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(54) **AUTOMATED COOKING MACHINE USING A CARTESIAN BOT**

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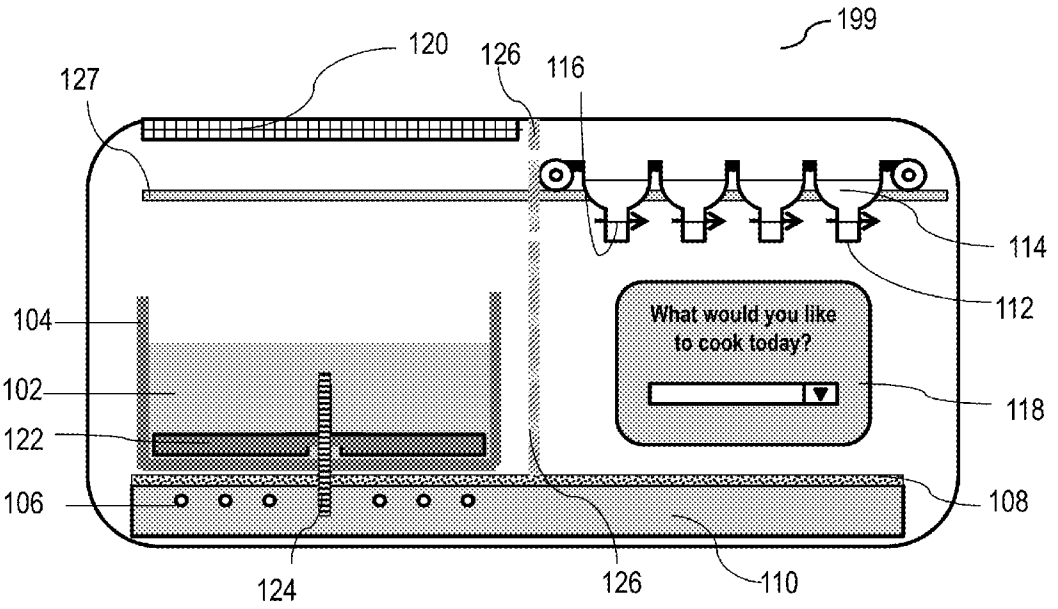
A47J 44/00	(2006.01)

(52) **U.S. Cl.**

CPC ***B25J 11/0045*** (2013.01); ***A47J 44/00*** (2013.01); ***B25J 9/023*** (2013.01); *Y10S 901/16* (2013.01)

(57) **ABSTRACT**

An automated cooking machine is described wherein various functions, such as dispensing, stirring, chopping, baking and cleaning are conducted by intelligent use of a Cartesian robot system.



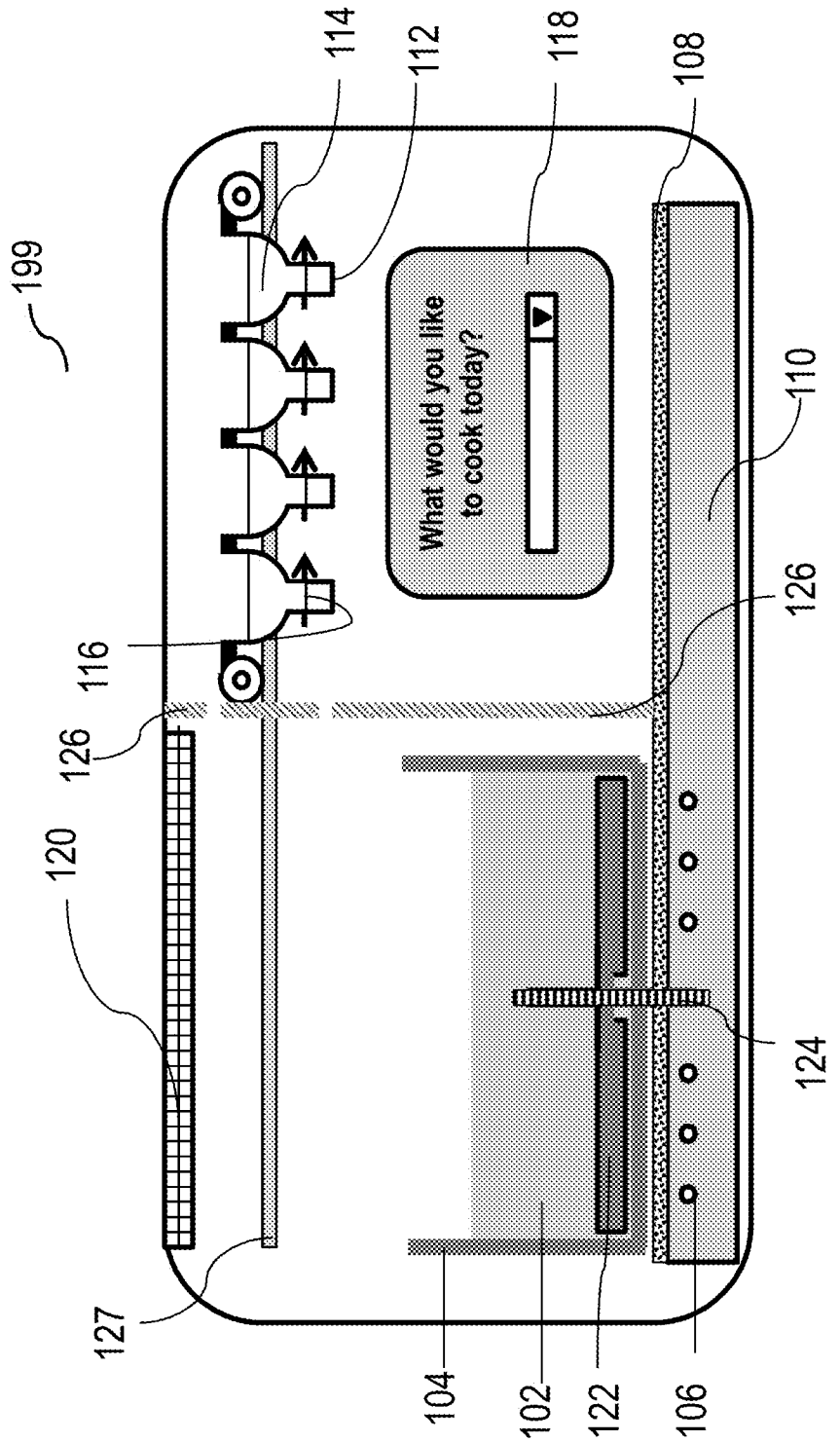

199
114
112
118
108
What would you like to cook today?
110
126
116
126
120
124
127
104
102
122
106

Fig. 1

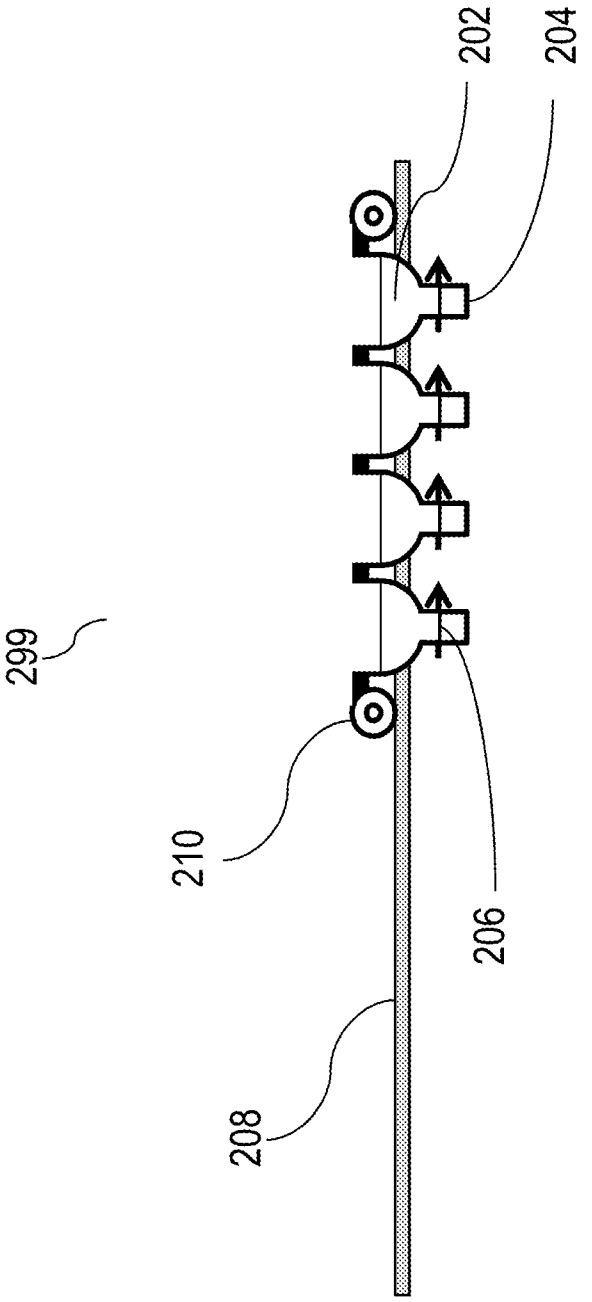


Fig. 2

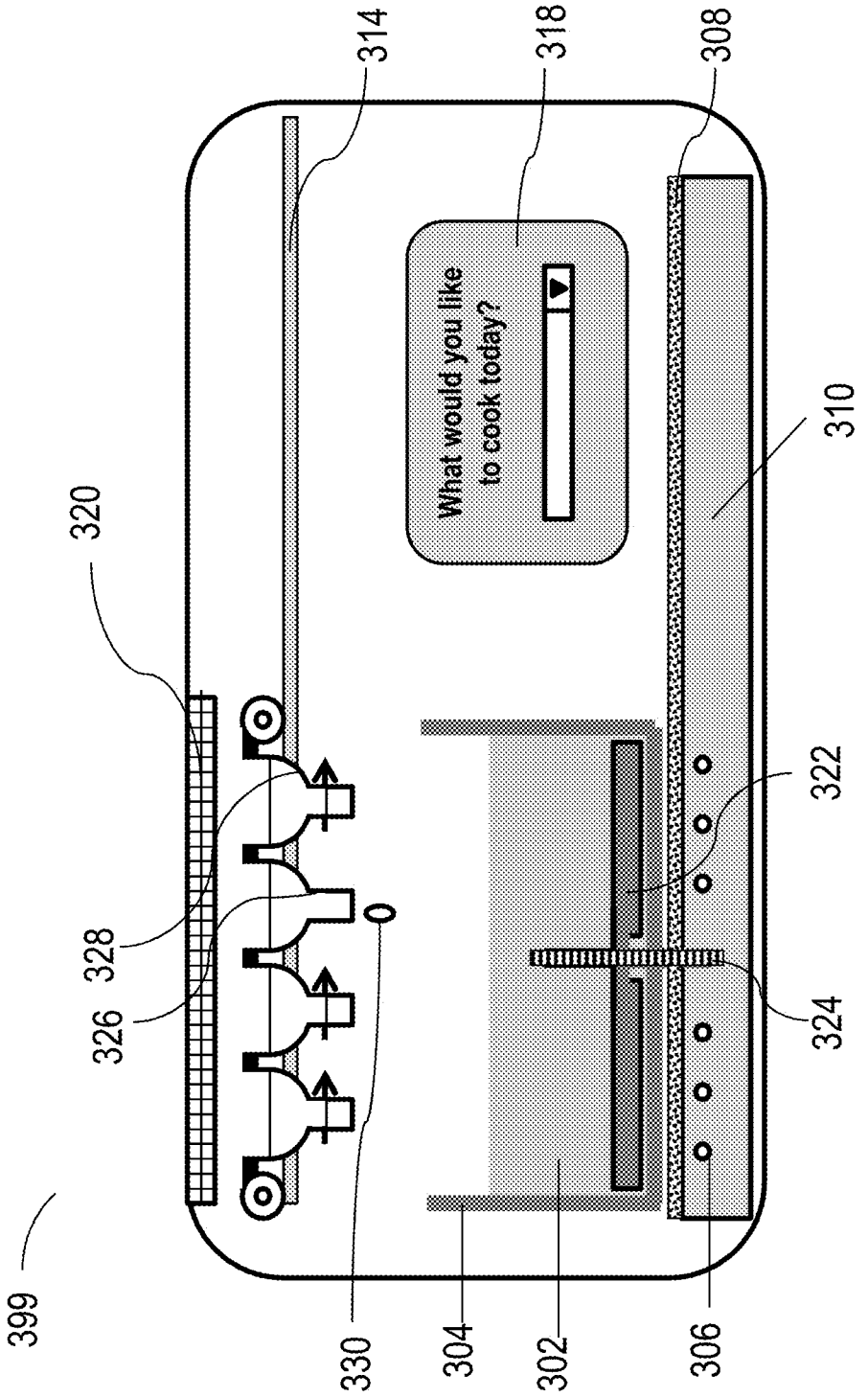

What would you like to cook today?
399
320
328
326
330
304
302
306
324
322
310
308
318
314

