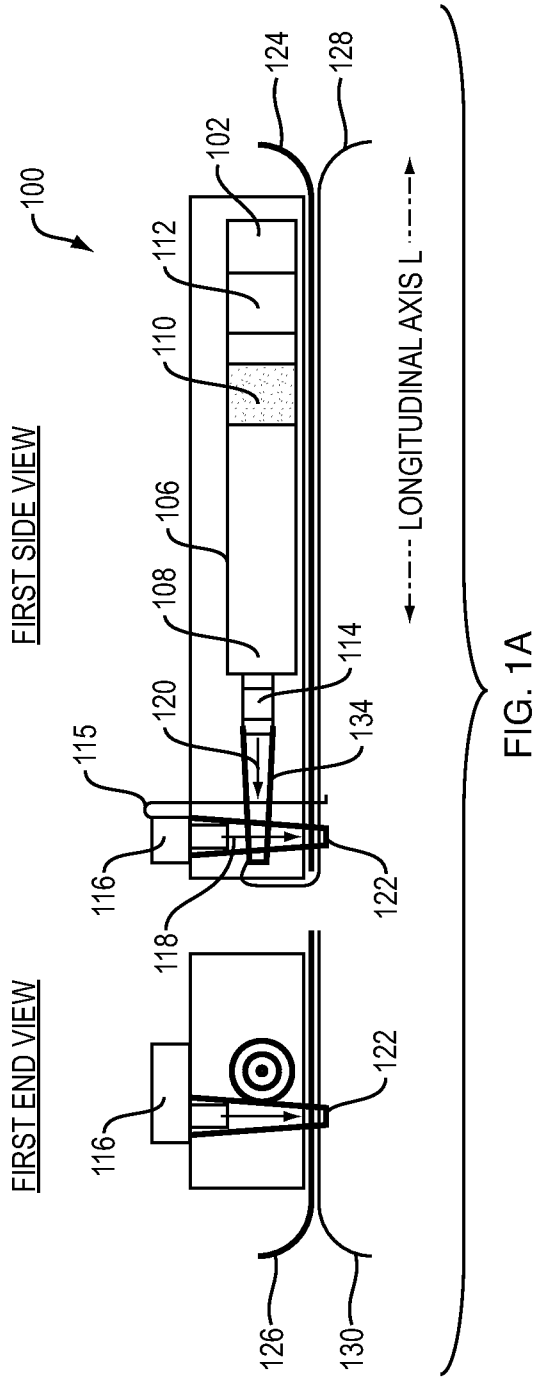

100
FIRST SIDE VIEW
FIRST END VIEW
LONGITUDINAL AXIS L
102
106
108
110
112
114
115
116
118
120
122
124
126
128
130
134

FIG. 1A

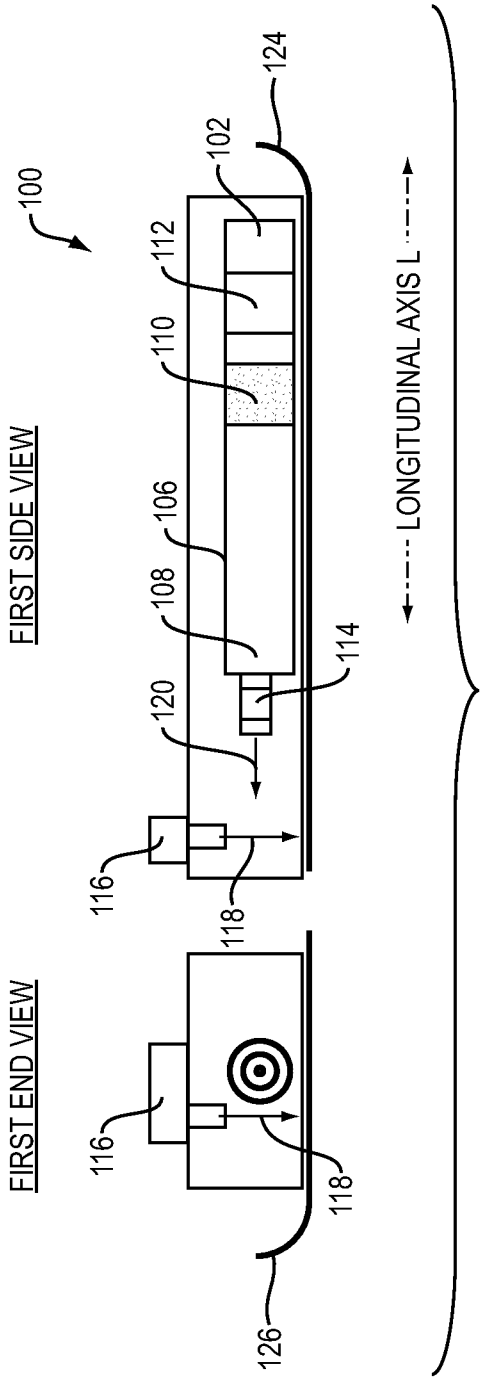

100
FIRST SIDE VIEW
FIRST END VIEW
LONGITUDINAL AXIS L
102
106
108
110
112
114
116
118
120
124
126

FIG. 1B

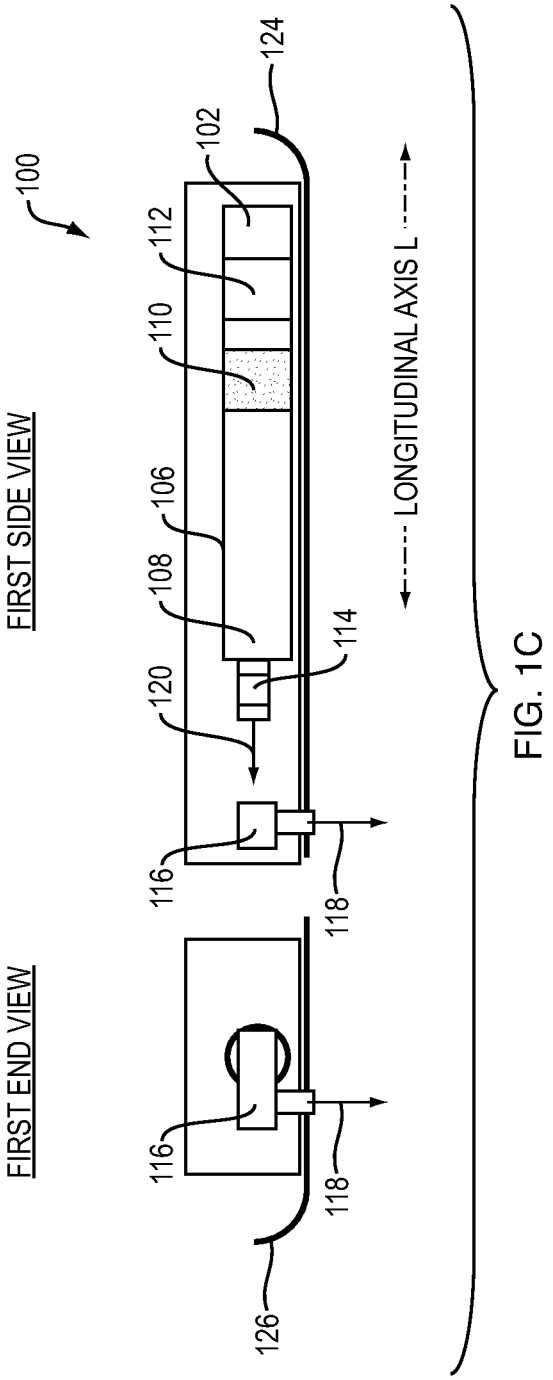

100
FIRST SIDE VIEW
FIRST END VIEW
102
106
108
110
112
114
116
118
120
124
126
LONGITUDINAL AXIS L

FIG. 1C

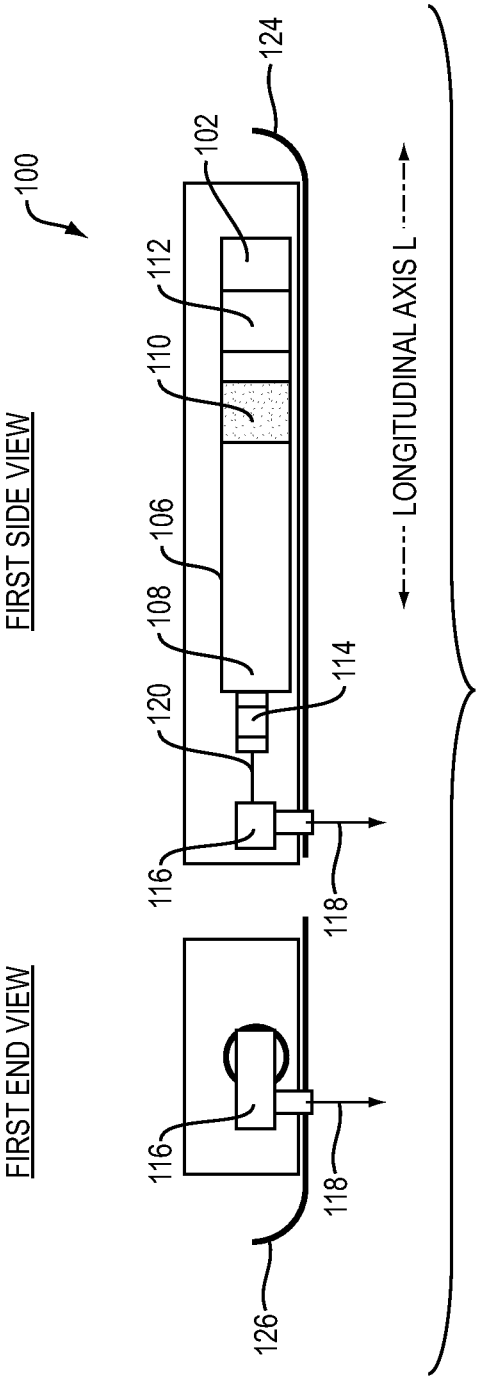

100
FIRST SIDE VIEW
FIRST END VIEW
102
106
108
110
112
114
116
118
120
124
126
LONGITUDINAL AXIS L

FIG. 1D

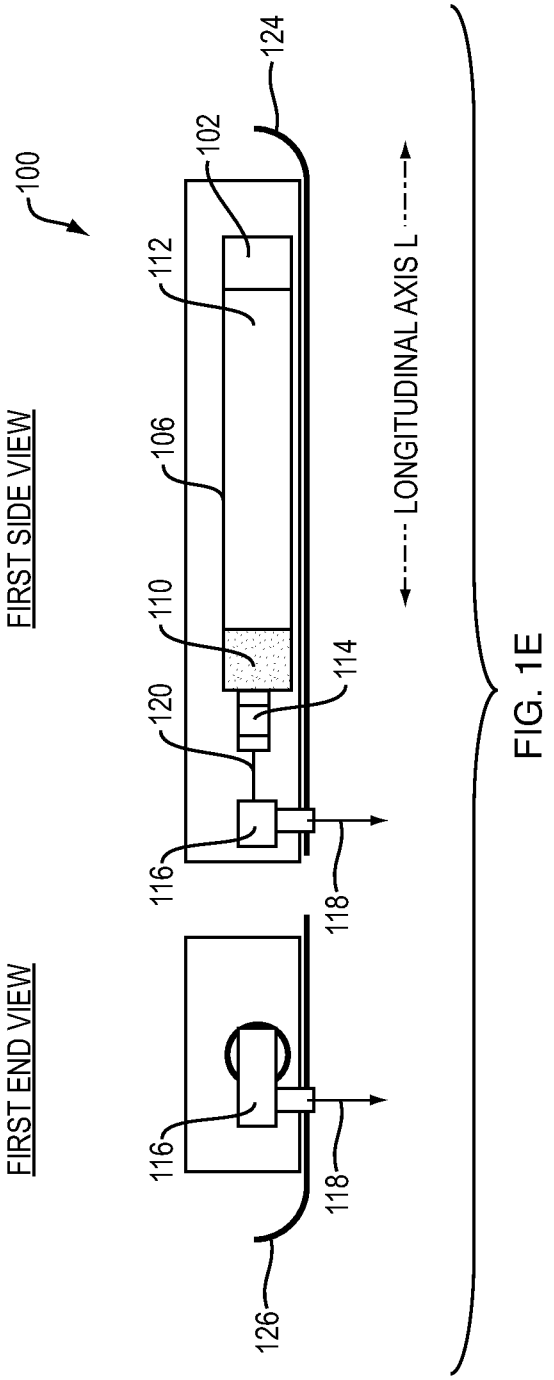

100
FIRST SIDE VIEW
FIRST END VIEW
102
106
110
112
114
116
118
120
124
126
LONGITUDINAL AXIS L

FIG. 1E

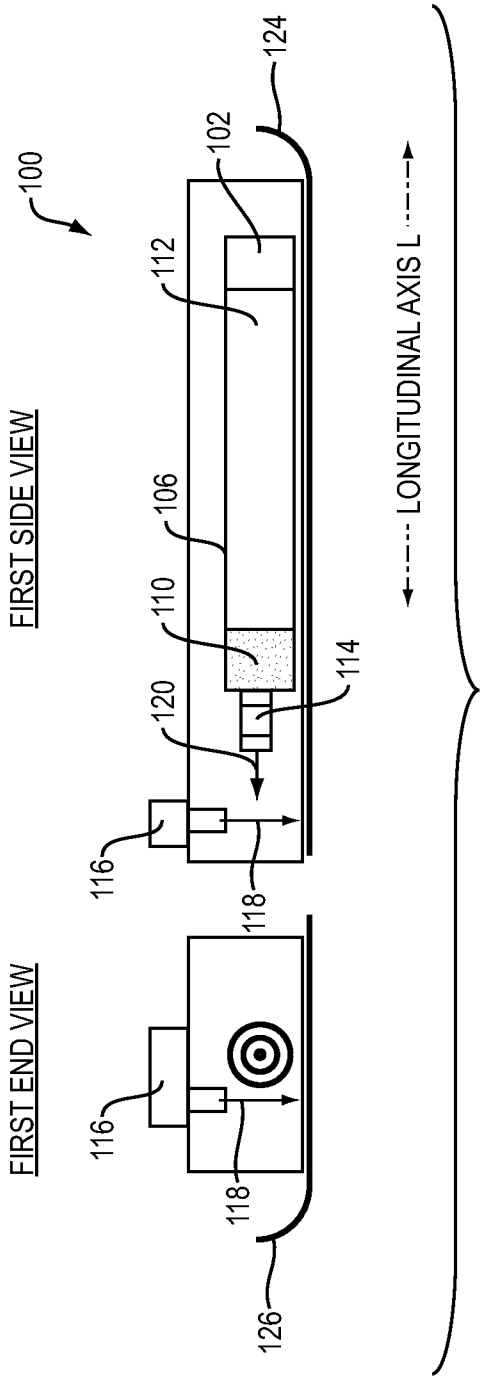

100
FIRST SIDE VIEW
FIRST END VIEW
102
106
110
112
114
116
118
120
124
126
LONGITUDINAL AXIS L

FIG. 1F

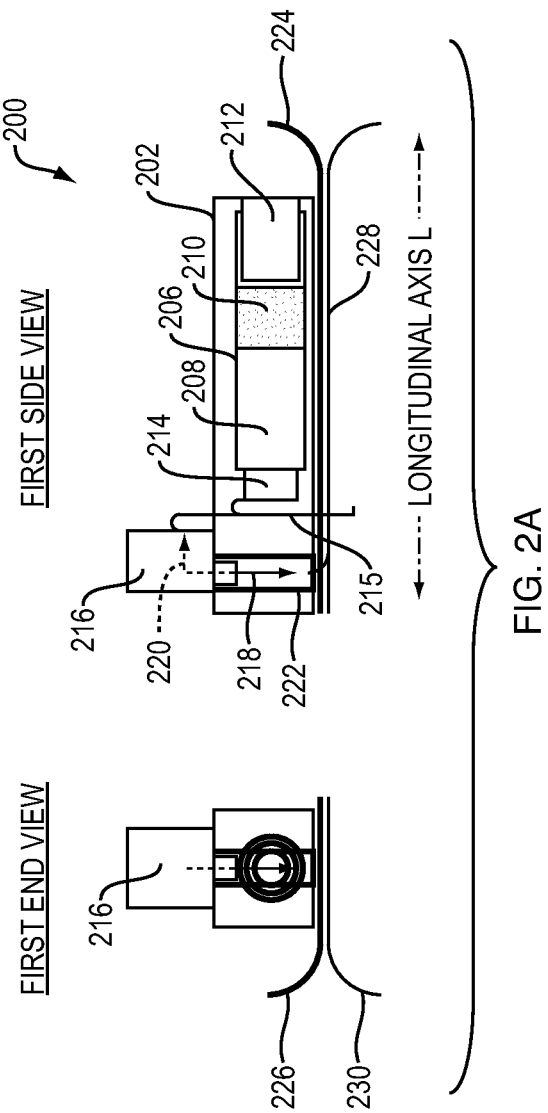

200
FIRST SIDE VIEW
202
212
224
210
206
208
214
228
216
220
218
222
215
LONGITUDINAL AXIS L
FIRST END VIEW
216
226
230

FIG. 2A

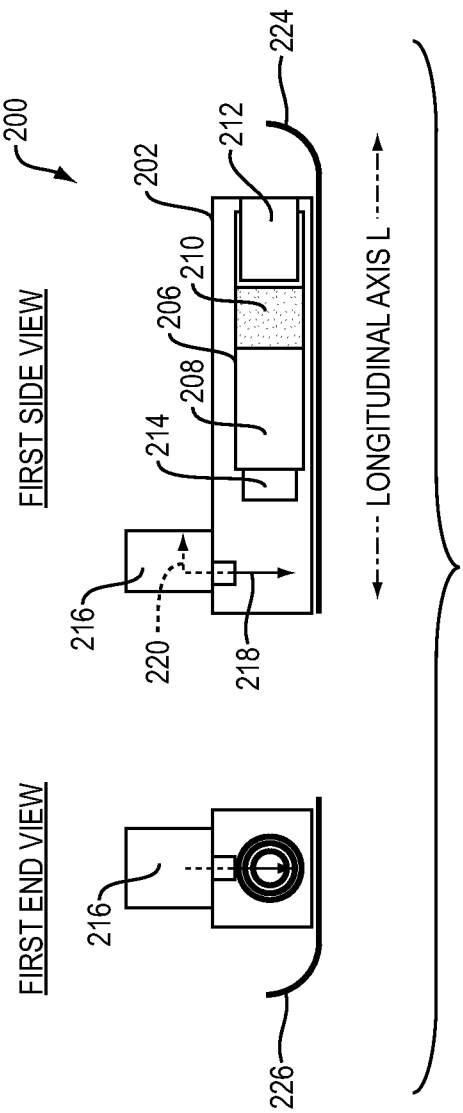

200
FIRST SIDE VIEW
202
212
224
210
206
208
214
216
220
218
LONGITUDINAL AXIS L
FIRST END VIEW
216
226

FIG. 2B

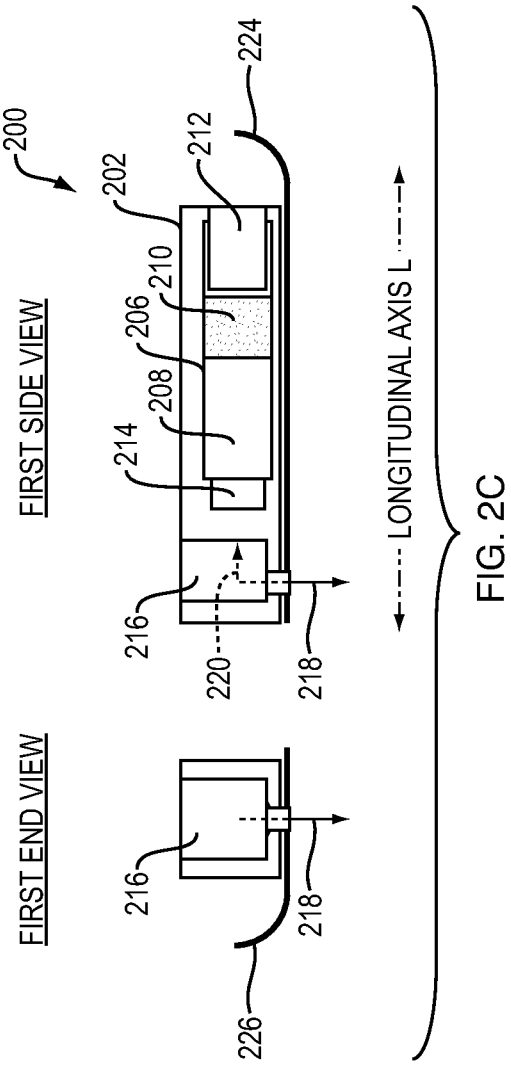

200
FIRST SIDE VIEW
202
212
224
210
206
208
214
216
220
218
LONGITUDINAL AXIS L
FIRST END VIEW
216
218
226

FIG. 2C

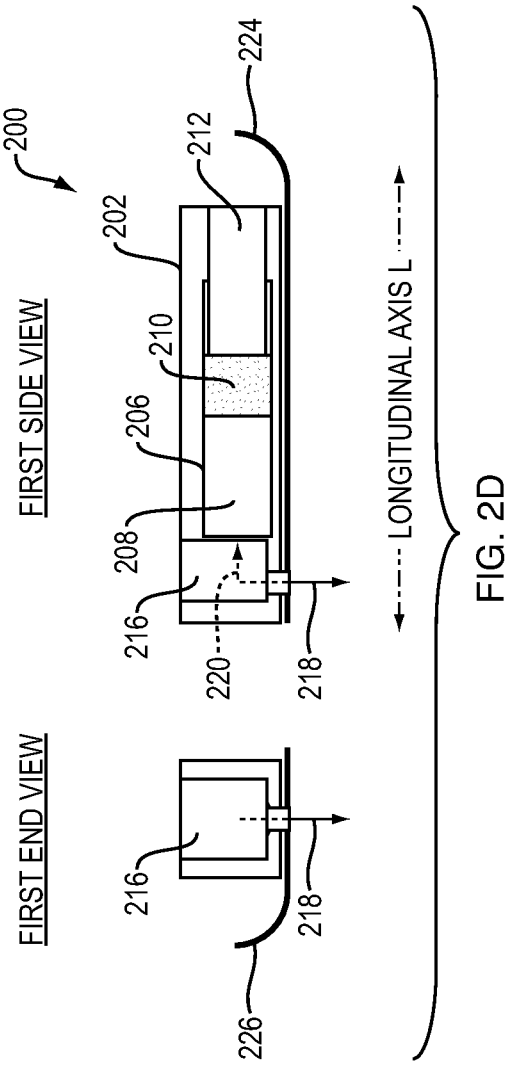

200
FIRST SIDE VIEW
202
212
224
210
206
208
216
220
218
LONGITUDINAL AXIS L
FIRST END VIEW
216
218
226

FIG. 2D

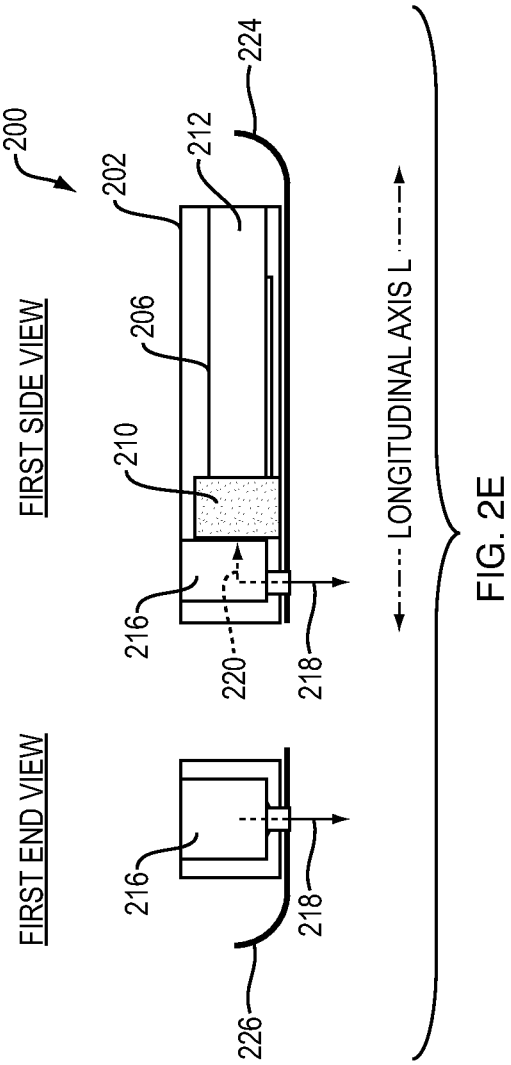

FIRST END VIEW
FIRST SIDE VIEW
200
202
206
210
212
216
218
220
224
226
LONGITUDINAL AXIS L

FIG. 2E

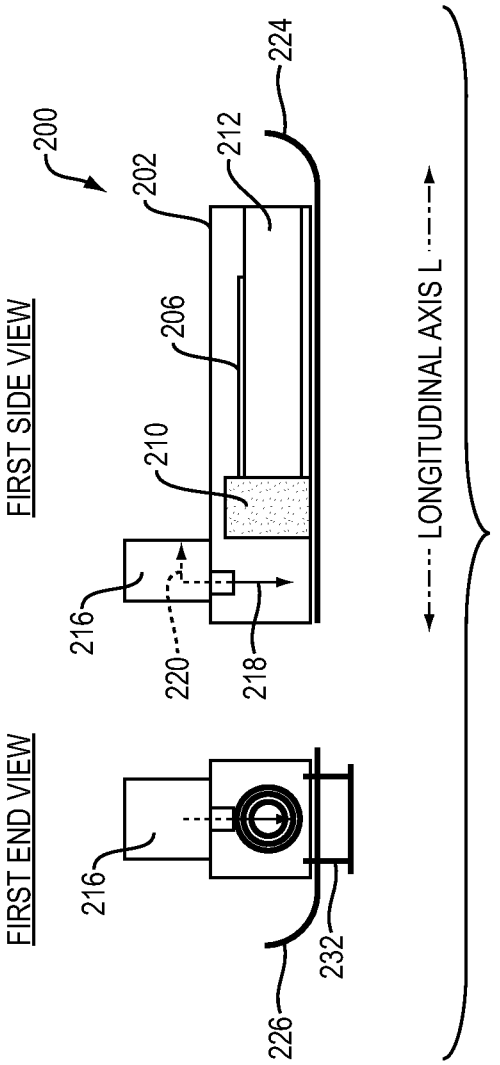

FIRST END VIEW
FIRST SIDE VIEW
200
202
206
210
212
216
218
220
224
226
232
LONGITUDINAL AXIS L

FIG. 2F

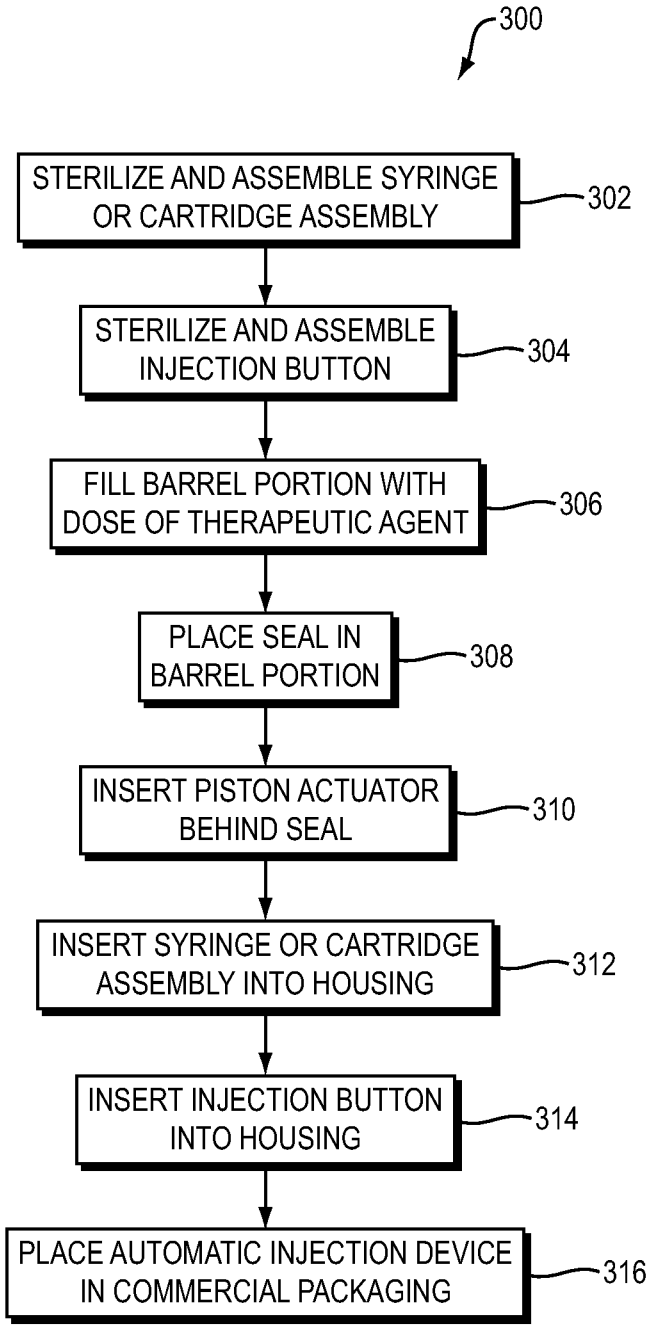

300
STERILIZE AND ASSEMBLE SYRINGE OR CARTRIDGE ASSEMBLY
302
STERILIZE AND ASSEMBLE INJECTION BUTTON
304
FILL BARREL PORTION WITH DOSE OF THERAPEUTIC AGENT
306
PLACE SEAL IN BARREL PORTION
308
INSERT PISTON ACTUATOR BEHIND SEAL
310
INSERT SYRINGE OR CARTRIDGE ASSEMBLY INTO HOUSING
312
INSERT INJECTION BUTTON INTO HOUSING
314
PLACE AUTOMATIC INJECTION DEVICE IN COMMERCIAL PACKAGING
316

