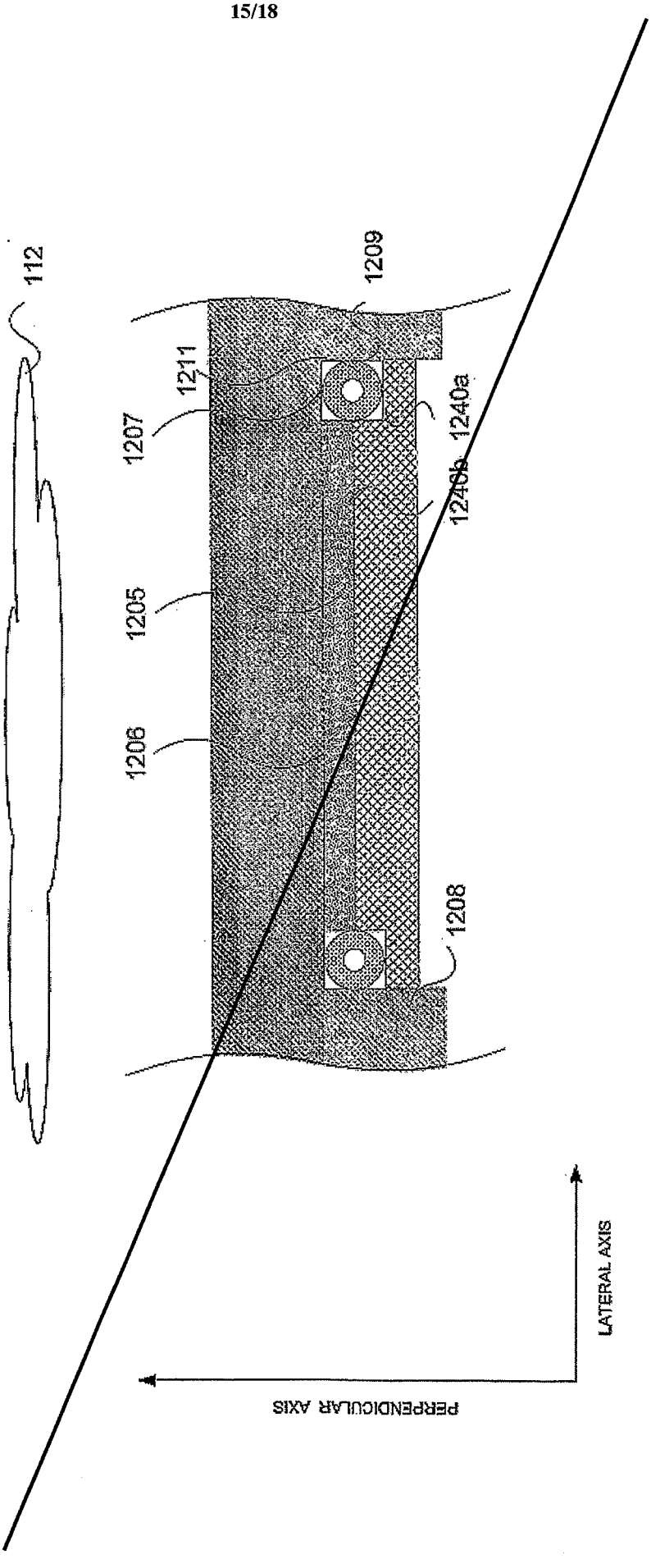

112
1209
1211
1207
1240a
1240b
1205
1206
1208
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 12

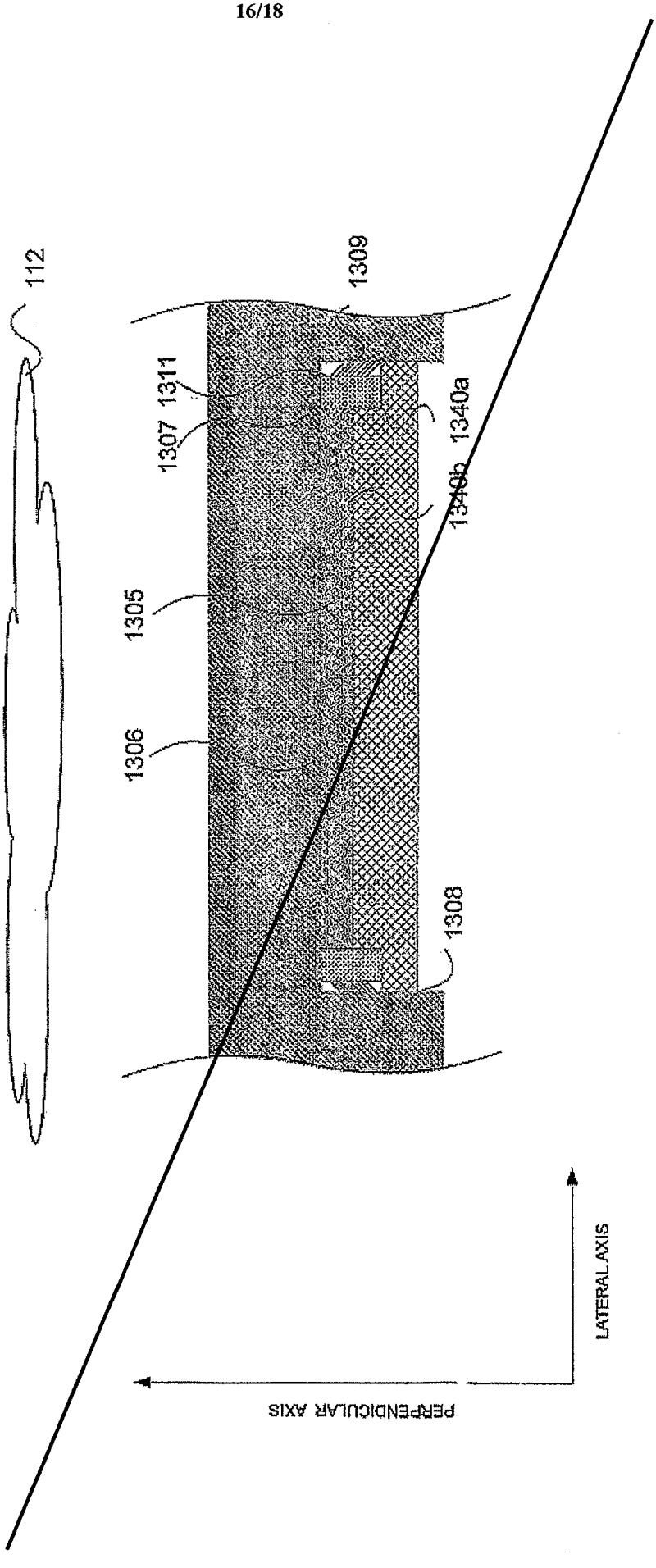

112
1309
1311
1307
1340a
1340b
1305
1306
1308
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 13

