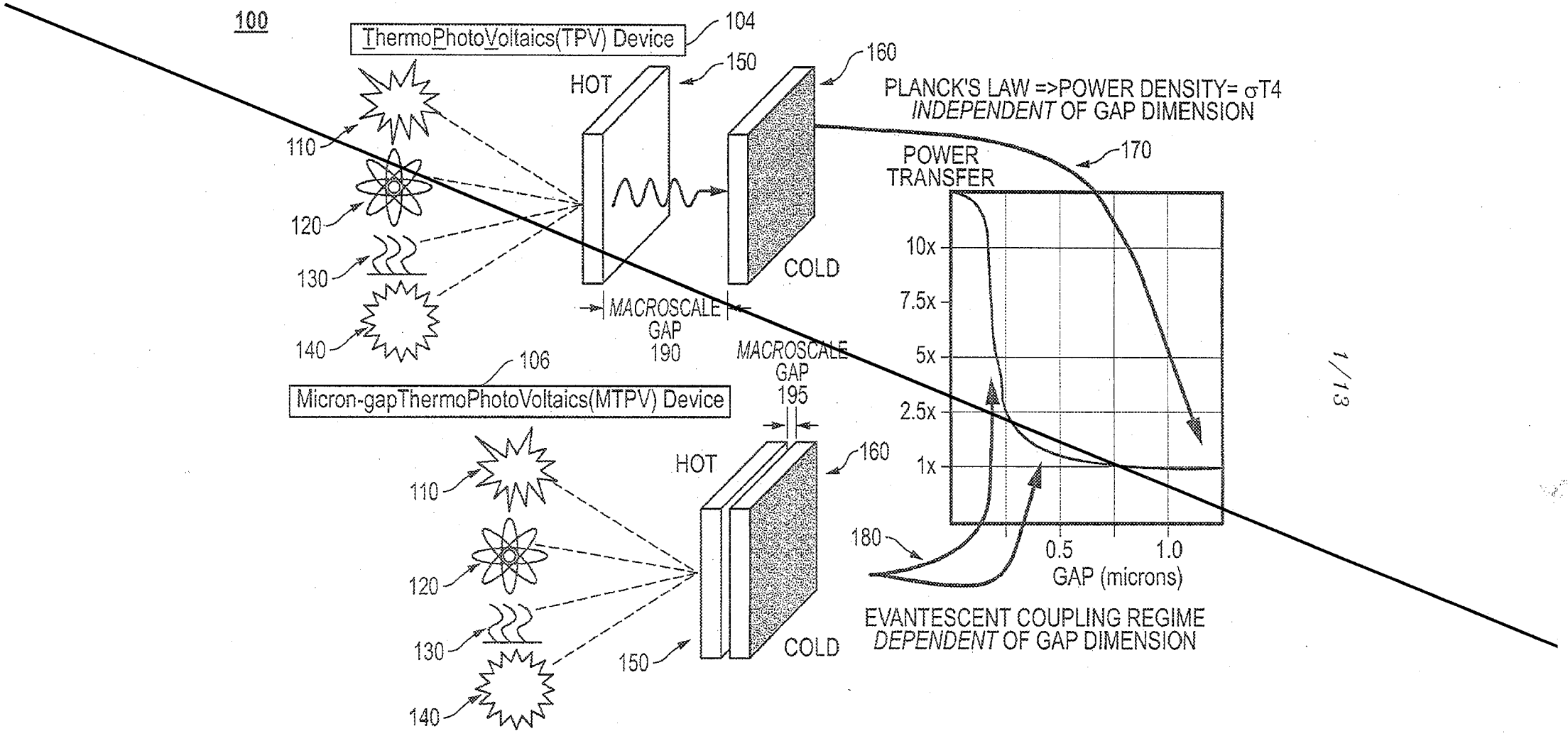

100
ThermoPhotoVoltaics(TPV) Device
104
150
160
HOT
COLD
110
120
130
140
MACROSCALE GAP 190
PLANCK'S LAW =>POWER DENSITY= σT4
INDEPENDENT OF GAP DIMENSION
POWER TRANSFER
170
10x
7.5x
5x
2.5x
1x
0.5
1.0
GAP (microns)
180
106
Micron-gapThermoPhotoVoltaics(MTPV) Device
MACROSCALE GAP 195
EVANTESCENT COUPLING REGIME
DEPENDENT OF GAP DIMENSION

FIG. 1

200

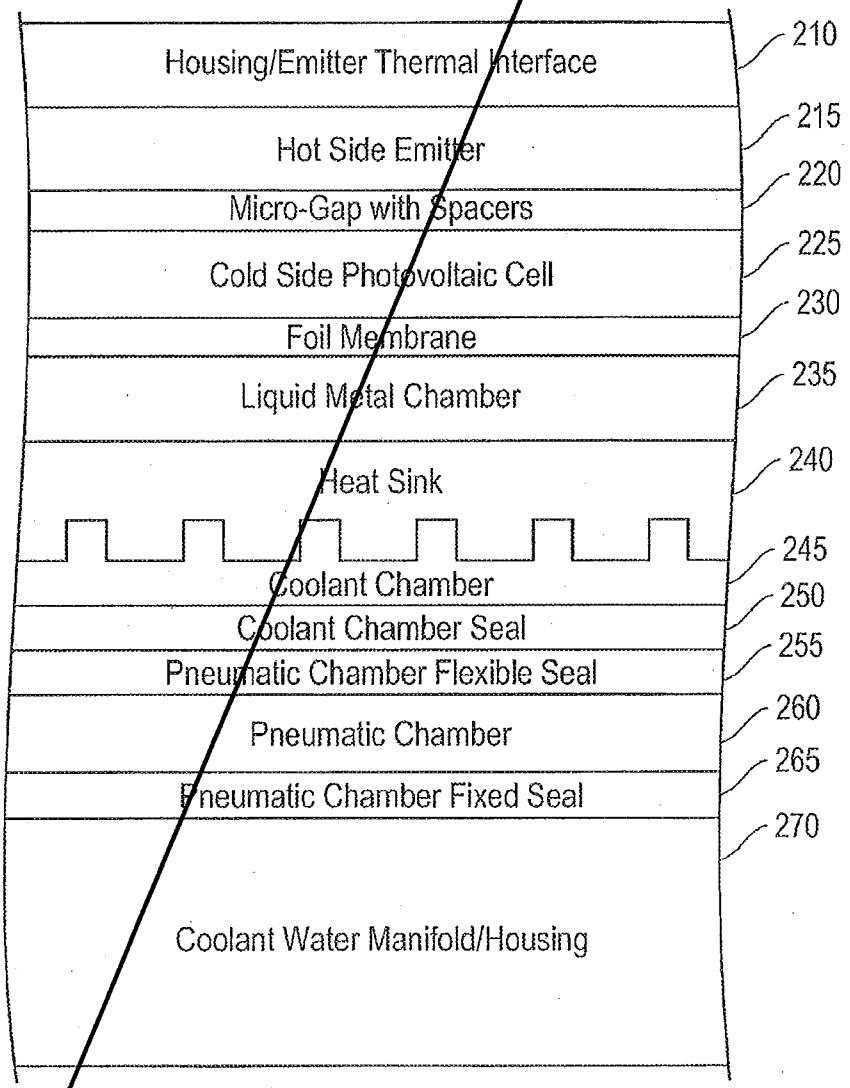

Housing/Emitter Thermal Interface
210
Hot Side Emitter
215
Micro-Gap with Spacers
220
Cold Side Photovoltaic Cell
225
Foil Membrane
230
Liquid Metal Chamber
235
Heat Sink
240
Coolant Chamber
245
Coolant Chamber Seal
250
Pneumatic Chamber Flexible Seal
255
Pneumatic Chamber
260
Pneumatic Chamber Fixed Seal
265
Coolant Water Manifold/Housing
270

FIG. 2A

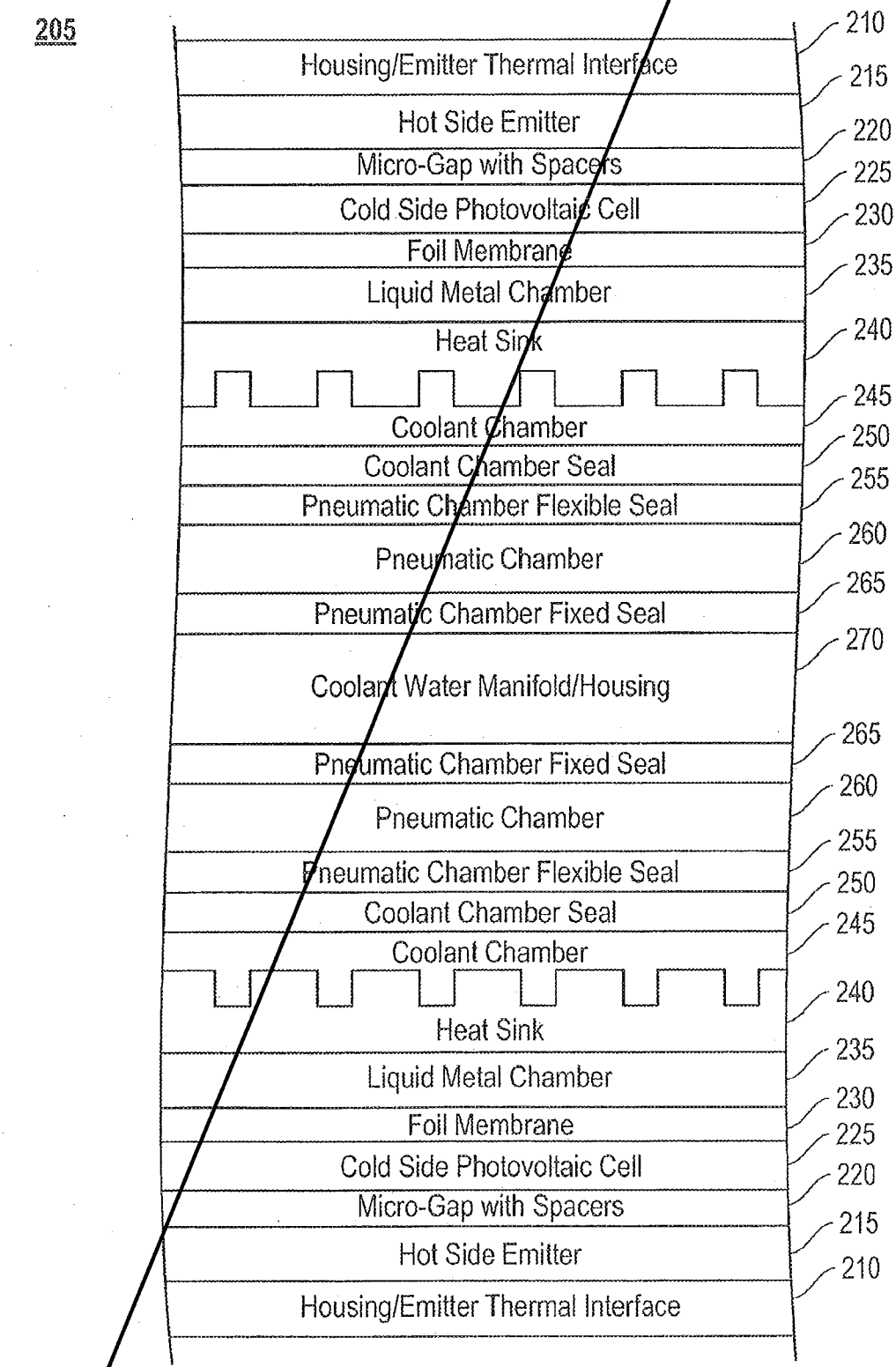

205
Housing/Emitter Thermal Interface
Hot Side Emitter
Micro-Gap with Spacers
Cold Side Photovoltaic Cell
Foil Membrane
Liquid Metal Chamber
Heat Sink
Coolant Chamber
Coolant Chamber Seal
Pneumatic Chamber Flexible Seal
Pneumatic Chamber
Pneumatic Chamber Fixed Seal
Coolant Water Manifold/Housing
Pneumatic Chamber Fixed Seal
Pneumatic Chamber
Pneumatic Chamber Flexible Seal
Coolant Chamber Seal
Coolant Chamber
Heat Sink
Liquid Metal Chamber
Foil Membrane
Cold Side Photovoltaic Cell
Micro-Gap with Spacers
Hot Side Emitter
Housing/Emitter Thermal Interface
210
215
220
225
230
235
240
245
250
255
260
265
270
265
260
255
250
245
240
235
230
225
220
215
210