FIG. 3

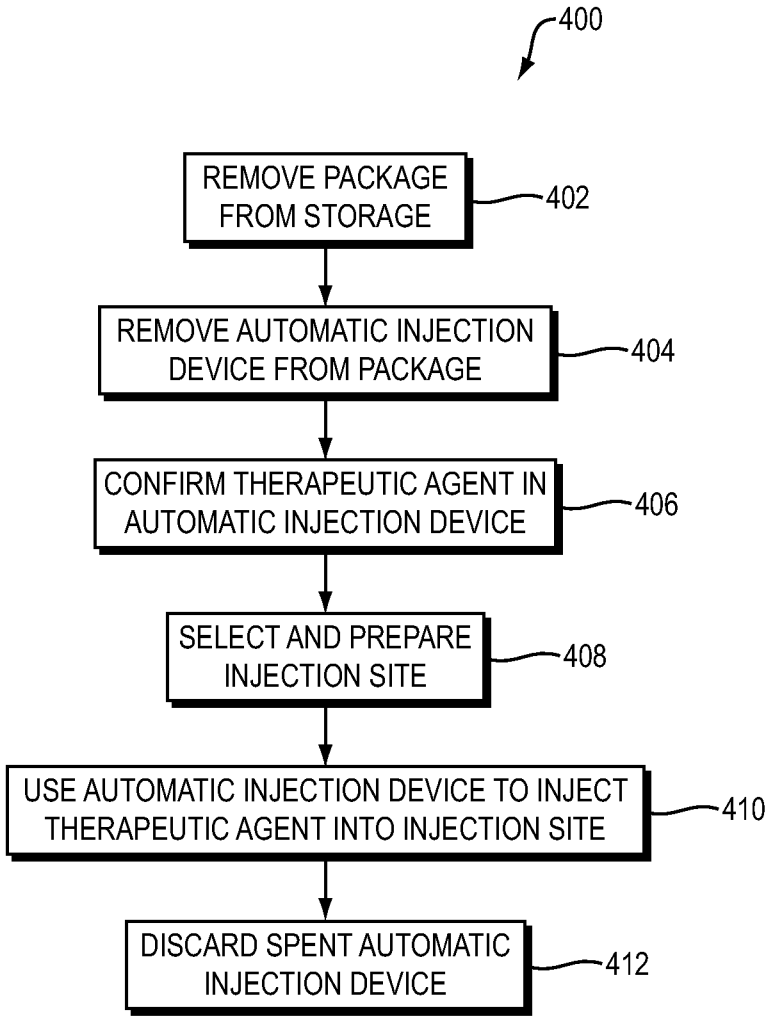

400
REMOVE PACKAGE FROM STORAGE
402
REMOVE AUTOMATIC INJECTION DEVICE FROM PACKAGE
404
CONFIRM THERAPEUTIC AGENT IN AUTOMATIC INJECTION DEVICE
406
SELECT AND PREPARE INJECTION SITE
408
USE AUTOMATIC INJECTION DEVICE TO INJECT THERAPEUTIC AGENT INTO INJECTION SITE
410
DISCARD SPENT AUTOMATIC INJECTION DEVICE
412

FIG. 4

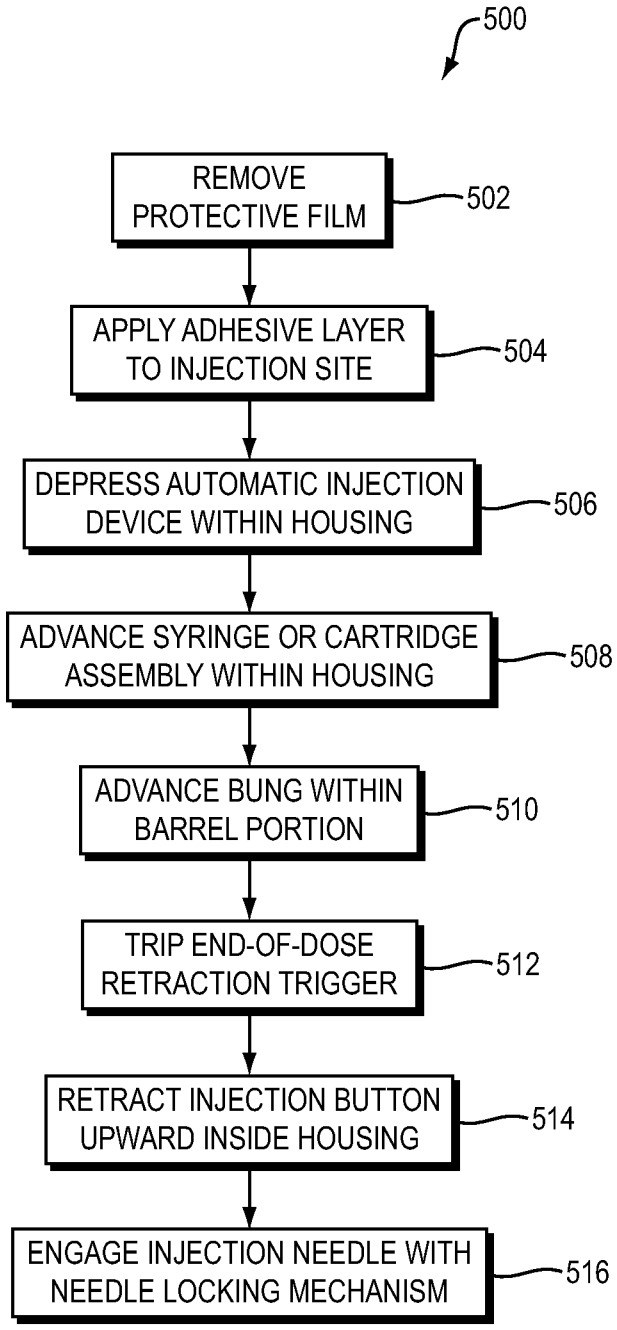

500
REMOVE PROTECTIVE FILM
502
APPLY ADHESIVE LAYER TO INJECTION SITE
504
DEPRESS AUTOMATIC INJECTION DEVICE WITHIN HOUSING
506
ADVANCE SYRINGE OR CARTRIDGE ASSEMBLY WITHIN HOUSING
508
ADVANCE BUNG WITHIN BARREL PORTION
510
TRIP END-OF-DOSE RETRACTION TRIGGER
512
RETRACT INJECTION BUTTON UPWARD INSIDE HOUSING
514
ENGAGE INJECTION NEEDLE WITH NEEDLE LOCKING MECHANISM
516

FIG. 5

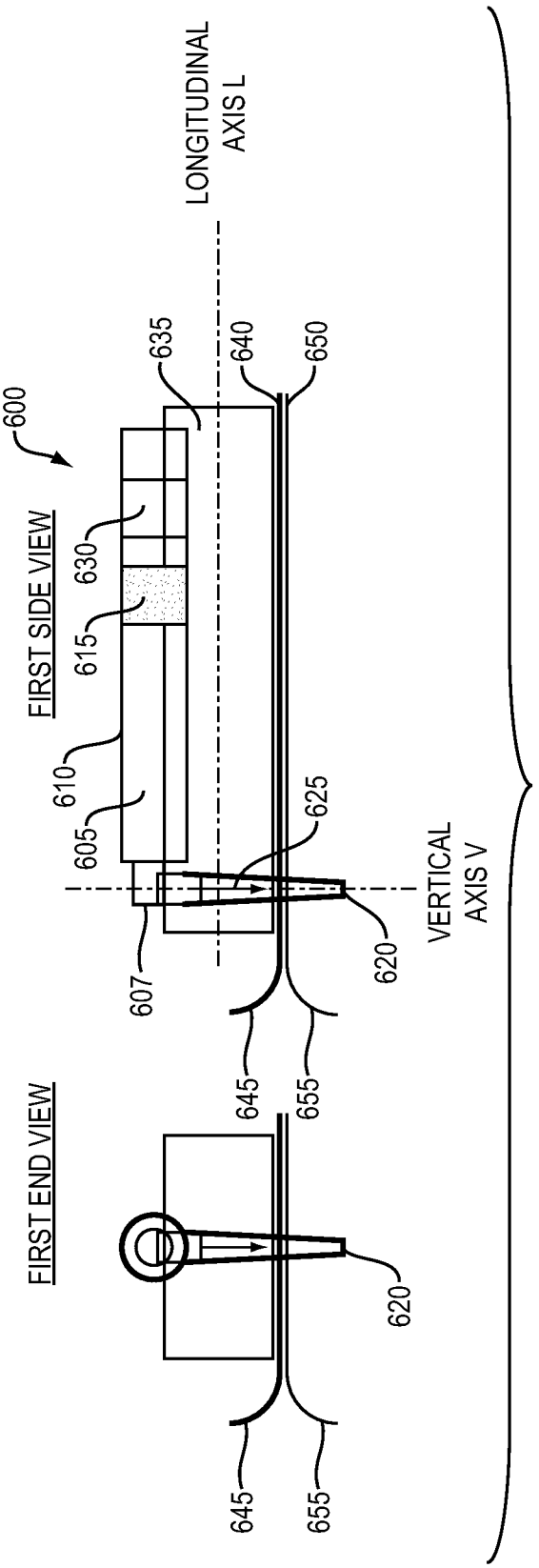

600
FIRST SIDE VIEW
LONGITUDINAL AXIS L
635
640
650
630
615
610
605
625
607
620
VERTICAL AXIS V
FIRST END VIEW
645
655
620

FIG. 6A

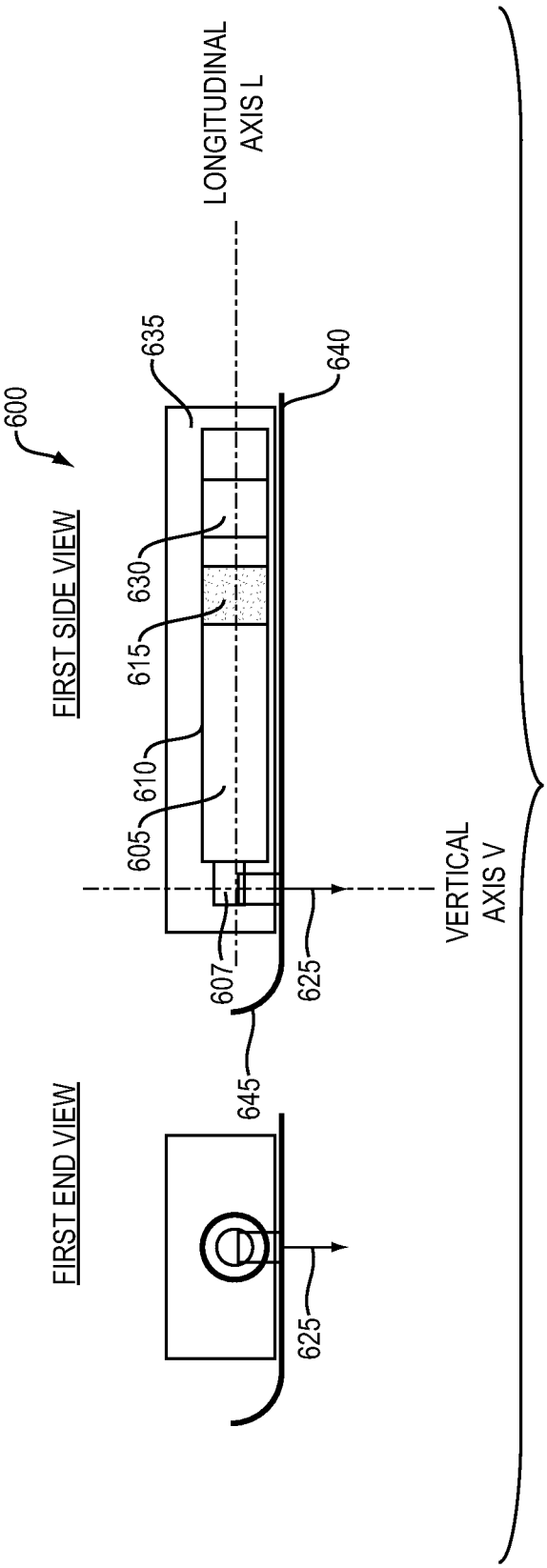

600
FIRST SIDE VIEW
LONGITUDINAL AXIS L
635
640
630
615
610
605
607
625
VERTICAL AXIS V
FIRST END VIEW
645
625

FIG. 6B

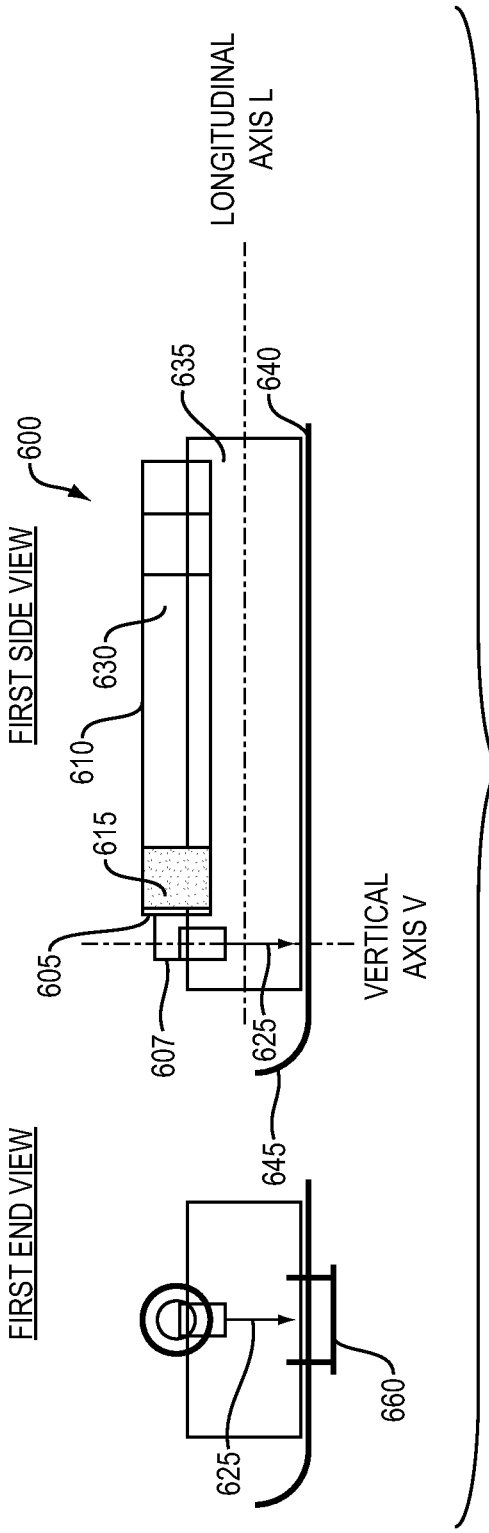

FIRST SIDE VIEW
600
635
640
LONGITUDINAL AXIS L
630
610
615
605
607
625
VERTICAL AXIS V
645
FIRST END VIEW
625
660

FIG. 6C

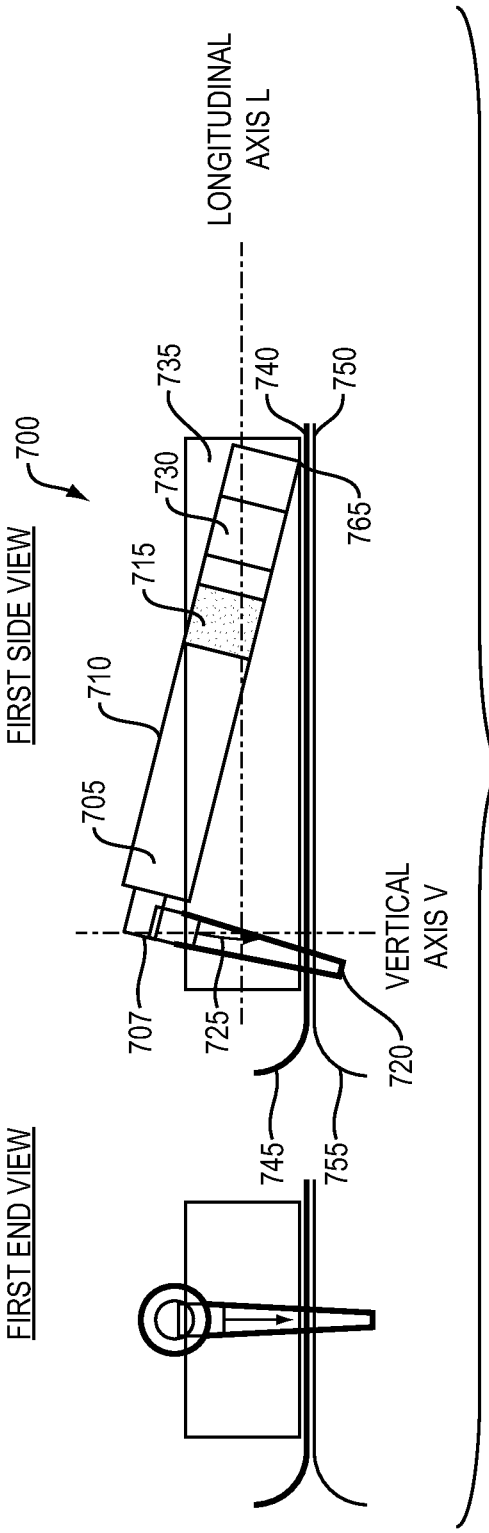

FIRST SIDE VIEW
700
735
740
750
LONGITUDINAL AXIS L
730
765
715
710
705
707
725
VERTICAL AXIS V
720
FIRST END VIEW
745
755

FIG. 7A

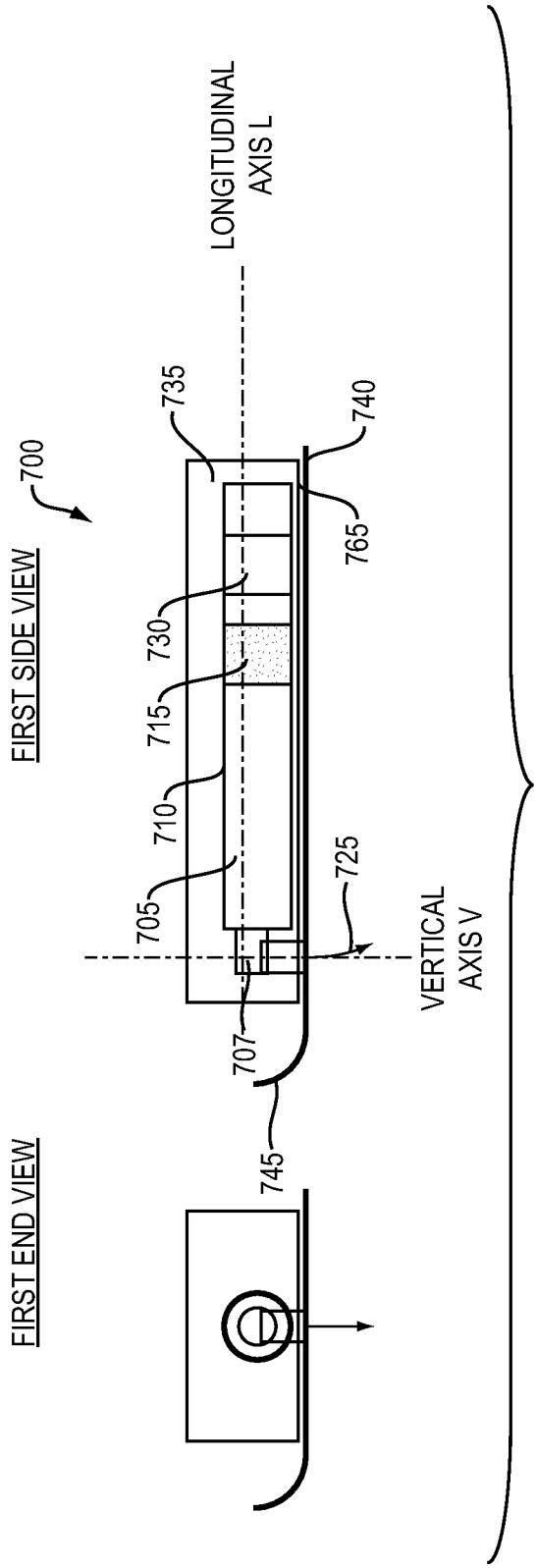

FIRST SIDE VIEW
700
LONGITUDINAL AXIS L
735
740
765
730
715
710
705
725
VERTICAL AXIS V
707
745
FIRST END VIEW

FIG. 7B

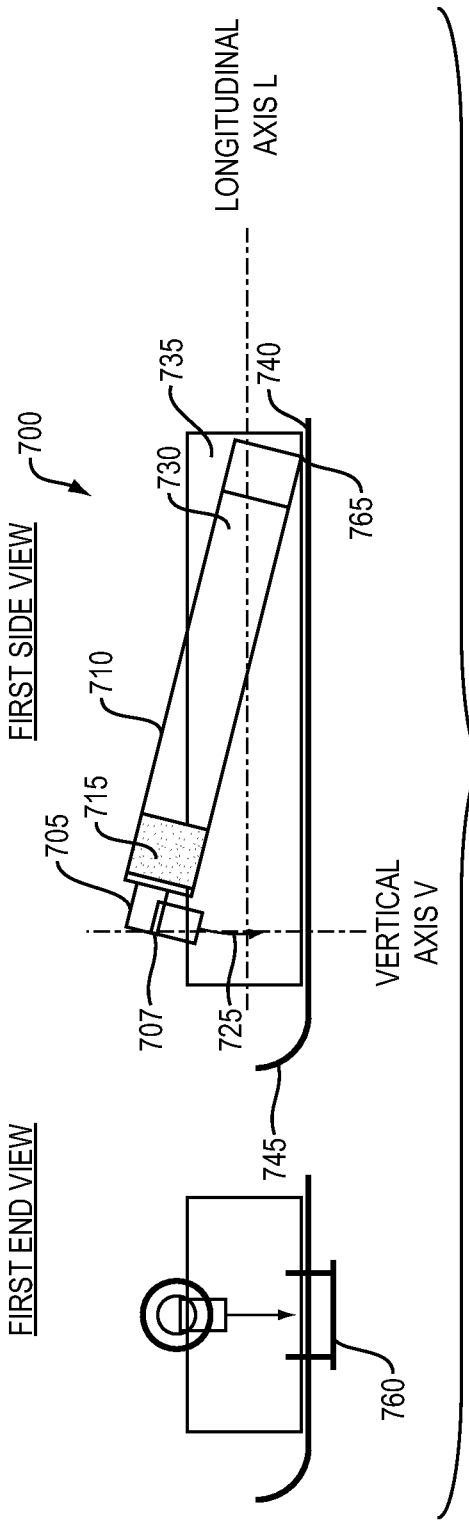

FIRST SIDE VIEW
700
LONGITUDINAL AXIS L
735
740
730
765
710
715
705
VERTICAL AXIS V
707
725
745
760
FIRST END VIEW

FIG. 7C

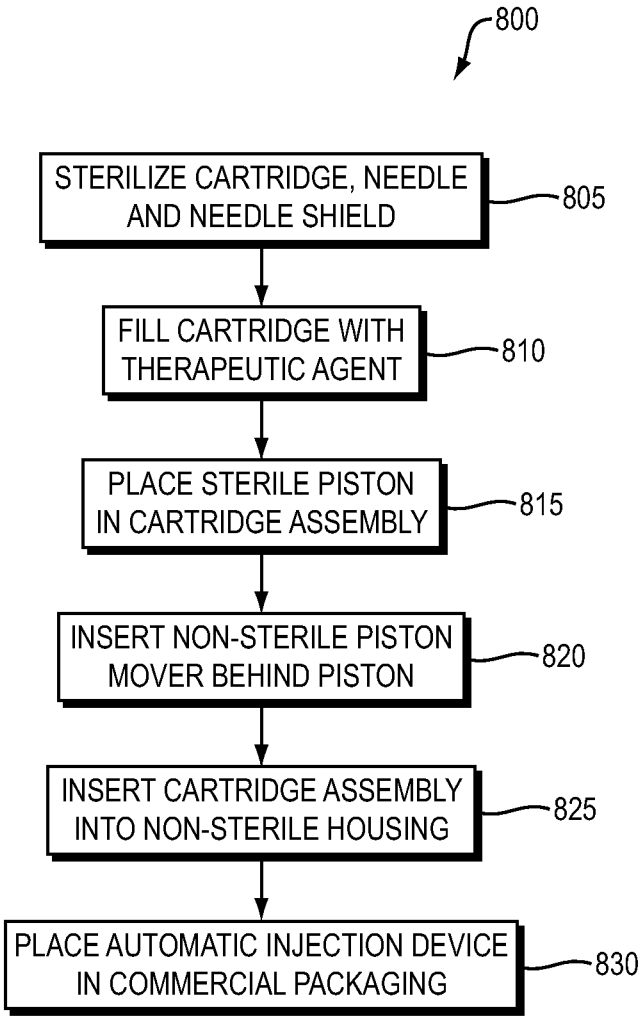

800
STERILIZE CARTRIDGE, NEEDLE AND NEEDLE SHIELD
805
FILL CARTRIDGE WITH THERAPEUTIC AGENT
810
PLACE STERILE PISTON IN CARTRIDGE ASSEMBLY
815
INSERT NON-STERILE PISTON MOVER BEHIND PISTON
820
INSERT CARTRIDGE ASSEMBLY INTO NON-STERILE HOUSING
825
PLACE AUTOMATIC INJECTION DEVICE IN COMMERCIAL PACKAGING
830

FIG. 8

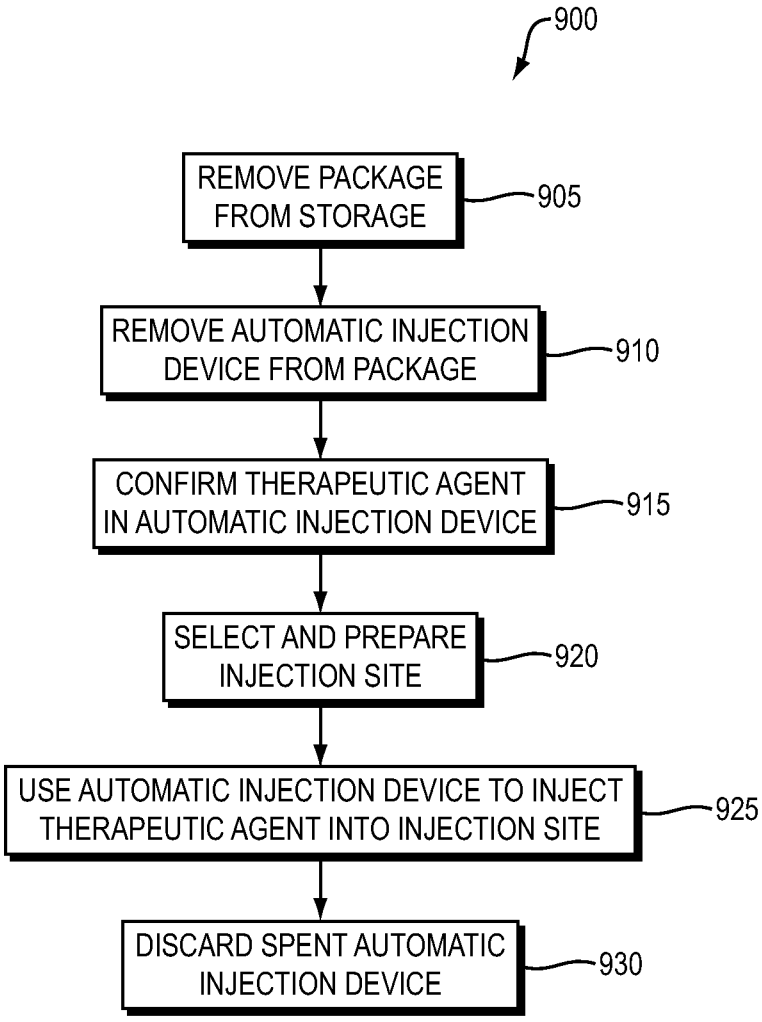

900
REMOVE PACKAGE FROM STORAGE
905
REMOVE AUTOMATIC INJECTION DEVICE FROM PACKAGE
910
CONFIRM THERAPEUTIC AGENT IN AUTOMATIC INJECTION DEVICE
915
SELECT AND PREPARE INJECTION SITE
920
USE AUTOMATIC INJECTION DEVICE TO INJECT THERAPEUTIC AGENT INTO INJECTION SITE
925
DISCARD SPENT AUTOMATIC INJECTION DEVICE
930

