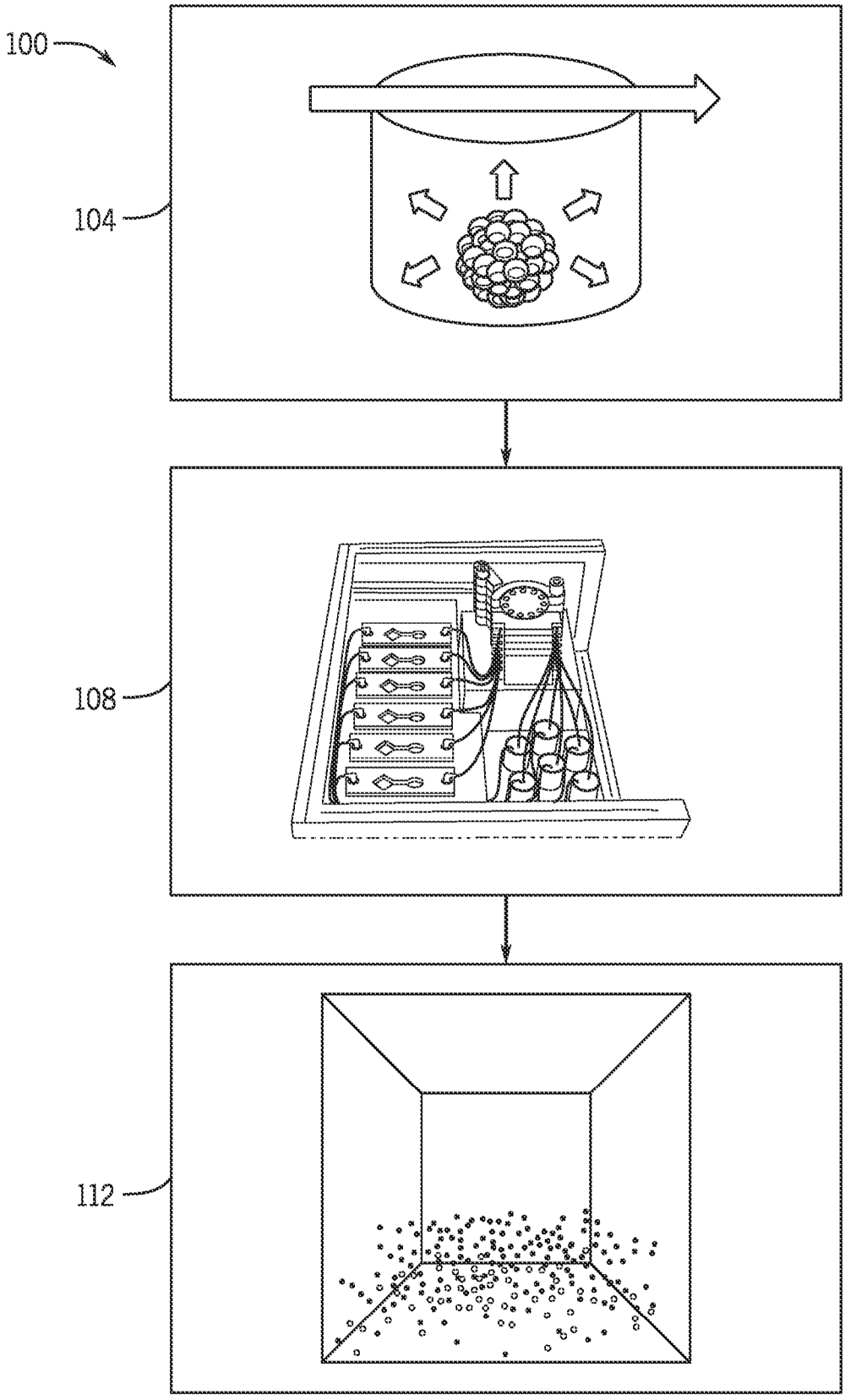


FIG. 1

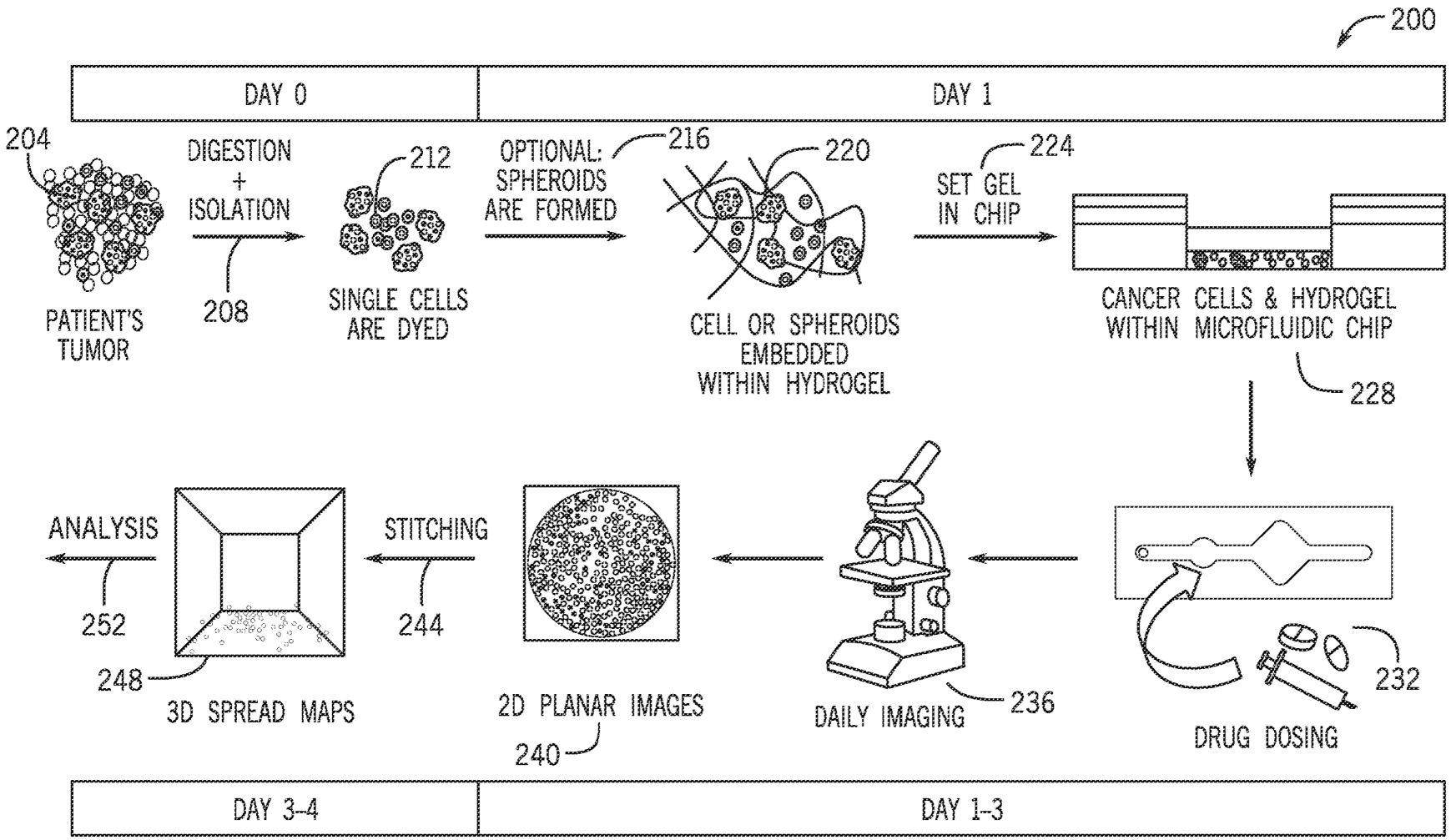

200
DAY 0
DAY 1
204
PATIENT'S TUMOR
DIGESTION + ISOLATION
208
212
SINGLE CELLS ARE DYED
OPTIONAL: SPHEROIDS ARE FORMED
216
220
CELL OR SPHEROIDS EMBEDDED WITHIN HYDROGEL
SET GEL IN CHIP
224
CANCER CELLS & HYDROGEL WITHIN MICROFLUIDIC CHIP
228
DRUG DOSING
232
DAILY IMAGING
236
2D PLANAR IMAGES
240
STITCHING
244
3D SPREAD MAPS
248
ANALYSIS
252
DAY 3–4
DAY 1–3

