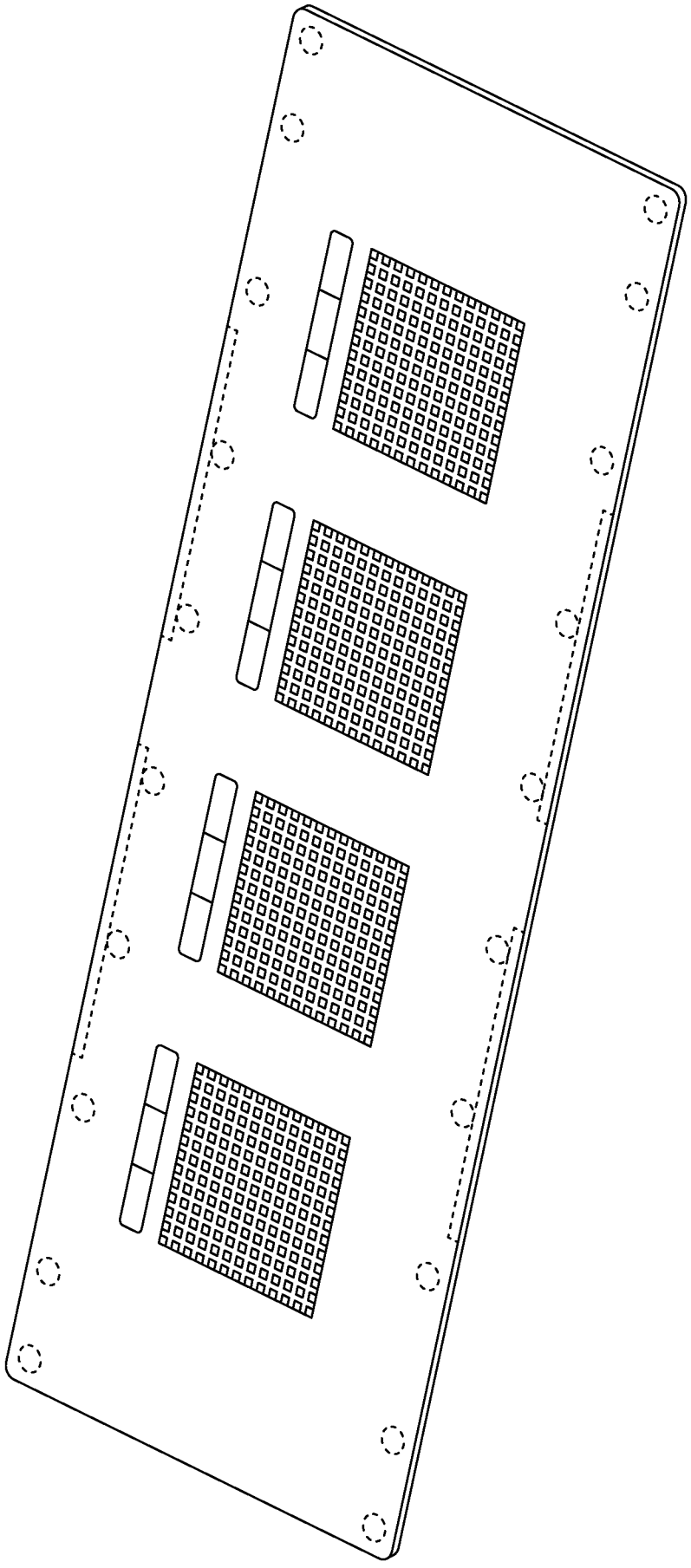

FIG. 1

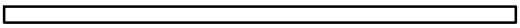

FIG. 2B

FIG. 2A

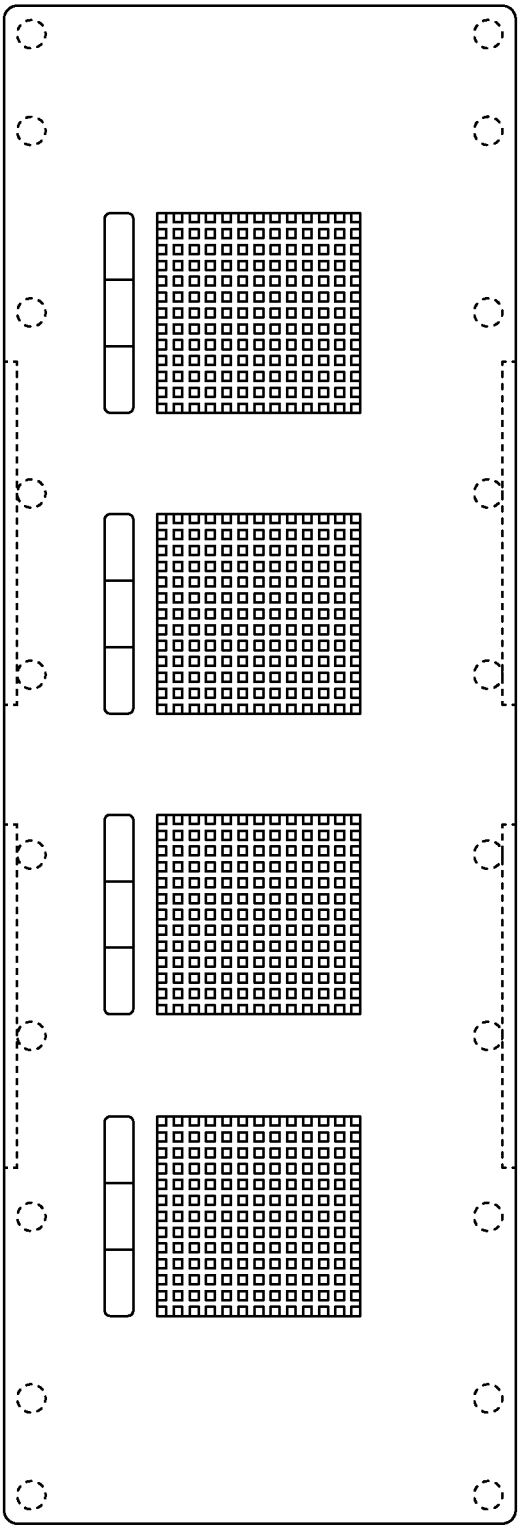

FIG. 2C

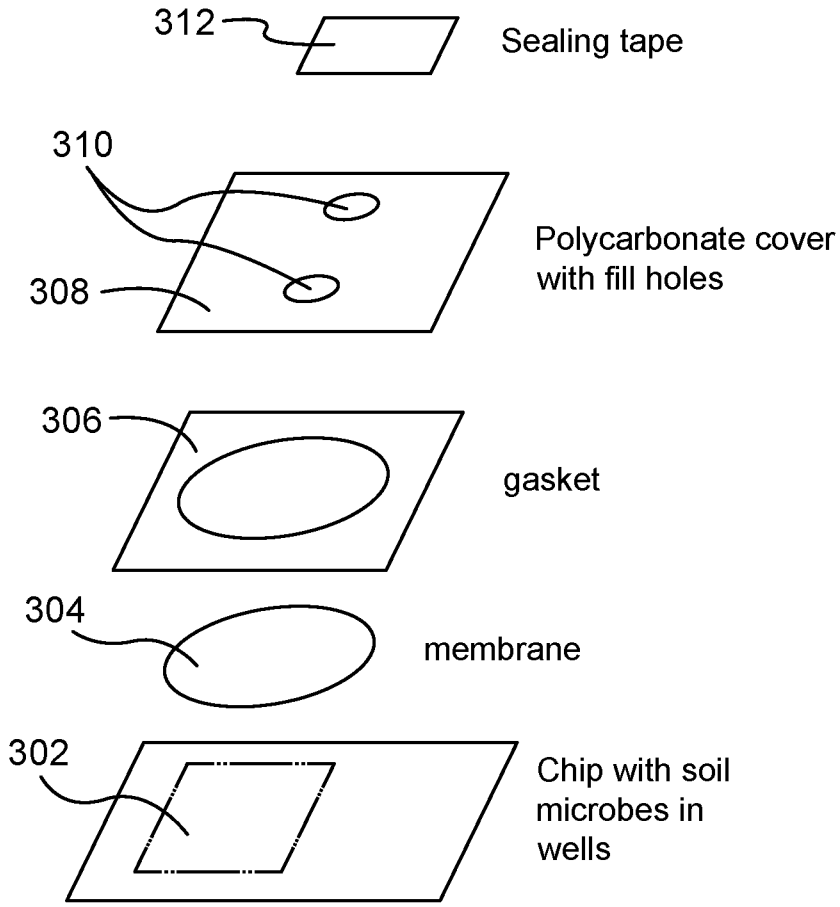
312
Sealing tape
310
308
Polycarbonate cover with fill holes
306
gasket
304
membrane
302
Chip with soil microbes in wells