FIG. 9

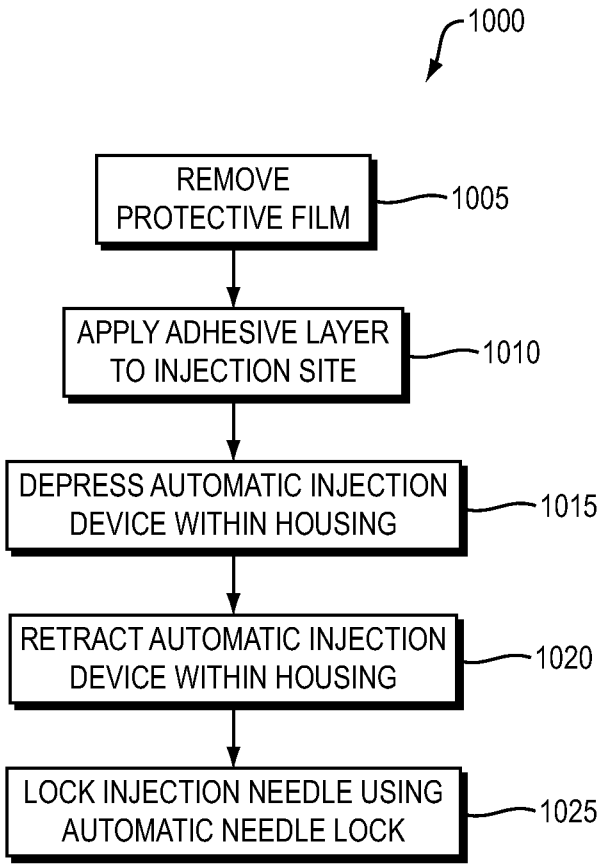

1000
REMOVE PROTECTIVE FILM
1005
APPLY ADHESIVE LAYER TO INJECTION SITE
1010
DEPRESS AUTOMATIC INJECTION DEVICE WITHIN HOUSING
1015
RETRACT AUTOMATIC INJECTION DEVICE WITHIN HOUSING
1020
LOCK INJECTION NEEDLE USING AUTOMATIC NEEDLE LOCK
1025