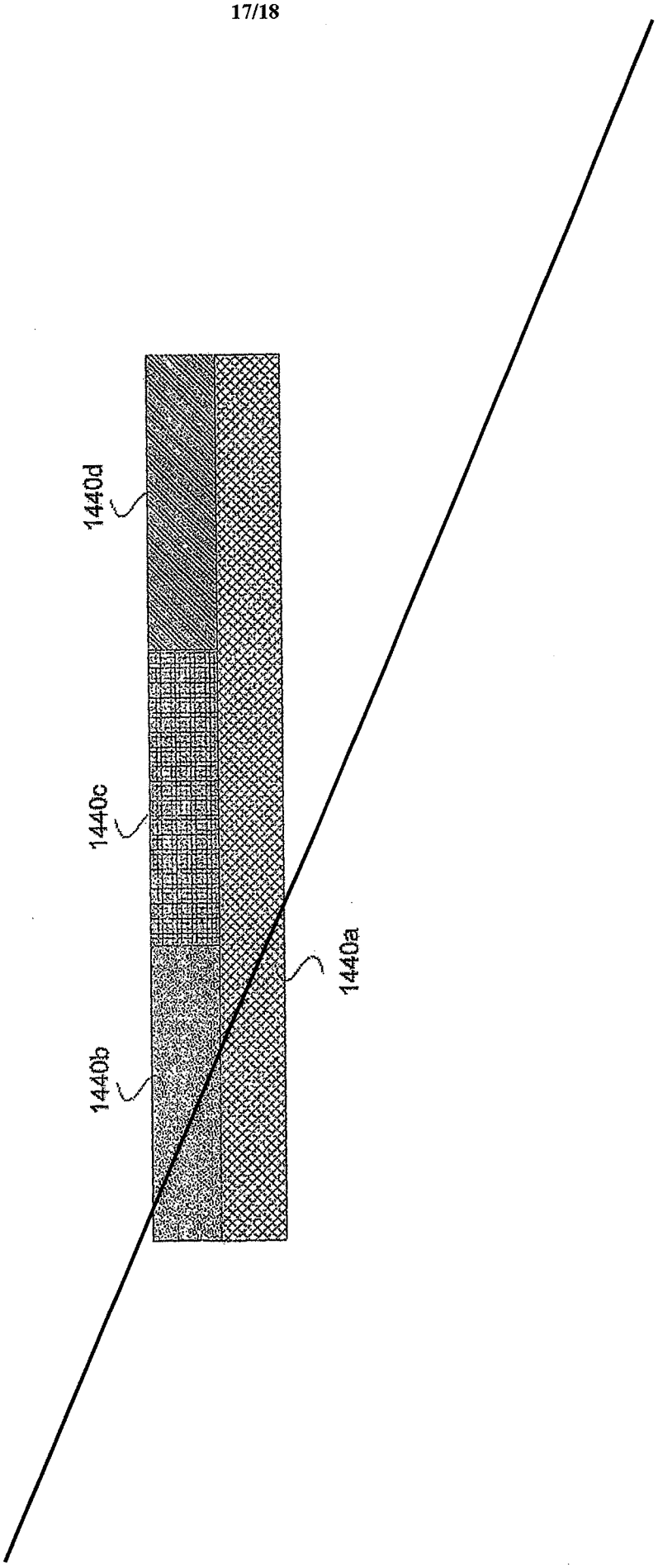


FIG. 14

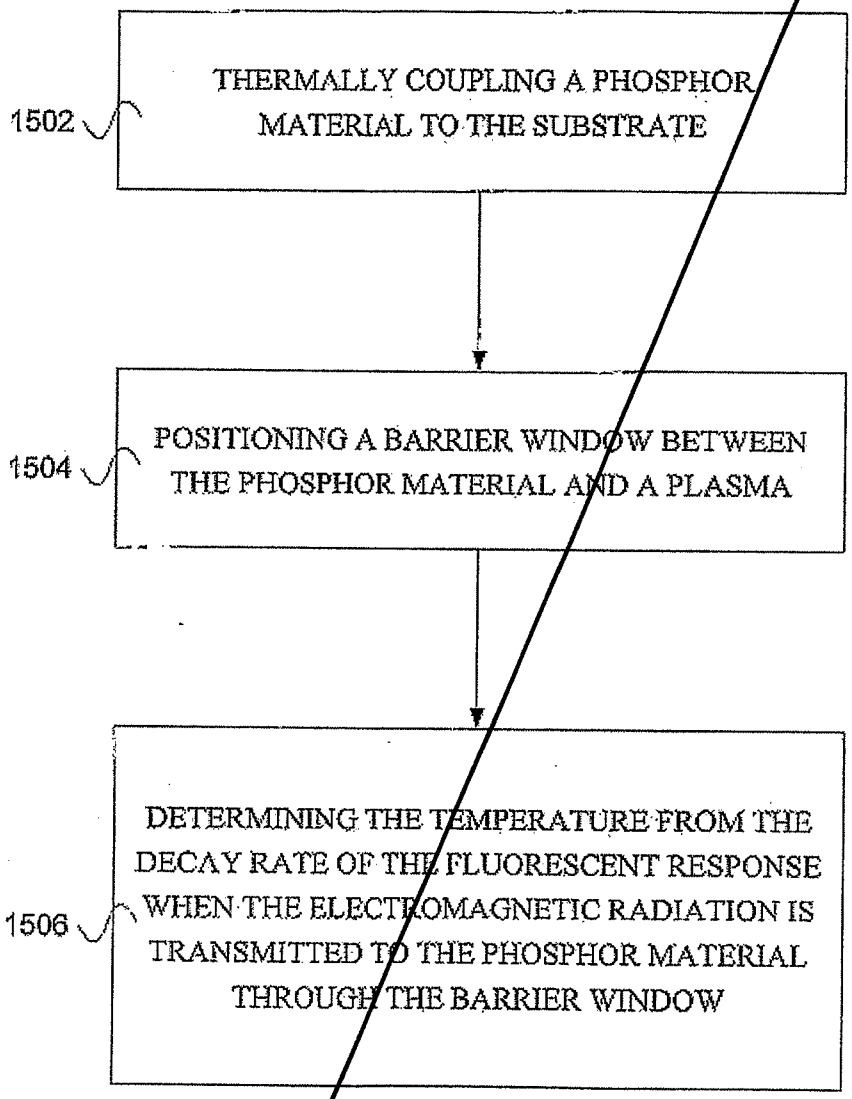

1502
THERMALLY COUPLING A PHOSPHOR MATERIAL TO THE SUBSTRATE
1504
POSITIONING A BARRIER WINDOW BETWEEN THE PHOSPHOR MATERIAL AND A PLASMA
1506
DETERMINING THE TEMPERATURE FROM THE DECAY RATE OF THE FLUORESCENT RESPONSE WHEN THE ELECTROMAGNETIC RADIATION IS TRANSMITTED TO THE PHOSPHOR MATERIAL THROUGH THE BARRIER WINDOW