FIG. 2

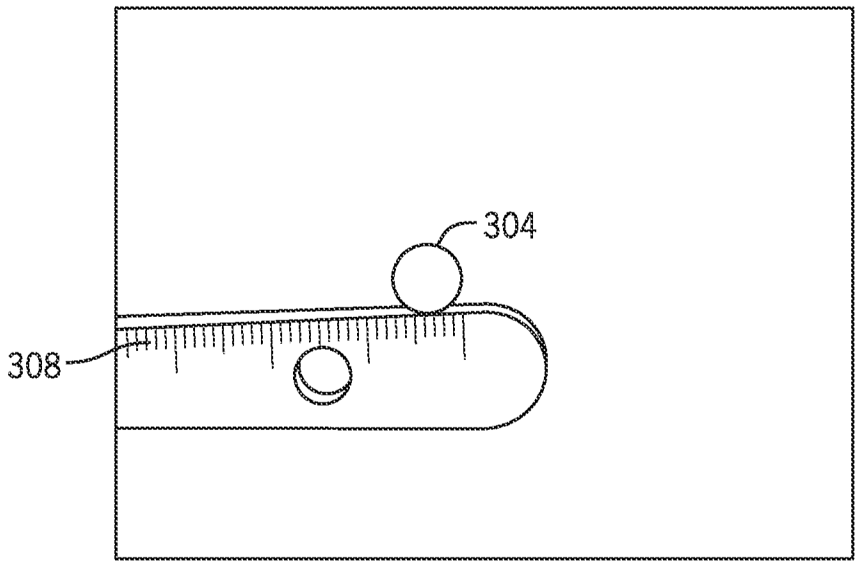

304
308

FIG. 3

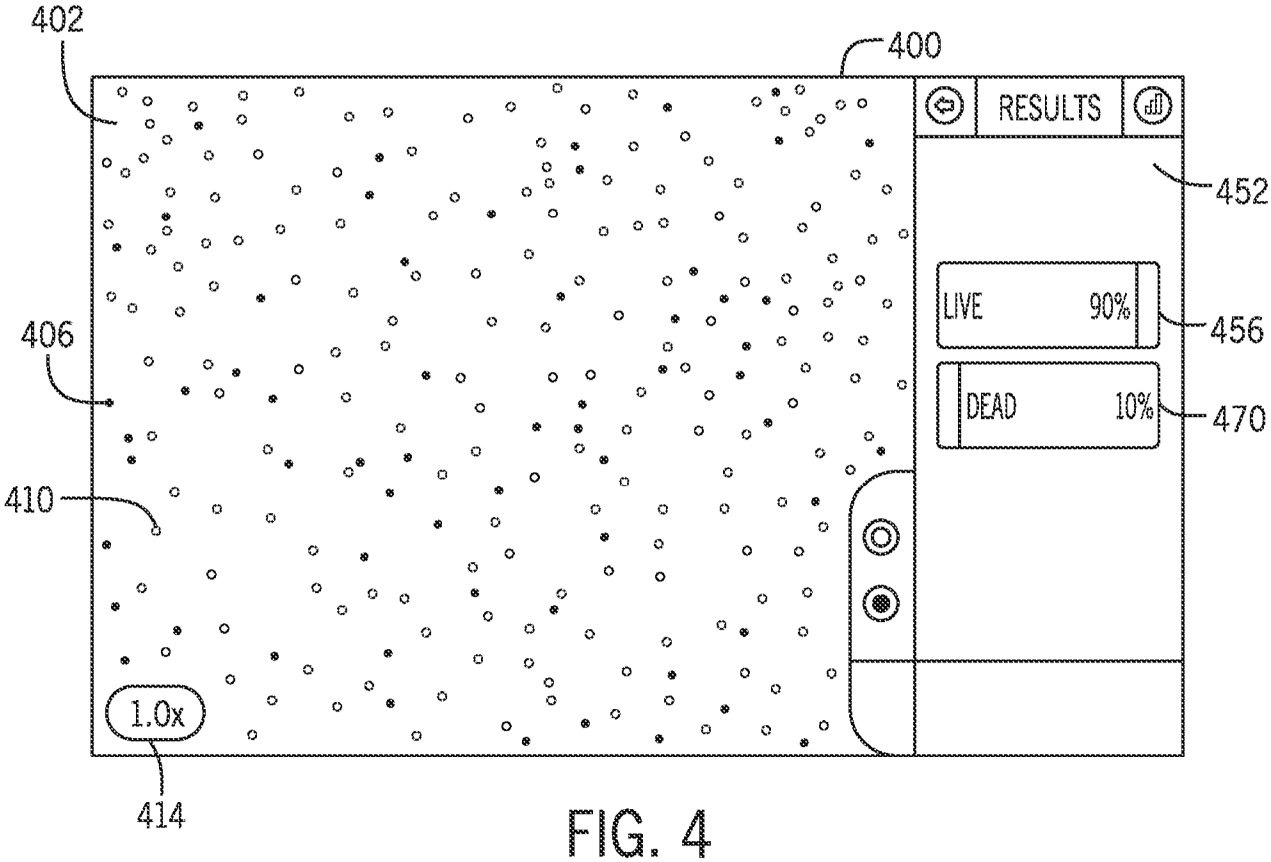

402
400
RESULTS
452
LIVE
90%
456
406
DEAD
10%
470
410
1.0x
414

FIG. 4

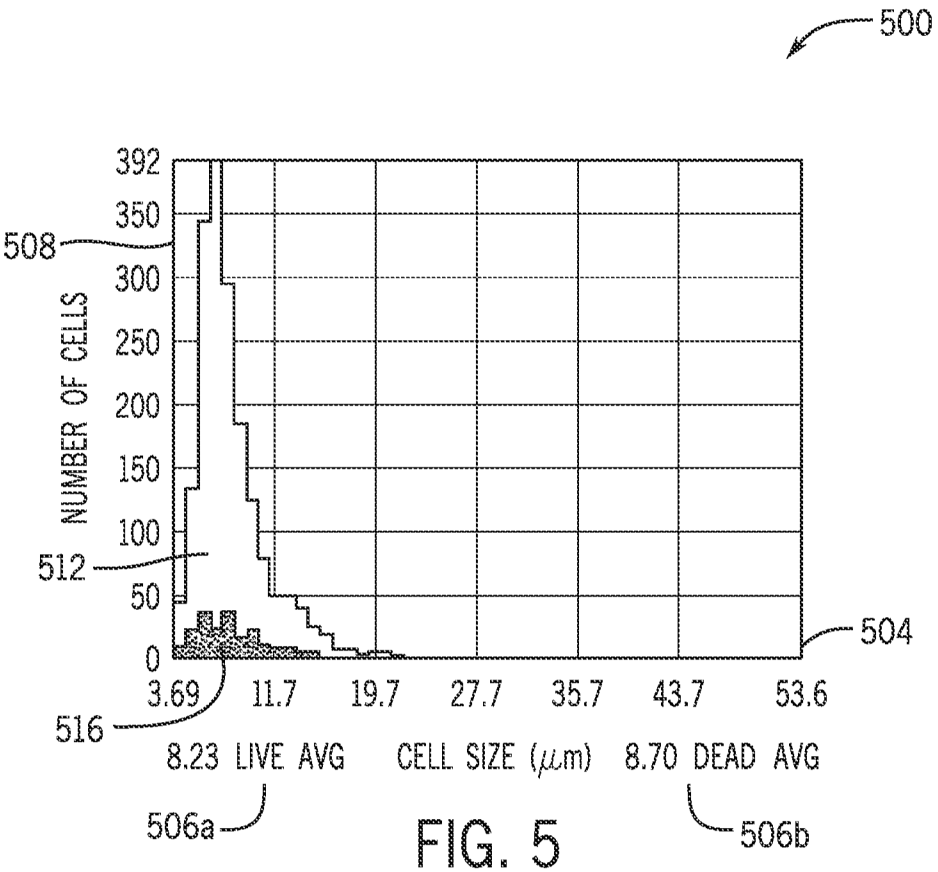

500
392
350
300
250
200
150
100
50
0
508
512
504
516
NUMBER OF CELLS
3.69
11.7
19.7
27.7
35.7
43.7
53.6
8.23 LIVE AVG
CELL SIZE (μm)
8.70 DEAD AVG
506a
506b