Fig. 3

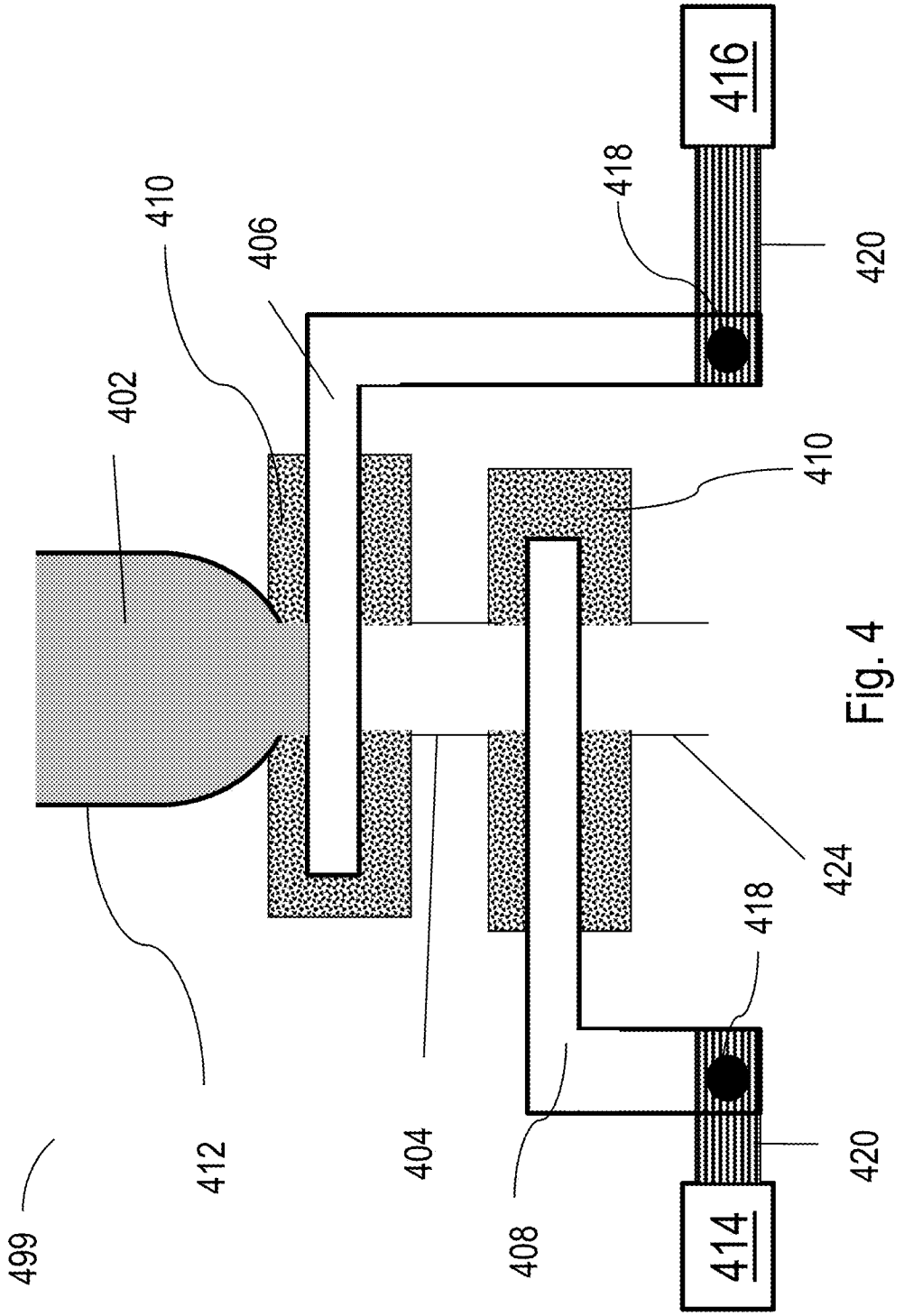


Fig. 4

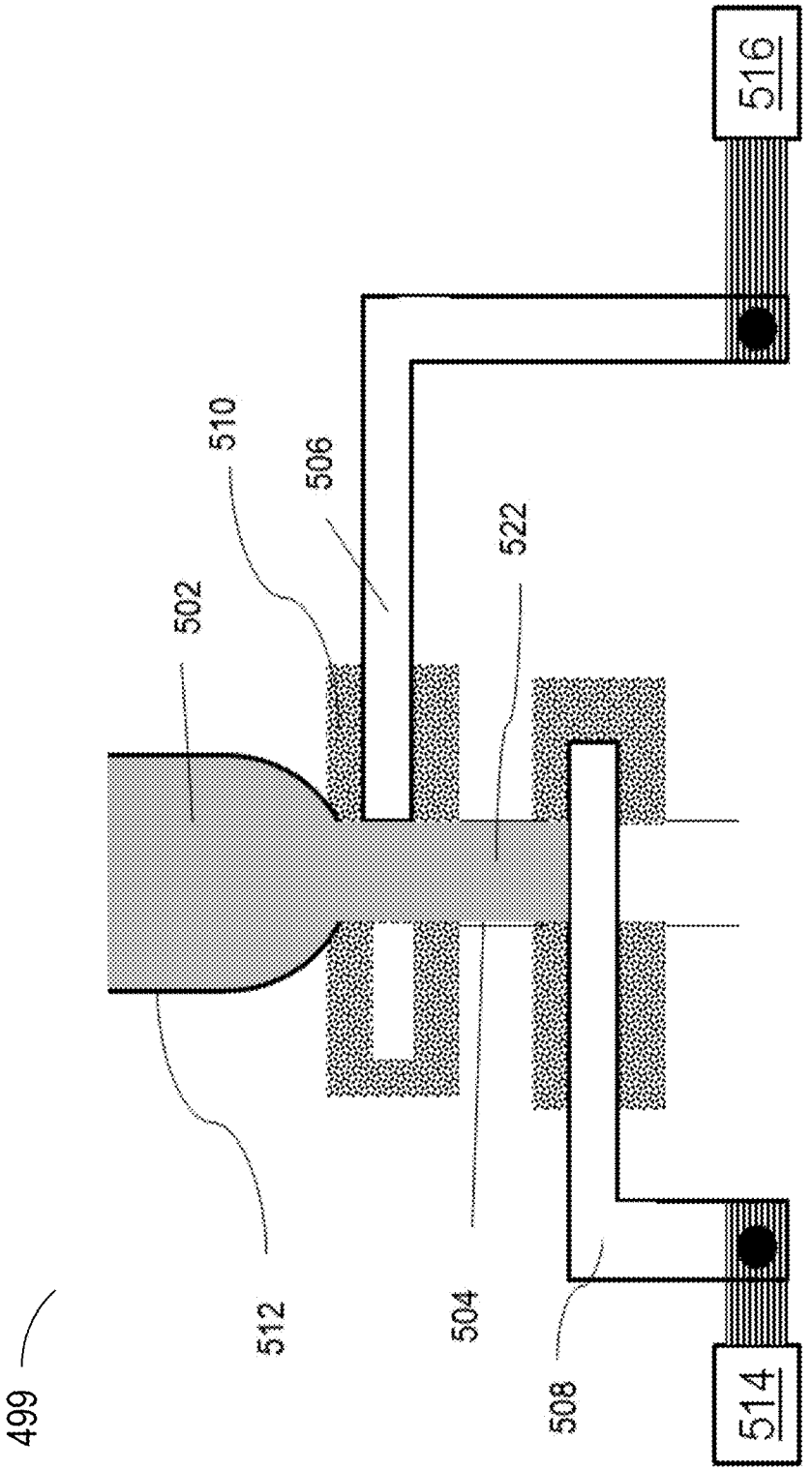


Fig. 5

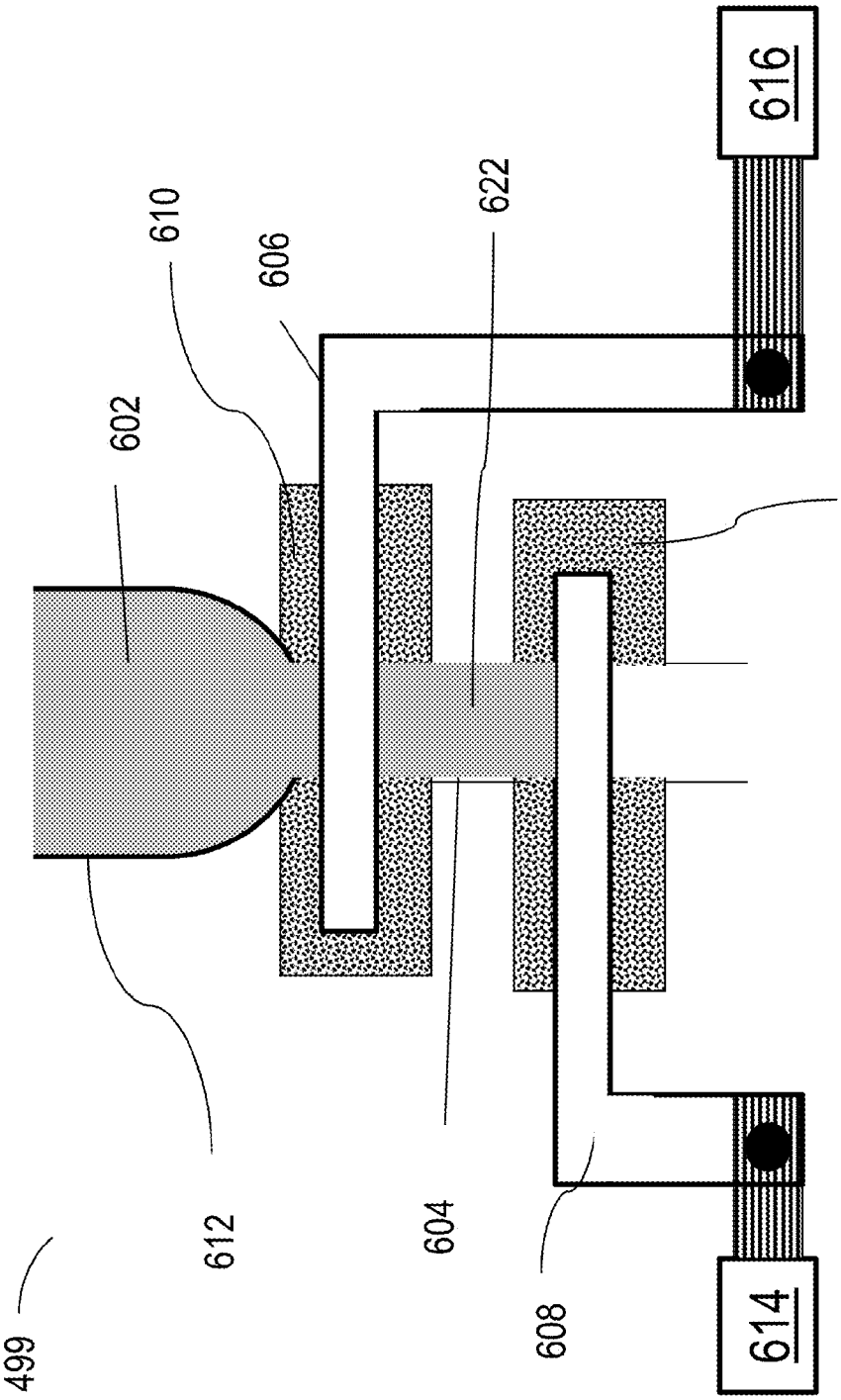


Fig. 6

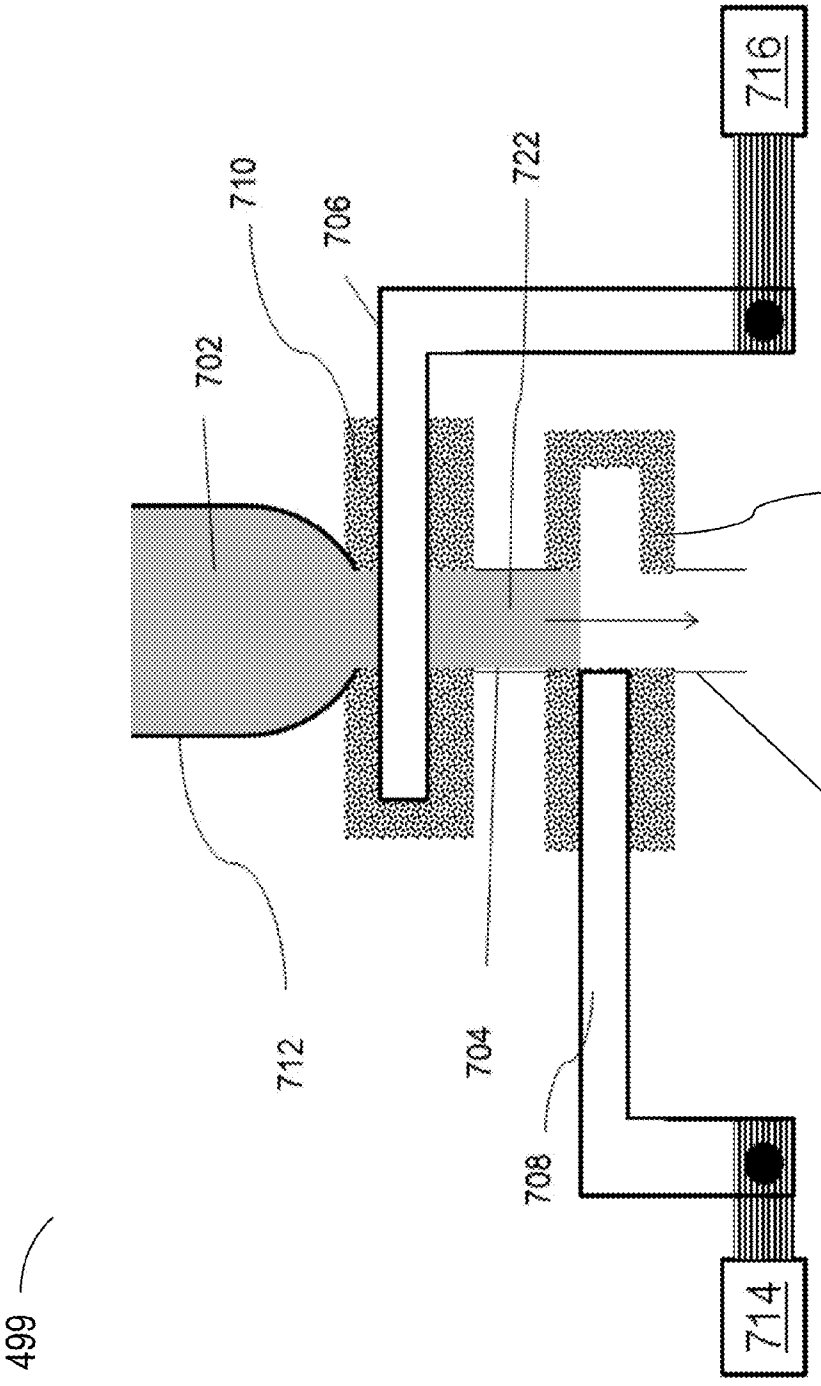


Fig. 7

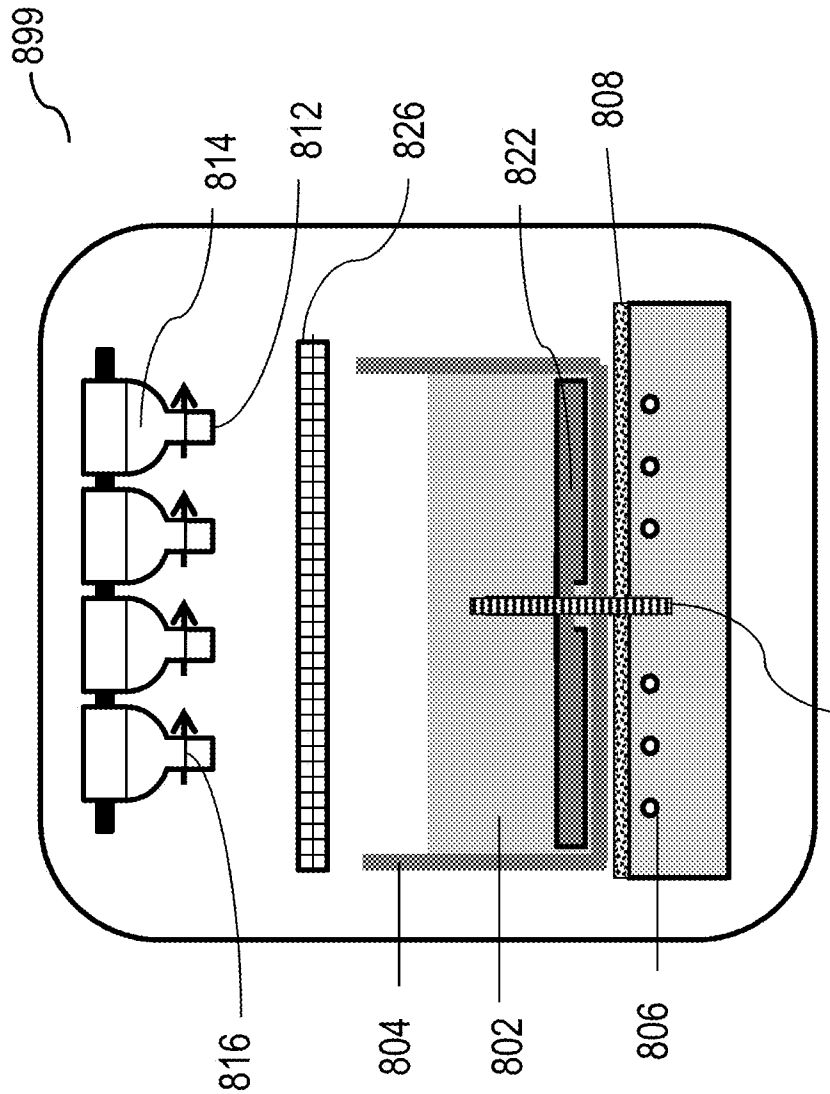


Fig. 8

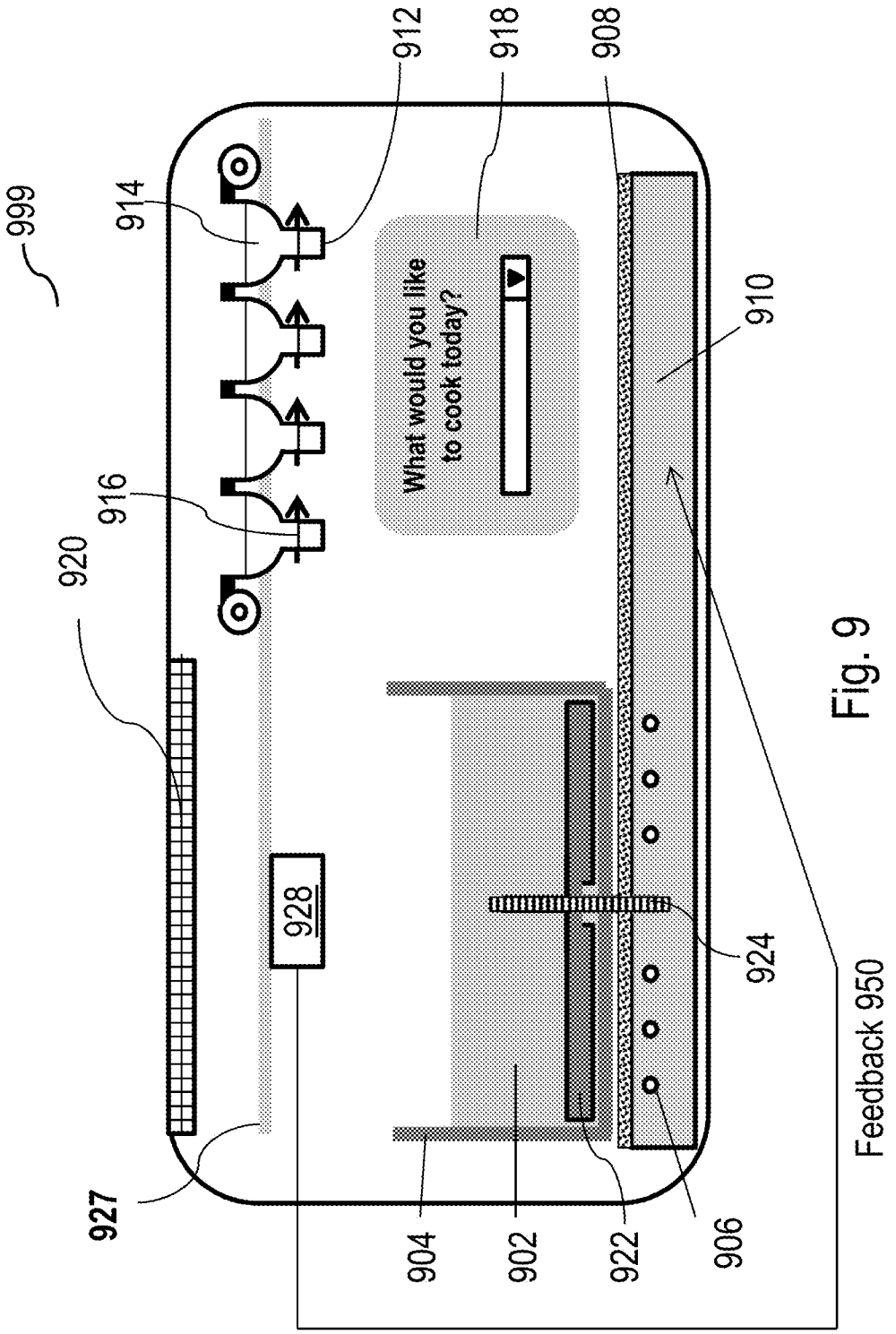

999
914
912
918
908
910
What would you like to cook today?
916
920
928
927
924
904
902
922
906
Feedback 950

Fig. 9

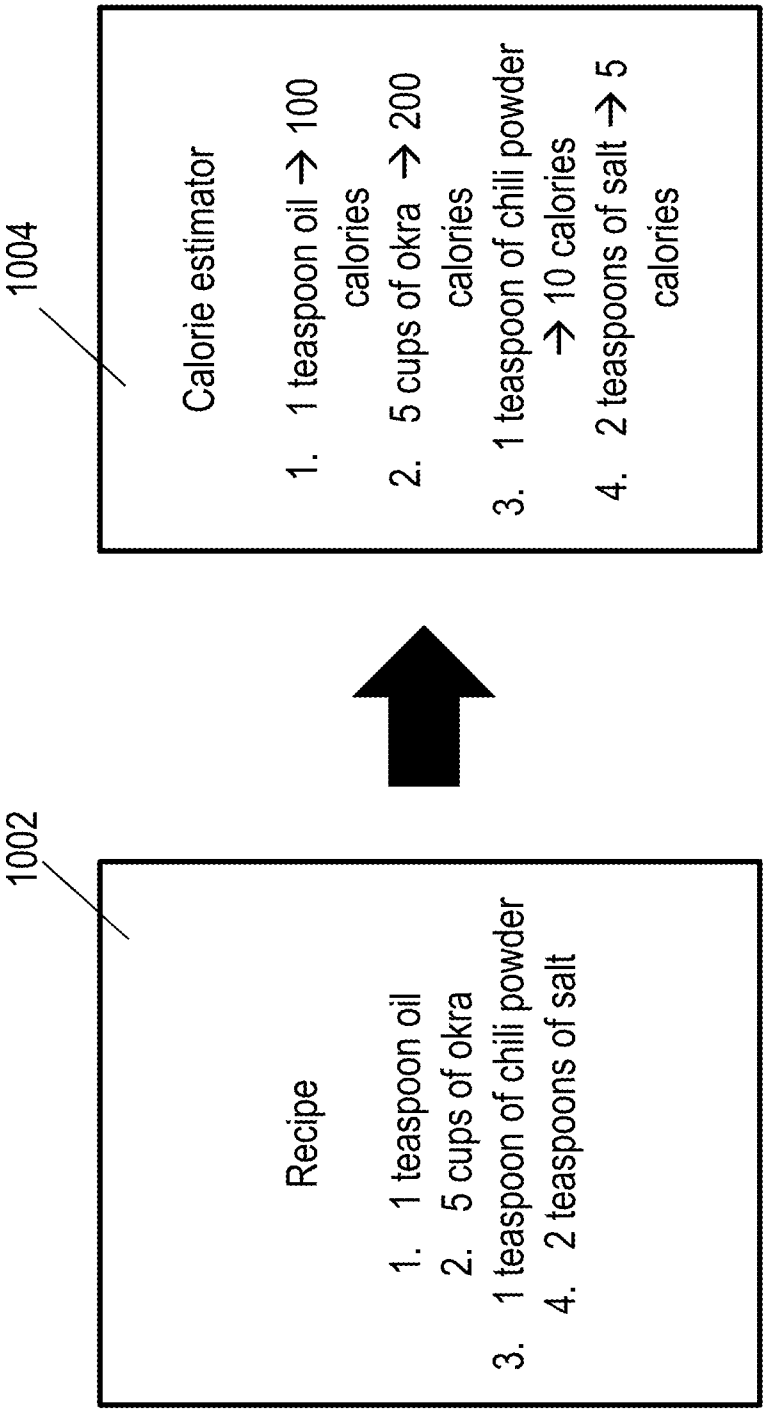

1002
Recipe
1. 1 teaspoon oil
2. 5 cups of okra
3. 1 teaspoon of chili powder
4. 2 teaspoons of salt
1004
Calorie estimator
1. 1 teaspoon oil → 100 calories
2. 5 cups of okra → 200 calories
3. 1 teaspoon of chili powder → 10 calories
4. 2 teaspoons of salt → 5 calories

Fig. 10

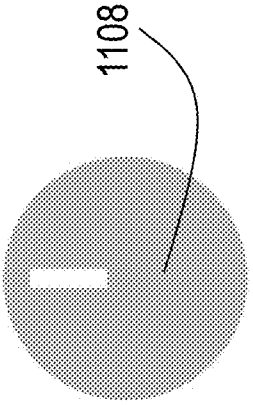


Fig. 12

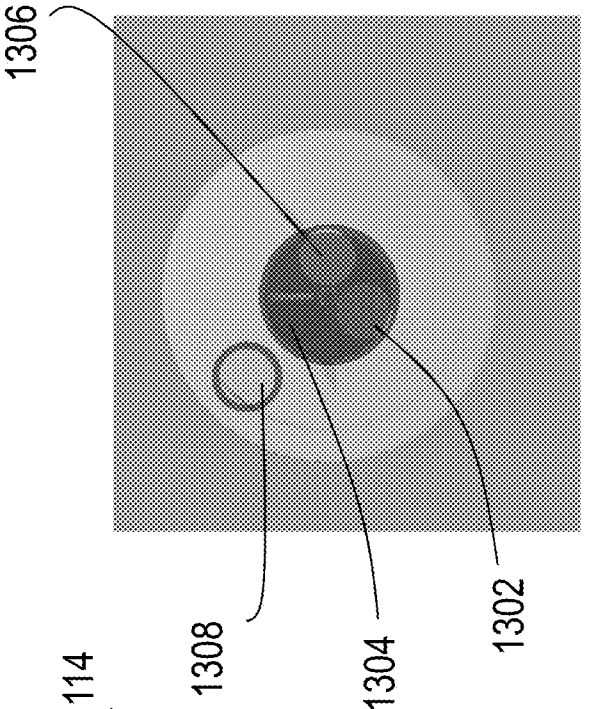


Fig. 13

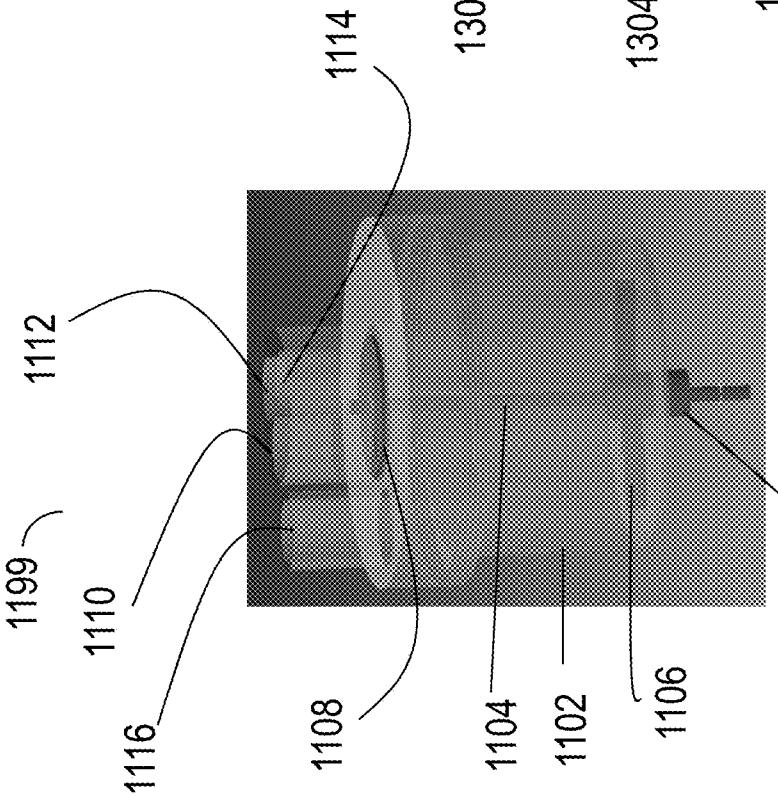


Fig. 11

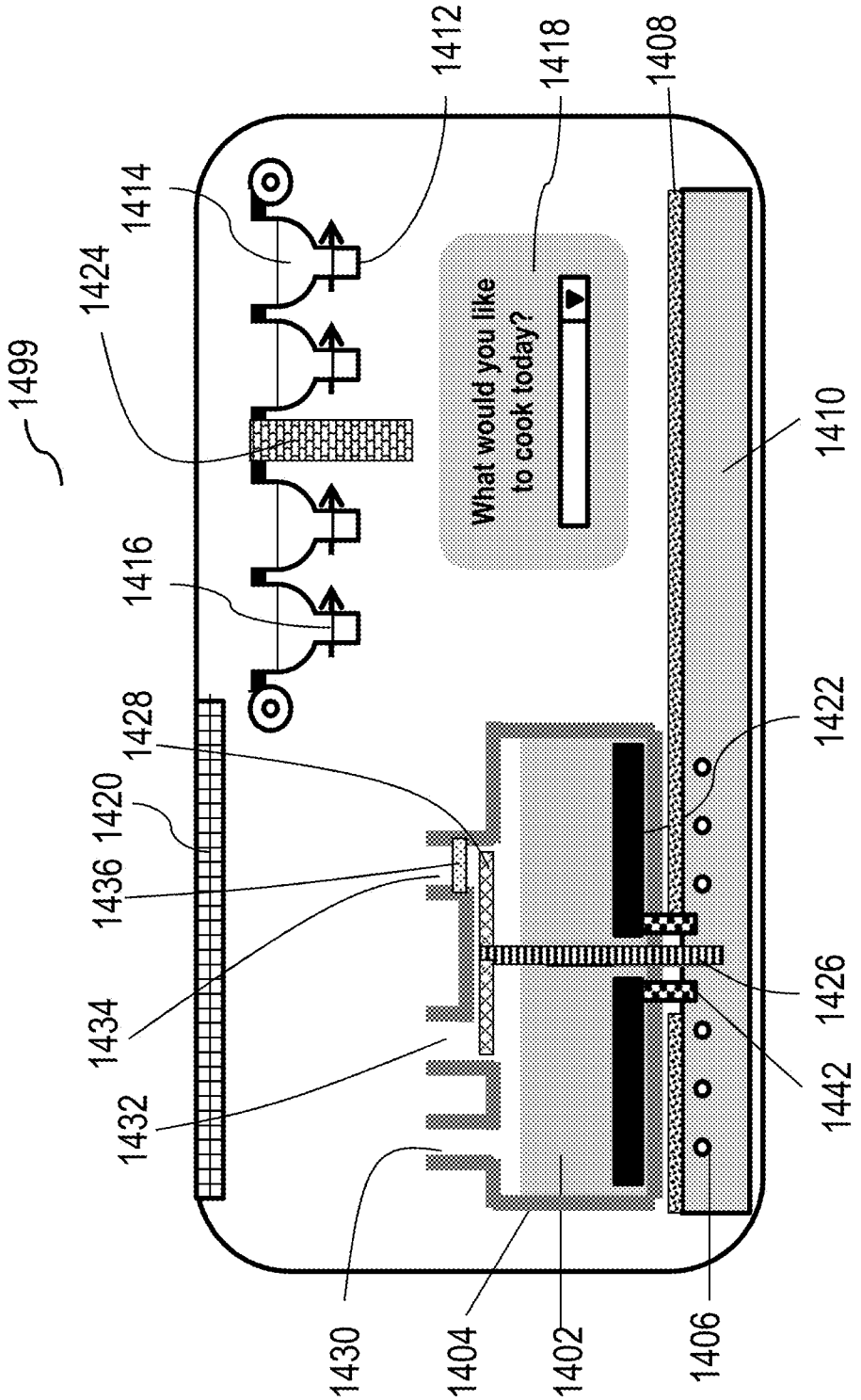

1499
1414
1424
1416
1428
1420
1436
1434
1432
1412
1418
1408
What would you like to cook today?
1410
1422
1426
1442
1430
1404
1402
1406

Fig. 14

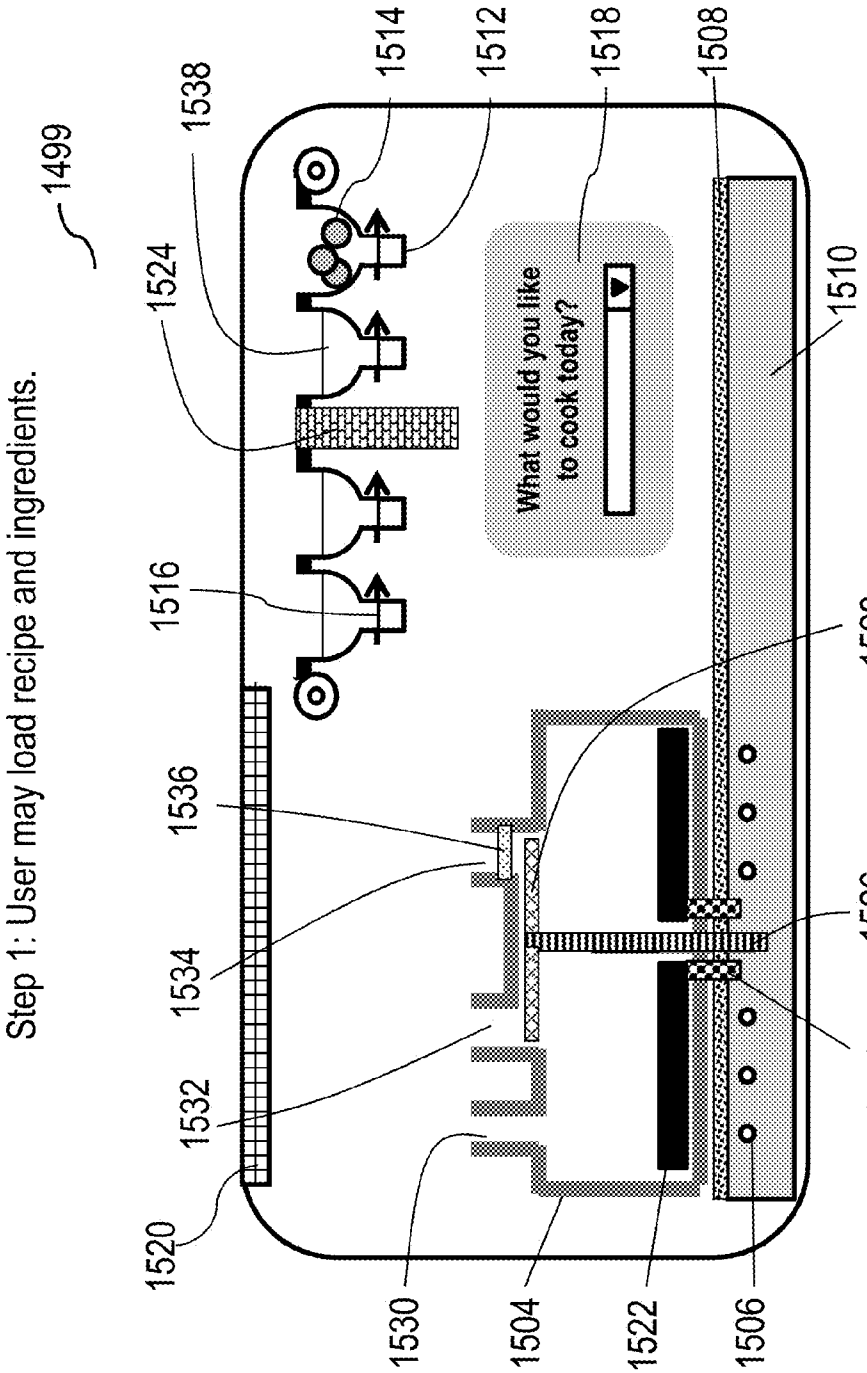

Step 1: User may load recipe and ingredients.
1499
1538
1514
1512
1518
1508
1524
What would you like to cook today?
1510
1516
1528
1536
1534
1526
1532
1542
1520
1530
1504
1522
1506

Fig. 15

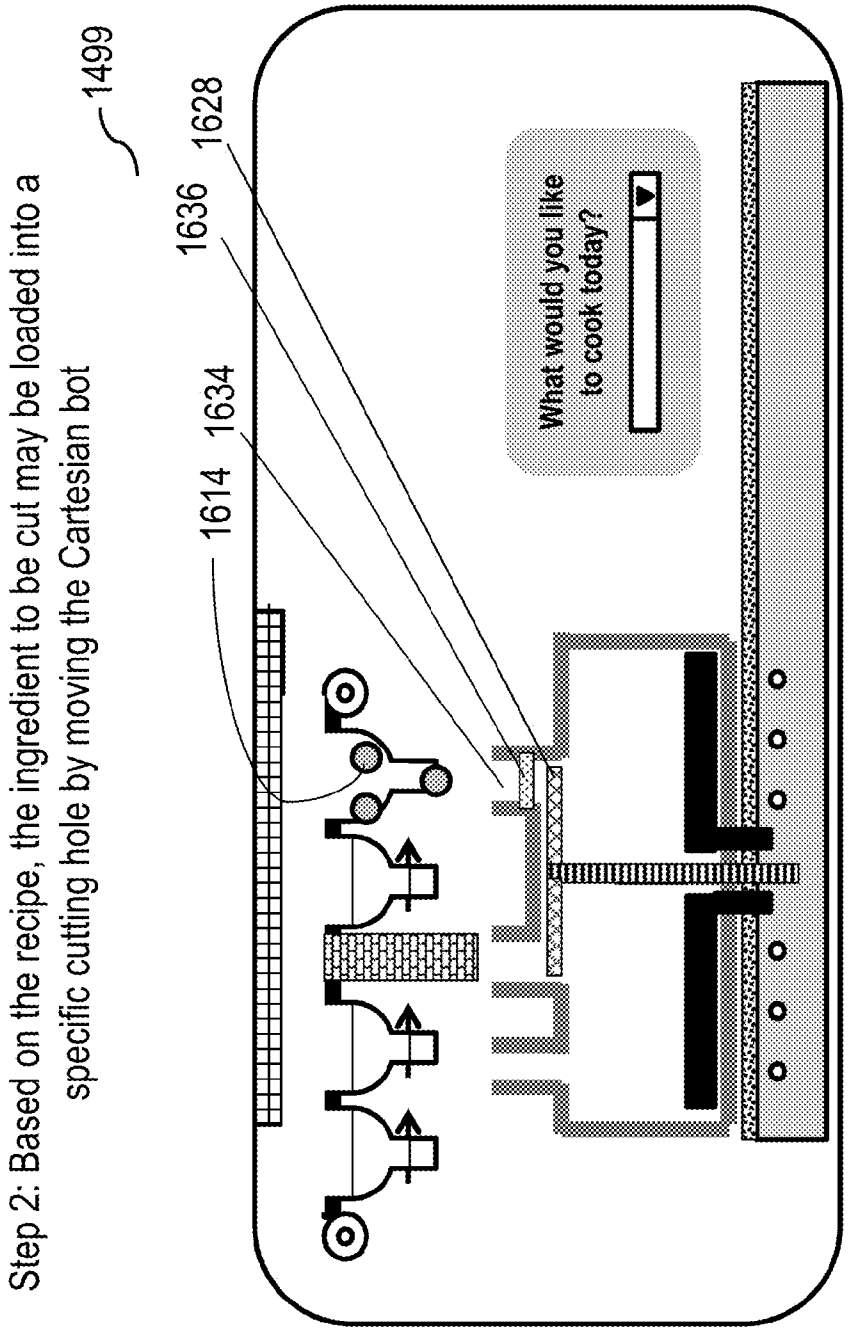

Step 2: Based on the recipe, the ingredient to be cut may be loaded into a specific cutting hole by moving the Cartesian bot
1499
1628
1636
1634
1614
What would you like to cook today?