FIG. 15

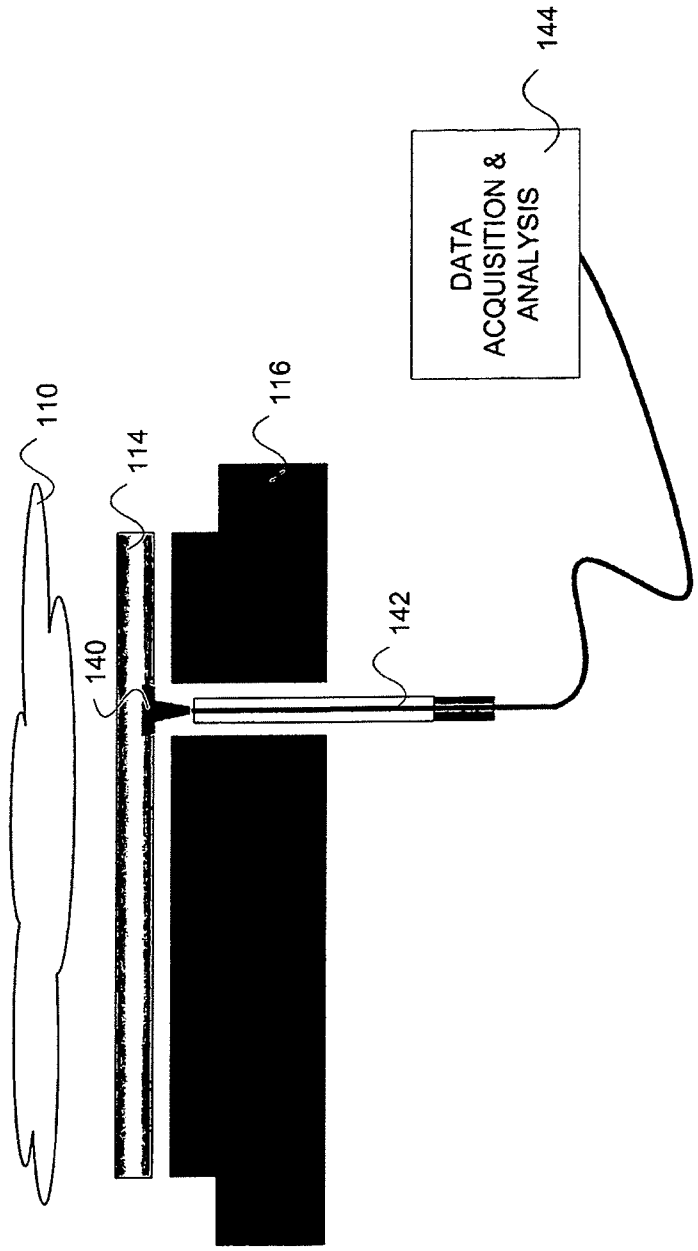


FIG. 1

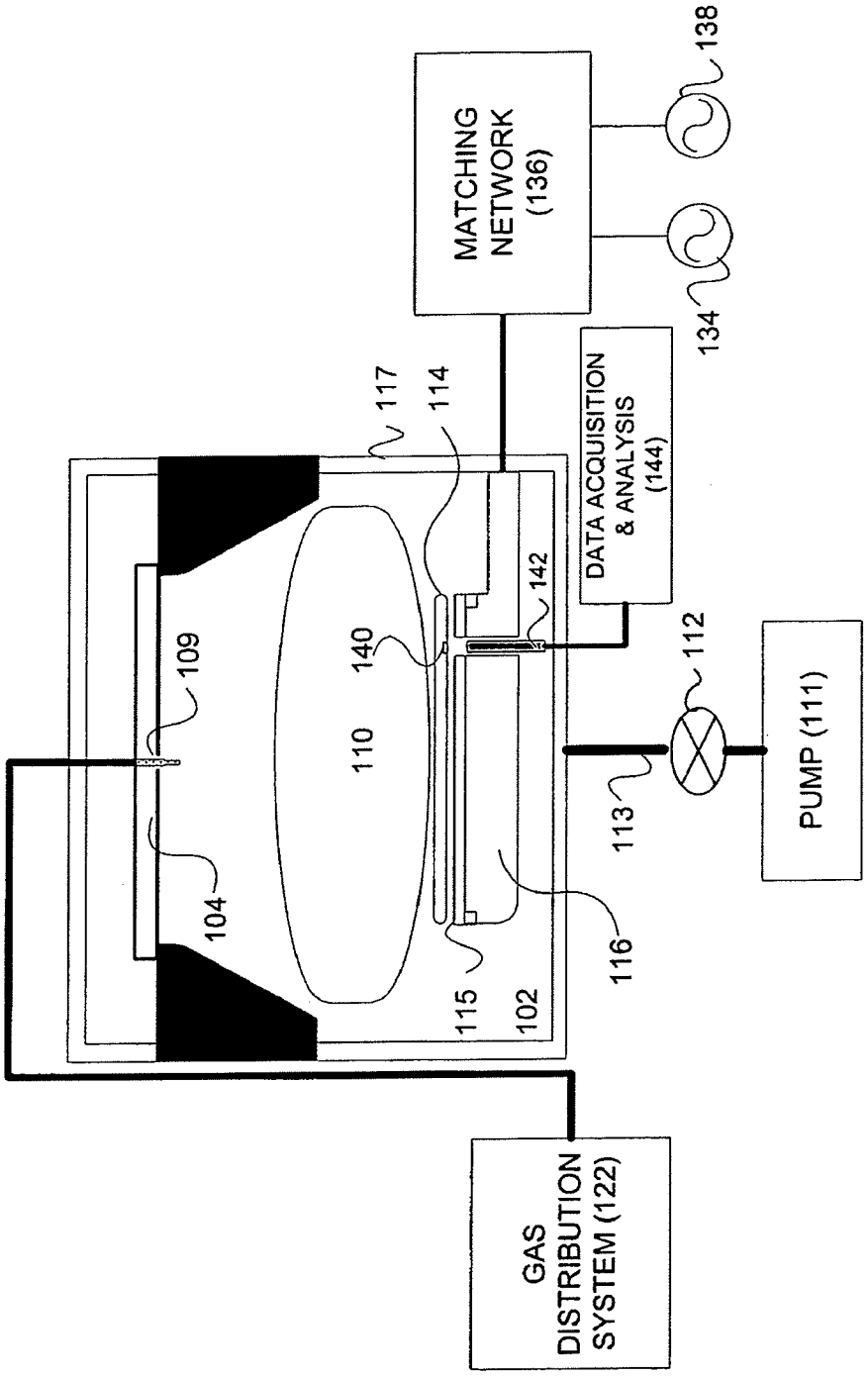

MATCHING NETWORK (136)
138
134
DATA ACQUISITION & ANALYSIS (144)
117
114
142
140
109
110
112
113
104
116
115
102
PUMP (111)
GAS DISTRIBUTION SYSTEM (122)

FIG. 2

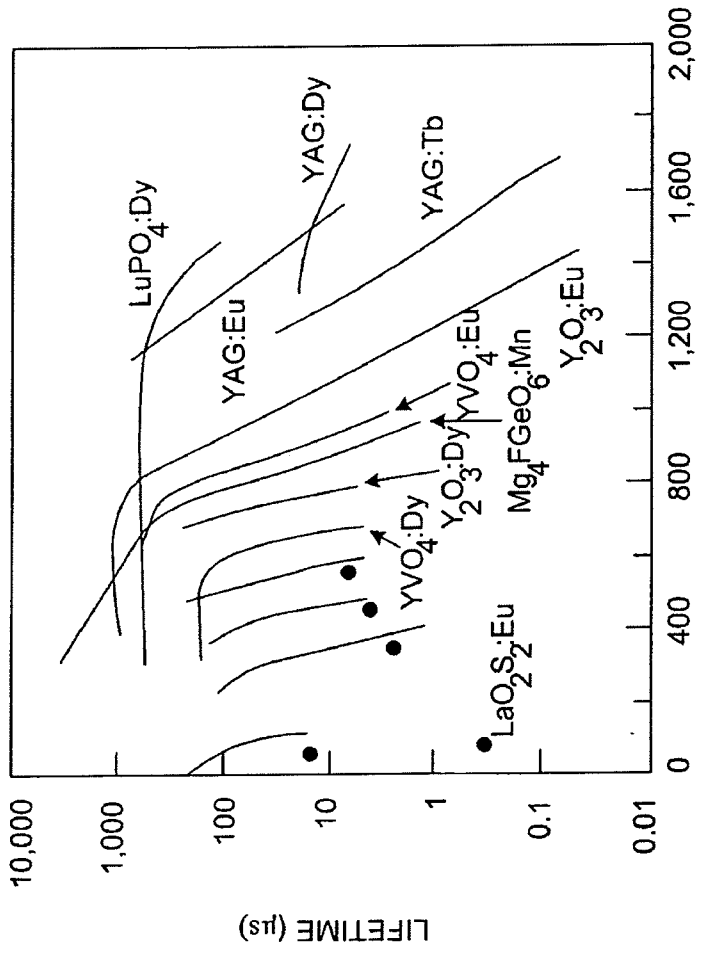

LIFETIME (μs)
10,000
1,000
100
10
1
0.1
0.01
0
400
800
1,200
1,600
2,000
TEMPERATURE (KELVIN)
LuPO4:Dy
YAG:Eu
YAG:Dy
YAG:Tb
YVO4:Dy
Y2O3:Dy
YVO4:Eu
Mg4FGeO6:Mn
Y2O3:Eu
La2O2S:Eu