FIG. 3A

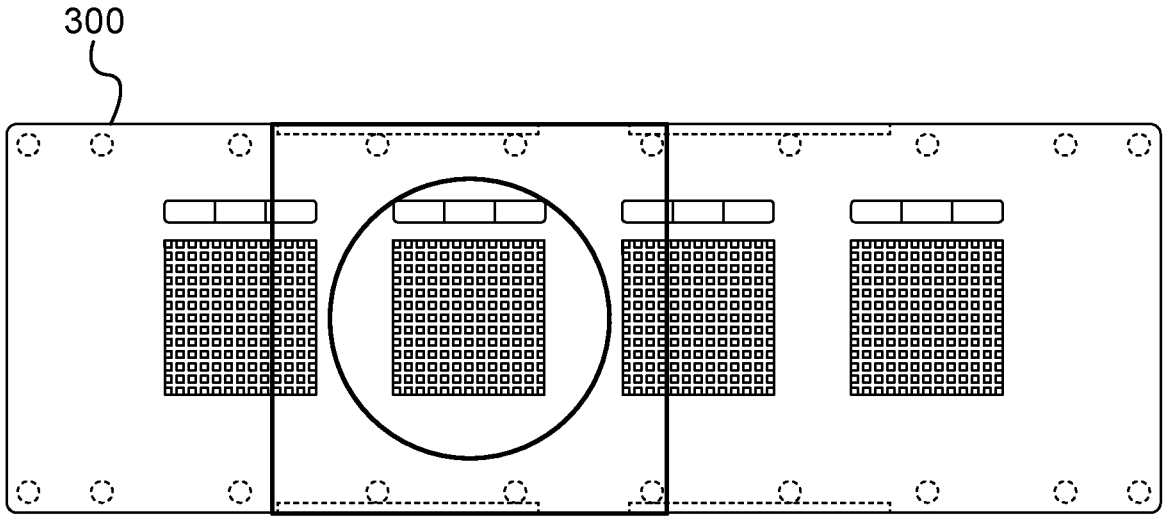
300

FIG. 3B

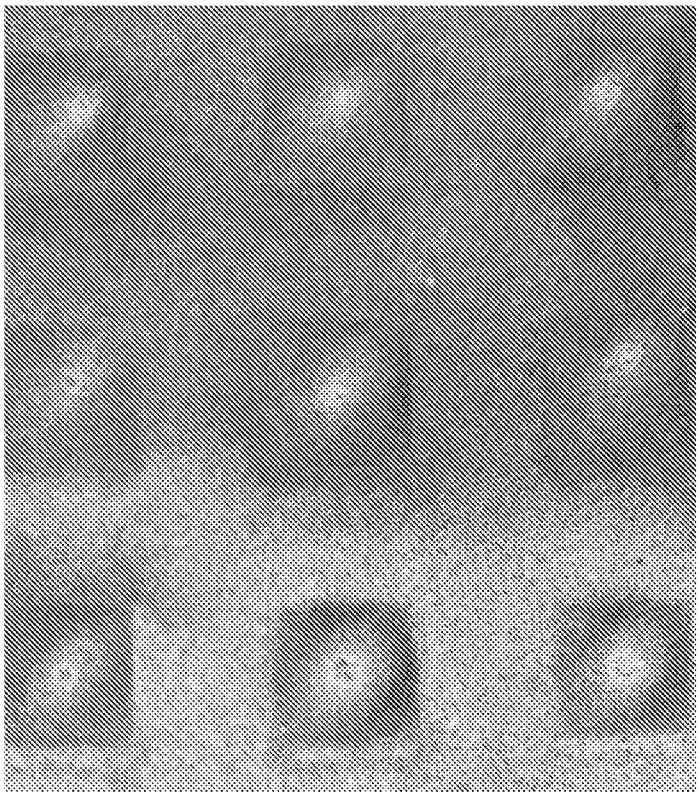

FIG. 4C

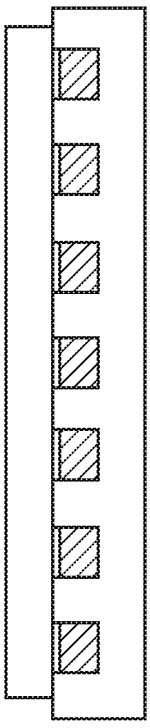

FIG. 4A

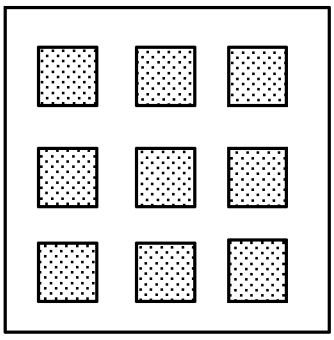

FIG. 4B

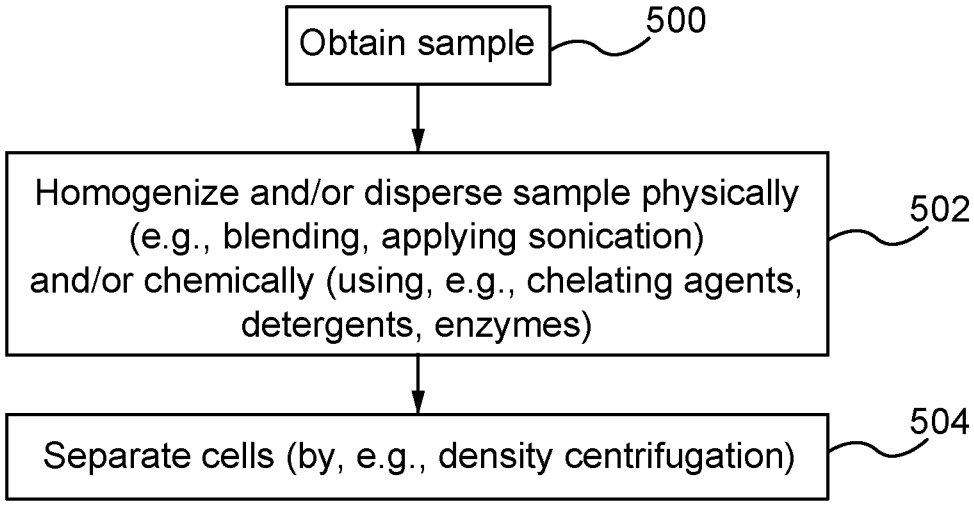
Obtain sample
500
Homogenize and/or disperse sample physically (e.g., blending, applying sonication) and/or chemically (using, e.g., chelating agents, detergents, enzymes)
502
Separate cells (by, e.g., density centrifugation)
504

