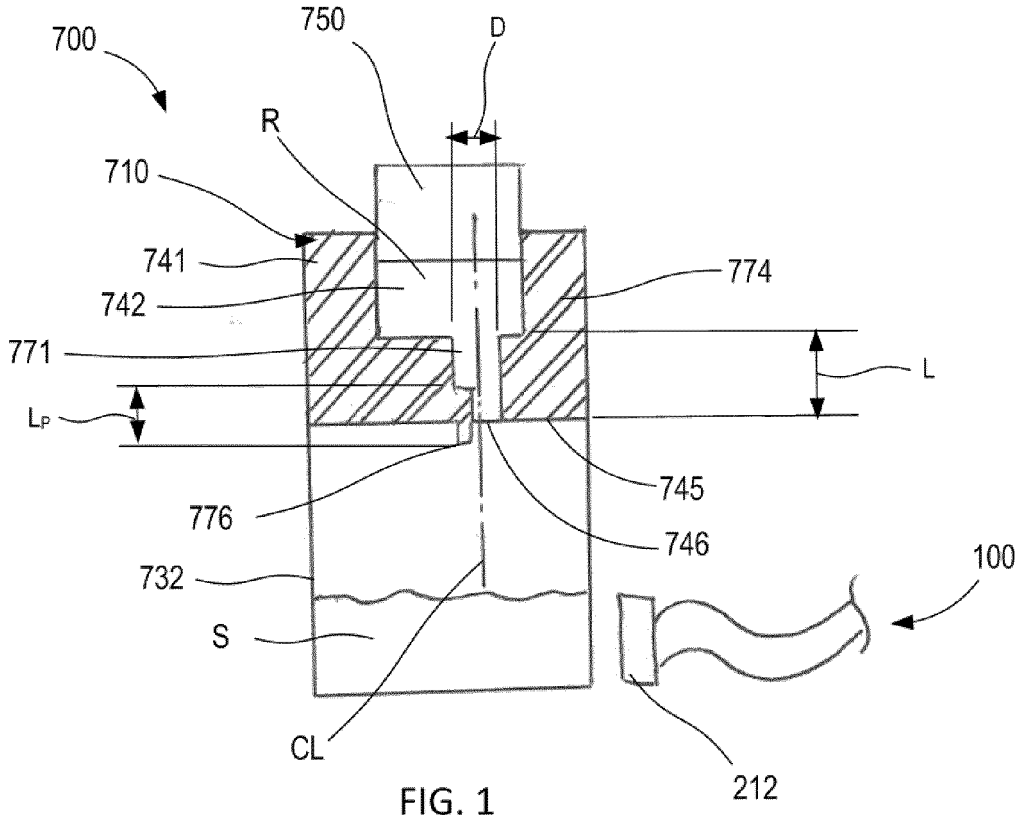

700
750
D
R
710
741
742
771
774
L
L_P
745
776
746
732
100
S
CL
212

FIG. 1

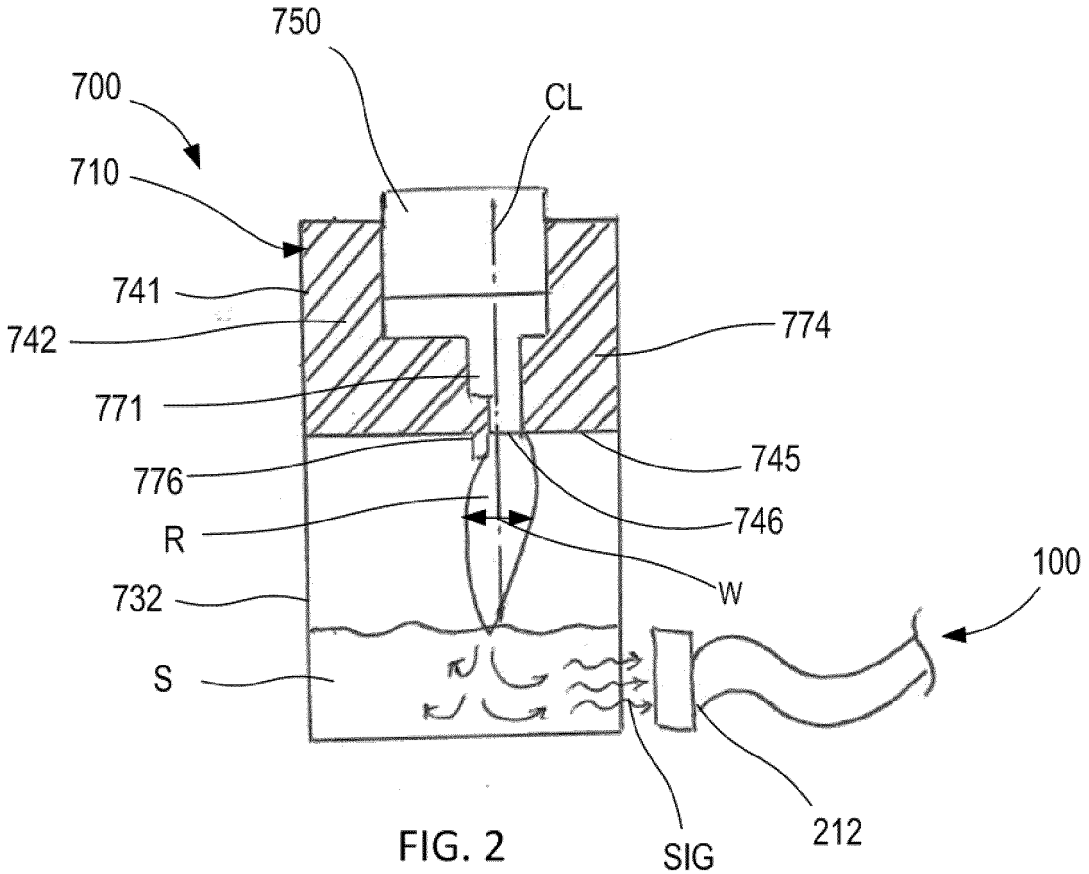

750
700
CL
710
741
742
774
771
745
776
746
R
W
732
100
S
212
SIG

FIG. 2

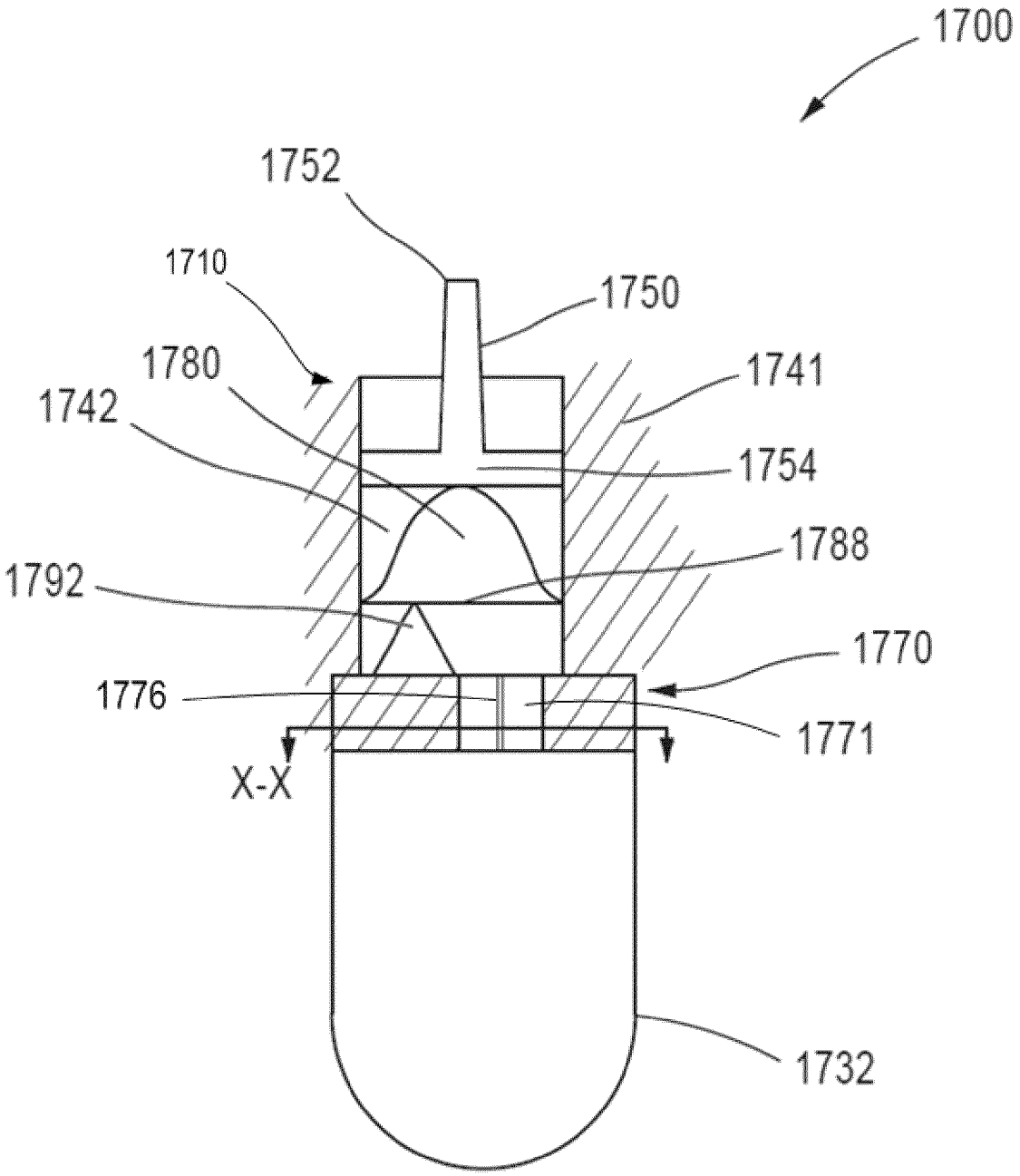

1700
1752
1710
1750
1780
1741
1742
1754
1788
1792
1770
1776
1771
X-X
1732

FIG. 3

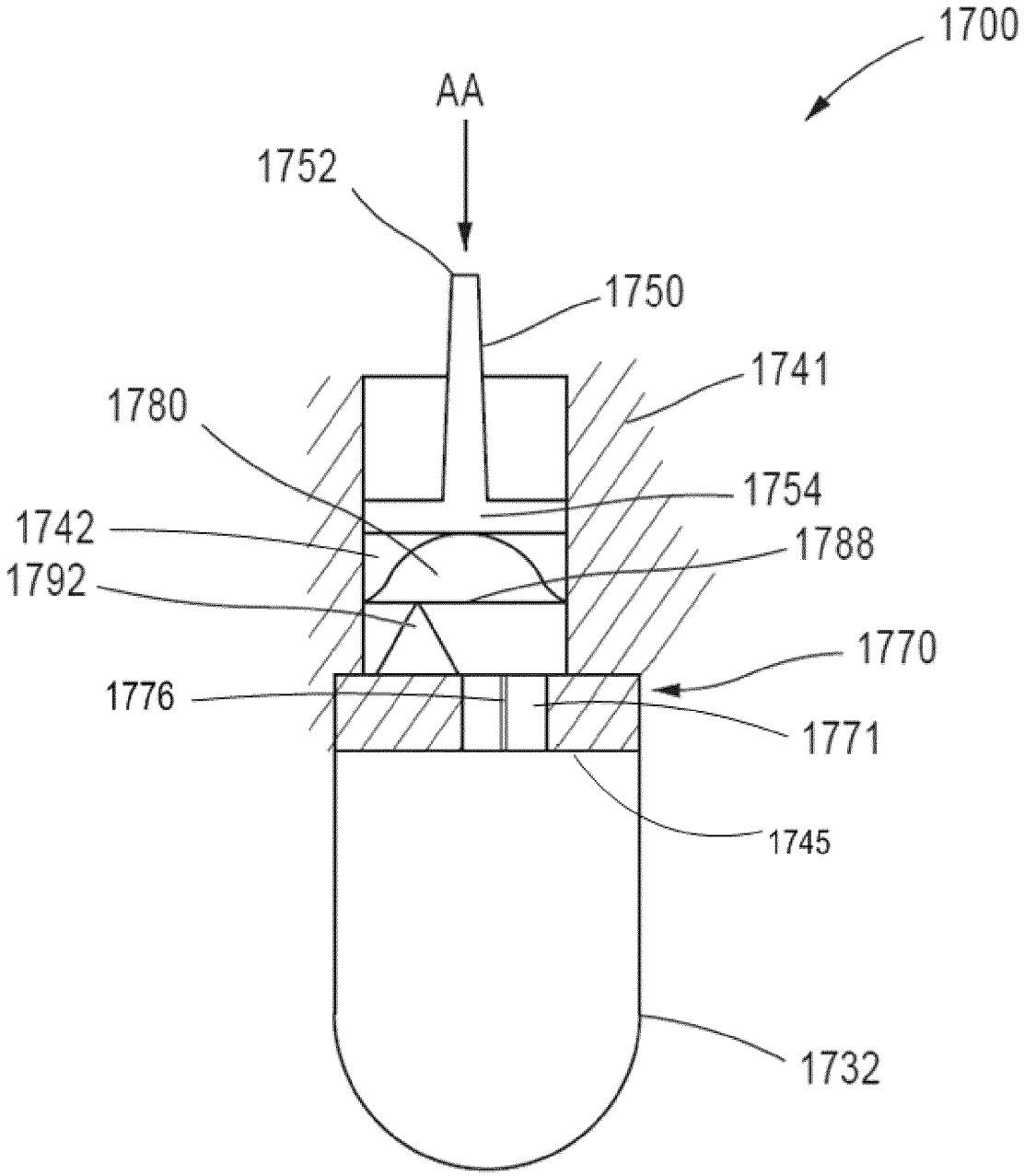

1700
AA
1752
1750