FIG. 3

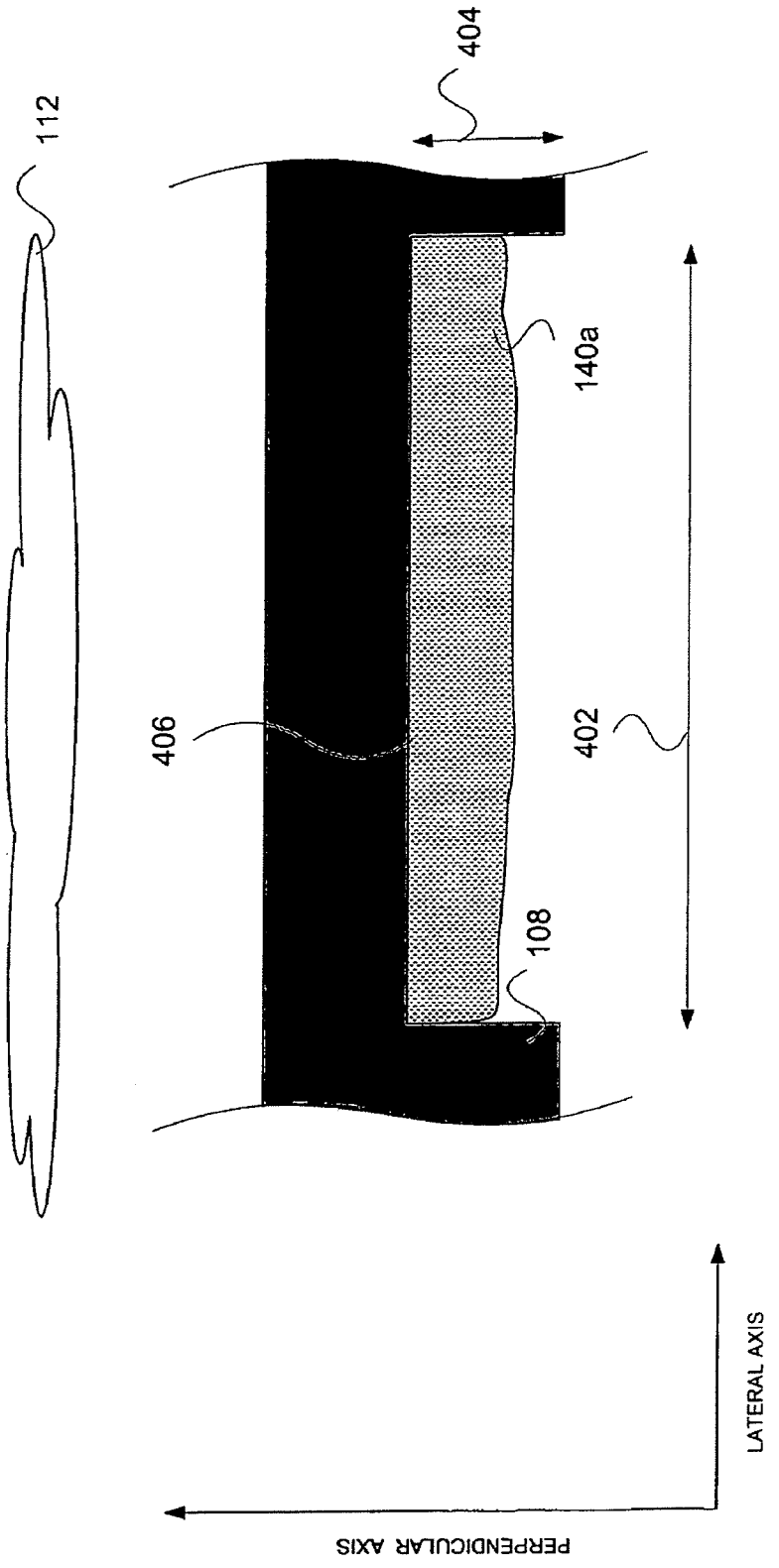


FIG. 4

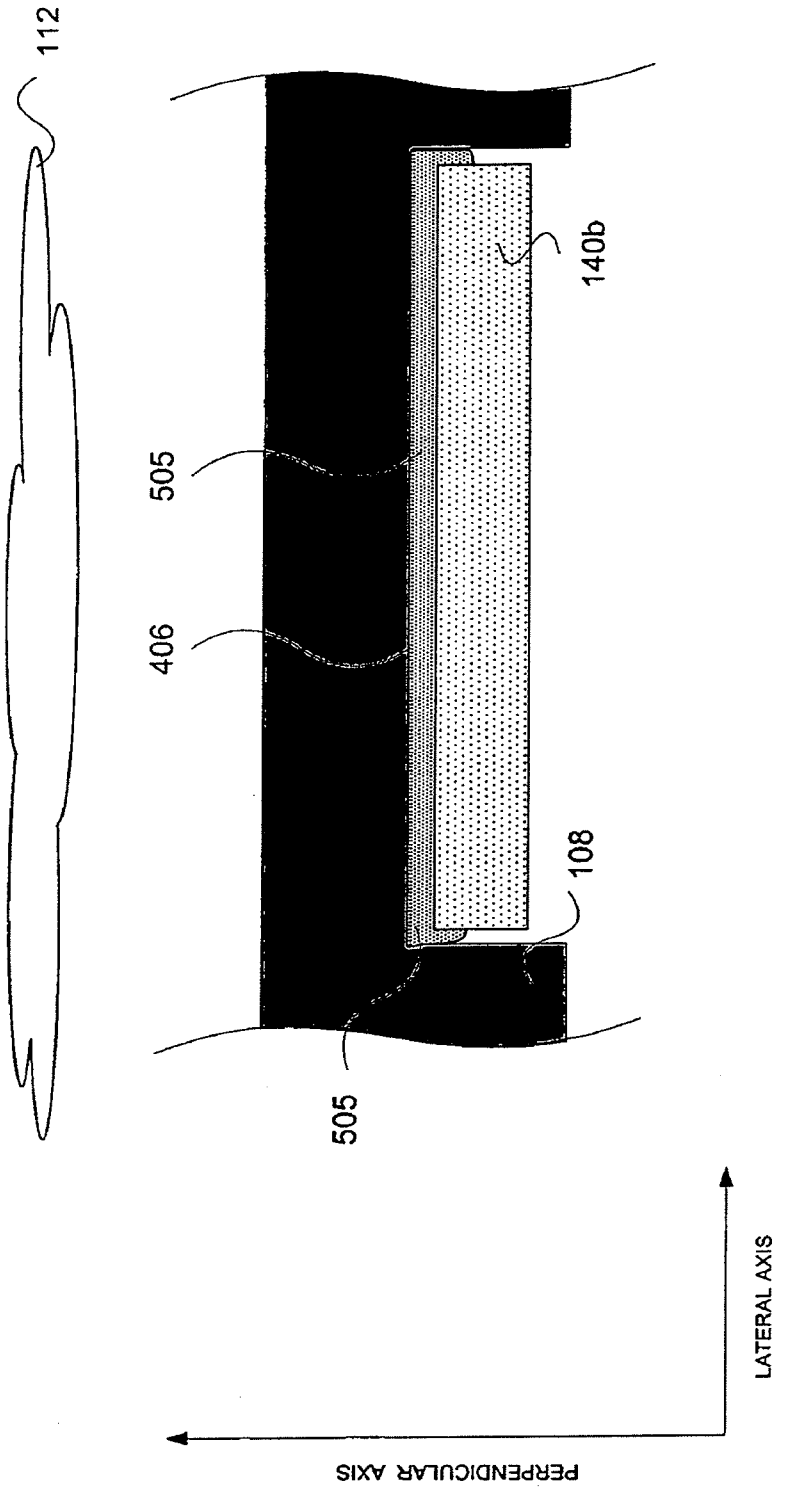


FIG. 5

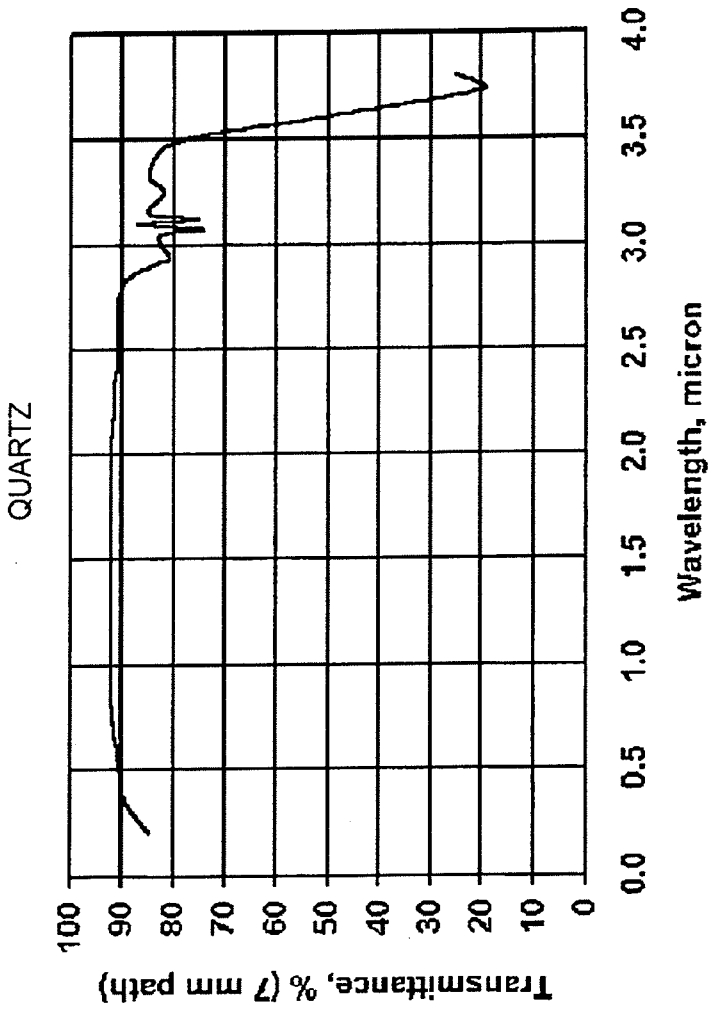

QUARTZ
Transmittance, % (7 mm path)
100
90
80
70
60
50
40
30
20
10
0
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
Wavelength, micron

FIG. 6

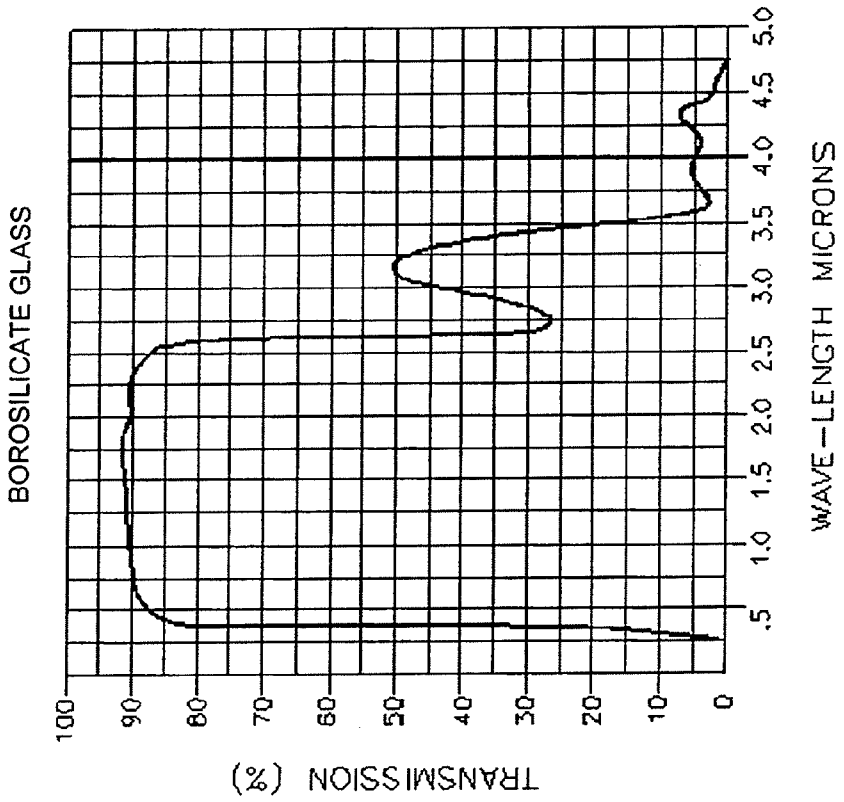

BOROSILICATE GLASS
TRANSMISSION (%)
100
90
80
70
60
50
40
30
20
10
0
.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
WAVE-LENGTH MICRONS