FIG. 5

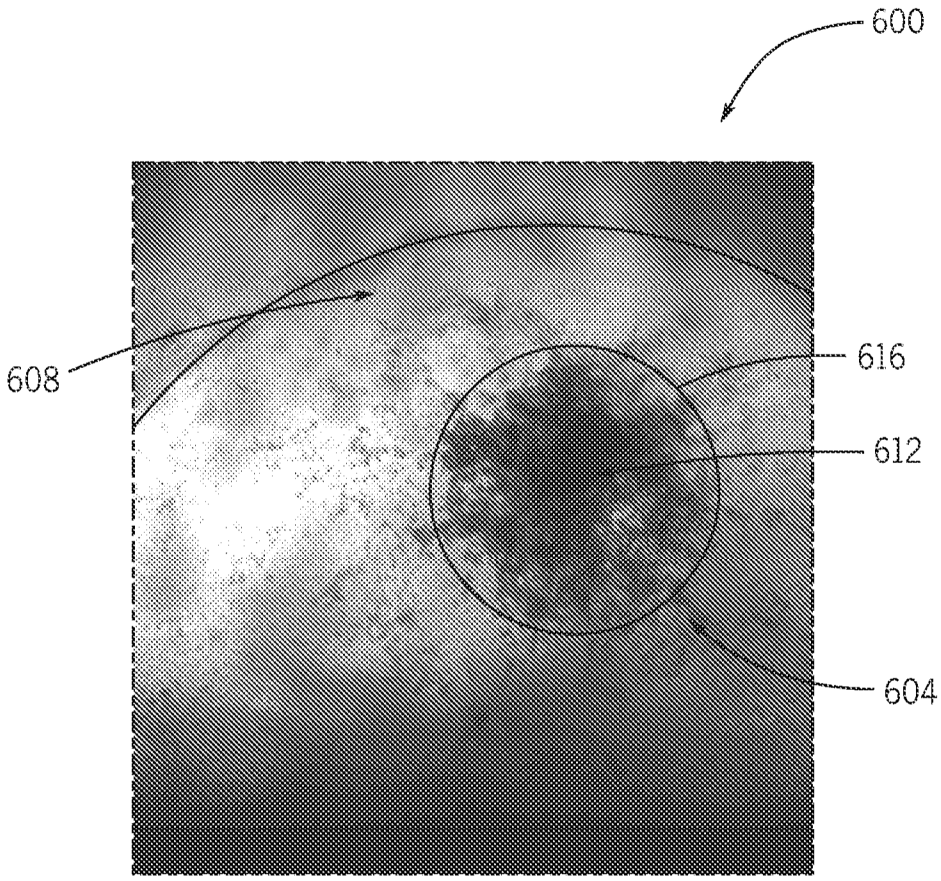


FIG. 6

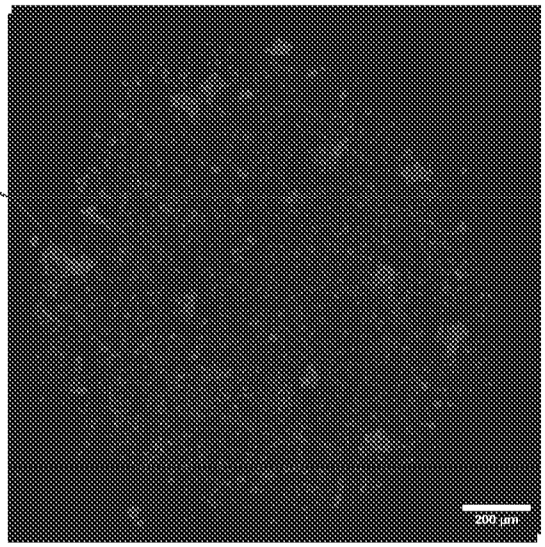


FIG. 7A

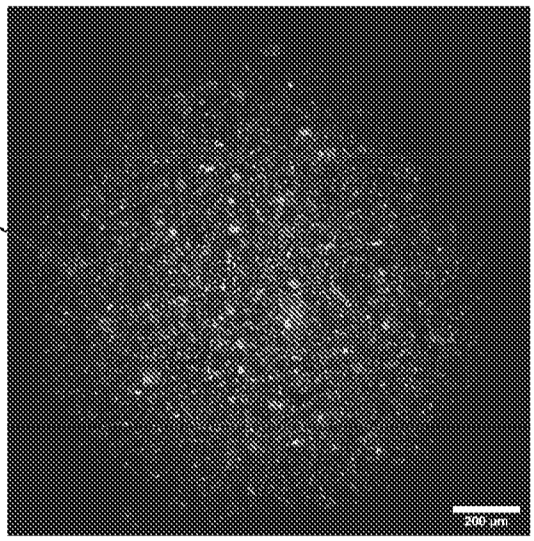


FIG. 7B

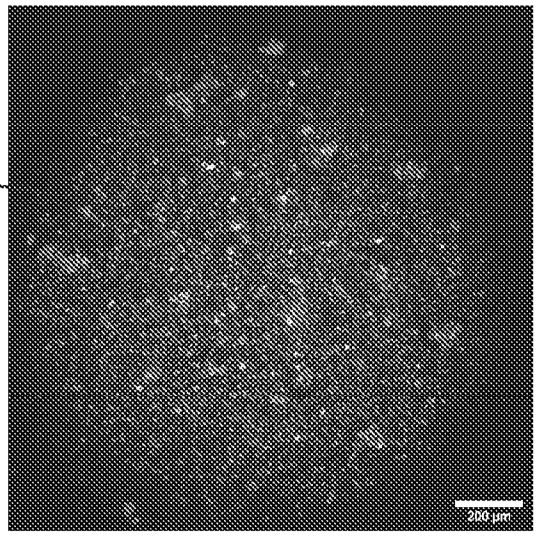


FIG. 7C

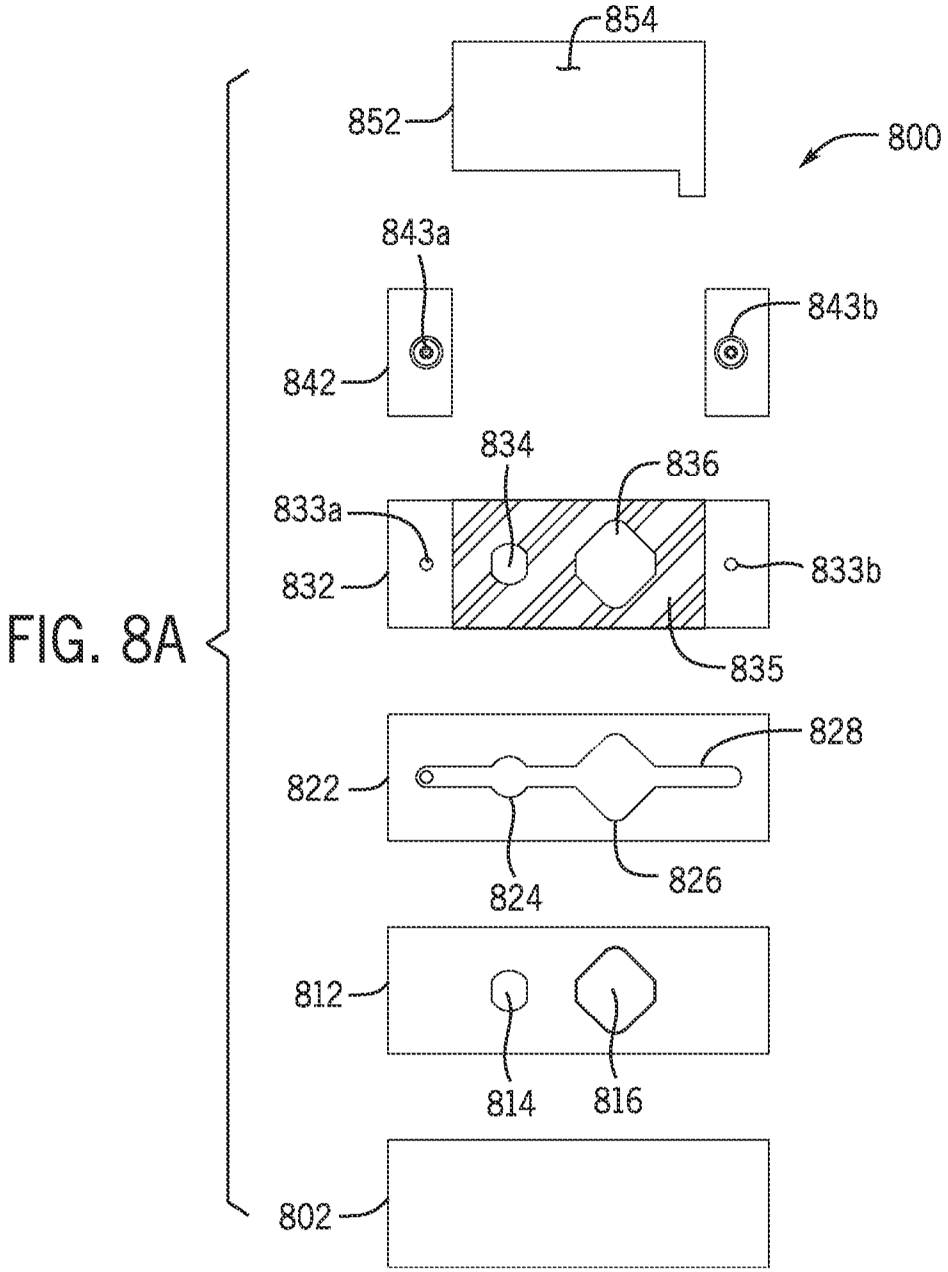

854
852
800
843a
843b
842
834
836
833a
832
833b
835
828
822
824
826
812
814
816
802