1741
1780
1754
1742
1788
1792
1770
1776
1771
1745
1732

FIG. 4

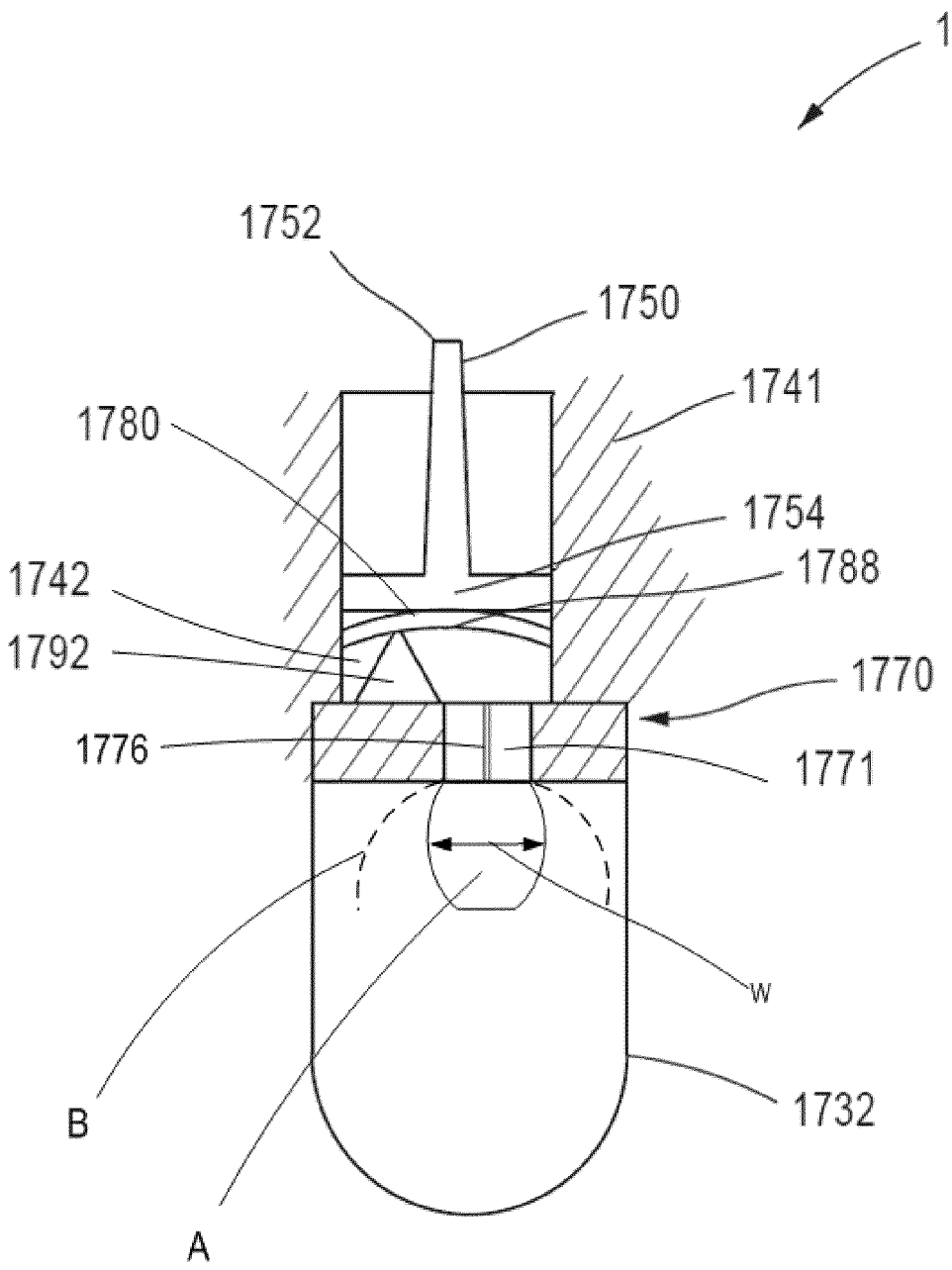

1700
1752
1750
1741
1780
1754
1742
1788
1792
1770
1776
1771
w
B
1732
A

FIG. 5

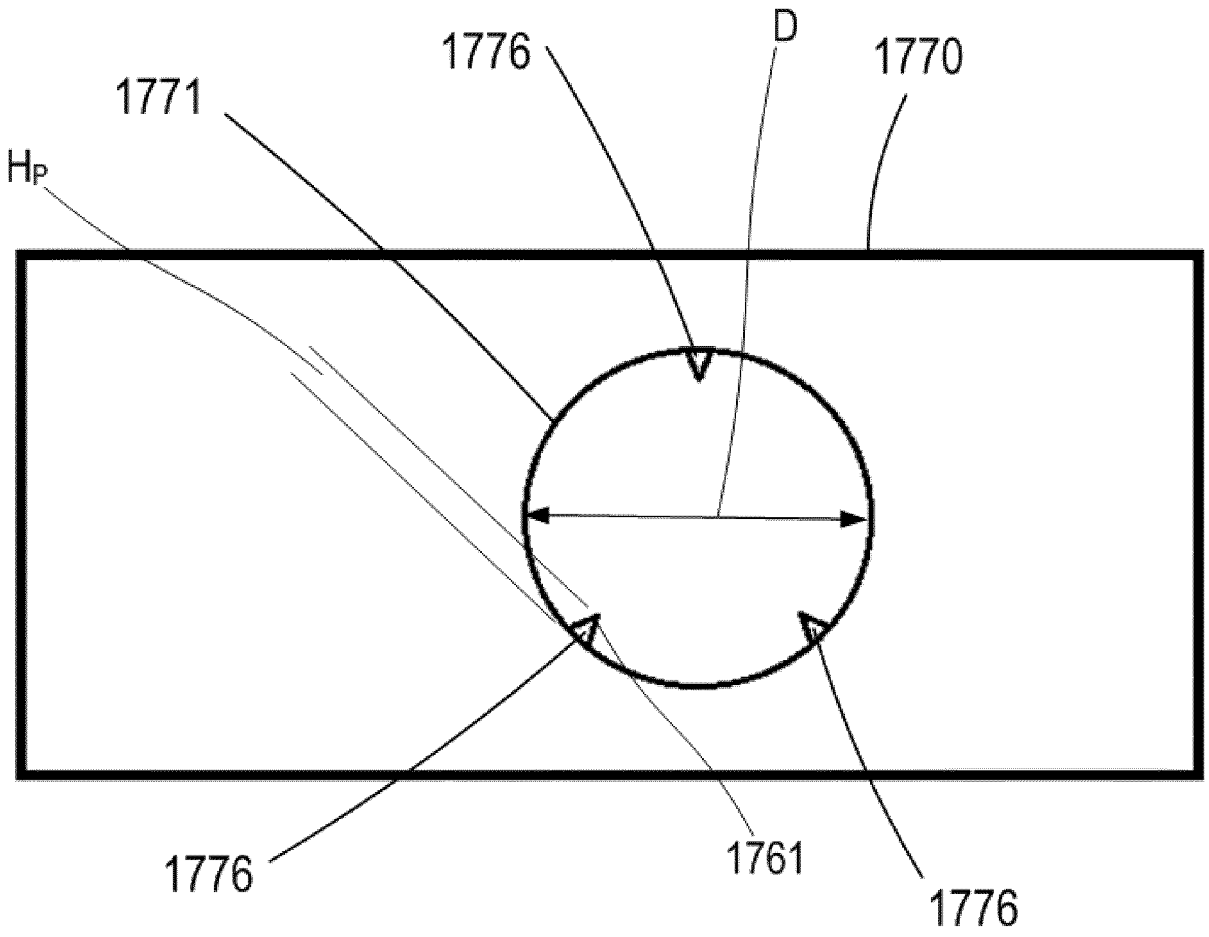


FIG. 6

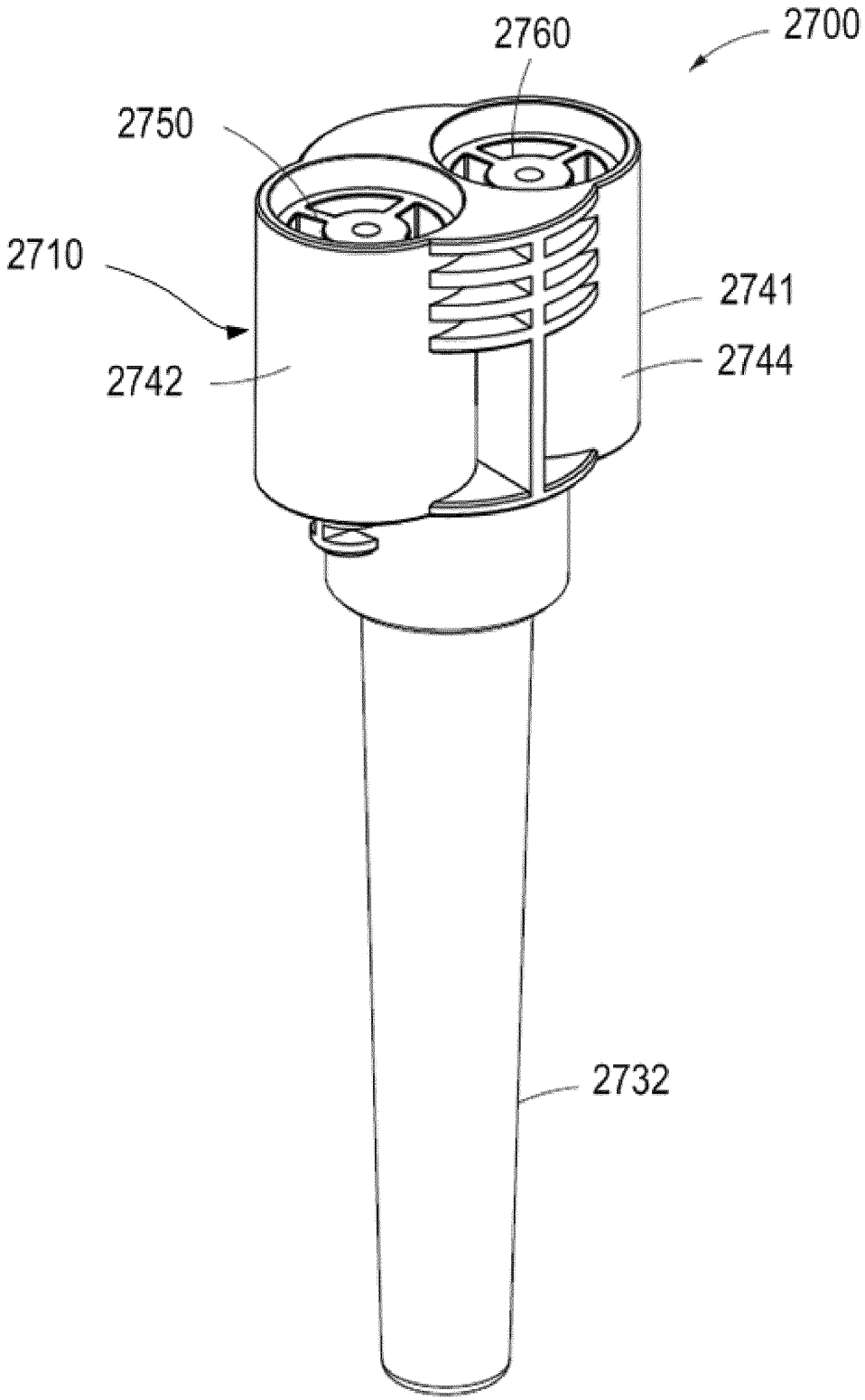


FIG. 7

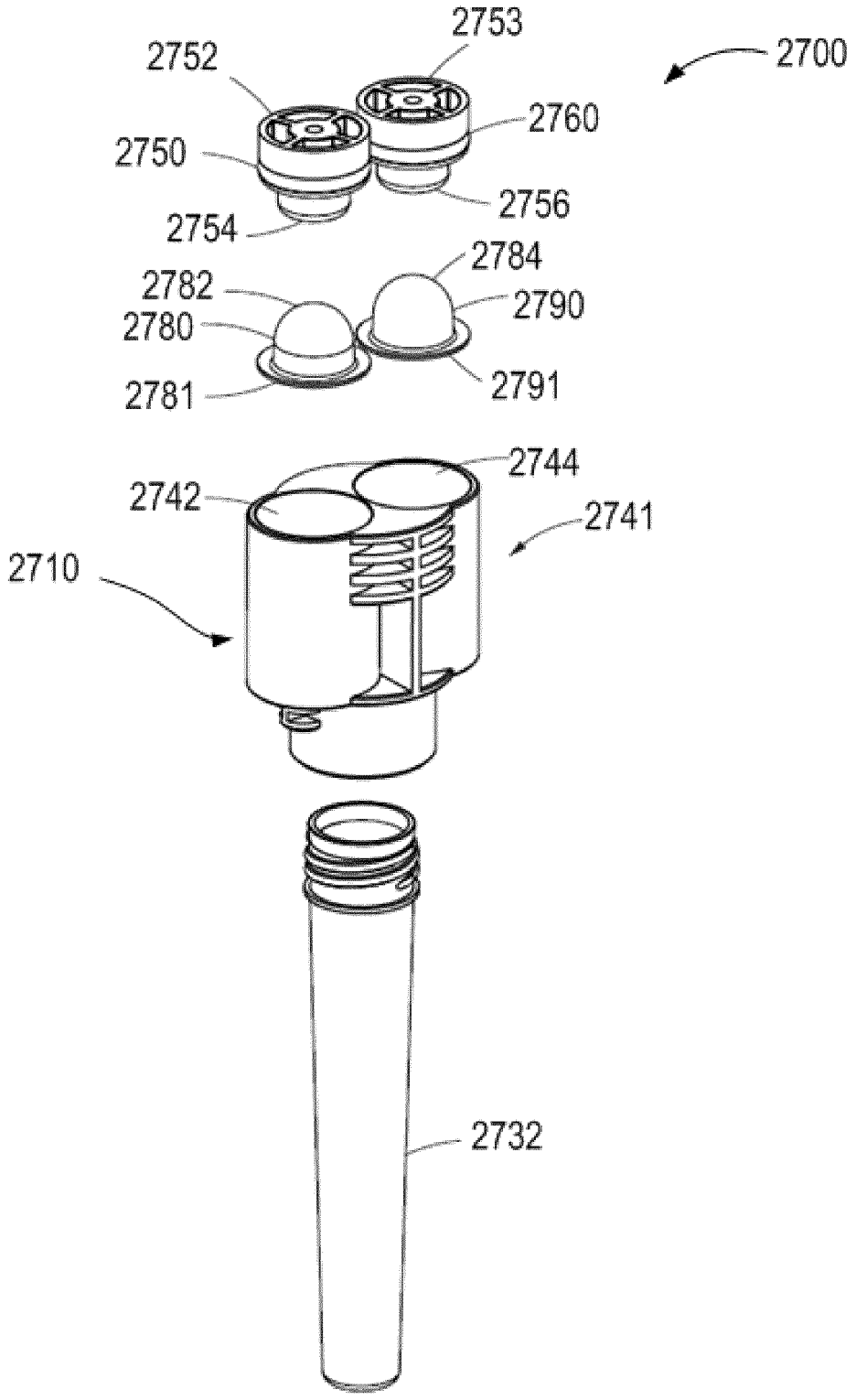

2753
2752
2700
2760
2750
2756
2754
2784
2782
2790
2780
2791
2781
2744
2742
2741
2710
2732