FIG. 2B

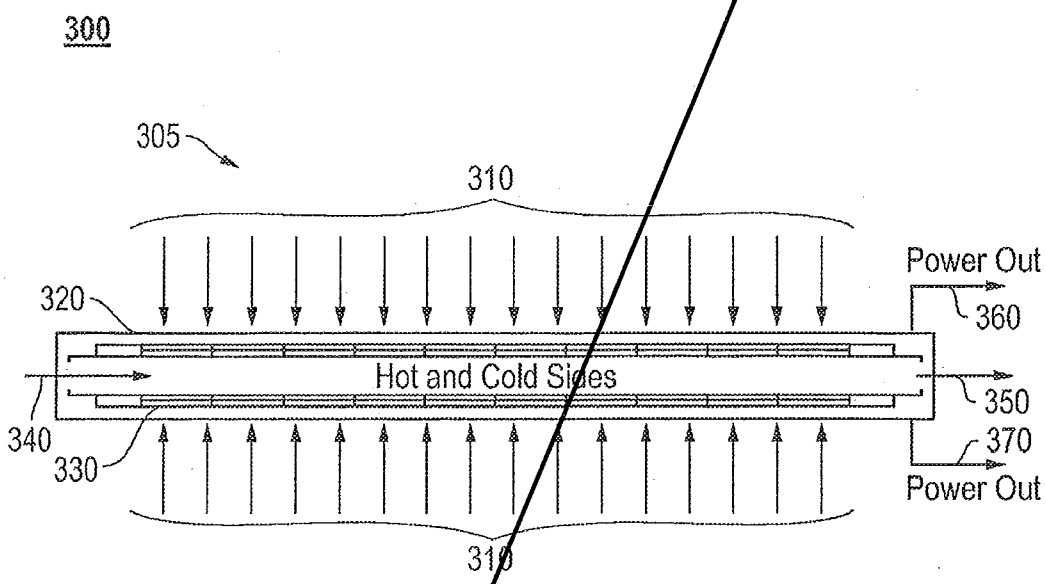

300
305
310
320
Power Out
360
Hot and Cold Sides
350
340
330
370
Power Out
310

FIG. 3

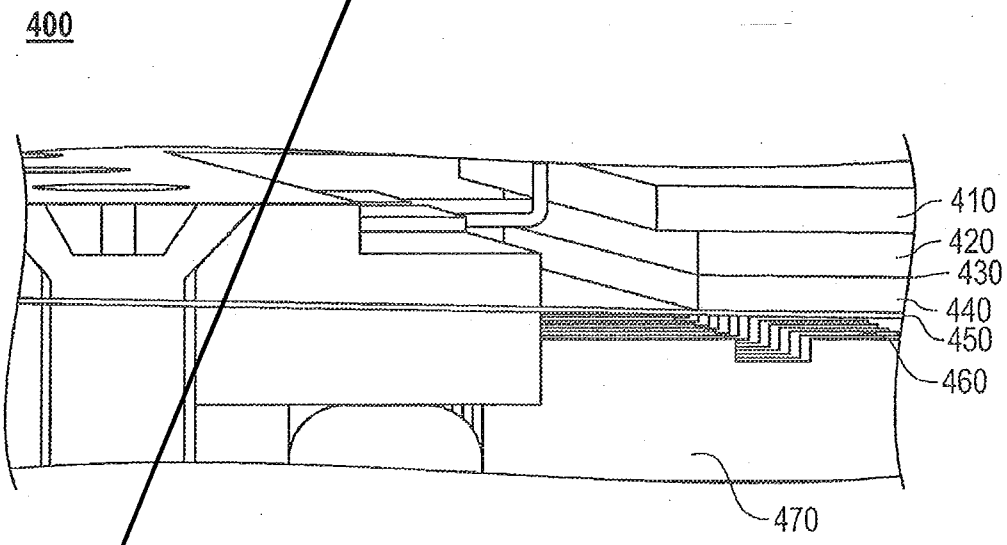

400
410
420
430
440
450
460
470

FIG. 4

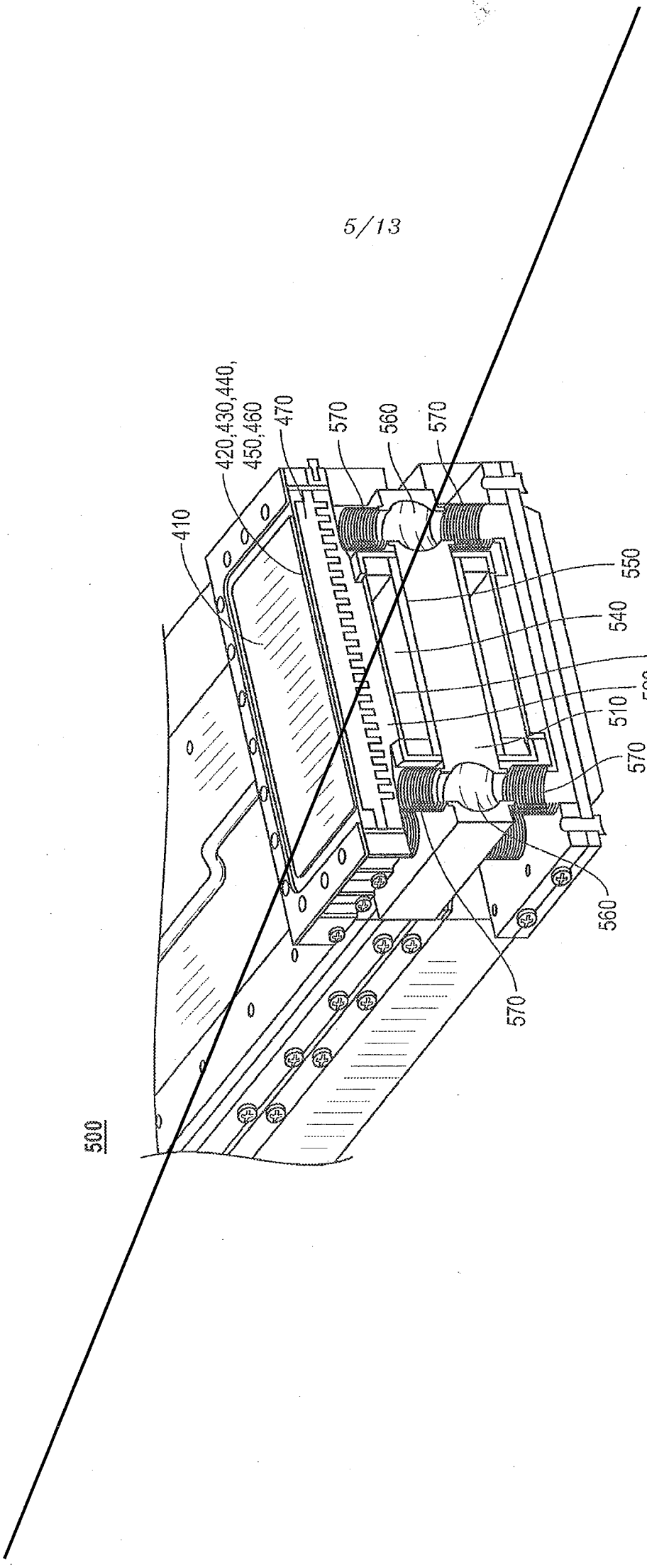

500
410
420,430,440,
450,460
470
570
560