Fig. 16

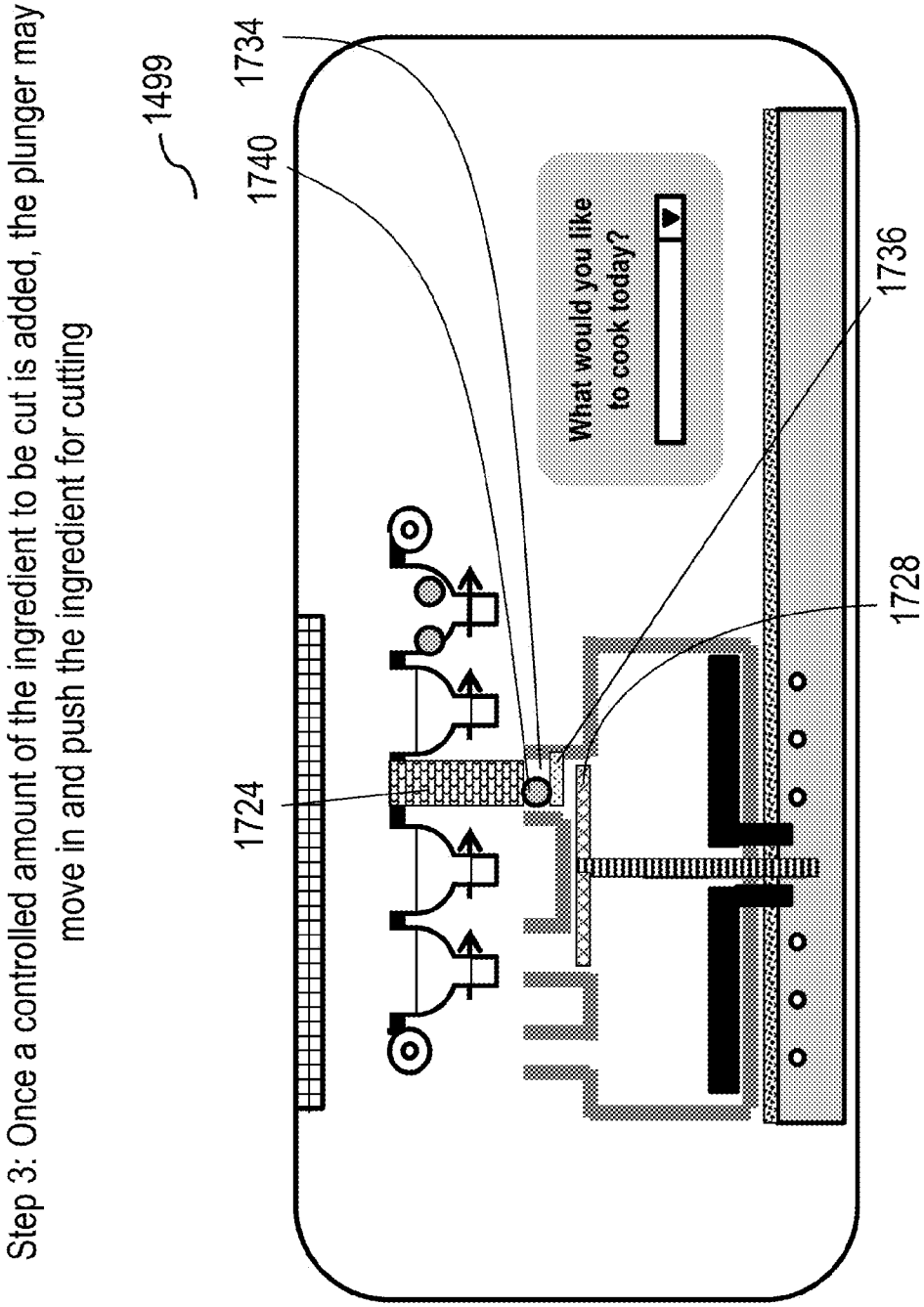

Step 3: Once a controlled amount of the ingredient to be cut is added, the plunger may move in and push the ingredient for cutting
1499
1734
1740
1724
1736
1728
What would you like to cook today?

Fig. 17

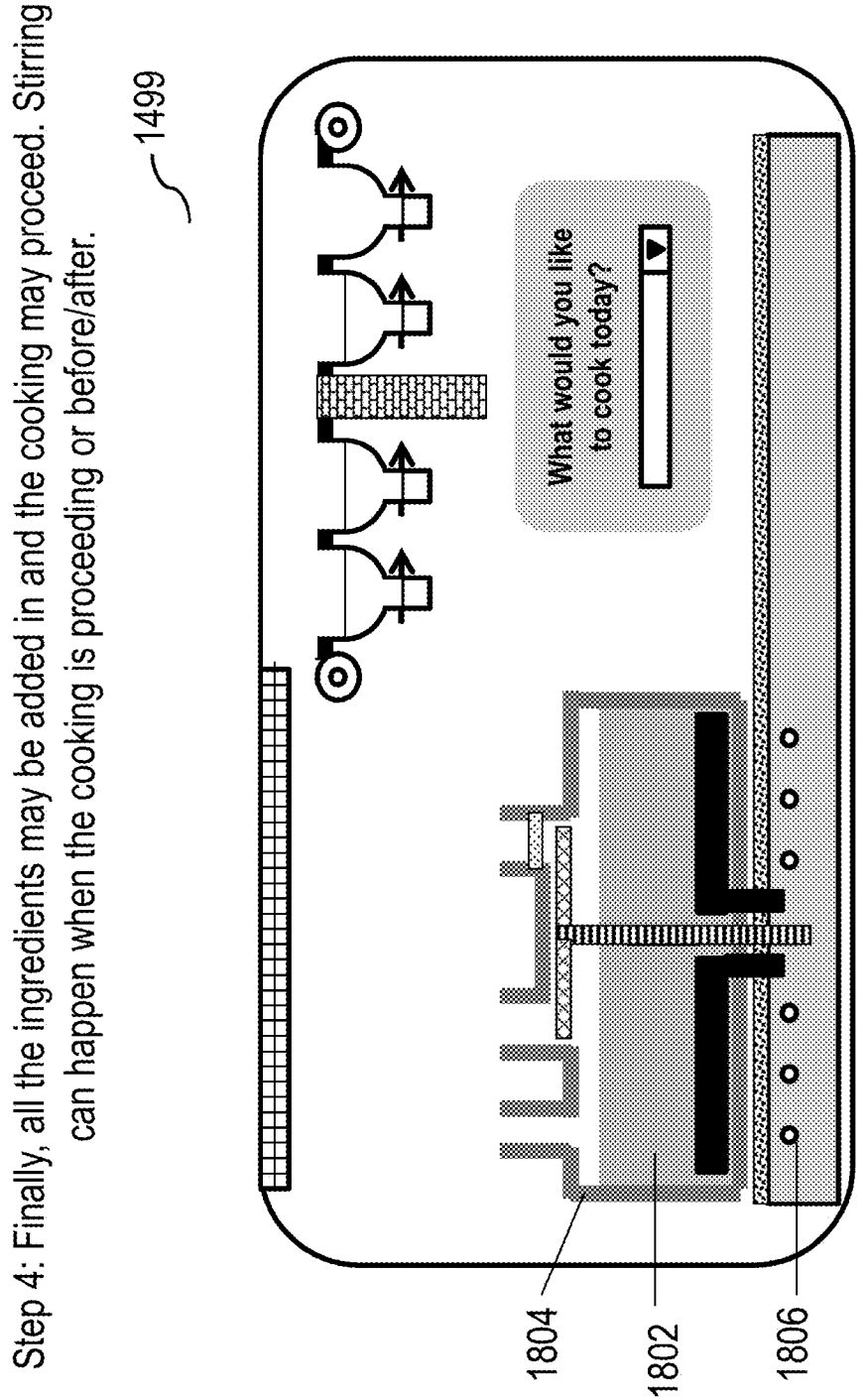

Step 4: Finally, all the ingredients may be added in and the cooking may proceed. Stirring can happen when the cooking is proceeding or before/after.
1499
What would you like to cook today?
1804
1802
1806

Fig. 18

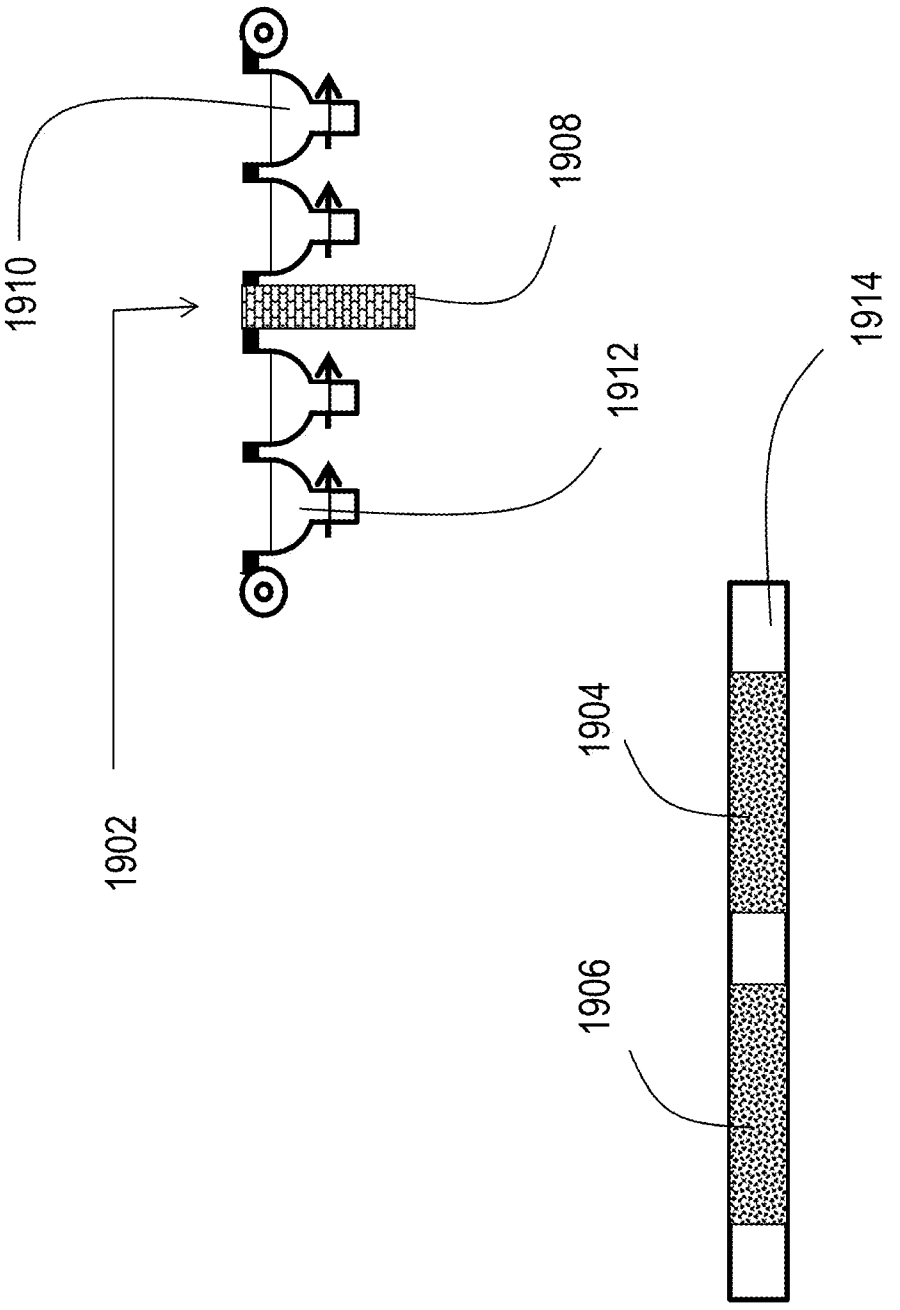


Fig. 19

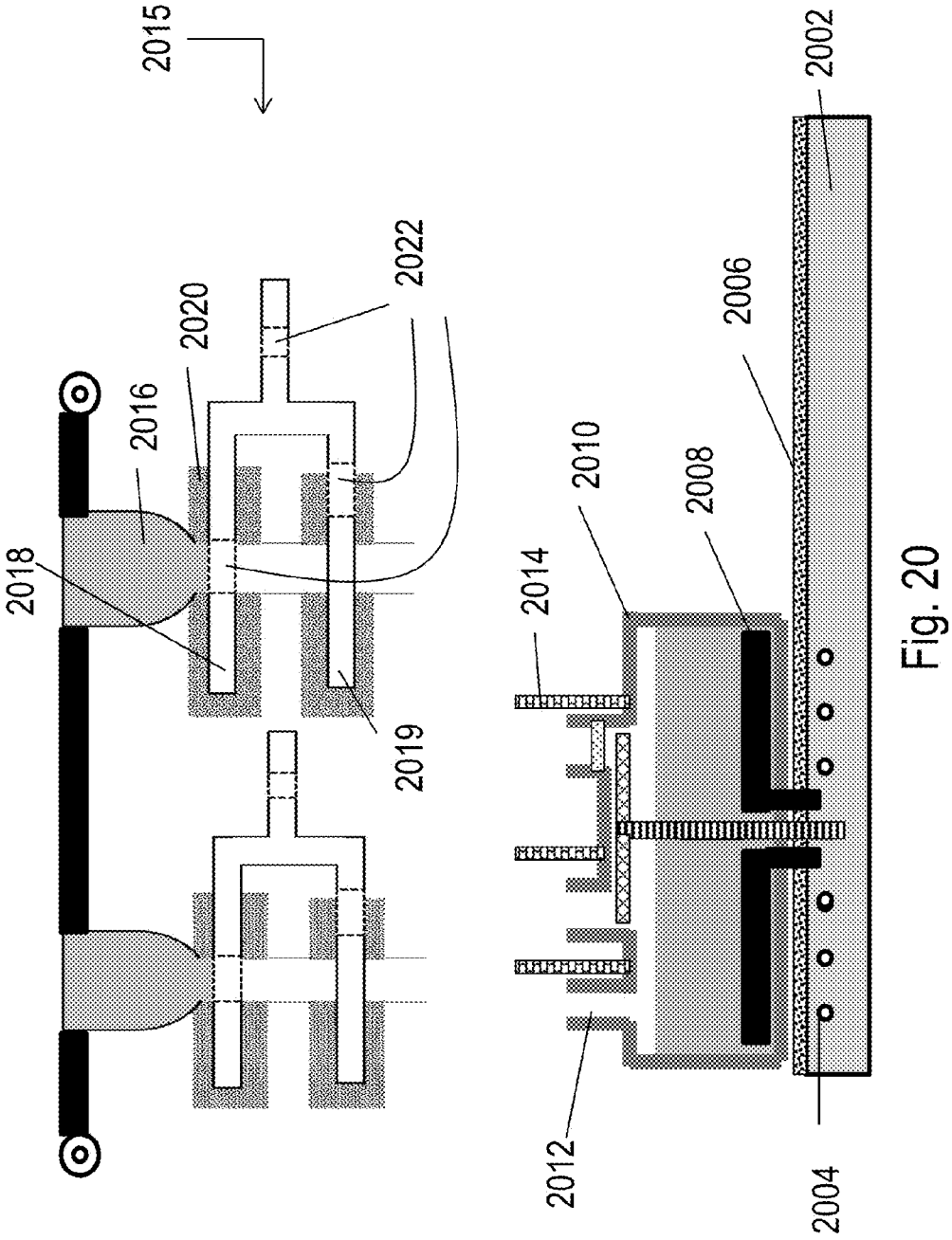
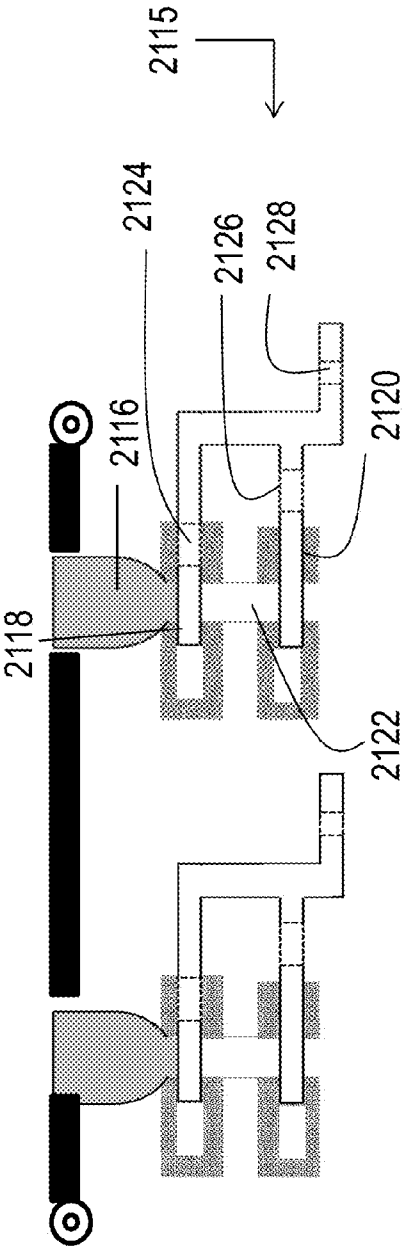

