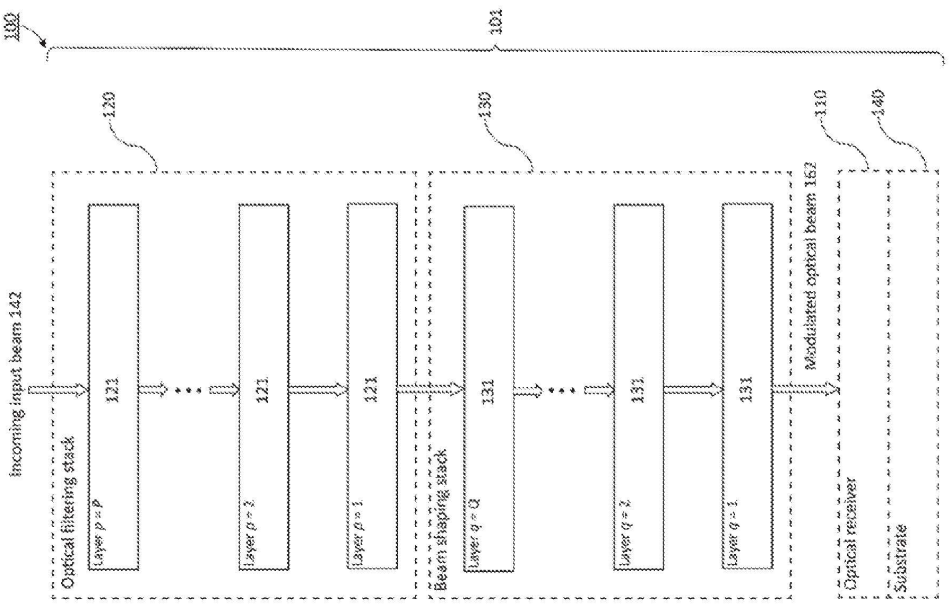

100
101
Incoming input beam 142
Optical filtering stack
Layer p = P
121
Layer p = 2
121
Layer p = 1
121
120
Beam shaping stack
Layer q = Q
131
Layer q = 2
131
Layer q = 1
131
130
Modulated optical beam 162
110
Optical receiver
140
Substrate

Fig. 1A

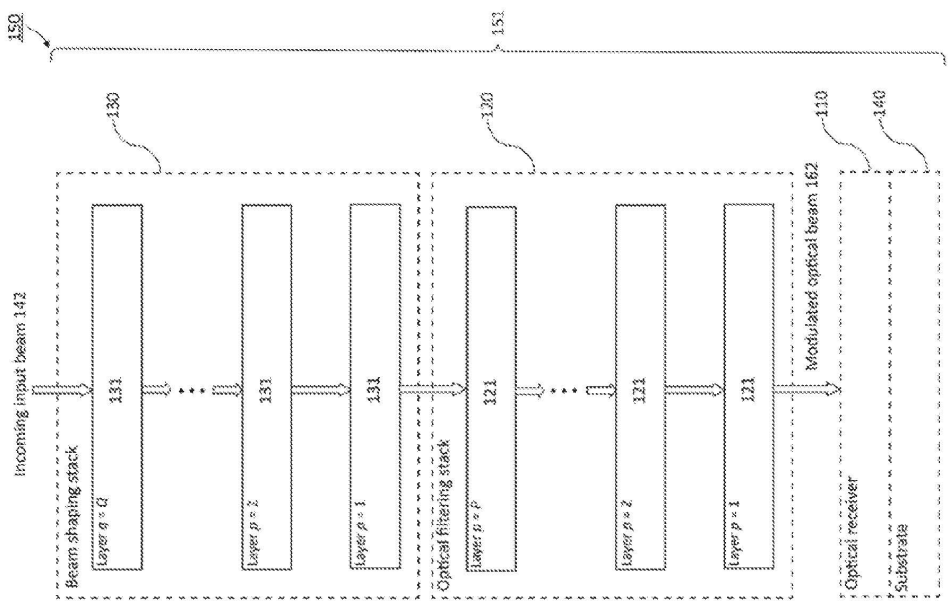

150
151
Incoming input beam 142
Beam shaping stack
Layer q = Q
131
Layer p = 2
131
Layer p = 1
131
130
Optical filtering stack
Layer p = P
121
Layer p = 2
121
Layer p = 1
121
120
Modulated optical beam 162
110
Optical receiver
140
Substrate