FIG. 8

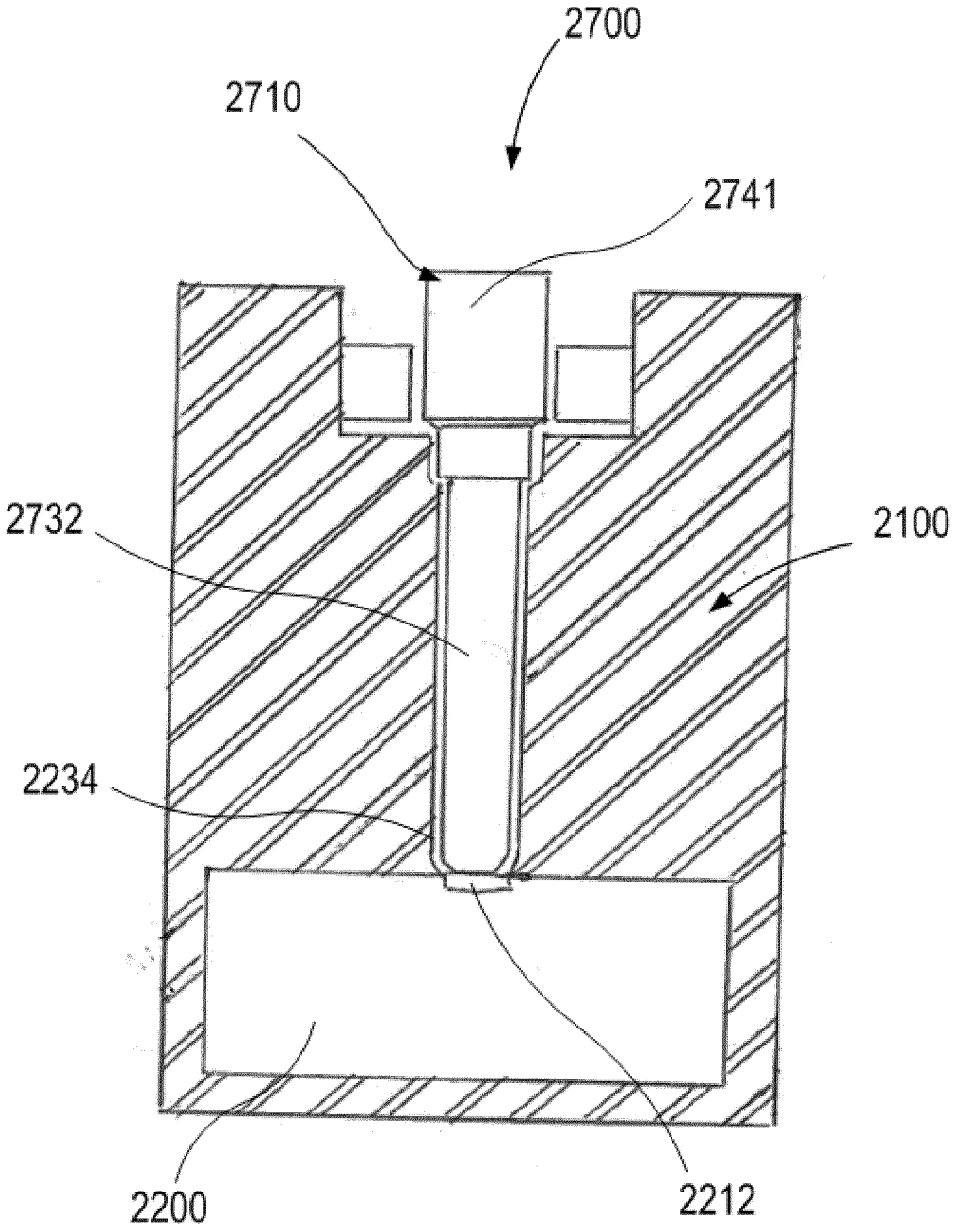


FIG. 9

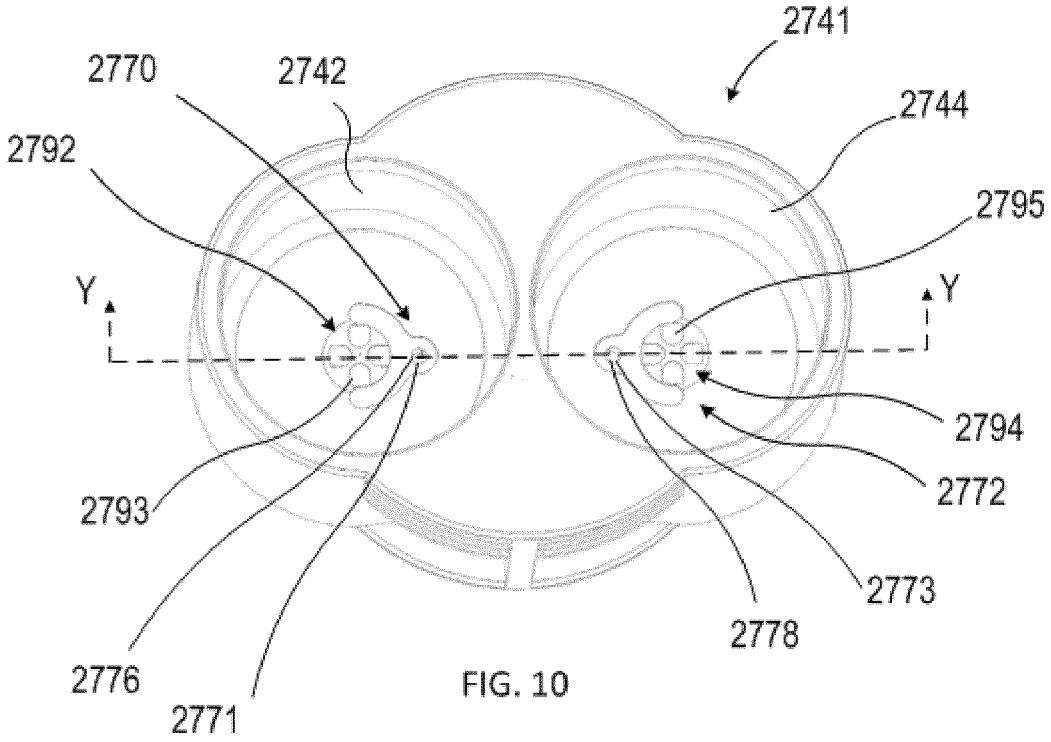

2741
2770
2742
2744
2792
2795
Y
Y
2794
2772
2793
2773
2778
2776
2771

FIG. 10

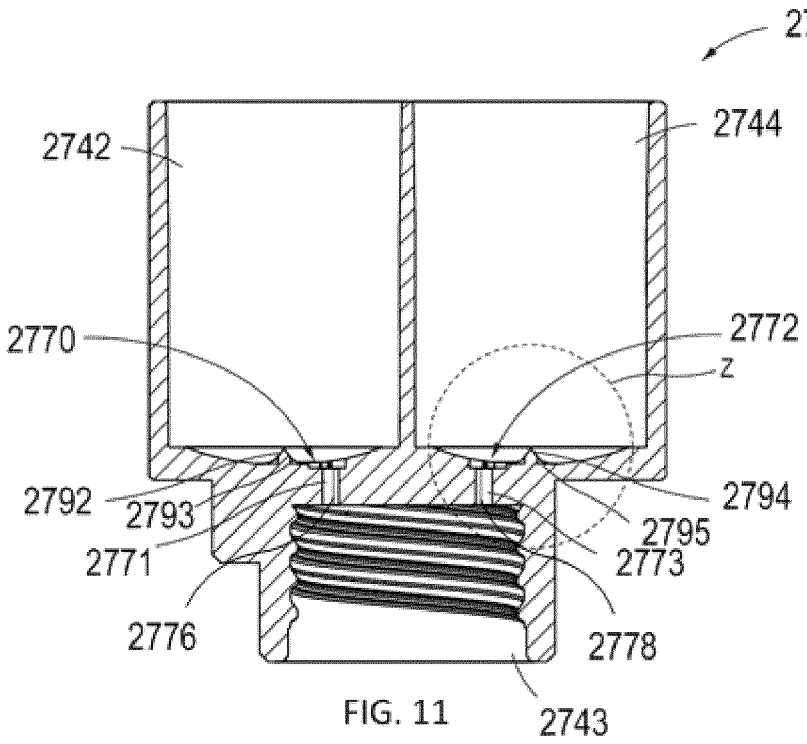

2741
2742
2744
2770
2772
z
2792
2793
2794
2795
2771
2773
2776
2778
2743

FIG. 11

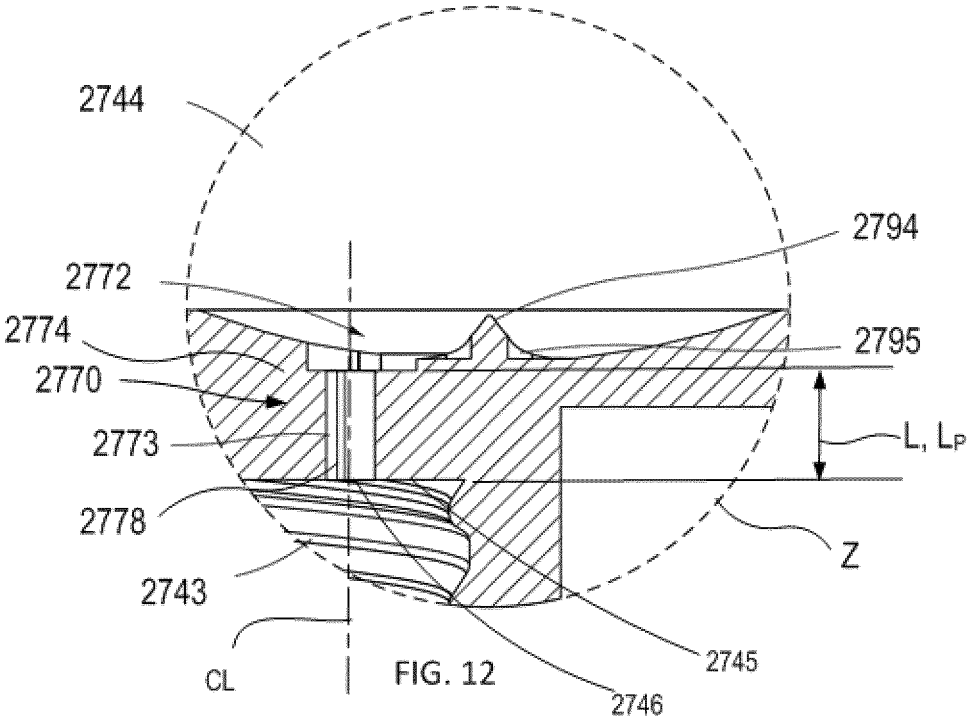

2744
2794
2772
2774
2795
2770
2773
L, L_P
2778
Z
2743
2745
CL
2746

FIG. 12

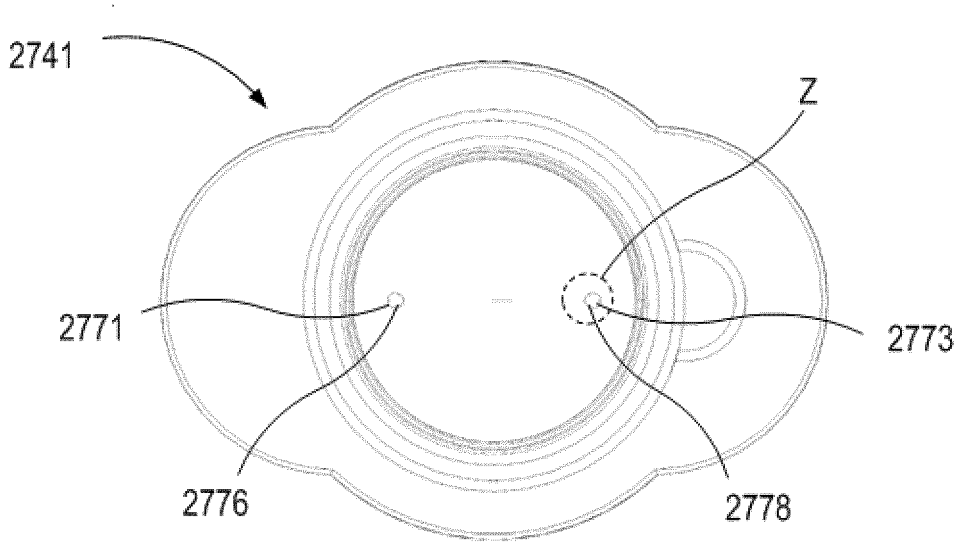

2741
Z
2771