FIG. 10

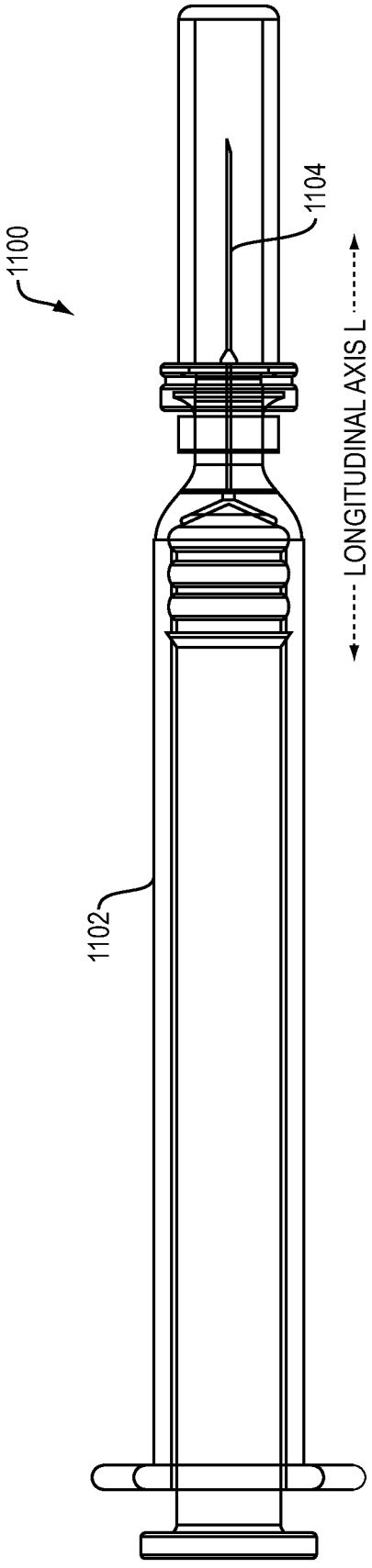

1100
1104
LONGITUDINAL AXIS L
1102

FIG. 11

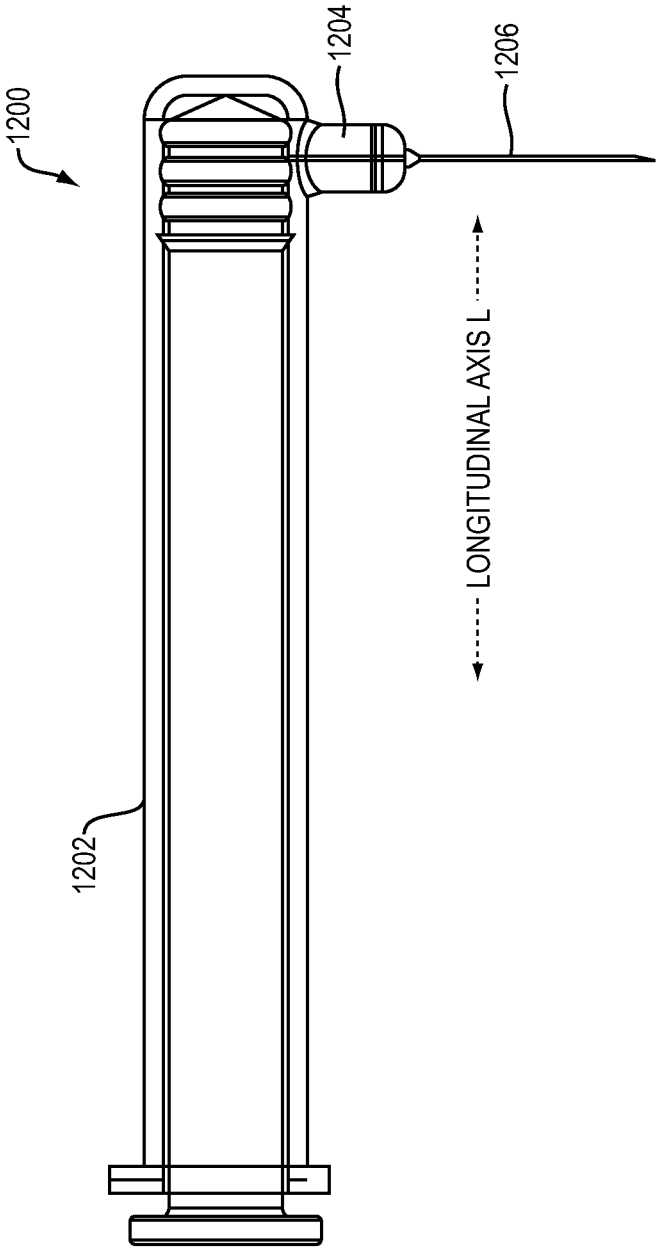

1200
1204
1206
LONGITUDINAL AXIS L
1202

FIG. 12

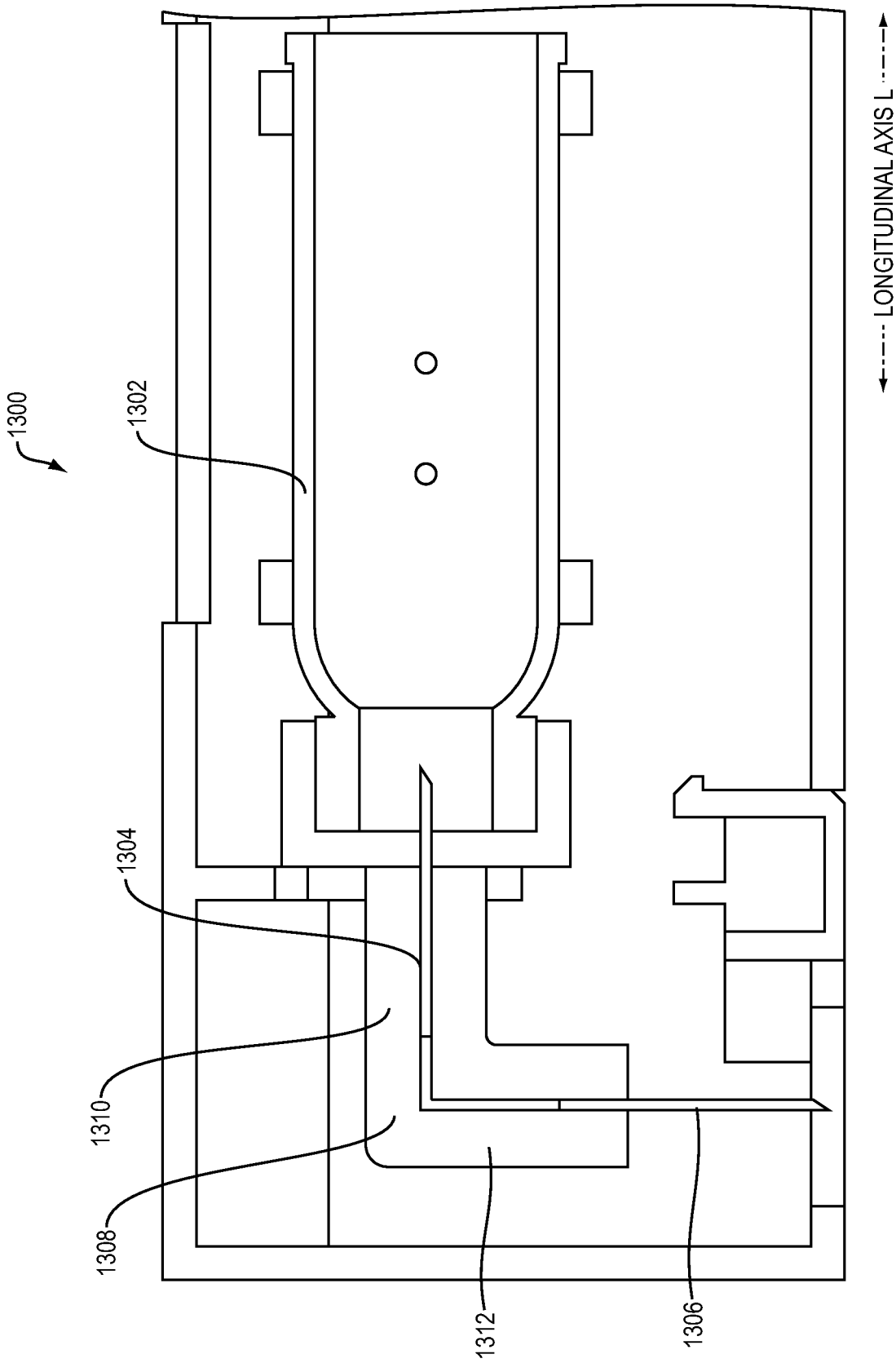


FIG. 13

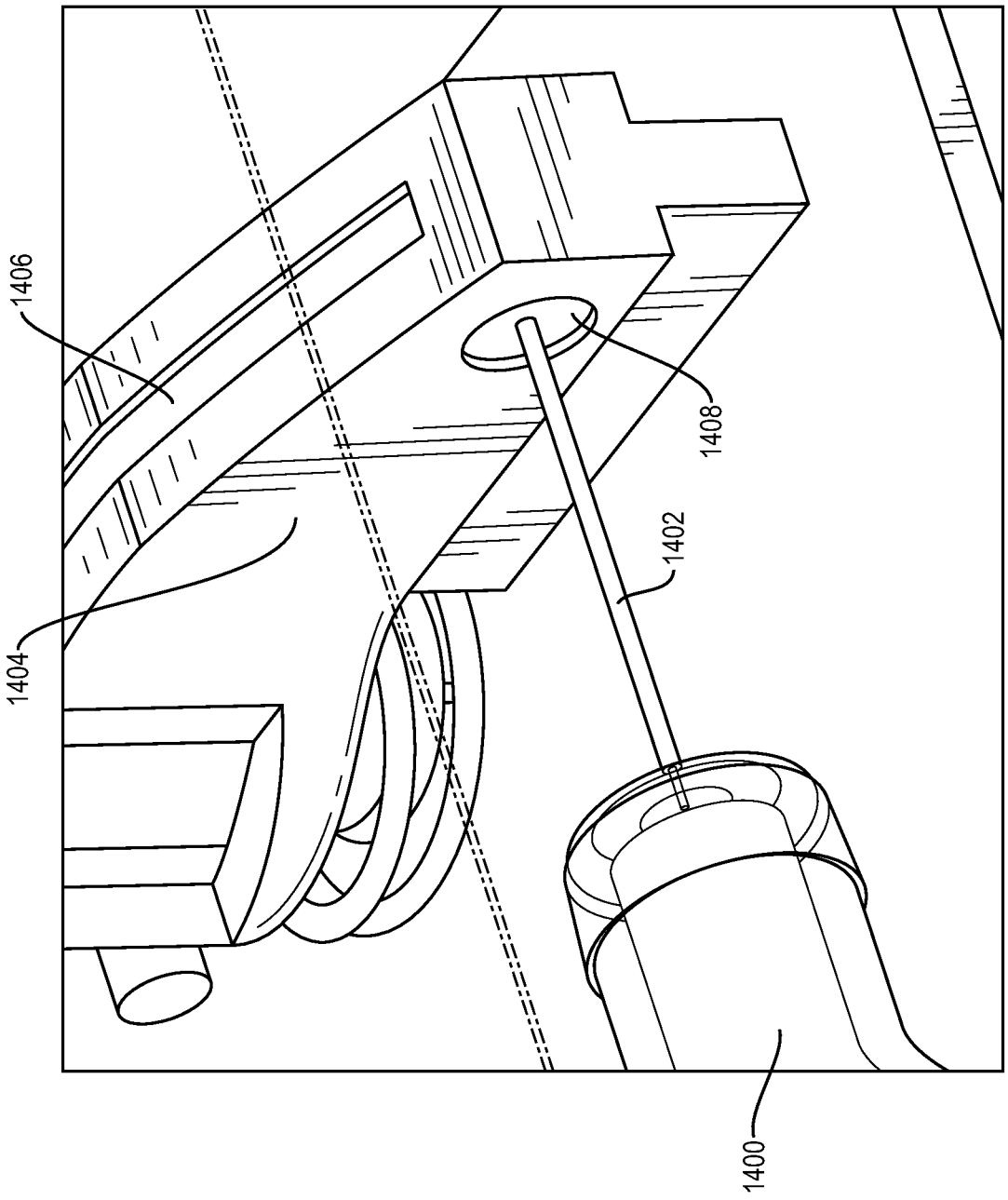


FIG. 14

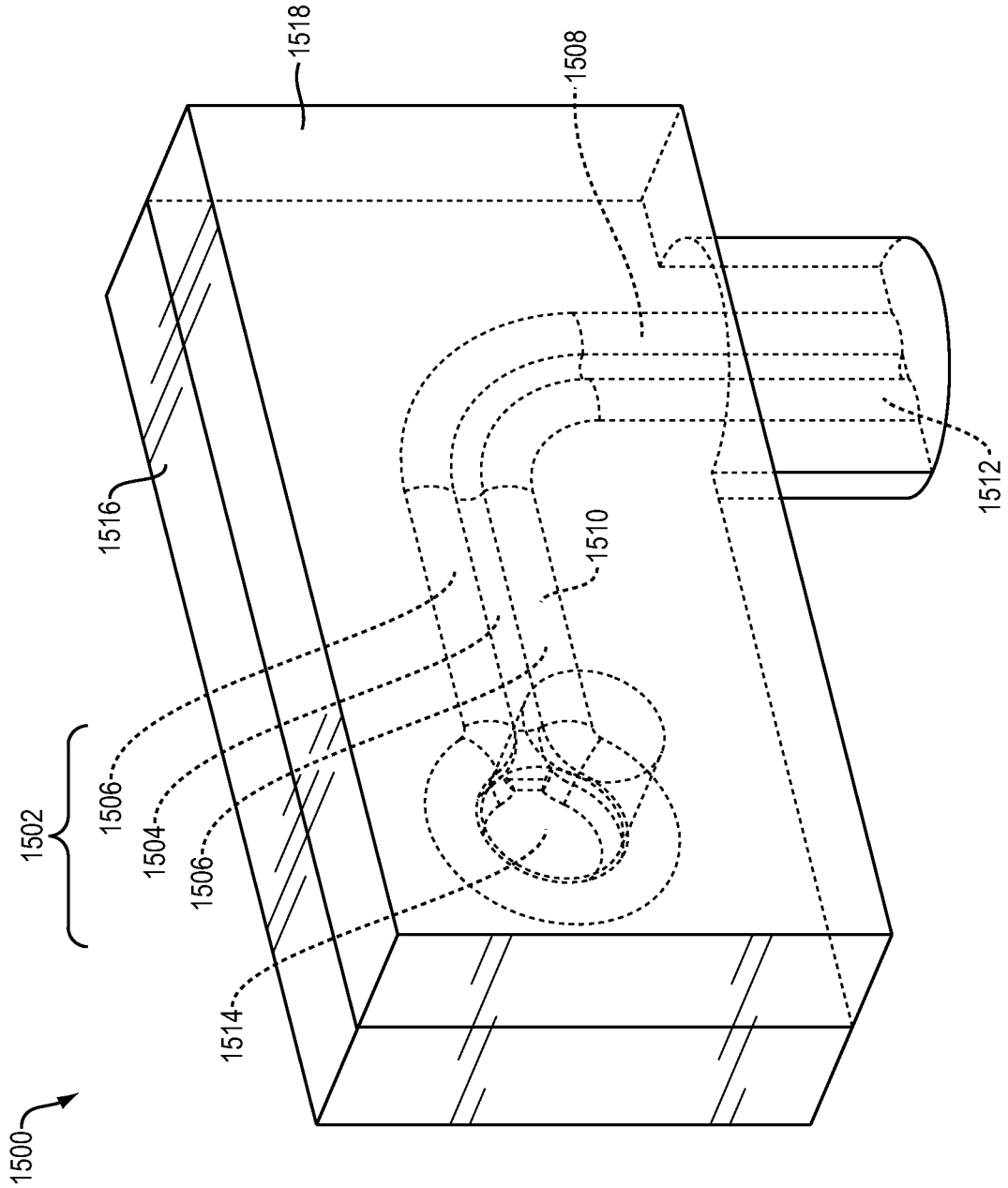


FIG. 15

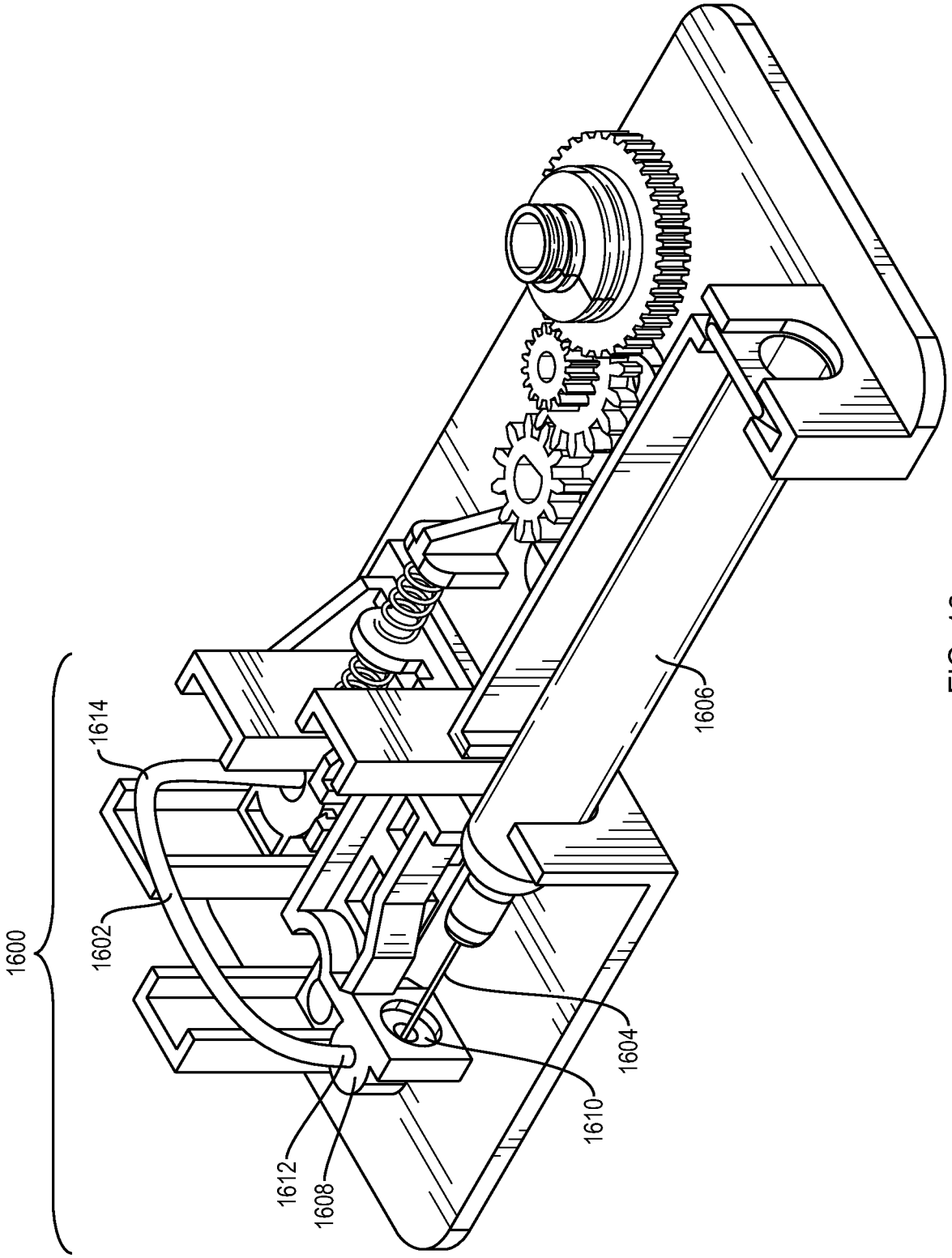


FIG. 16

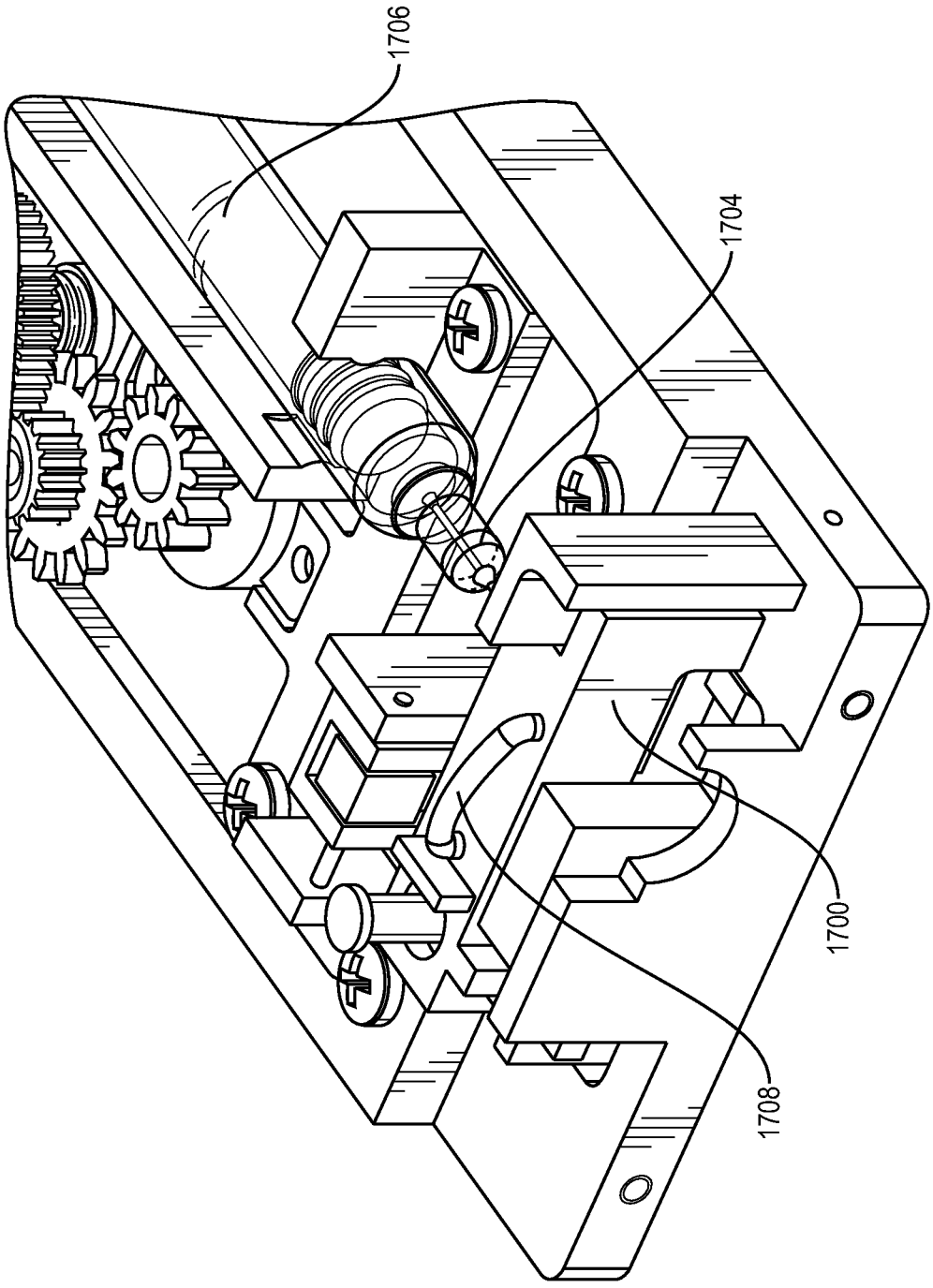


FIG. 17

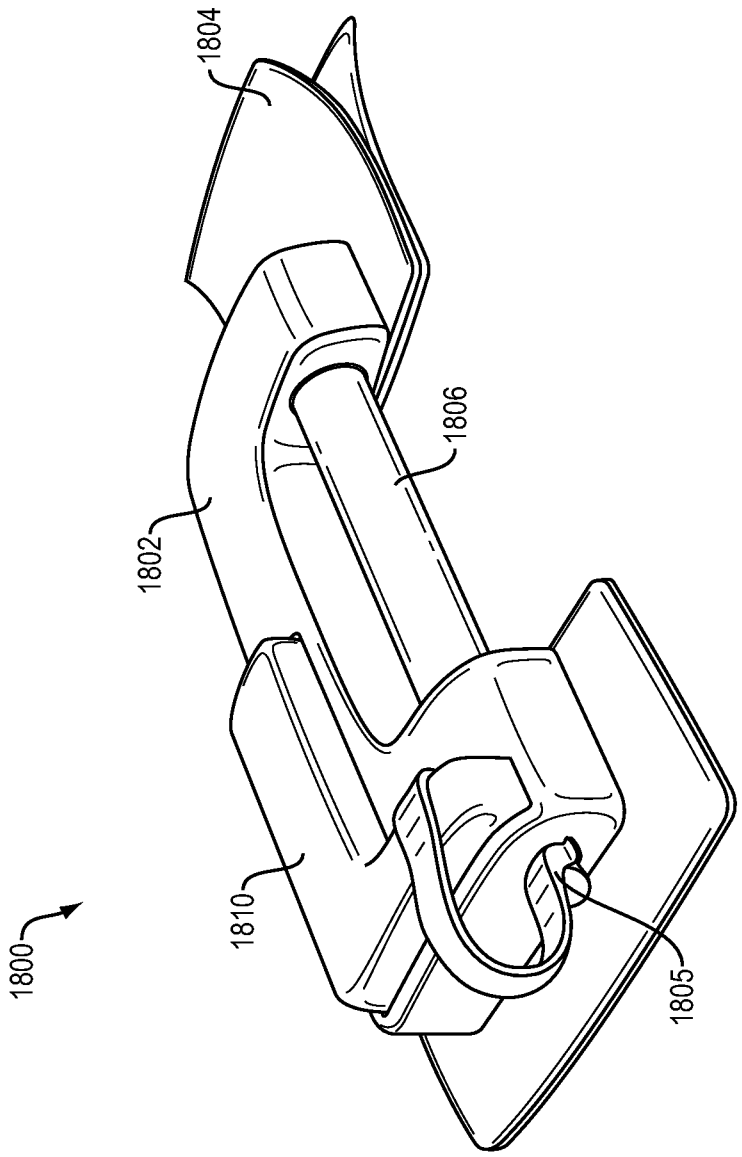


FIG. 18A

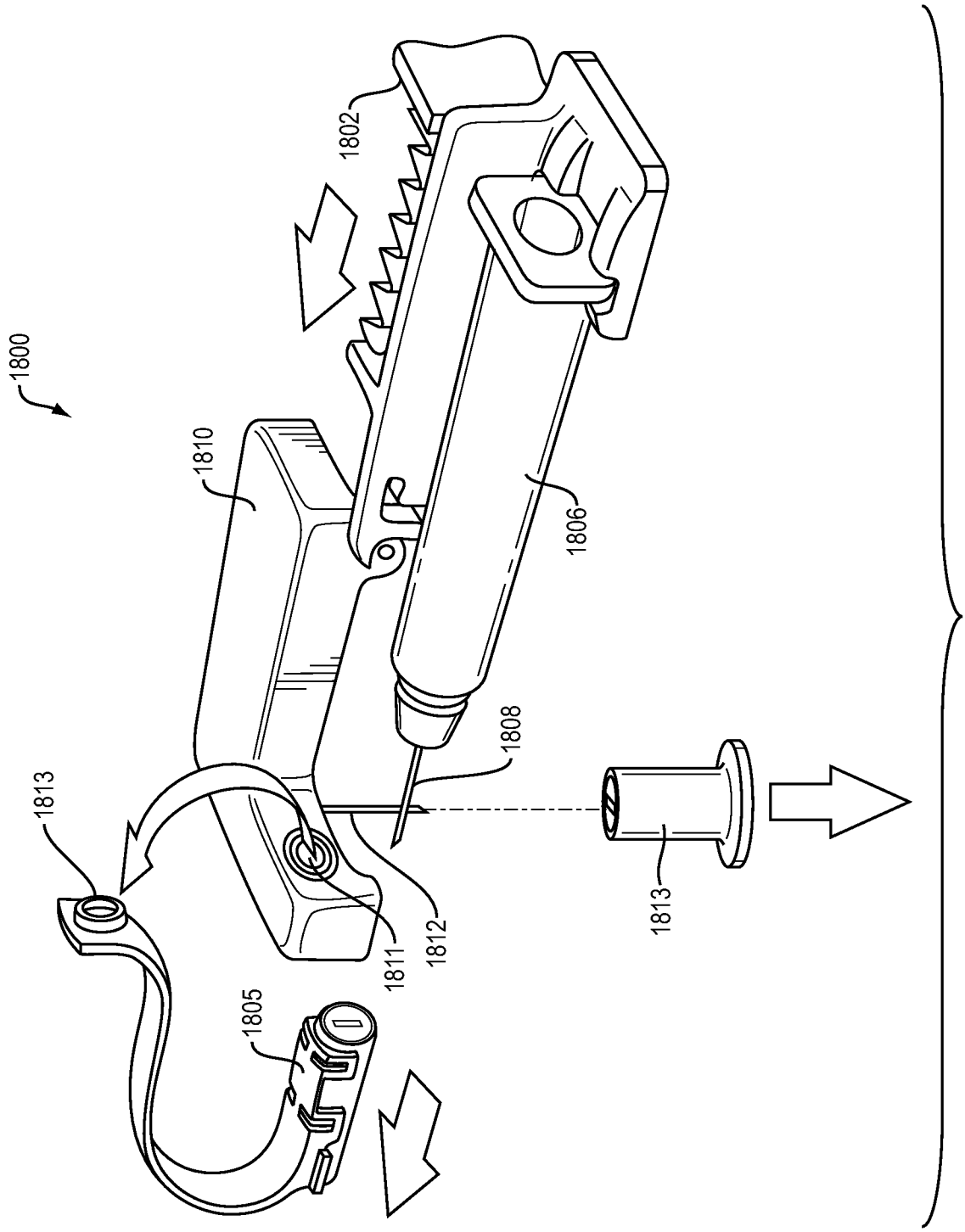


FIG. 18B

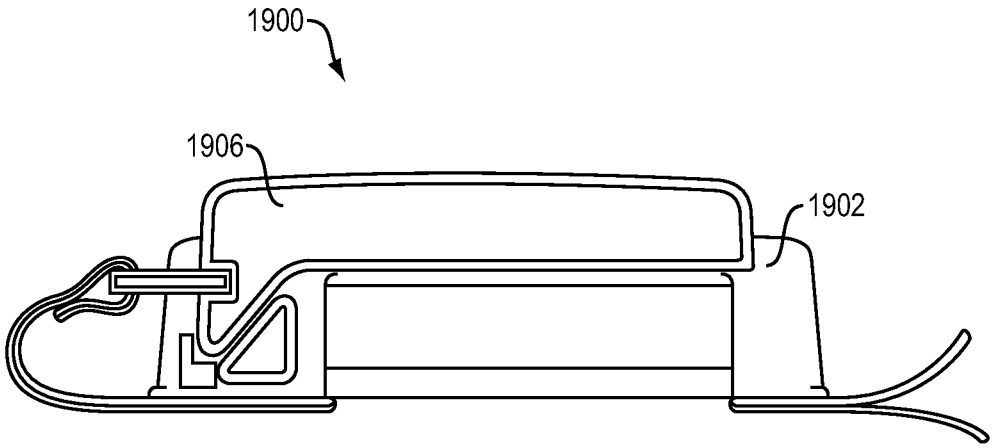


FIG. 19A

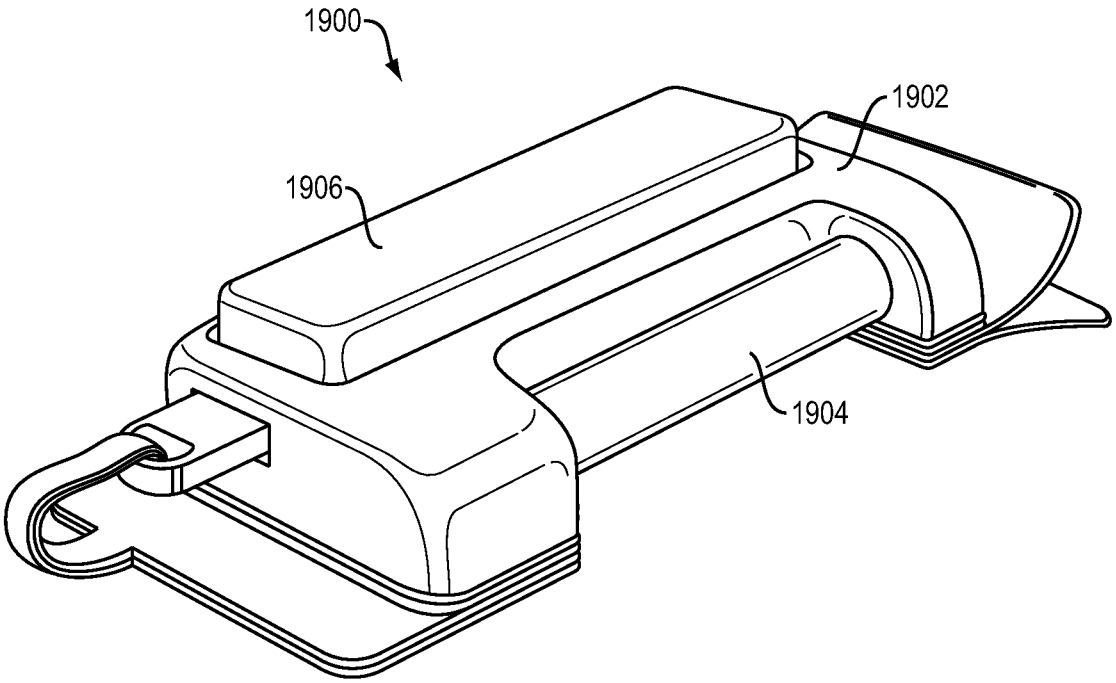


FIG. 19B

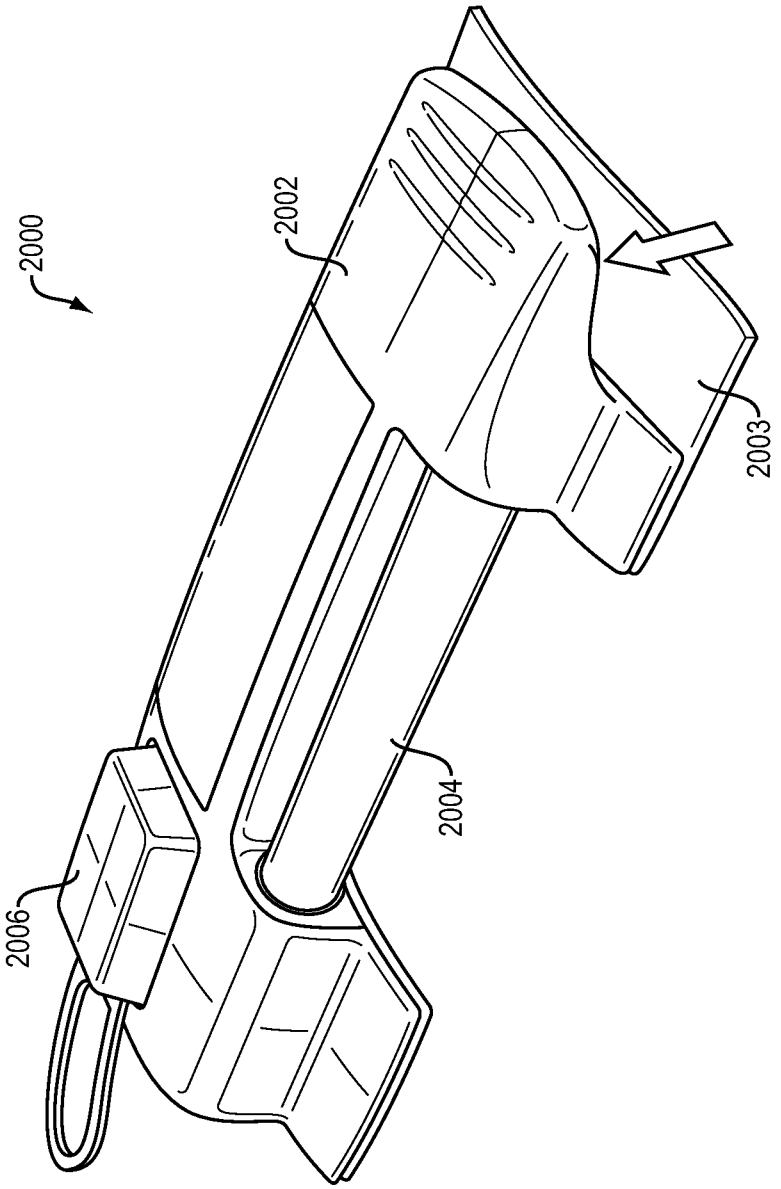


FIG. 20A

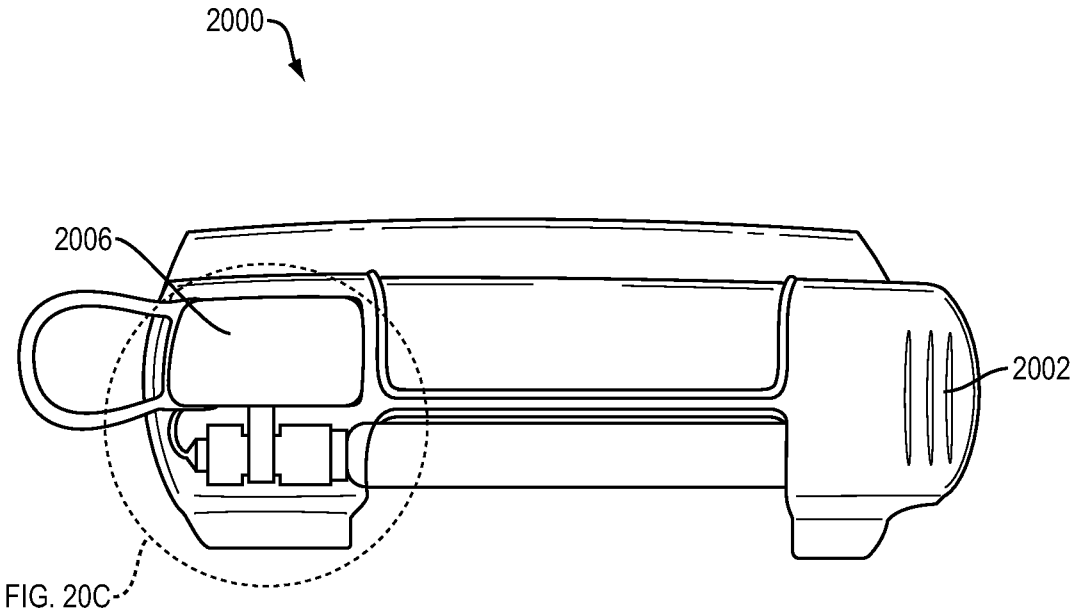


FIG. 20B

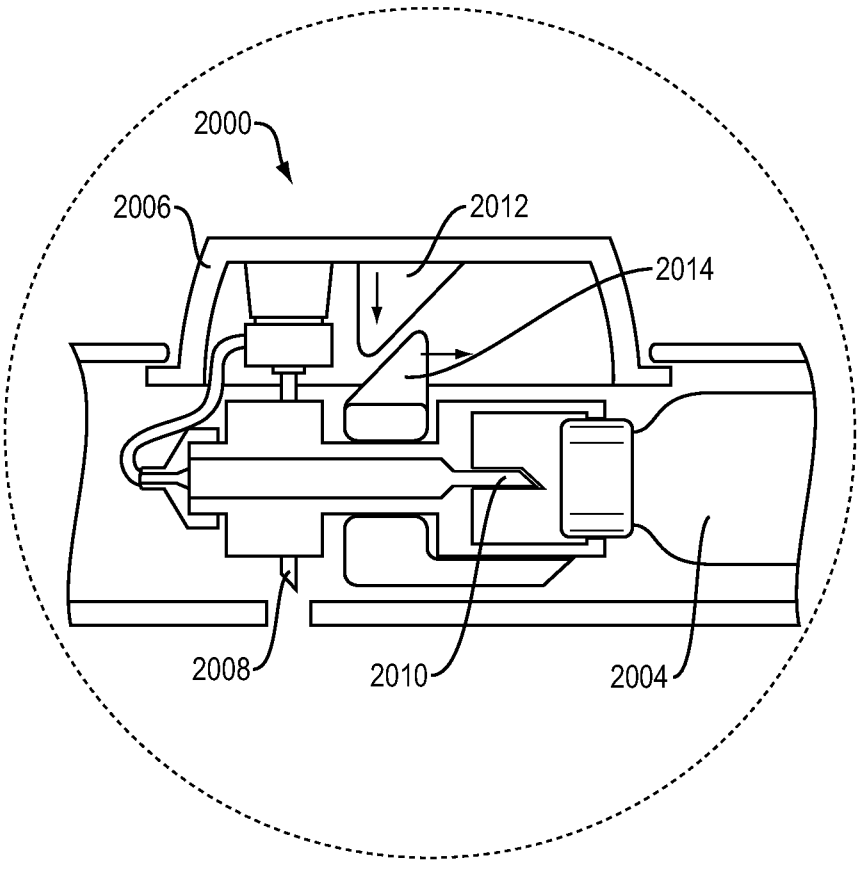


FIG. 20C

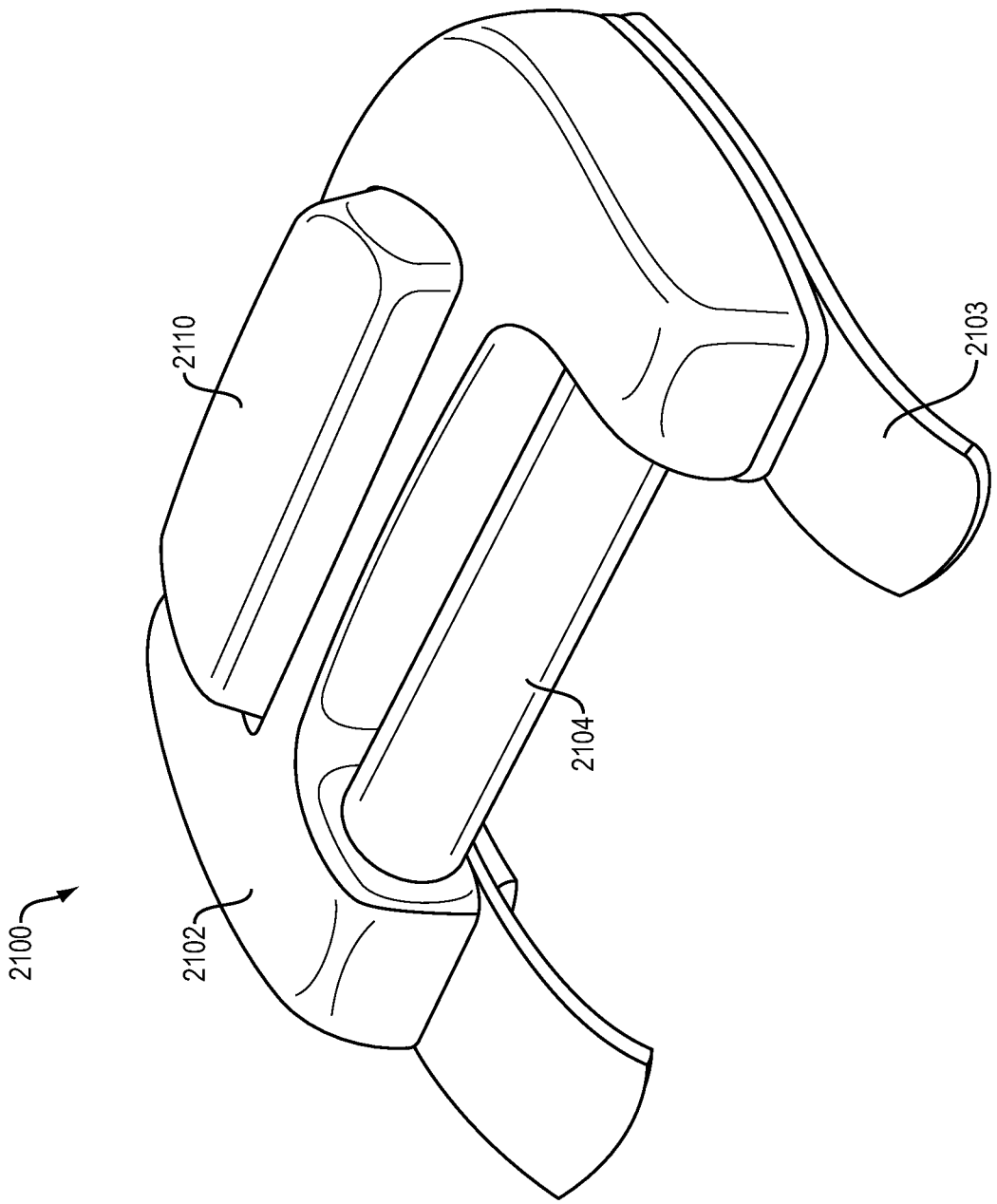


FIG. 21A

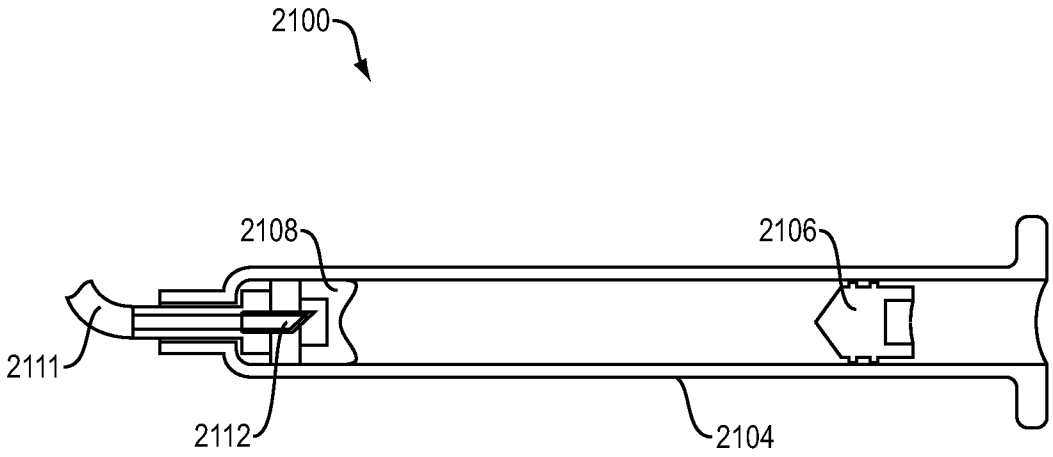


FIG. 21B

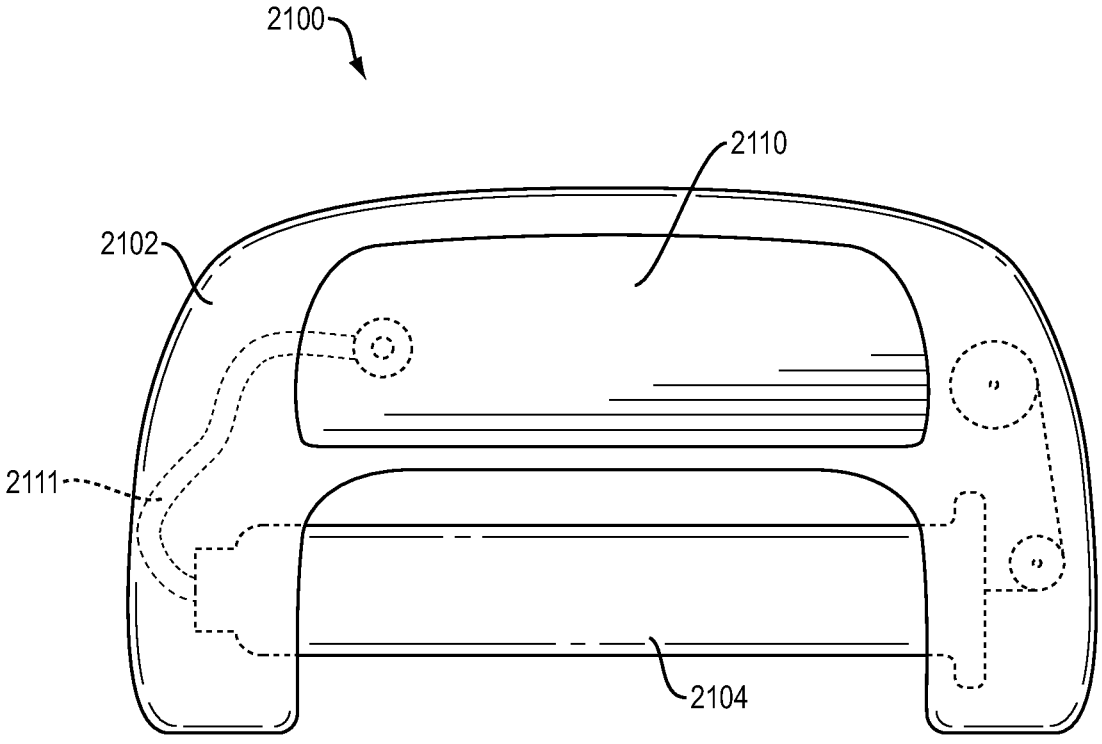


FIG. 21C

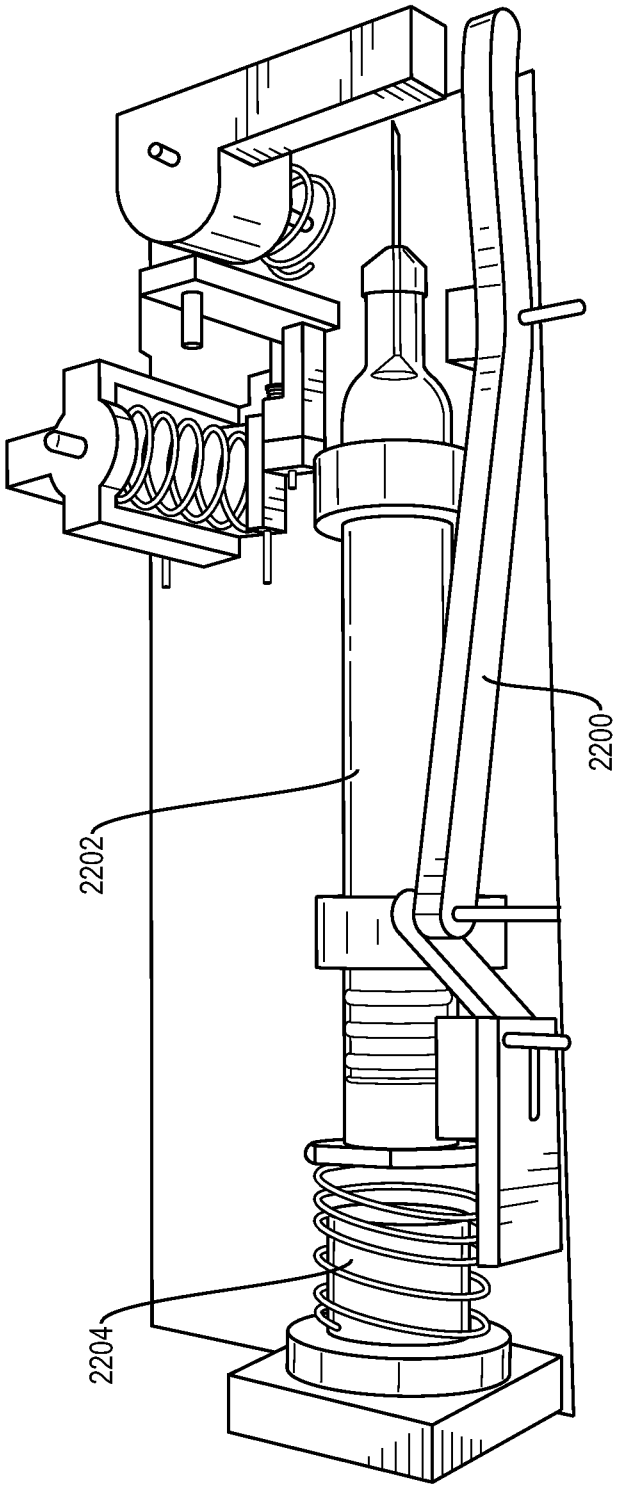


FIG. 22

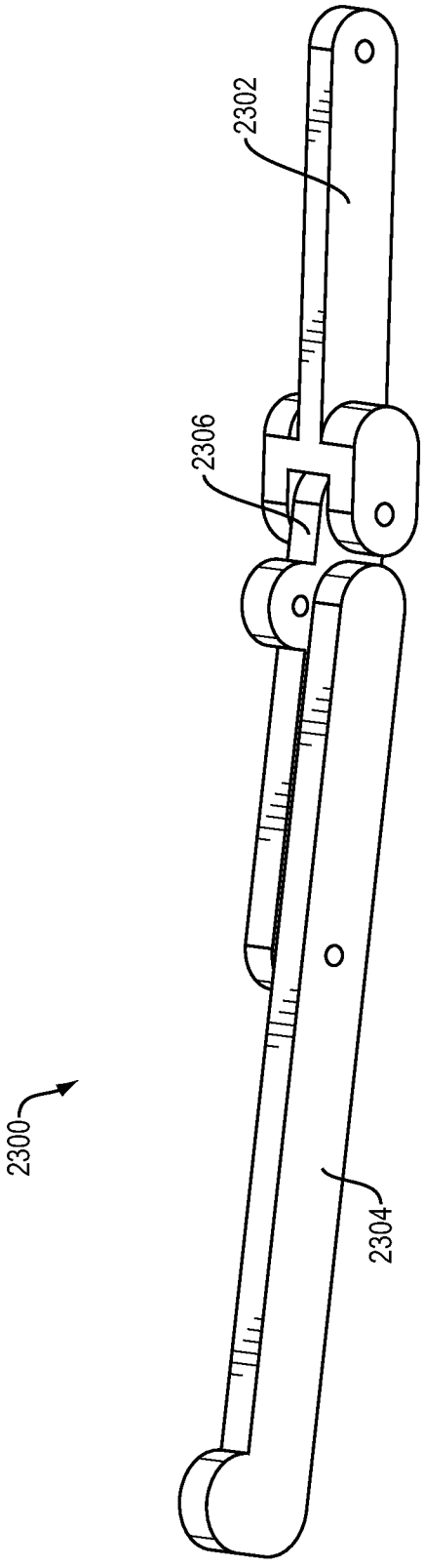


FIG. 23

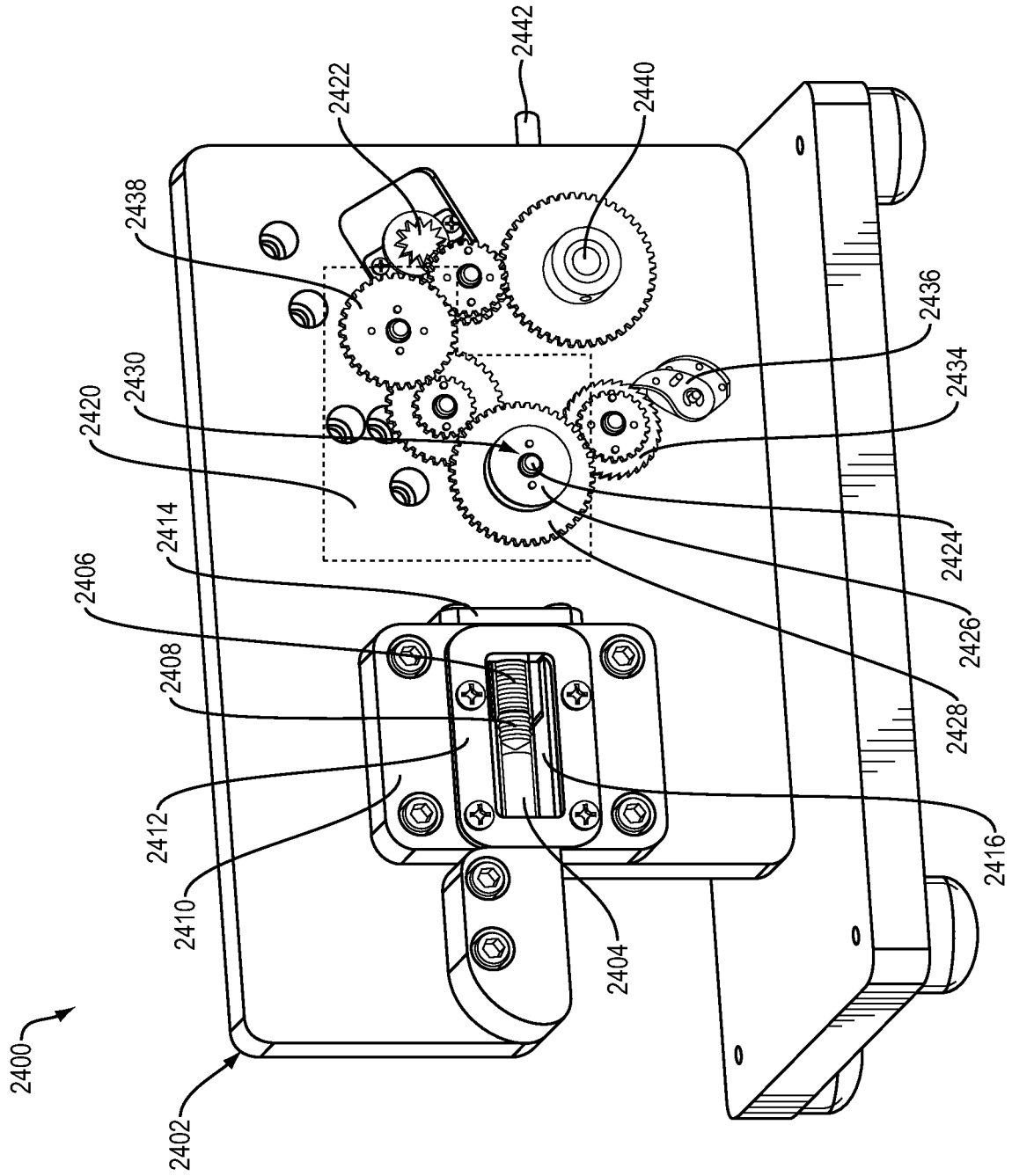

2400
2402
2404
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2442

FIG. 24

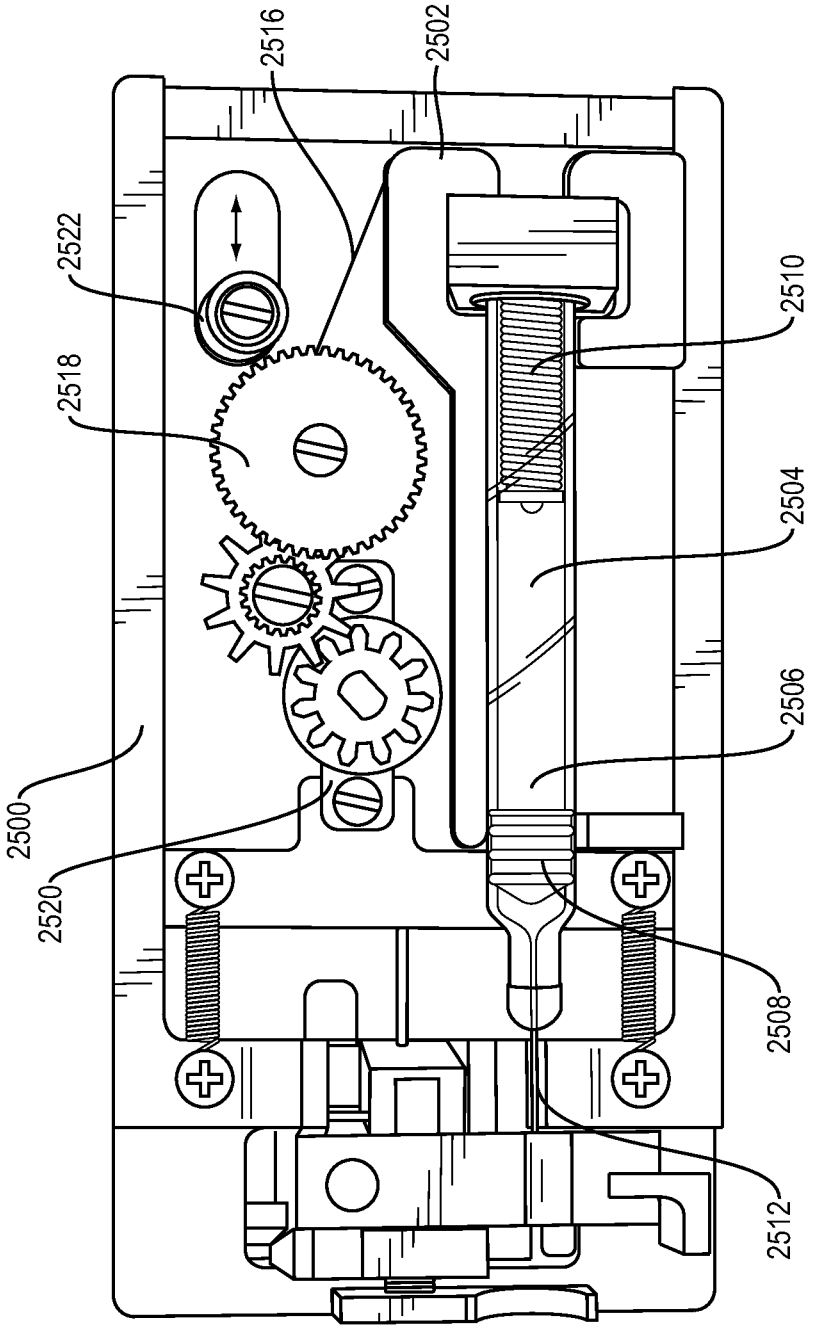