Fig. 1B

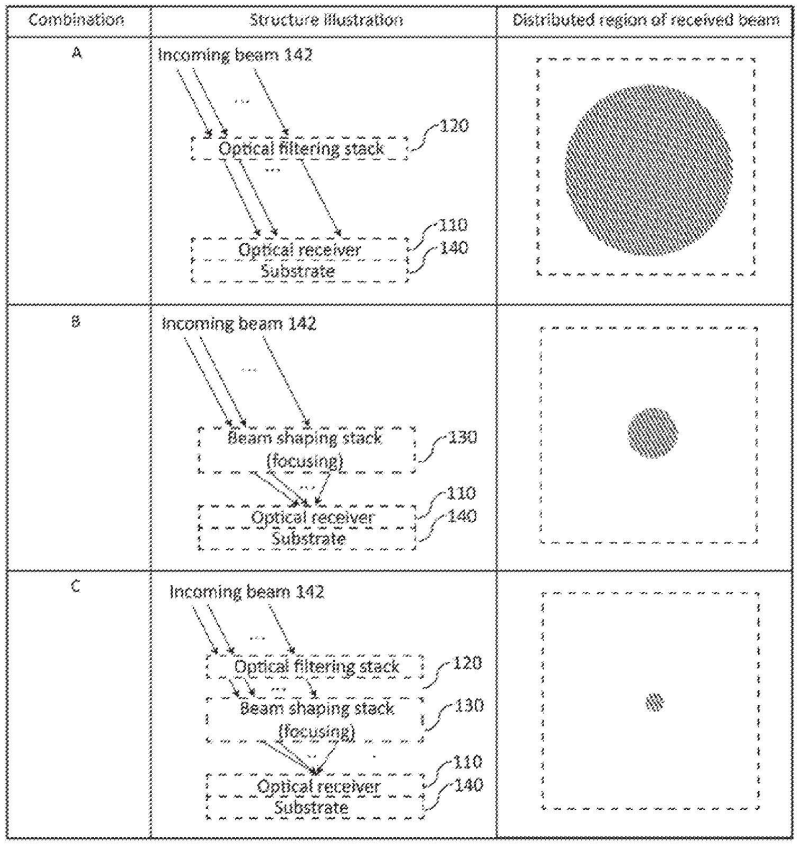

Combination
Structure illustration
Distributed region of received beam
A
Incoming beam 142
Optical filtering stack
120
Optical receiver
110
Substrate
140
B
Incoming beam 142
Beam shaping stack
(focusing)
130
Optical receiver
110
Substrate
140
C
Incoming beam 142
Optical filtering stack
120
Beam shaping stack
(focusing)
130
Optical receiver
110
Substrate
140