570
550
540
530
520
510
570
560
570

FIG. 5

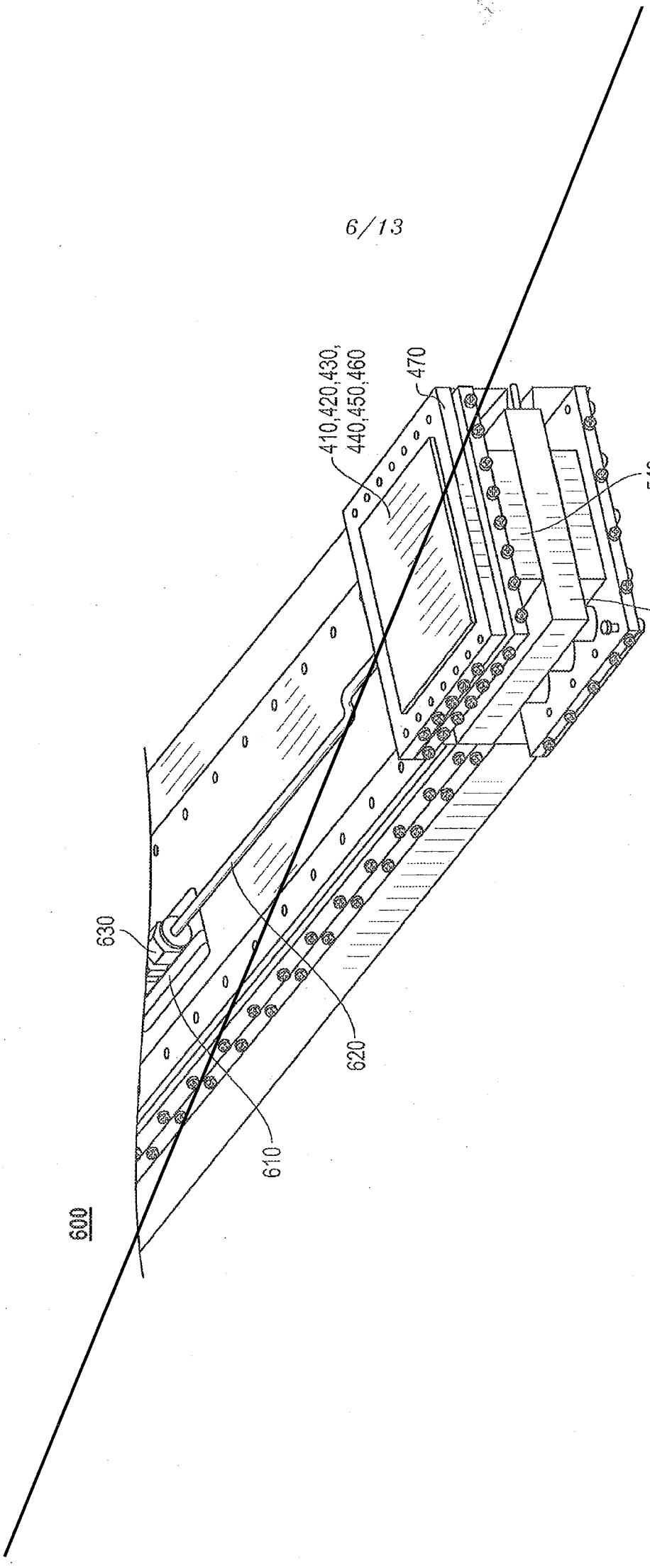


FIG. 6

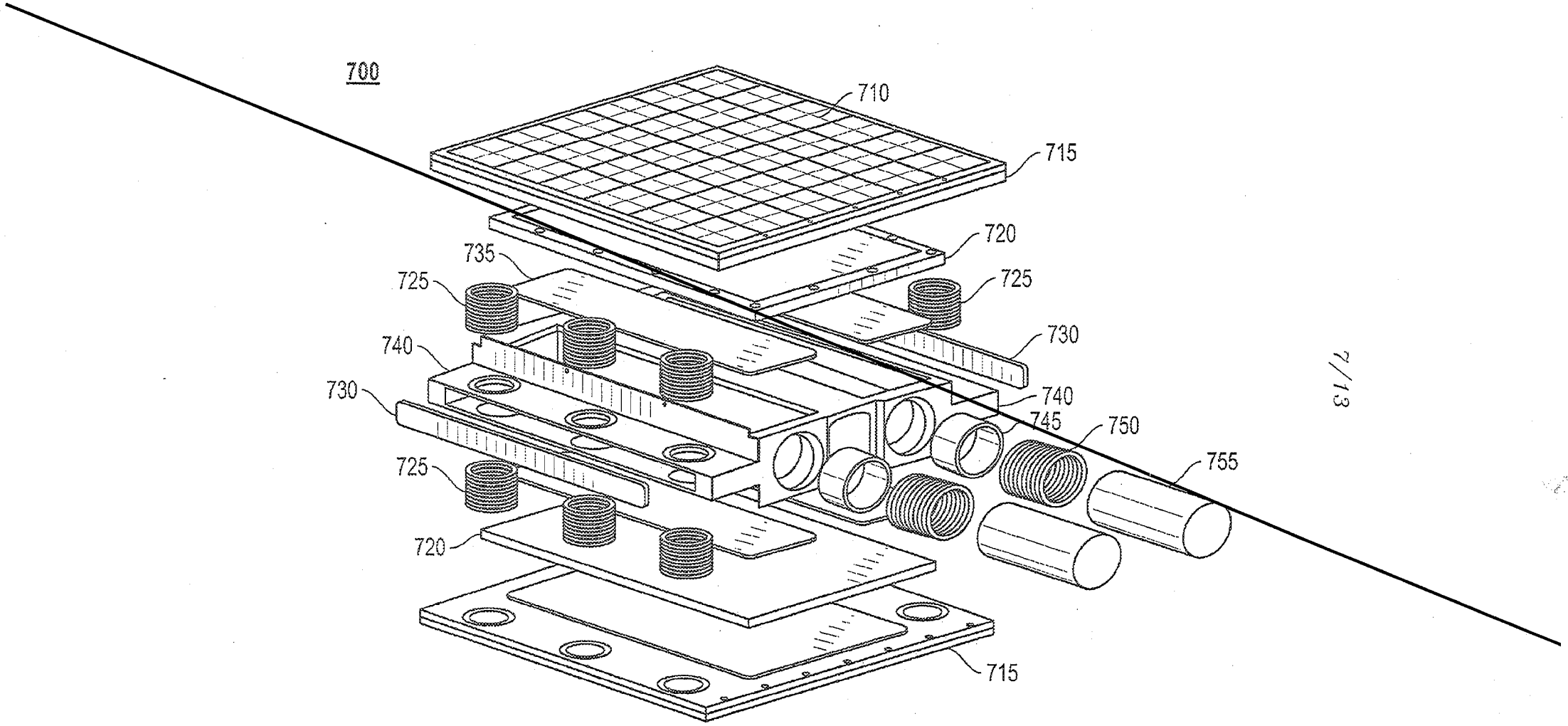

700
710
715
720
735
725
725
730
740
730
740
745
750
755
725
720
715

FIG. 7

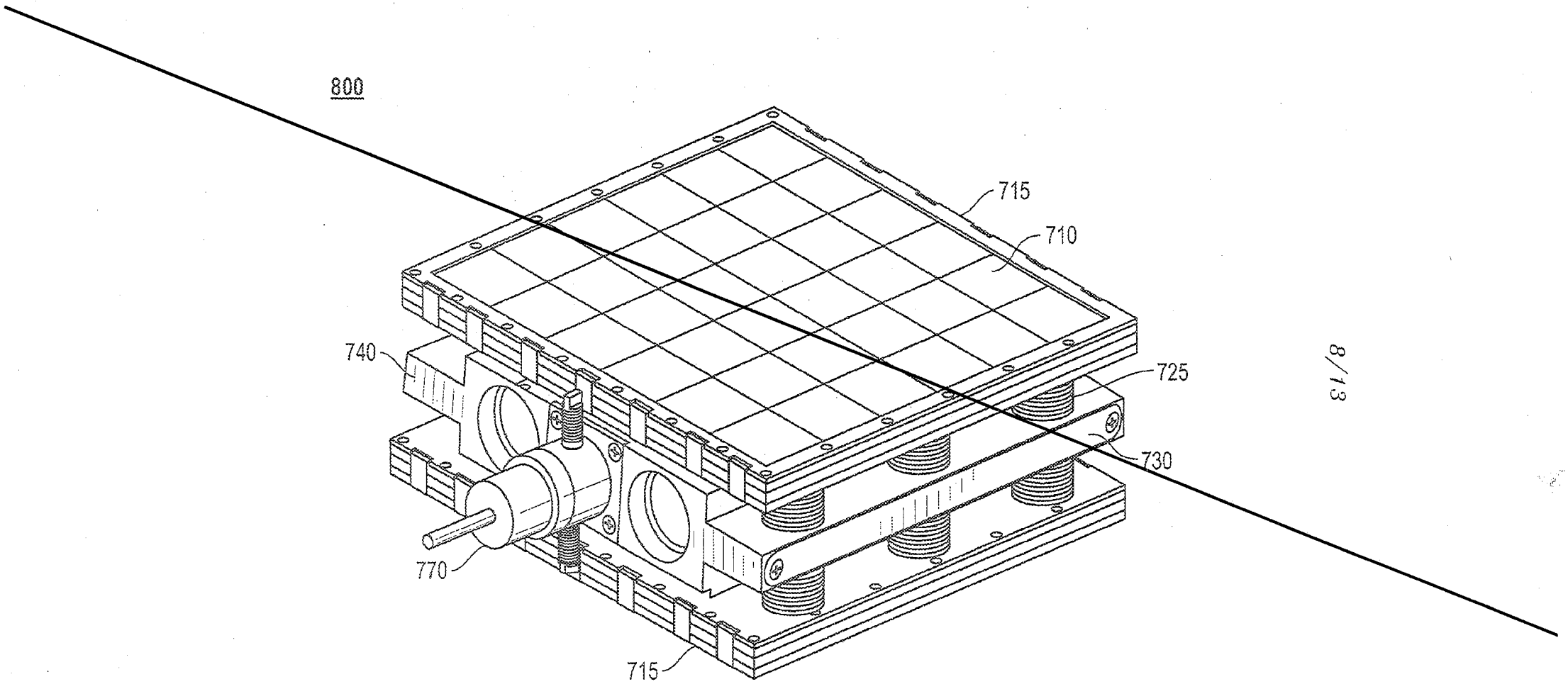


FIG. 8

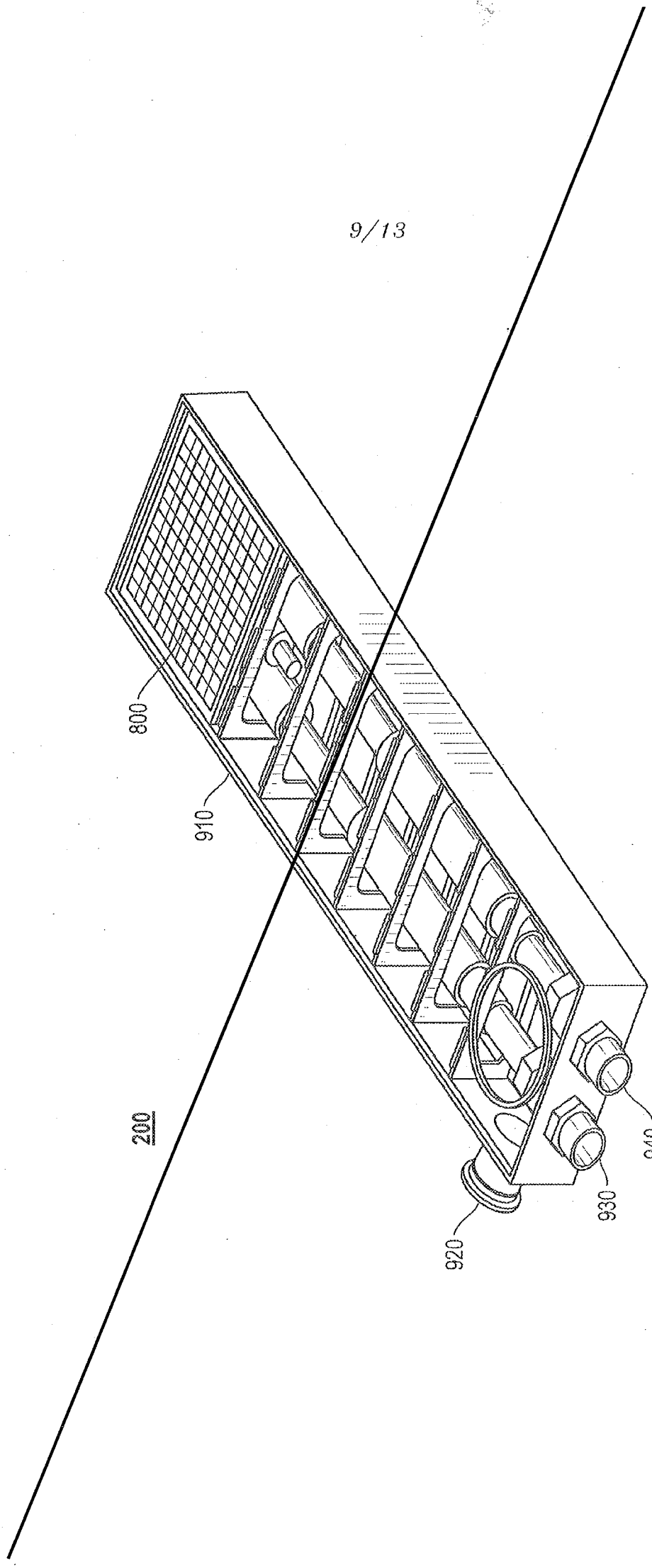