FIG. 7

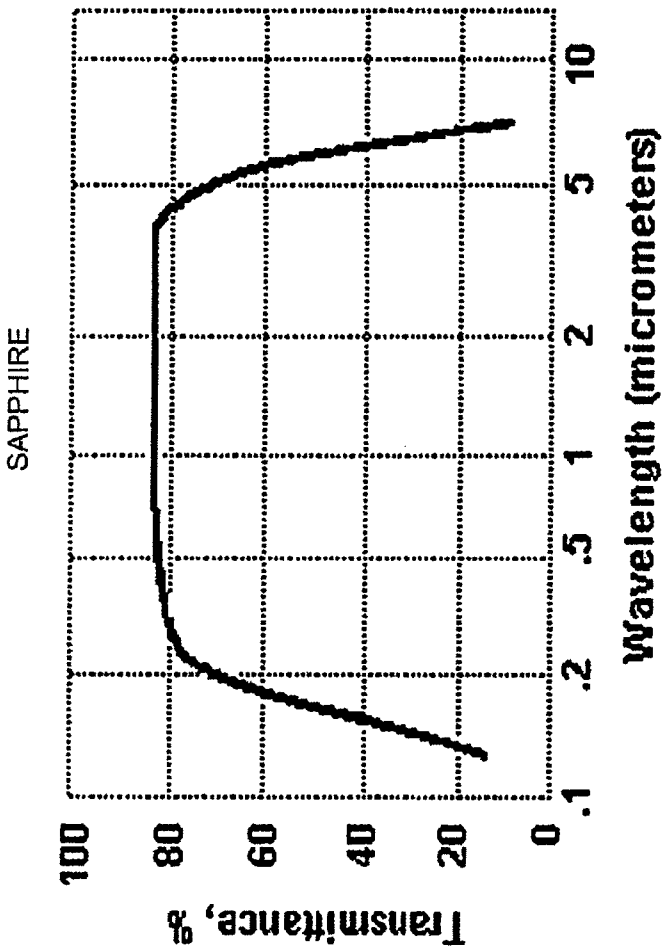

SAPPHIRE
Transmittance, %
100
80
60
40
20
0
.1
.2
.5
1
2
5
10
Wavelength (micrometers)

FIG. 8

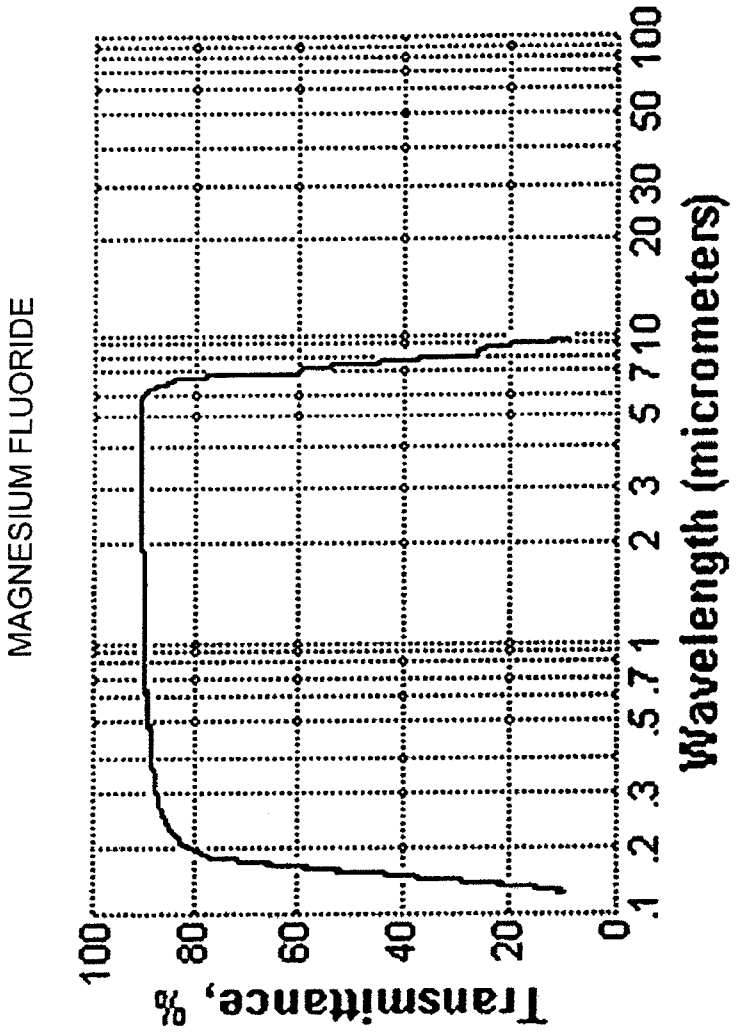

MAGNESIUM FLUORIDE
Transmittance, %
100
80
60
40
20
0
.1 .2 .3 .5 .7 1 2 3 5 7 10 20 30 50 100
Wavelength (micrometers)

FIG. 9

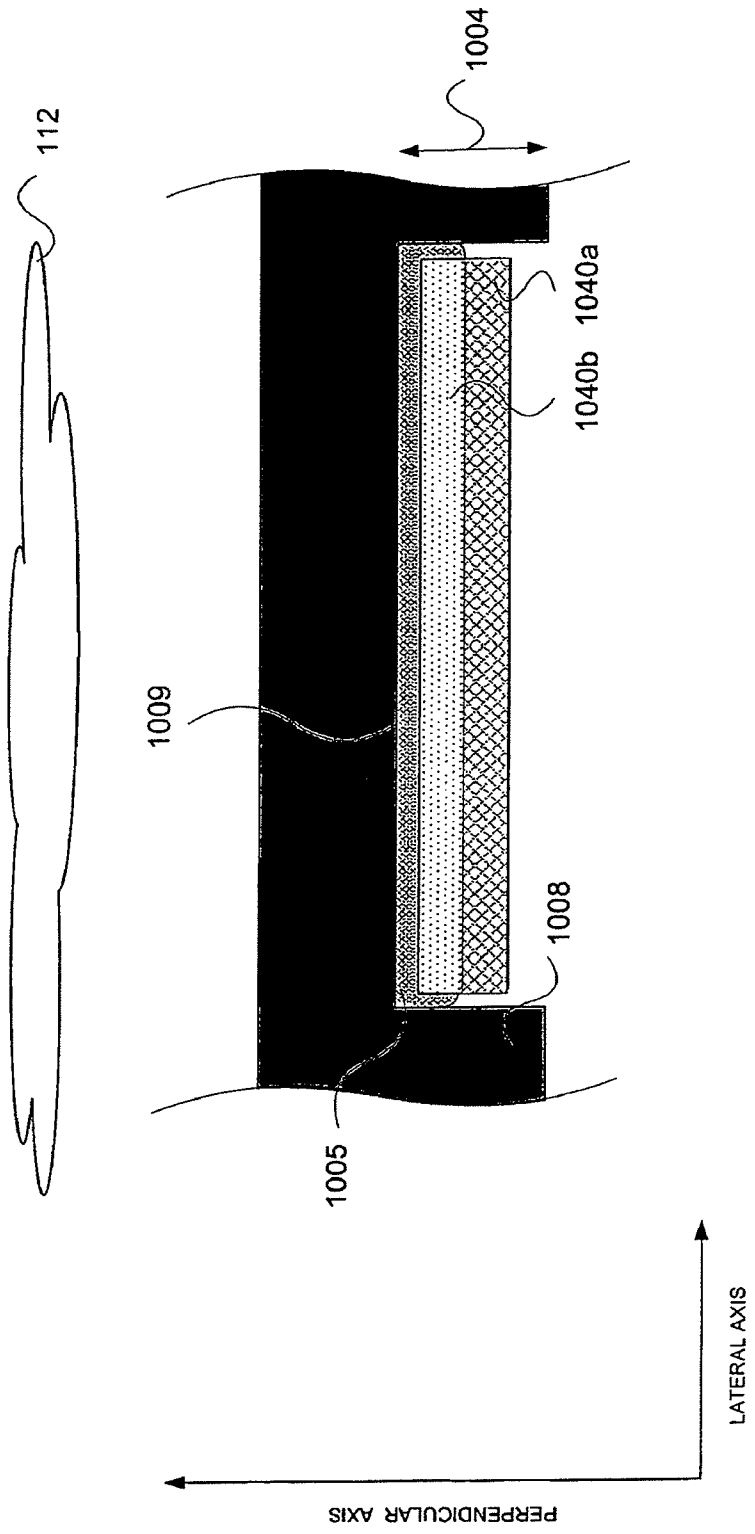

112
1004
1040a
1040b
1009
1008
1005
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 10A