Fig. 2A

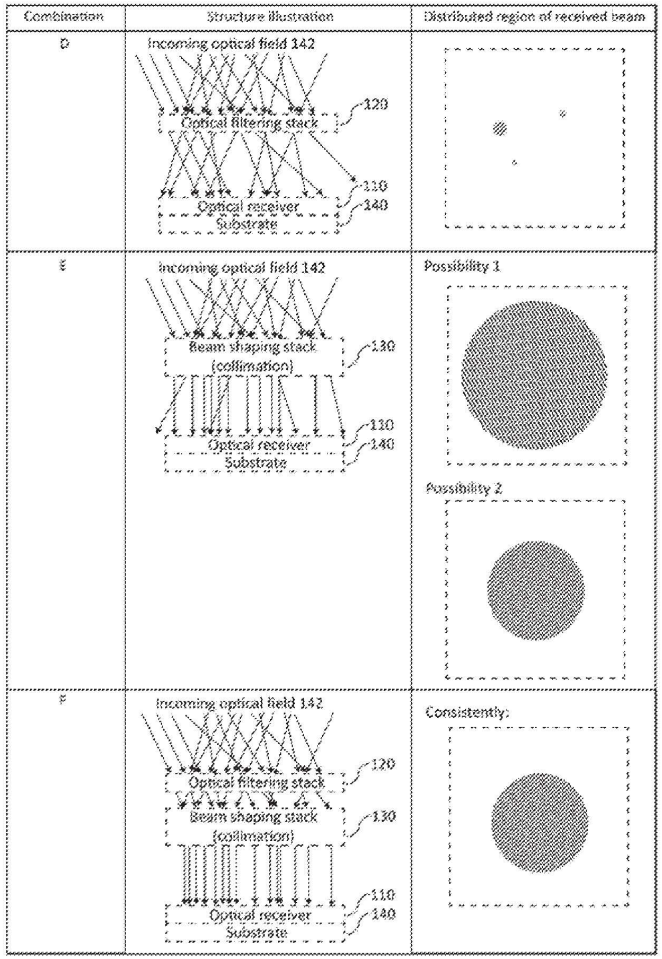

Combination
Structure illustration
Distributed region of received beam
D
Incoming optical field 142
Optical filtering stack
120
Optical receiver
110
Substrate
140
E
Incoming optical field 142
Beam shaping stack
(collimation)
130
Optical receiver
110
Substrate
140
Possibility 1
Possibility 2
F
Incoming optical field 142
Optical filtering stack
120
Beam shaping stack
(collimation)
130
Optical receiver
110
Substrate
140
Consistently:

Fig. 2B

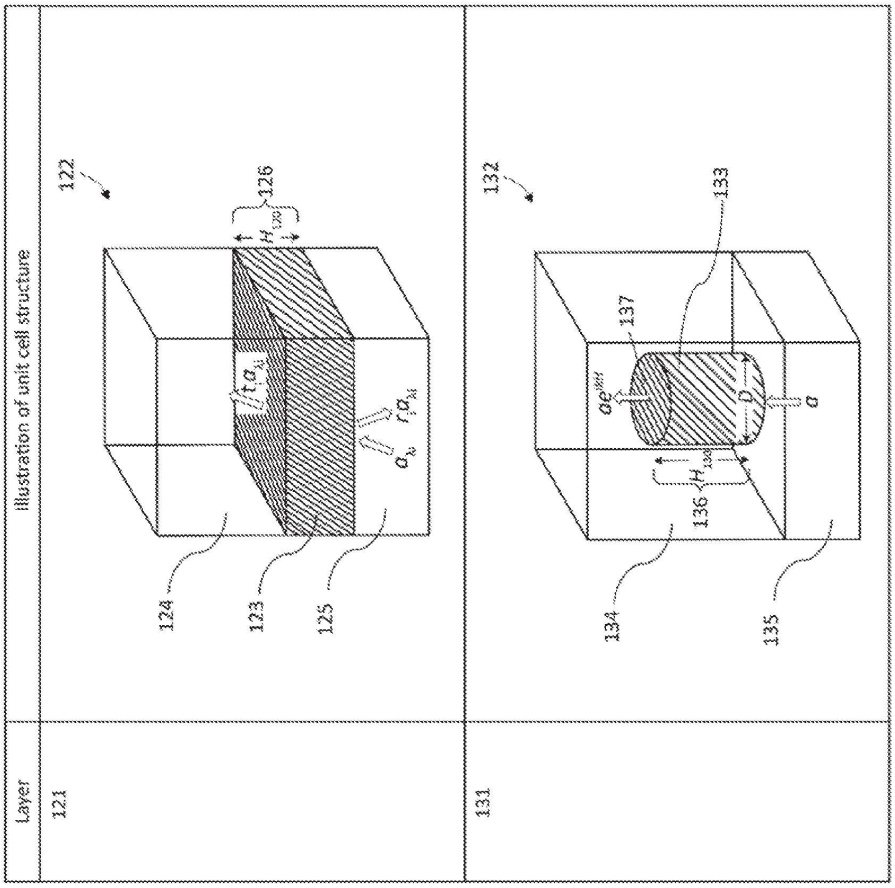

Layer
Illustration of unit cell structure
121
122
126
124
123
125
131
132
133
137
134
135
136