FIG. 9

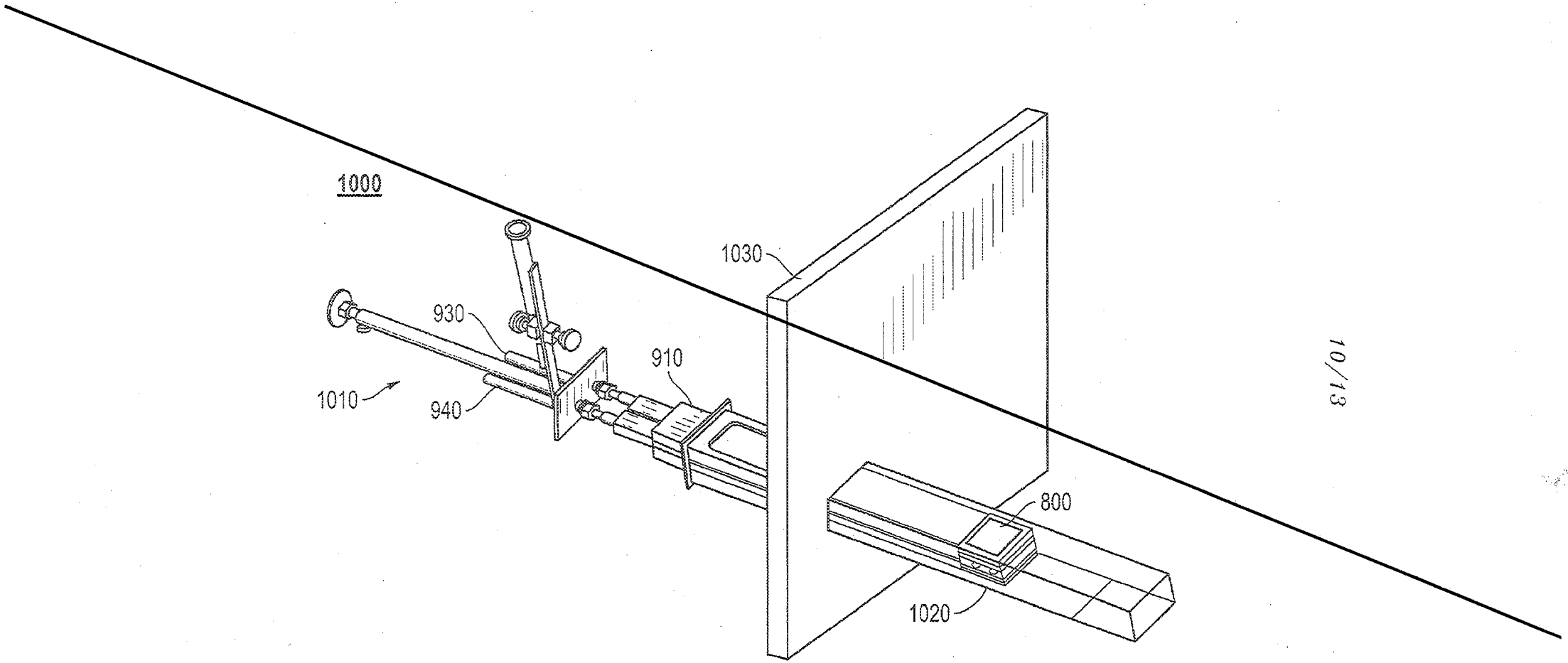


FIG. 10

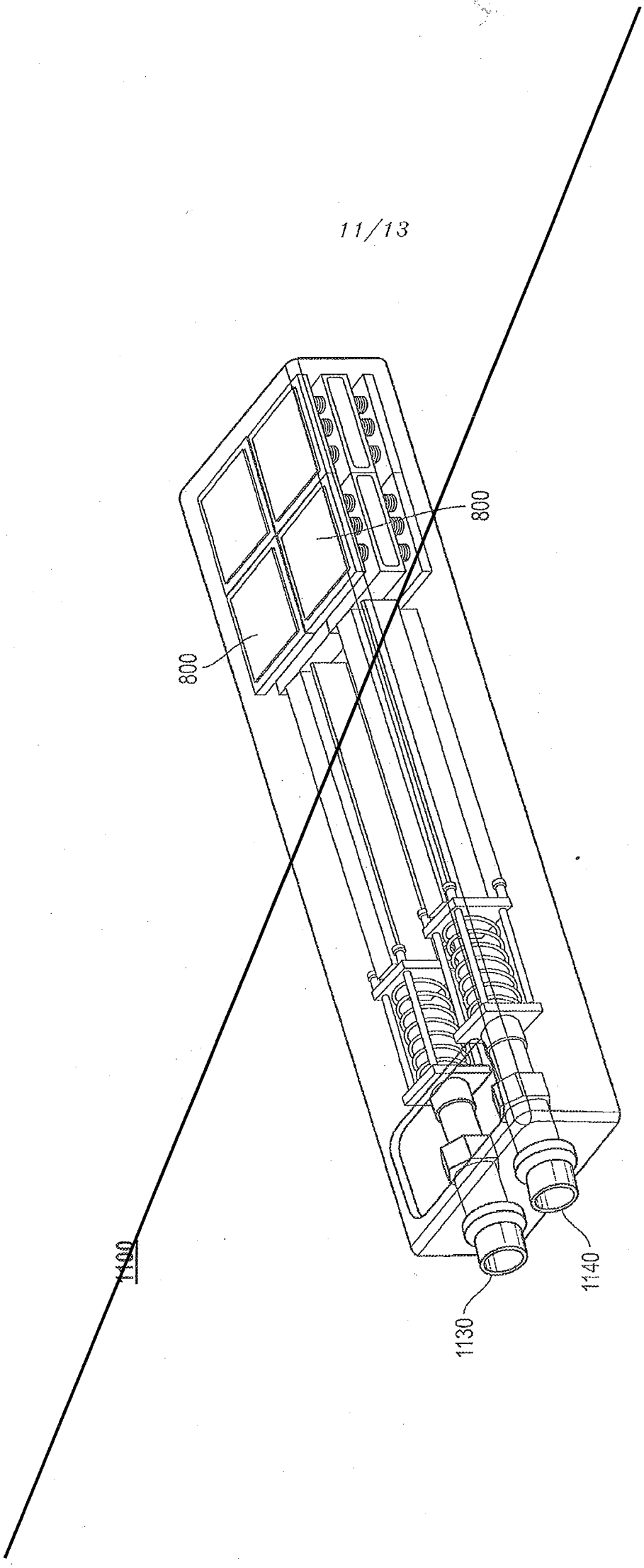


FIG. 11

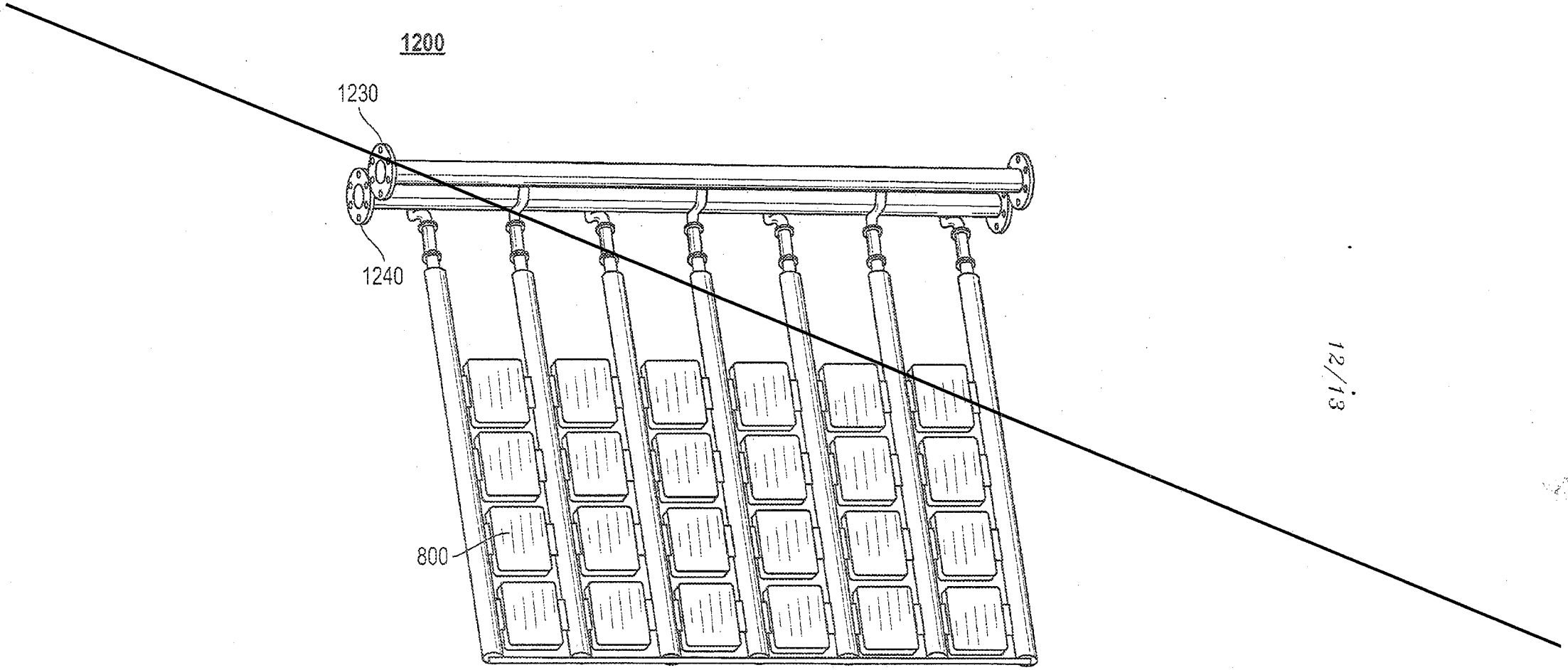


FIG. 12

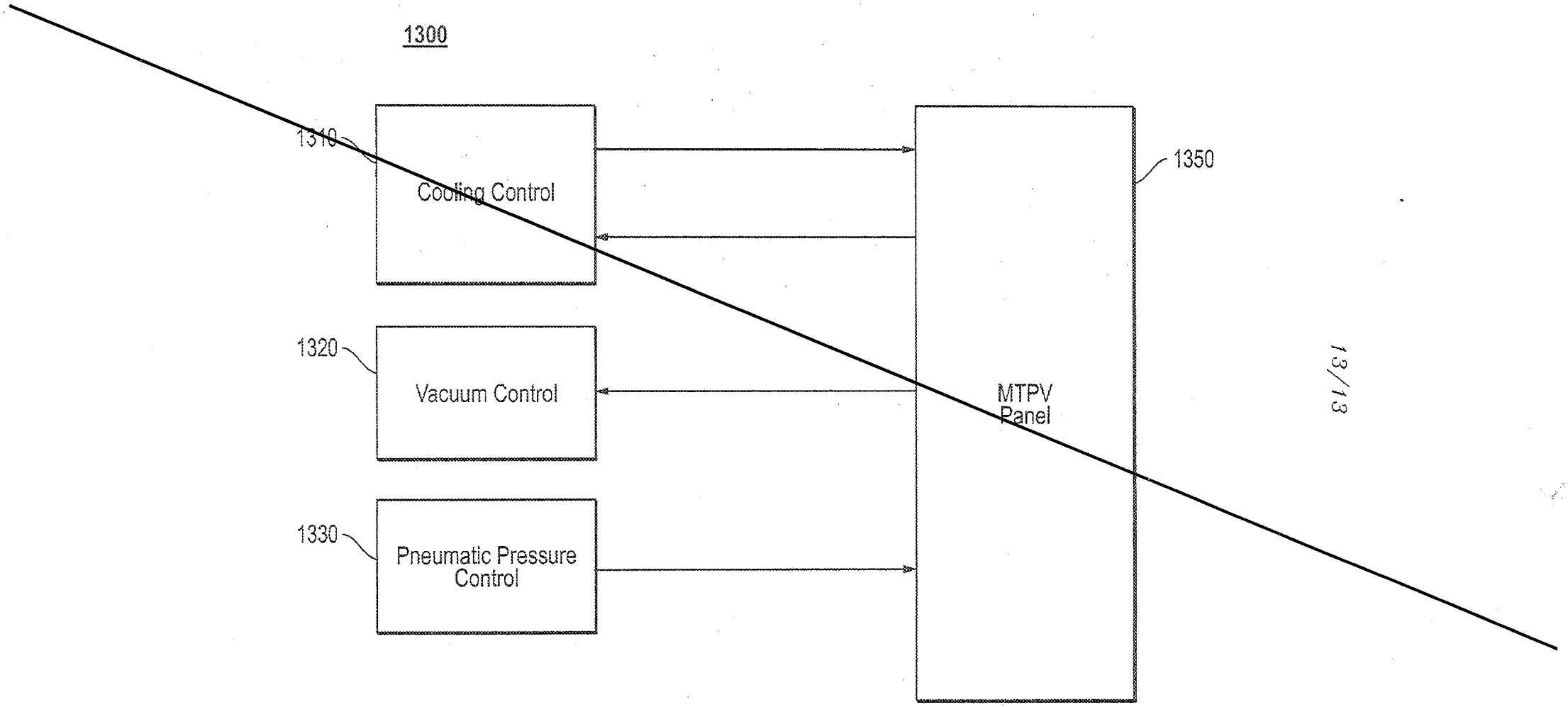

1300
1310
Cooling Control
1320
Vacuum Control
1330
Pneumatic Pressure Control
1350
MTPV Panel