FIG. 8A

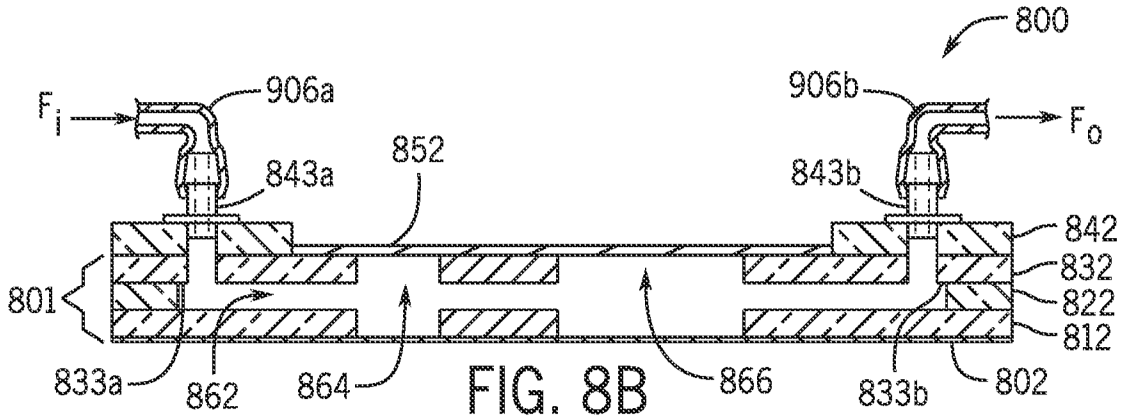

800
F_i
906a
906b
F_o
843a
852
843b
842
832
822
812
801
833a
862
864
866
833b
802

FIG. 8B

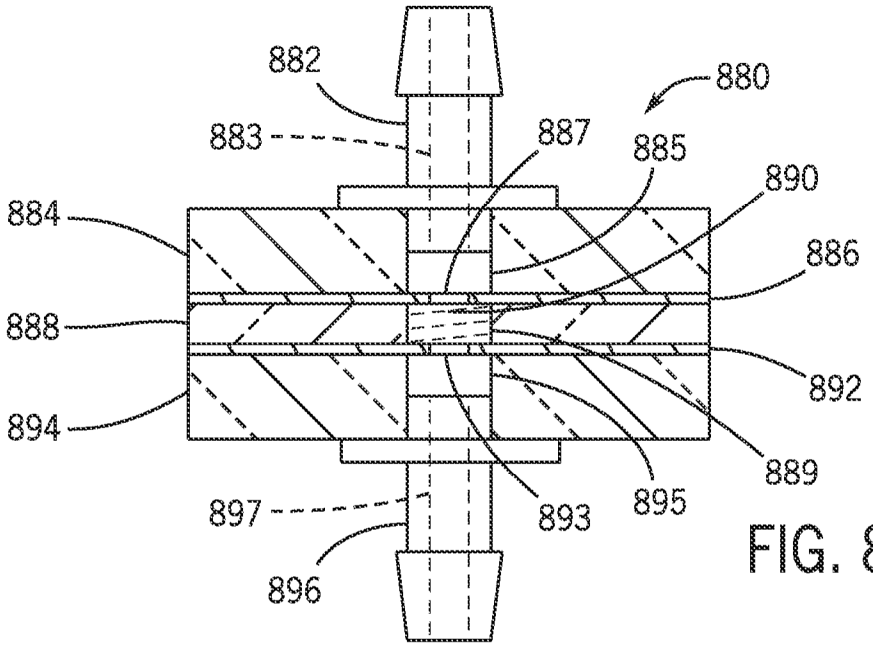


FIG. 8C

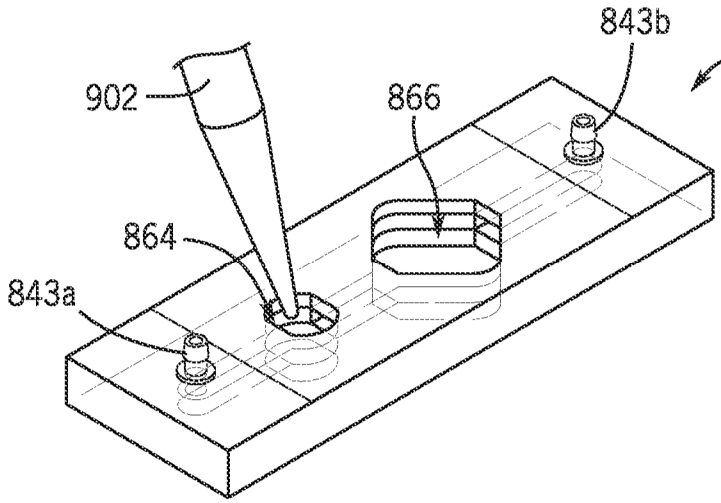


FIG. 9A

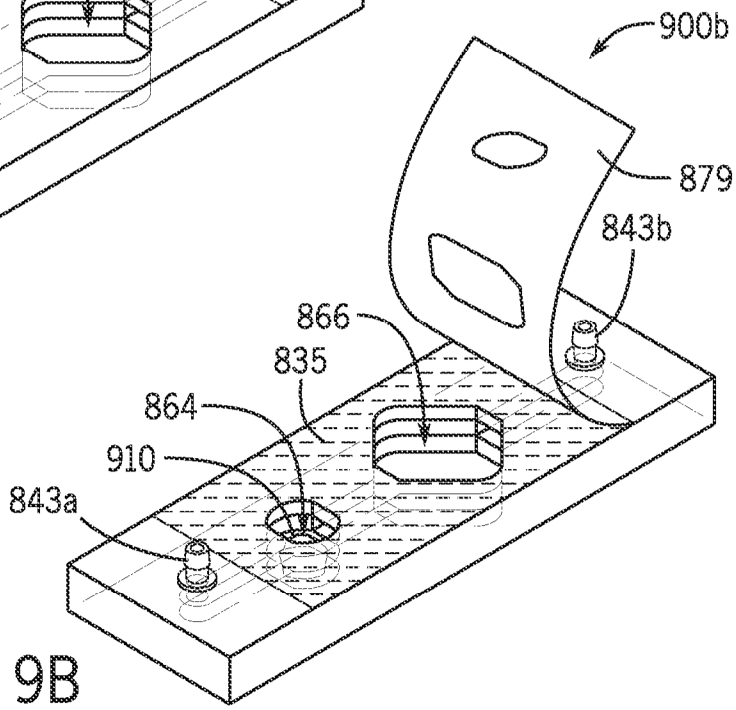


FIG. 9B

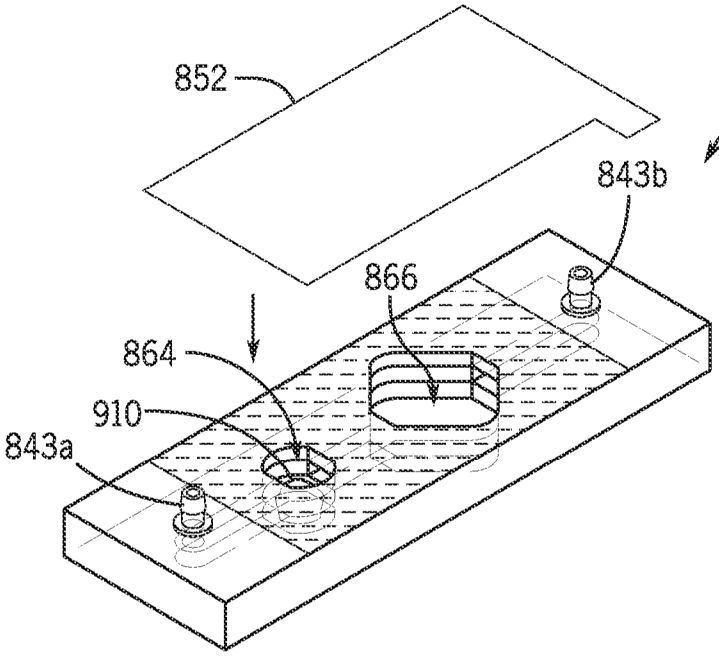


FIG. 9C

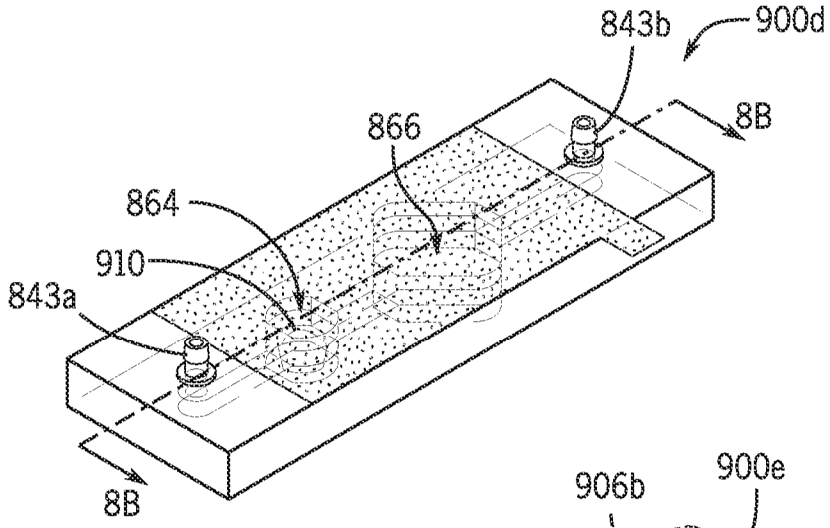


FIG. 9D