2015
2022
2020
2016
2018
2019
2002
2006
2010
2008
2014
2012
2004

Fig. 20



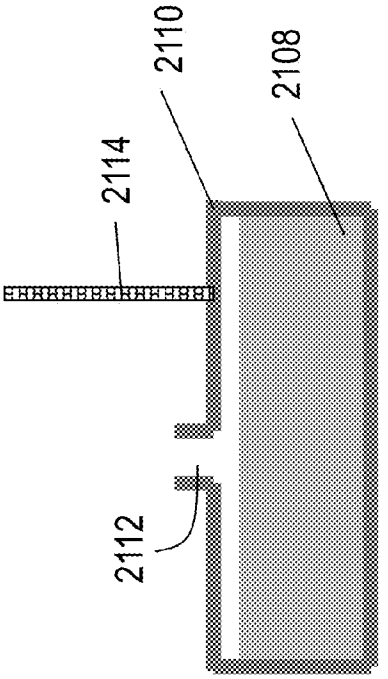


Fig. 21

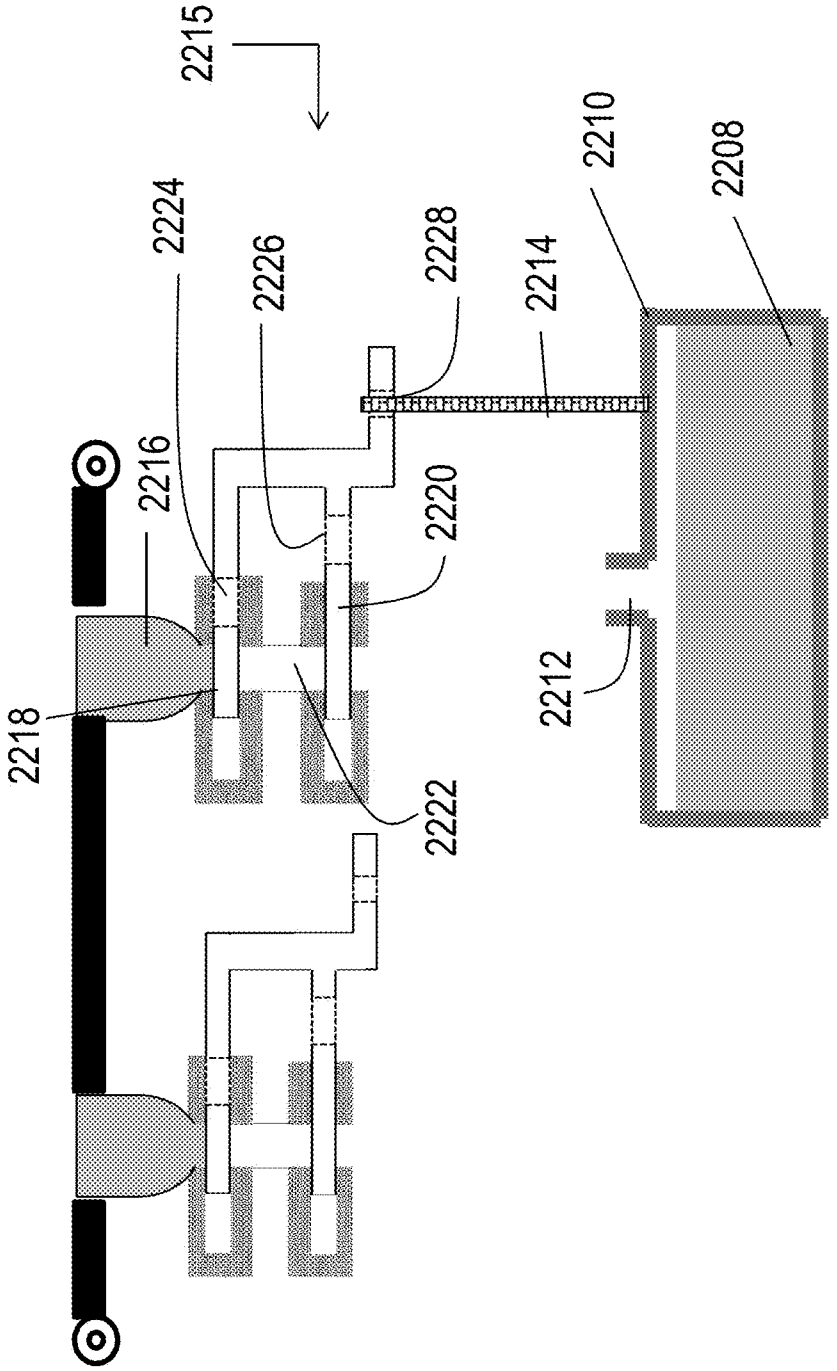


Fig. 22

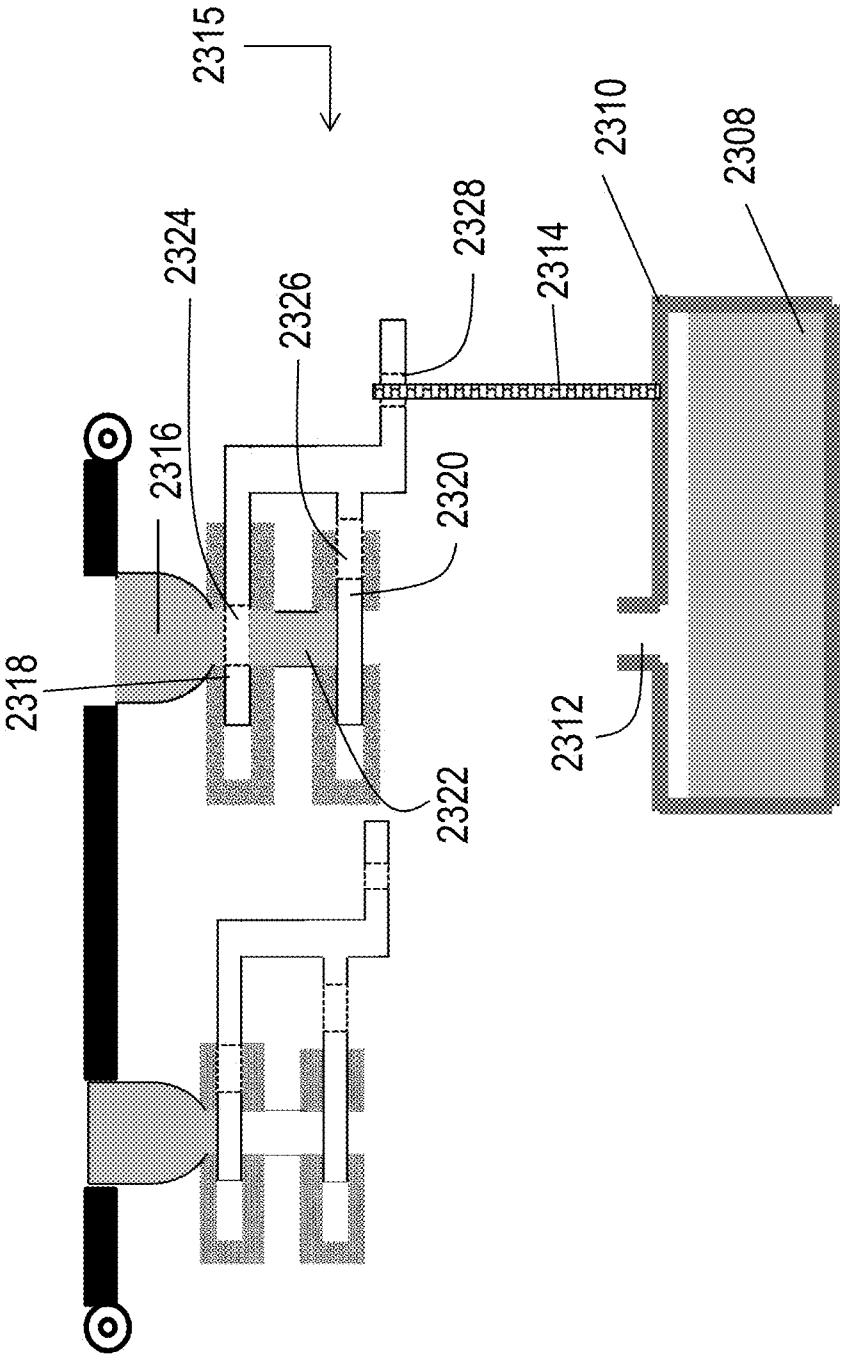


Fig. 23

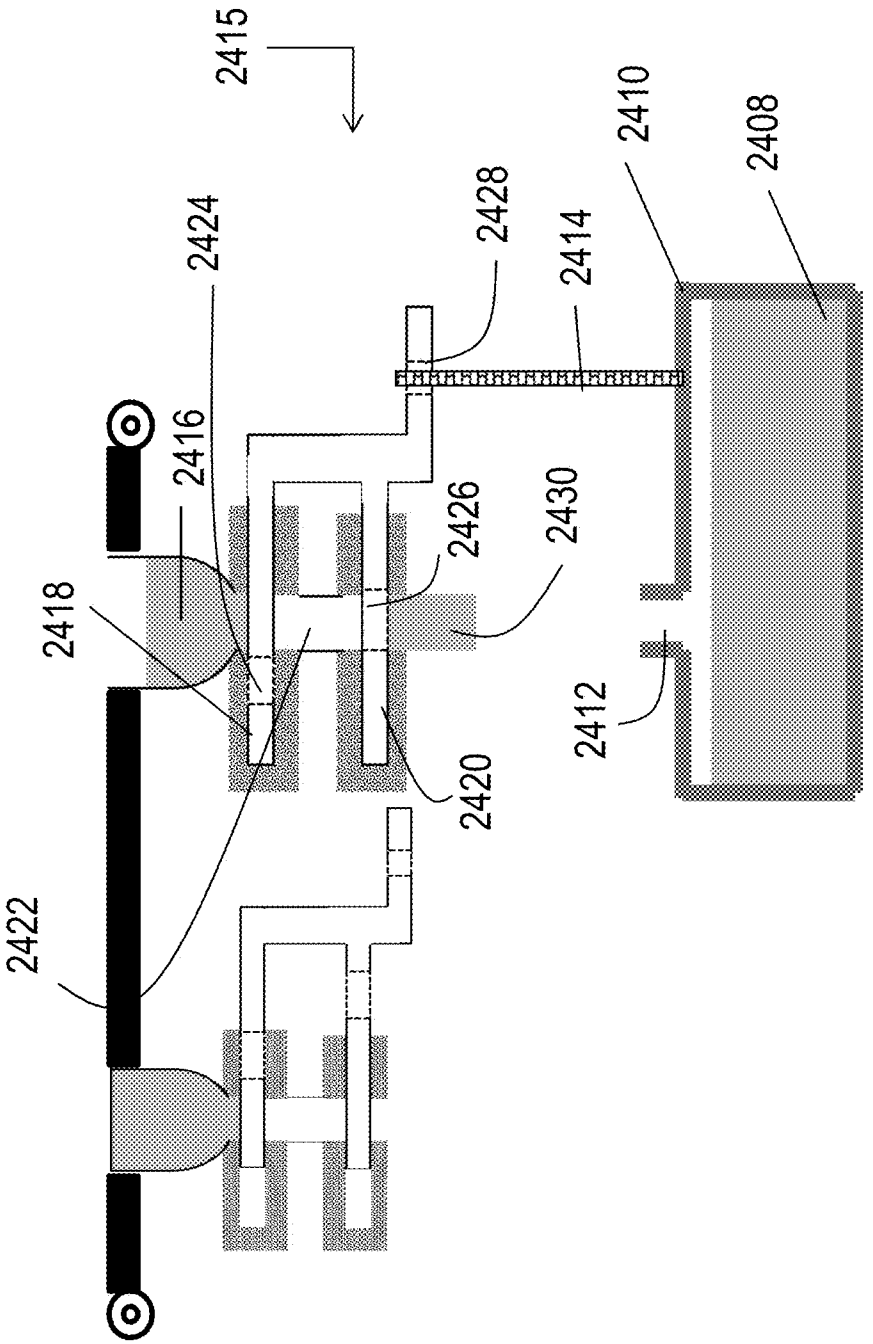

2415
2410
2408
2424
2428
2414
2416
2426
2430
2418
2412
2420
2422

Fig. 24

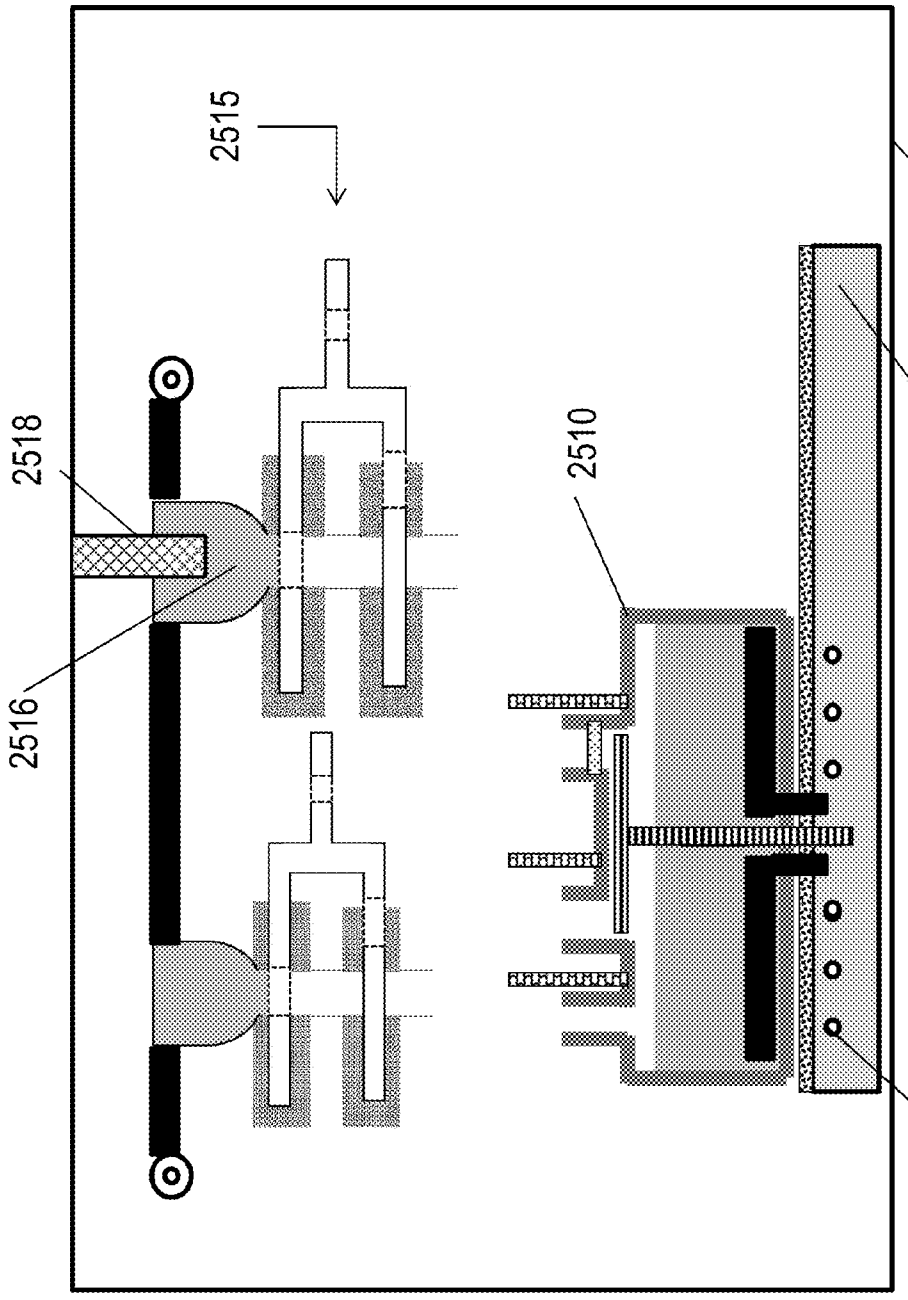


Fig. 25

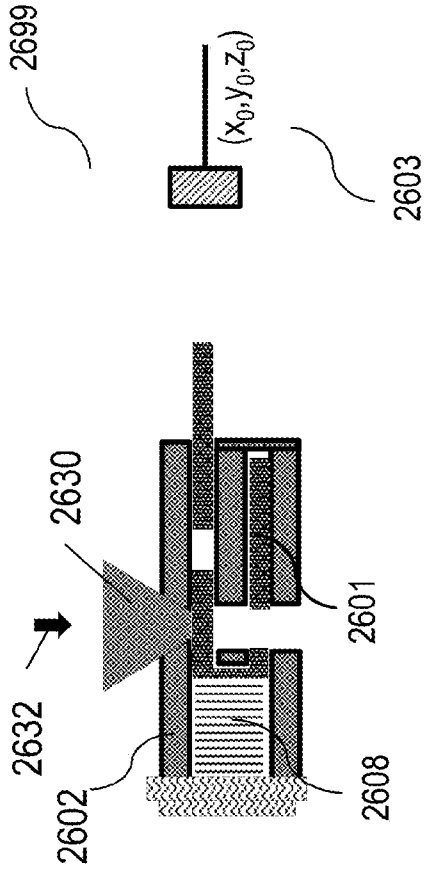


Fig. 26A

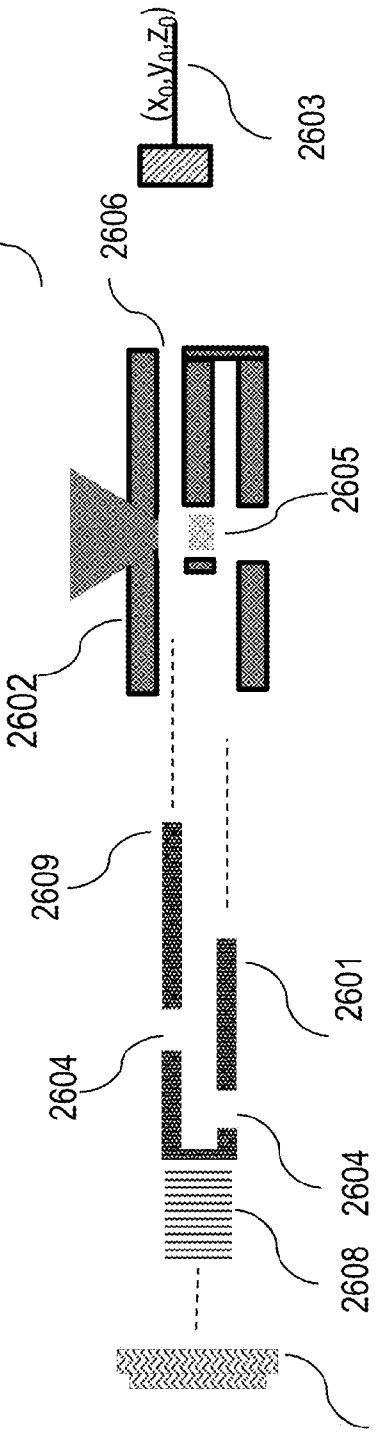


Fig. 26B

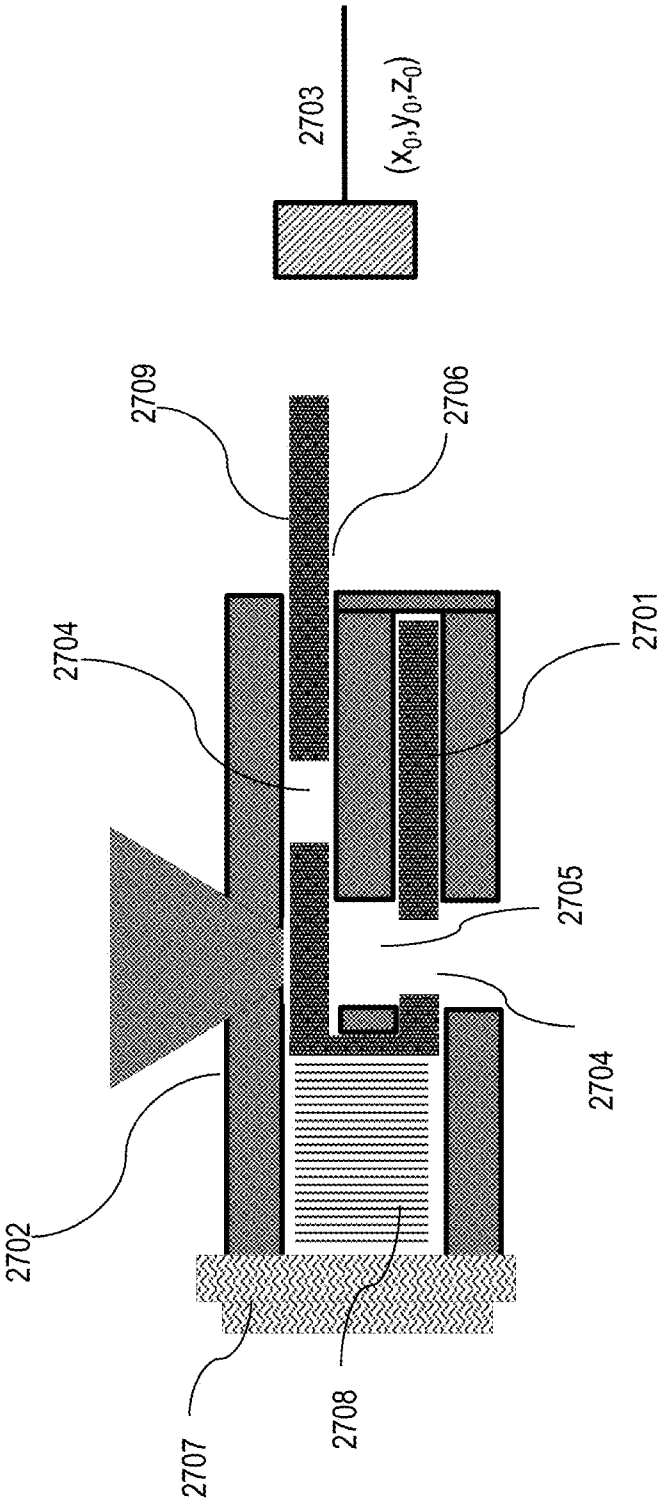


Fig. 27

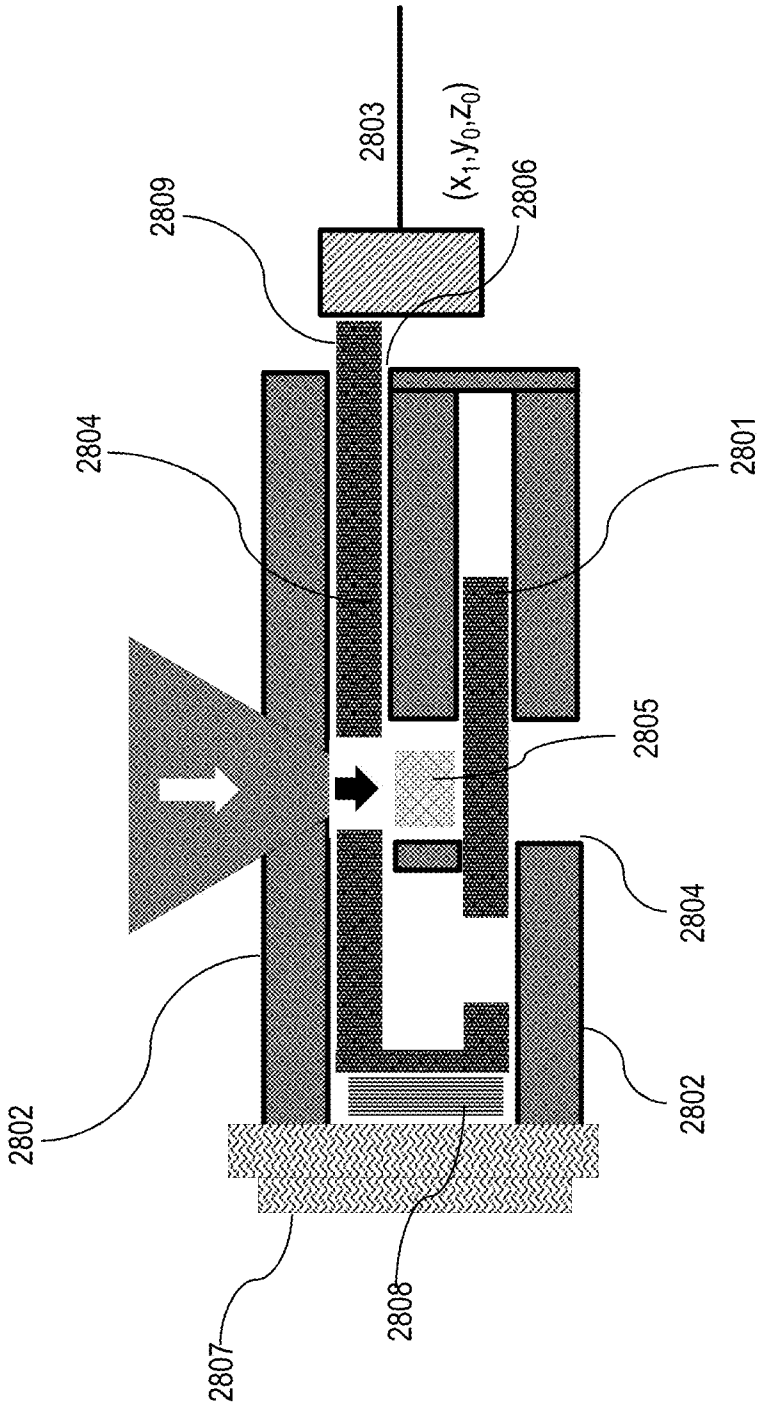

2803
(x_1, y_0, z_0)
2806
2809
2804
2801
2805
2804
2802
2802
2807
2808

Fig. 28

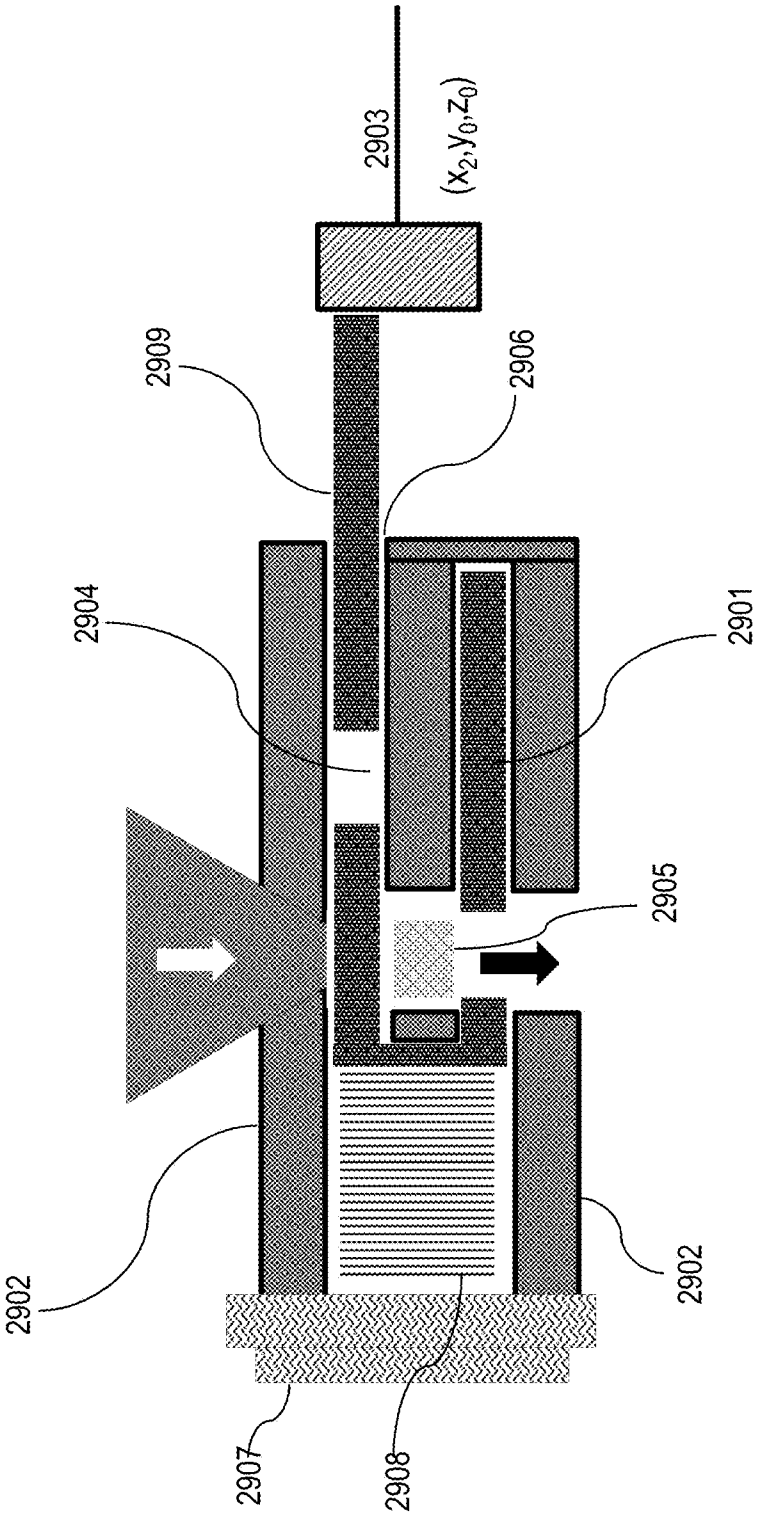


Fig. 29

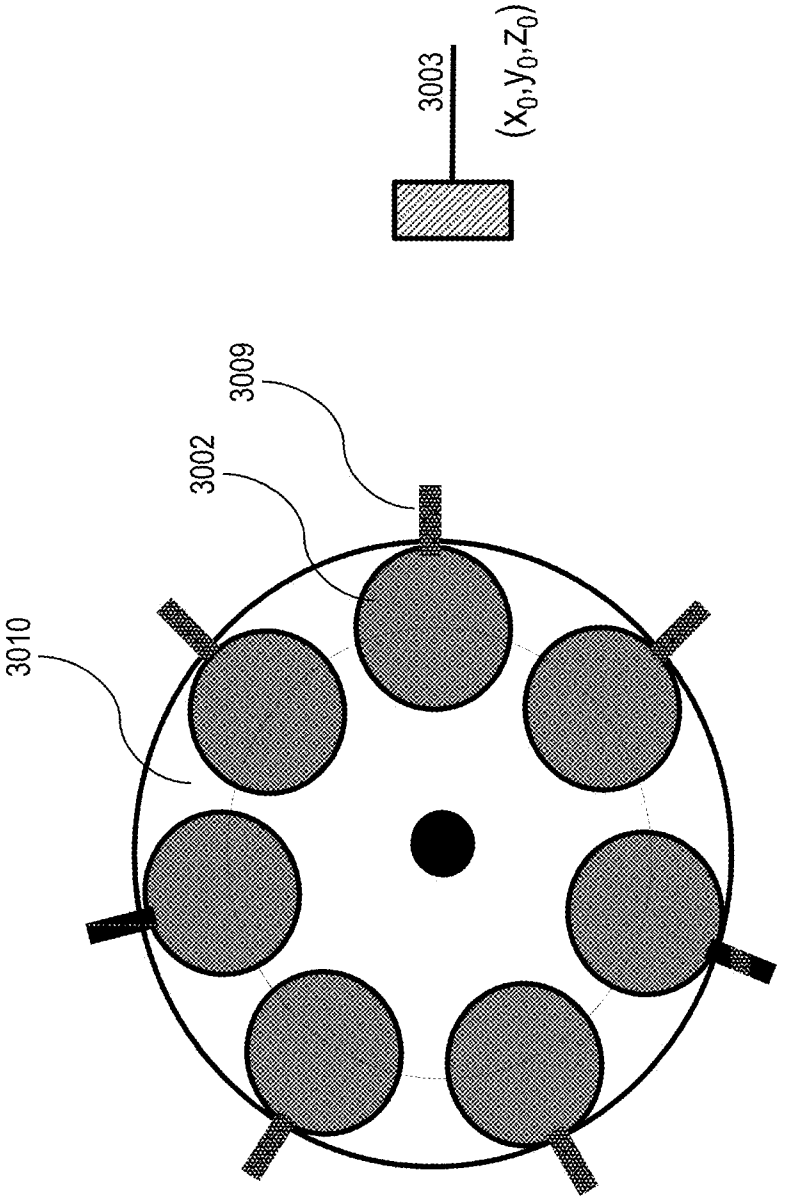


Fig. 30

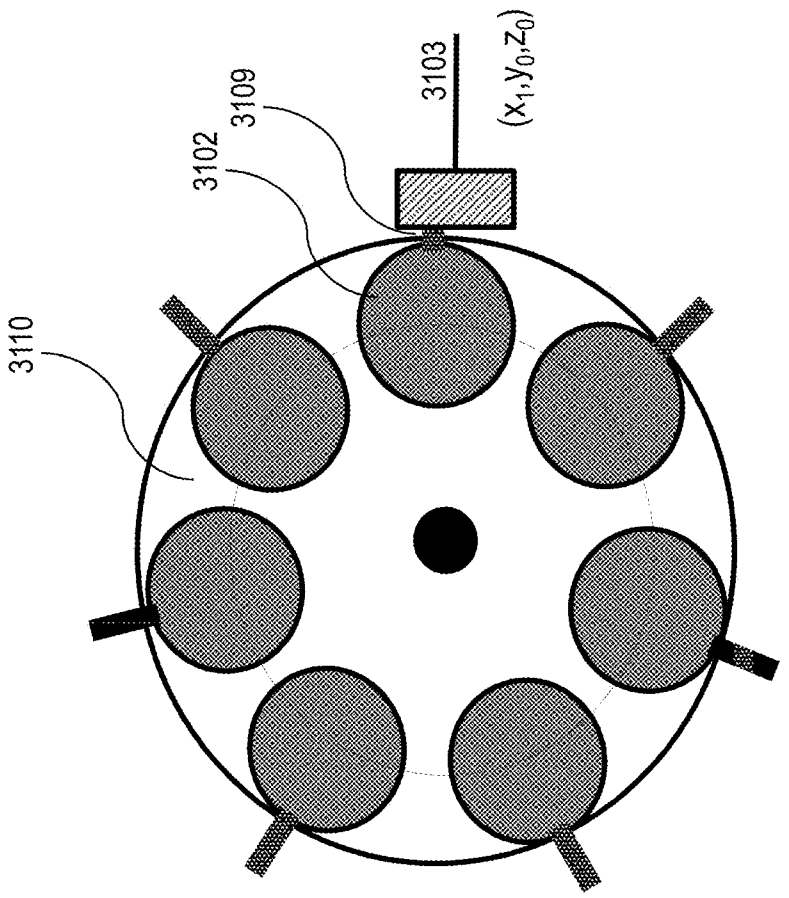


Fig. 31

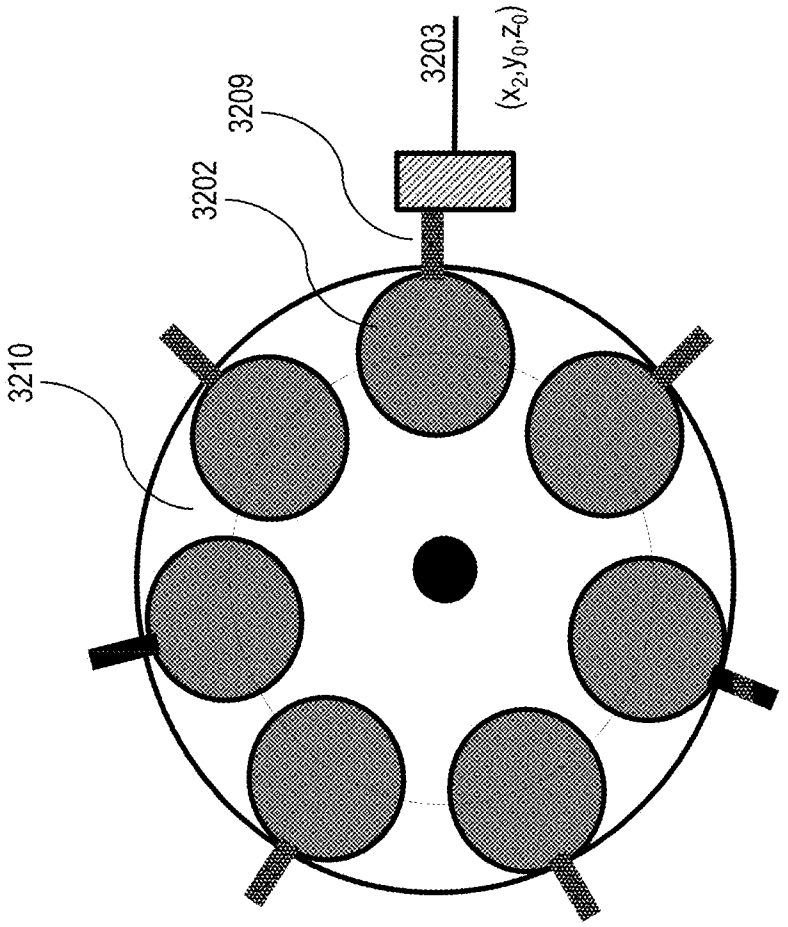


Fig. 32

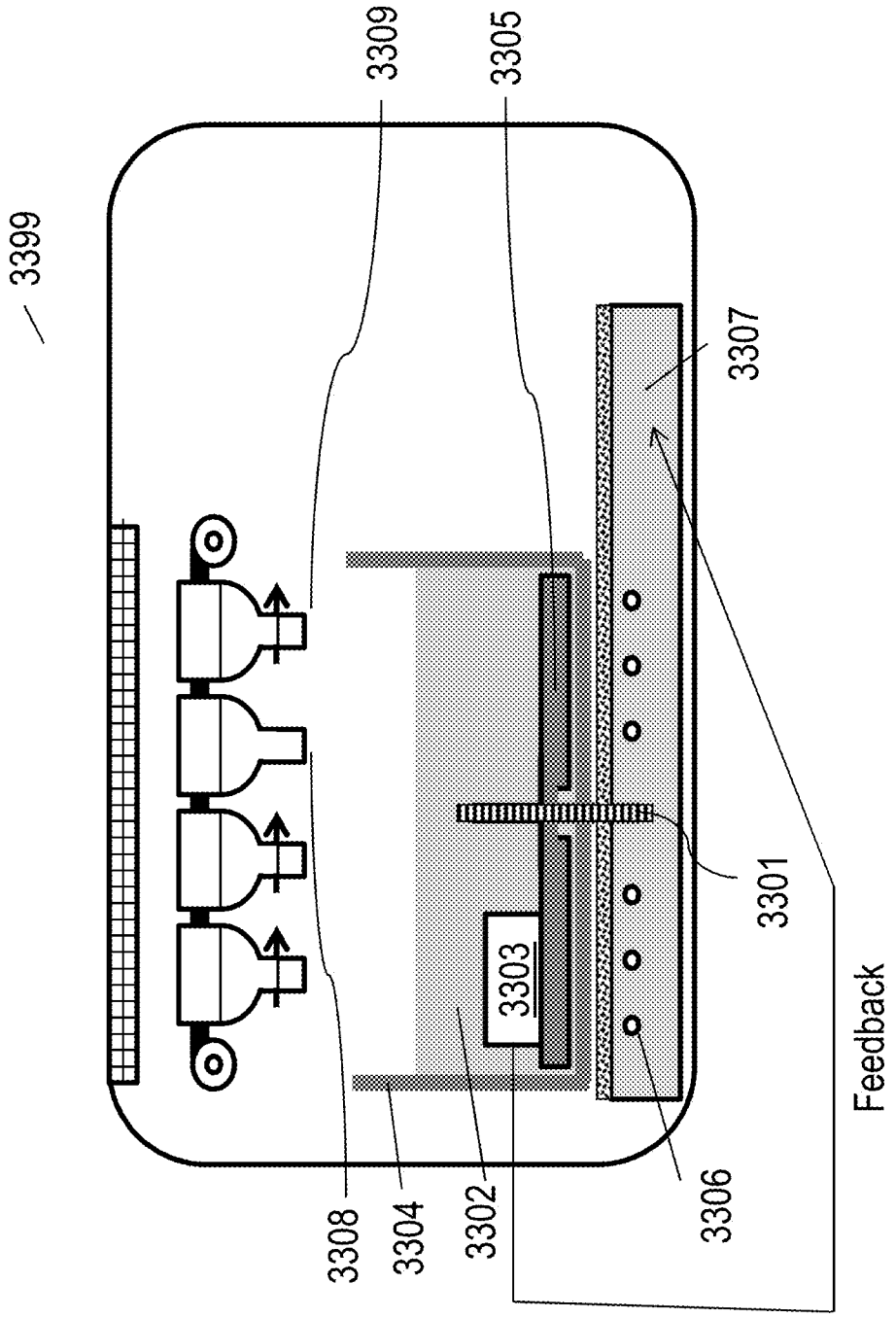


Fig. 33

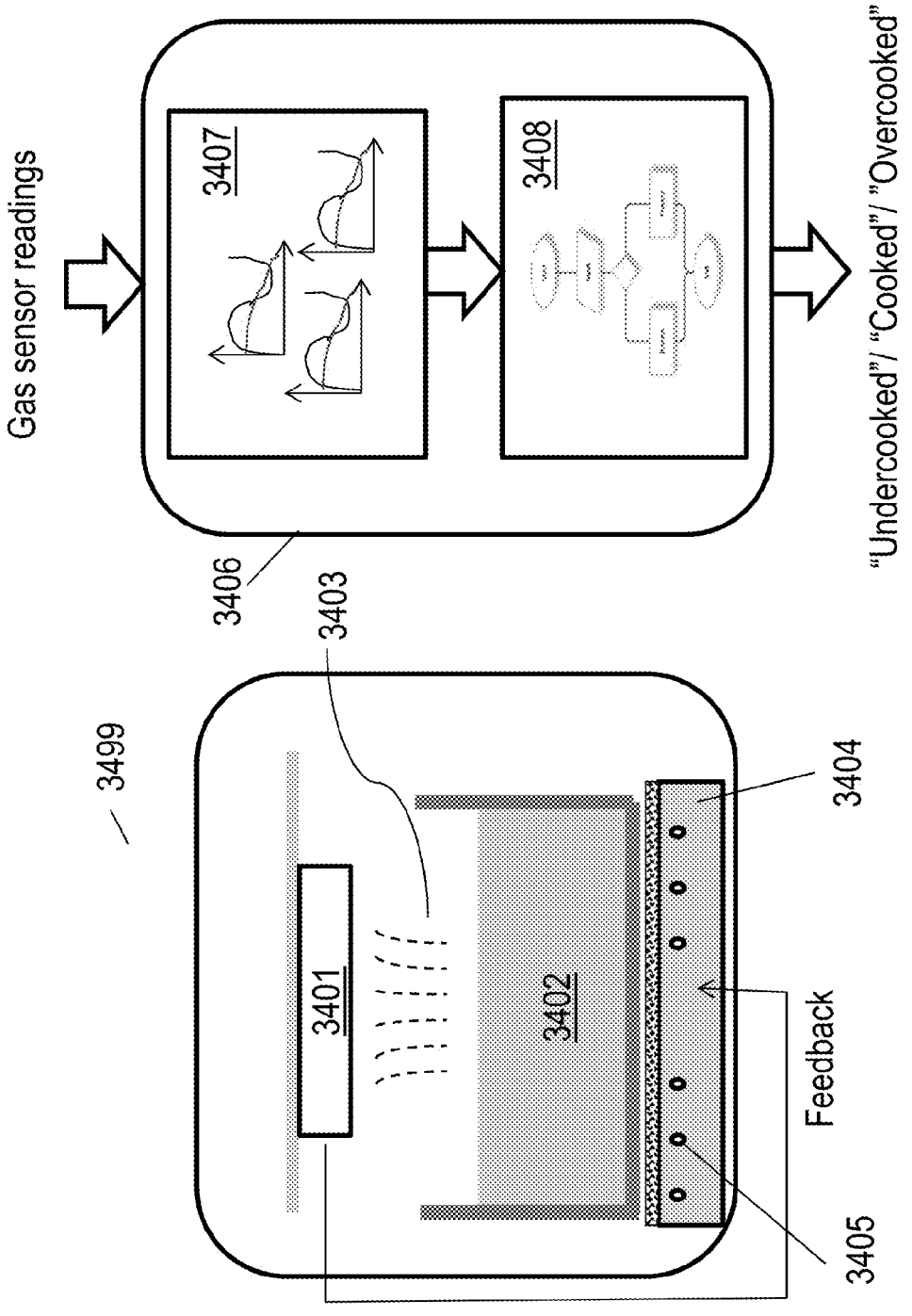

Gas sensor readings
3407
3408