FIG. 25

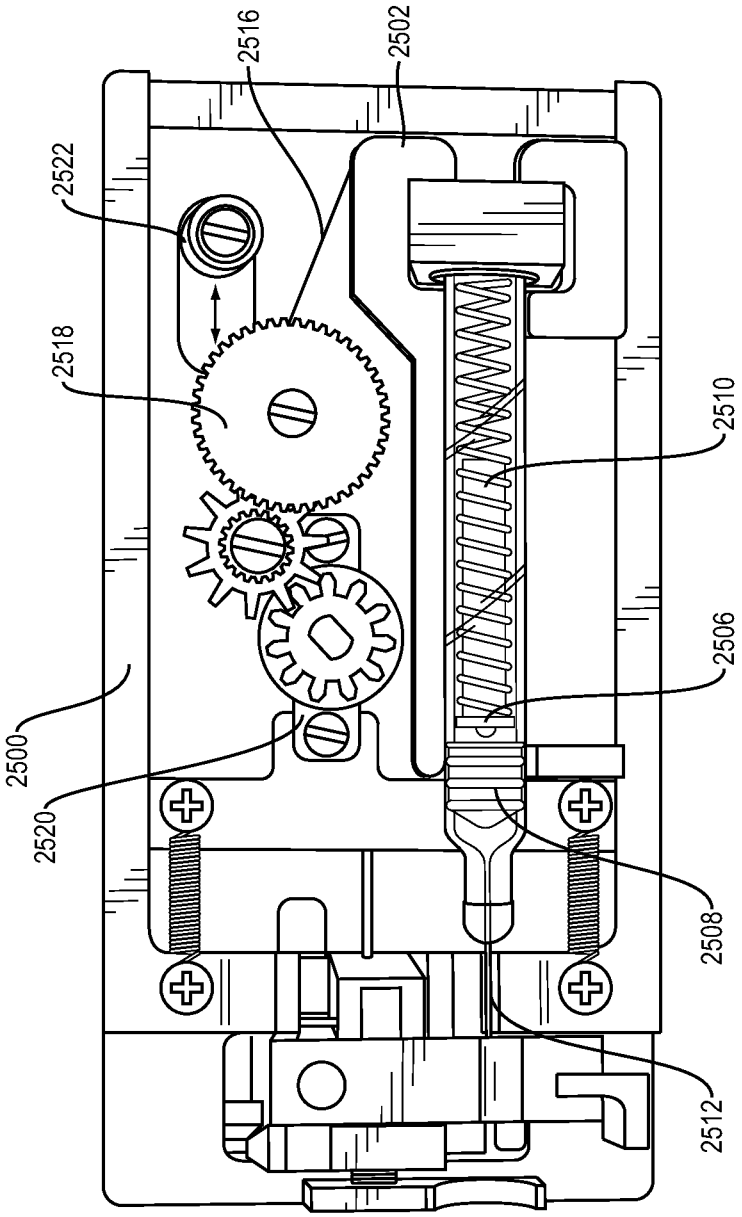


FIG. 26

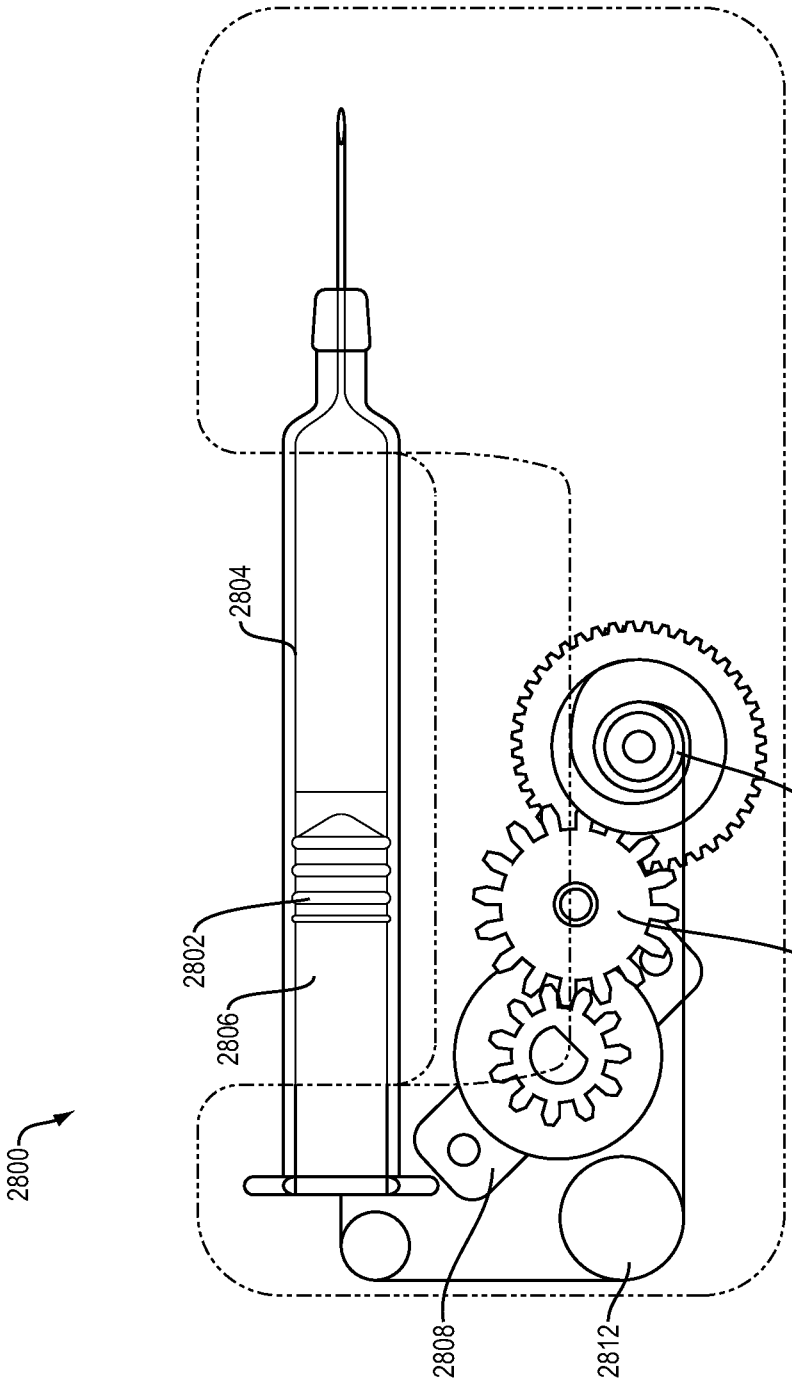


FIG. 27

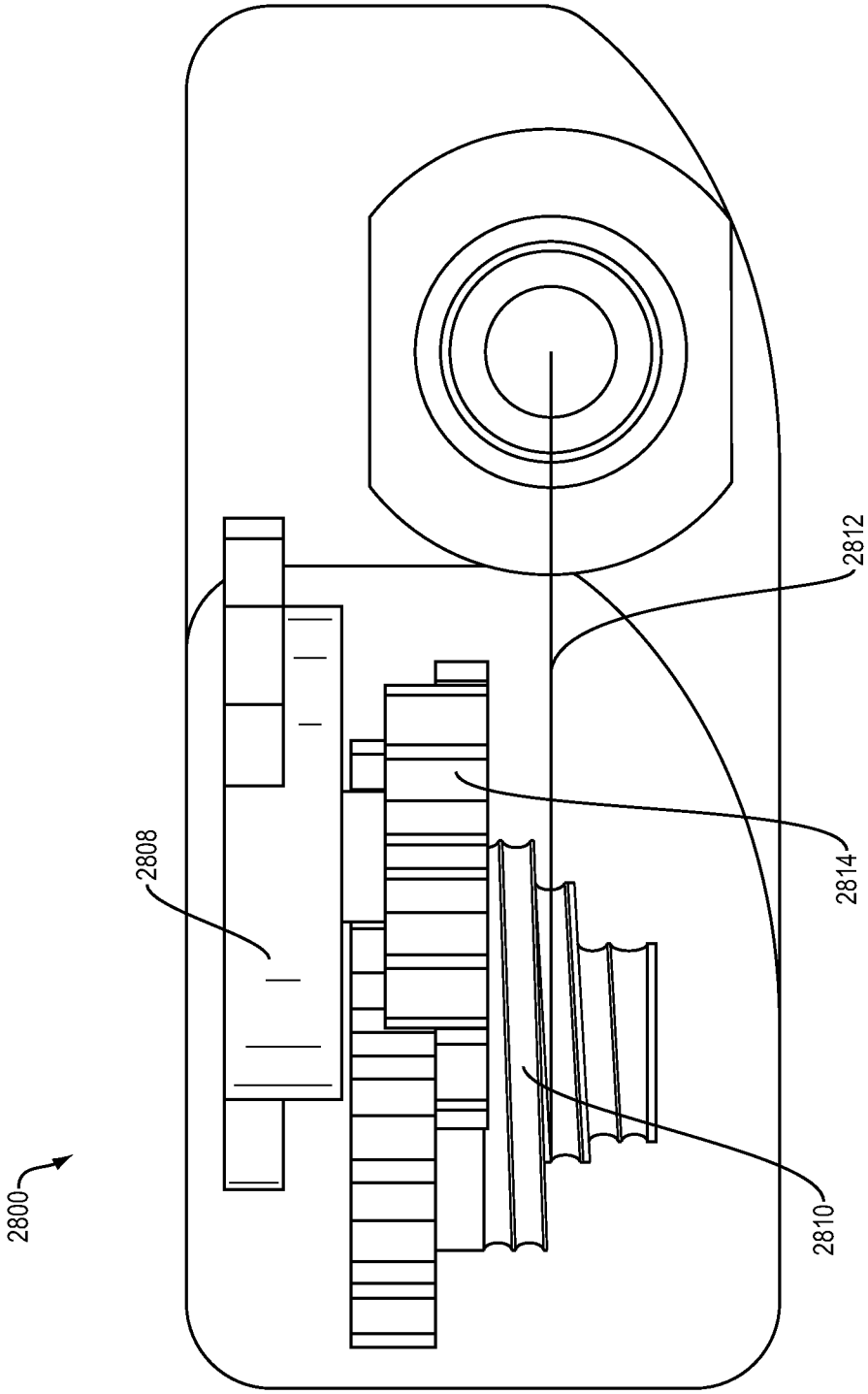


FIG. 28

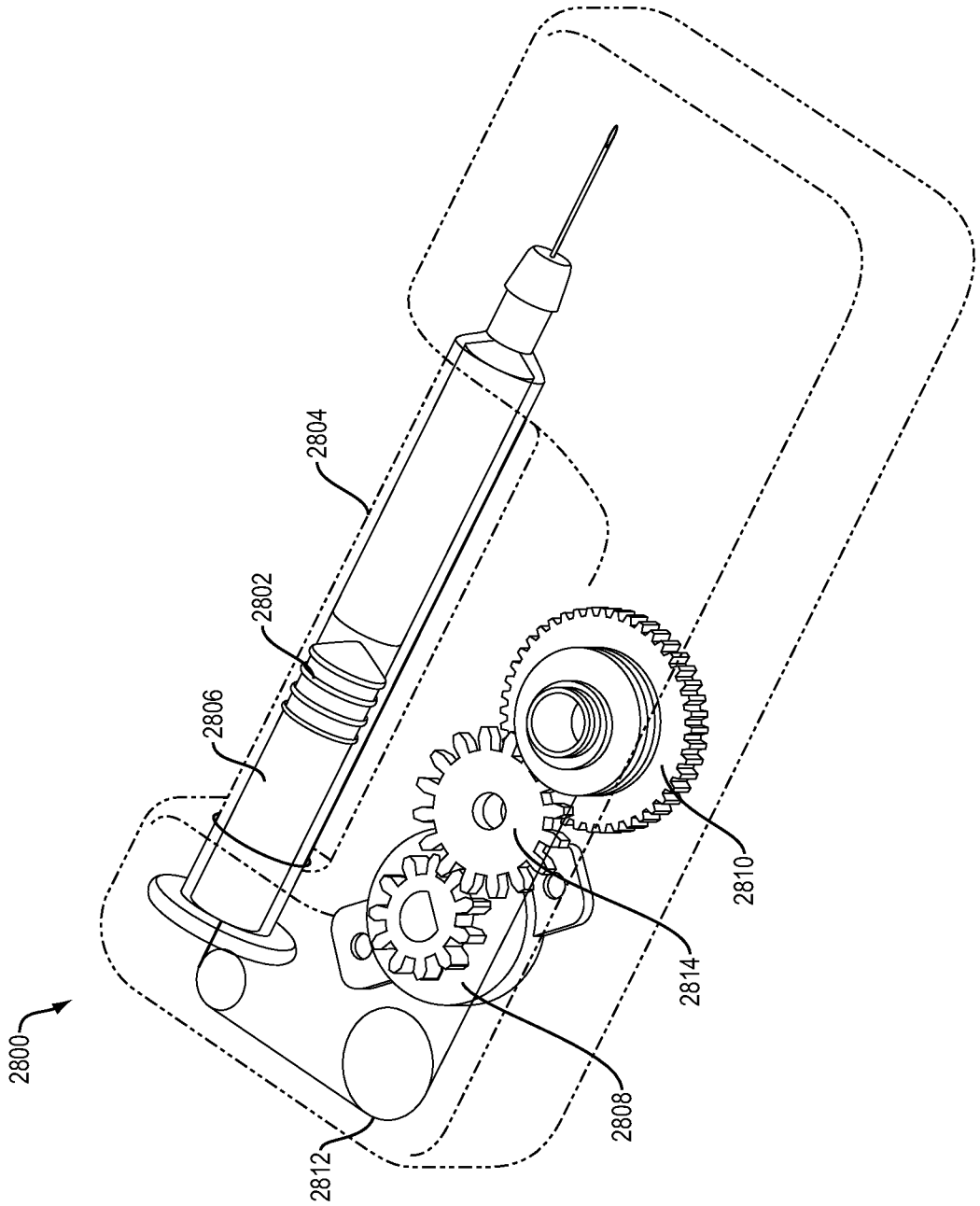


FIG. 29

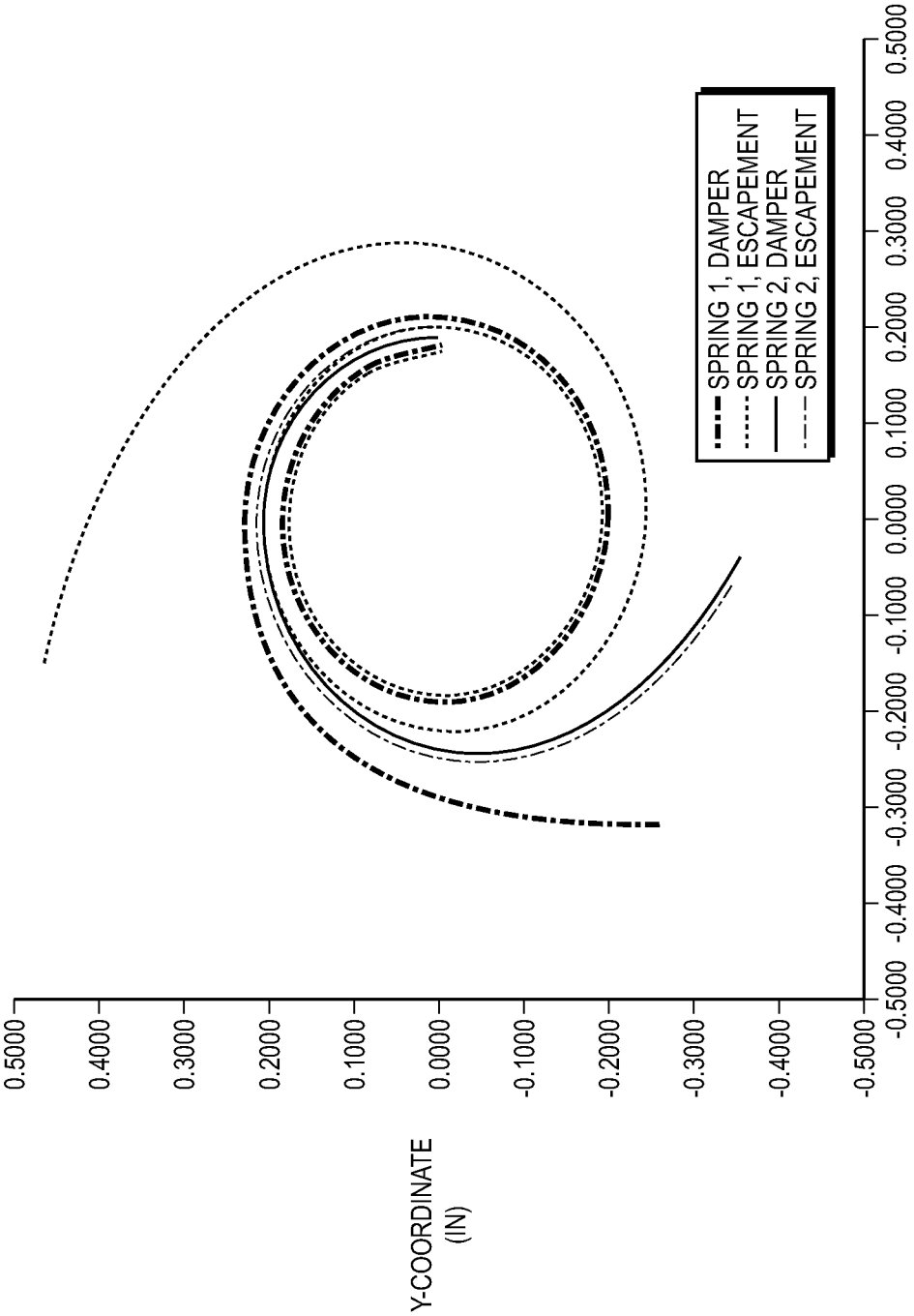

SPRING 1, DAMPER
SPRING 1, ESCAPEMENT
SPRING 2, DAMPER
SPRING 2, ESCAPEMENT
X-COORDINATE
(IN)
Y-COORDINATE
(IN)
0.5000
0.4000
0.3000
0.2000
0.1000
0.0000
-0.1000
-0.2000
-0.3000
-0.4000
-0.5000
-0.5000
-0.4000
-0.3000
-0.2000
-0.1000
0.0000
0.1000
0.2000
0.3000
0.4000
0.5000

FIG. 30

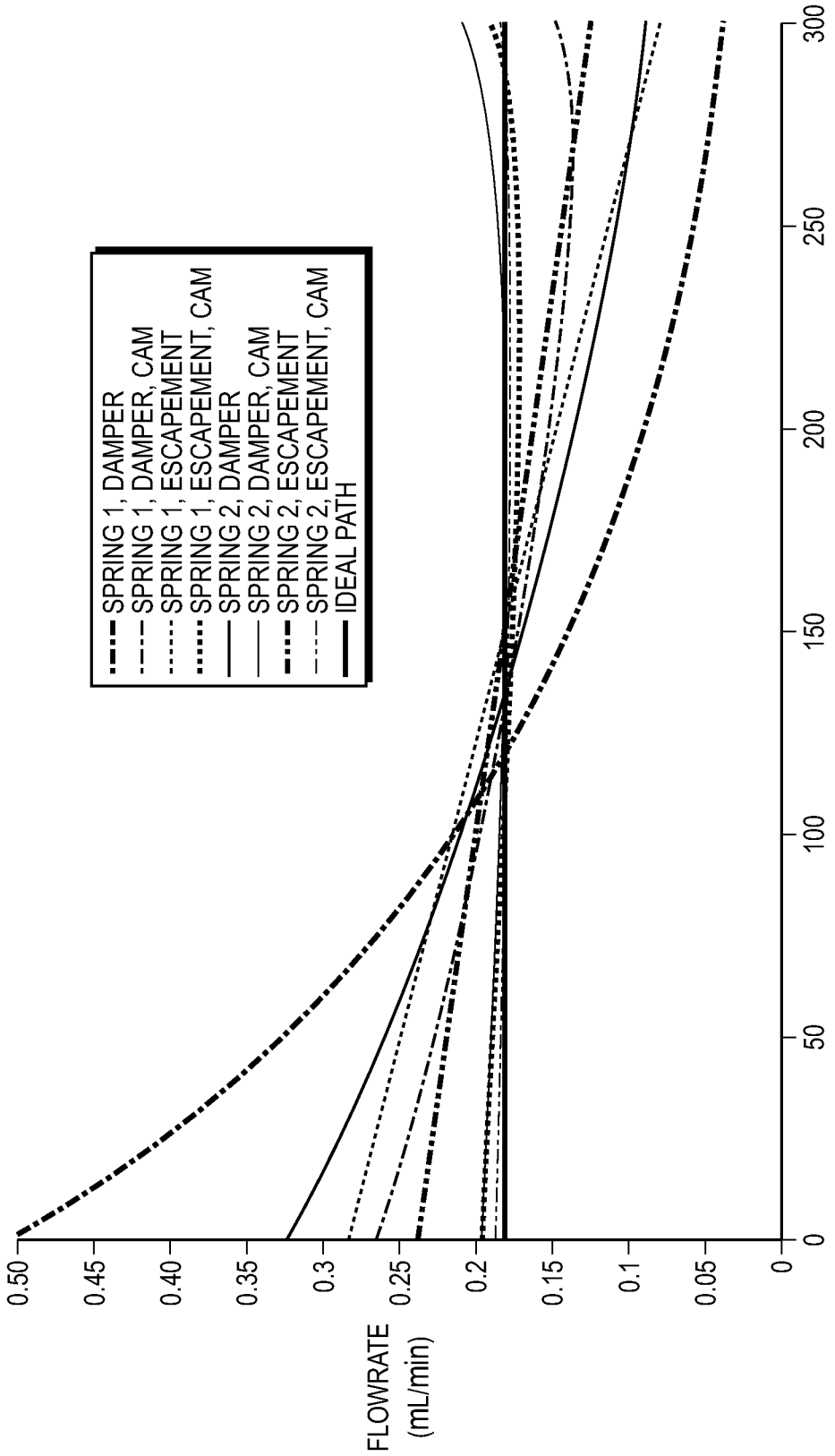

SPRING 1, DAMPER
SPRING 1, DAMPER, CAM
SPRING 1, ESCAPEMENT
SPRING 1, ESCAPEMENT, CAM
SPRING 2, DAMPER
SPRING 2, DAMPER, CAM
SPRING 2, ESCAPEMENT
SPRING 2, ESCAPEMENT, CAM
IDEAL PATH
FLOWRATE (mL/min)
0.50
0.45
0.40
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
0
50
100
150
200
250
300
TIME(s)

FIG. 31

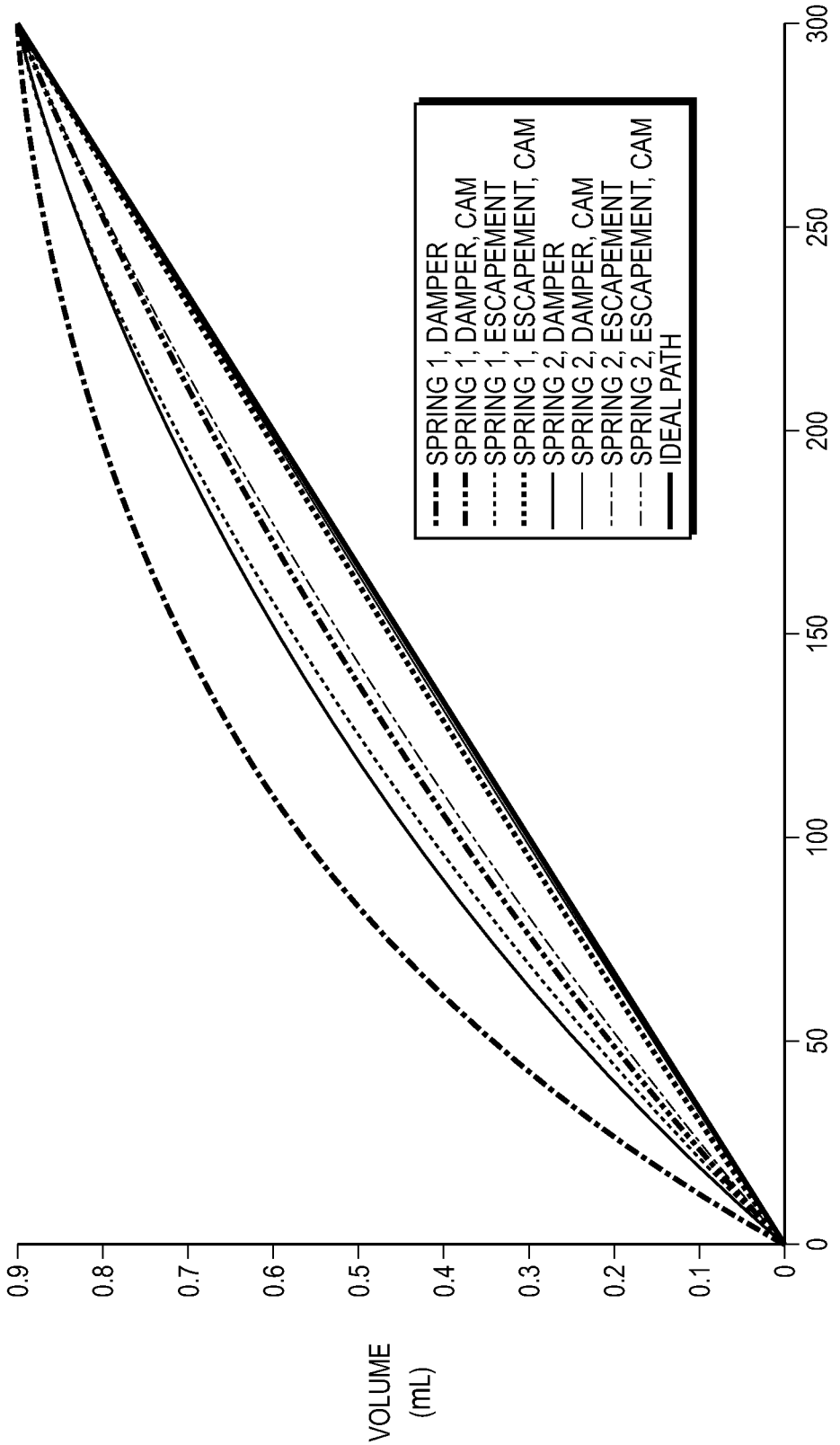

SPRING 1, DAMPER
SPRING 1, DAMPER, CAM
SPRING 1, ESCAPEMENT
SPRING 1, ESCAPEMENT, CAM
SPRING 2, DAMPER
SPRING 2, DAMPER, CAM
SPRING 2, ESCAPEMENT
SPRING 2, ESCAPEMENT, CAM
IDEAL PATH
VOLUME (mL)
TIME(s)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0
50
100
150
200
250
300