Fig. 3

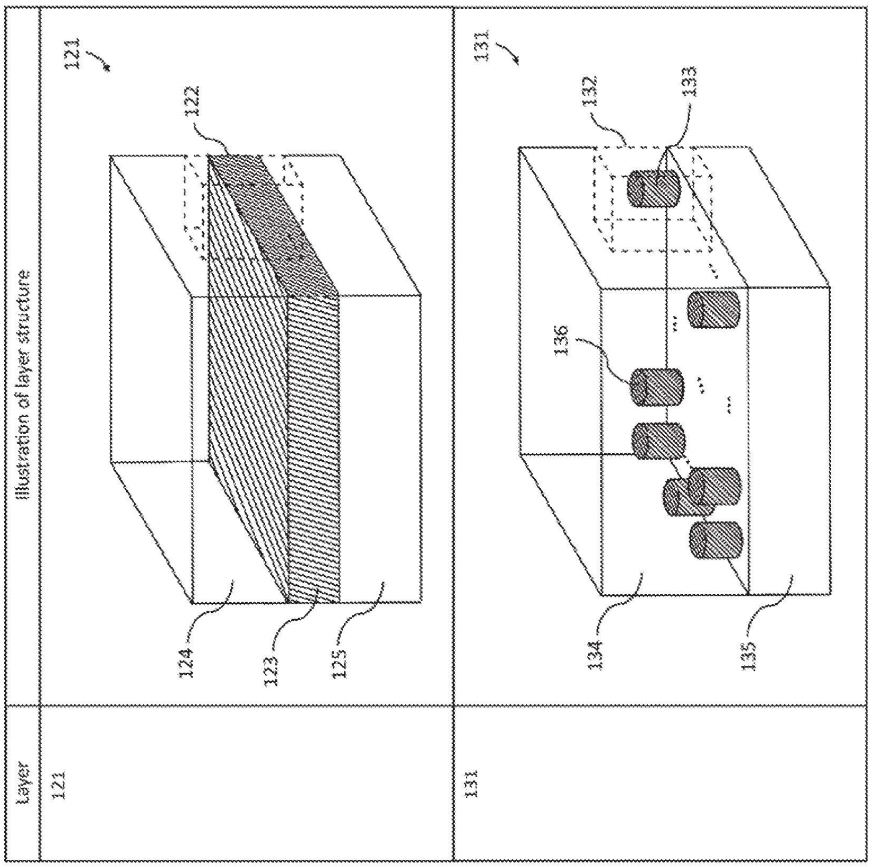

Layer
Illustration of layer structure
121
121
122
124
123
125
131
131
132
133
136
134
135