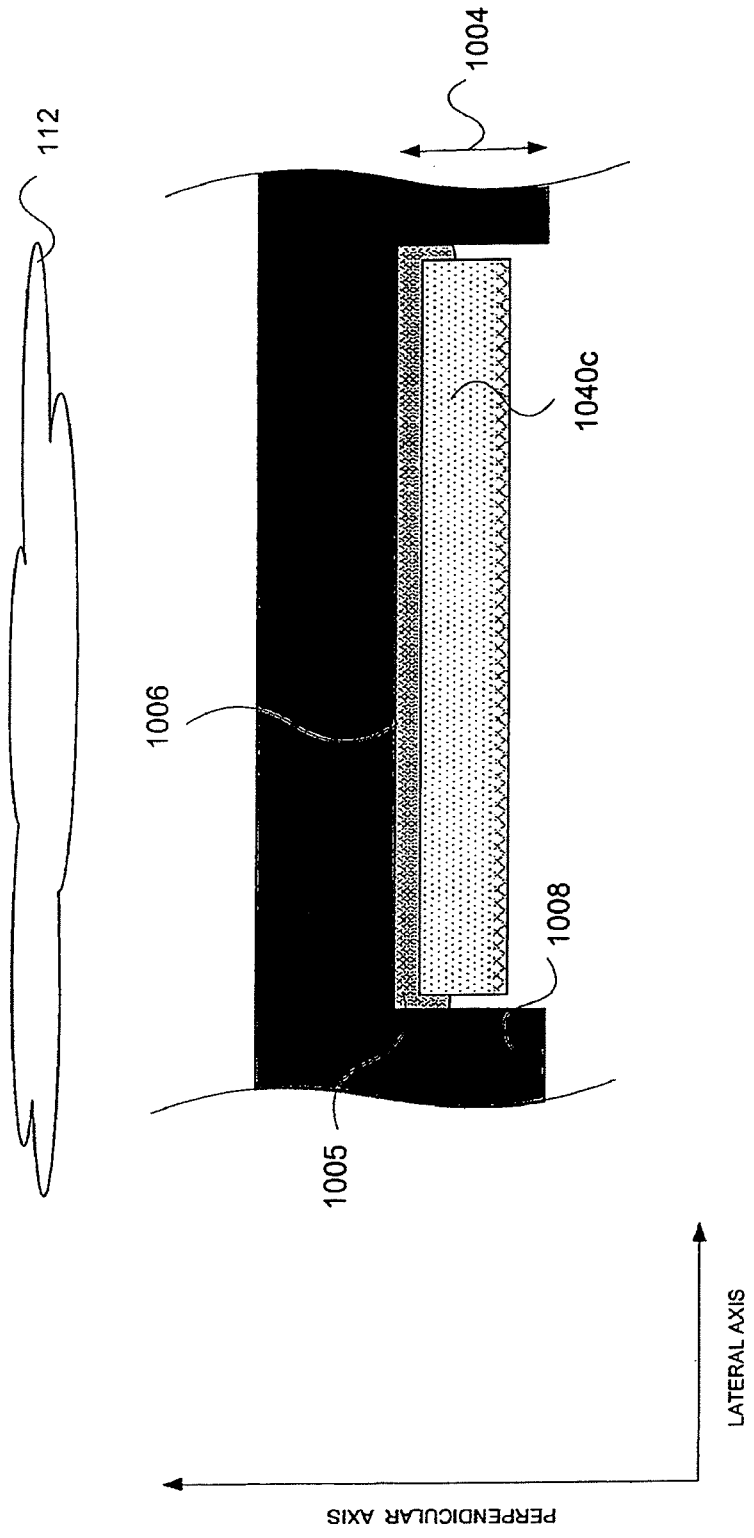

112
1004
1040c
1006
1008
1005
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 10B

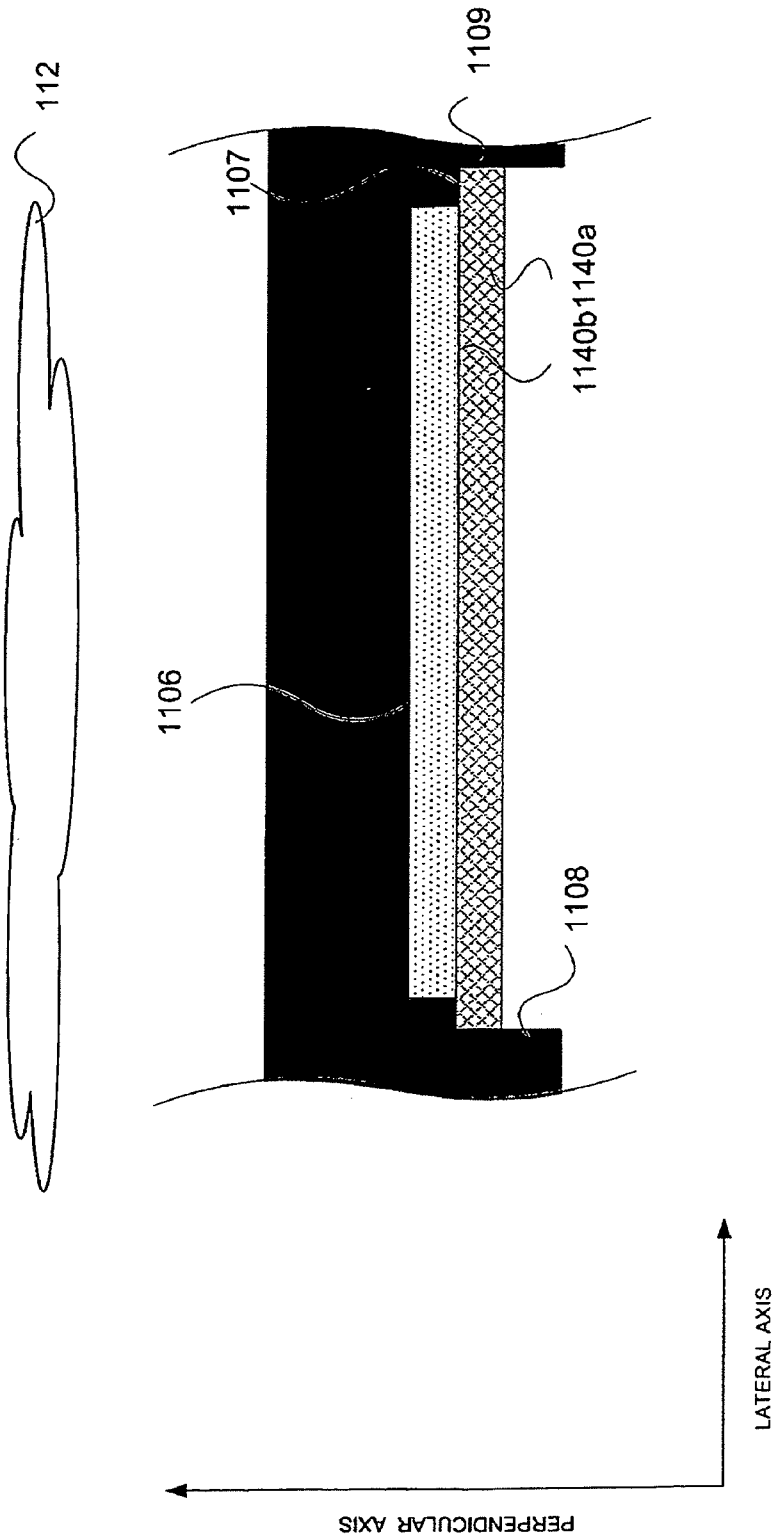

112
1109
1107
1140b1140a
1106
1108
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 11A