FIG. 32

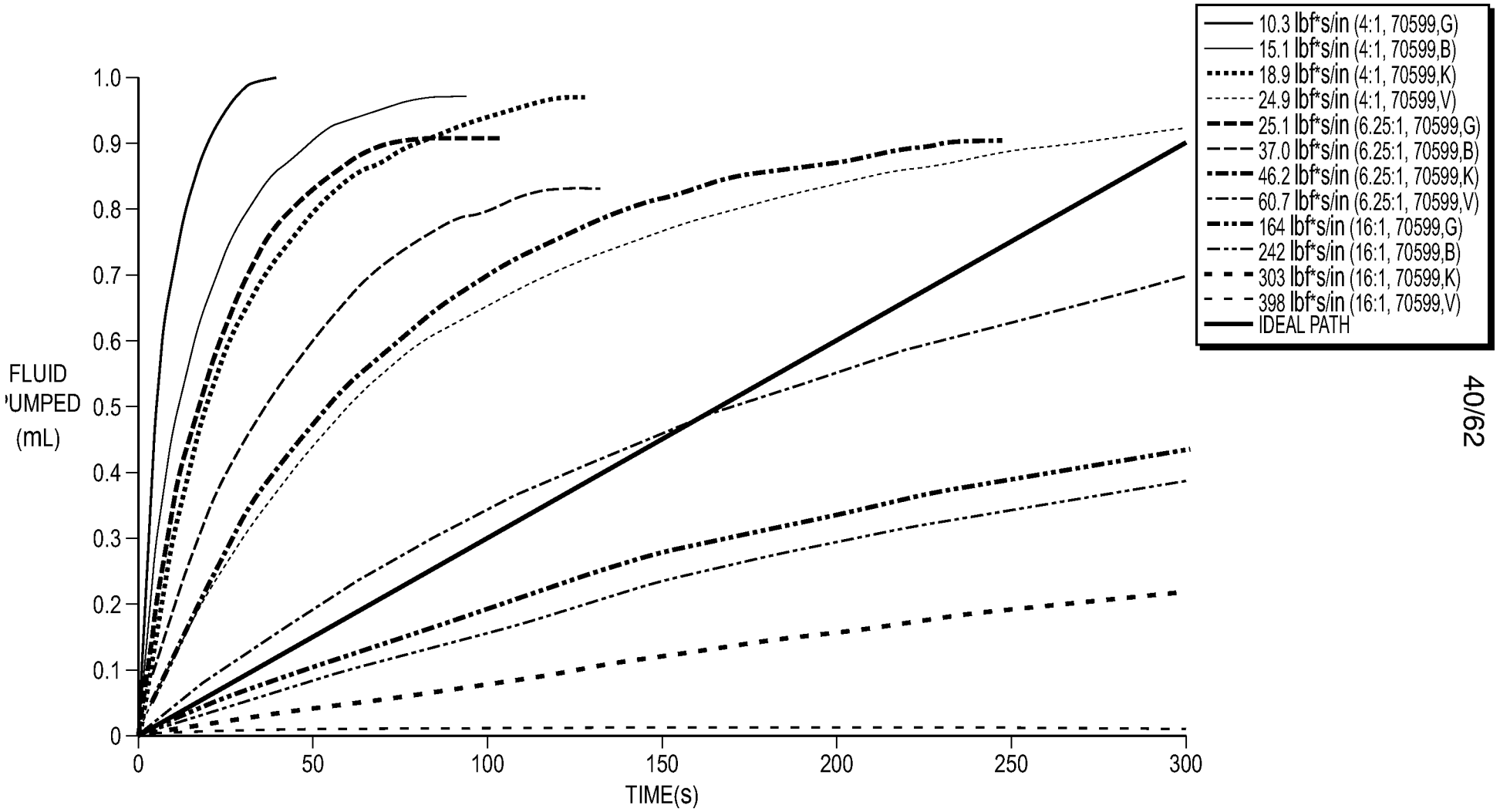

10.3 lbf*s/in (4:1, 70599,G)
15.1 lbf*s/in (4:1, 70599,B)
18.9 lbf*s/in (4:1, 70599,K)
24.9 lbf*s/in (4:1, 70599,V)
25.1 lbf*s/in (6.25:1, 70599,G)
37.0 lbf*s/in (6.25:1, 70599,B)
46.2 lbf*s/in (6.25:1, 70599,K)
60.7 lbf*s/in (6.25:1, 70599,V)
164 lbf*s/in (16:1, 70599,G)
242 lbf*s/in (16:1, 70599,B)
303 lbf*s/in (16:1, 70599,K)
398 lbf*s/in (16:1, 70599,V)
IDEAL PATH
FLUID
UMPED
(mL)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
50
100
150
200
250
300
TIME(s)

FIG. 33

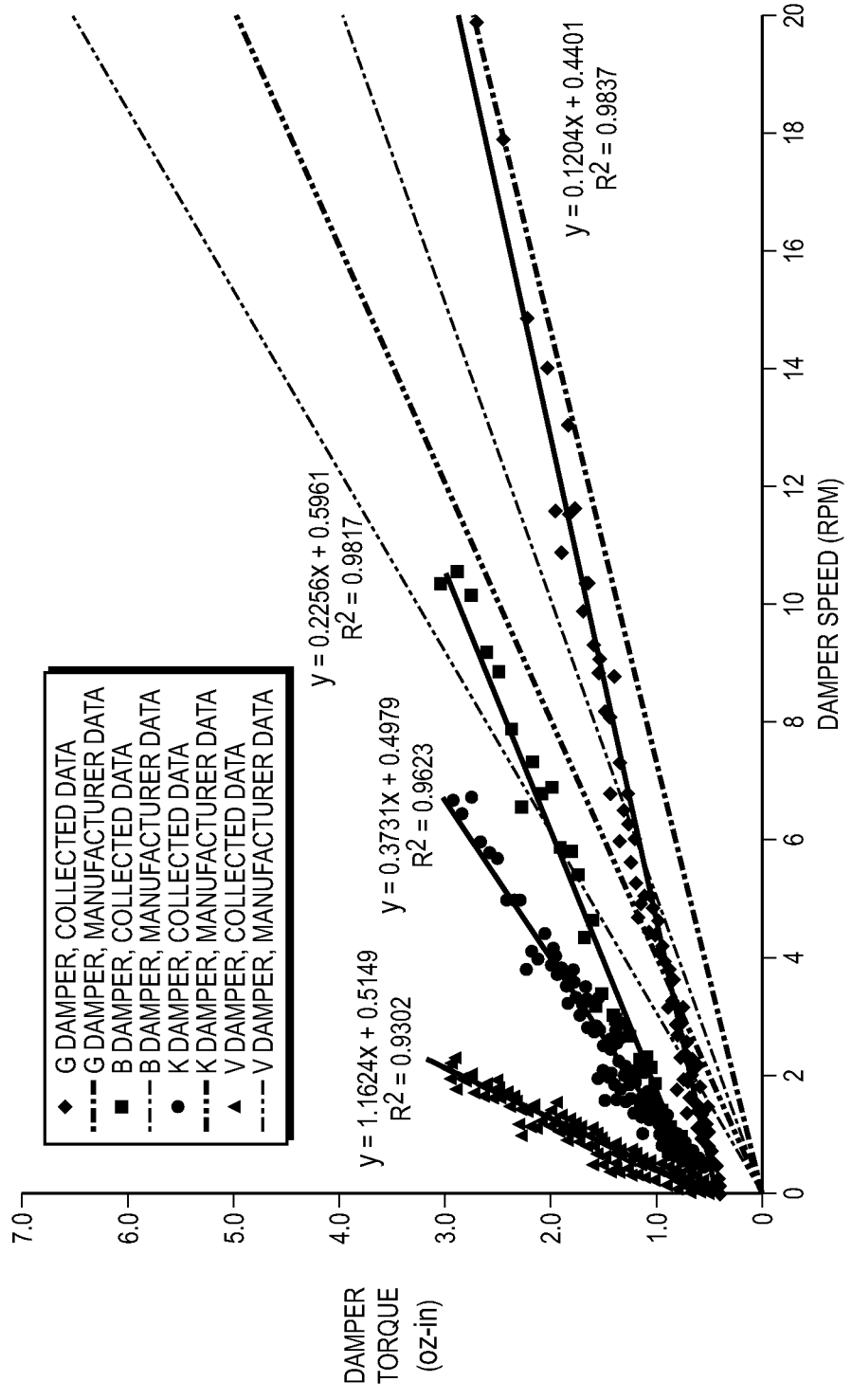

G DAMPER, COLLECTED DATA
G DAMPER, MANUFACTURER DATA
B DAMPER, COLLECTED DATA
B DAMPER, MANUFACTURER DATA
K DAMPER, COLLECTED DATA
K DAMPER, MANUFACTURER DATA
V DAMPER, COLLECTED DATA
V DAMPER, MANUFACTURER DATA
y = 0.2256x + 0.5961
R2 = 0.9817
y = 0.3731x + 0.4979
R2 = 0.9623
y = 1.1624x + 0.5149
R2 = 0.9302
y = 0.1204x + 0.4401
R2 = 0.9837
DAMPER TORQUE (oz-in)
DAMPER SPEED (RPM)
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
0
2
4
6
8
10
12
14
16
18
20

FIG. 34

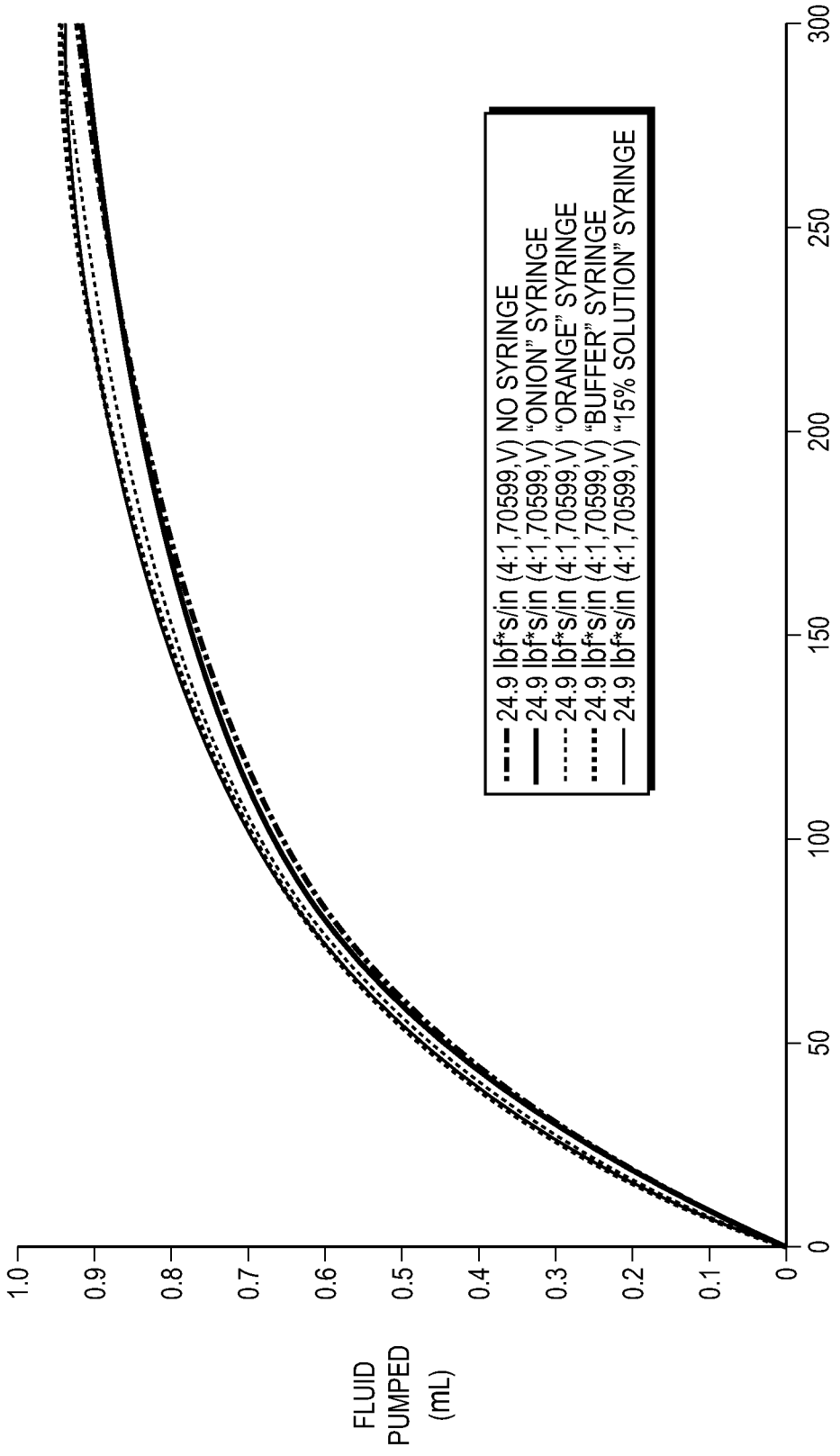

FLUID PUMPED (mL)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
50
100
150
200
250
300
TIME(s)
24.9 lbf*s/in (4:1,70599,V) NO SYRINGE
24.9 lbf*s/in (4:1,70599,V) "ONION" SYRINGE
24.9 lbf*s/in (4:1,70599,V) "ORANGE" SYRINGE
24.9 lbf*s/in (4:1,70599,V) "BUFFER" SYRINGE
24.9 lbf*s/in (4:1,70599,V) "15% SOLUTION" SYRINGE

FIG. 35

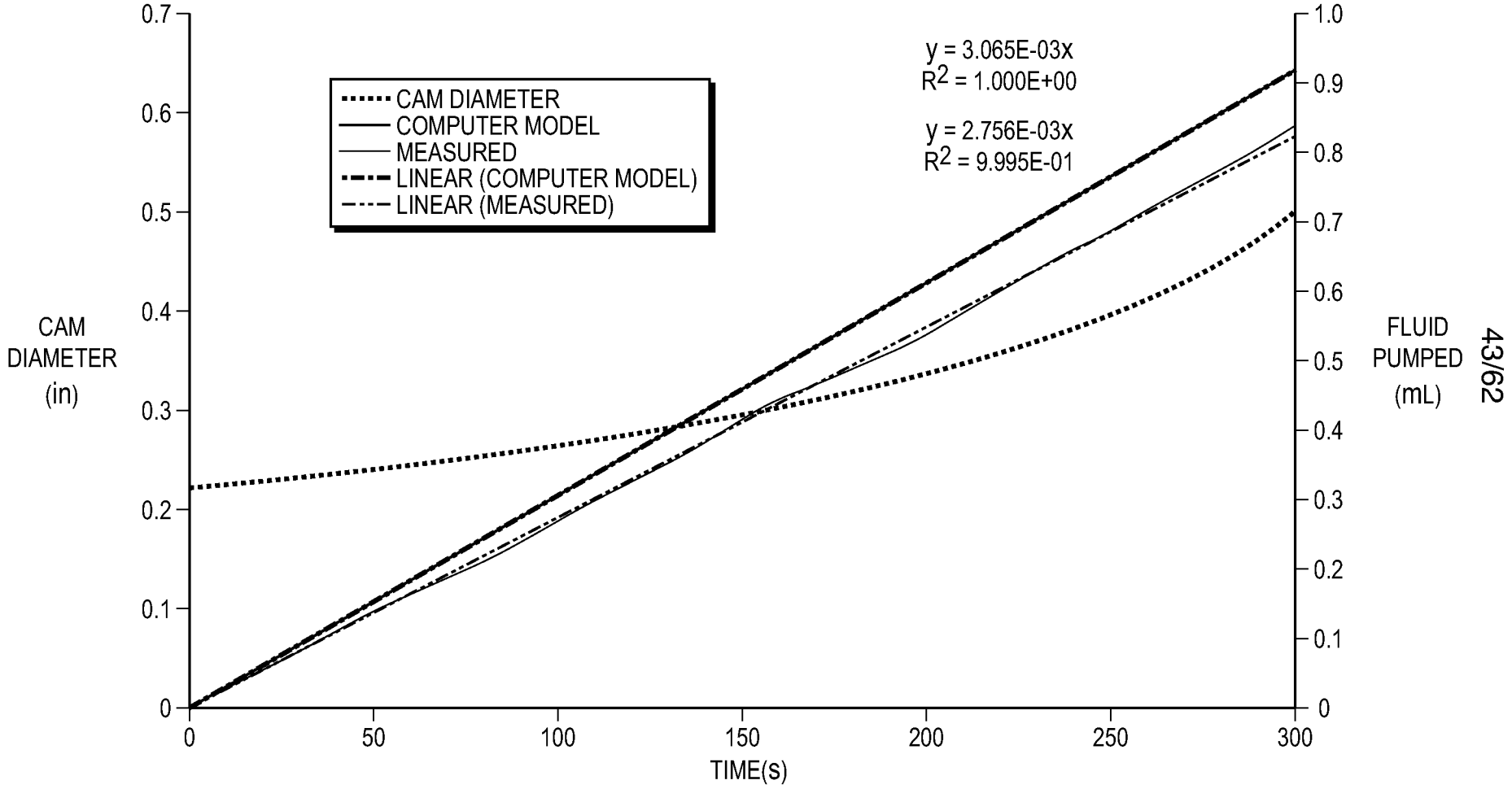

CAM DIAMETER
COMPUTER MODEL
MEASURED
LINEAR (COMPUTER MODEL)
LINEAR (MEASURED)
y = 3.065E-03x
R2 = 1.000E+00
y = 2.756E-03x
R2 = 9.995E-01
CAM DIAMETER (in)
FLUID PUMPED (mL)
TIME(s)
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
0
50
100
150
200
250
300

FIG. 36

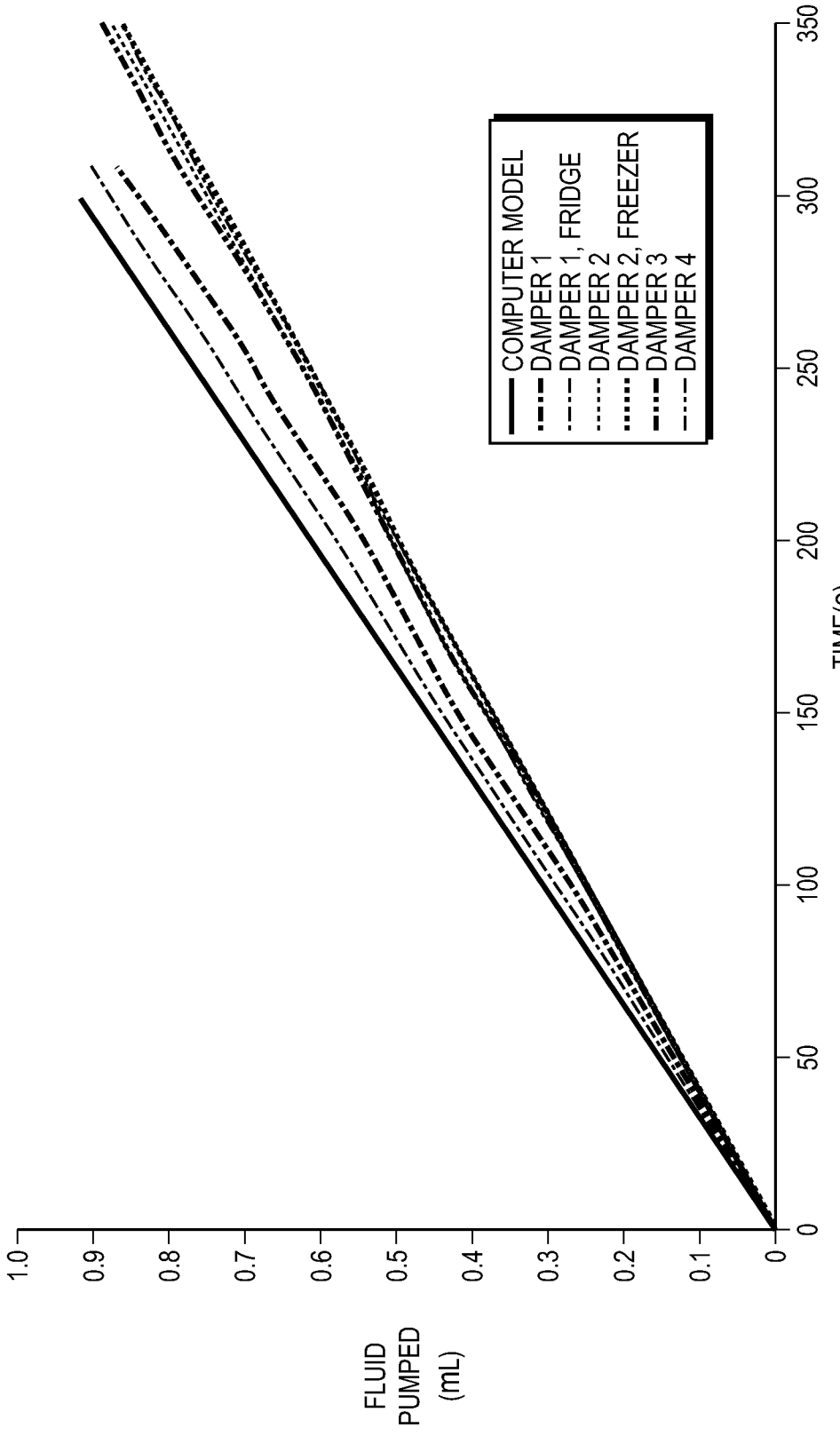

FLUID PUMPED (mL)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
50
100
150
200
250
300
350
TIME(s)
COMPUTER MODEL
DAMPER 1
DAMPER 1, FRIDGE
DAMPER 2
DAMPER 2, FREEZER
DAMPER 3
DAMPER 4

FIG. 37

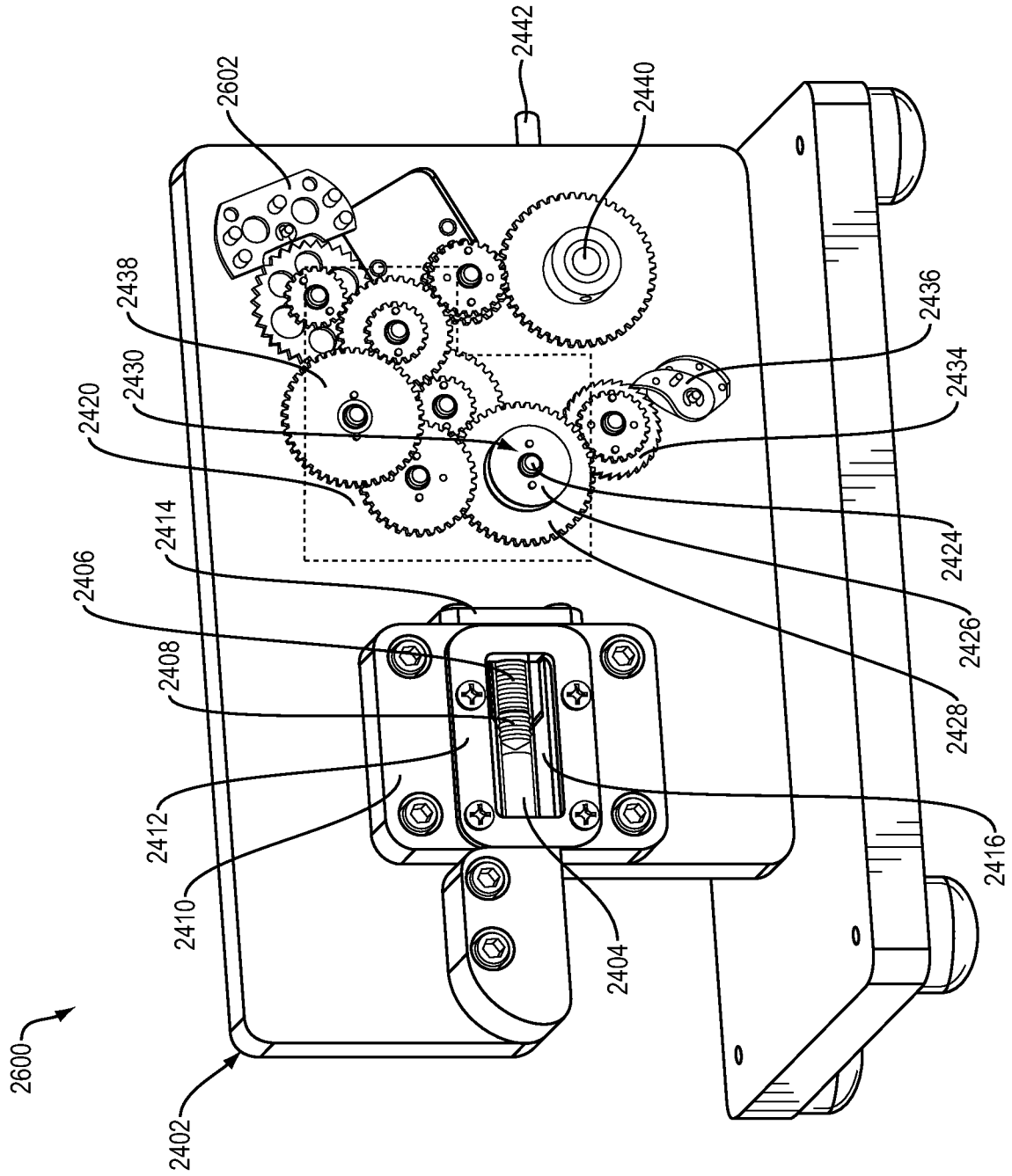

2600
2602
2442
2440
2438
2436
2430
2434
2420
2424
2414
2426
2406
2428
2408
2412
2416
2410
2404
2402