"Undercooked"/ "Cooked"/ "Overcooked"
3406
3403
3499
3404
3401
3402
Feedback
3405

Fig. 34

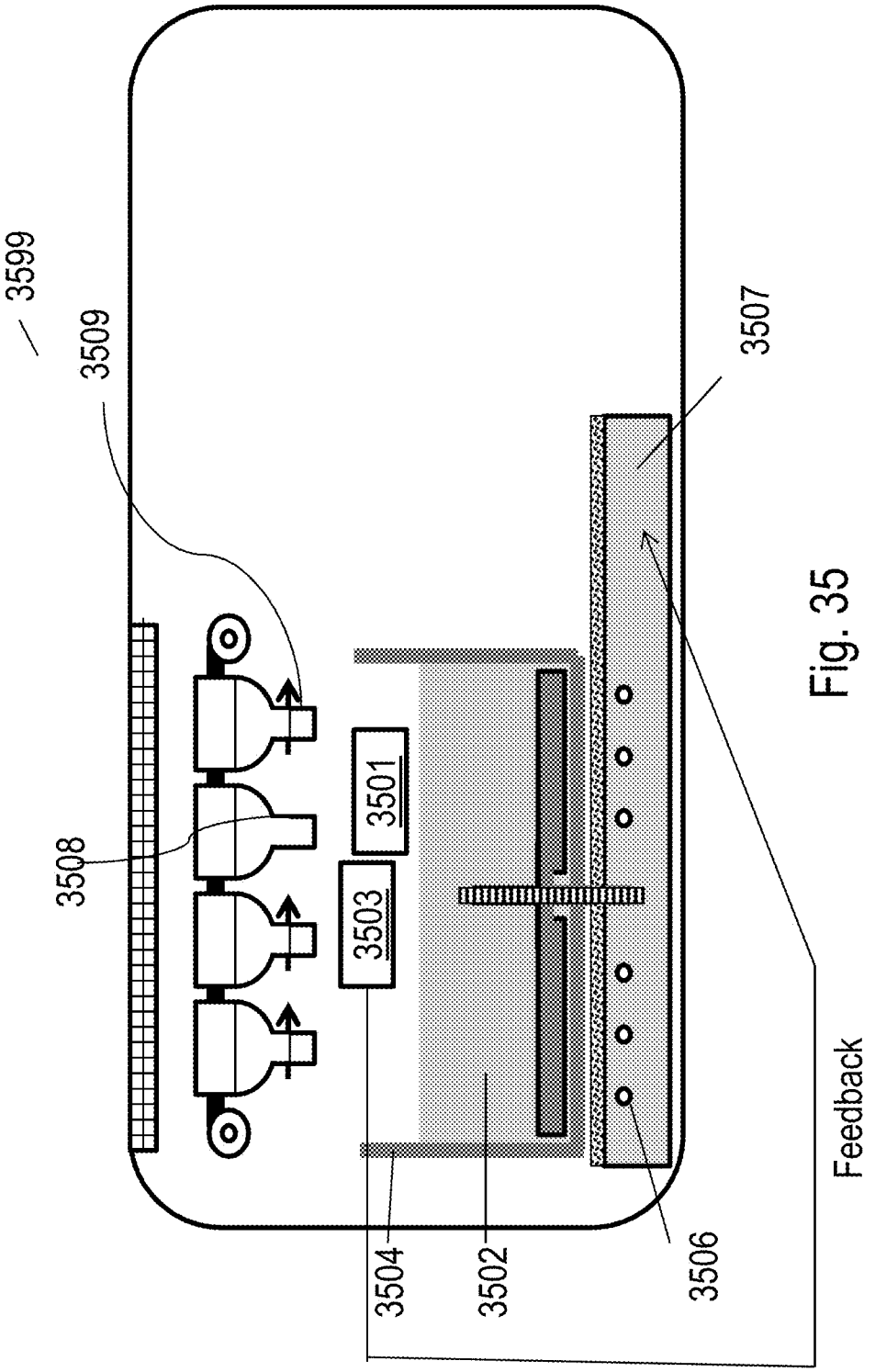


Fig. 35

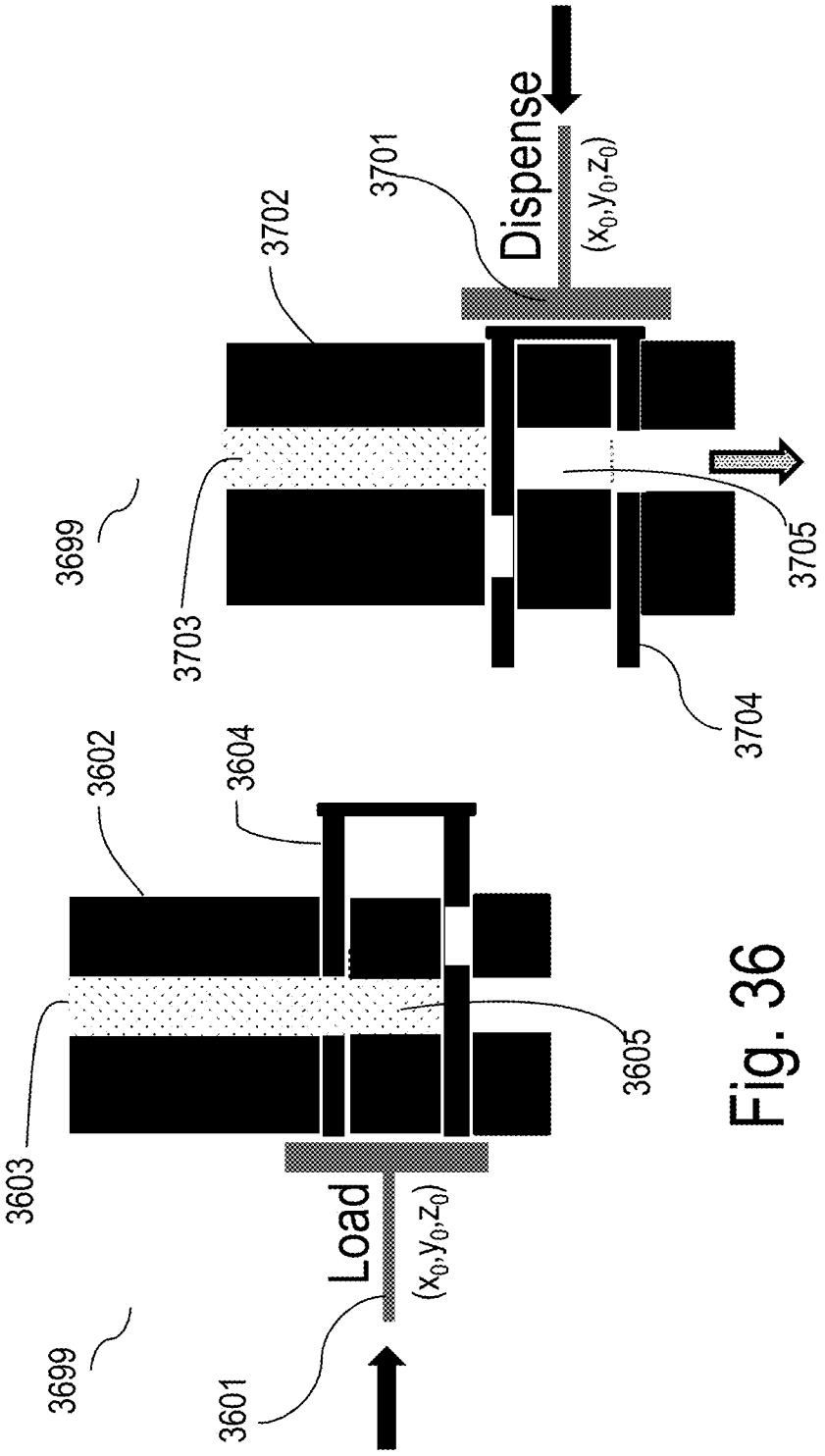

Dispense
(x_0,y_0,z_0)
3701
3702
3699
3703
3705
3704
3602
3604
3603
3605
Load
(x_0,y_0,z_0)
3699
3601

Fig. 36

Fig. 37

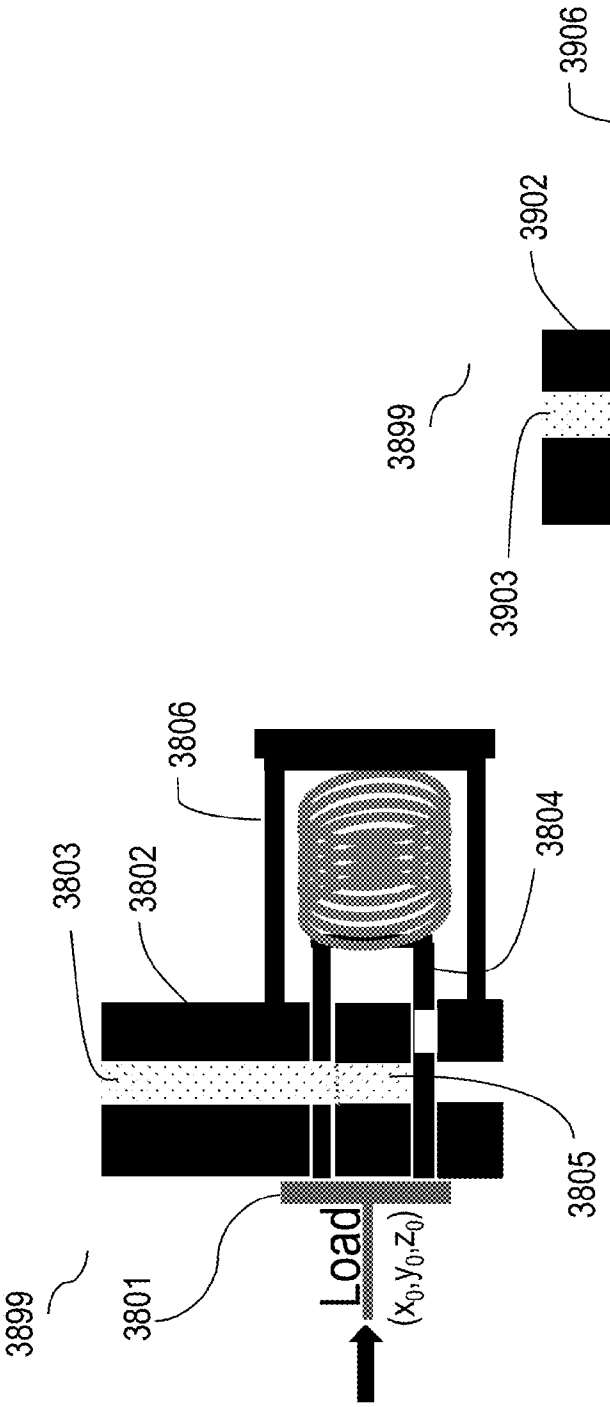

3899
3801
Load
(x_0,y_0,z_0)
3805
3804
3803
3802
3806

Fig. 38

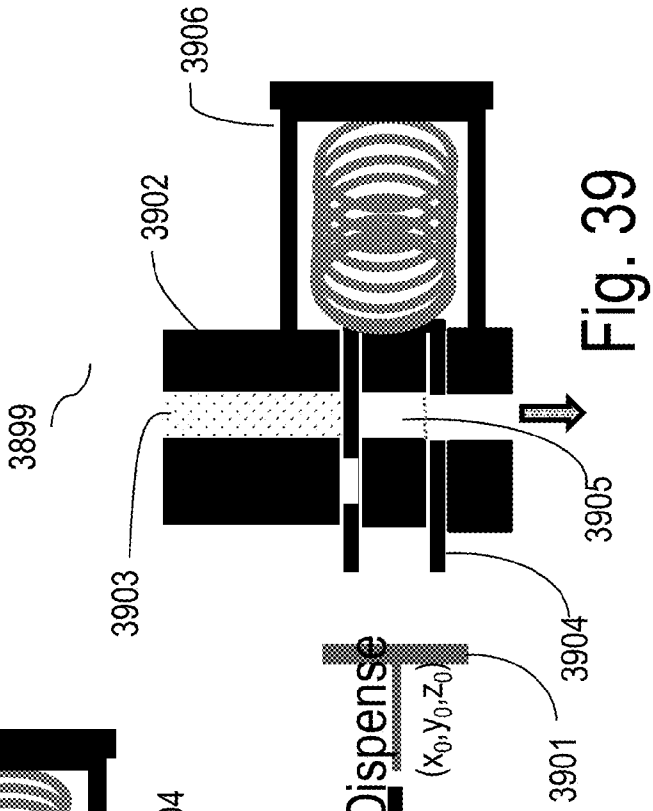

3899
3903
3902
3906
3905
3904
Dispense
(x_0,y_0,z_0)
3901

Fig. 39

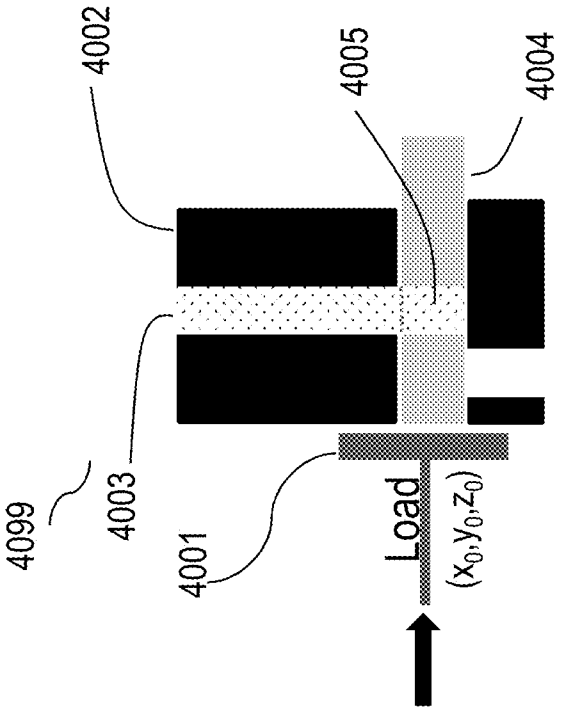

4099
4003
4001
Load
(x_0,y_0,z_0)
4002
4005
4004

Fig. 40

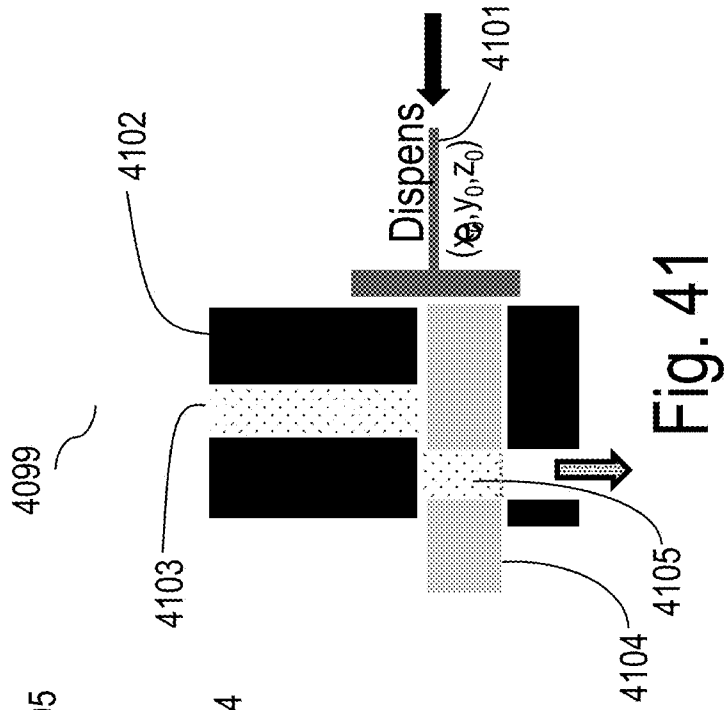

4099
4102
4103
Dispens
(x_0,y_0,z_0)
4101
4105
4104

Fig. 41

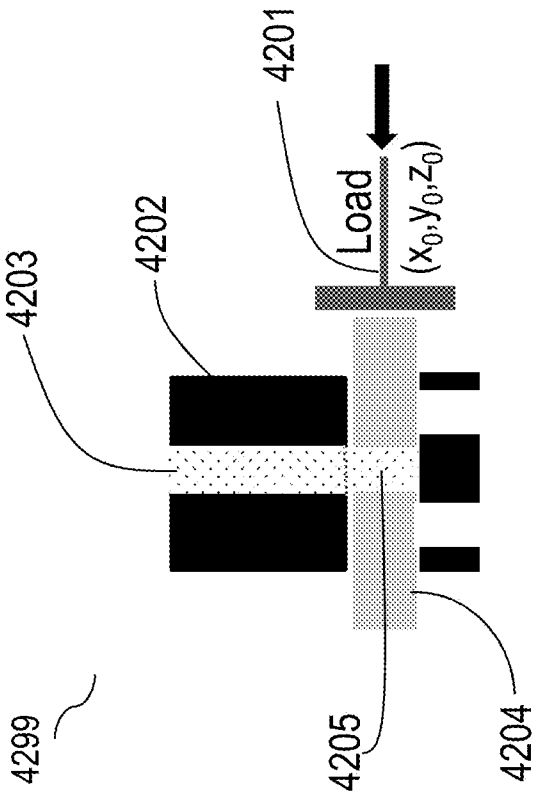


Fig. 42

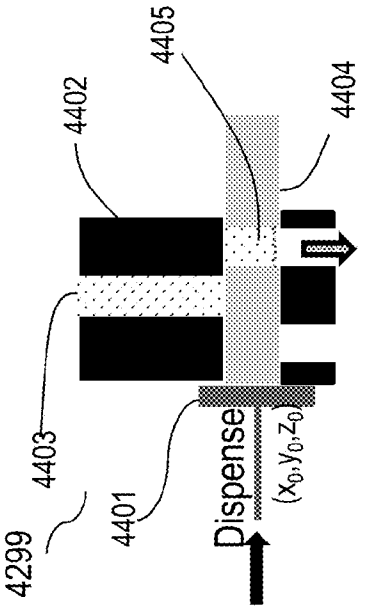


Fig. 44

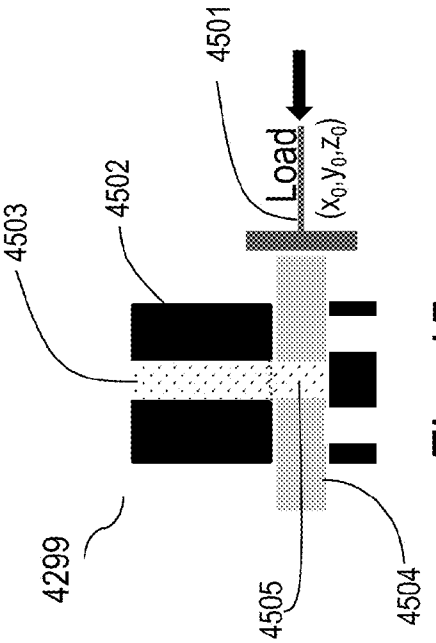


Fig. 45

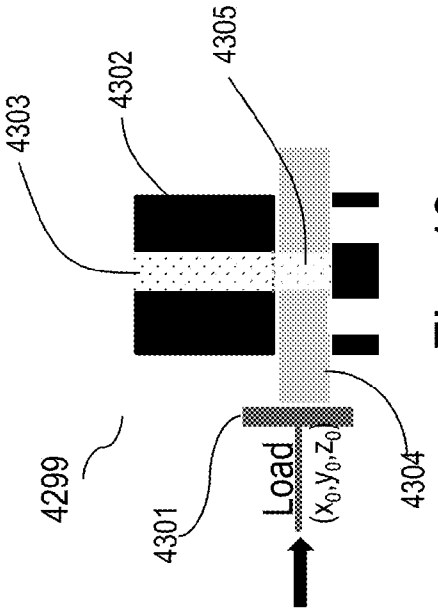


Fig. 43

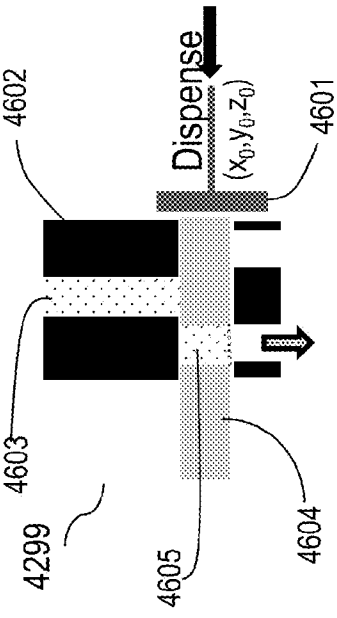
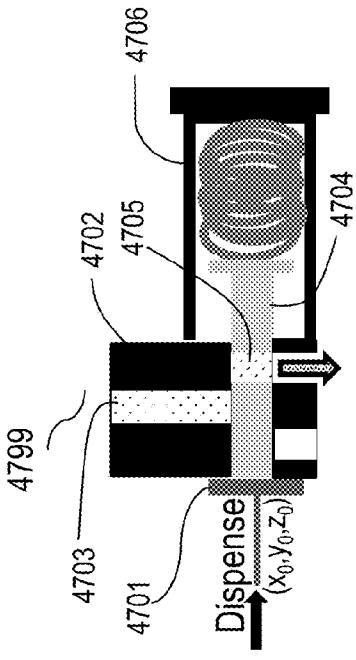