Fig. 4

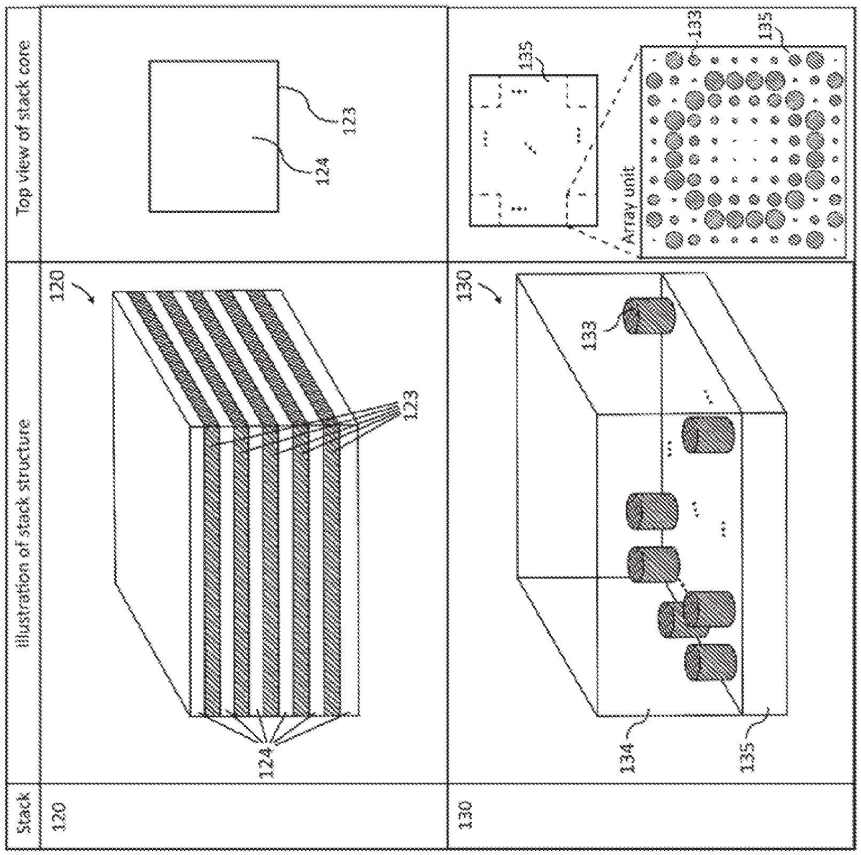

Stack
illustration of stack structure
Top view of stack core
120
120
123
124
123
124
130
130
133
135
Array unit
133
135
134
135

Fig. 5

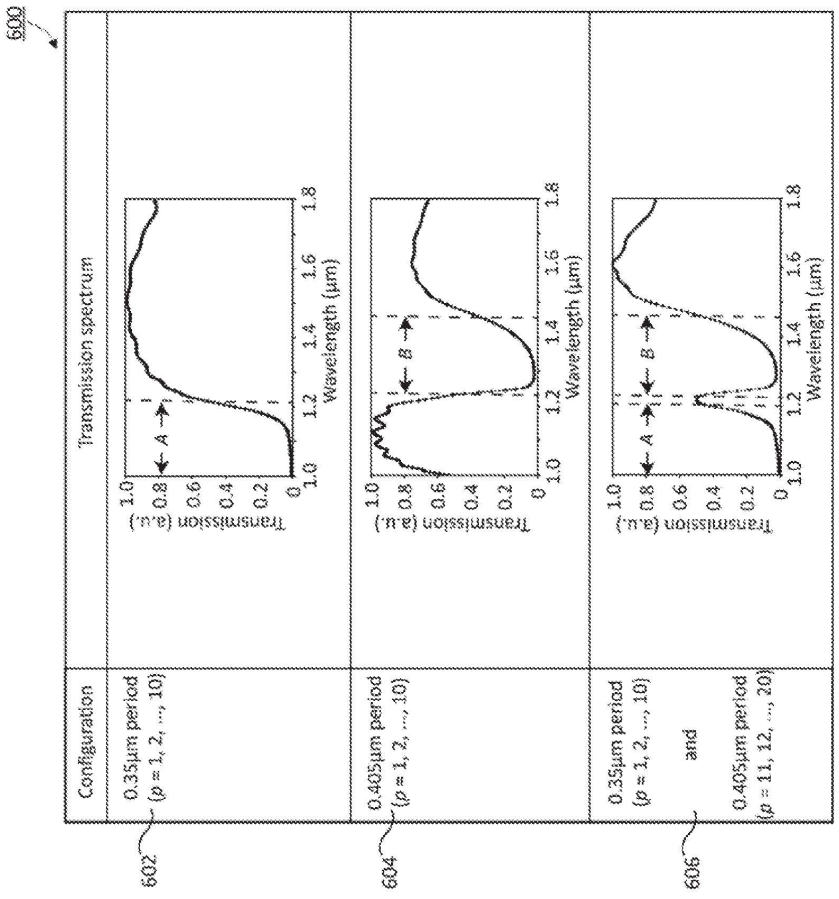

600
Configuration
Transmission spectrum
602
0.35μm period
(p = 1, 2, ..., 10)
604
0.405μm period
(p = 1, 2, ..., 10)
606
0.35μm period
(p = 1, 2, ..., 10)
and
0.405μm period
(p = 11, 12, ..., 20)
Transmission (a.u.)
Wavelength (μm)
A
B
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8