FIG. 38

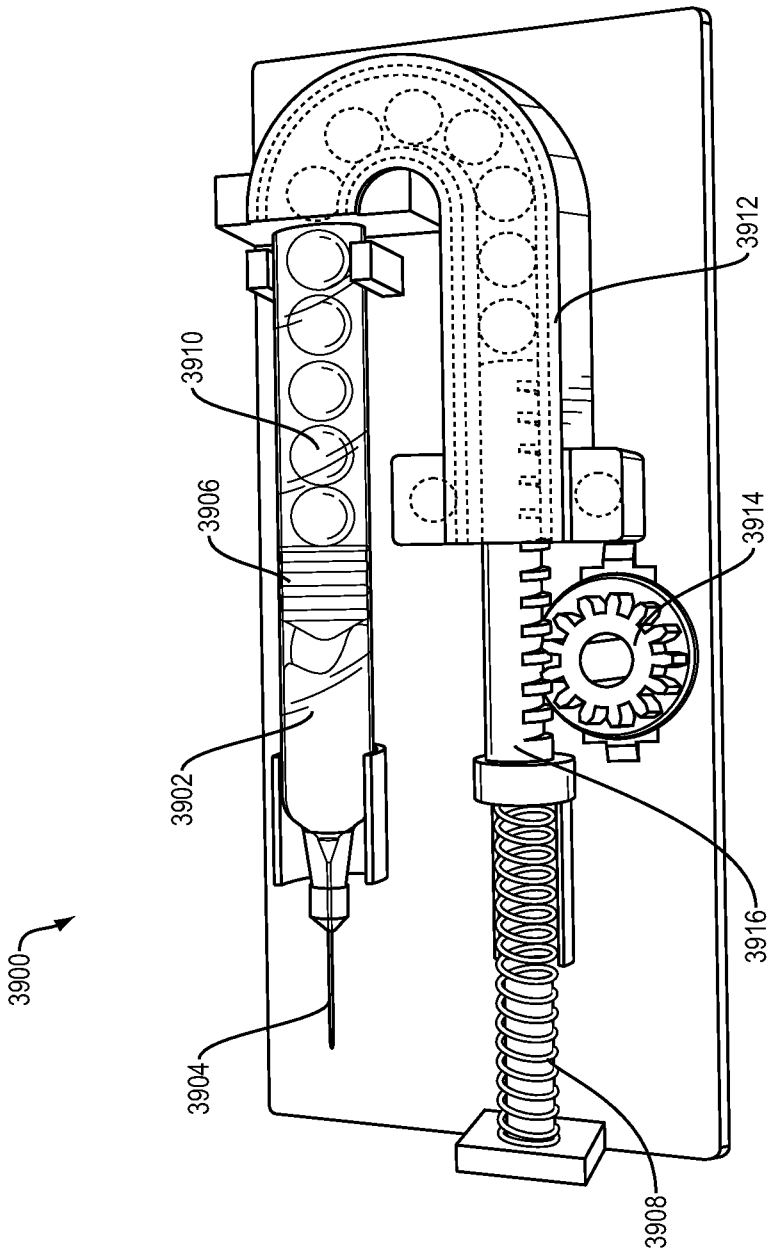


FIG. 39

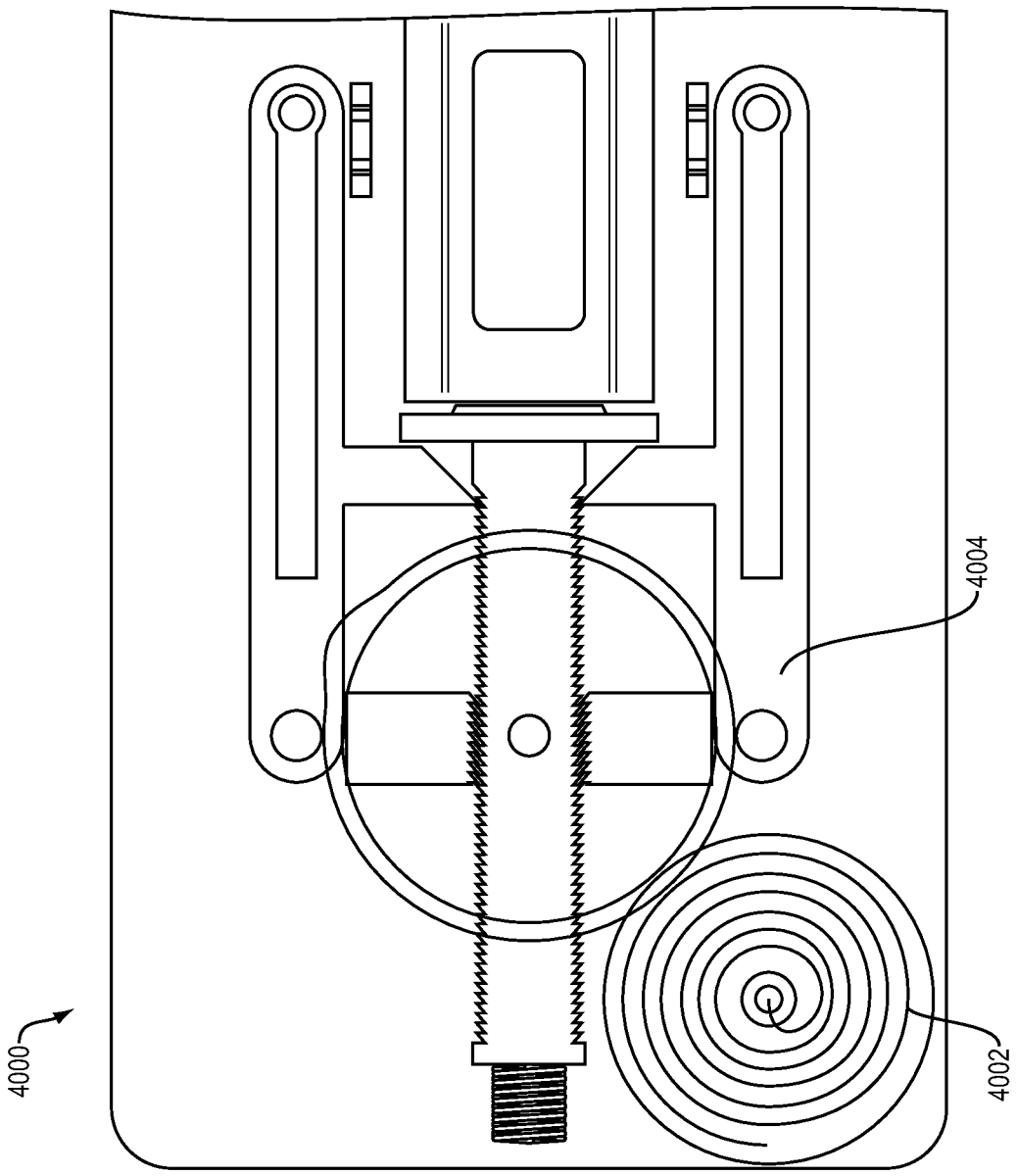


FIG. 40

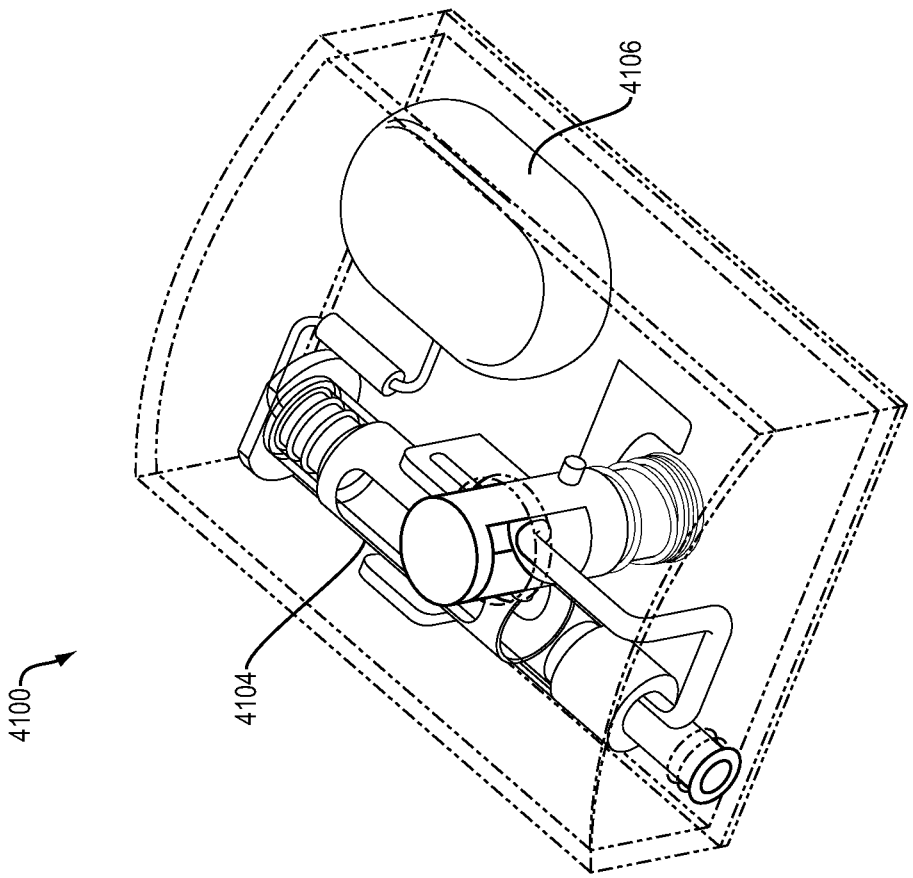


FIG. 41

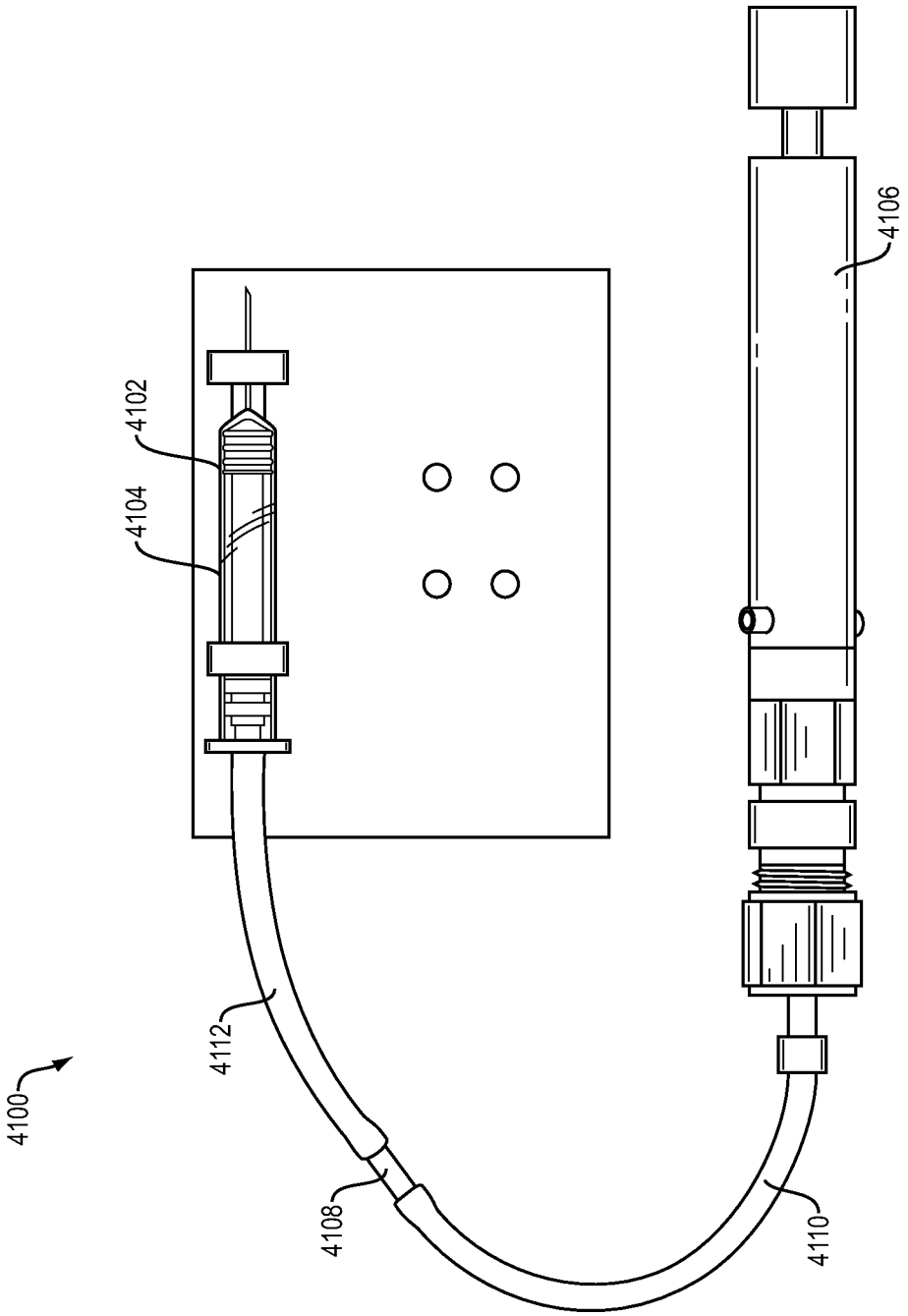


FIG. 42

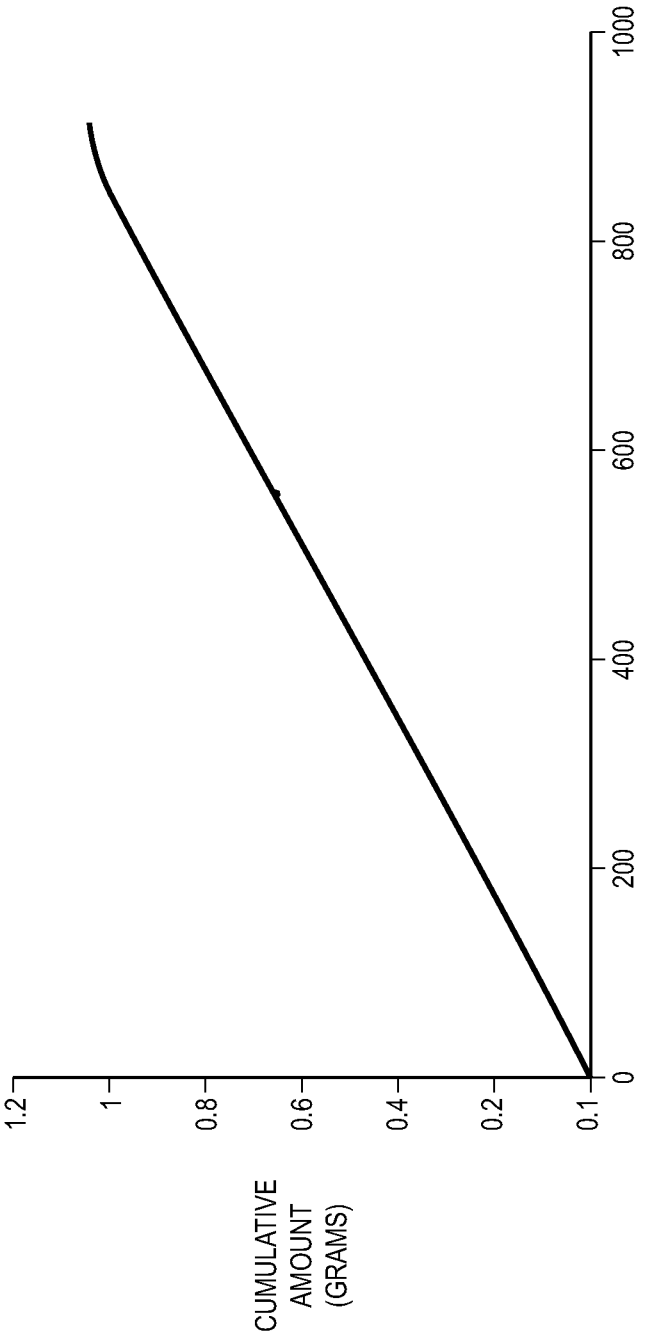

CUMULATIVE AMOUNT (GRAMS)
1.2
1
0.8
0.6
0.4
0.2
0.1
0
200
400
600
800
1000
TIME(SEC)

FIG. 43

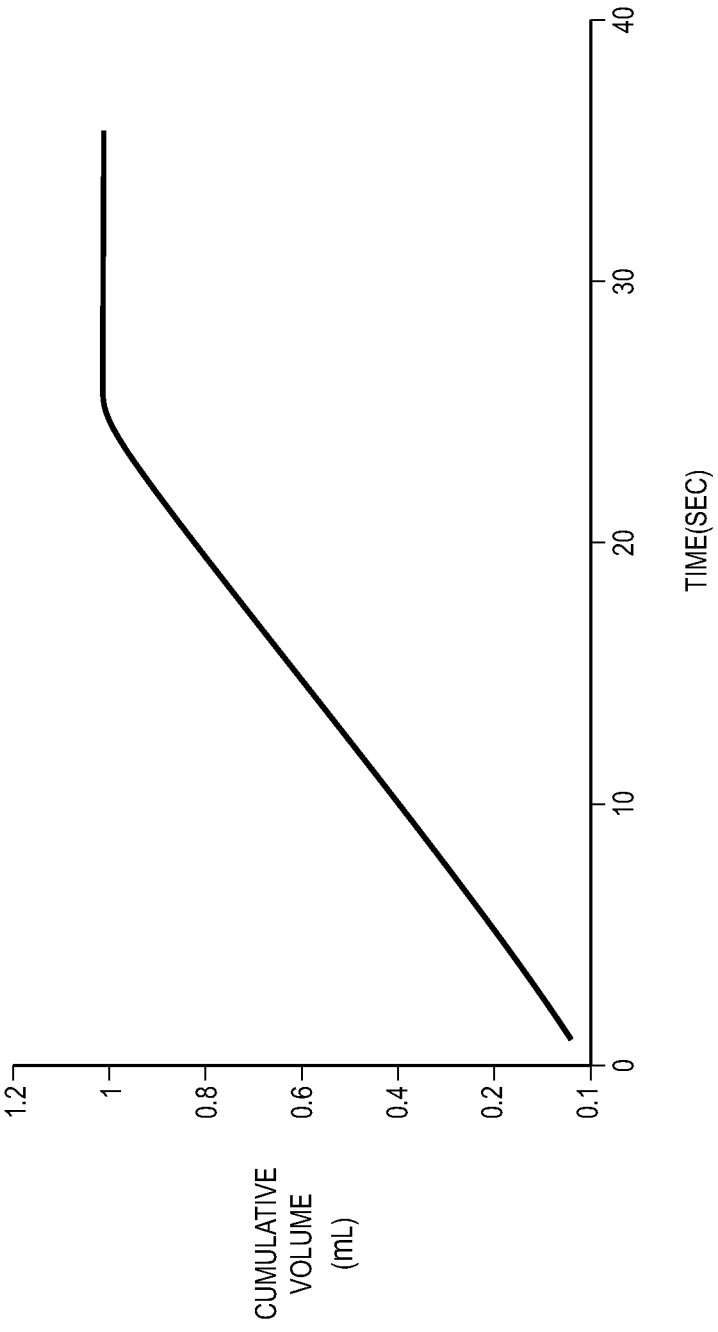


FIG. 44

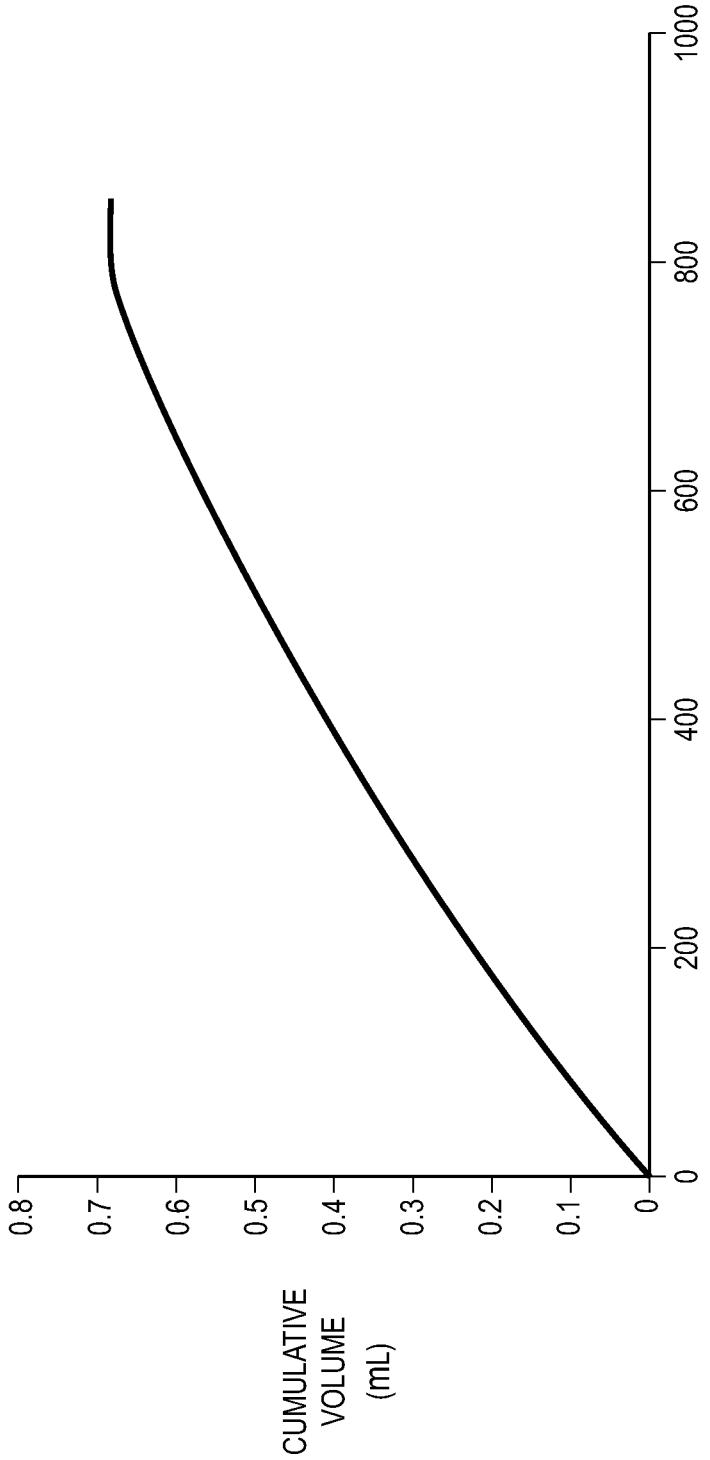

CUMULATIVE VOLUME (mL)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
200
400
600
800
1000
TIME(SEC)