Fig. 46



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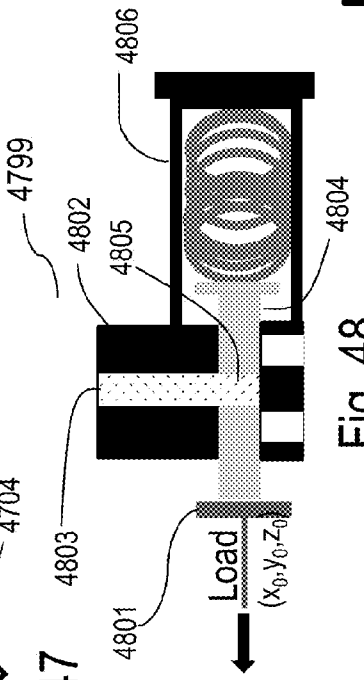

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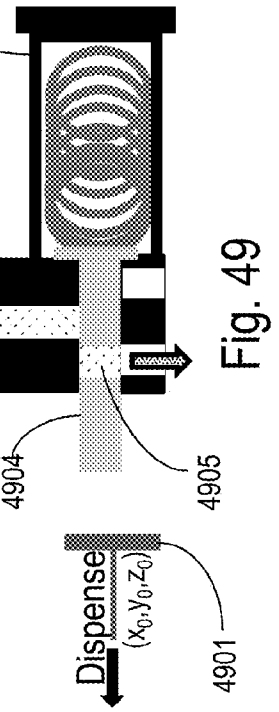

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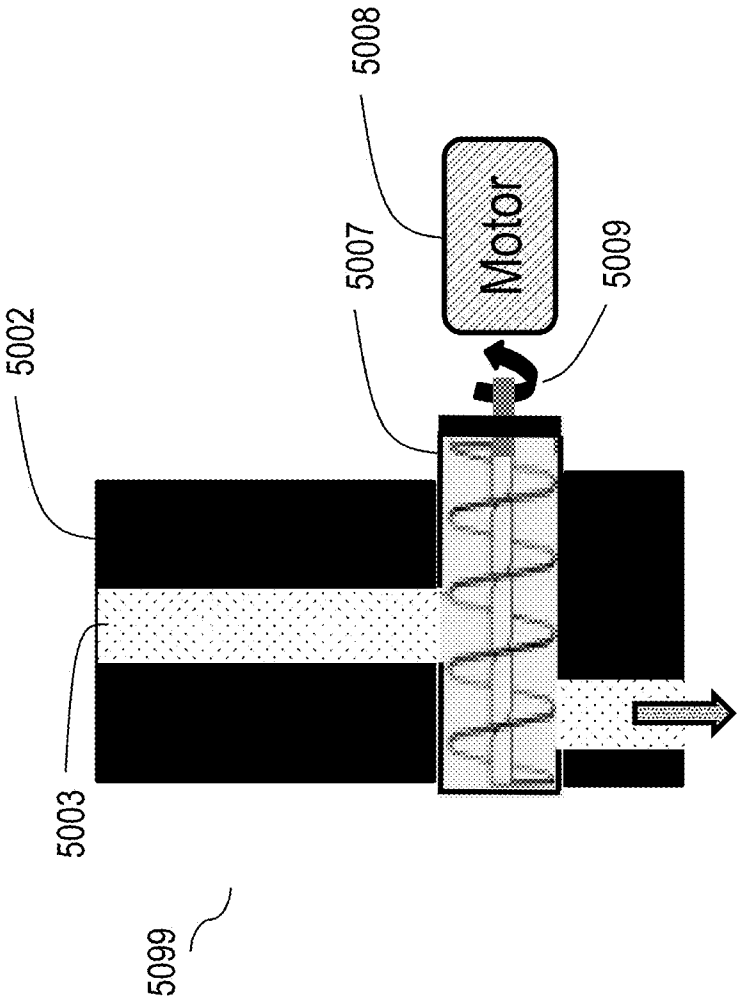

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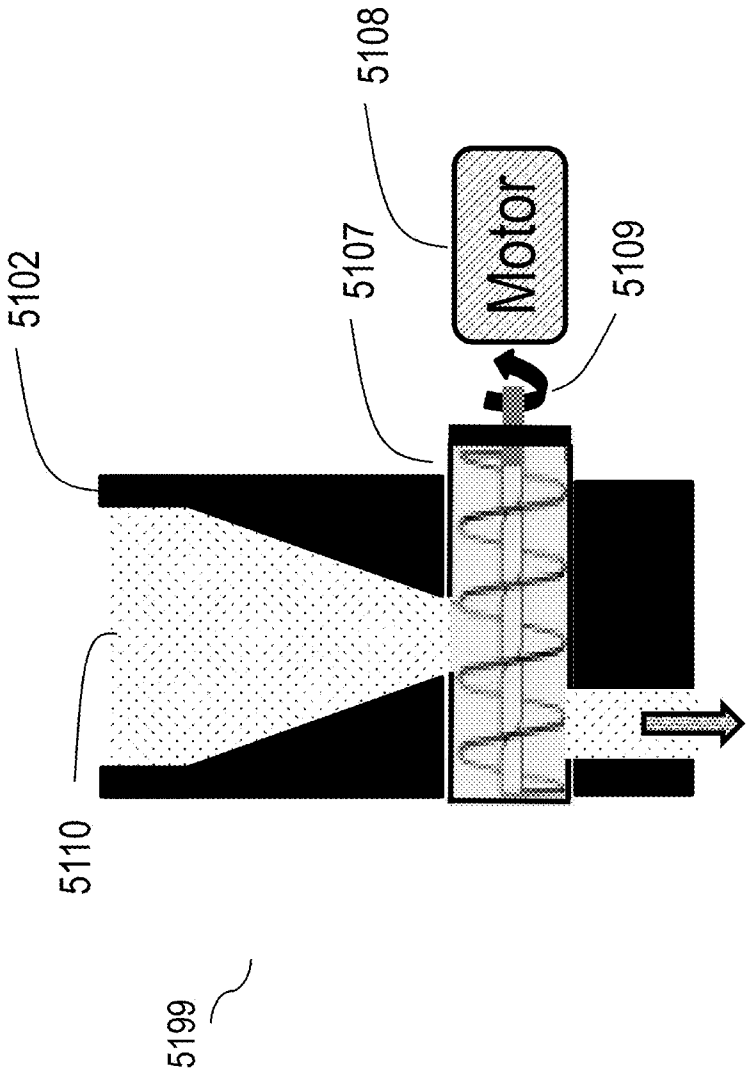

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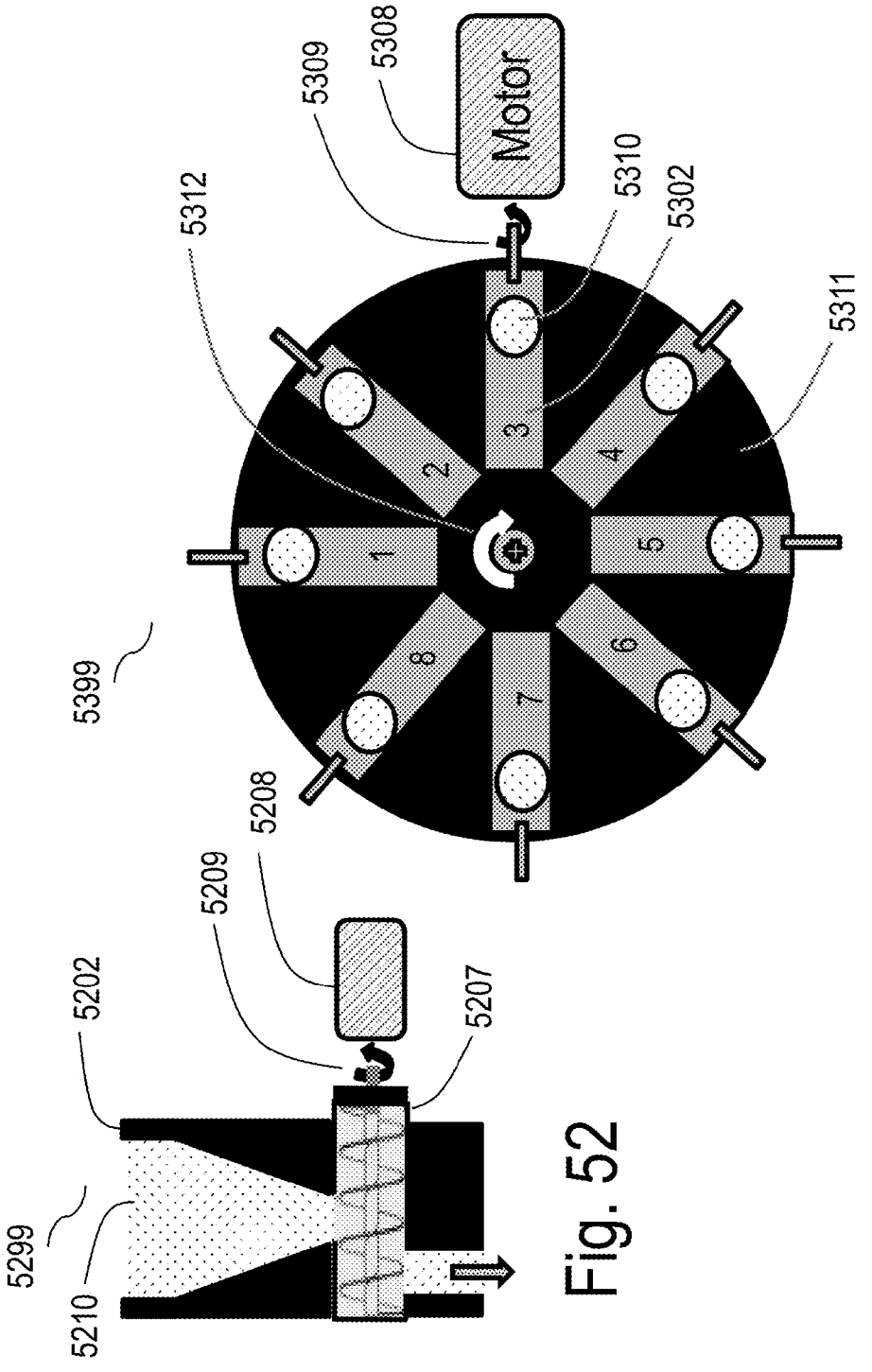
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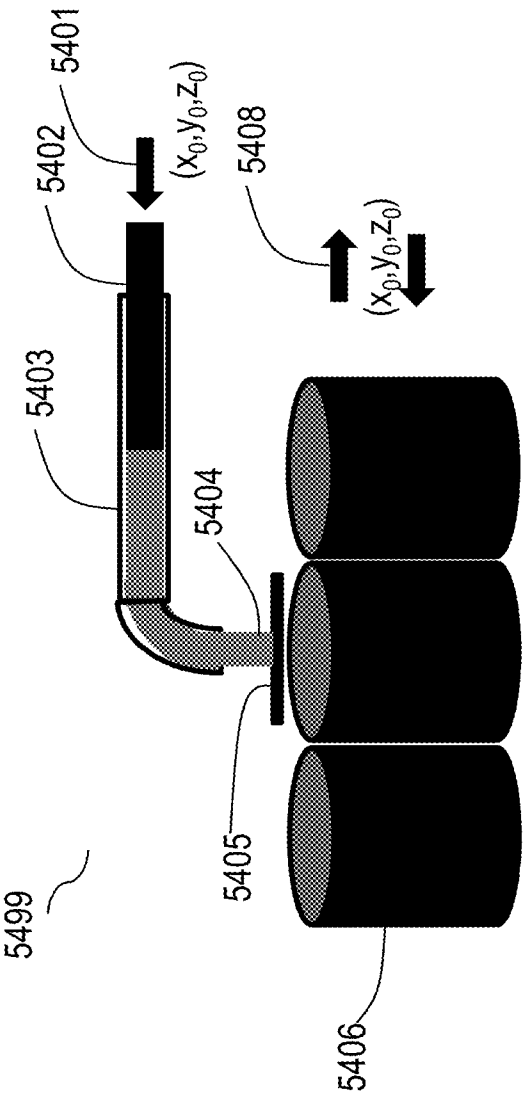
Fig. 52

Fig. 53



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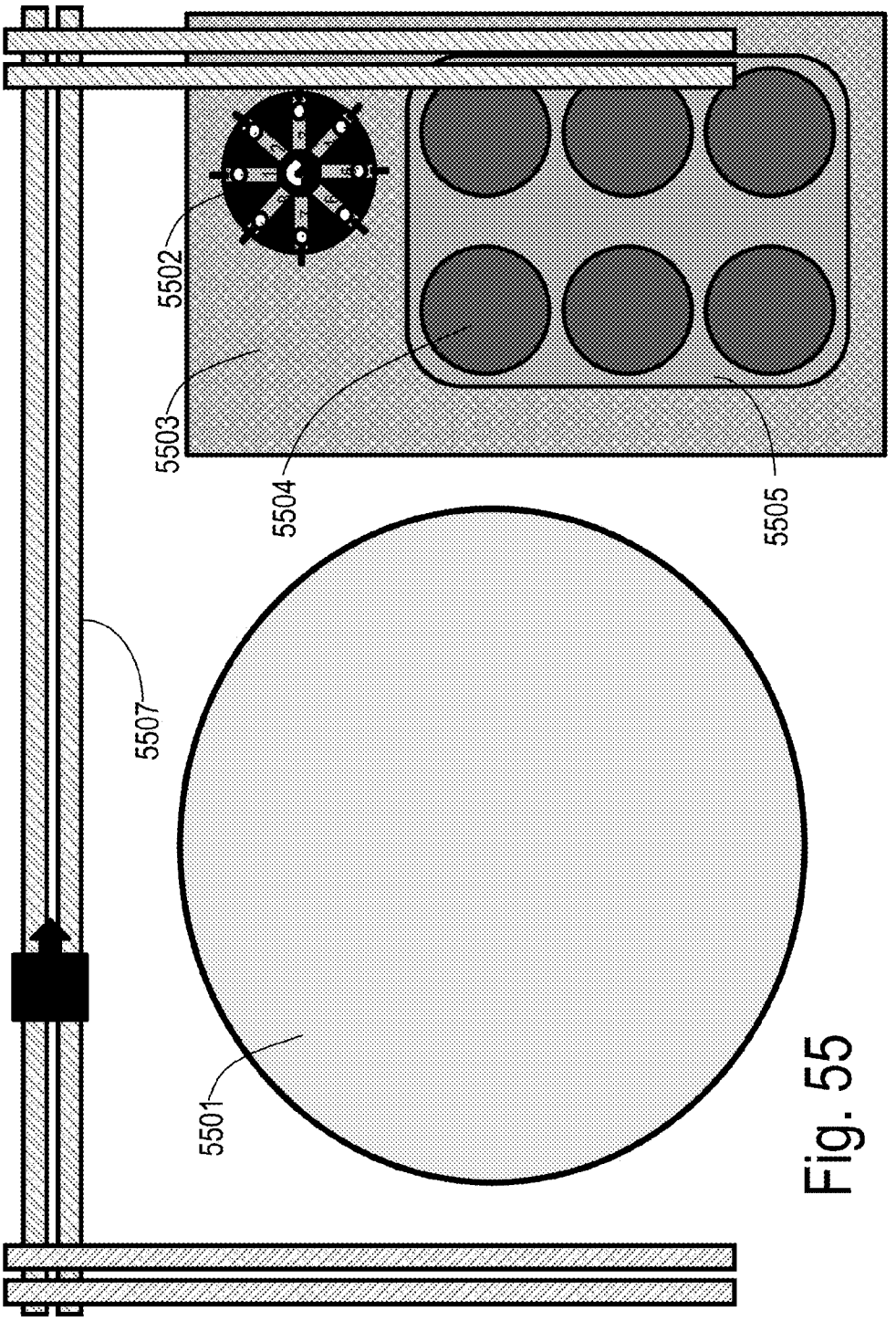

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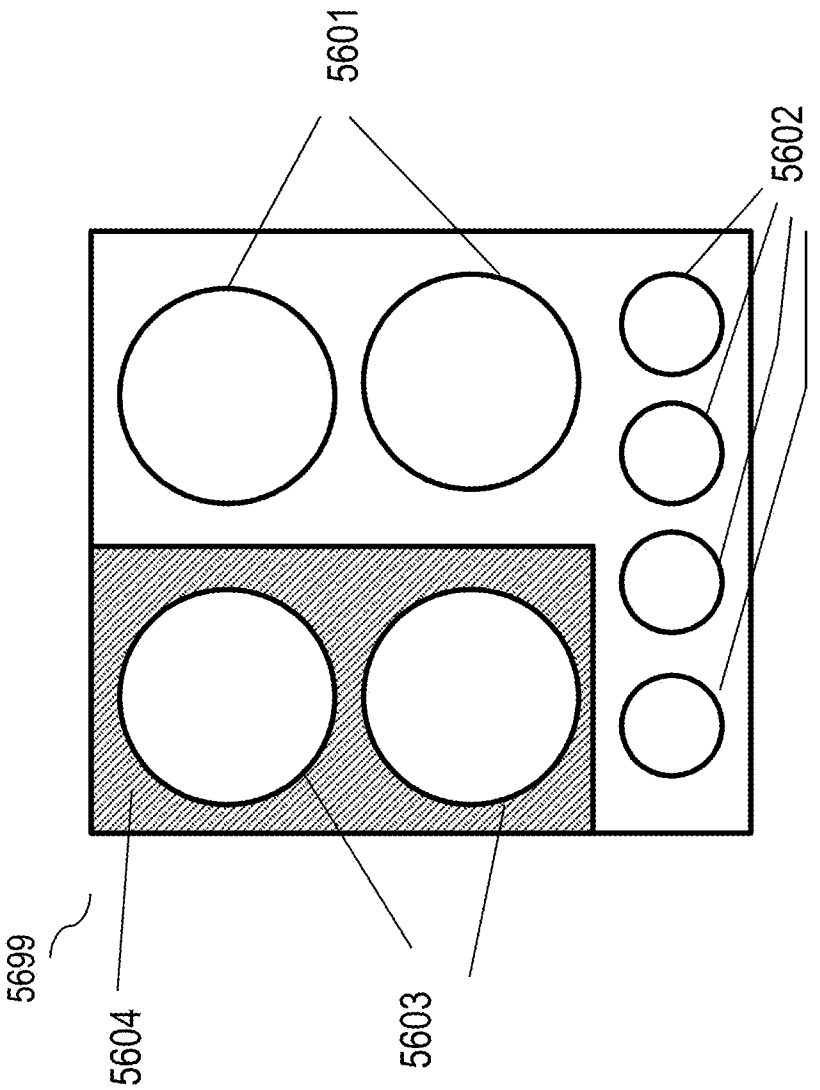

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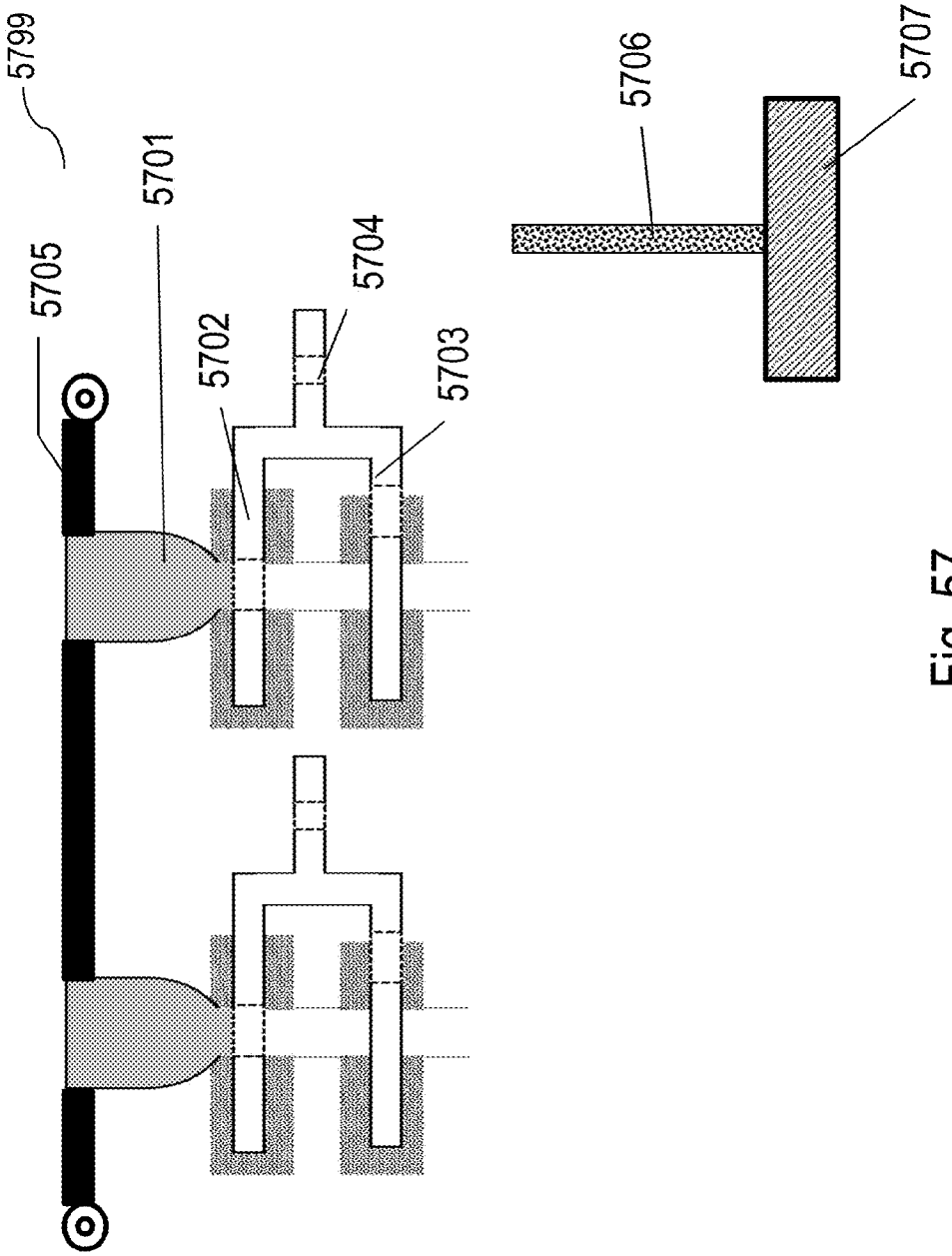

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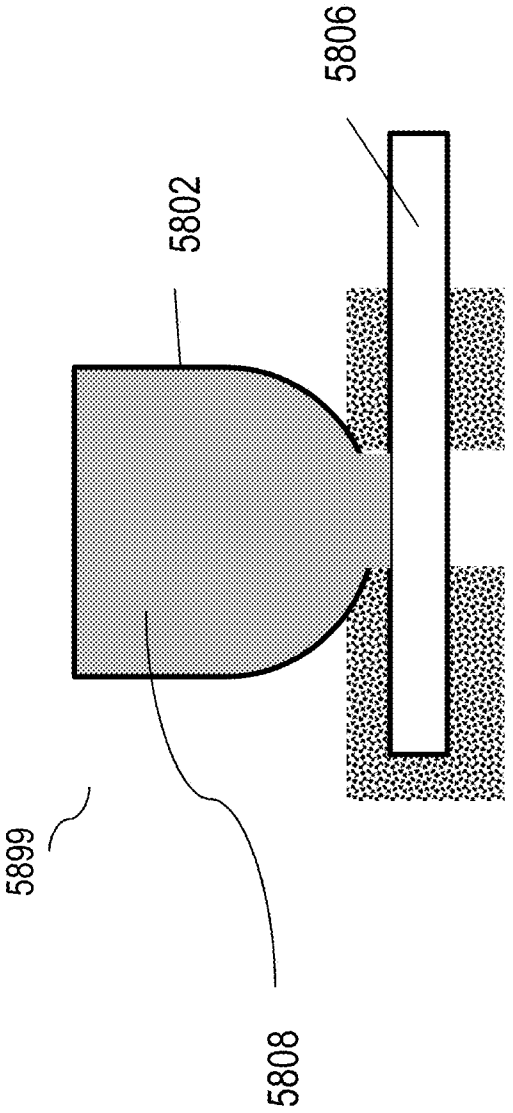