Fig. 6

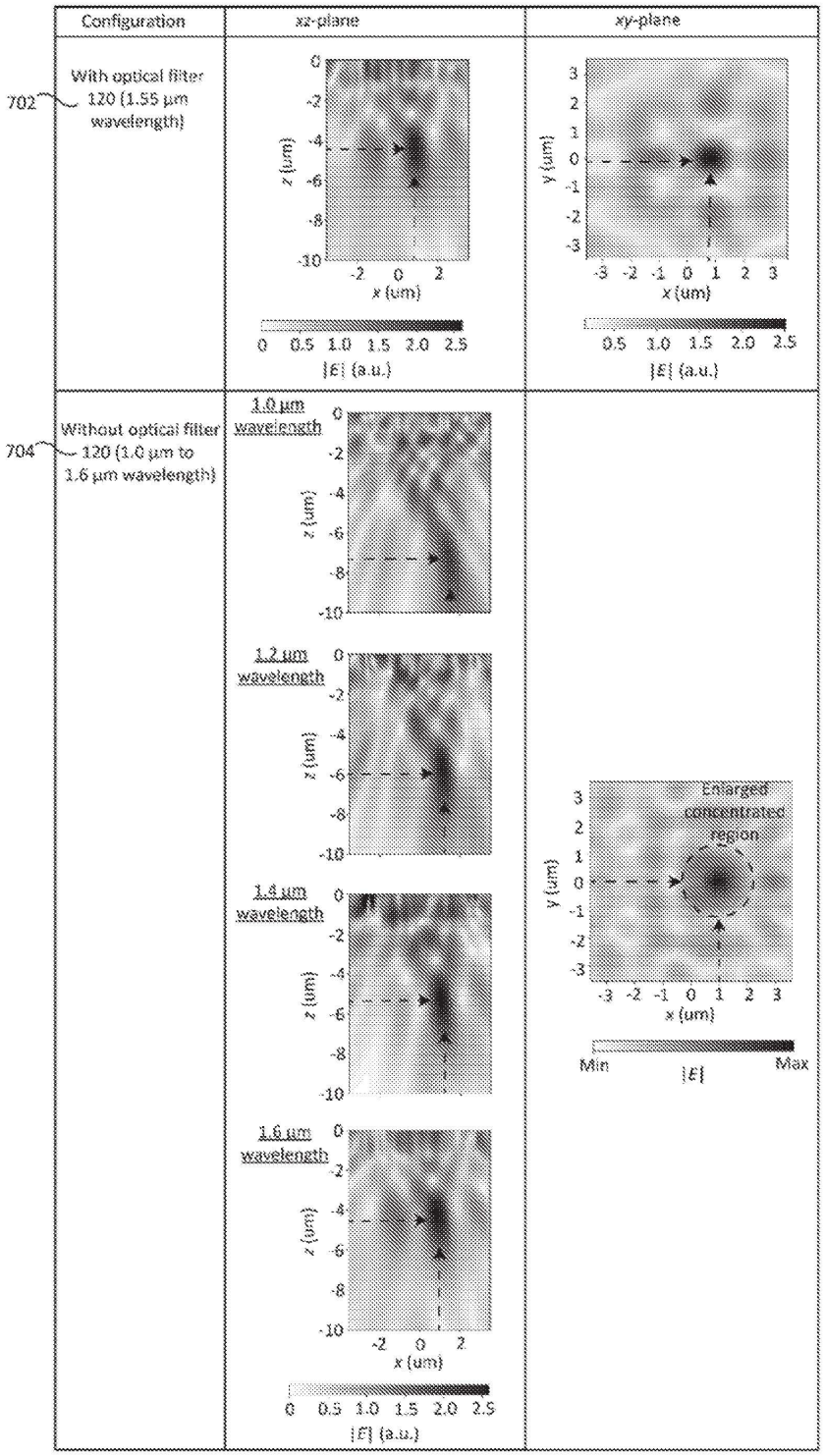

Configuration
xz-plane
xy-plane
With optical filter 120 (1.55 μm wavelength)
702
Without optical filter 120 (1.0 μm to 1.6 μm wavelength)
704
1.0 μm wavelength
1.2 μm wavelength
1.4 μm wavelength
1.6 μm wavelength
z (μm)
x (μm)
y (μm)
|E| (a.u.)