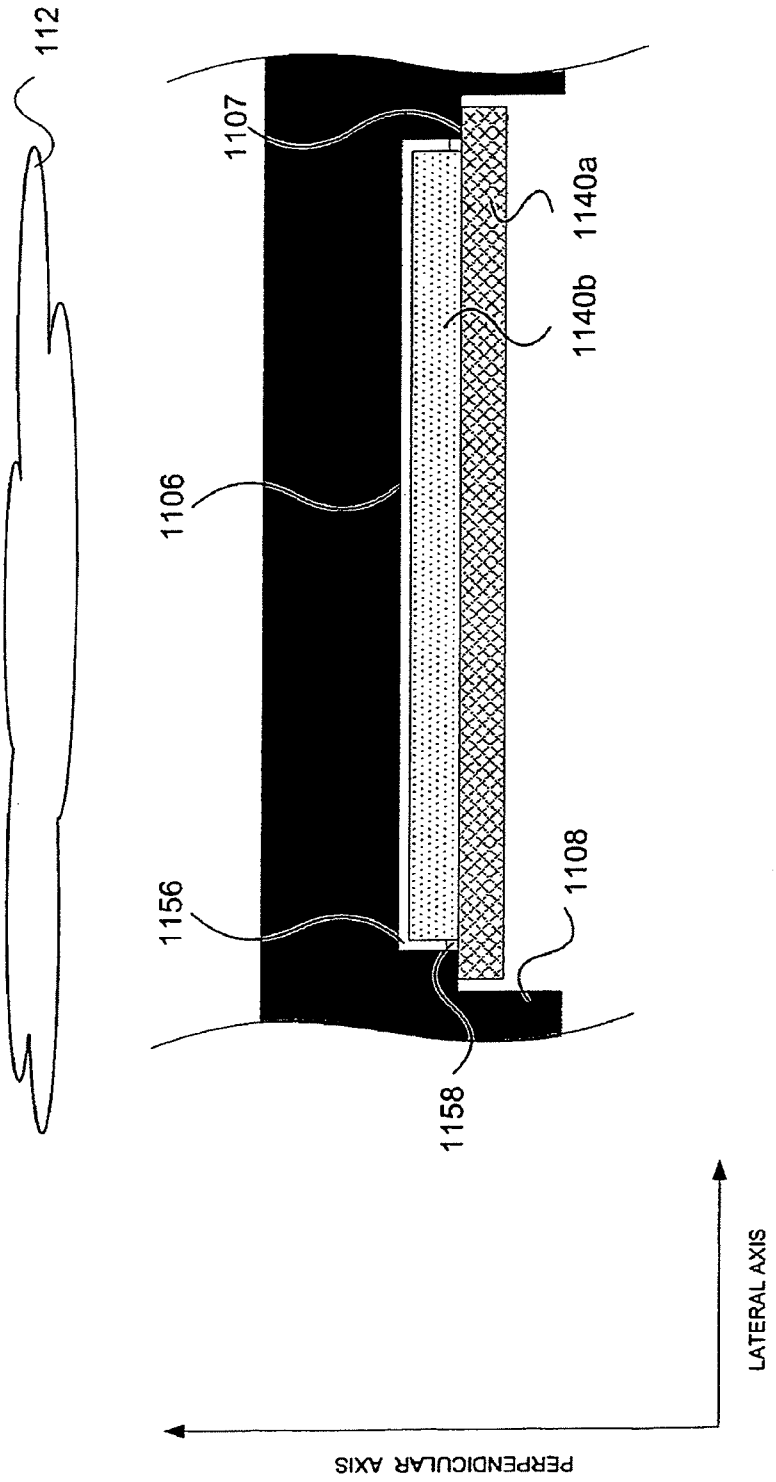

112
1107
1140a
1140b
1106
1156
1108
1158
PERPENDICULAR AXIS
LATERAL AXIS

FIG. 11B

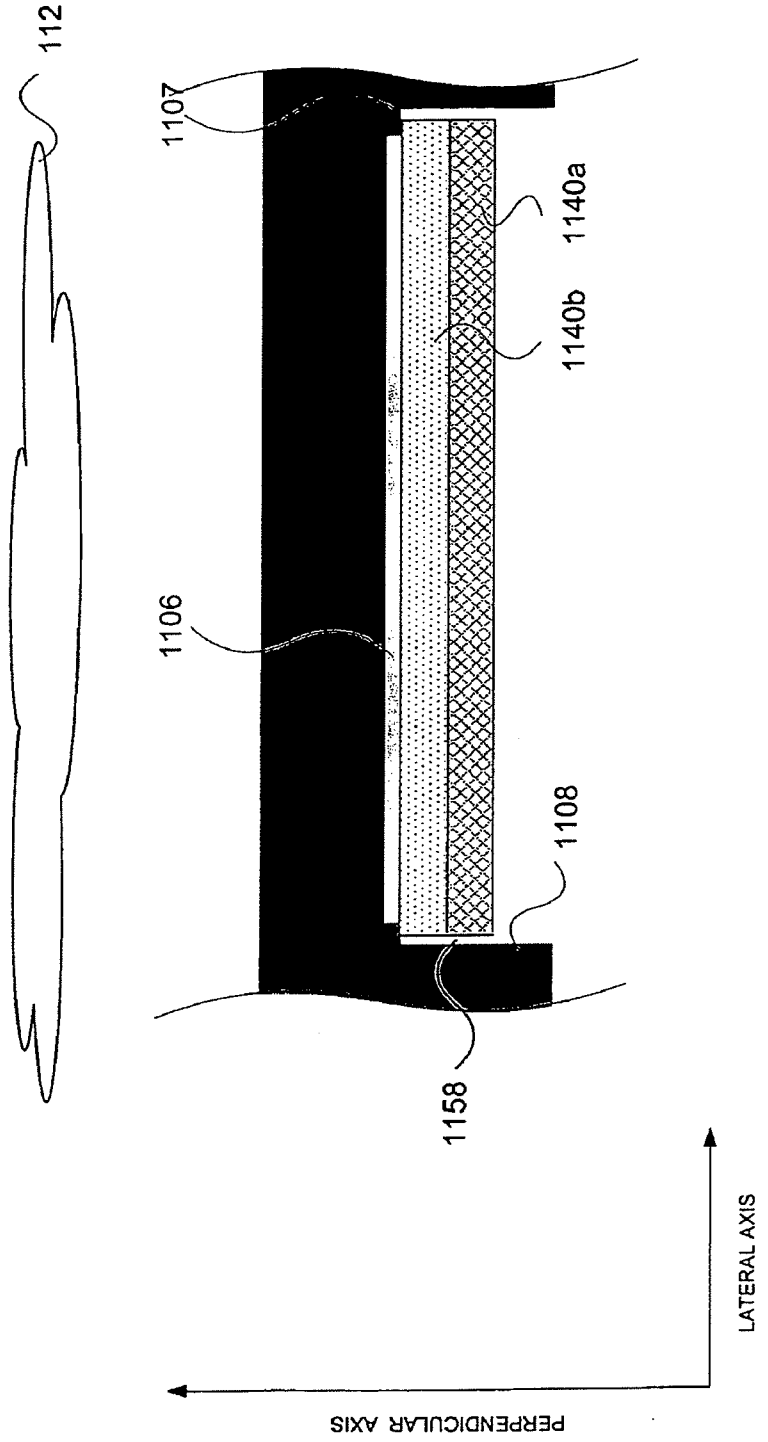

112
1107
1140a
1140b
1106
1108
1158
PERPENDICULAR AXIS
LATERAL AXIS

FIG. 11C

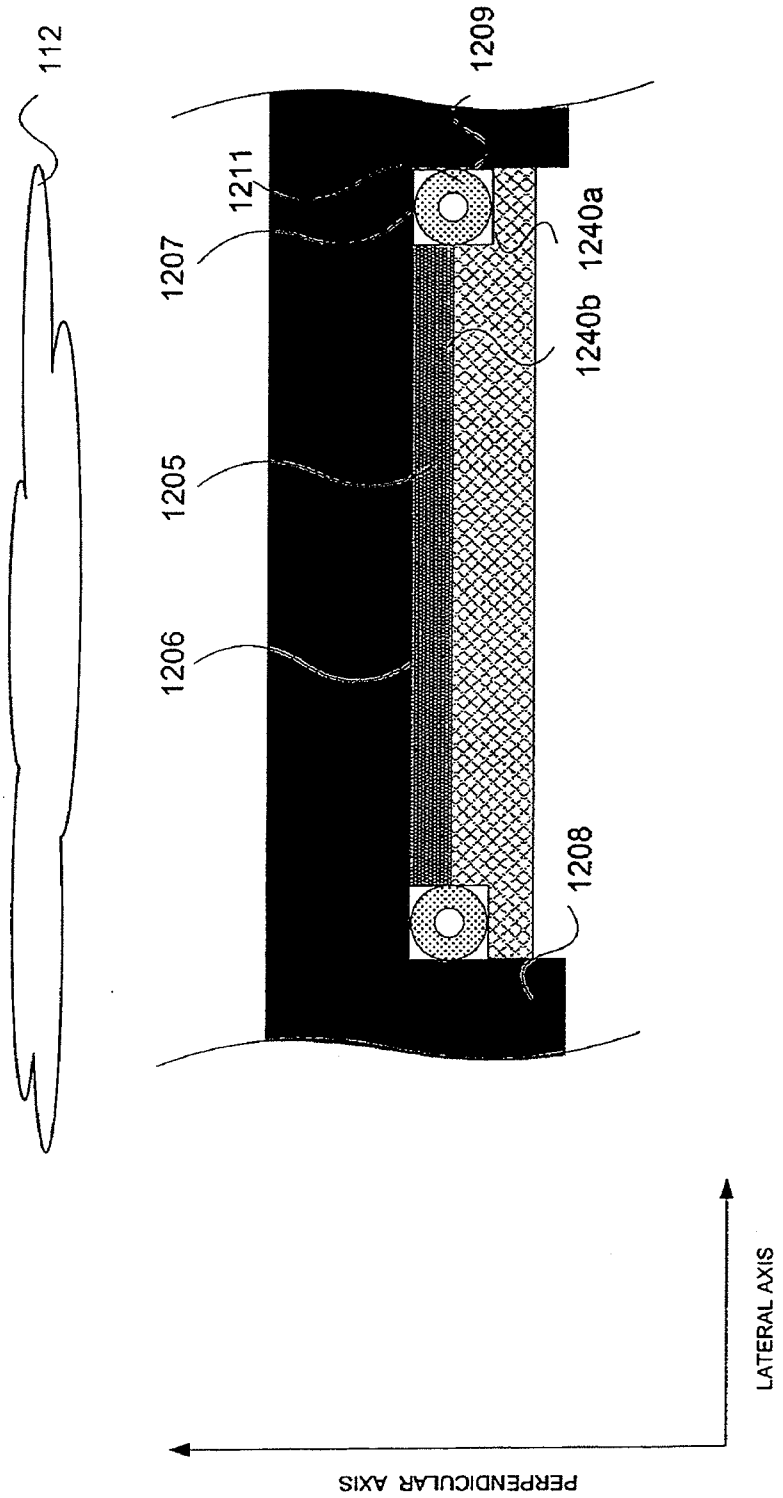

112
1209
1211
1207
1240a
1240b
1205
1206
1208
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 12