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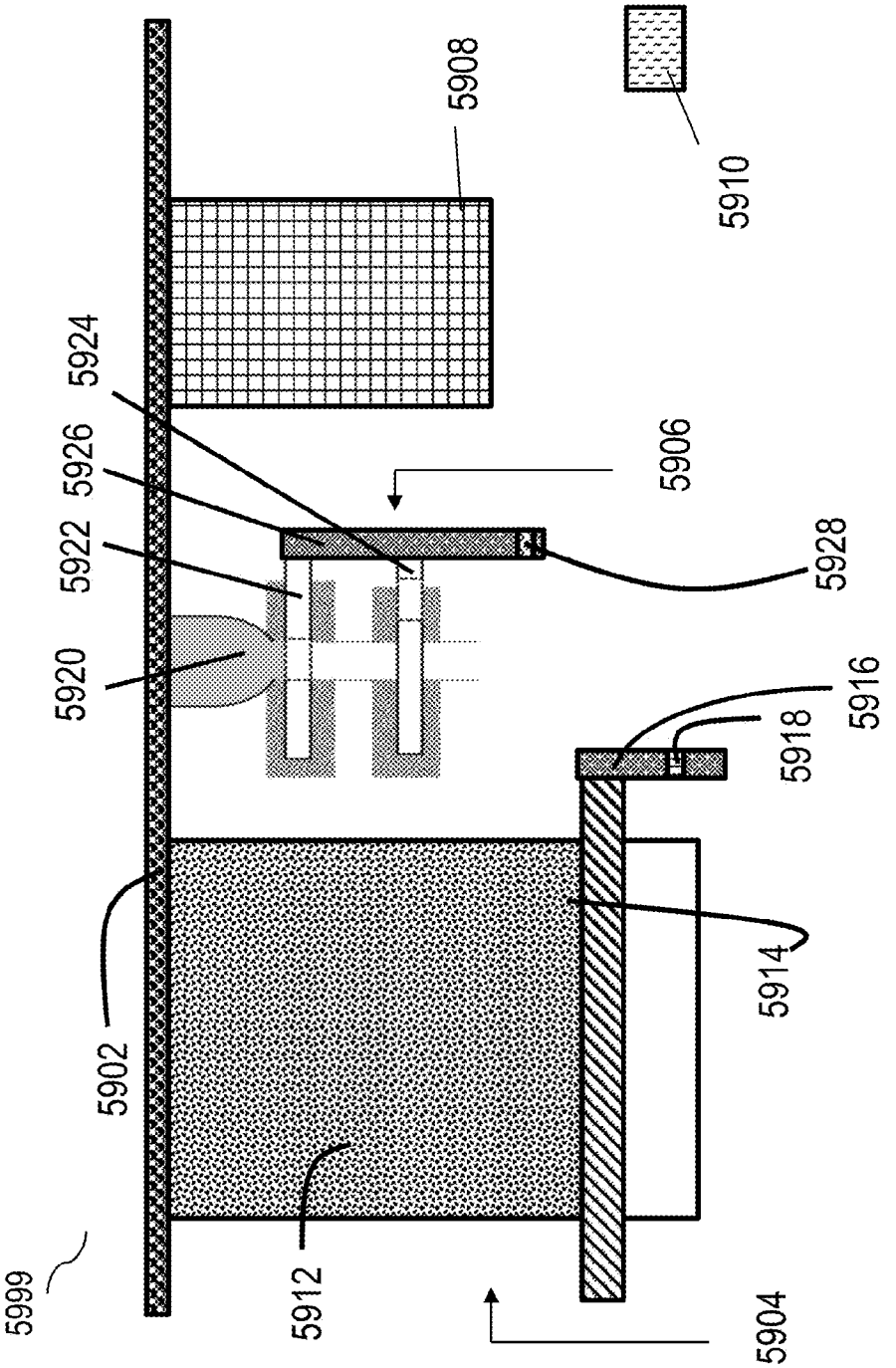
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Fig. 59

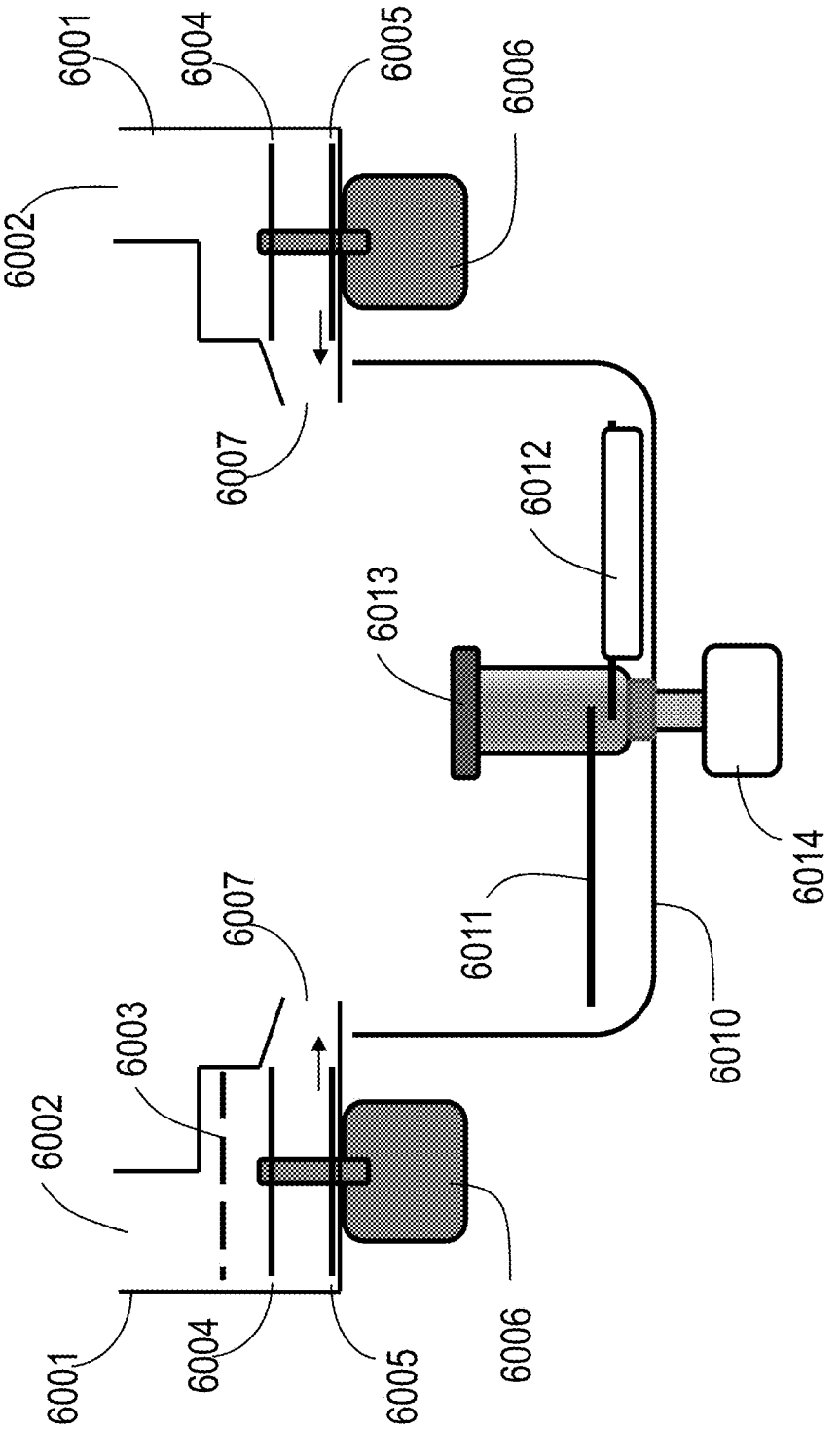
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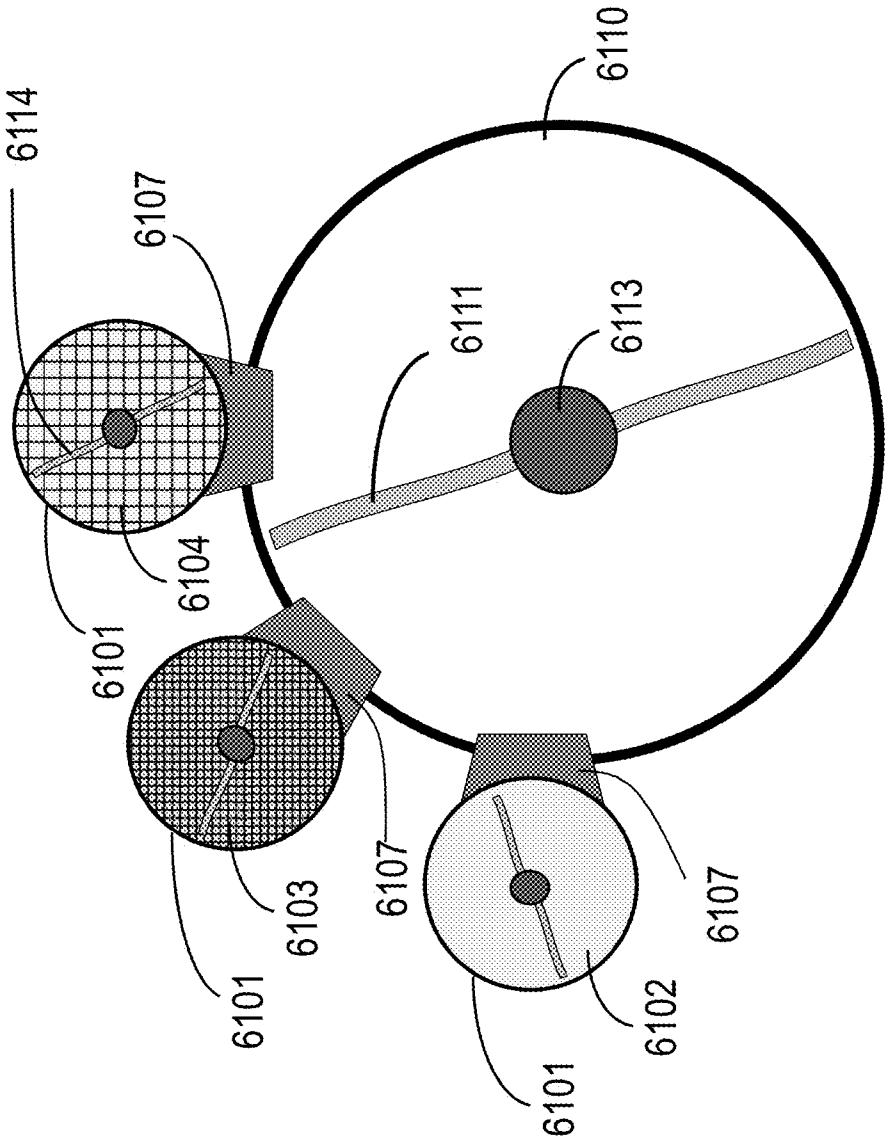
Fig. 60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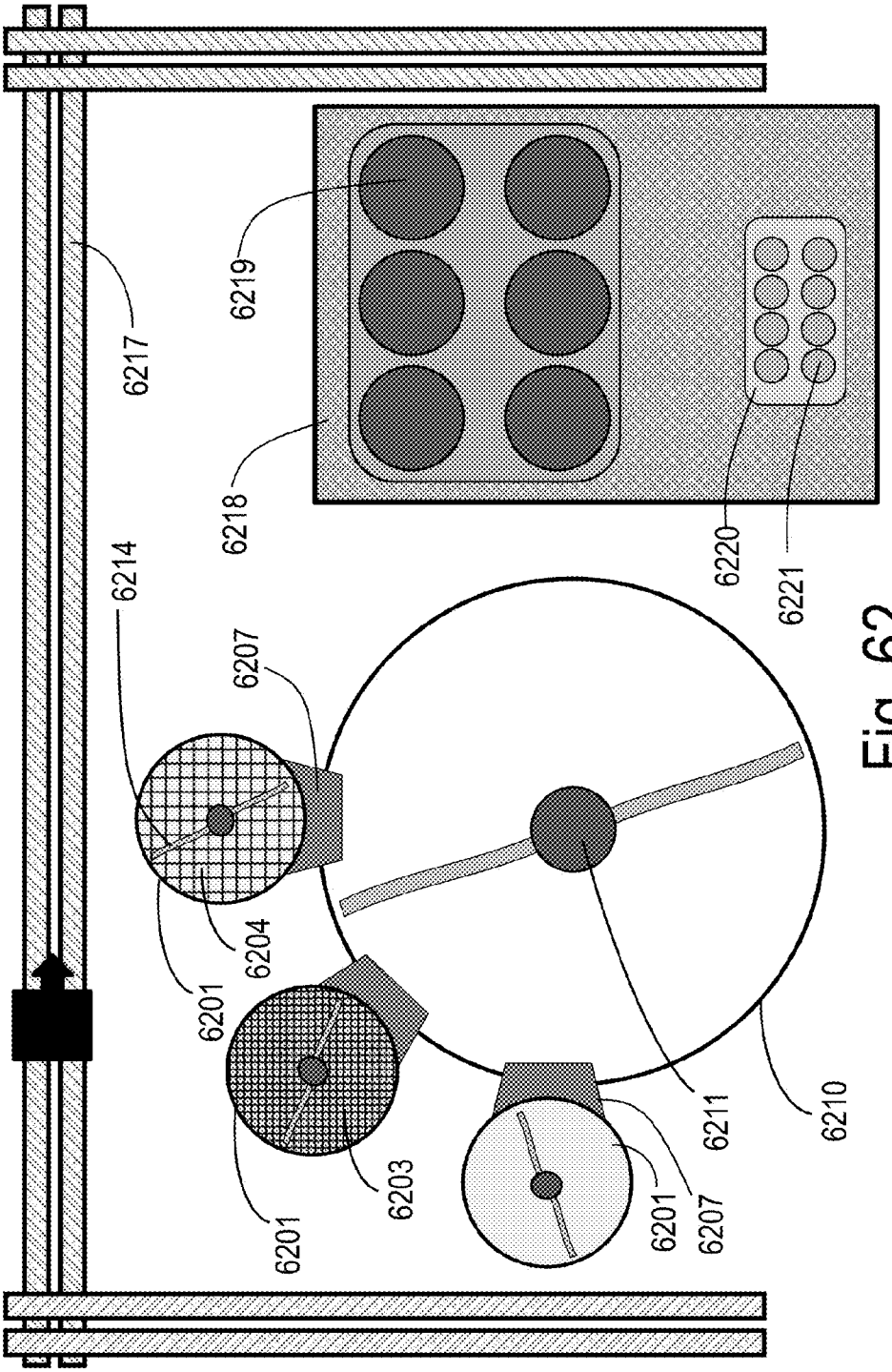
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Fig. 62

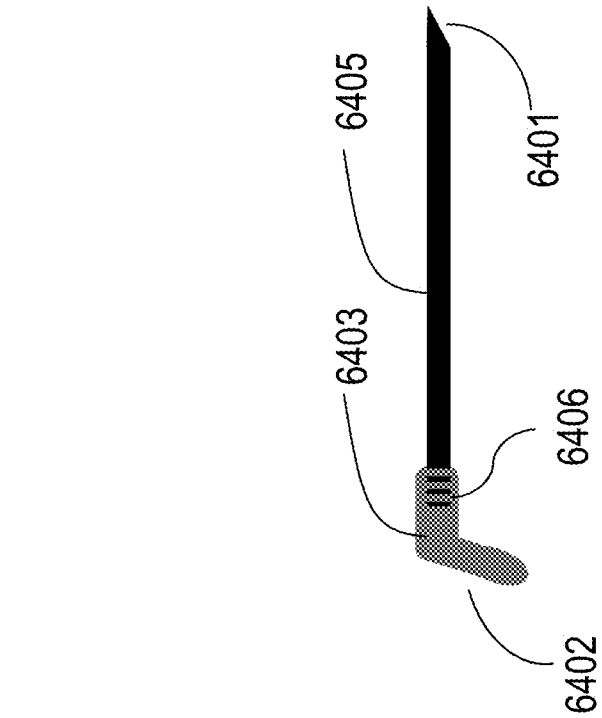
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Fig. 64

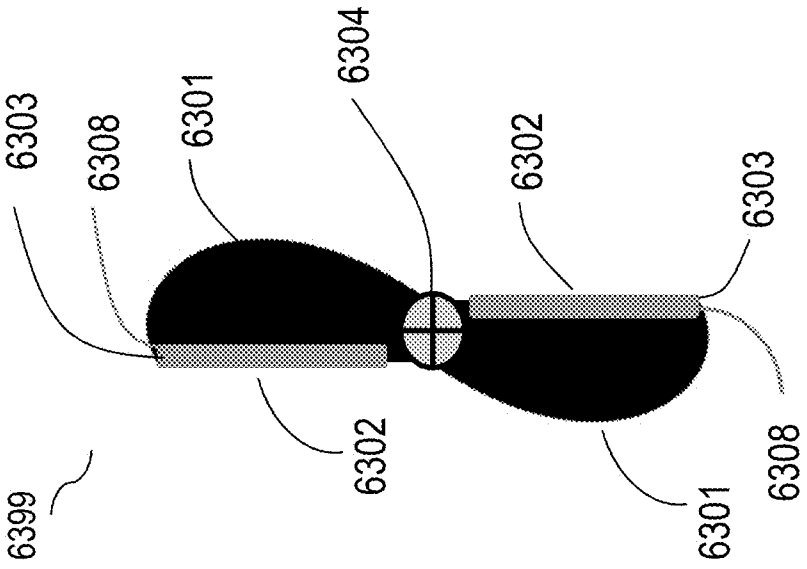
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Fig. 63

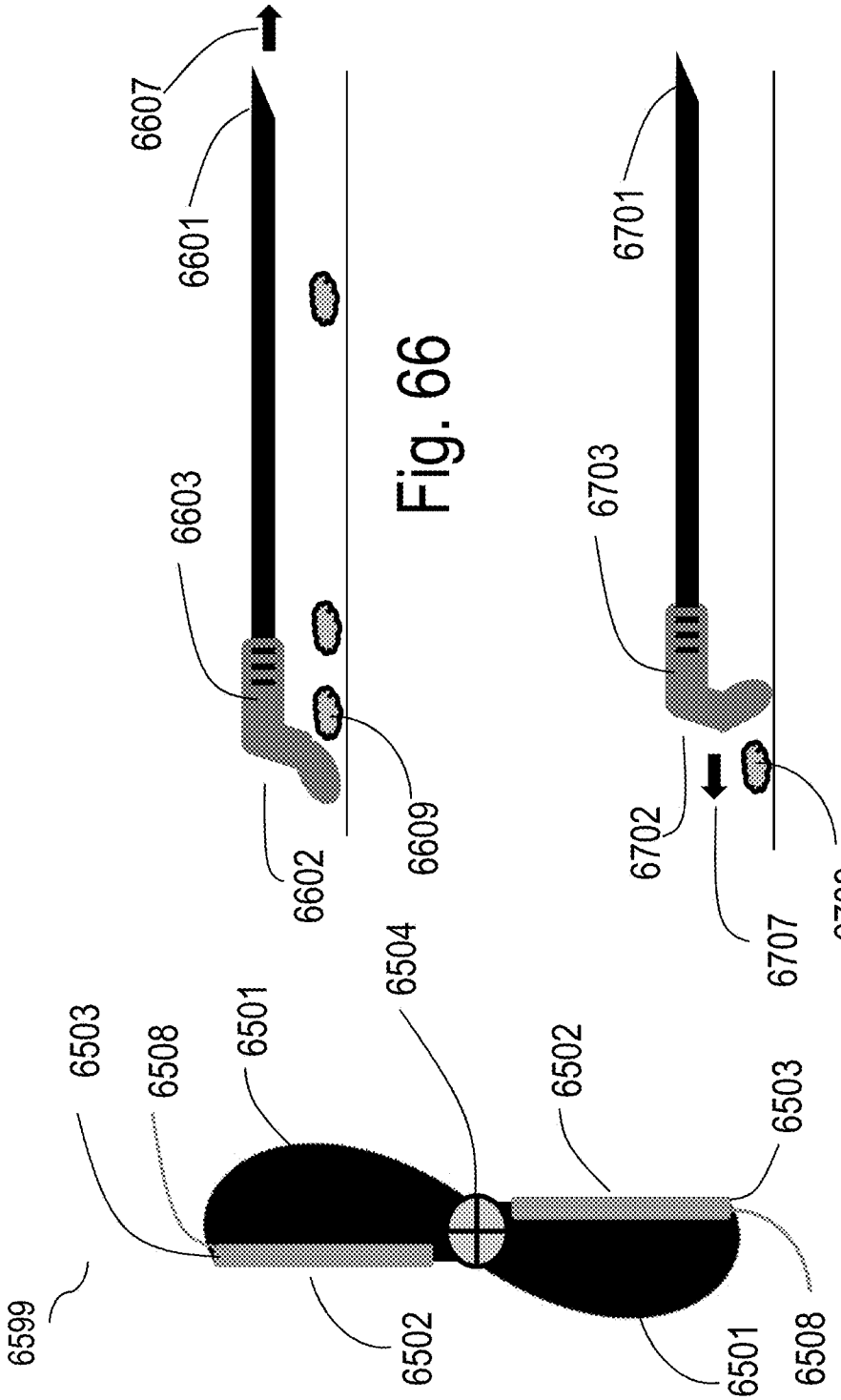
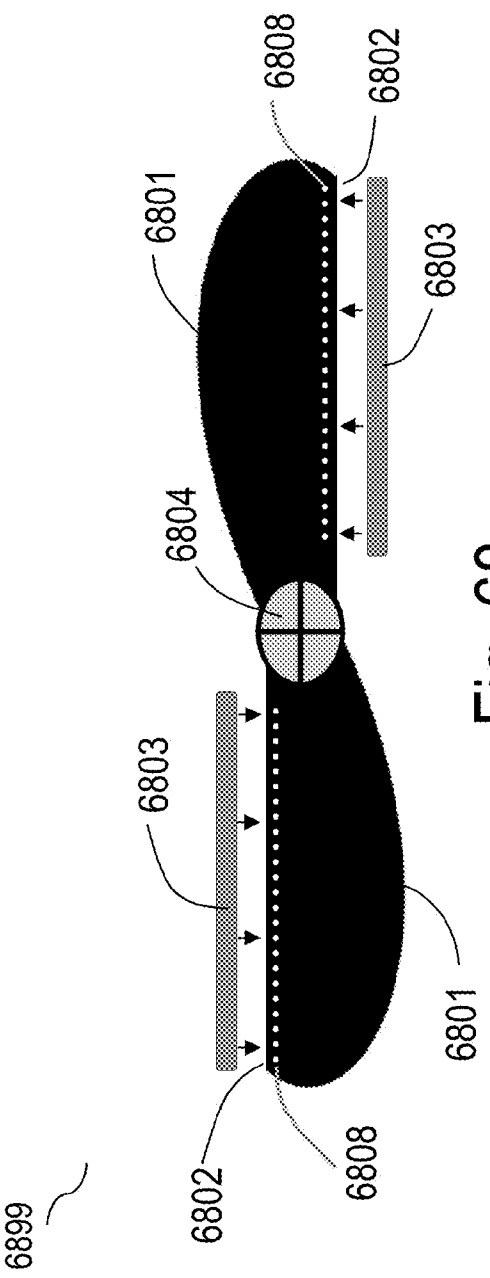


Fig. 66

Fig. 67

Fig. 65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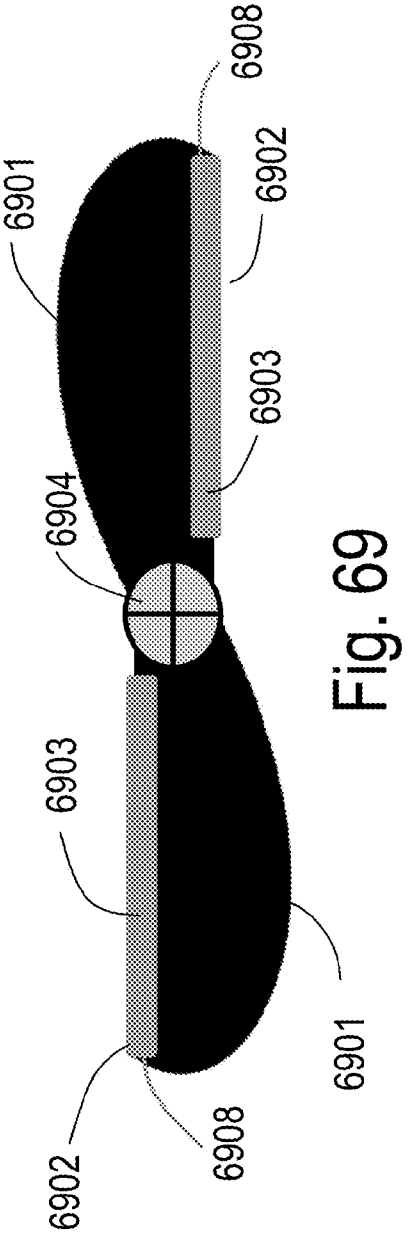
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Fig. 69