Enlarged concentrated region
Min
Max
|E|

Fig. 7

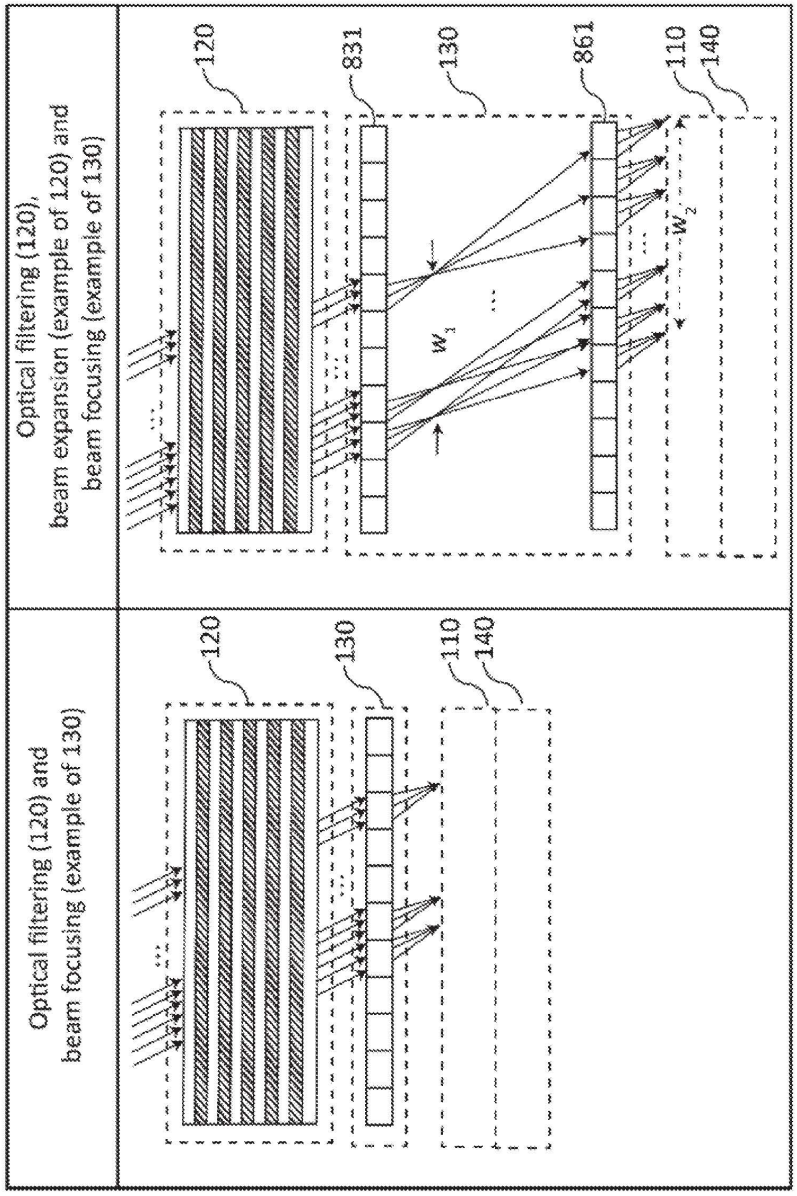

Optical filtering (120) and
beam focusing (example of 130)
120
130
110
140
Optical filtering (120),
beam expansion (example of 120) and
beam focusing (example of 130)
120
831
130
861
110
140
w_1
w_2

Fig. 8