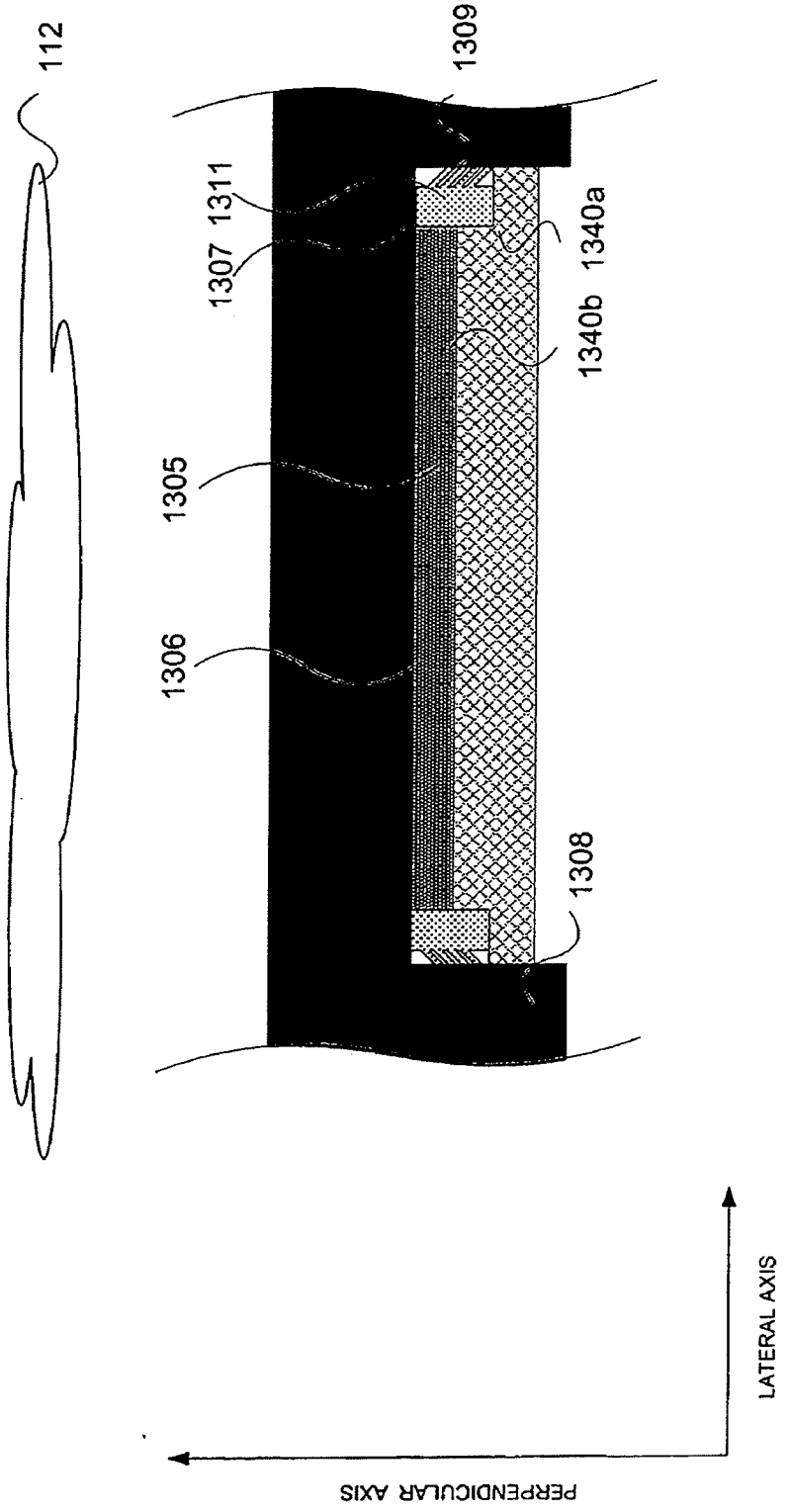

112
1309
1311
1307
1340a
1340b
1305
1306
1308
LATERAL AXIS
PERPENDICULAR AXIS

FIG. 13

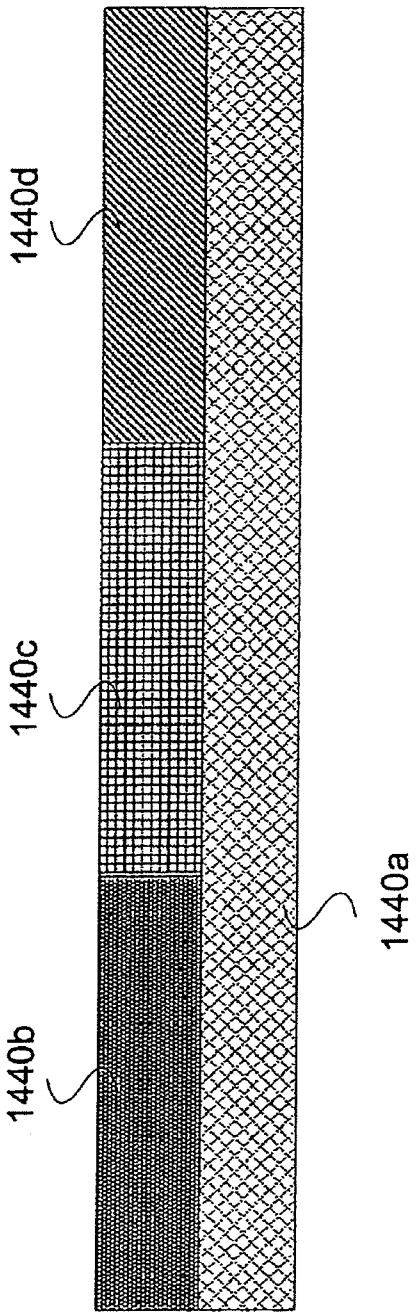


FIG. 14

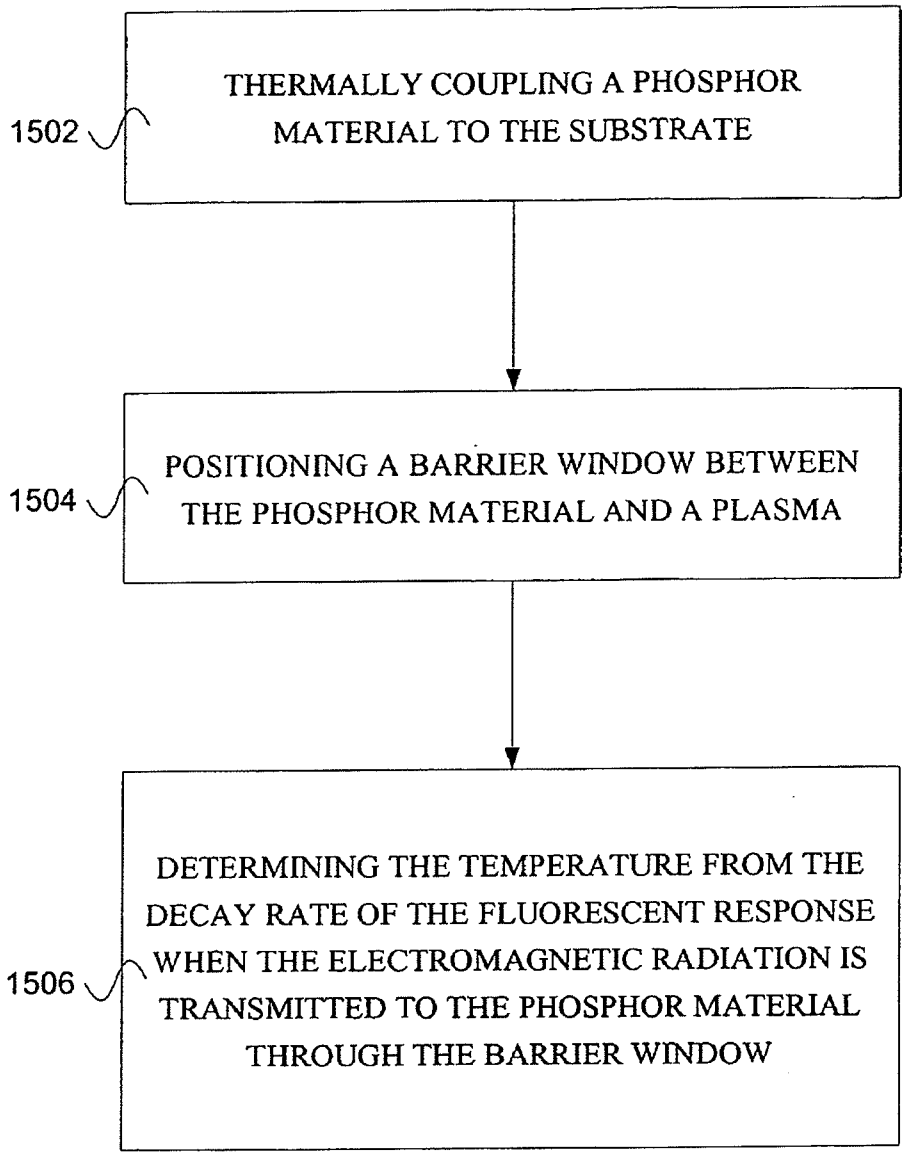

1502
THERMALLY COUPLING A PHOSPHOR MATERIAL TO THE SUBSTRATE
1504
POSITIONING A BARRIER WINDOW BETWEEN THE PHOSPHOR MATERIAL AND A PLASMA
1506
DETERMINING THE TEMPERATURE FROM THE DECAY RATE OF THE FLUORESCENT RESPONSE WHEN THE ELECTROMAGNETIC RADIATION IS TRANSMITTED TO THE PHOSPHOR MATERIAL THROUGH THE BARRIER WINDOW

FIG. 15