FIG. 13

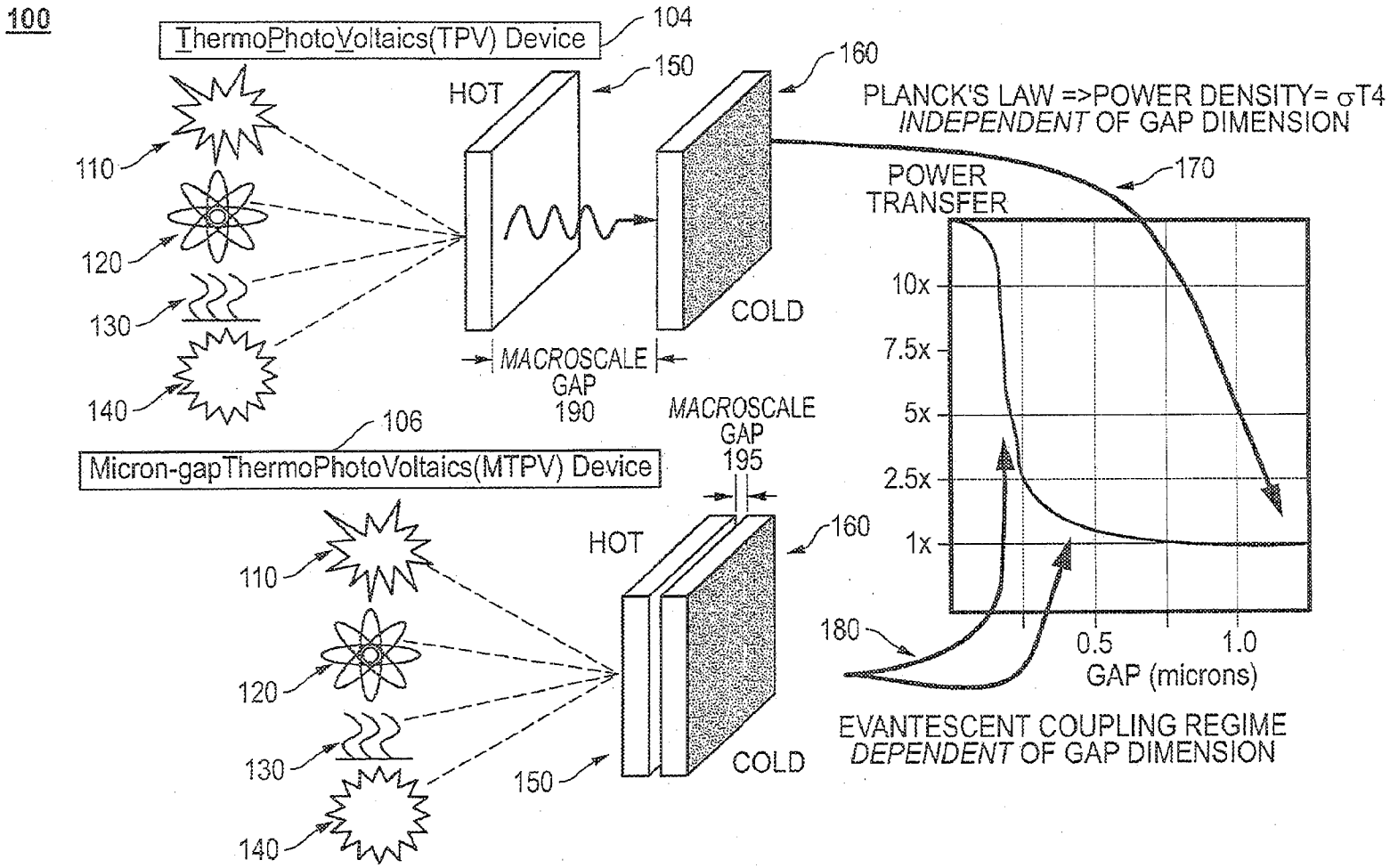

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180
106
Micron-gapThermoPhotoVoltaics(MTPV) Device
MACROSCALE GAP 195
EVANTESCENT COUPLING REGIME
DEPENDENT OF GAP DIMENSION

FIG. 1

200

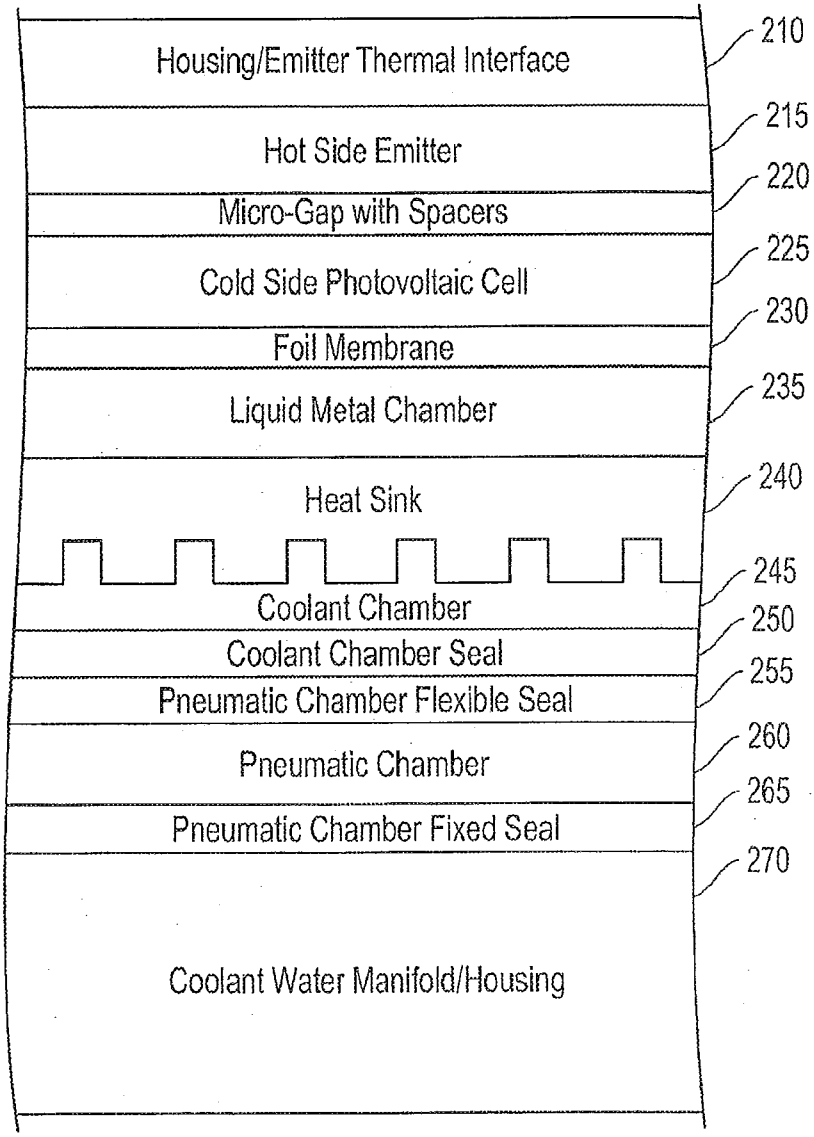

Housing/Emitter Thermal Interface
210
Hot Side Emitter
215
Micro-Gap with Spacers
220
Cold Side Photovoltaic Cell
225
Foil Membrane
230
Liquid Metal Chamber
235
Heat Sink
240
Coolant Chamber
245
Coolant Chamber Seal
250
Pneumatic Chamber Flexible Seal
255
Pneumatic Chamber
260
Pneumatic Chamber Fixed Seal
265
Coolant Water Manifold/Housing
270

FIG. 2A

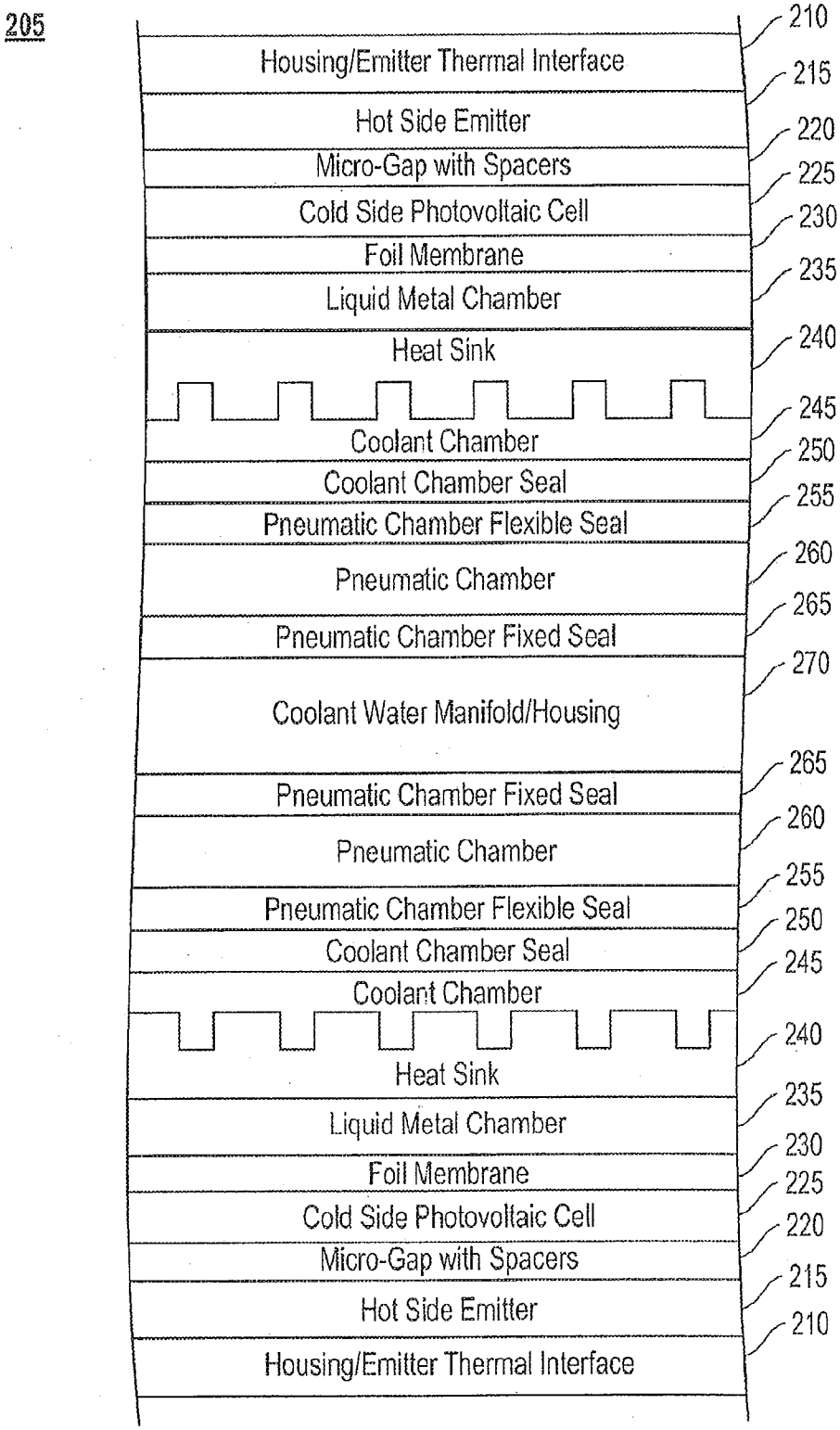

205
Housing/Emitter Thermal Interface
Hot Side Emitter
Micro-Gap with Spacers
Cold Side Photovoltaic Cell
Foil Membrane
Liquid Metal Chamber
Heat Sink
Coolant Chamber
Coolant Chamber Seal
Pneumatic Chamber Flexible Seal
Pneumatic Chamber
Pneumatic Chamber Fixed Seal
Coolant Water Manifold/Housing
Pneumatic Chamber Fixed Seal
Pneumatic Chamber
Pneumatic Chamber Flexible Seal
Coolant Chamber Seal
Coolant Chamber
Heat Sink
Liquid Metal Chamber
Foil Membrane
Cold Side Photovoltaic Cell
Micro-Gap with Spacers
Hot Side Emitter
Housing/Emitter Thermal Interface
210
215
220
225
230
235
240
245
250
255
260
265
270
265
260
255
250
245
240
235
230
225
220
215
210