FIG. 5A

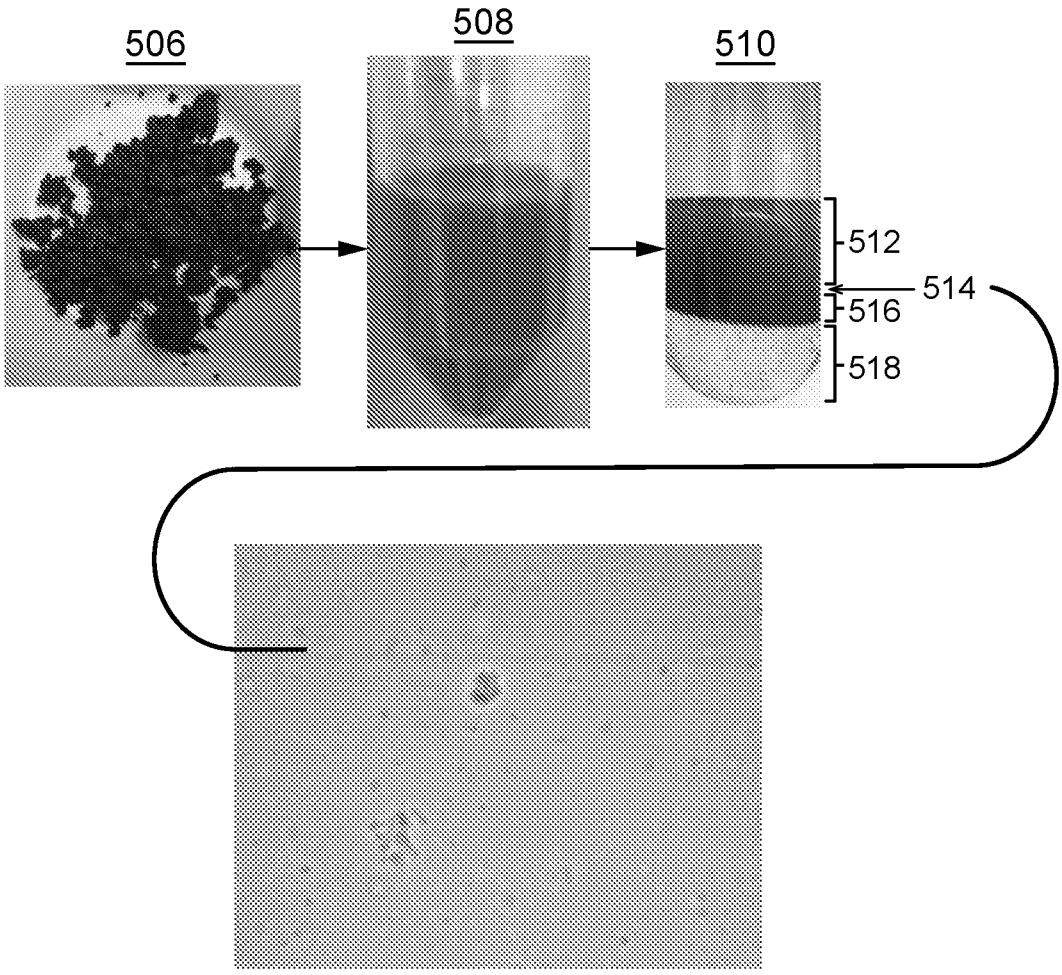
506
508
510
512
514
516
518

FIG. 5B

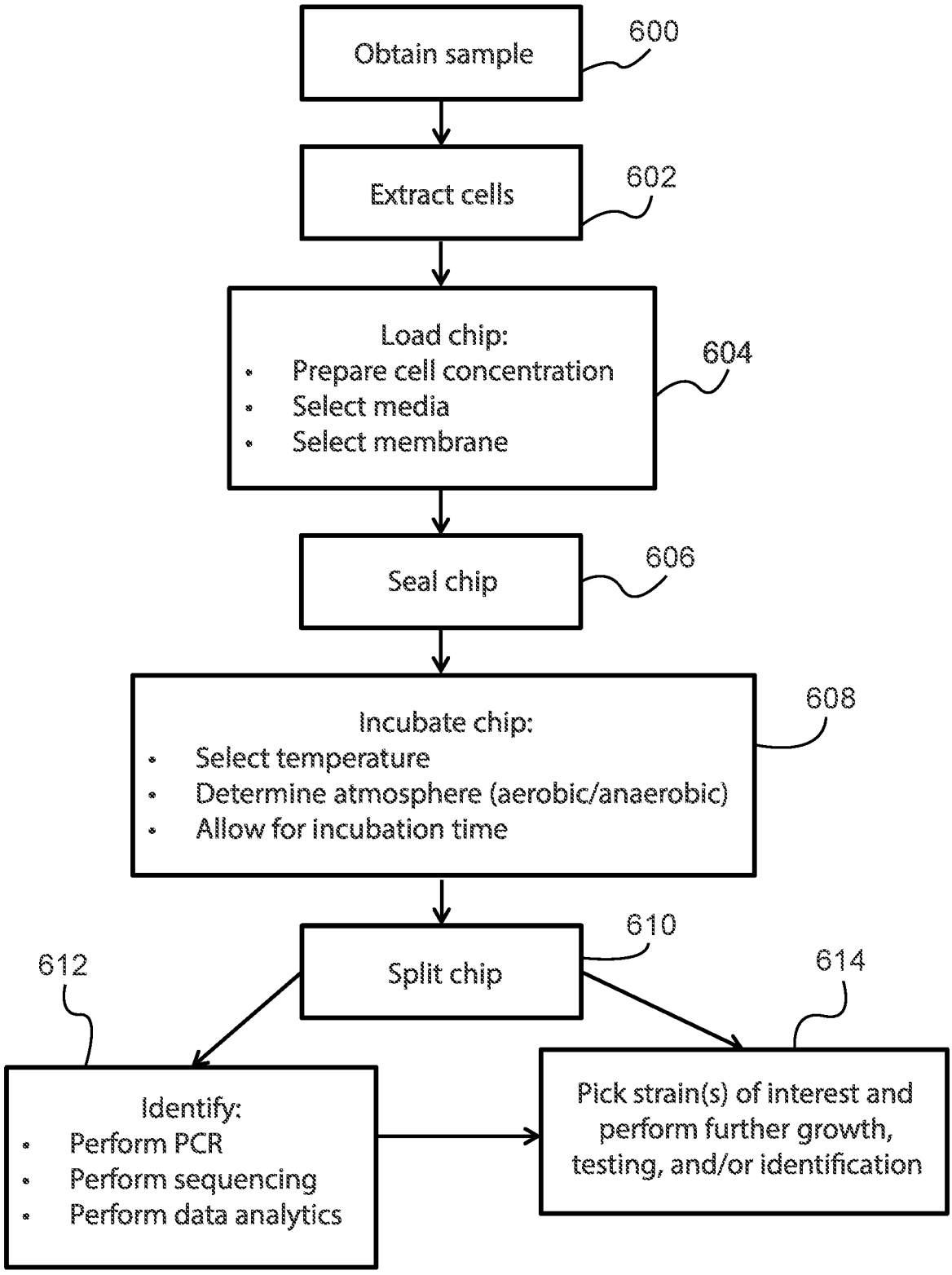
Obtain sample
600
Extract cells
602
Load chip:
• Prepare cell concentration
• Select media
• Select membrane
604
Seal chip
606
Incubate chip:
• Select temperature
• Determine atmosphere (aerobic/anaerobic)
• Allow for incubation time
608
Split chip
610
612
614
Identify:
• Perform PCR
• Perform sequencing
• Perform data analytics
Pick strain(s) of interest and perform further growth, testing, and/or identification

FIG. 6

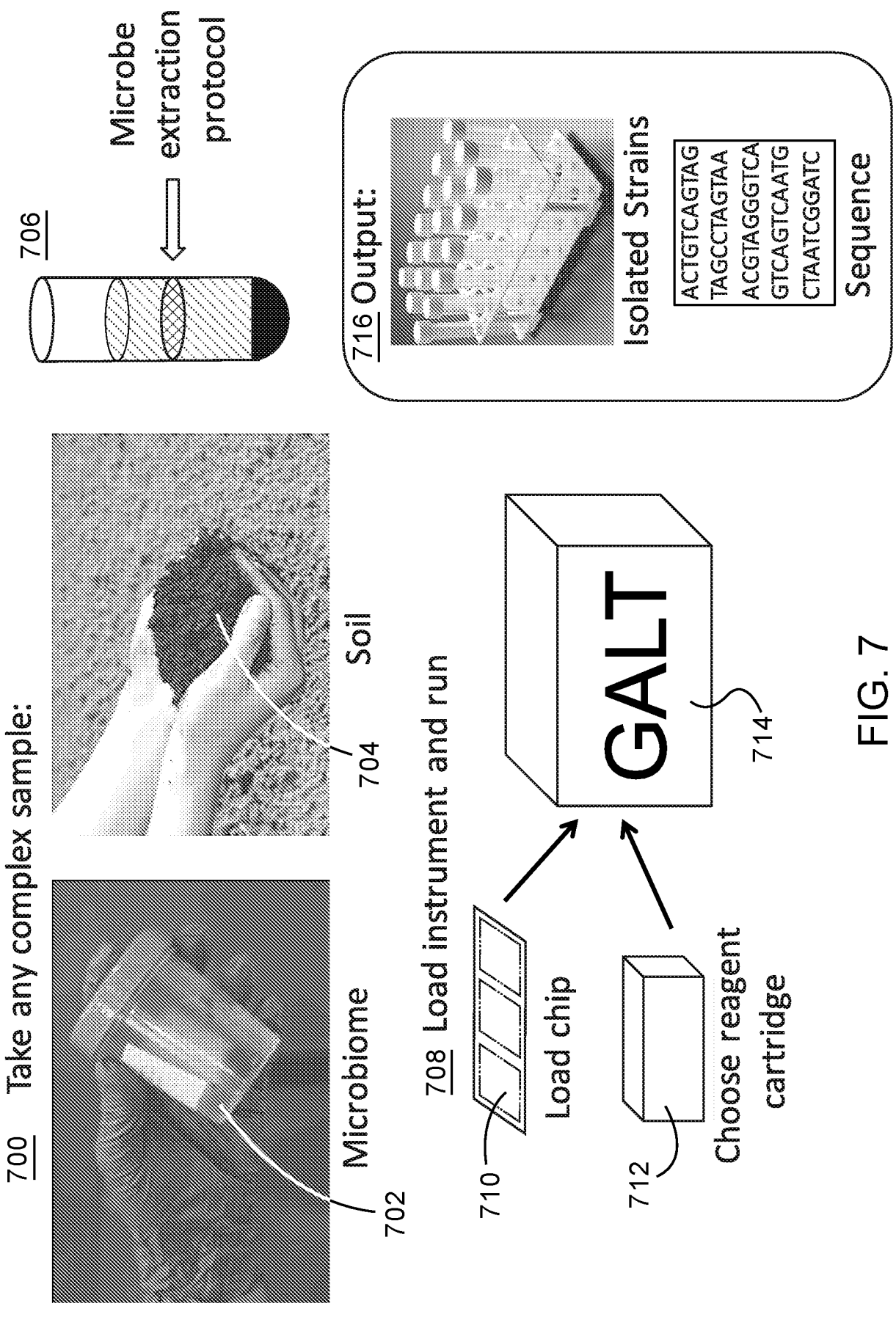
700 Take any complex sample:
Microbiome
702
Soil
704
706
Microbe extraction protocol
708 Load instrument and run
710
Load chip
712
Choose reagent cartridge
GALT
714
716 Output:
Isolated Strains
ACTGTCAGTAG
TAGCCTAGTAA
ACGTAGGGTCA
GTCAGTCAATG
CTAATCGGATC
Sequence