2773
2776
2778

FIG. 13

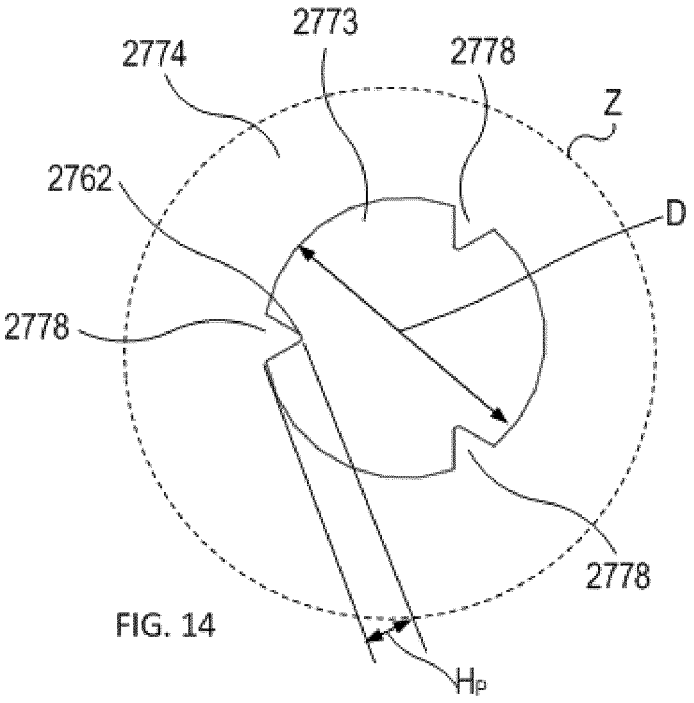

2773
2774
2778
Z
2762
D
2778
2778
H_P

FIG. 14

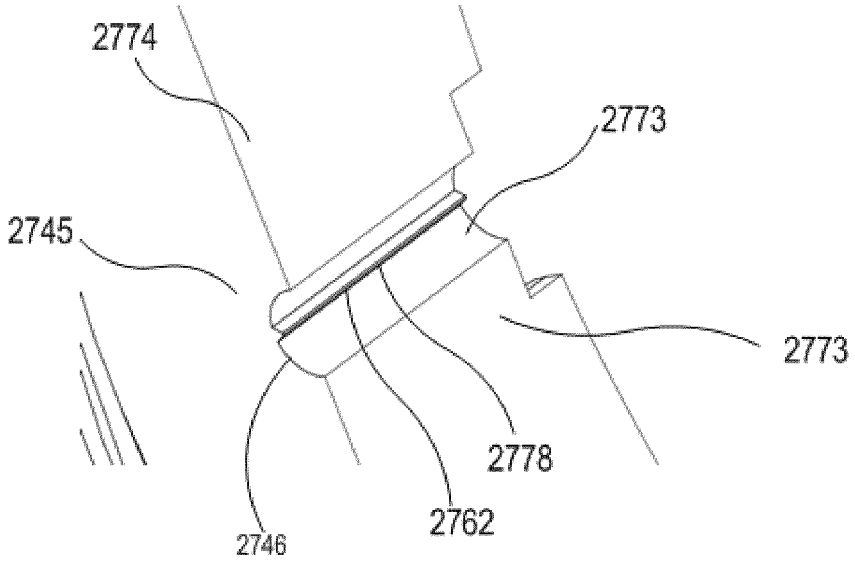

2774
2773
2745
2773
2778
2762
2746

FIG. 15

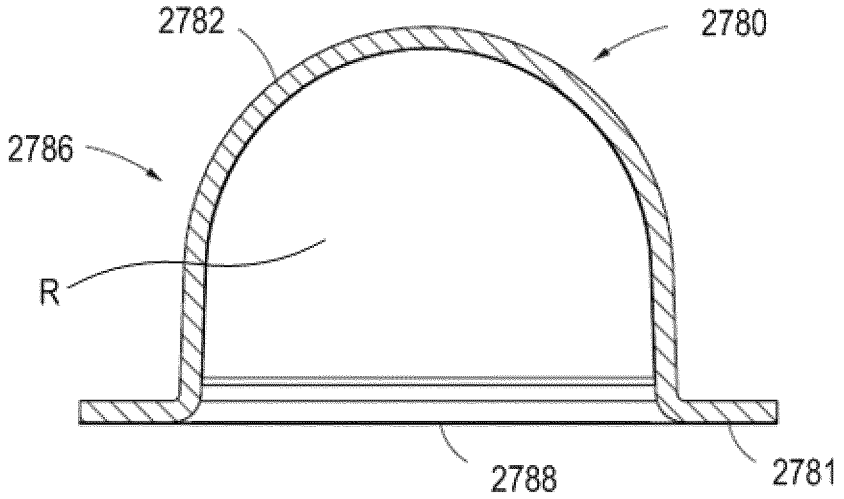


FIG. 16

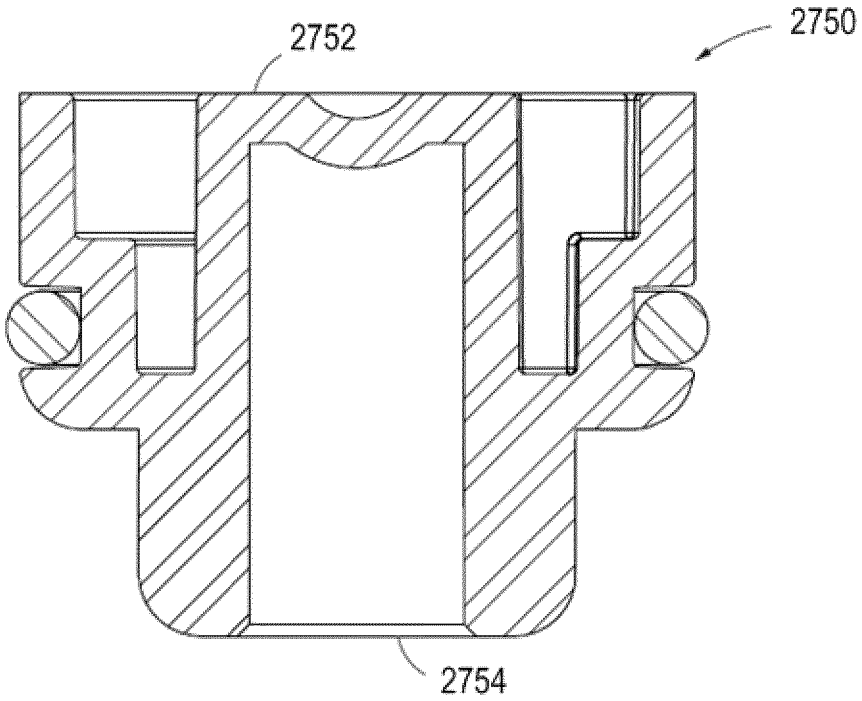


FIG. 17

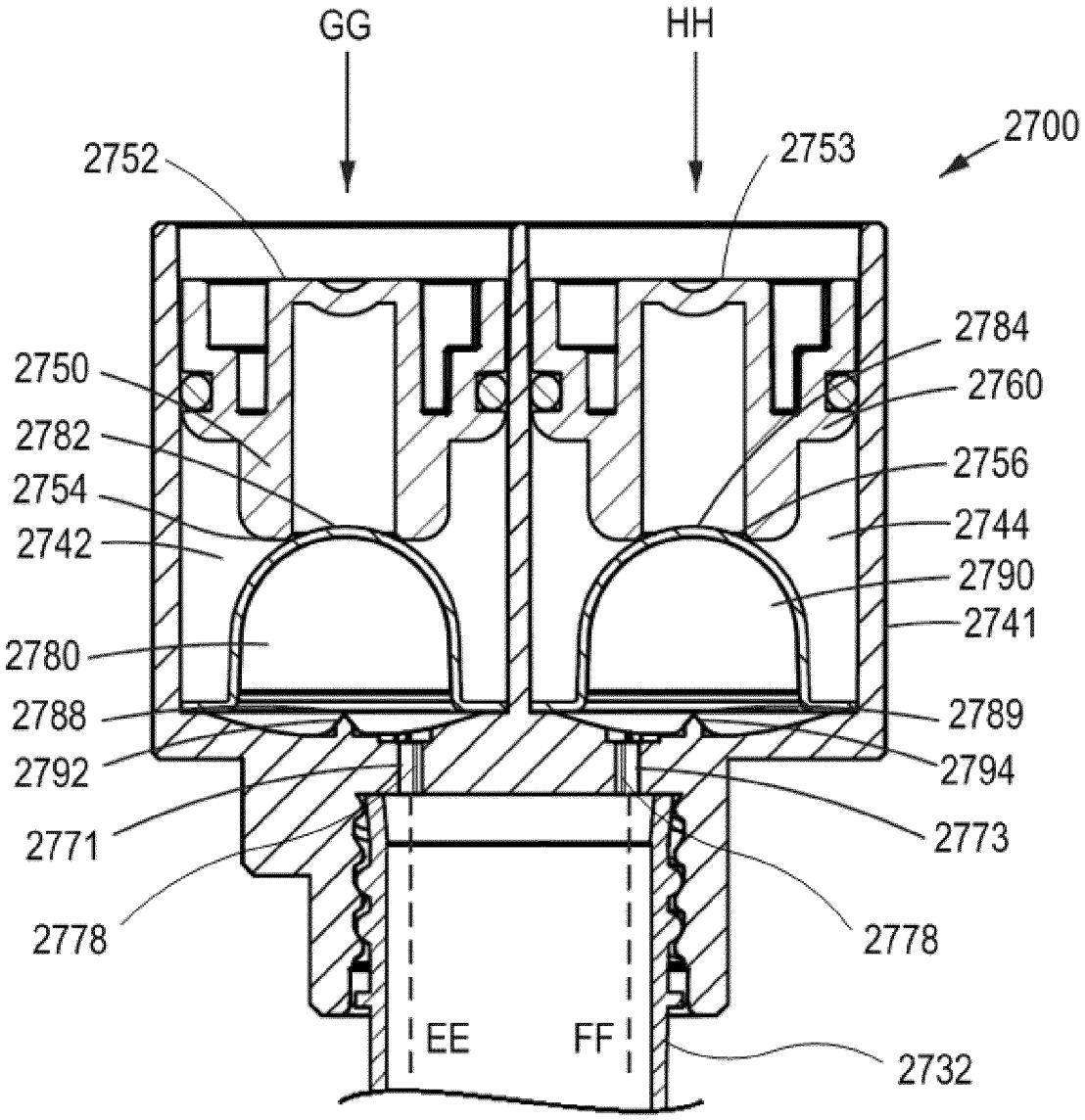

GG
HH
2700
2752
2753
2784
2750
2760
2782
2756
2754
2744
2742
2790
2741
2780
2788
2789
2792
2794
2771
2773
2778
2778
EE
FF
2732