FIG. 2B

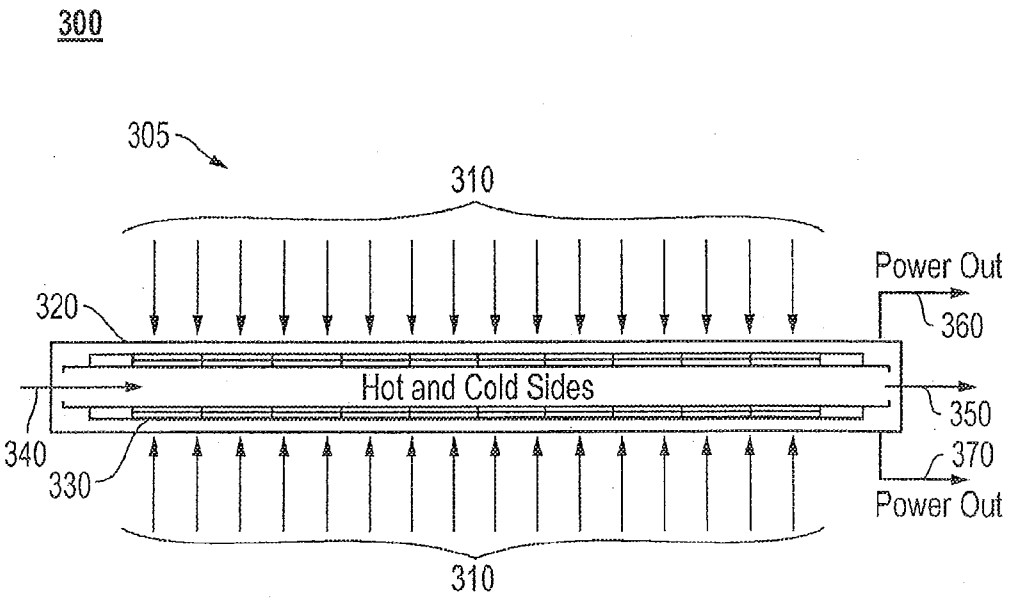

300
305
310
Power Out
320
360
Hot and Cold Sides
350
340
330
370
Power Out
310

FIG. 3

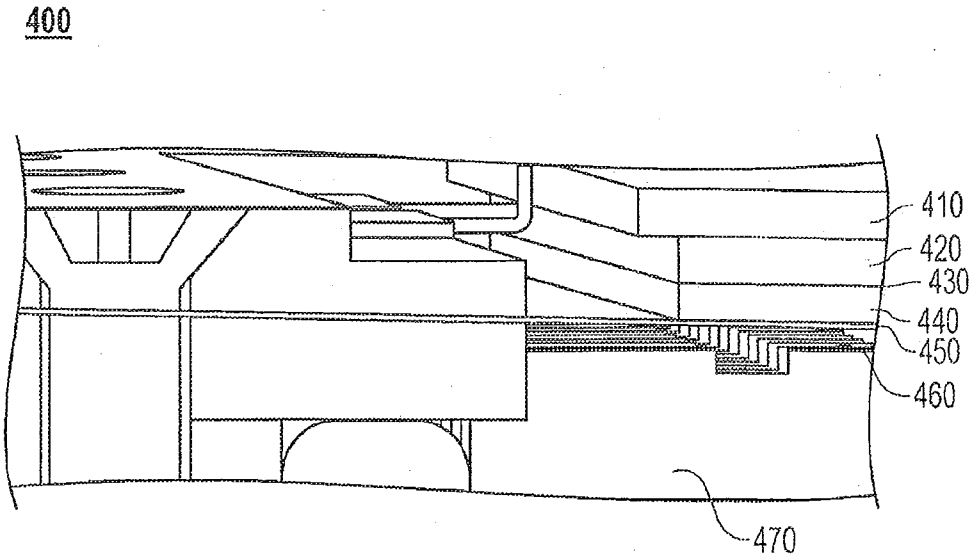

400
410
420
430
440
450
460
470

FIG. 4

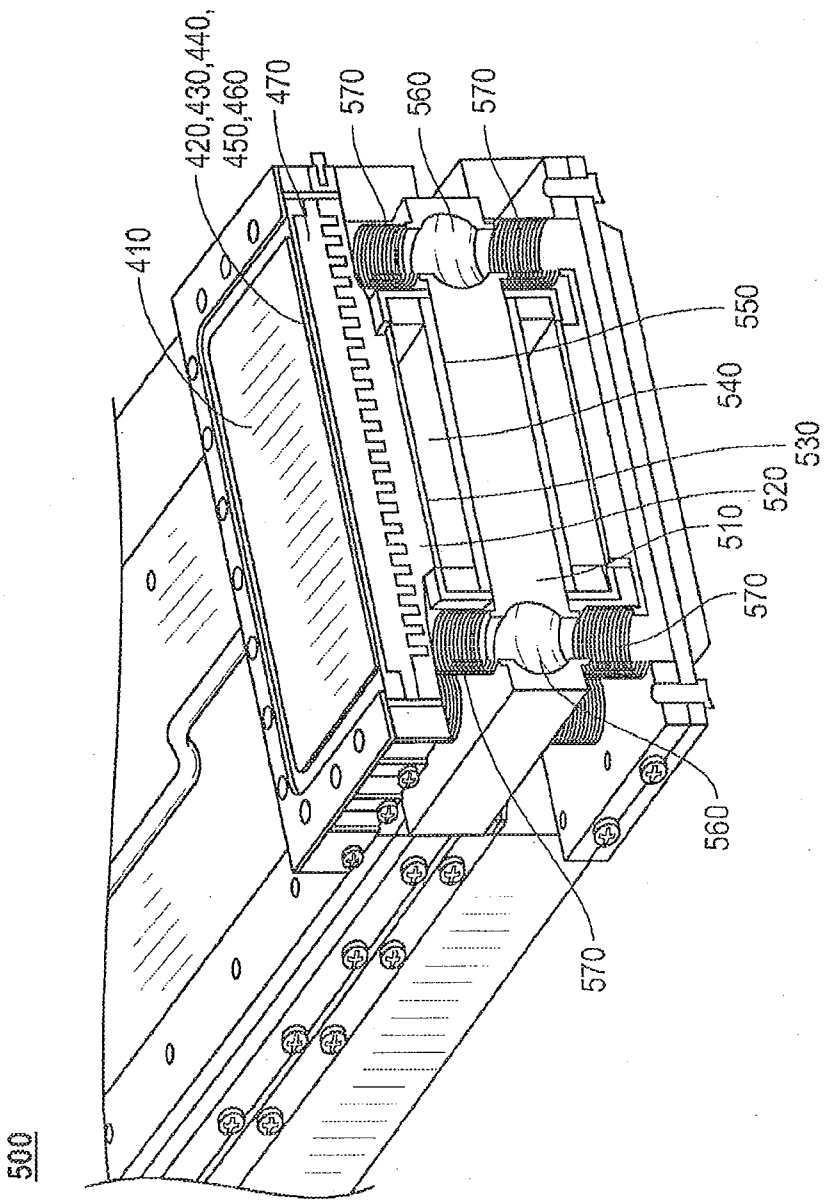

500
410
420,430,440,