FIG. 7

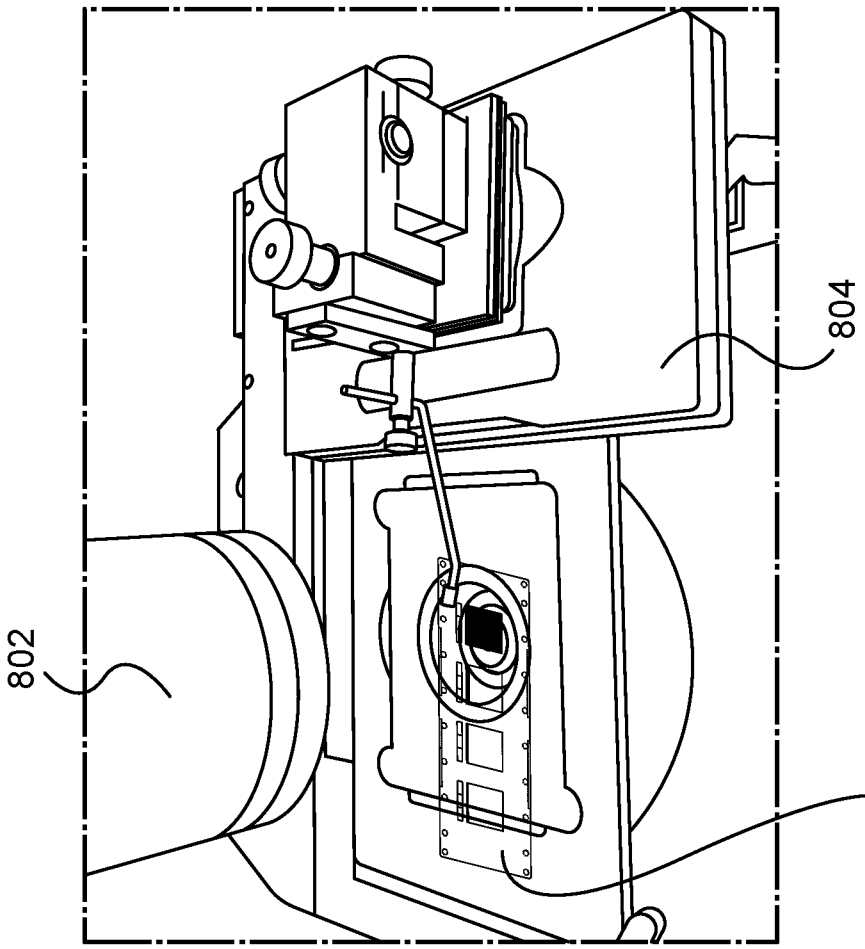

FIG. 8C

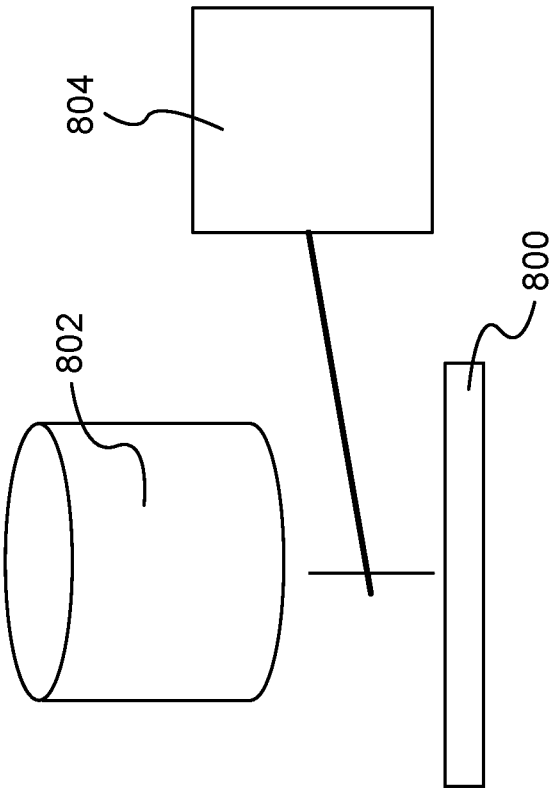

FIG. 8A

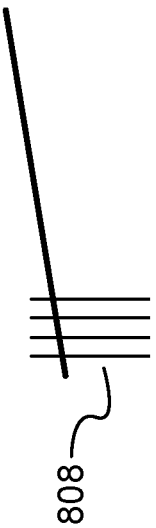

FIG. 8B

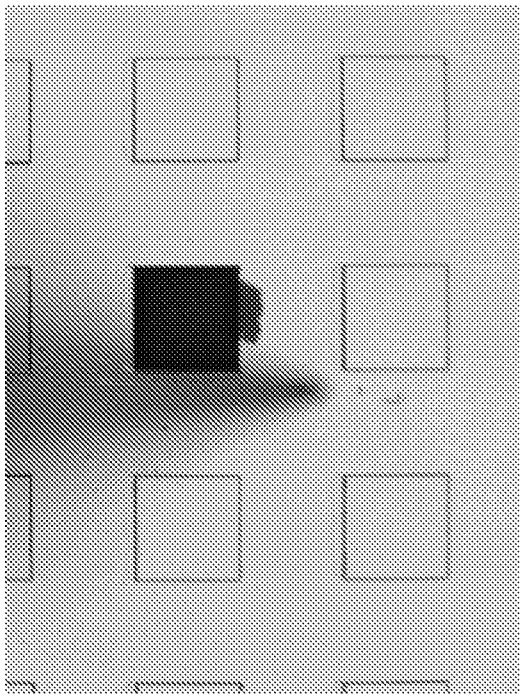

FIG. 9B

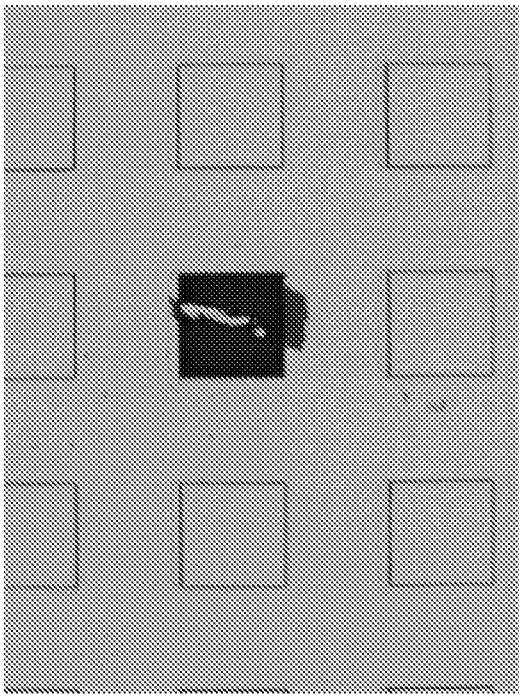

FIG. 9D

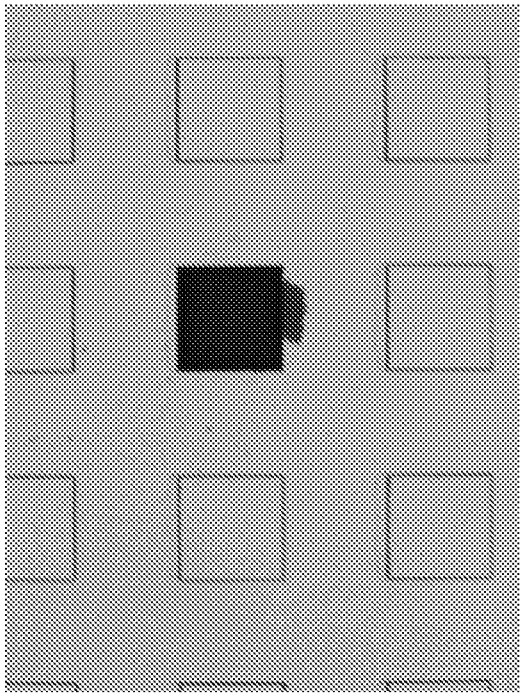

FIG. 9A

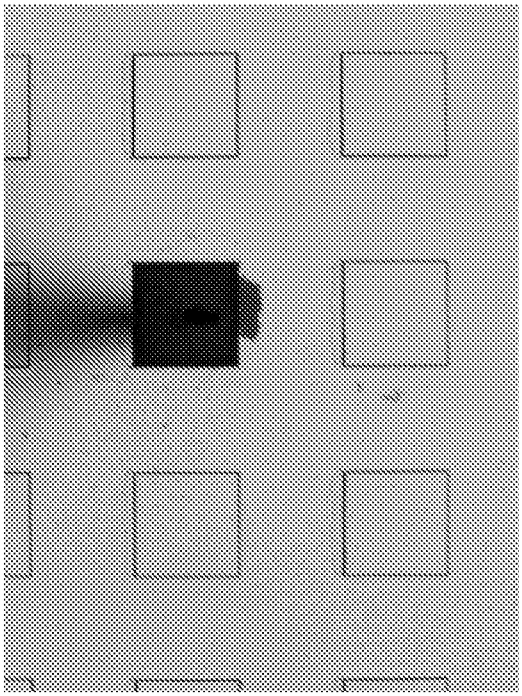

FIG. 9C

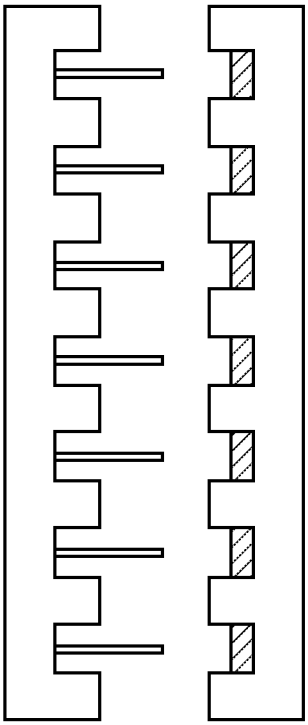

FIG. 10A

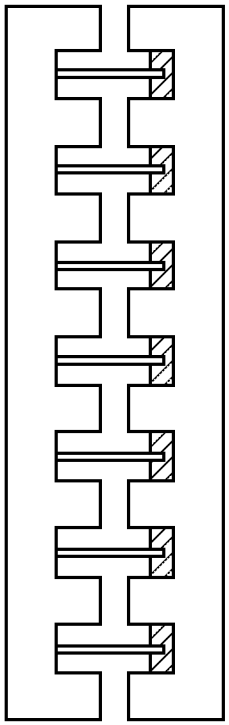

FIG. 10B

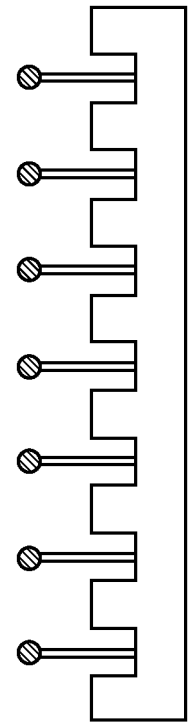

FIG. 10D

OR

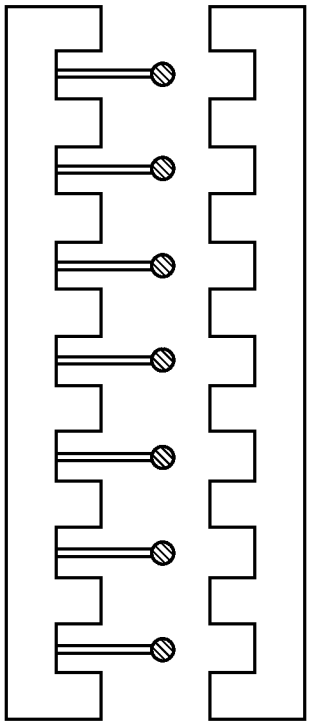

FIG. 10C