FIG. 18

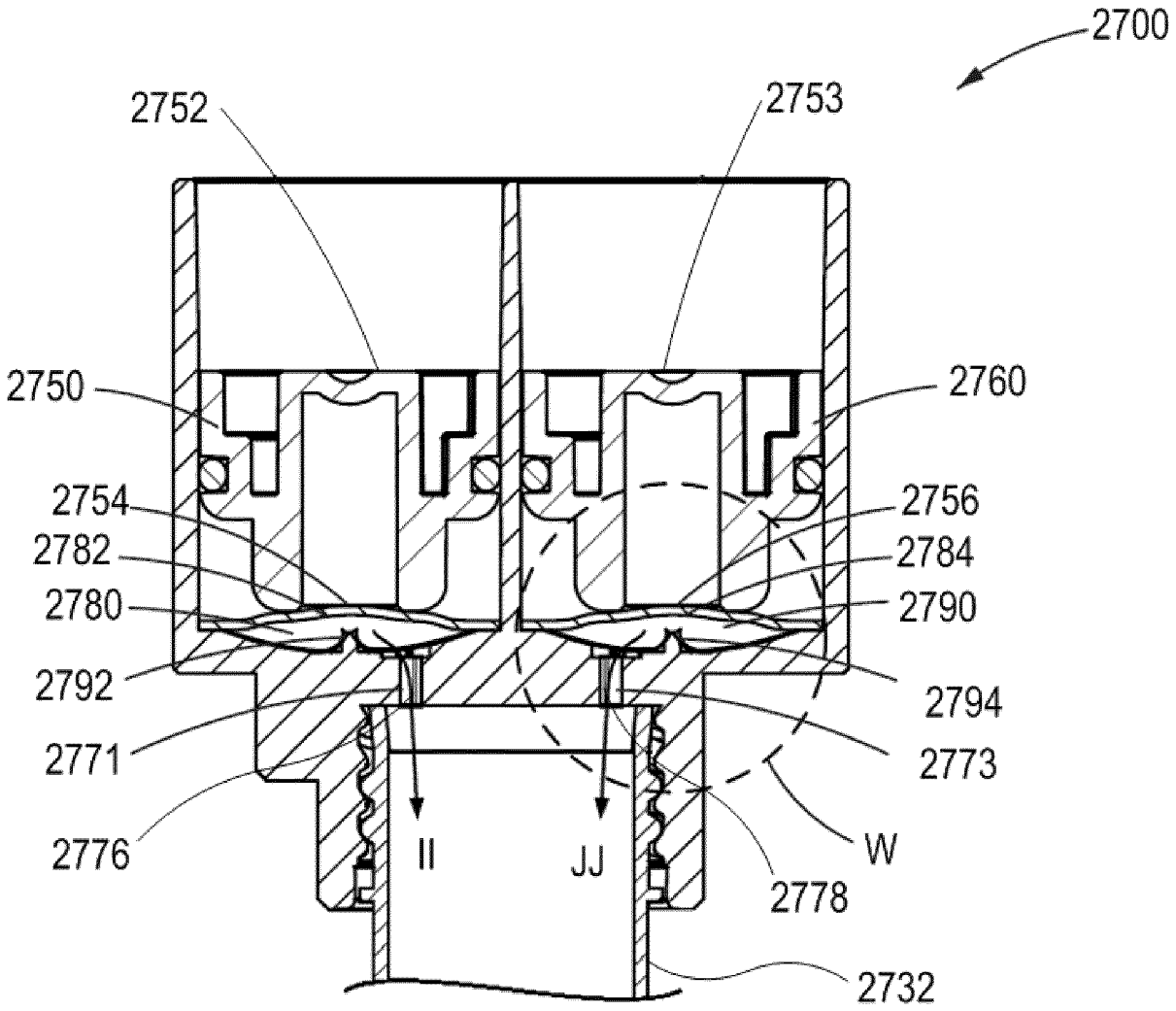

2700
2752
2753
2750
2760
2754
2756
2782
2784
2780
2790
2792
2794
2771
2773
2776
II
JJ
W
2778
2732

FIG. 19

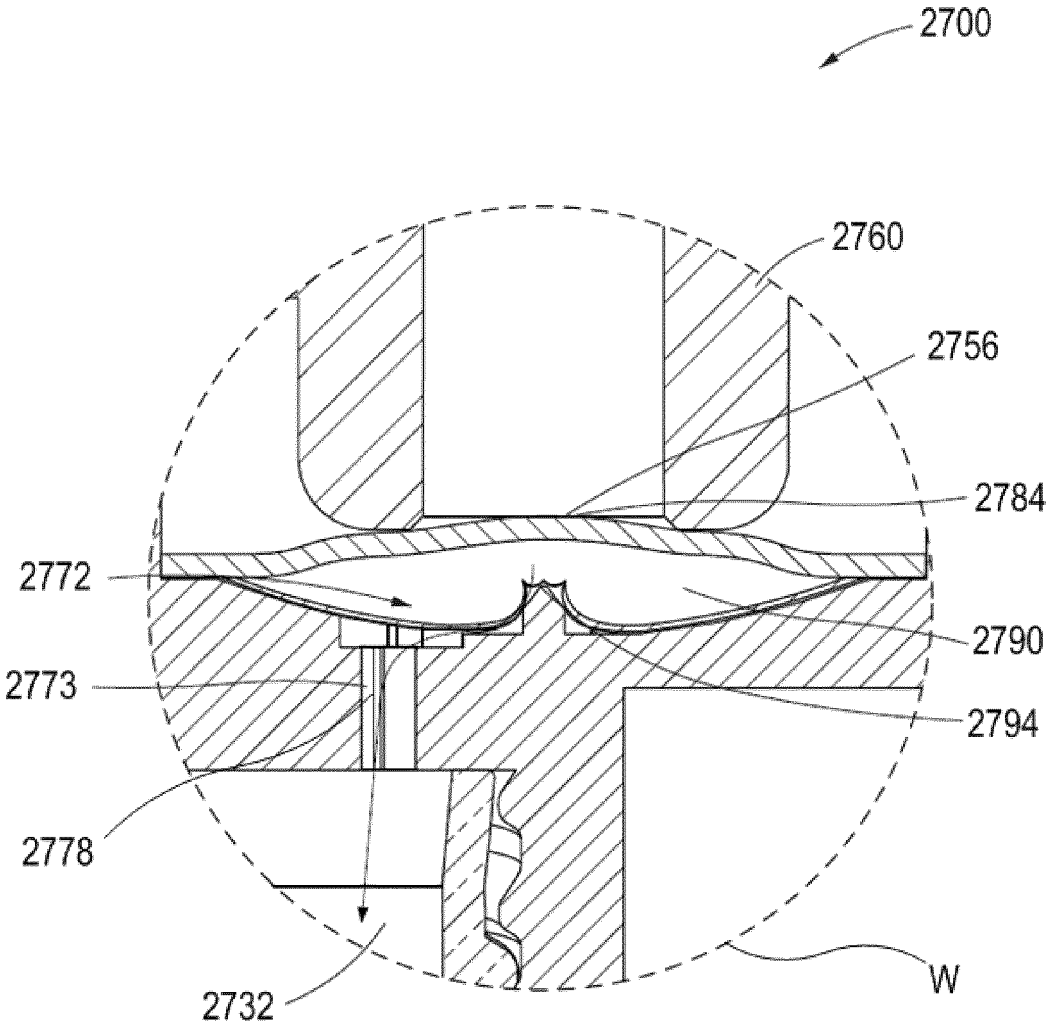


FIG. 20

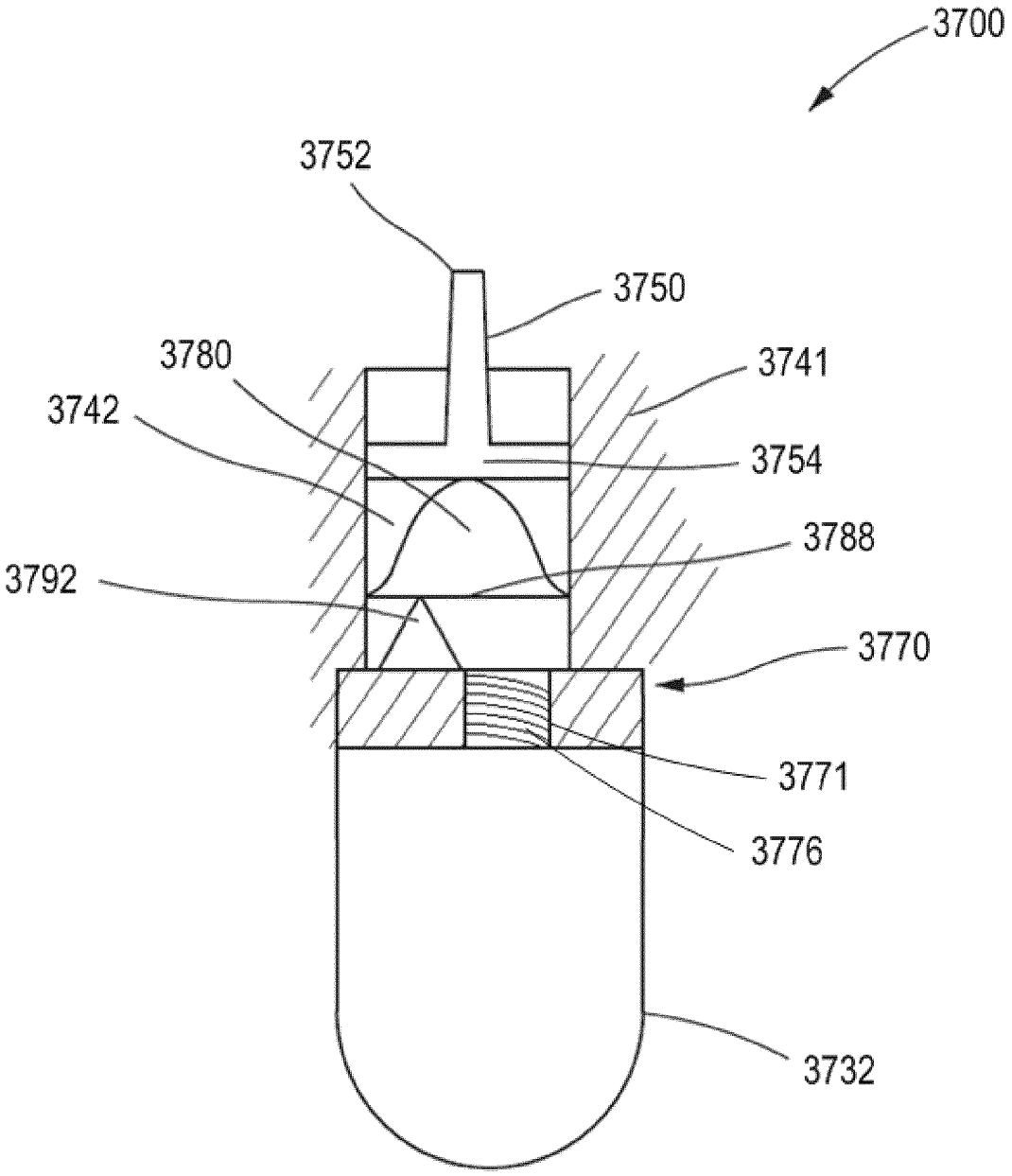

3700
3752
3750
3780
3741
3742
3754
3788
3792
3770
3771
3776
3732

FIG. 21

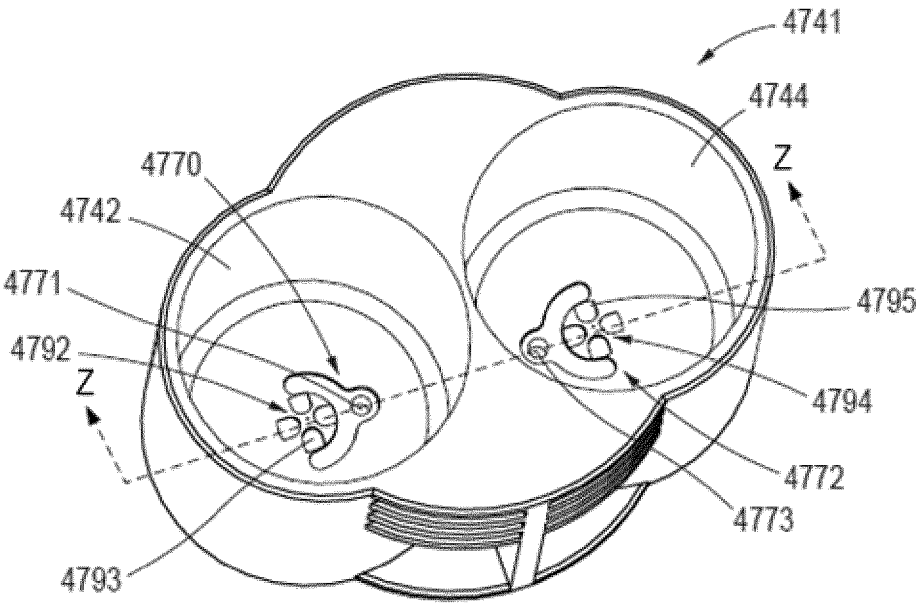

4741
4744
Z
4770
4742
4771
4795
4792
4794
Z
4772
4773
4793

FIG. 22

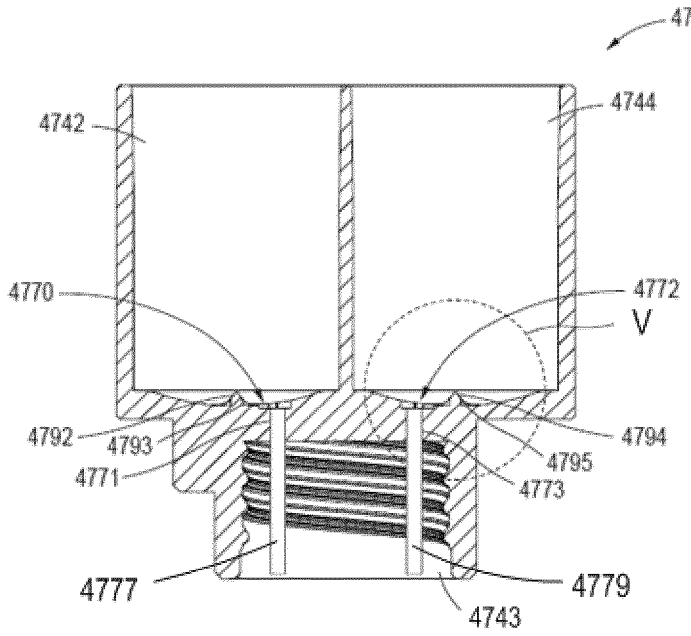

4741
4742
4744
4770
4772
V
4792
4793
4794
4795
4771
4773
4777
4779
4743

FIG. 23

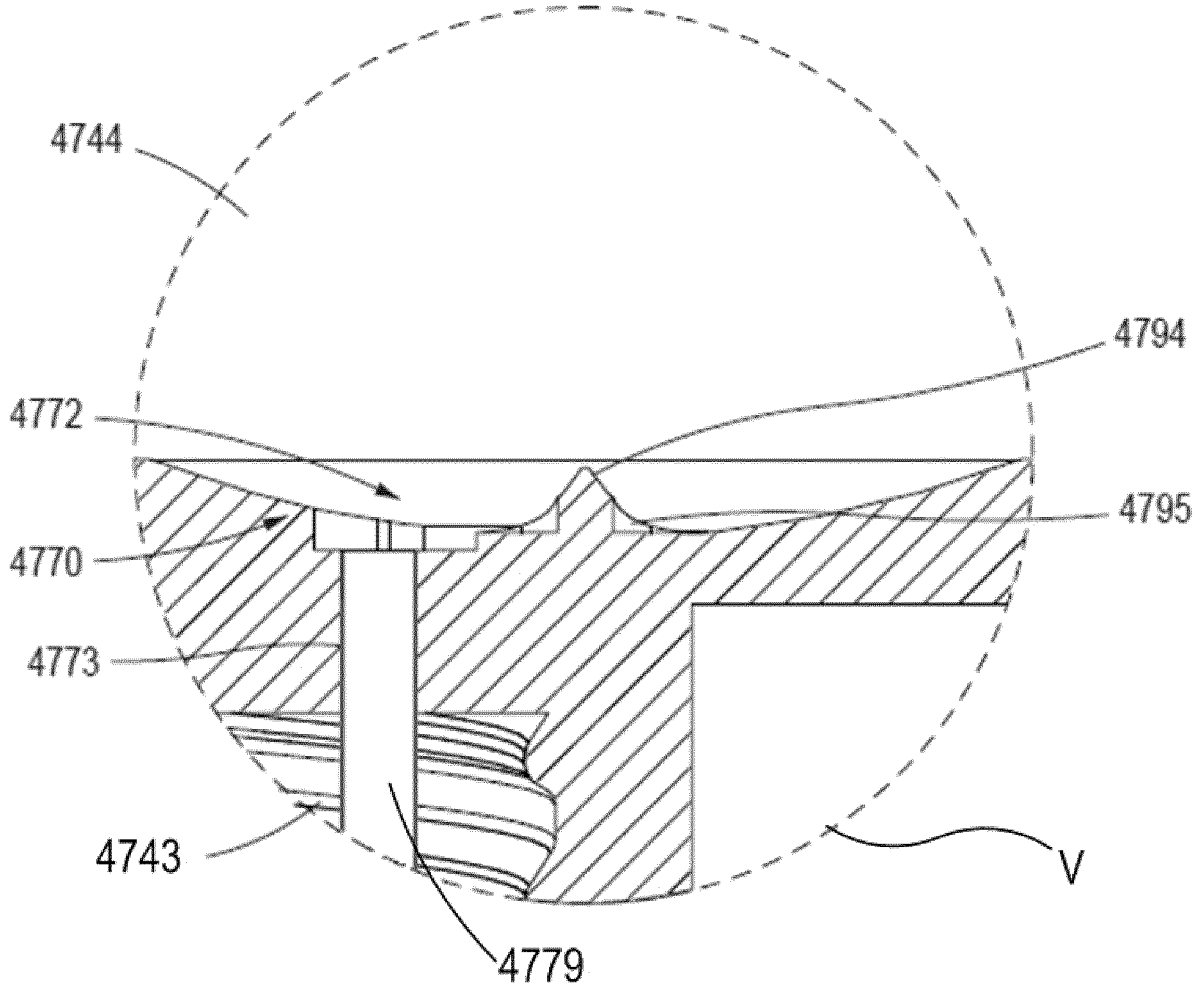


FIG. 24

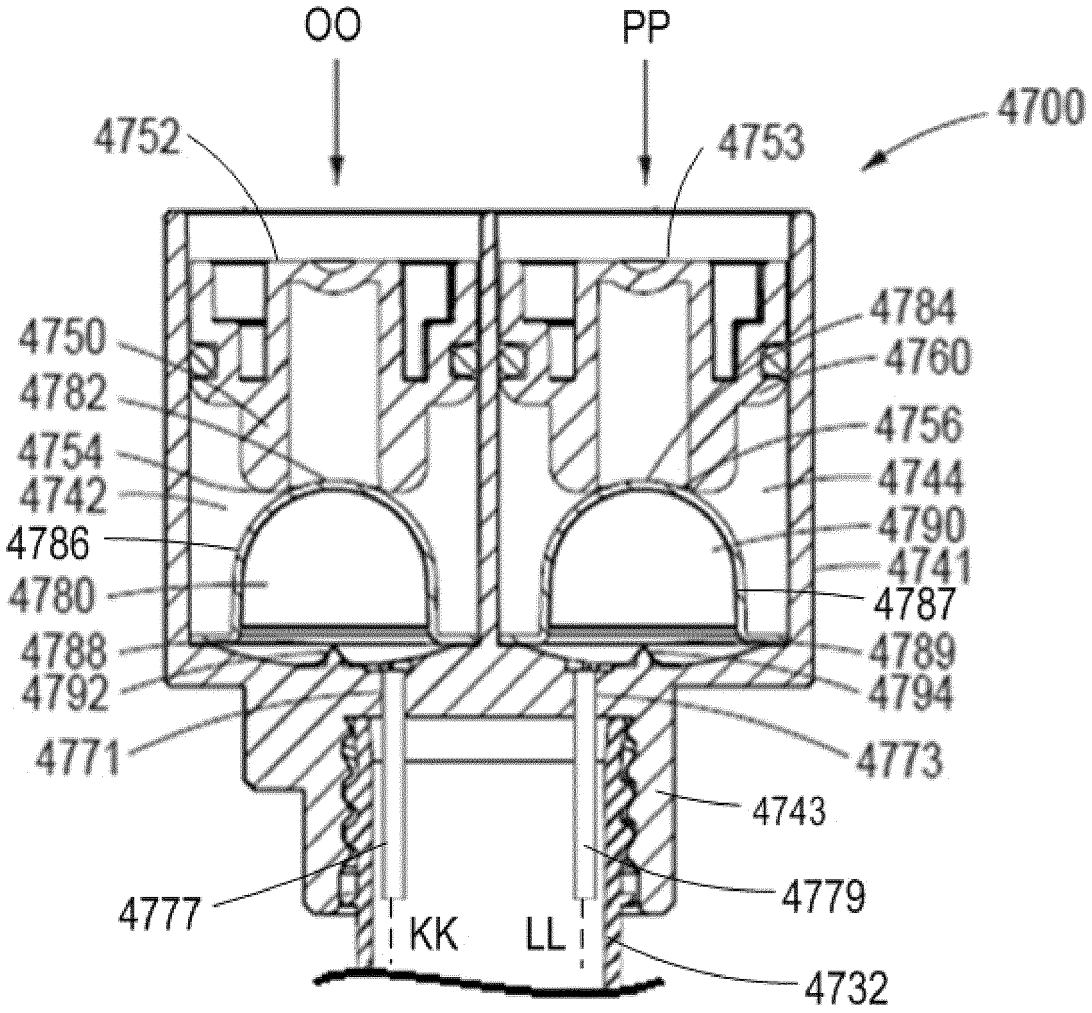

OO
PP
4700
4752
4753
4784
4750
4760
4782
4756
4754
4744
4742
4790
4786
4741
4780
4787
4788
4789
4792
4794
4771
4773
4743
4777
4779
KK
LL
4732