450,460
470
570
560
570
550
540
530
520
510
570
560
570

FIG. 5

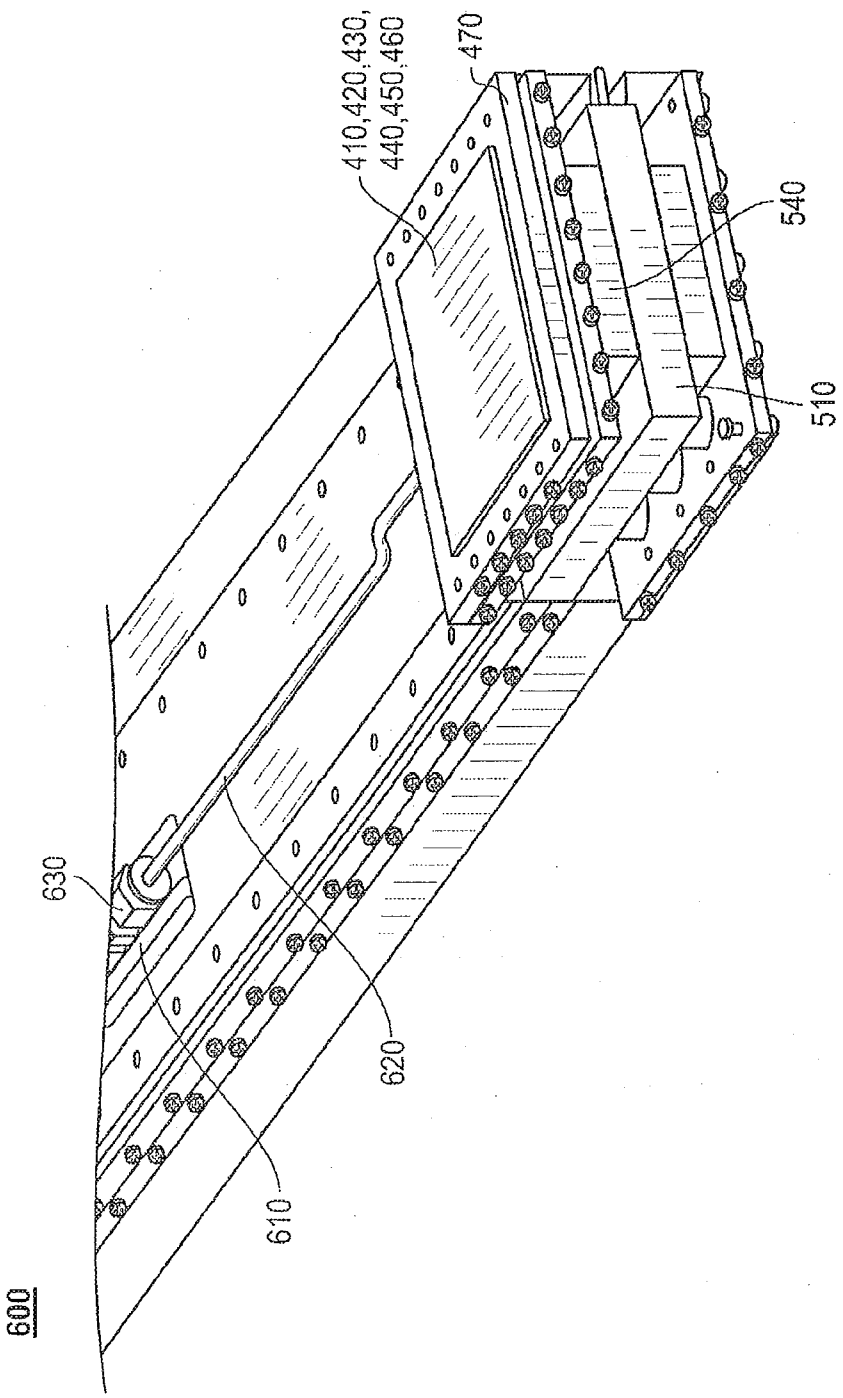


FIG. 6

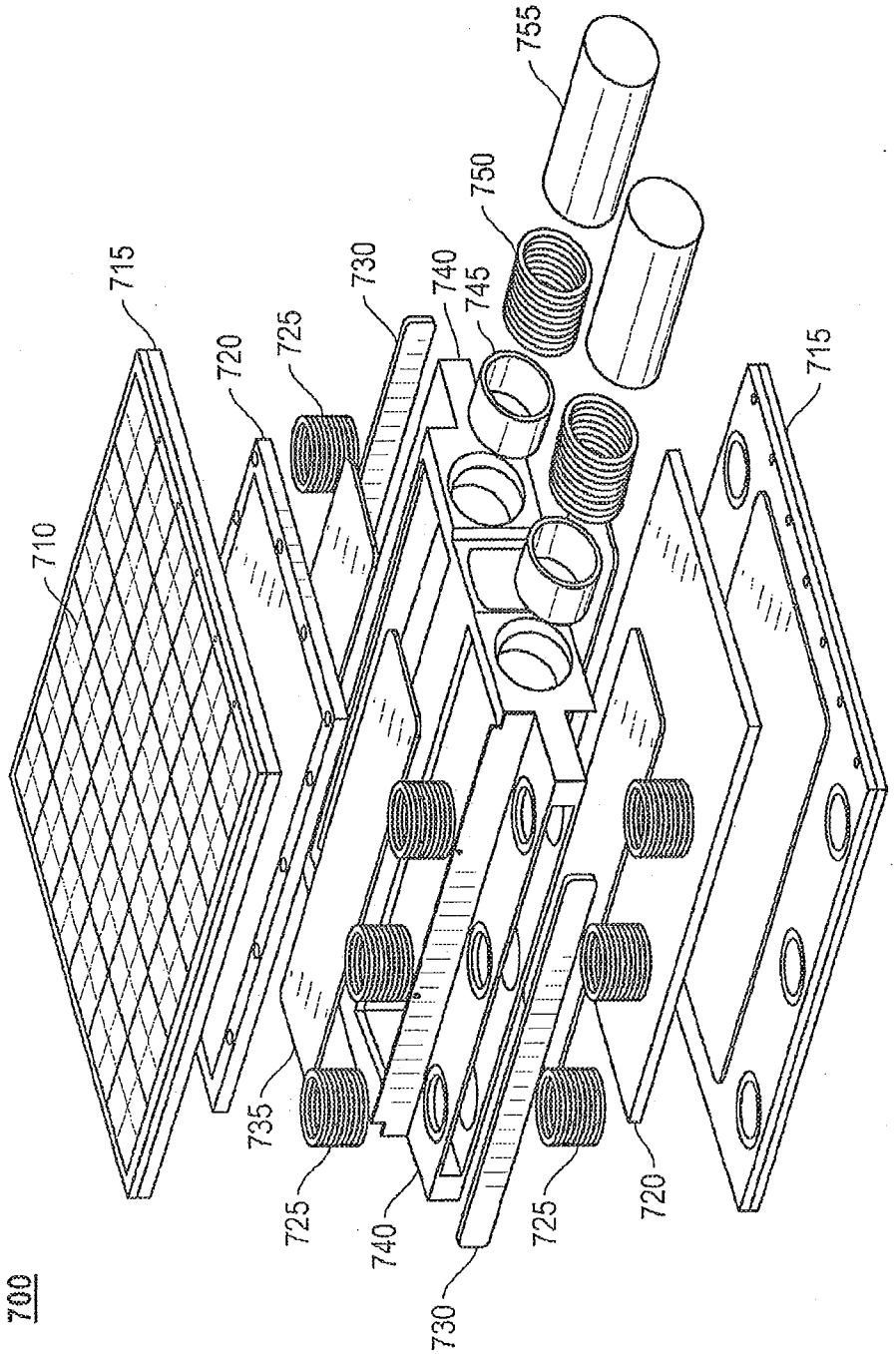


FIG. 7

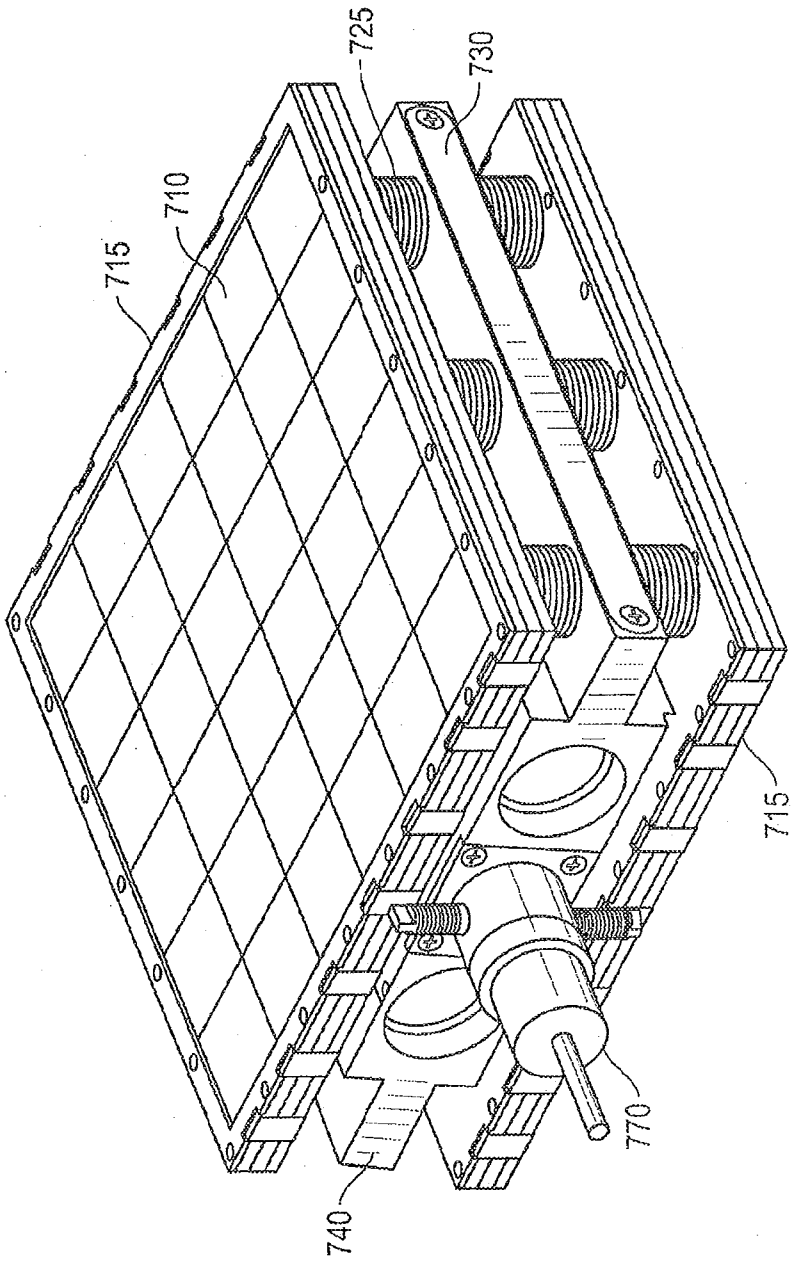


FIG. 8

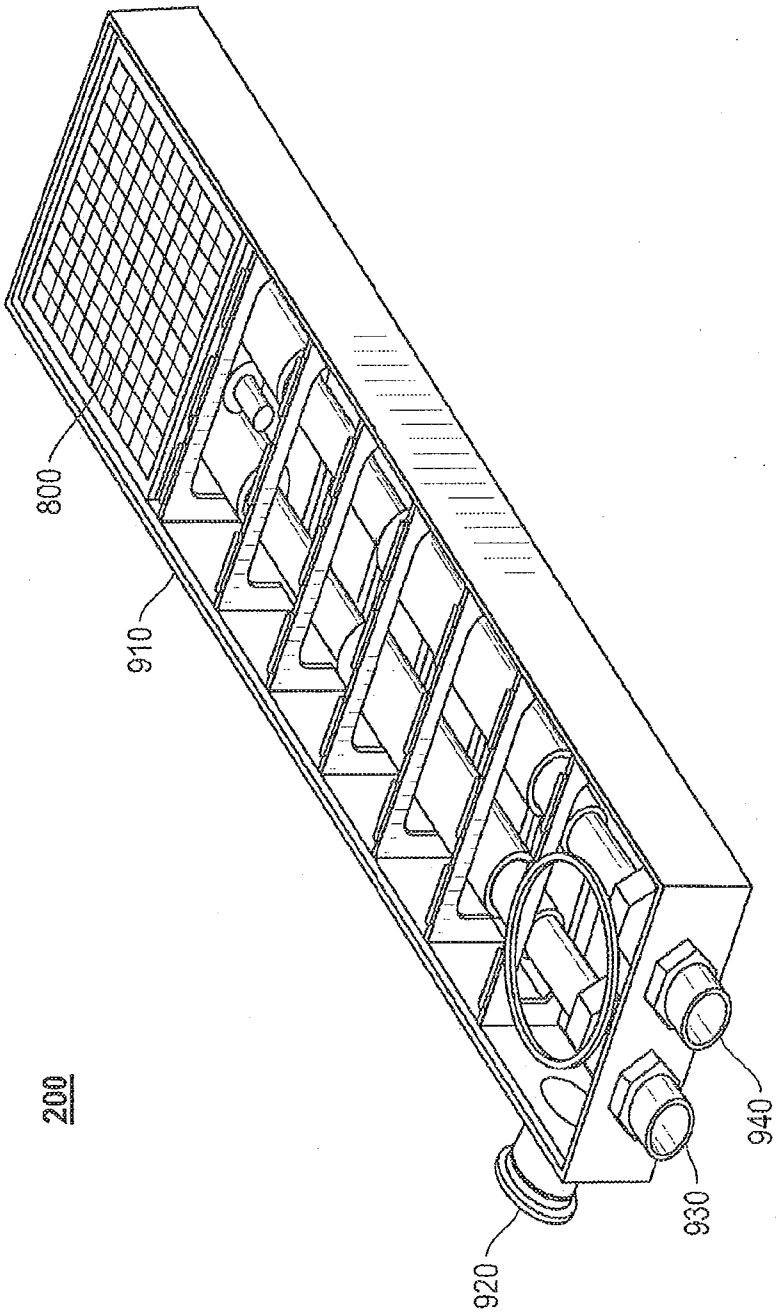


FIG. 9