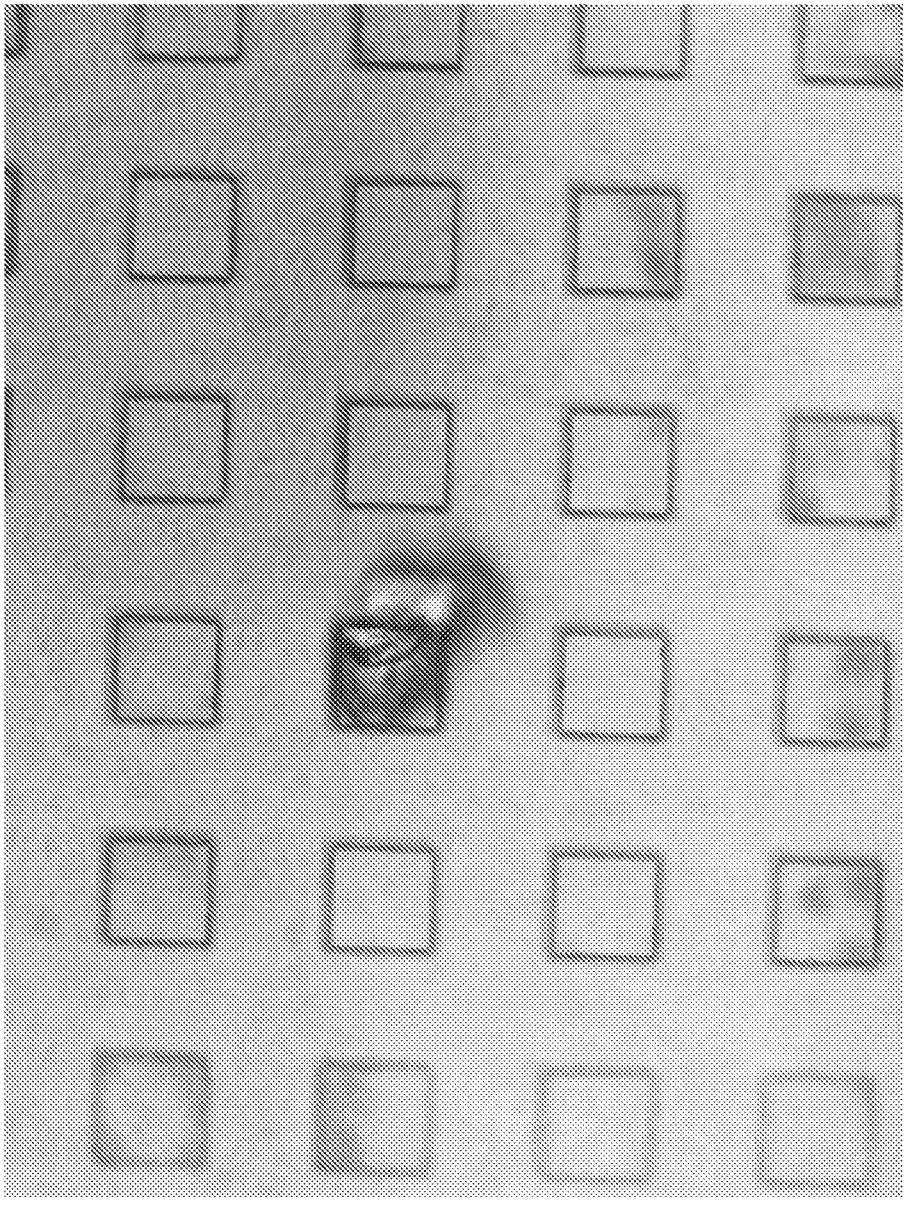

FIG. 11

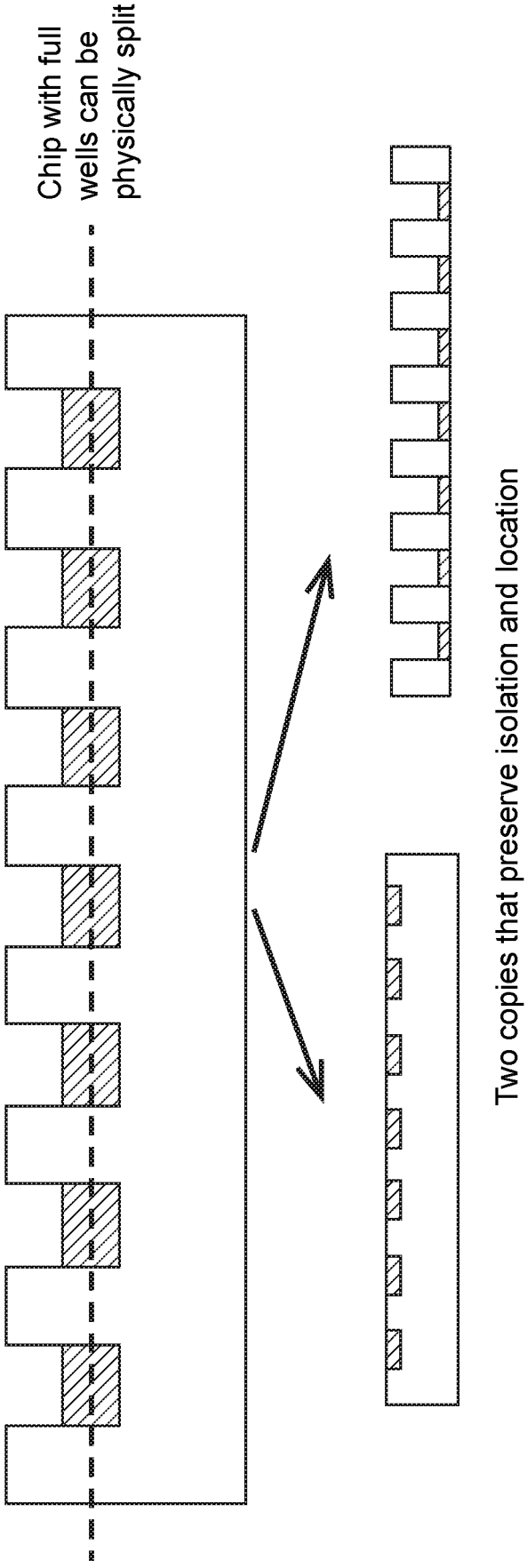
Chip with full wells can be physically split
Two copies that preserve isolation and location

FIG. 12

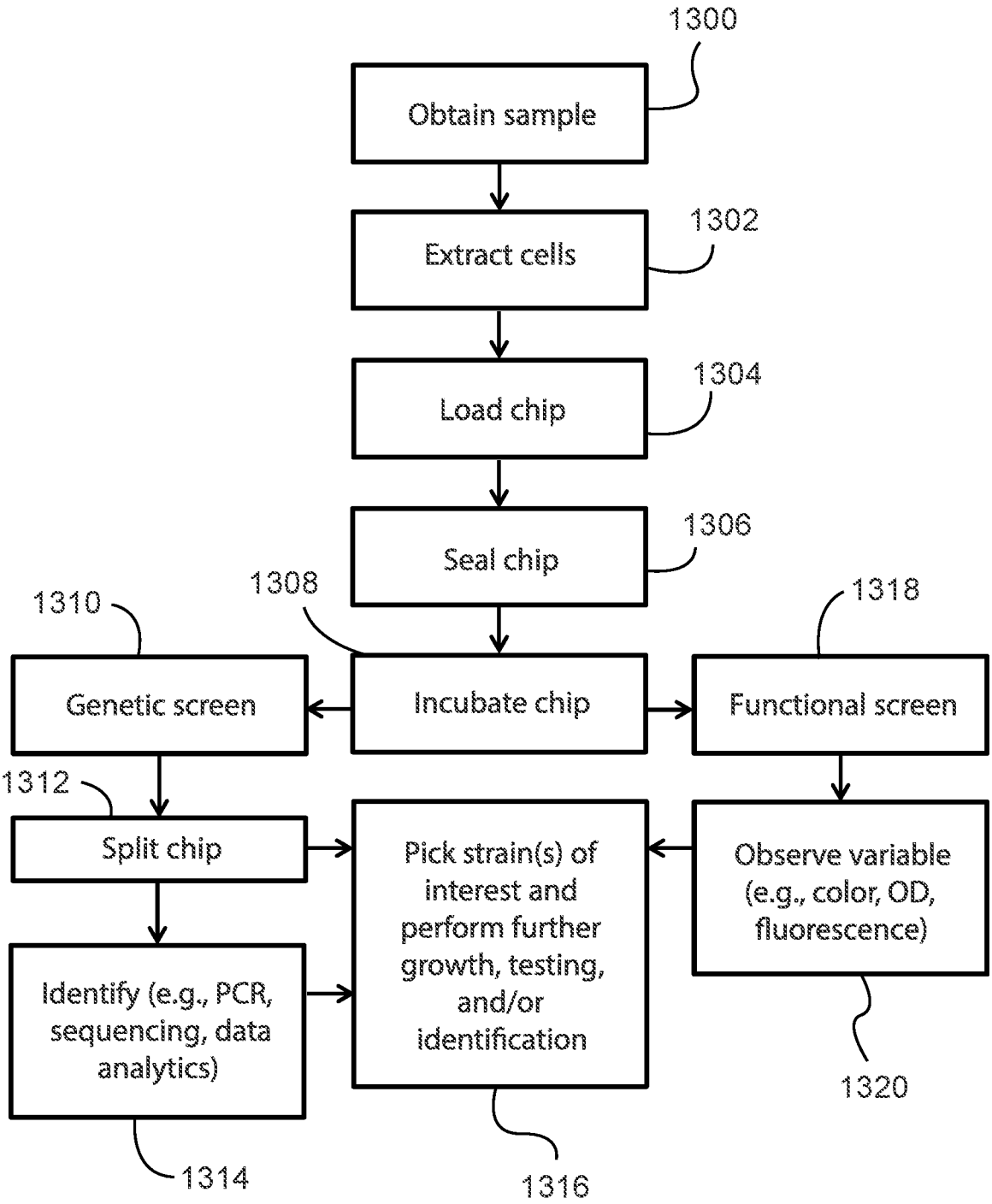
1300
Obtain sample
1302
Extract cells
1304
Load chip
1306
Seal chip
1308
1310
Genetic screen
Incubate chip
1318
Functional screen
1312
Split chip
Pick strain(s) of interest and perform further growth, testing, and/or identification
Observe variable (e.g., color, OD, fluorescence)
Identify (e.g., PCR, sequencing, data analytics)
1314
1316
1320