FIG. 25

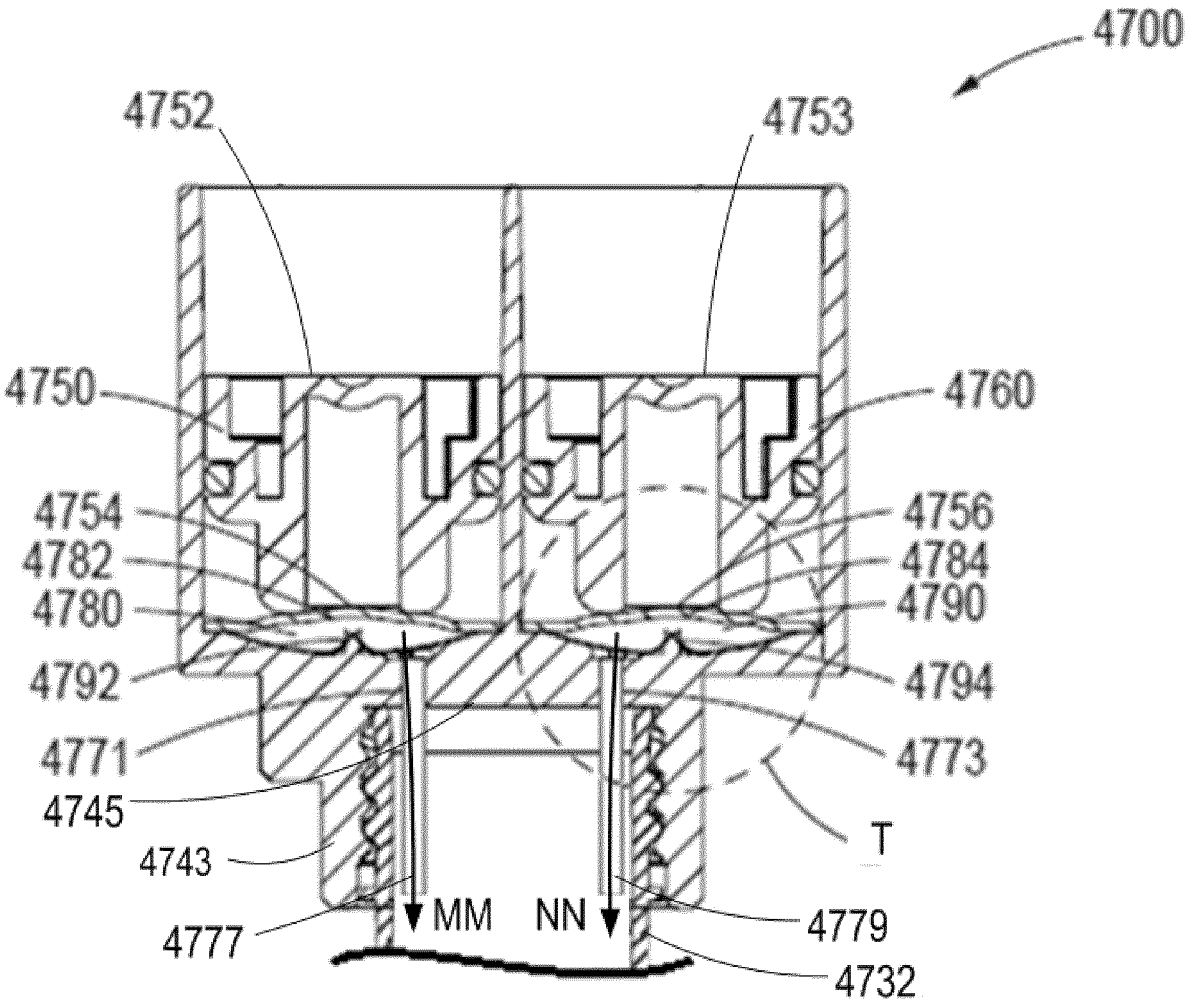

4700
4752
4753
4750
4760
4754
4756
4782
4784
4780
4790
4792
4794
4771
4773
4745
T
4743
MM
NN
4777
4779
4732

FIG. 26

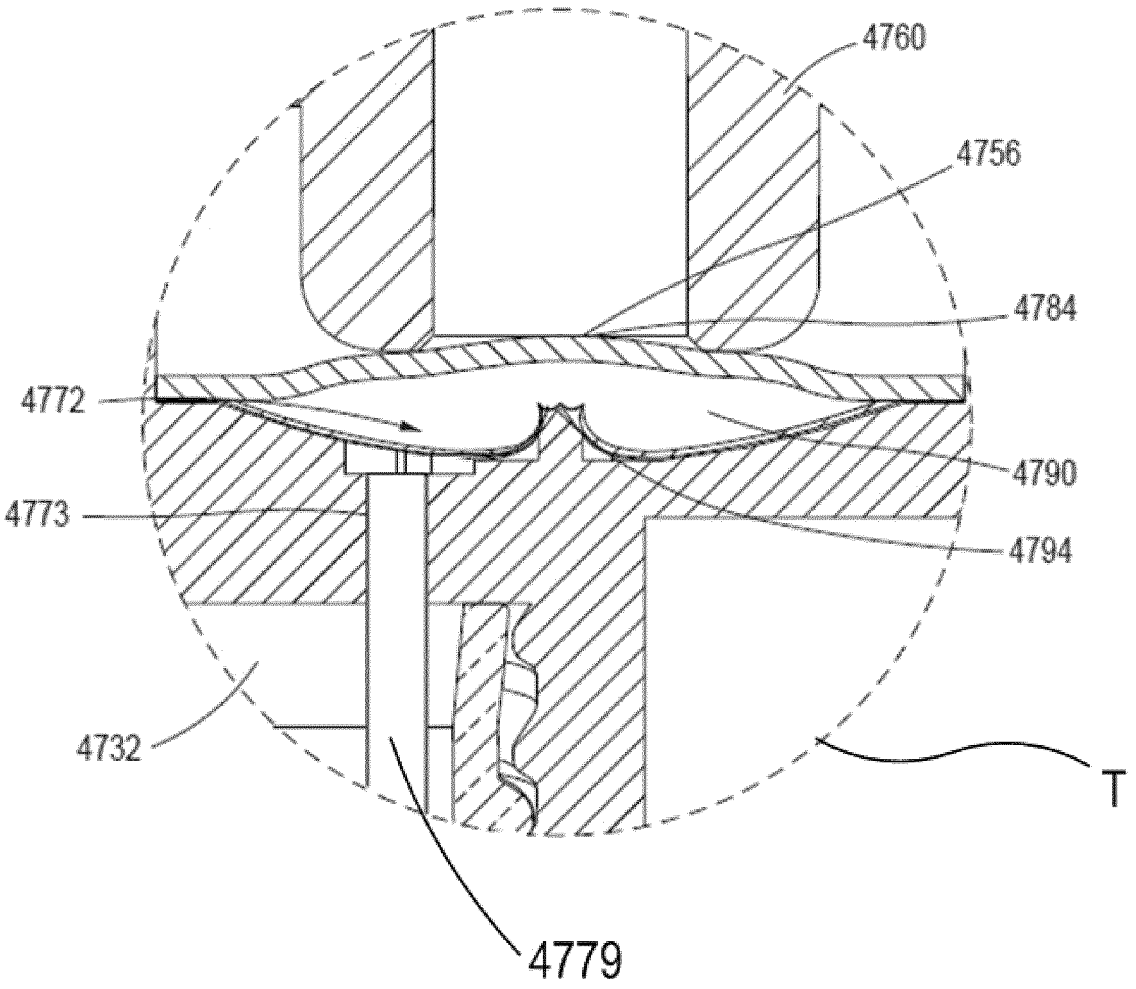


FIG. 27

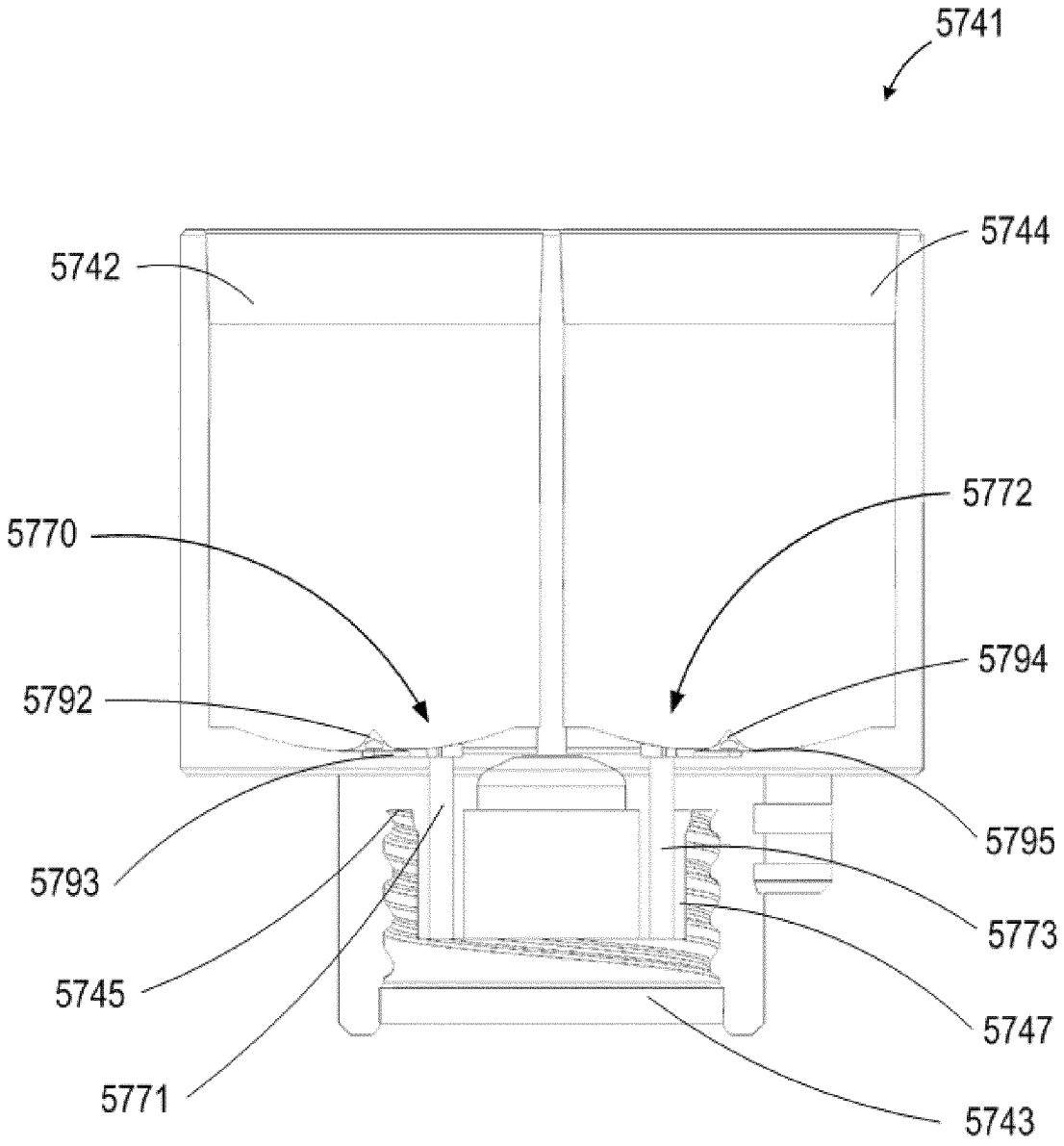

5741
5742
5744
5770
5772
5792
5794
5793
5795
5745
5773
5771
5747
5743

FIG. 28

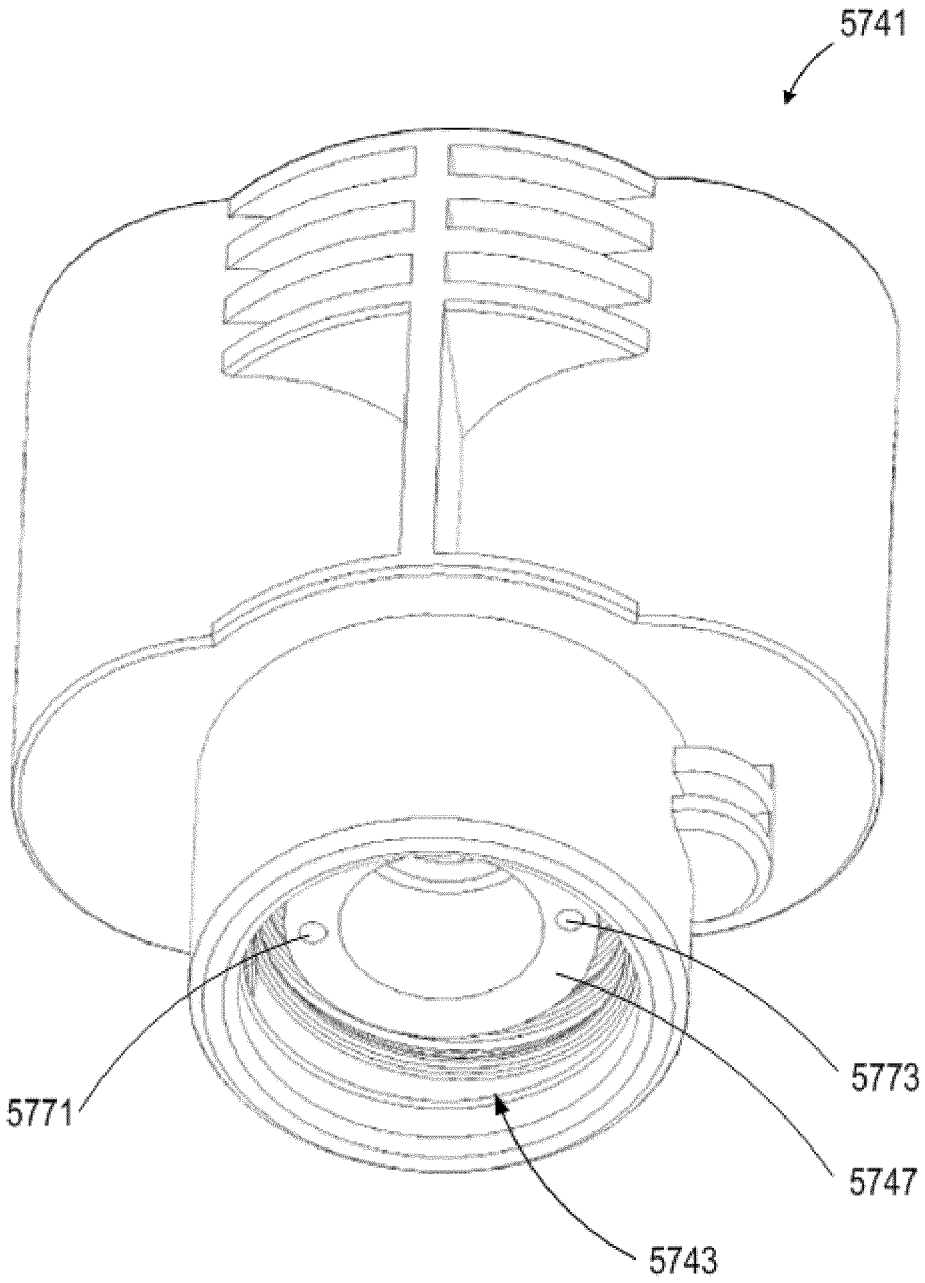


FIG. 29

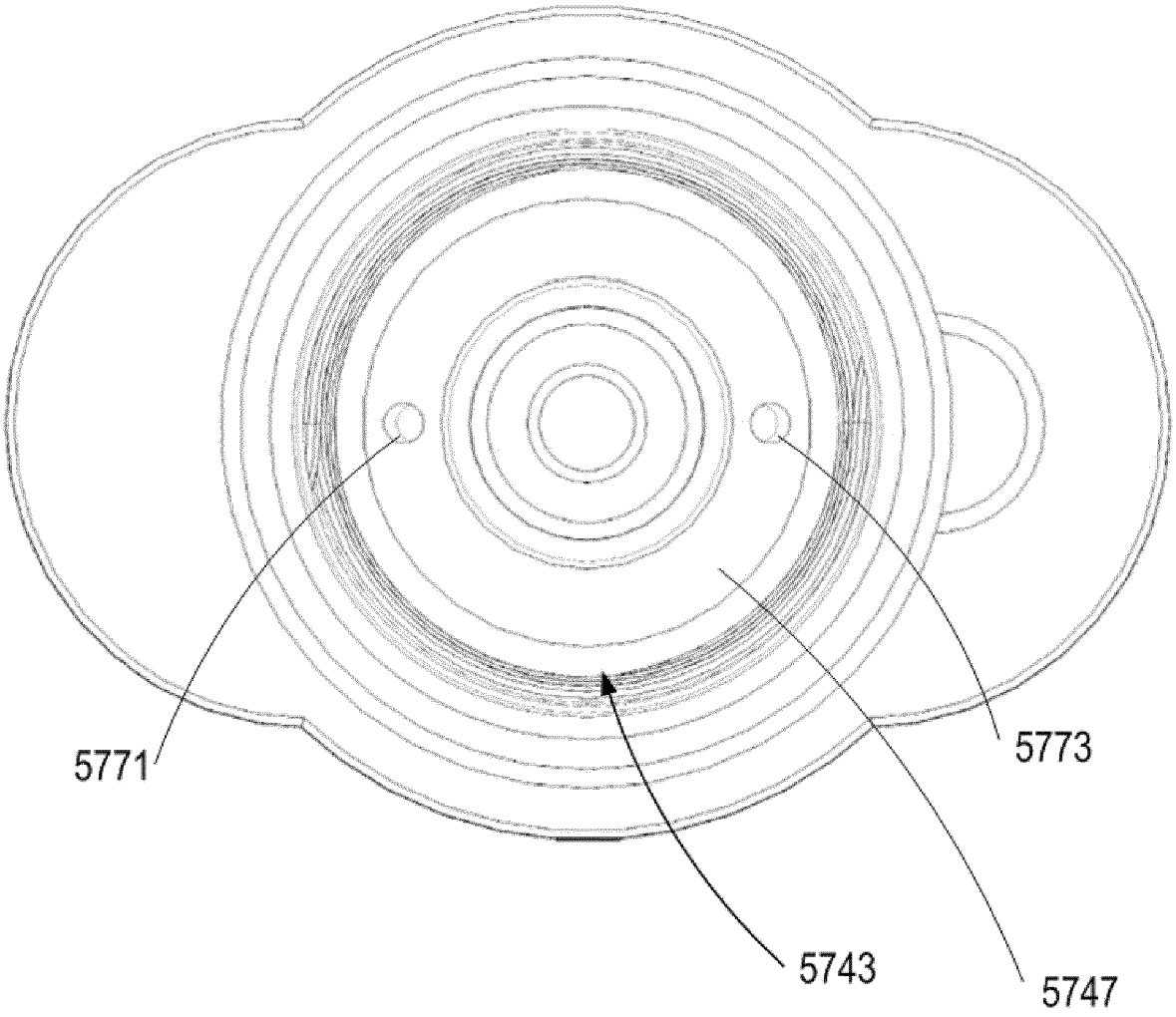


FIG. 30

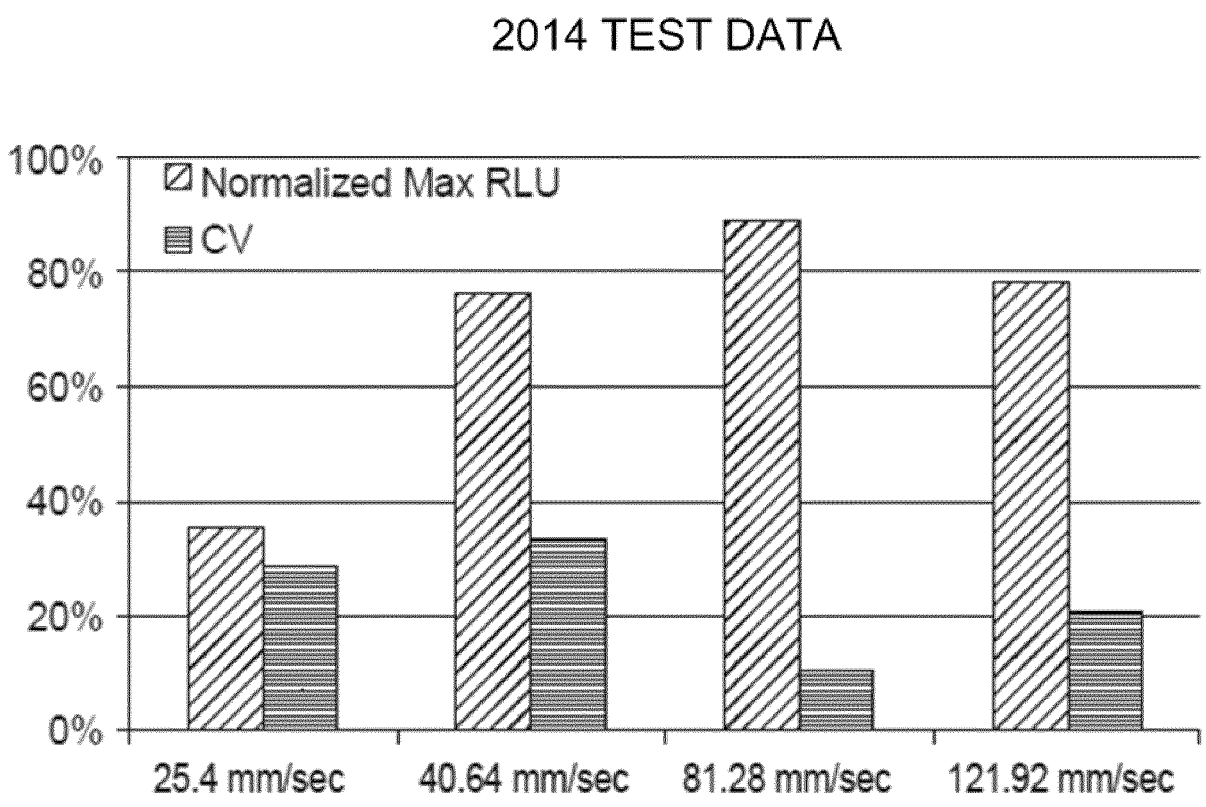

2014 TEST DATA