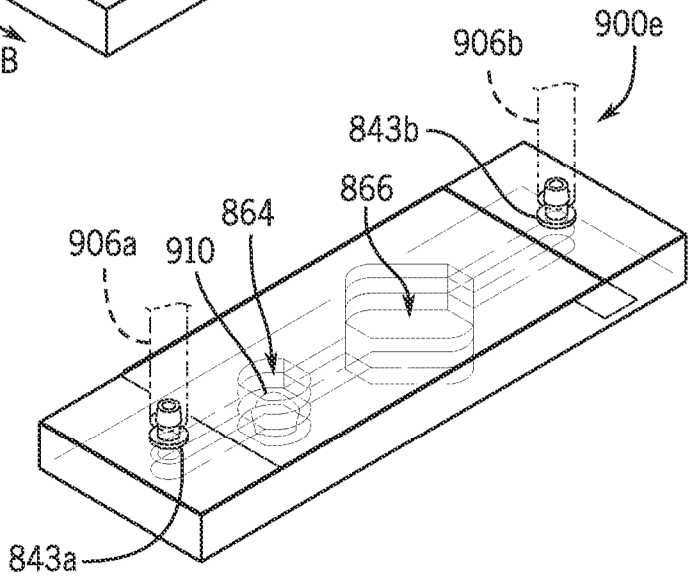


FIG. 9E

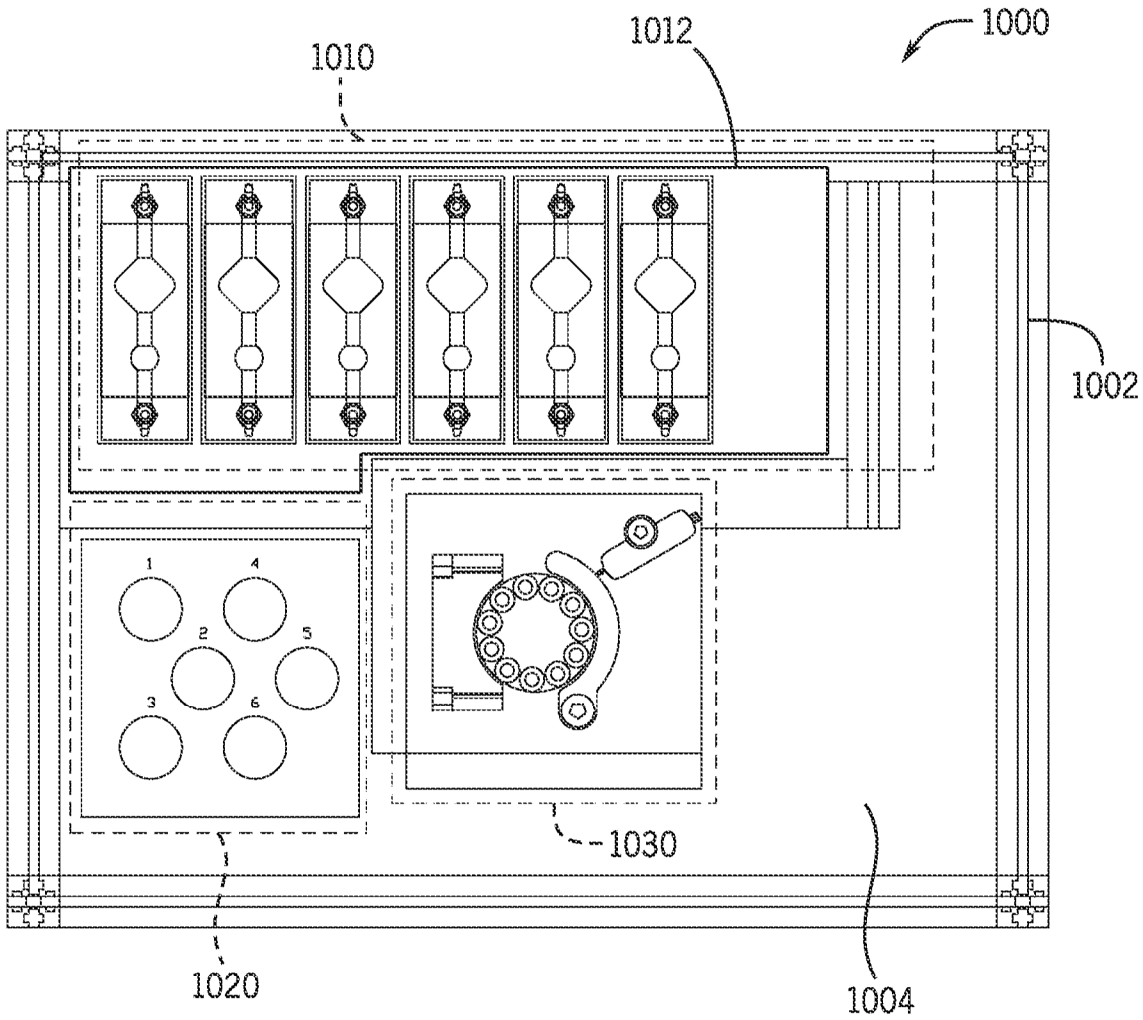


FIG. 10

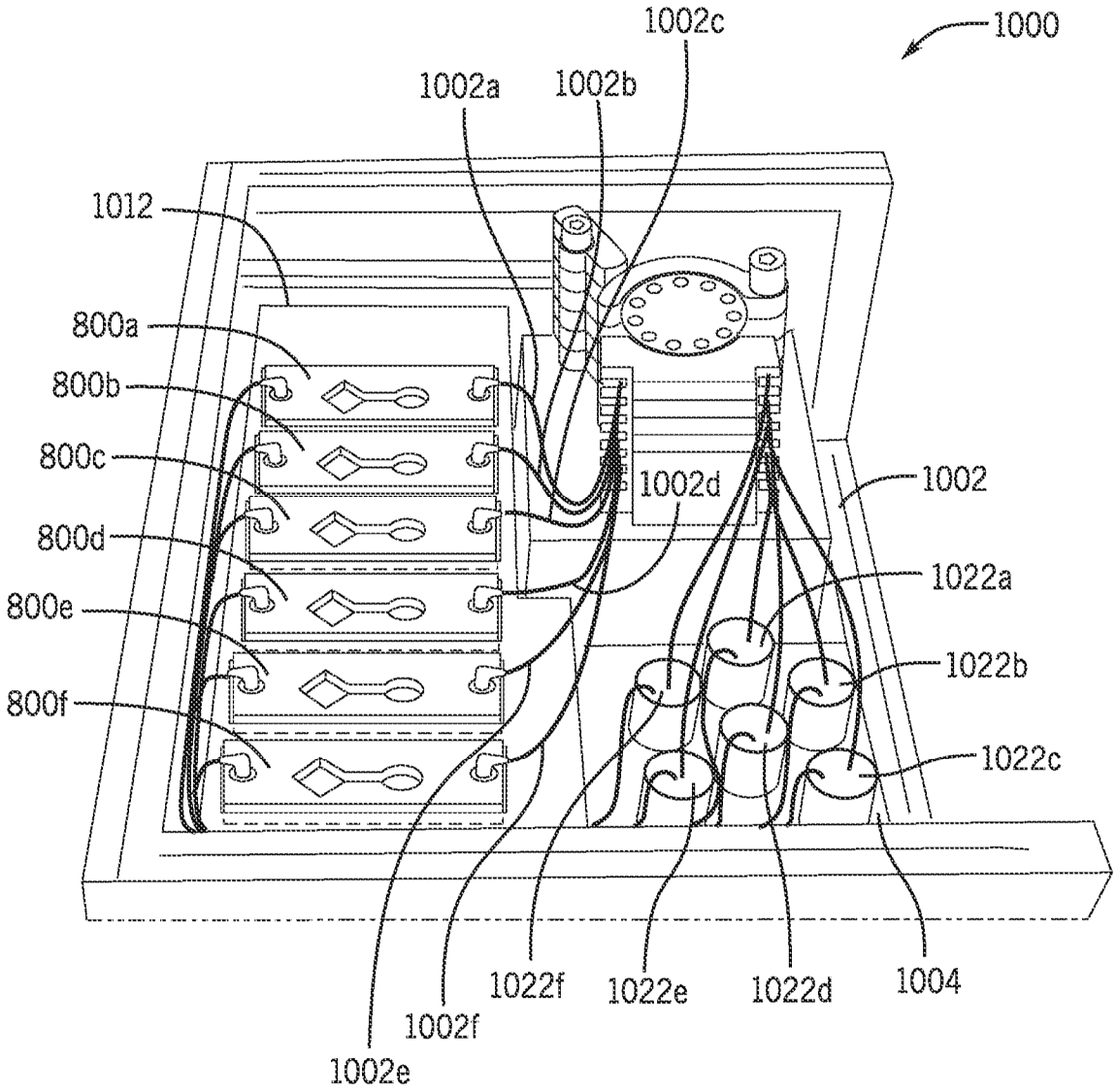

1002c
1000
1002a
1002b
1012
800a
800b
800c
800d
800e
800f
1002d
1002
1022a
1022b
1022c
1022f
1022e
1022d
1004
1002f
1002e

FIG. 11

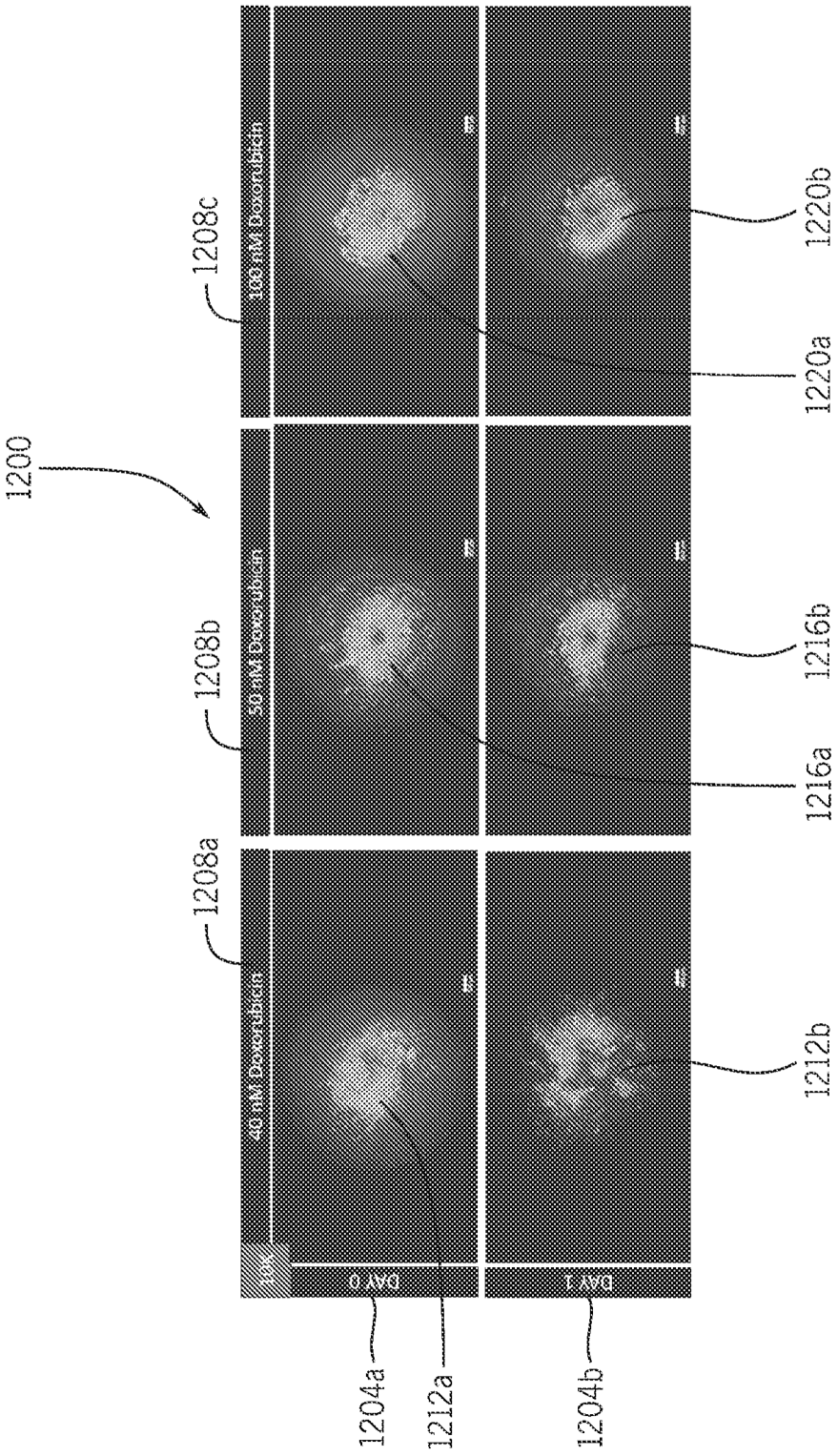

1200
1208a
1208b
1208c
1204a
1212a
1204b
1212b
1216a
1216b
1220a
1220b
DAY 0
DAY 1