FIG. 13

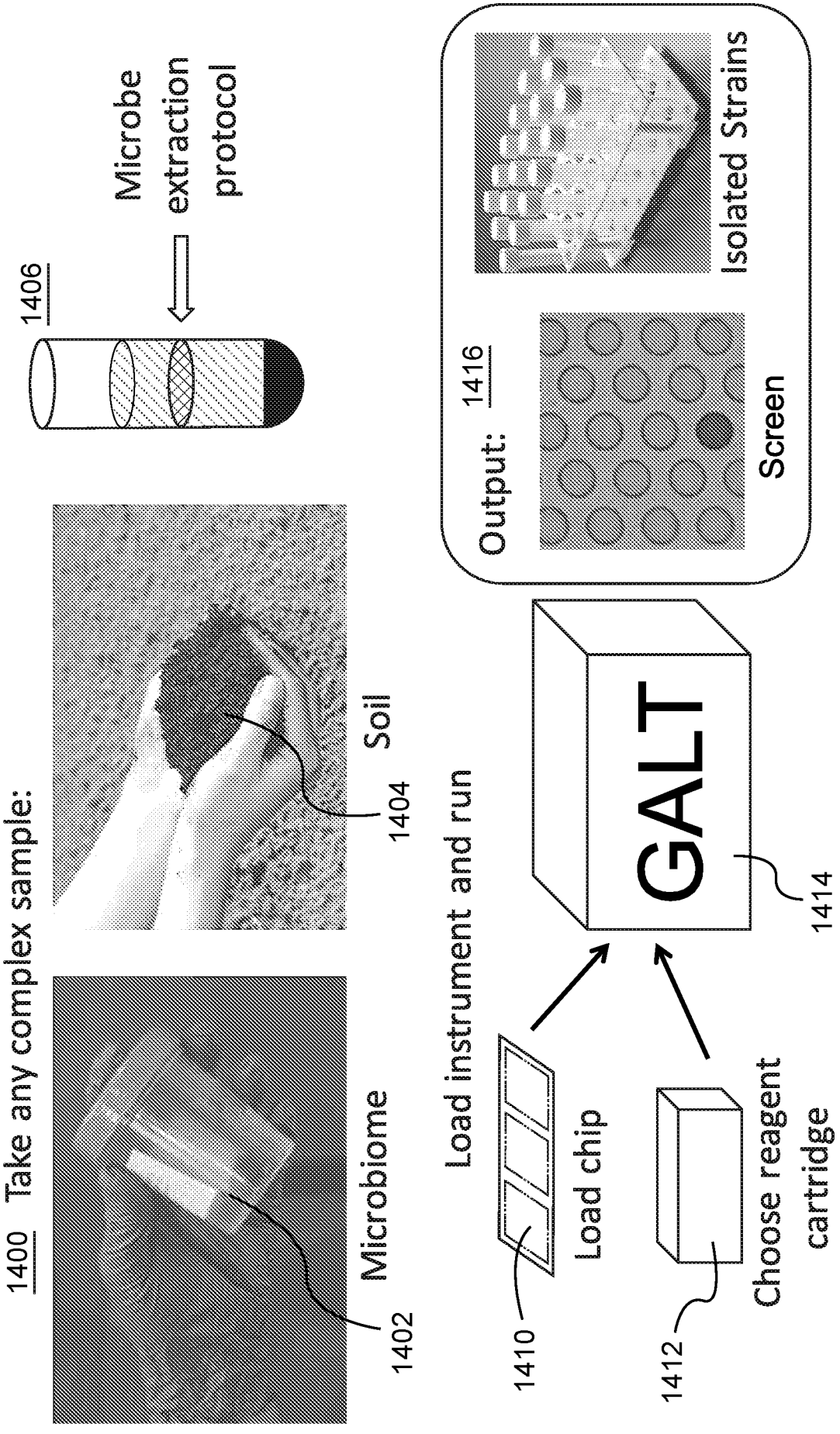
1400 Take any complex sample:
Microbiome
1402
Soil
1404
1406
Microbe extraction protocol
Load instrument and run
Load chip
1410
Choose reagent cartridge
1412
GALT
1414
Output: 1416
Screen
Isolated Strains