100%
80%
60%
40%
20%
0%
Normalized Max RLU
CV
25.4 mm/sec
40.64 mm/sec
81.28 mm/sec
121.92 mm/sec

FIG. 31

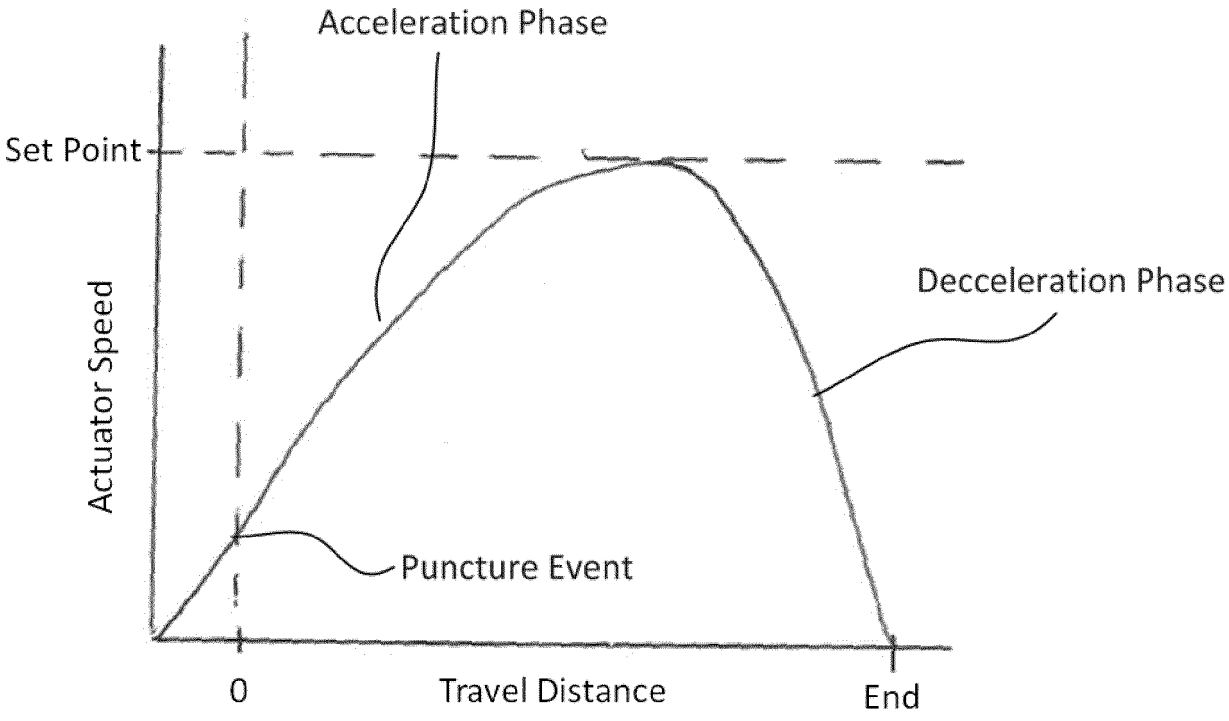

Acceleration Phase
Set Point
Actuator Speed
Decceleration Phase
Puncture Event
0
Travel Distance
End

FIG. 32

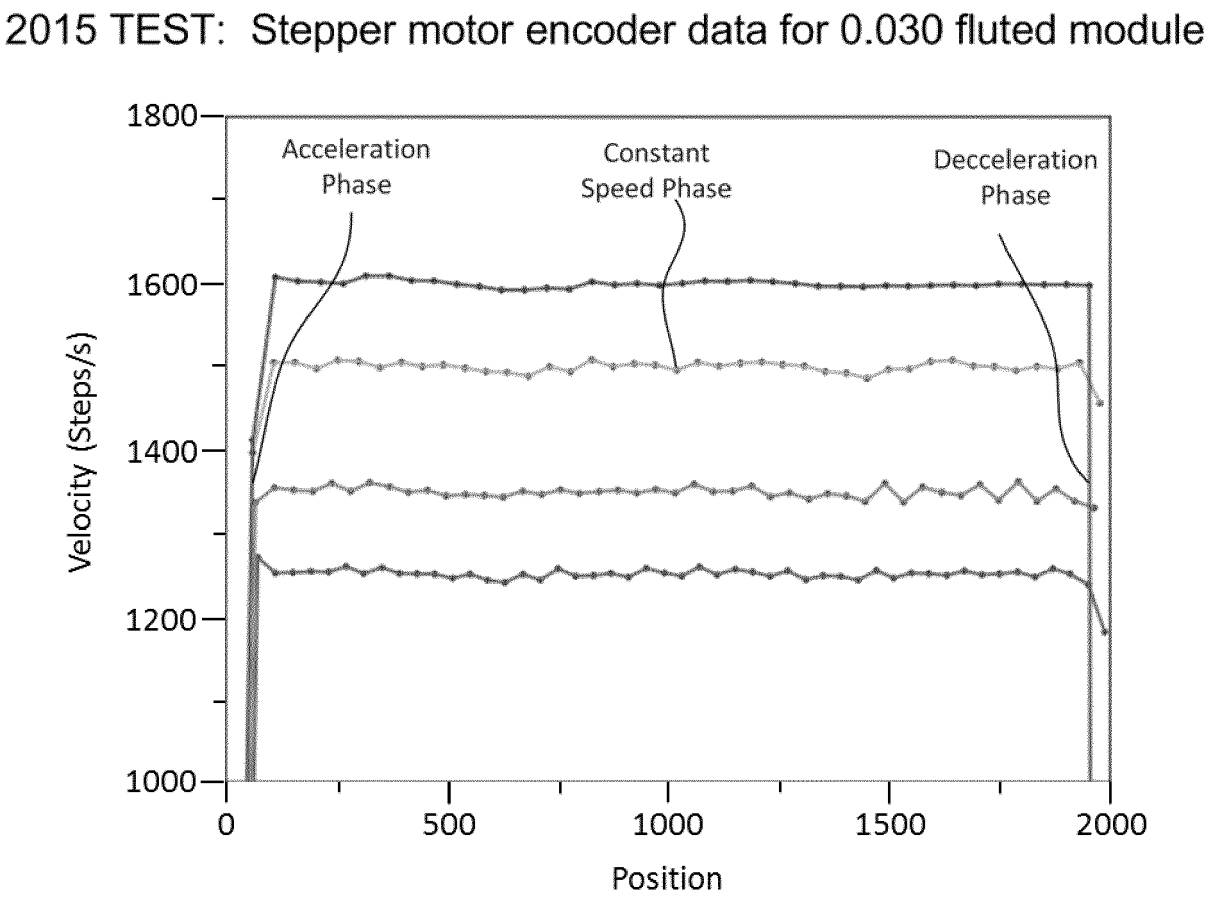

2015 TEST: Stepper motor encoder data for 0.030 fluted module
Acceleration Phase
Constant Speed Phase
Decceleration Phase
Velocity (Steps/s)
1800
1600
1400
1200
1000
0
500
1000
1500
2000
Position