FIG. 12

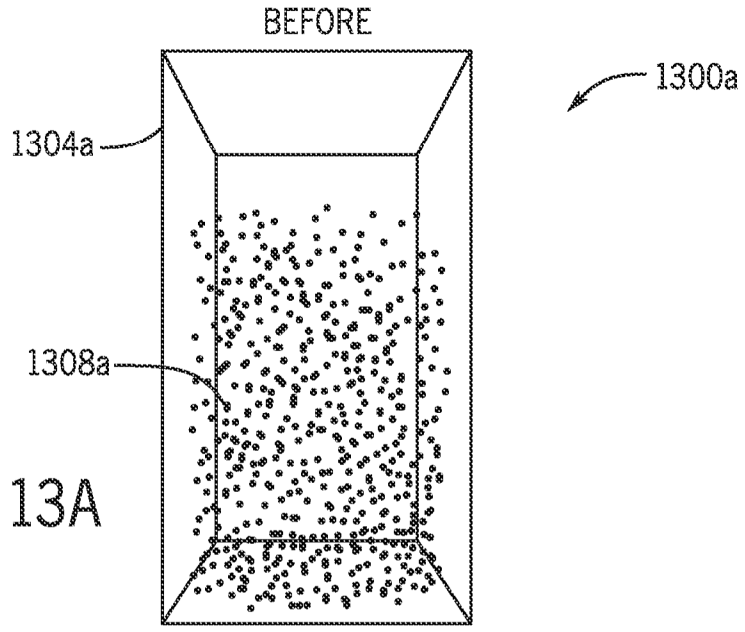


FIG. 13A

NUMBER OF LIVING CELLS ON DAY 1

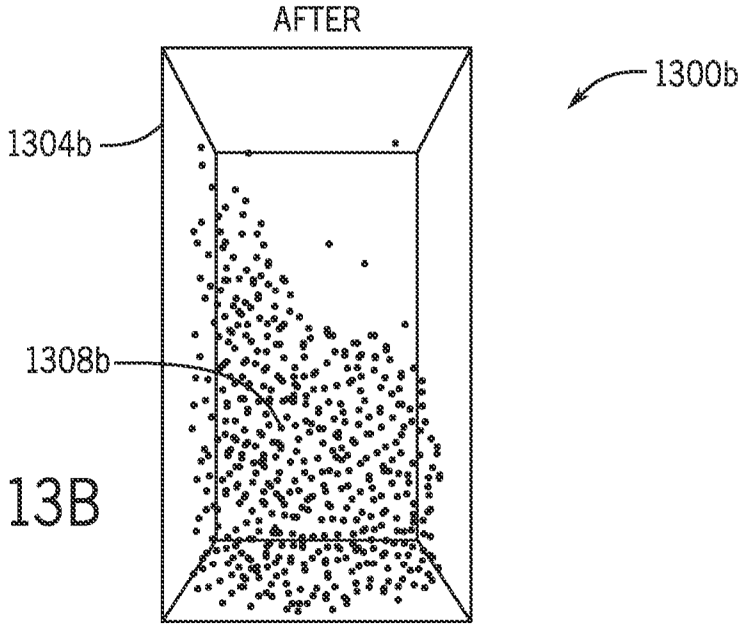


FIG. 13B

NUMBER OF LIVING CELLS ON DAY 4

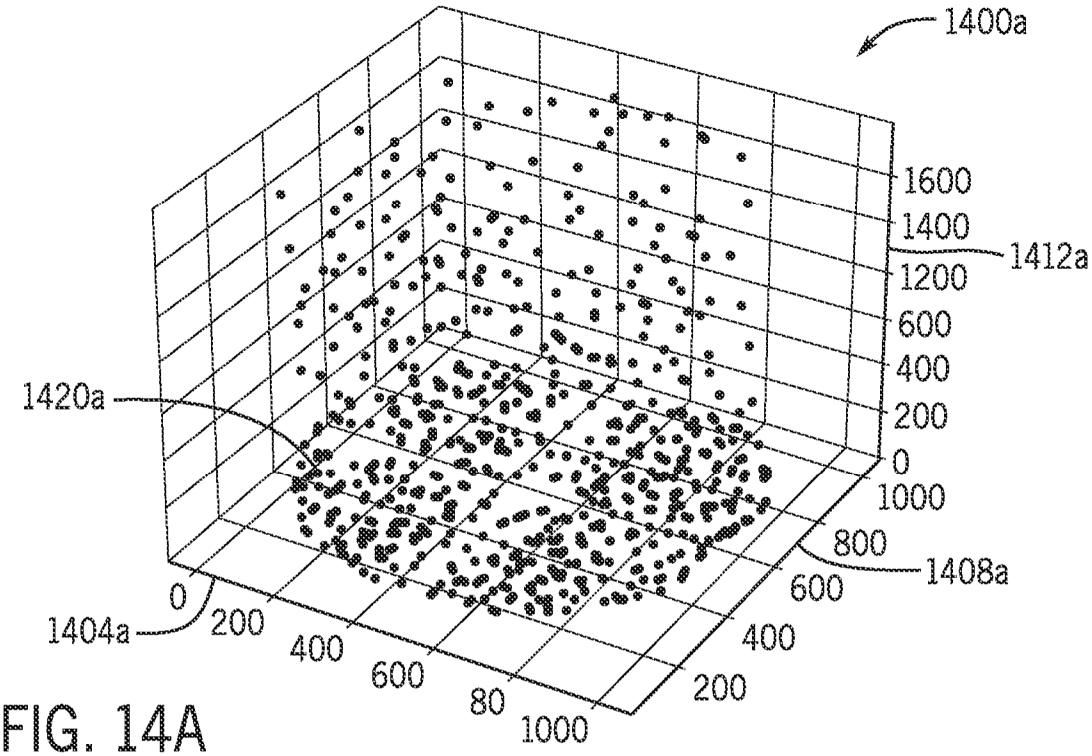


FIG. 14A

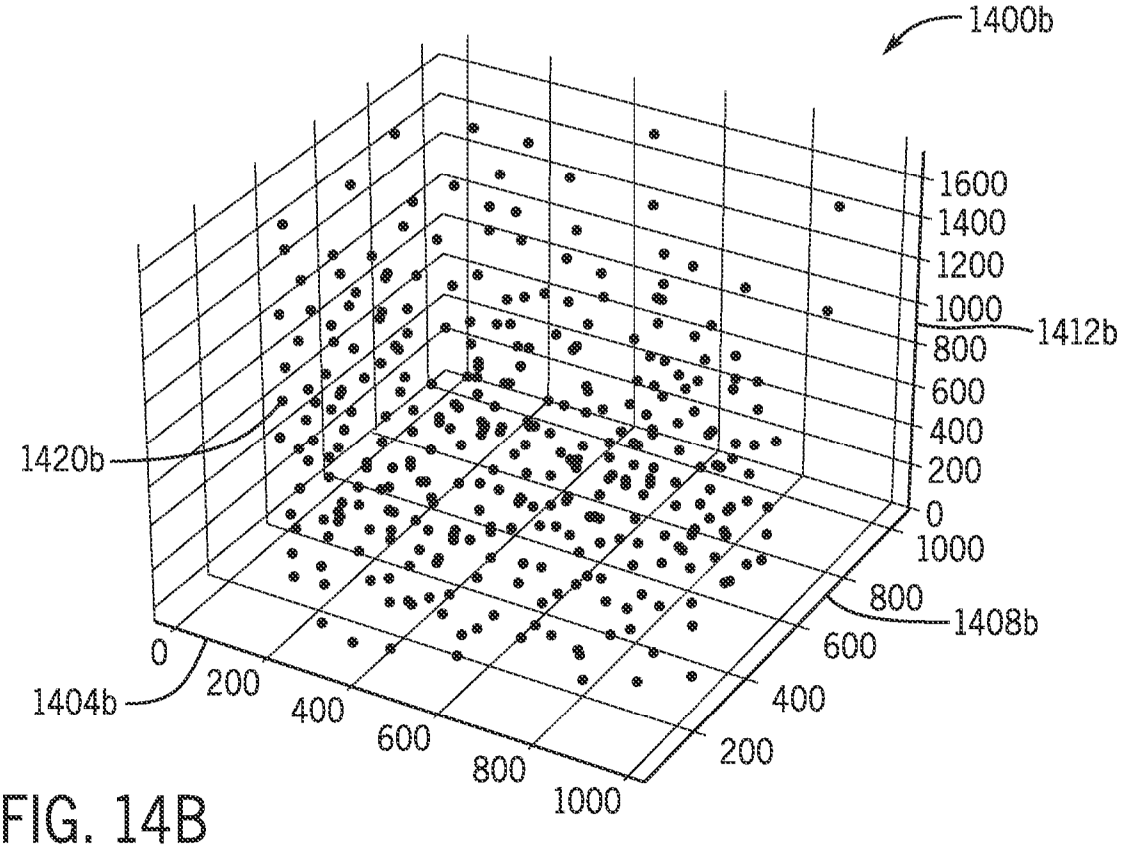


FIG. 14B

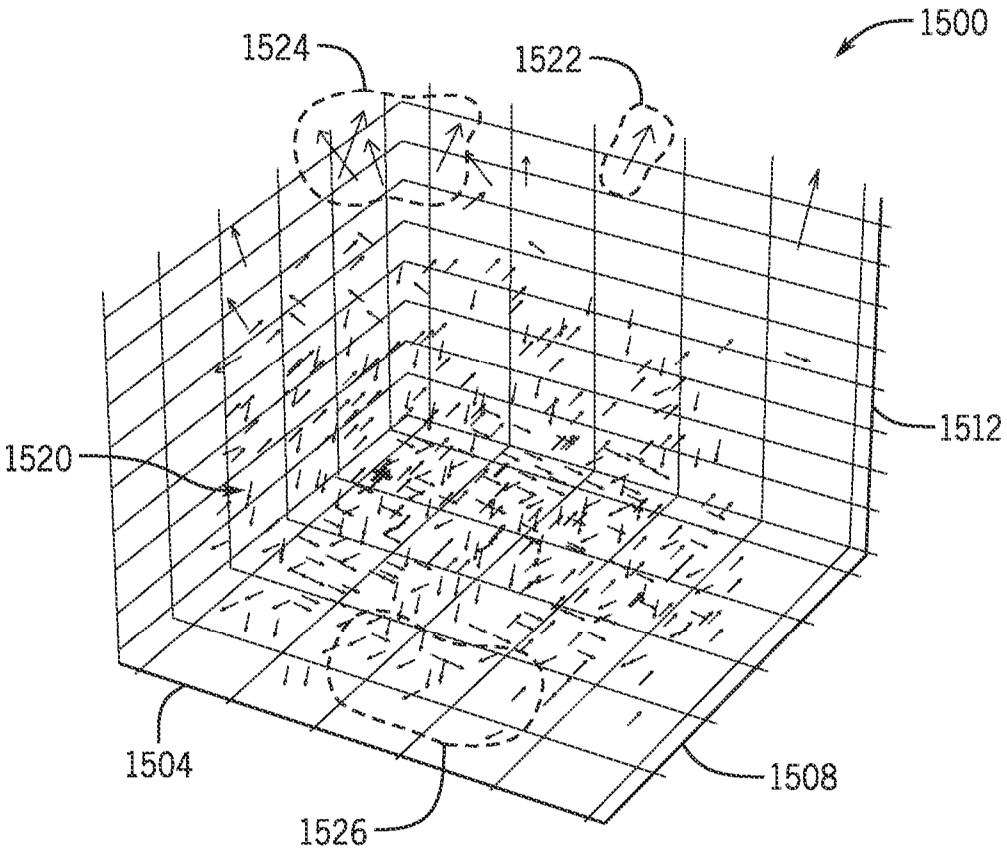


FIG. 15

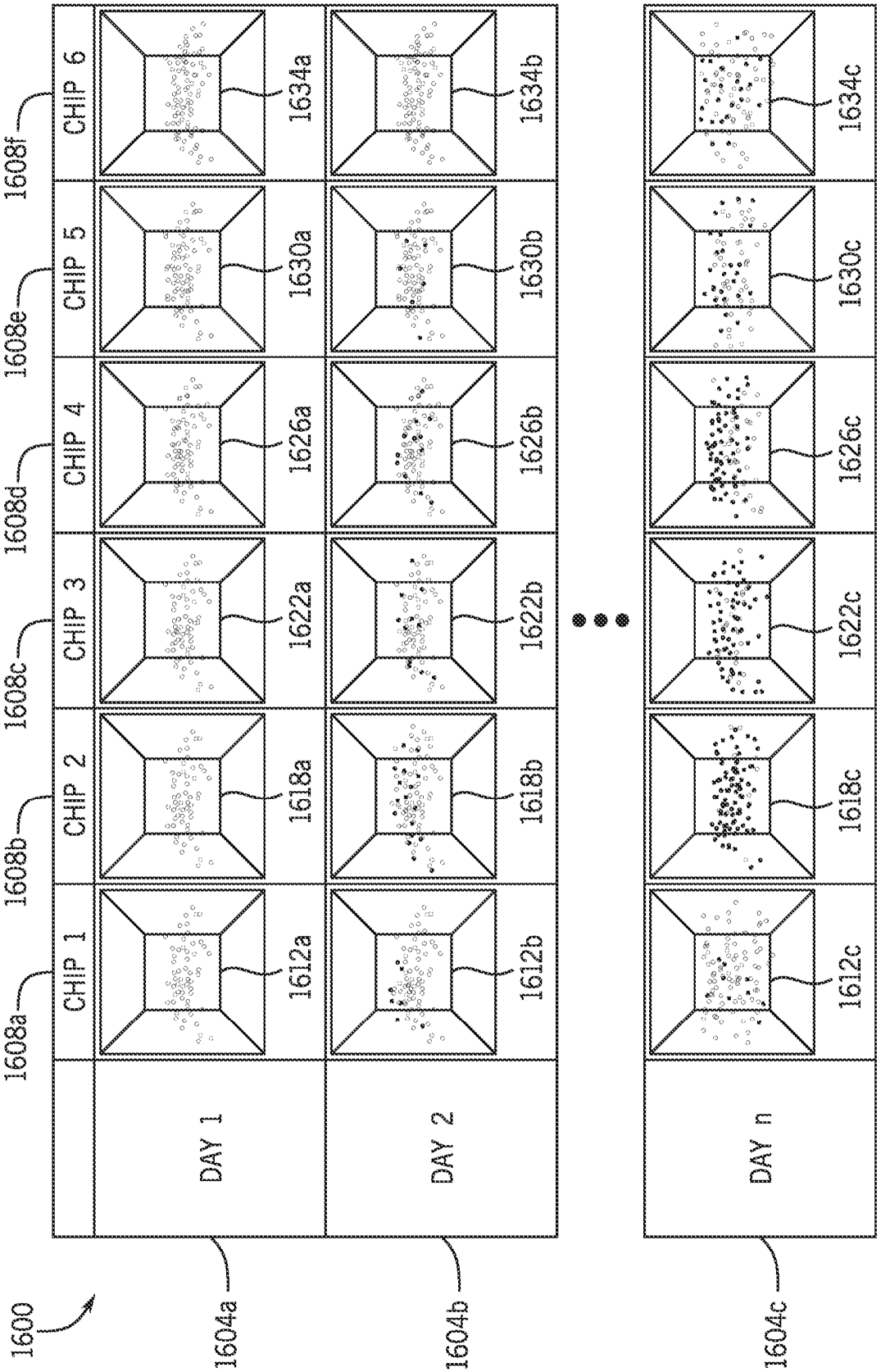

1600
1604a
1604b
1604c
DAY 1
DAY 2
DAY n
1608a
1608b
1608c
1608d
1608e
1608f
CHIP 1
CHIP 2
CHIP 3
CHIP 4
CHIP 5
CHIP 6
1612a
1612b