FIG. 14

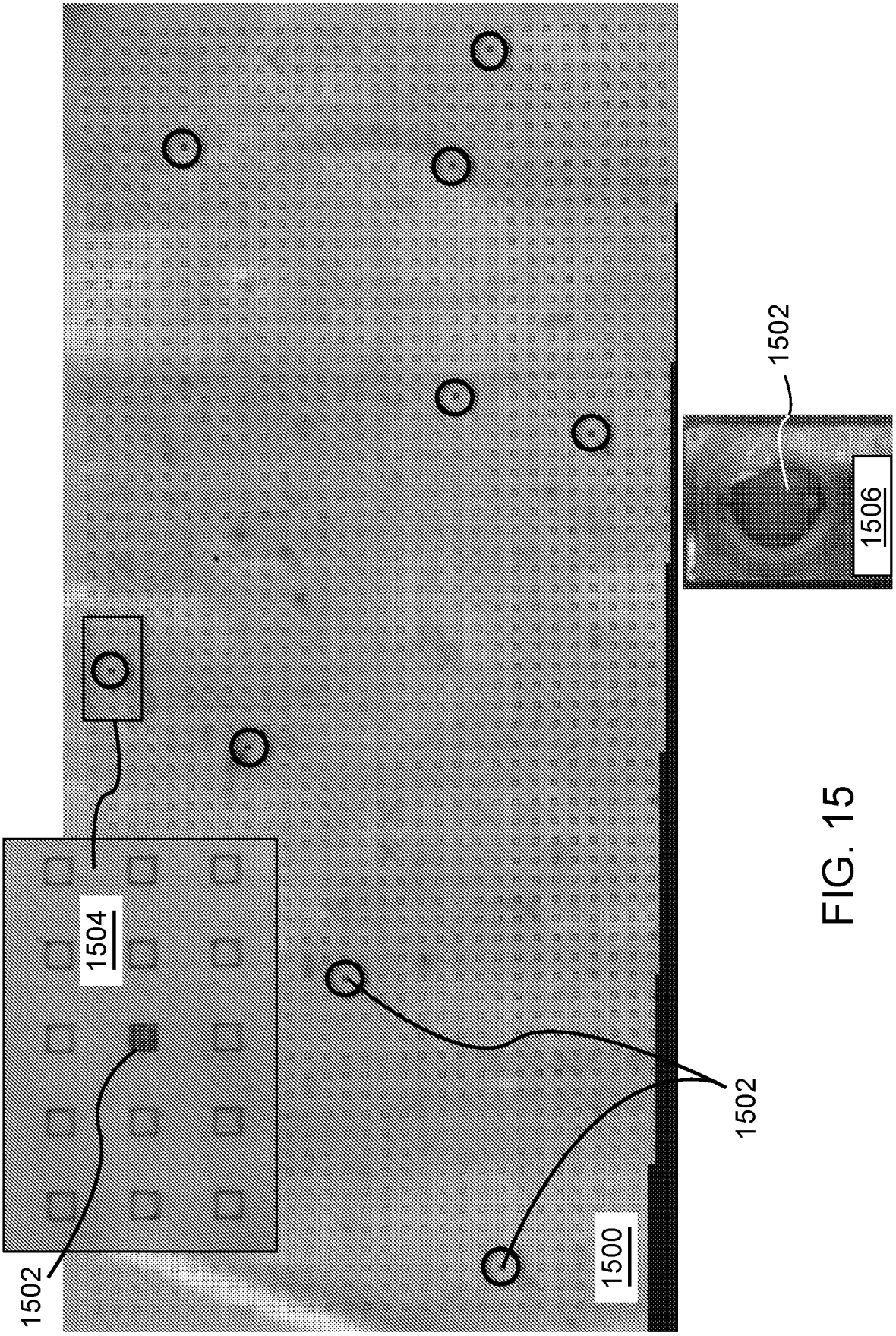

FIG. 15

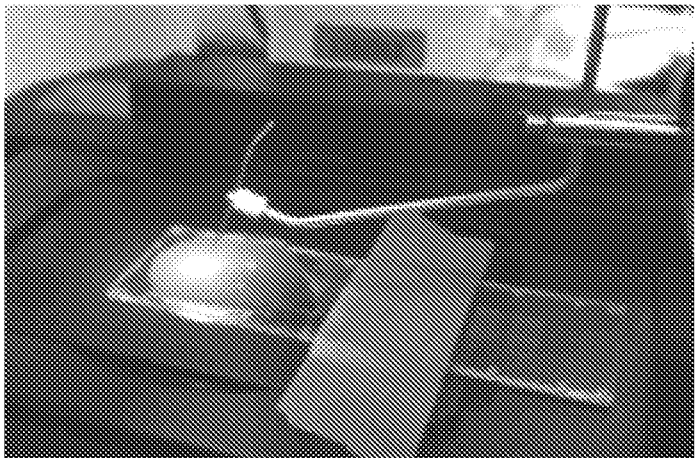

FIG. 16A

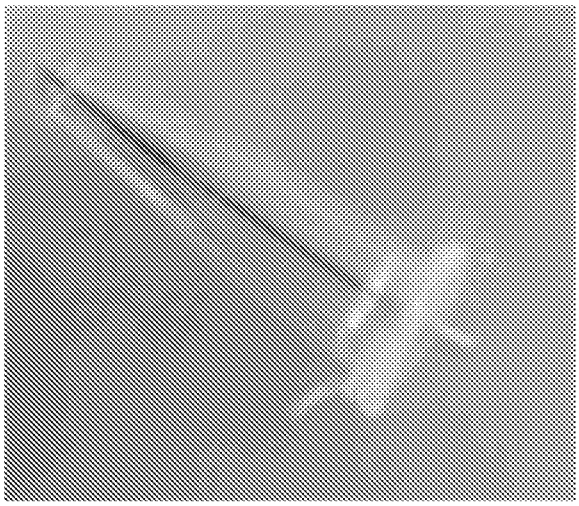

FIG. 16B

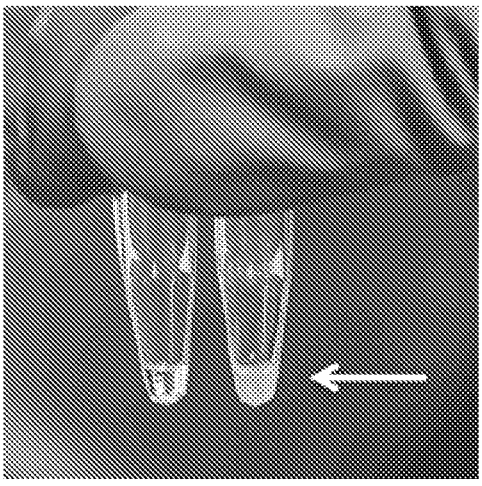

FIG. 16C

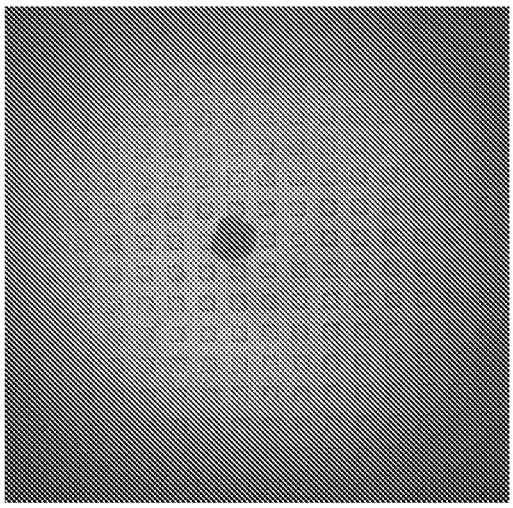

FIG. 17B

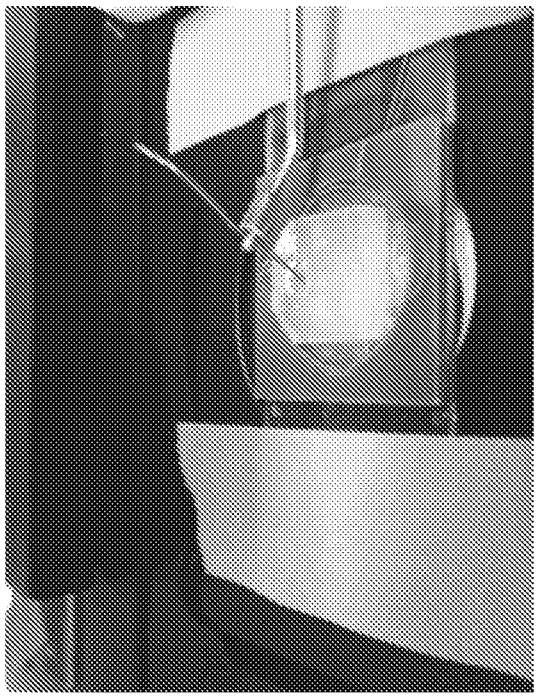

FIG. 17C

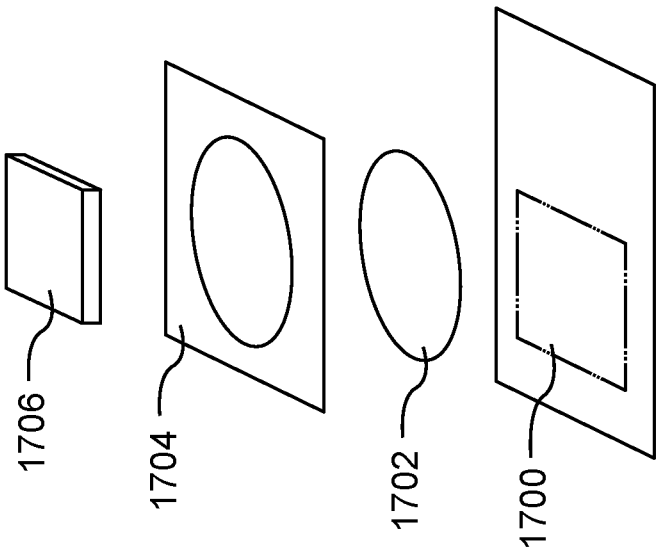

FIG. 17A

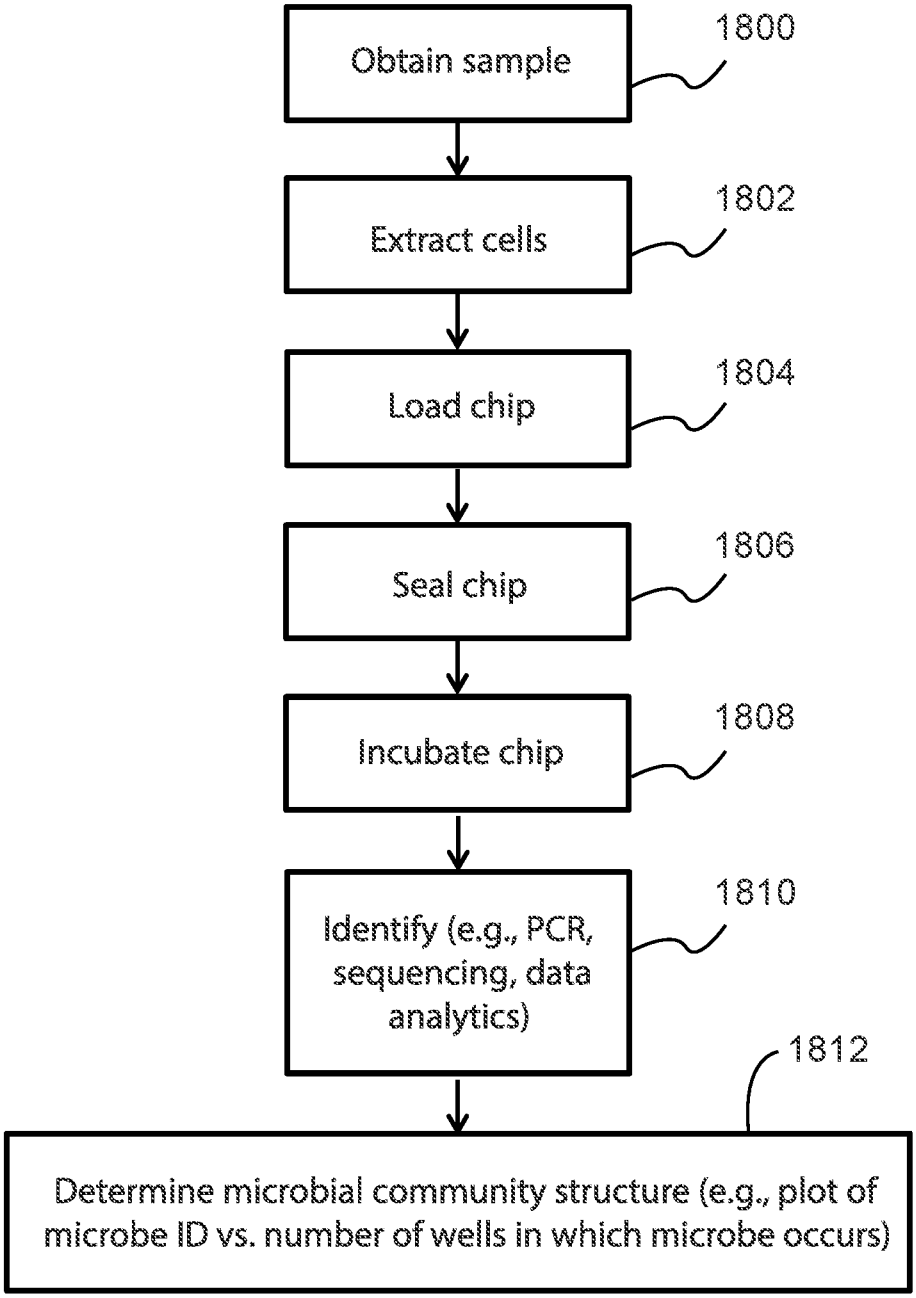
Obtain sample
1800
Extract cells
1802
Load chip
1804
Seal chip
1806
Incubate chip
1808
Identify (e.g., PCR, sequencing, data analytics)
1810
1812
Determine microbial community structure (e.g., plot of microbe ID vs. number of wells in which microbe occurs)