FIG. 33

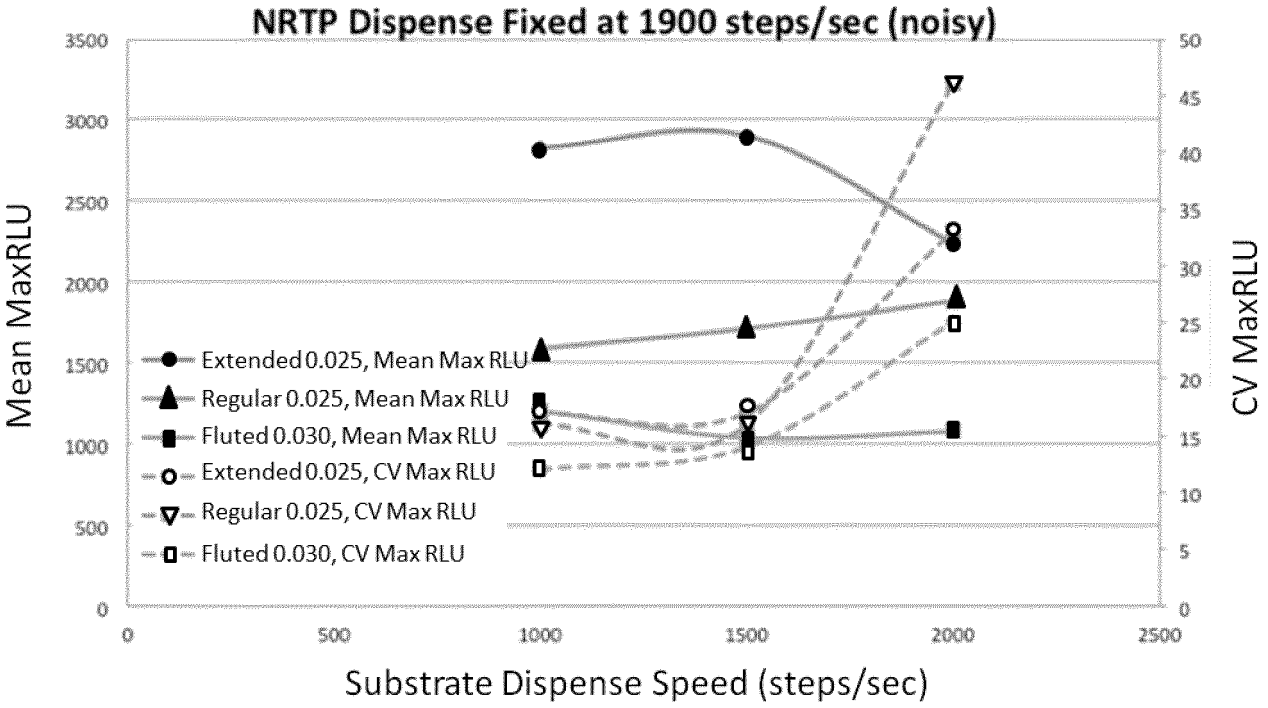

NRTP Dispense Fixed at 1900 steps/sec (noisy)
Mean MaxRLU
CV MaxRLU
Substrate Dispense Speed (steps/sec)
Extended 0.025, Mean Max RLU
Regular 0.025, Mean Max RLU
Fluted 0.030, Mean Max RLU
Extended 0.025, CV Max RLU
Regular 0.025, CV Max RLU
Fluted 0.030, CV Max RLU
0
500
1000
1500
2000
2500
3000
3500
5
10
15
20
25
30
35
40
45
50

FIG. 34

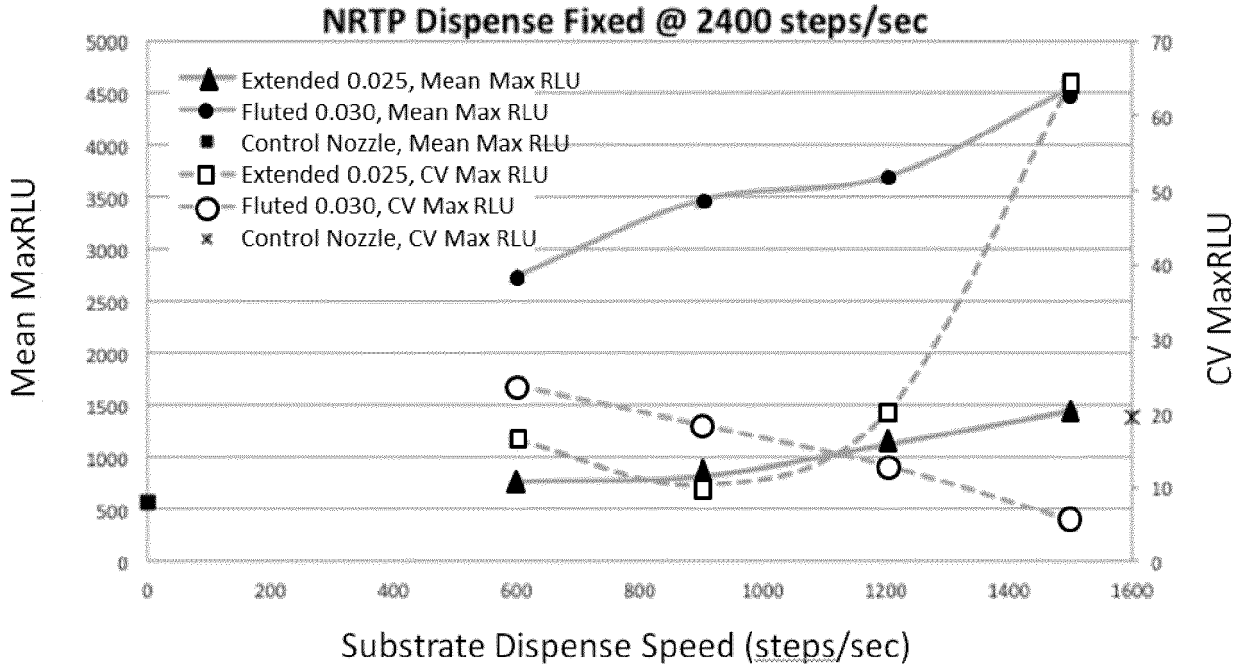

NRTP Dispense Fixed @ 2400 steps/sec
Mean MaxRLU
CV MaxRLU
Substrate Dispense Speed (steps/sec)
Extended 0.025, Mean Max RLU
Fluted 0.030, Mean Max RLU
Control Nozzle, Mean Max RLU
Extended 0.025, CV Max RLU
Fluted 0.030, CV Max RLU
Control Nozzle, CV Max RLU
0
200
400
600
800
1000
1200
1400
1600
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
10
20
30
40
50
60
70

FIG. 35

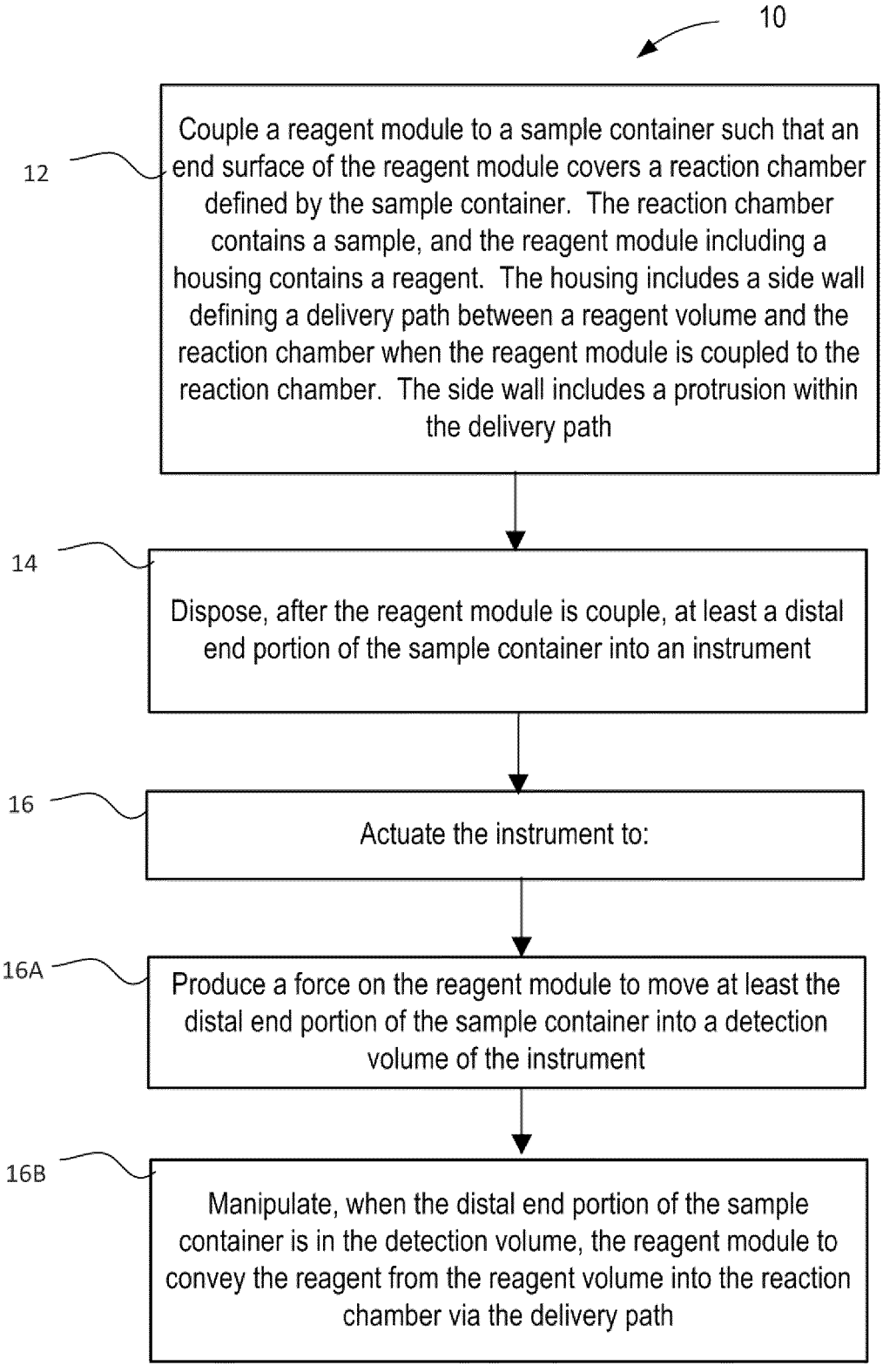

10
12
Couple a reagent module to a sample container such that an end surface of the reagent module covers a reaction chamber defined by the sample container. The reaction chamber contains a sample, and the reagent module including a housing contains a reagent. The housing includes a side wall defining a delivery path between a reagent volume and the reaction chamber when the reagent module is coupled to the reaction chamber. The side wall includes a protrusion within the delivery path
14
Dispose, after the reagent module is couple, at least a distal end portion of the sample container into an instrument
16
Actuate the instrument to:
16A
Produce a force on the reagent module to move at least the distal end portion of the sample container into a detection volume of the instrument
16B
Manipulate, when the distal end portion of the sample container is in the detection volume, the reagent module to convey the reagent from the reagent volume into the reaction chamber via the delivery path

FIG. 36

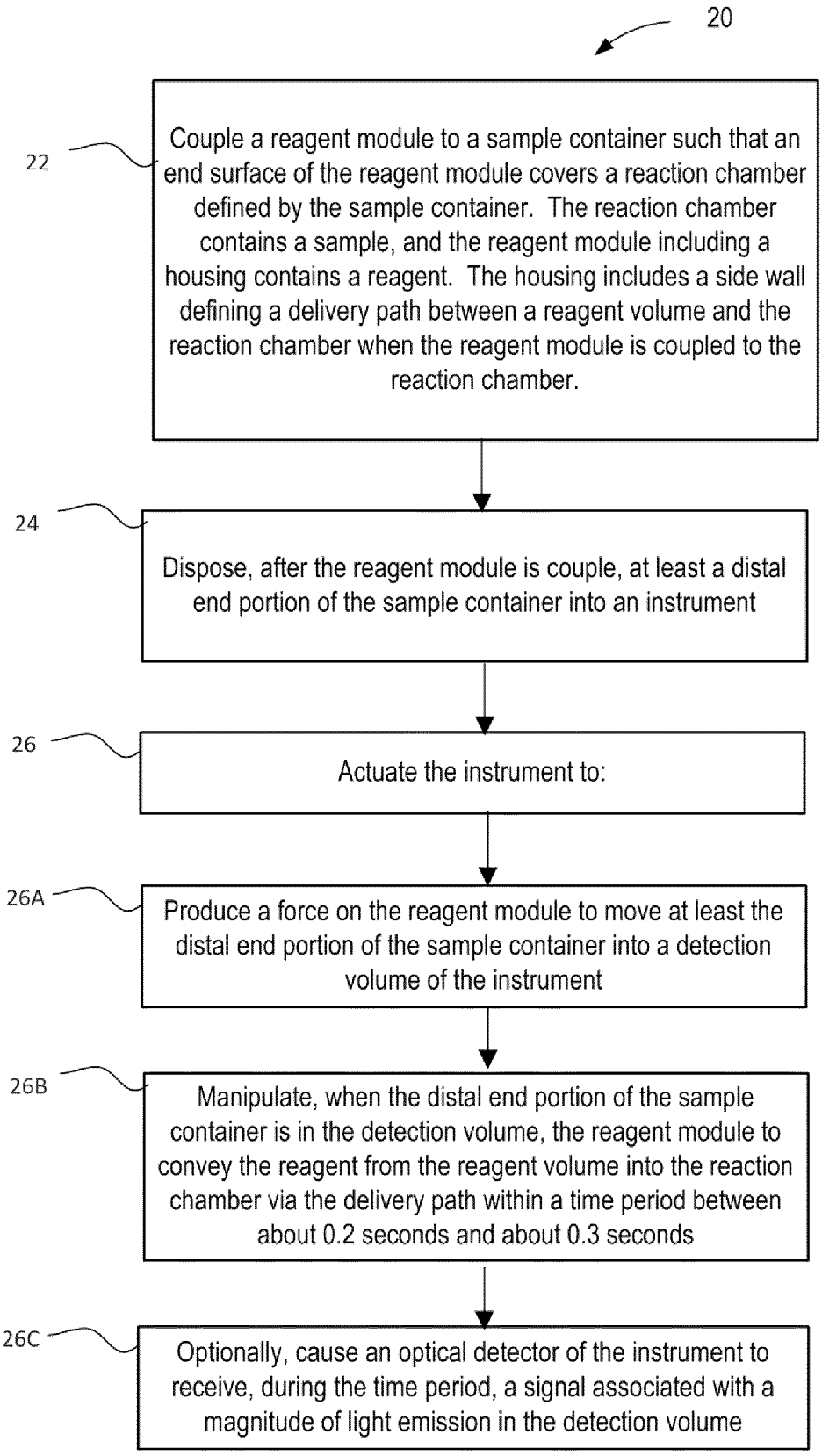

20
22
Couple a reagent module to a sample container such that an end surface of the reagent module covers a reaction chamber defined by the sample container. The reaction chamber contains a sample, and the reagent module including a housing contains a reagent. The housing includes a side wall defining a delivery path between a reagent volume and the reaction chamber when the reagent module is coupled to the reaction chamber.
24
Dispose, after the reagent module is couple, at least a distal end portion of the sample container into an instrument
26
Actuate the instrument to:
26A
Produce a force on the reagent module to move at least the distal end portion of the sample container into a detection volume of the instrument
26B
Manipulate, when the distal end portion of the sample container is in the detection volume, the reagent module to convey the reagent from the reagent volume into the reaction chamber via the delivery path within a time period between about 0.2 seconds and about 0.3 seconds
26C
Optionally, cause an optical detector of the instrument to receive, during the time period, a signal associated with a magnitude of light emission in the detection volume

FIG. 37