1612c
1618a
1618b
1618c
1622a
1622b
1622c
1626a
1626b
1626c
1630a
1630b
1630c
1634a
1634b
1634c

FIG. 16

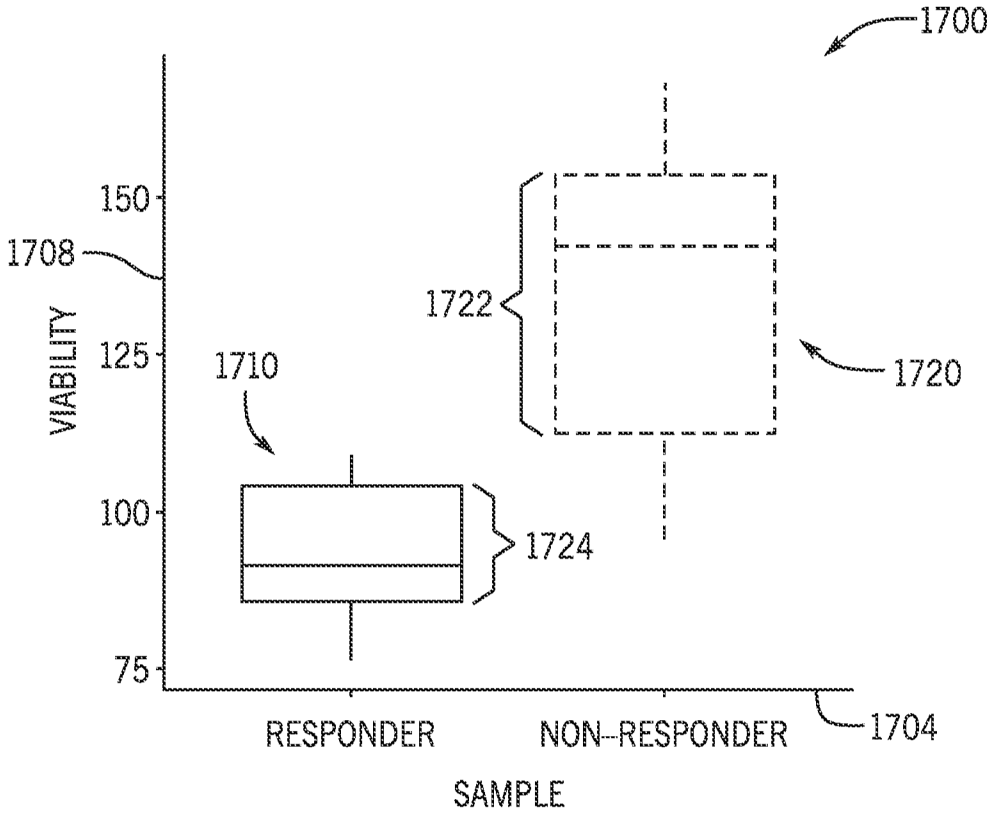

1700
150
1708
VIABILITY
125
100
75
1710
1722
1720
1724
RESPONDER
NON-RESPONDER
1704
SAMPLE

FIG. 17

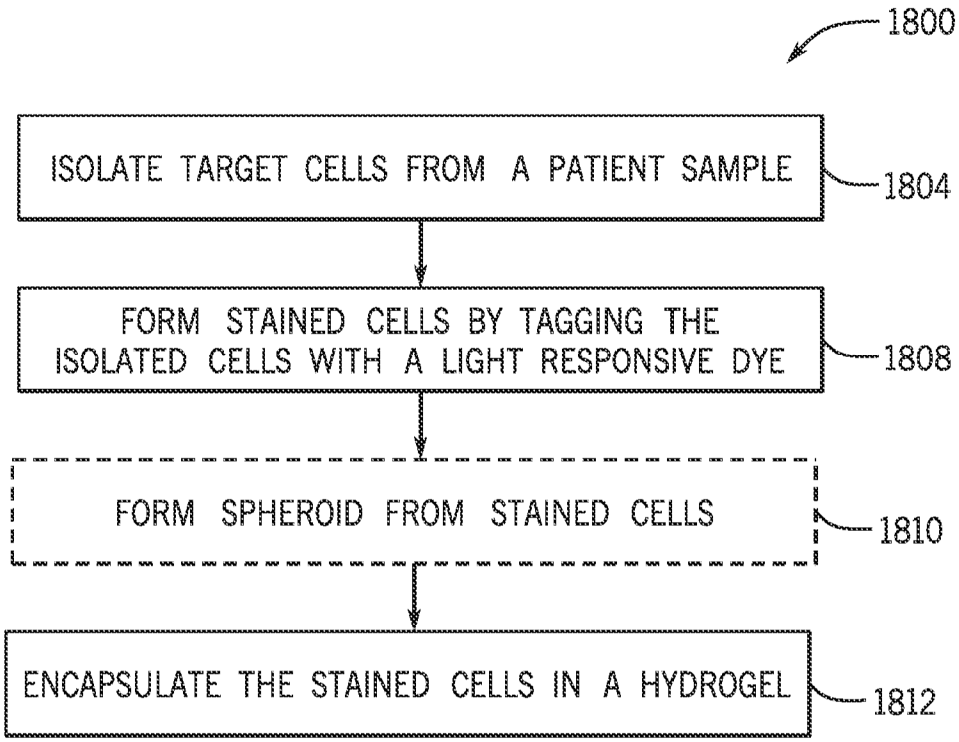

1800
ISOLATE TARGET CELLS FROM A PATIENT SAMPLE
1804
FORM STAINED CELLS BY TAGGING THE ISOLATED CELLS WITH A LIGHT RESPONSIVE DYE
1808
FORM SPHEROID FROM STAINED CELLS
1810
ENCAPSULATE THE STAINED CELLS IN A HYDROGEL
1812