FIG. 18

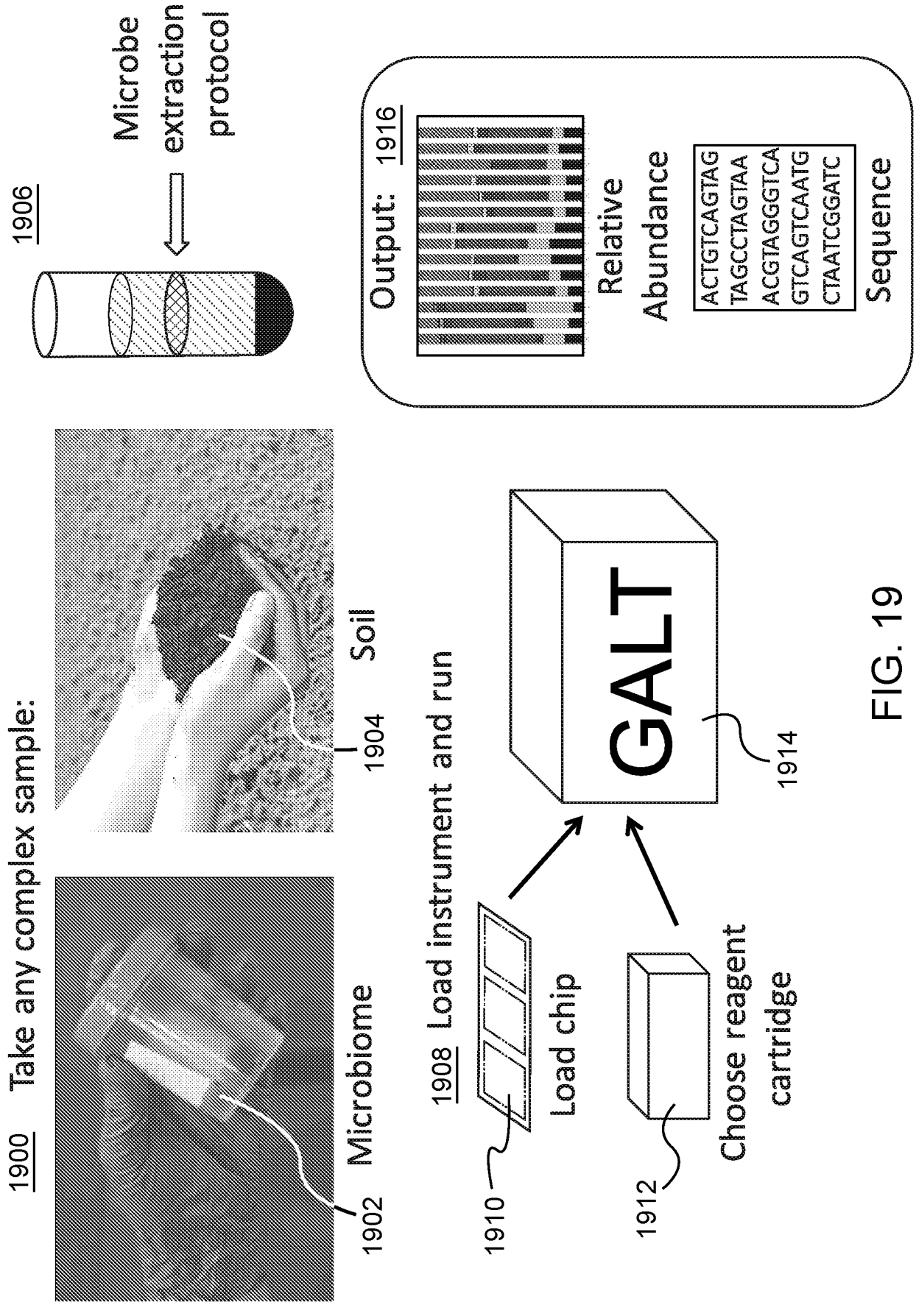
1900 Take any complex sample:
Microbiome
1902
Soil
1904
1906
Microbe extraction protocol
1908 Load instrument and run
Load chip
1910
Choose reagent cartridge
1912
GALT
1914
Output: 1916
Relative Abundance
ACTGTCAGTAG
TAGCCTAGTAA
ACGTAGGGTCA
GTCAGTCAATG
CTAATCGGATC
Sequence

FIG. 19

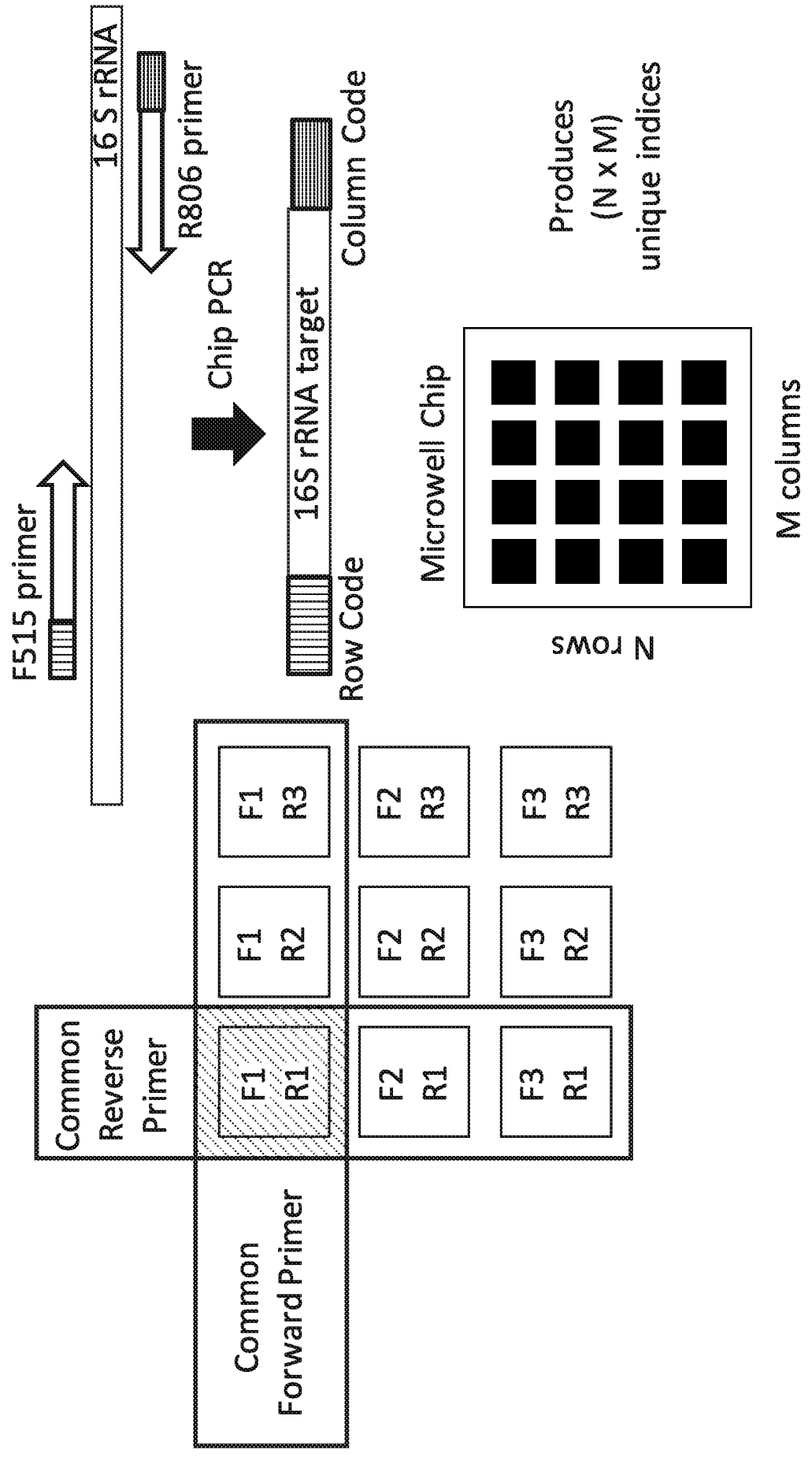
16 S rRNA
R806 primer
Chip PCR
Column Code
16S rRNA target
Row Code
F515 primer
Produces
(N x M)
unique indices
Microwell Chip
N rows
M columns
Common
Reverse
Primer
Common
Forward Primer
F1
R1
F2
R1
F3
R1
F1
R2
F2
R2
F3
R2
F1
R3
F2
R3
F3
R3

FIG. 20

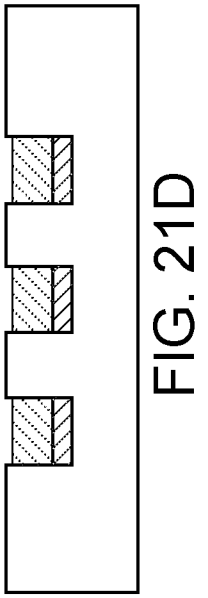

FIG. 21D

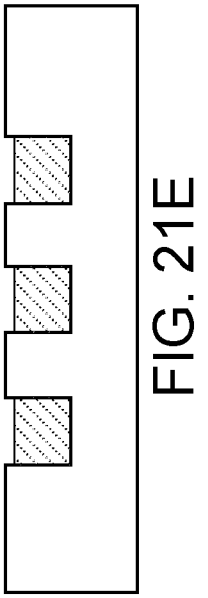

FIG. 21E

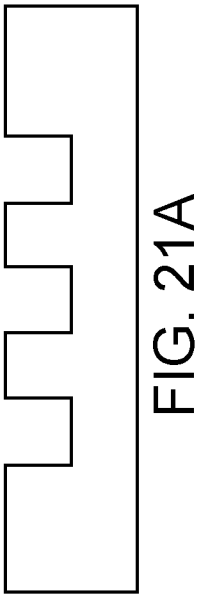

FIG. 21A

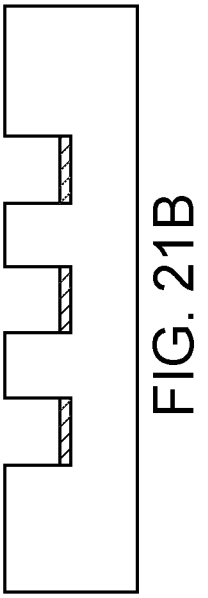

FIG. 21B

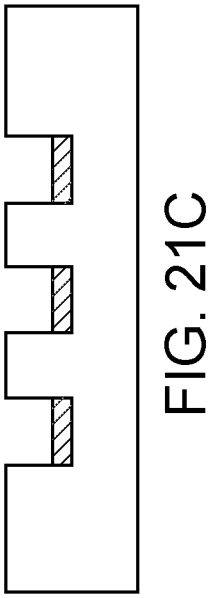

FIG. 21C