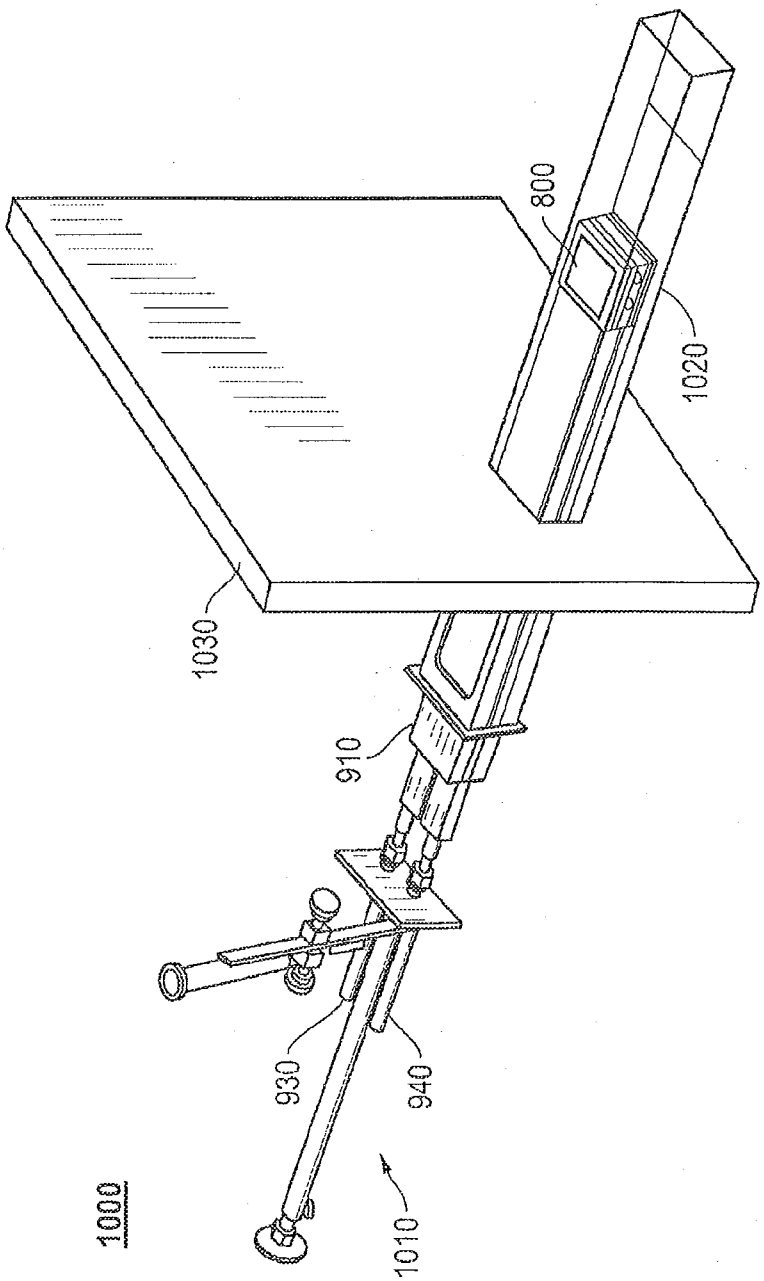


FIG. 10

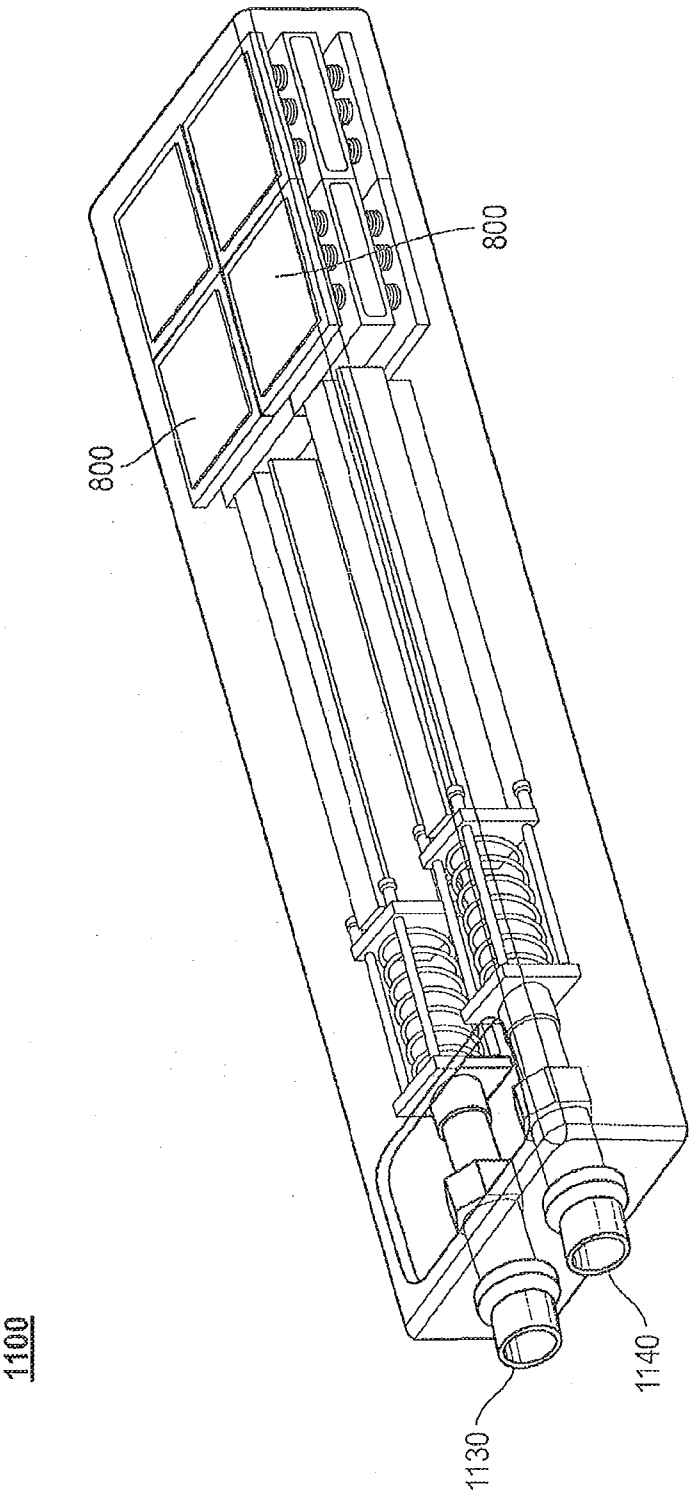


FIG. 11

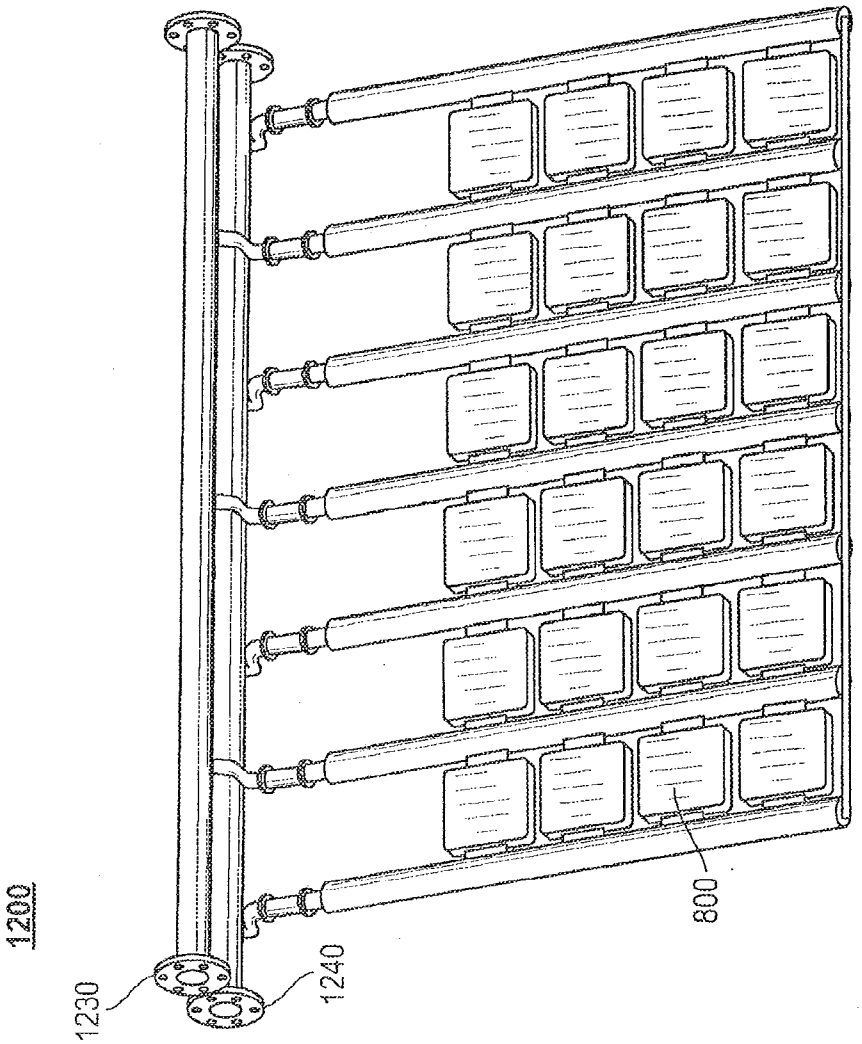


FIG. 12

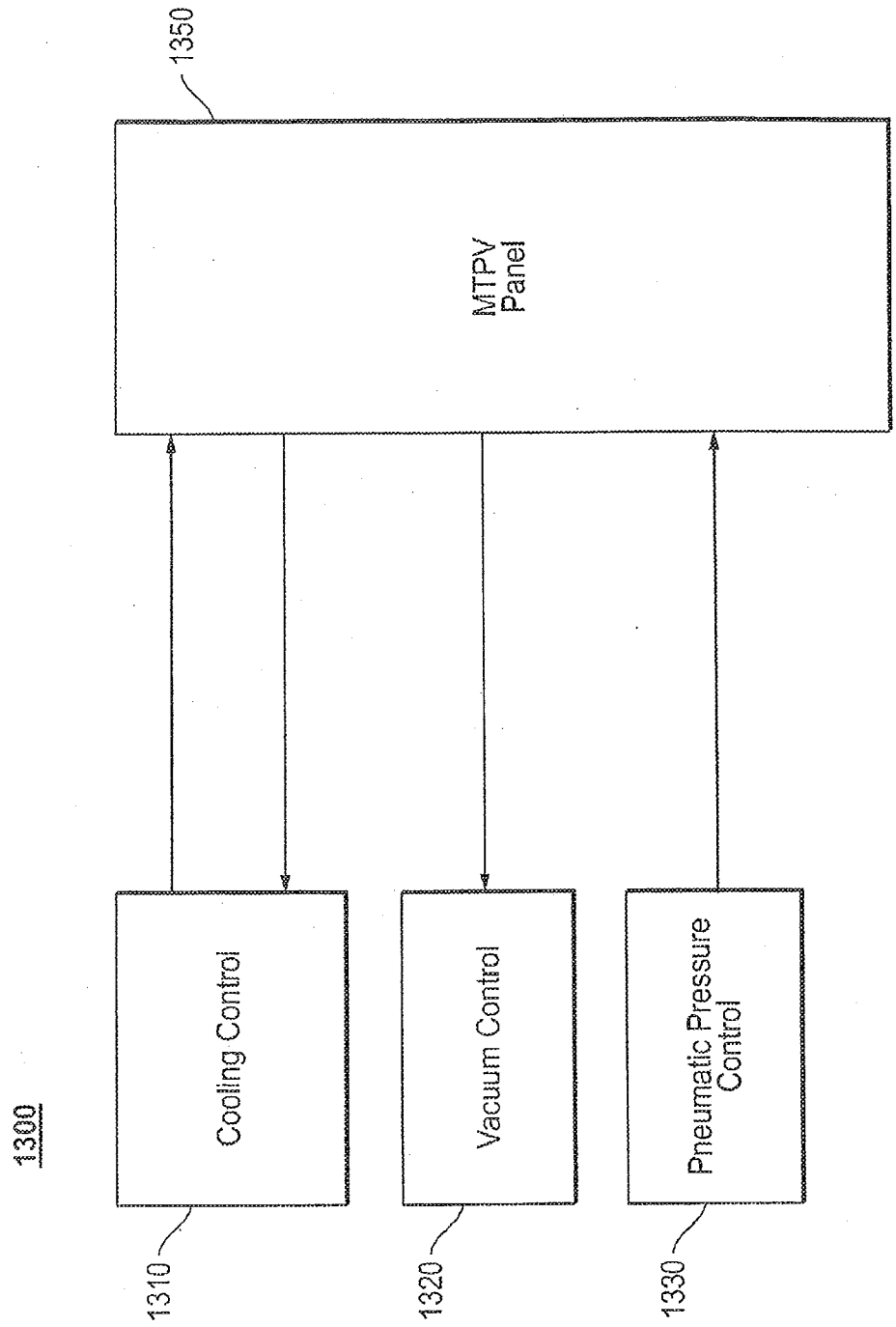

1300
1350
MTPV Panel
Cooling Control
Vacuum Control
Pneumatic Pressure Control
1310
1320
1330

FIG. 13