FIG. 18

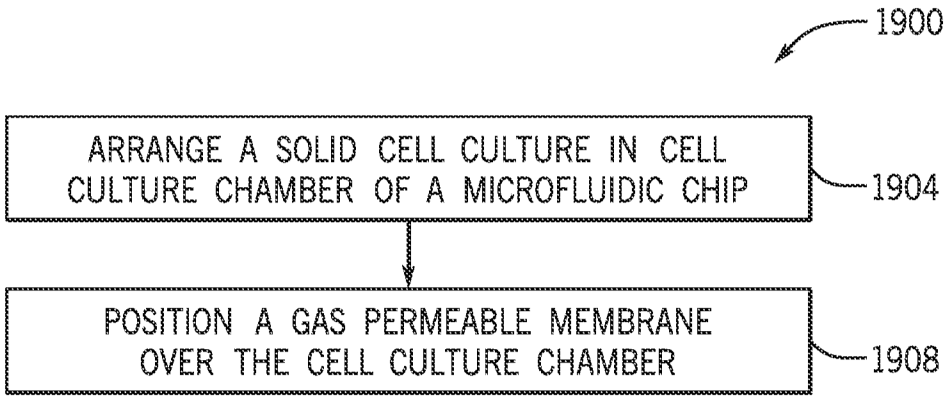

1900
ARRANGE A SOLID CELL CULTURE IN CELL CULTURE CHAMBER OF A MICROFLUIDIC CHIP
1904
POSITION A GAS PERMEABLE MEMBRANE OVER THE CELL CULTURE CHAMBER
1908

FIG. 19

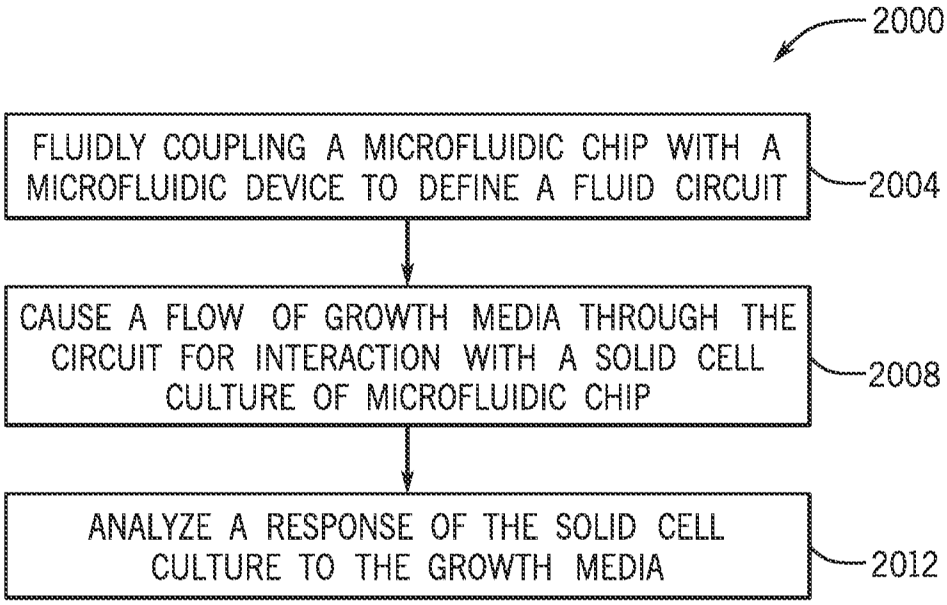

2000
FLUIDLY COUPLING A MICROFLUIDIC CHIP WITH A MICROFLUIDIC DEVICE TO DEFINE A FLUID CIRCUIT
2004
CAUSE A FLOW OF GROWTH MEDIA THROUGH THE CIRCUIT FOR INTERACTION WITH A SOLID CELL CULTURE OF MICROFLUIDIC CHIP
2008
ANALYZE A RESPONSE OF THE SOLID CELL CULTURE TO THE GROWTH MEDIA
2012

FIG. 20

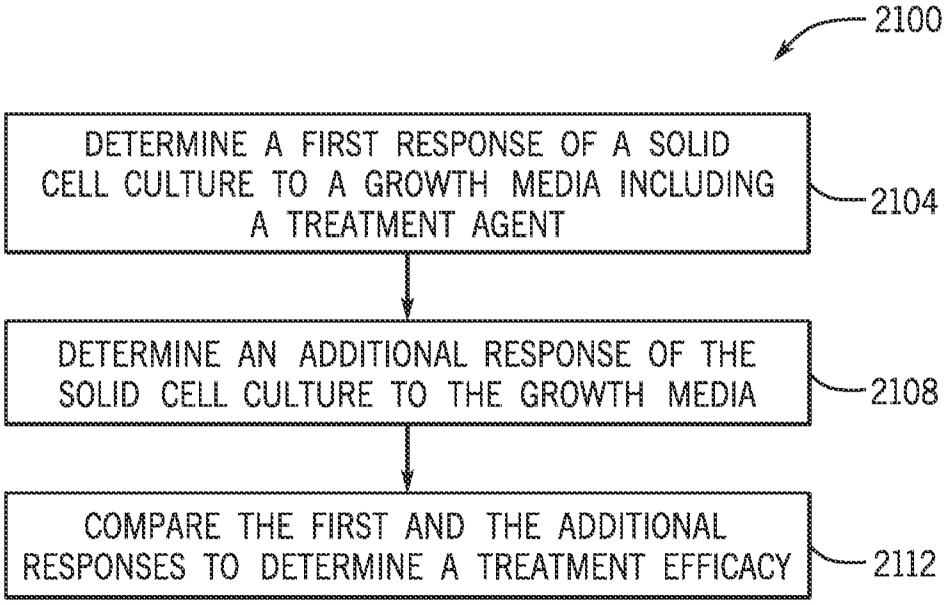

2100
DETERMINE A FIRST RESPONSE OF A SOLID CELL CULTURE TO A GROWTH MEDIA INCLUDING A TREATMENT AGENT
2104
DETERMINE AN ADDITIONAL RESPONSE OF THE SOLID CELL CULTURE TO THE GROWTH MEDIA
2108
COMPARE THE FIRST AND THE ADDITIONAL RESPONSES TO DETERMINE A TREATMENT EFFICACY
2112

FIG. 21

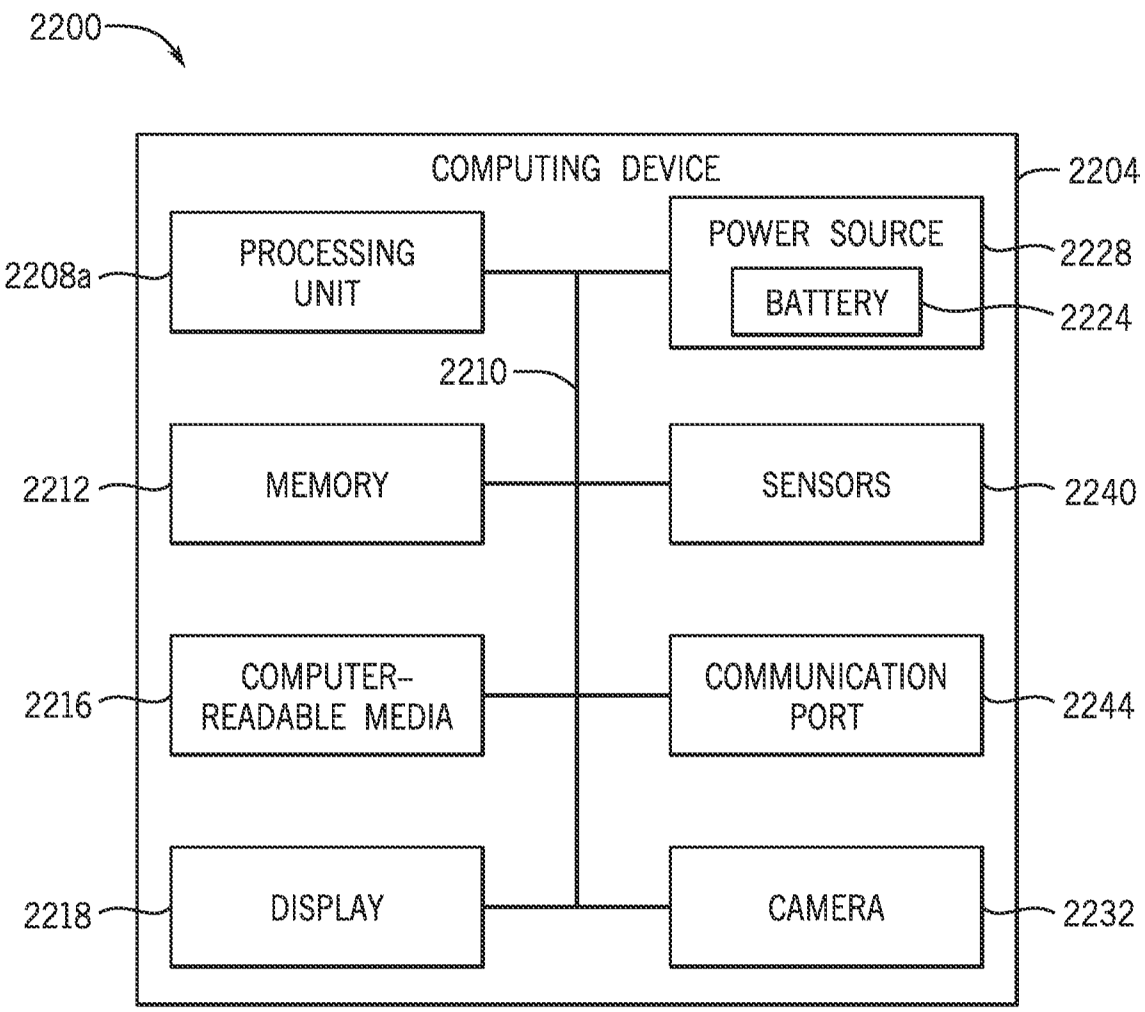

2200
COMPUTING DEVICE
2204
PROCESSING UNIT
2208a
POWER SOURCE
2228
BATTERY
2224
2210
MEMORY
2212
SENSORS
2240
COMPUTER-READABLE MEDIA
2216
COMMUNICATION PORT
2244
DISPLAY
2218
CAMERA
2232

FIG. 22