FIG. 45

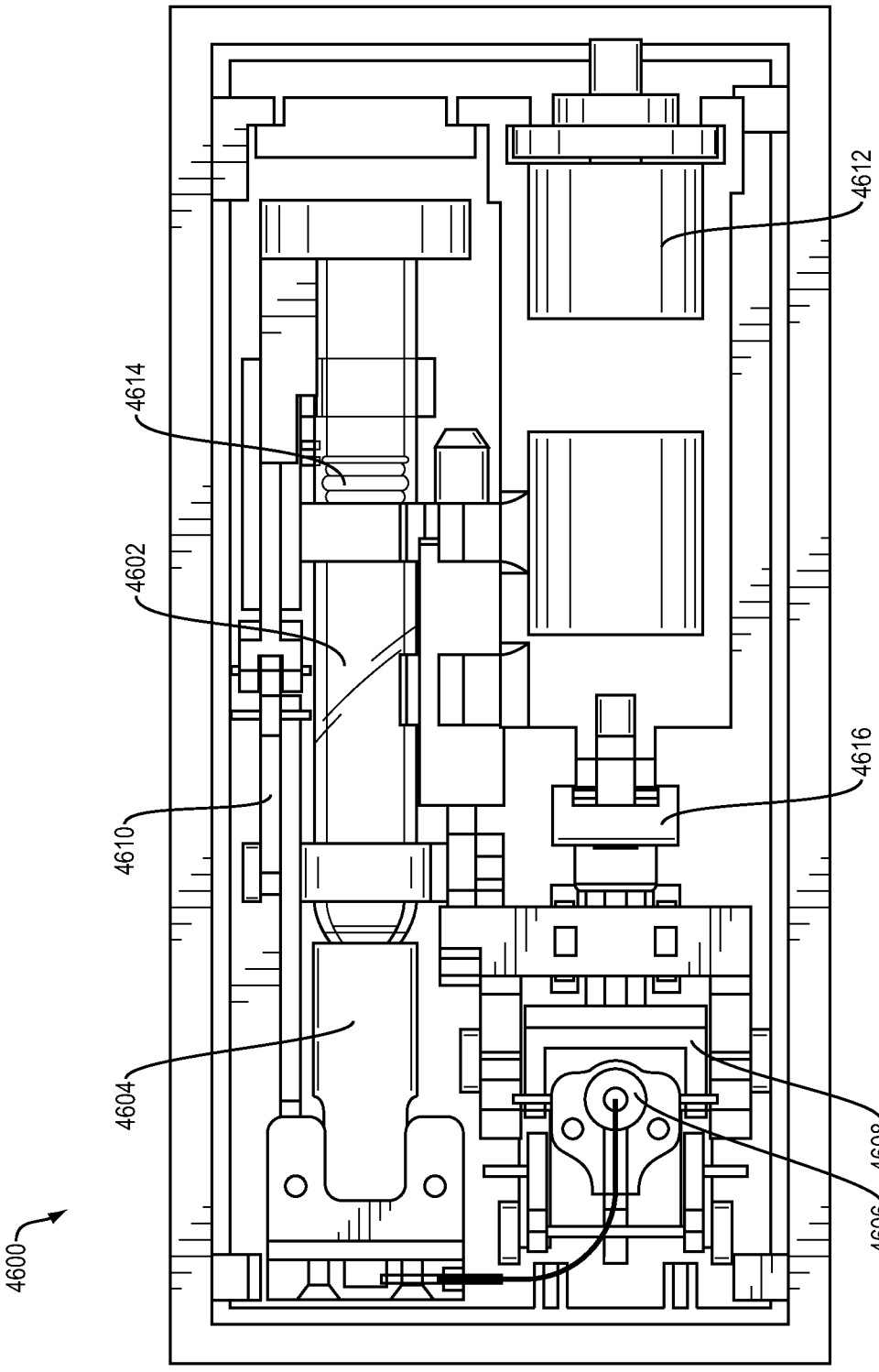


FIG. 46

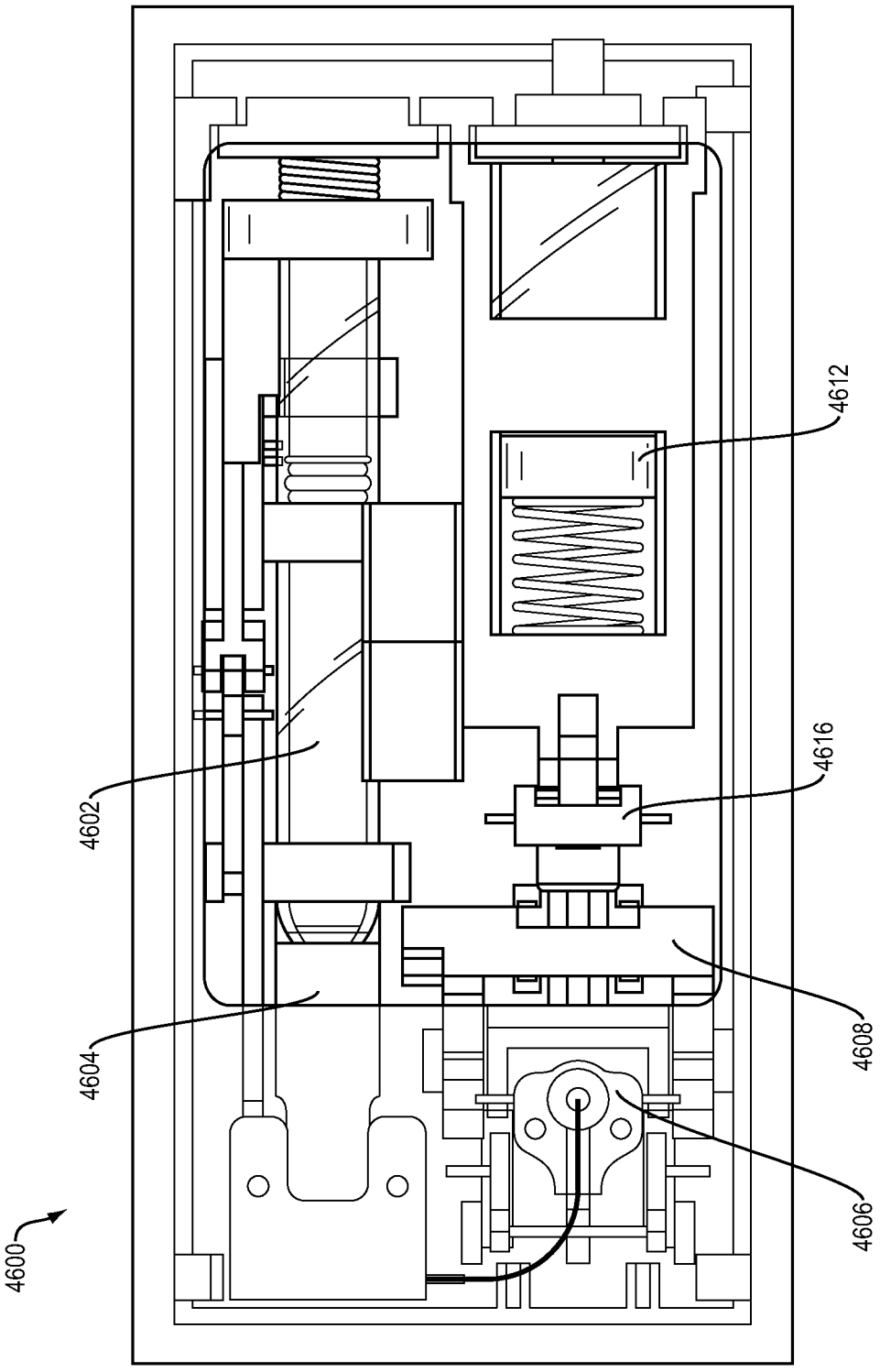


FIG. 47

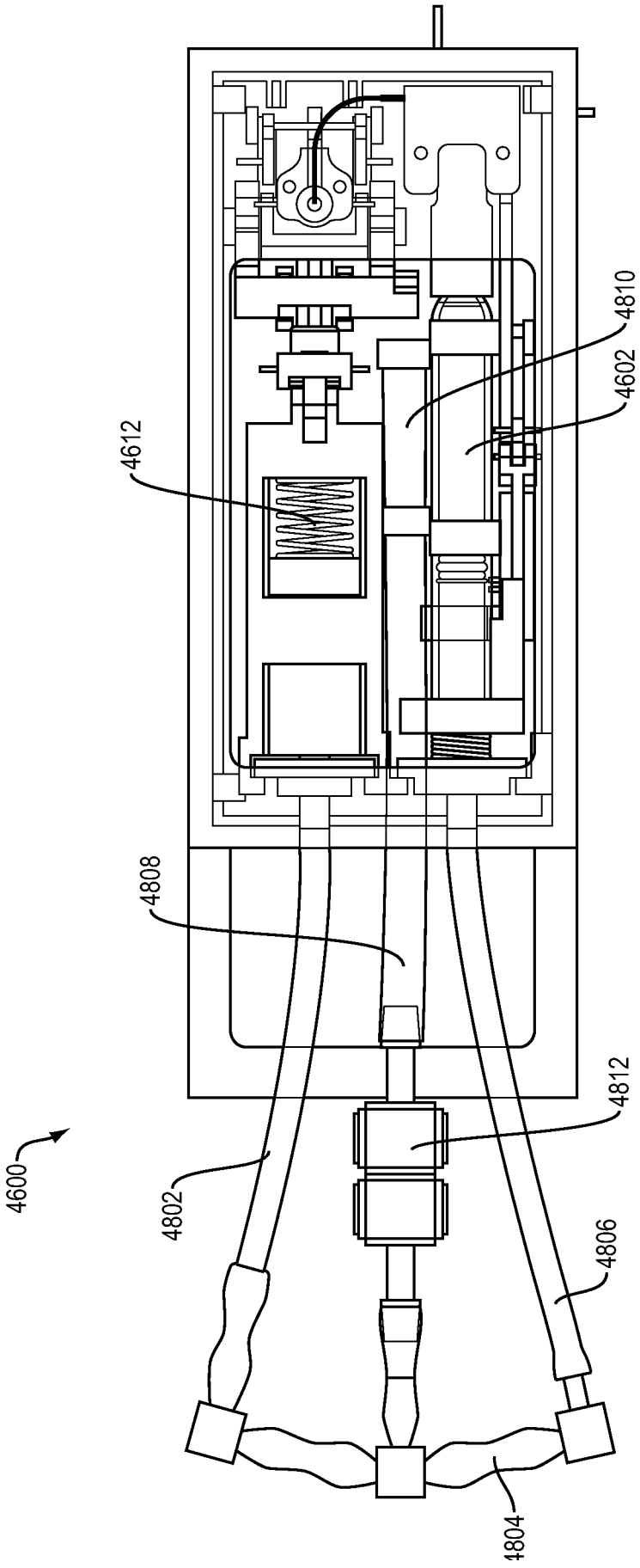


FIG. 48

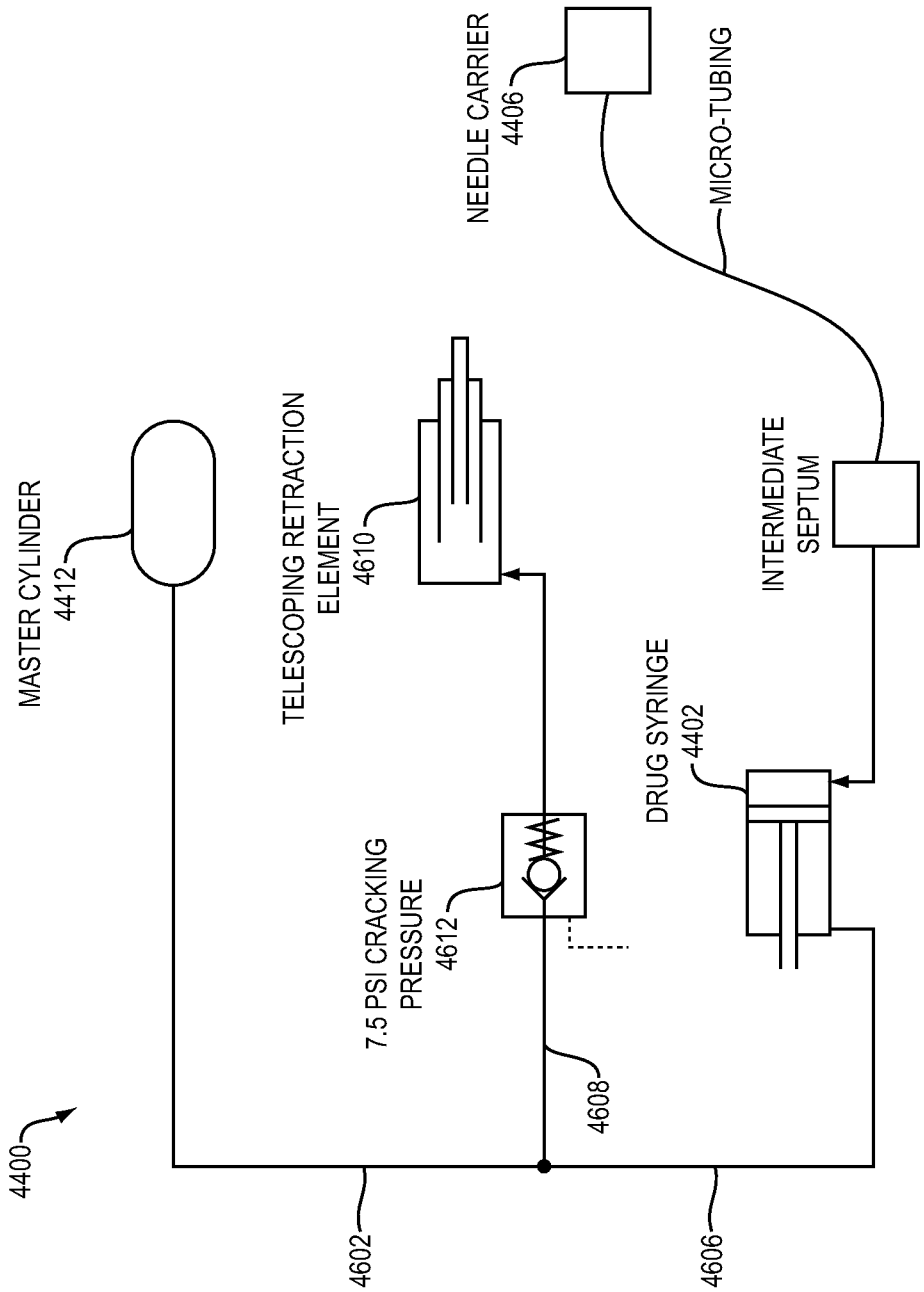

4400
MASTER CYLINDER
4412
TELESCOPING RETRACTION
ELEMENT
4610
7.5 PSI CRACKING
PRESSURE
4612
4608
4602
NEEDLE CARRIER
4406
MICRO-TUBING
INTERMEDIATE
SEPTUM
DRUG SYRINGE
4402
4606

FIG. 49

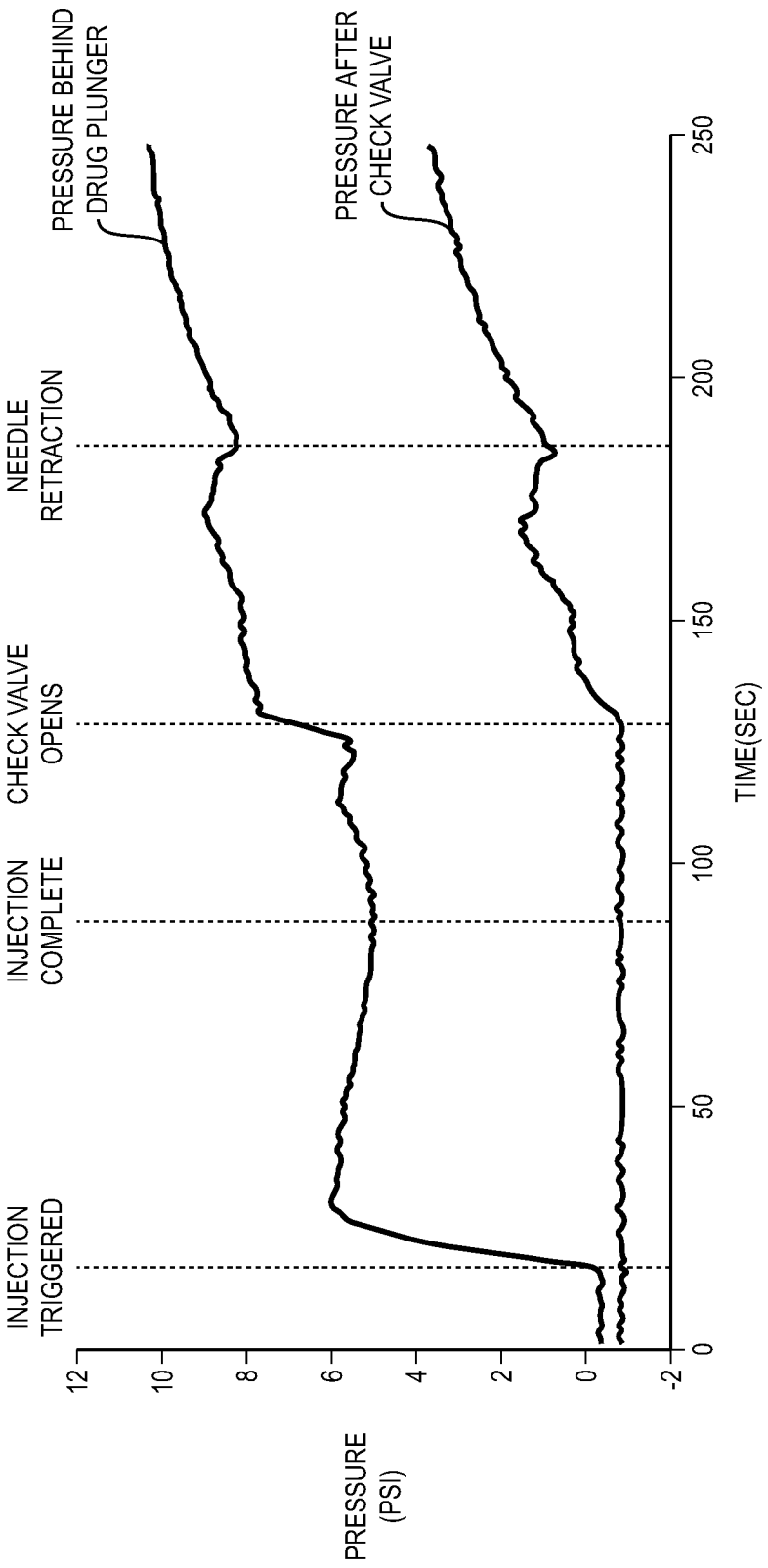

PRESSURE BEHIND DRUG PLUNGER
PRESSURE AFTER CHECK VALVE
INJECTION TRIGGERED
INJECTION COMPLETE
CHECK VALVE OPENS
NEEDLE RETRACTION
PRESSURE (PSI)
TIME(SEC)
12
10
8
6
4
2
0
-2
0
50
100
150
200
250

FIG. 50

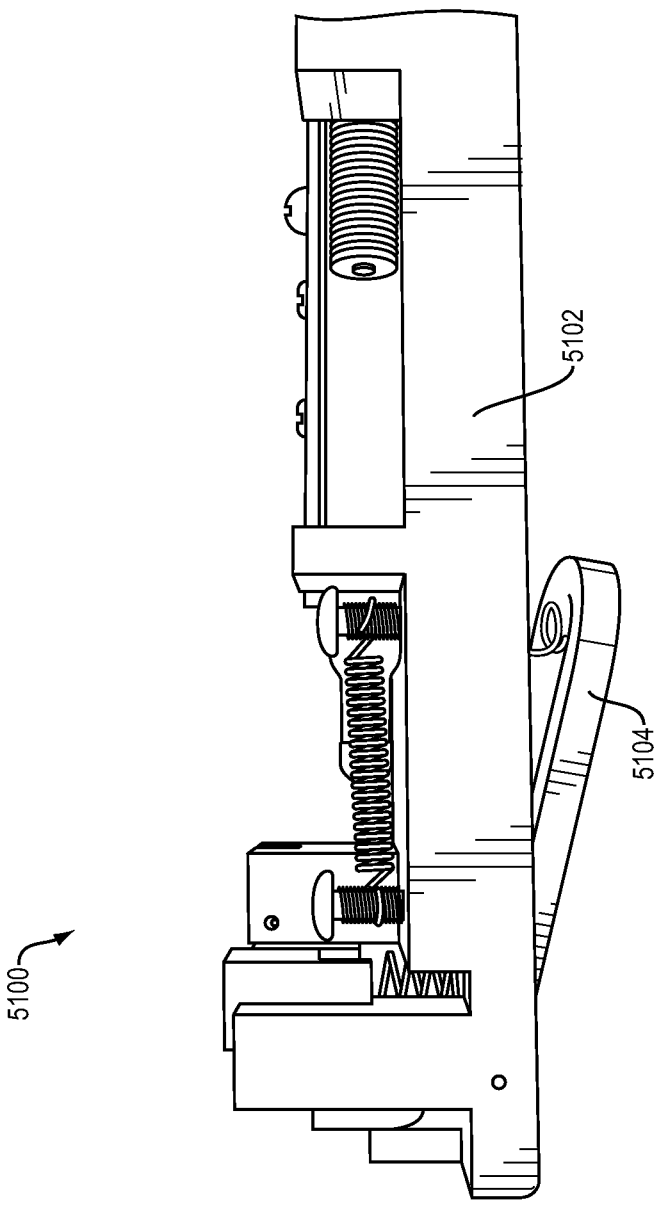


FIG. 51

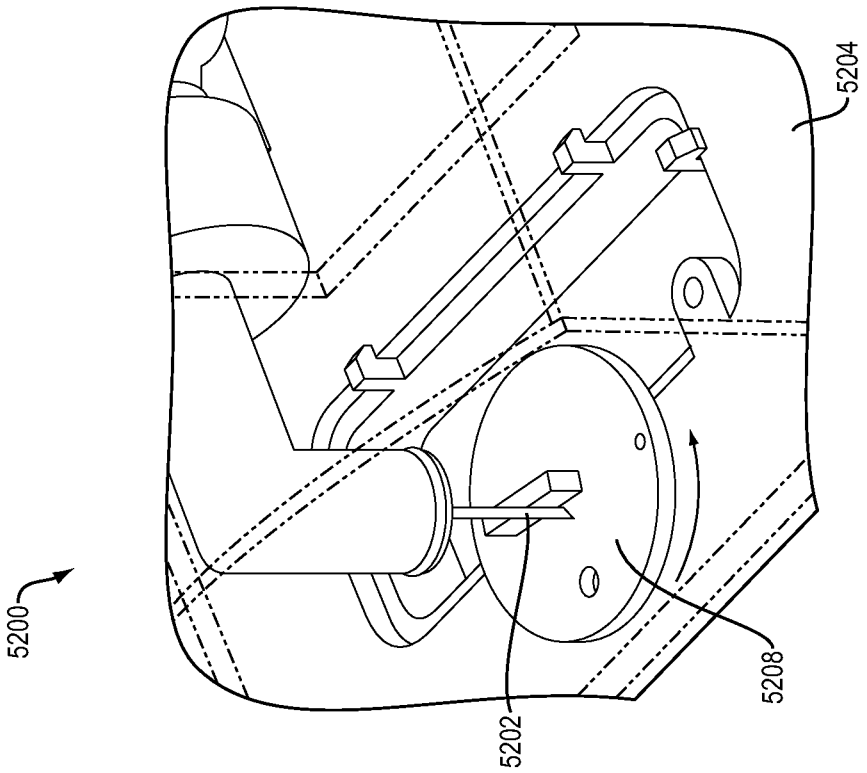


FIG. 52B

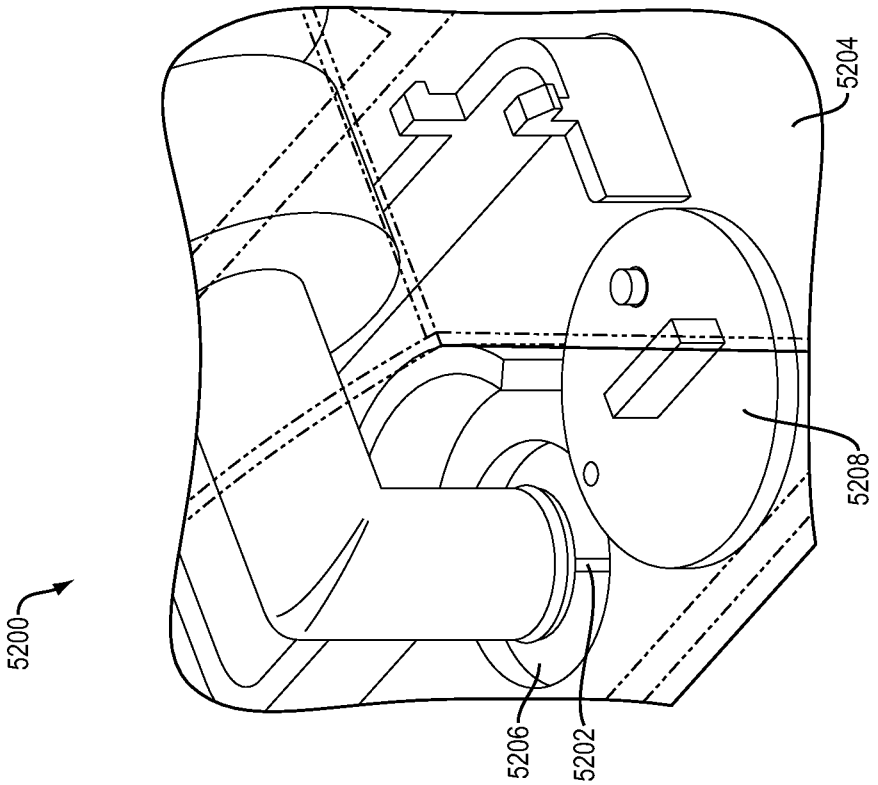


FIG. 52A

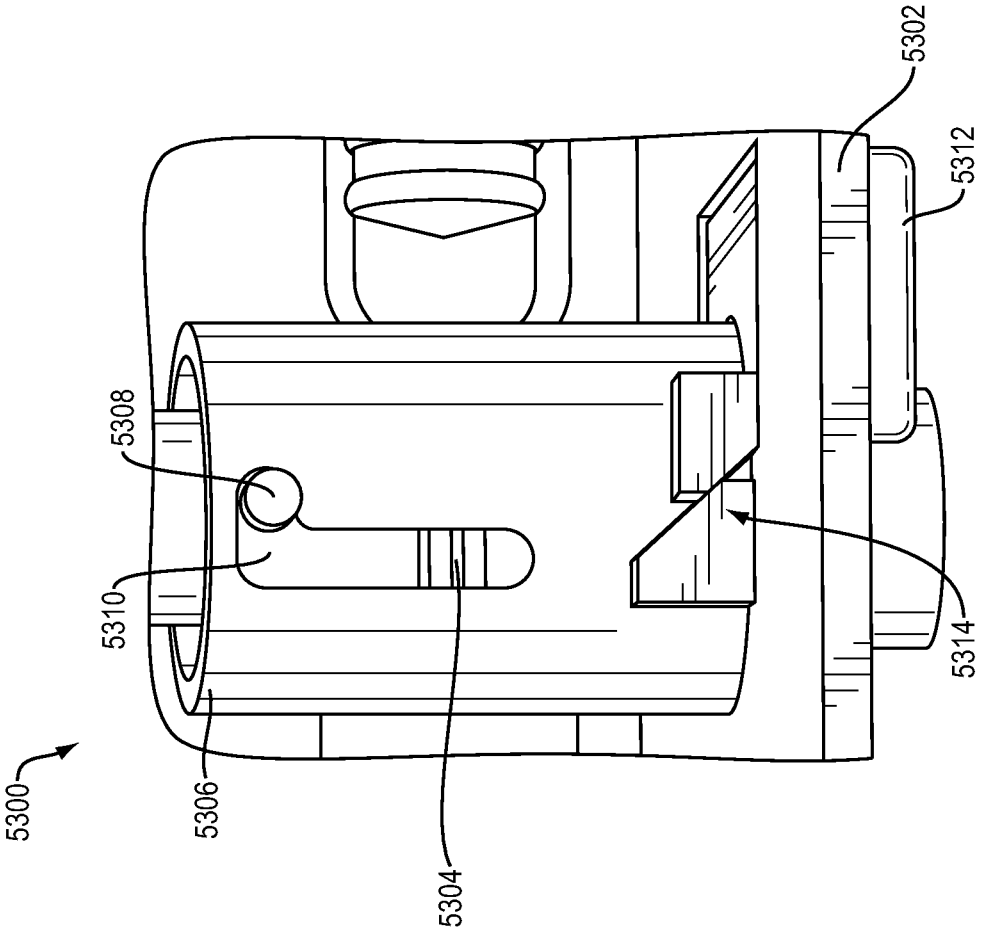


FIG. 53B

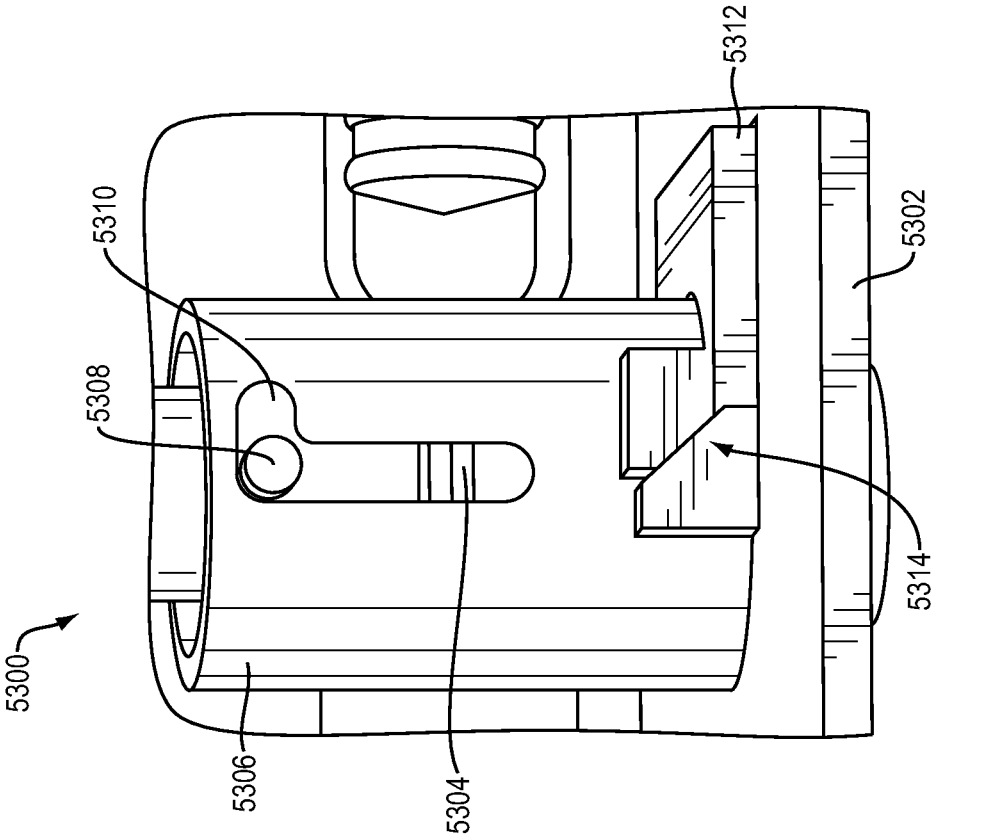


FIG. 53A

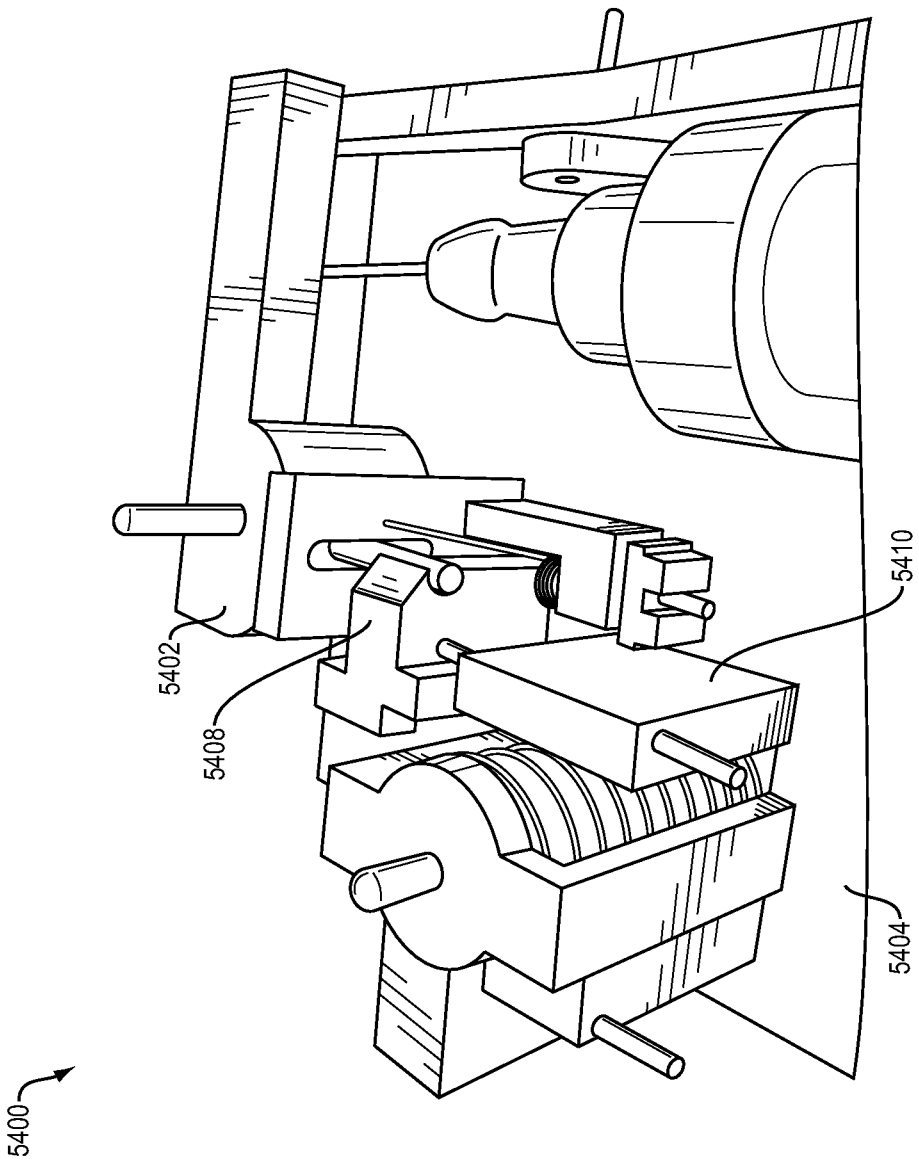


FIG. 54

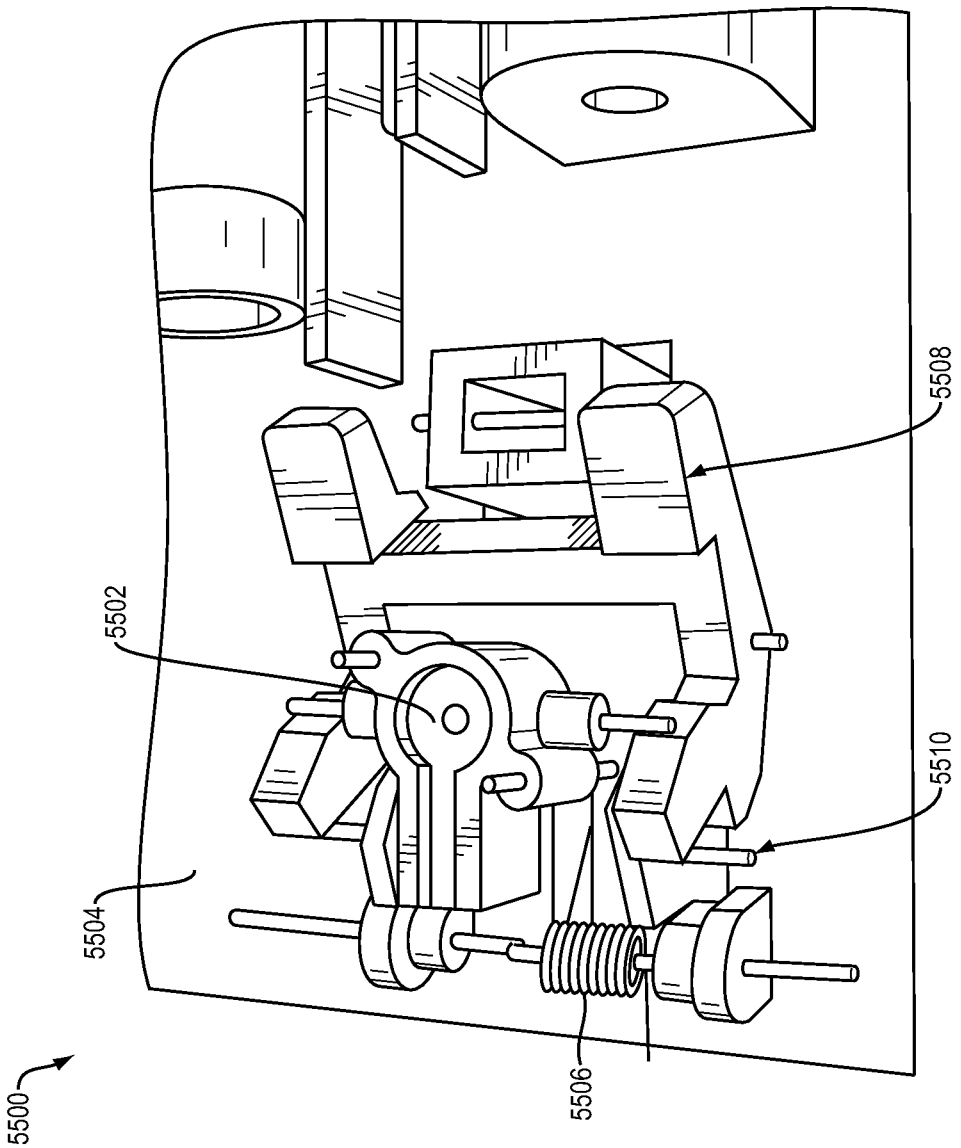


FIG. 55