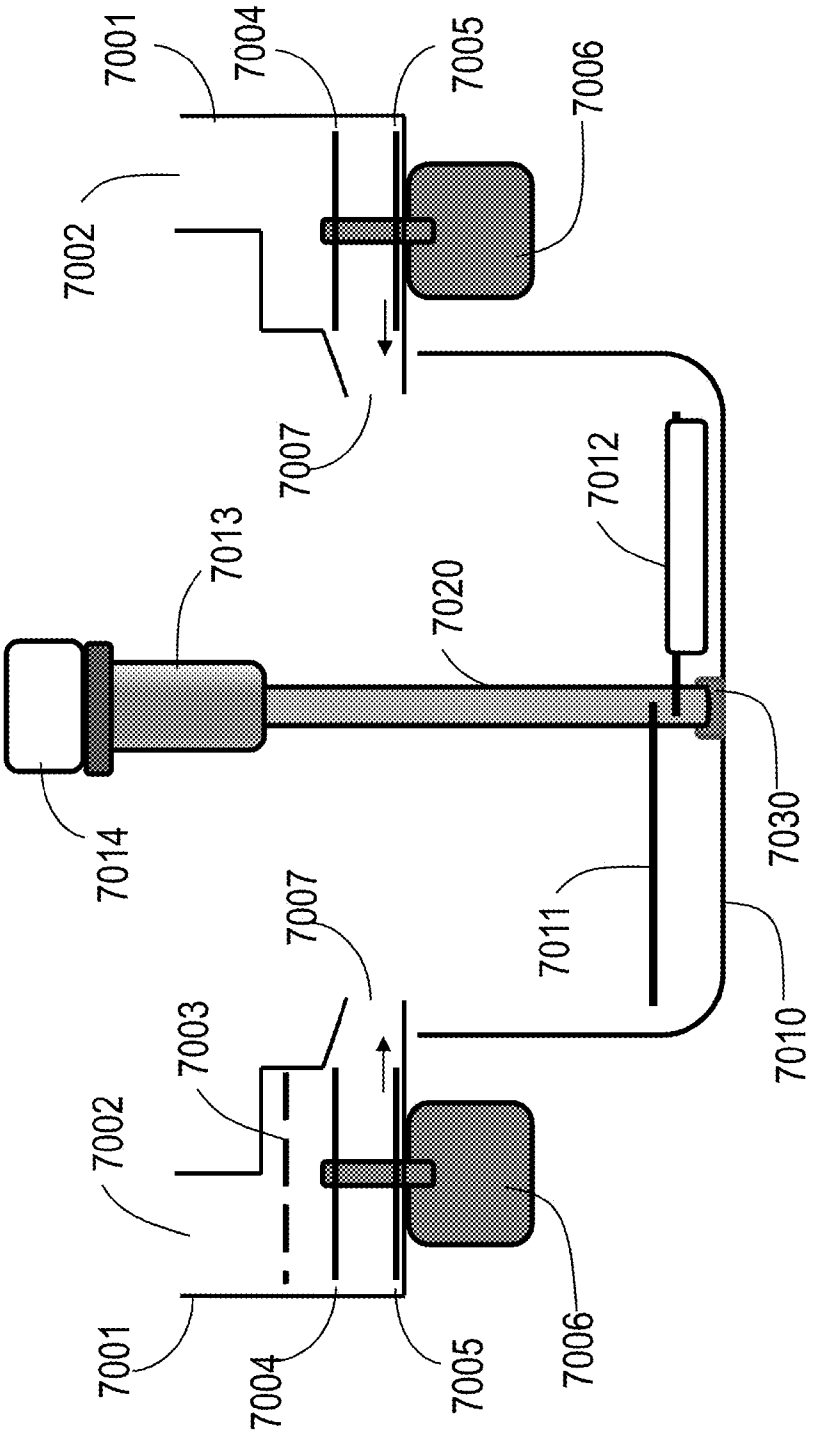
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Fig. 70

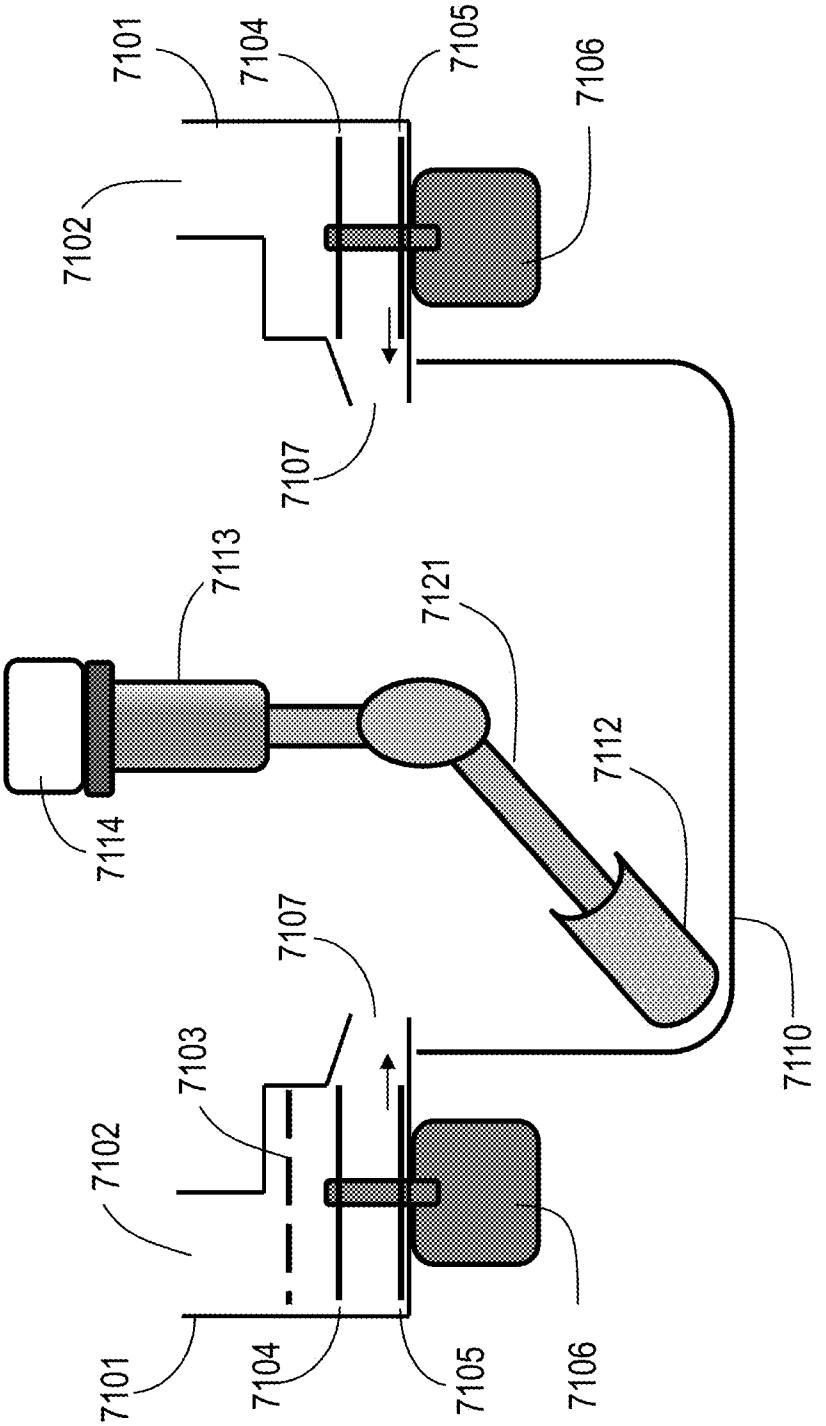
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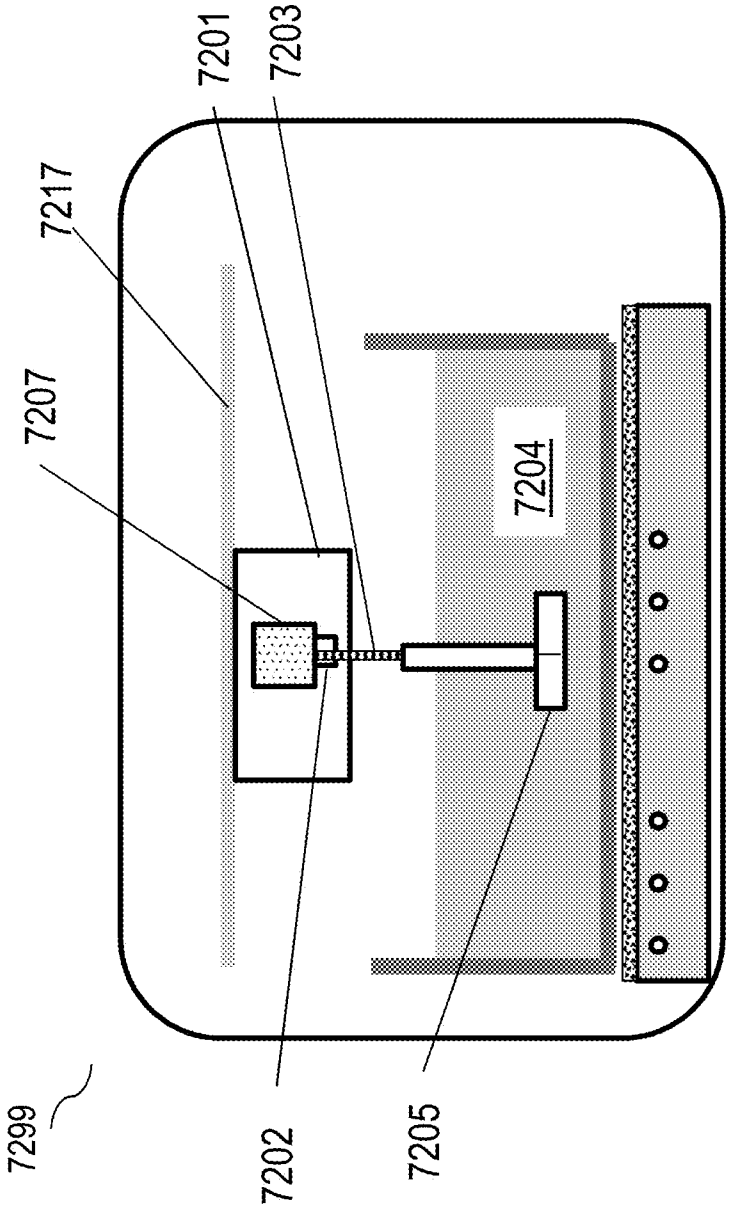
Fig. 71



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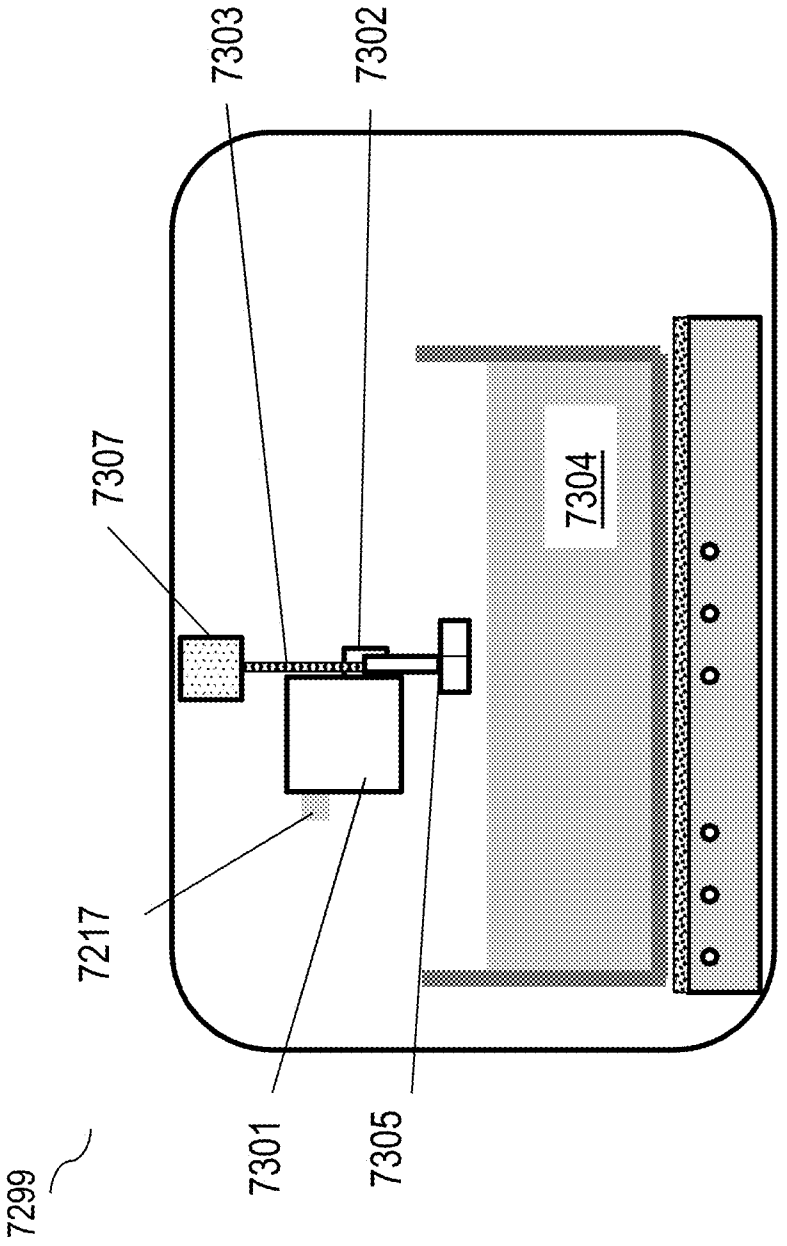

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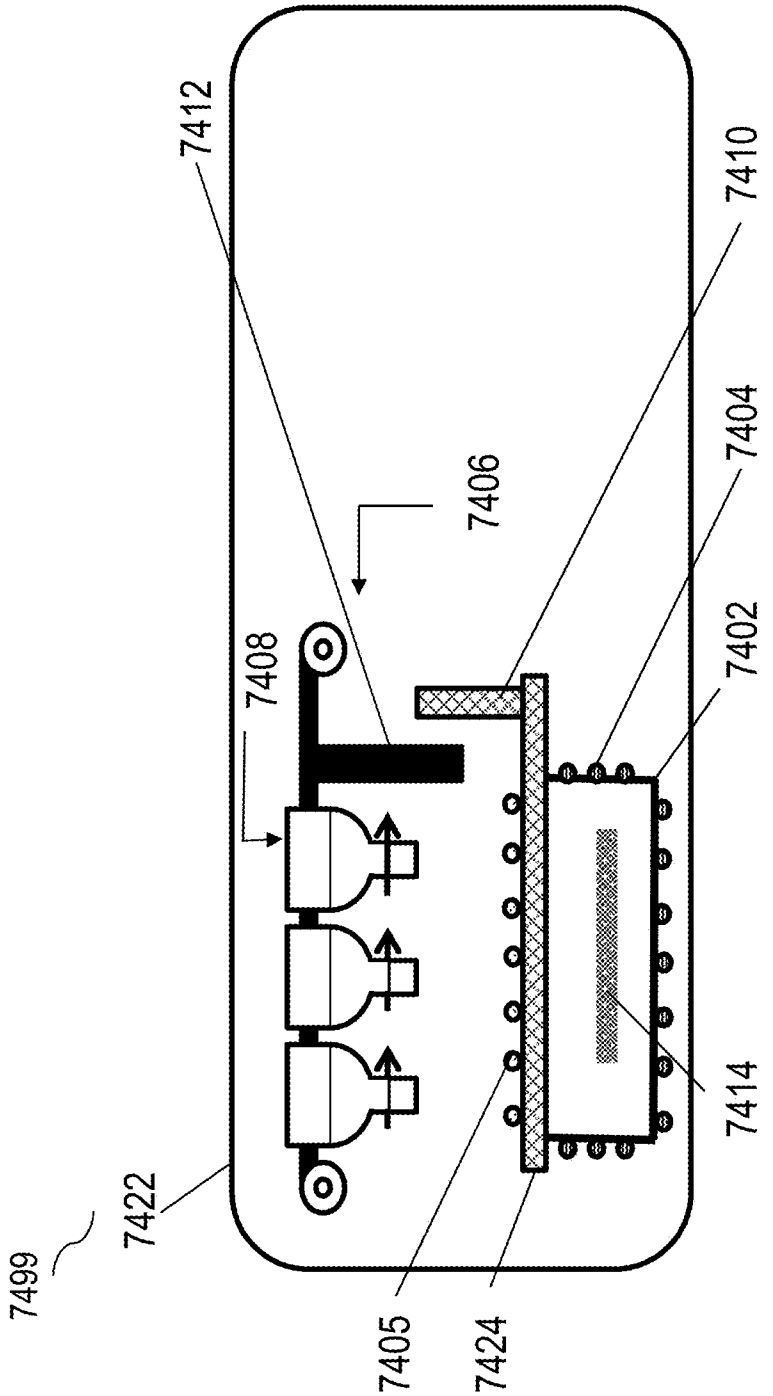


Fig. 74A

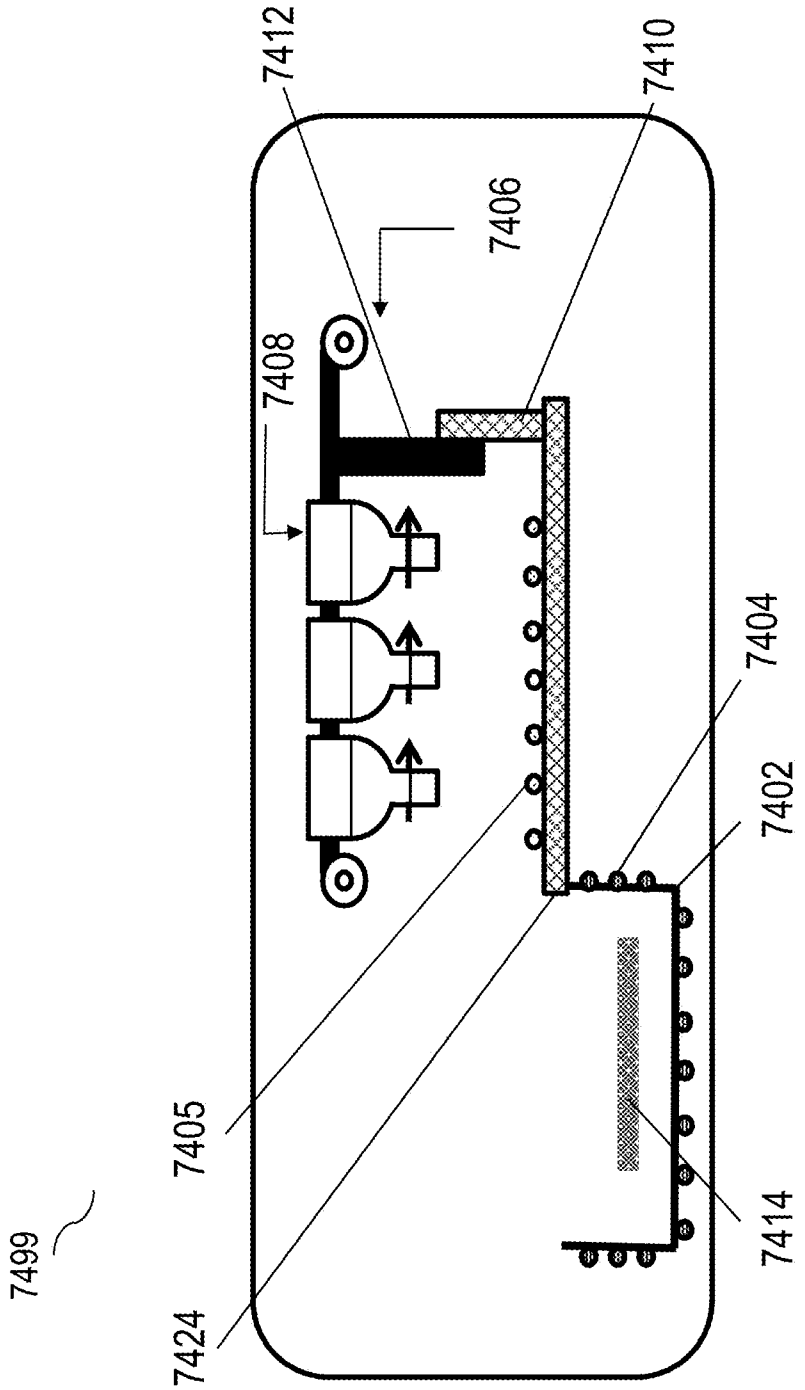


Fig. 74B

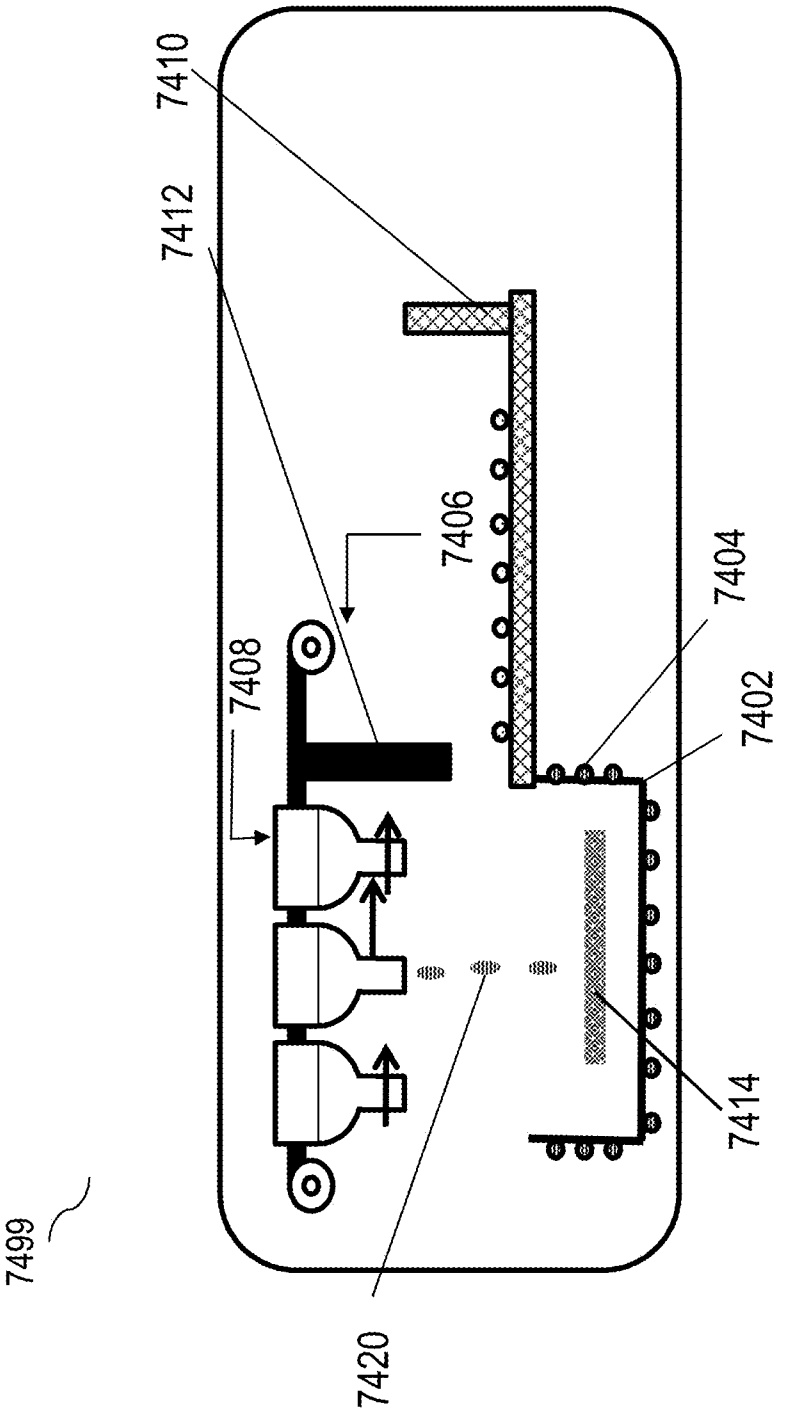


Fig. 74C

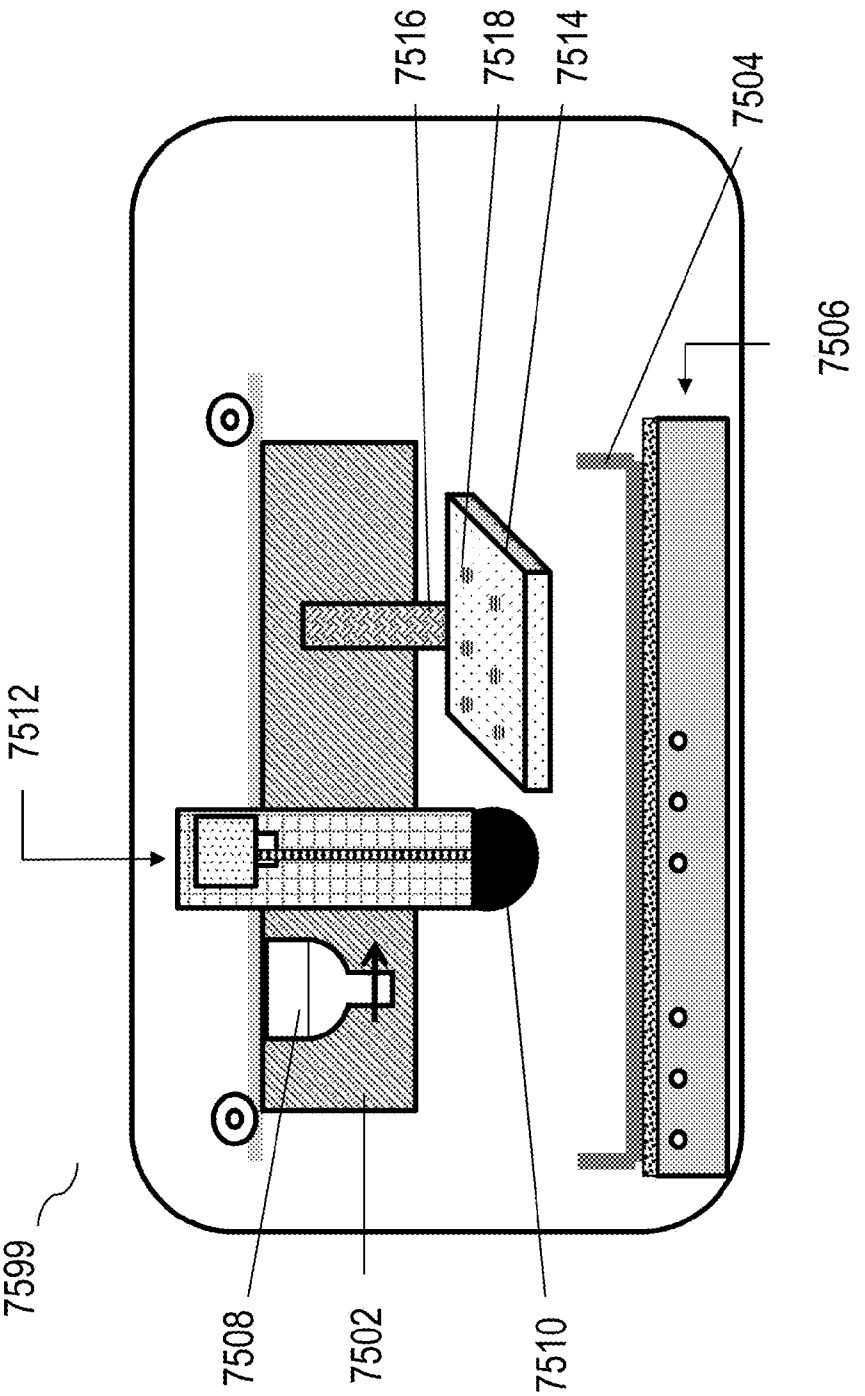
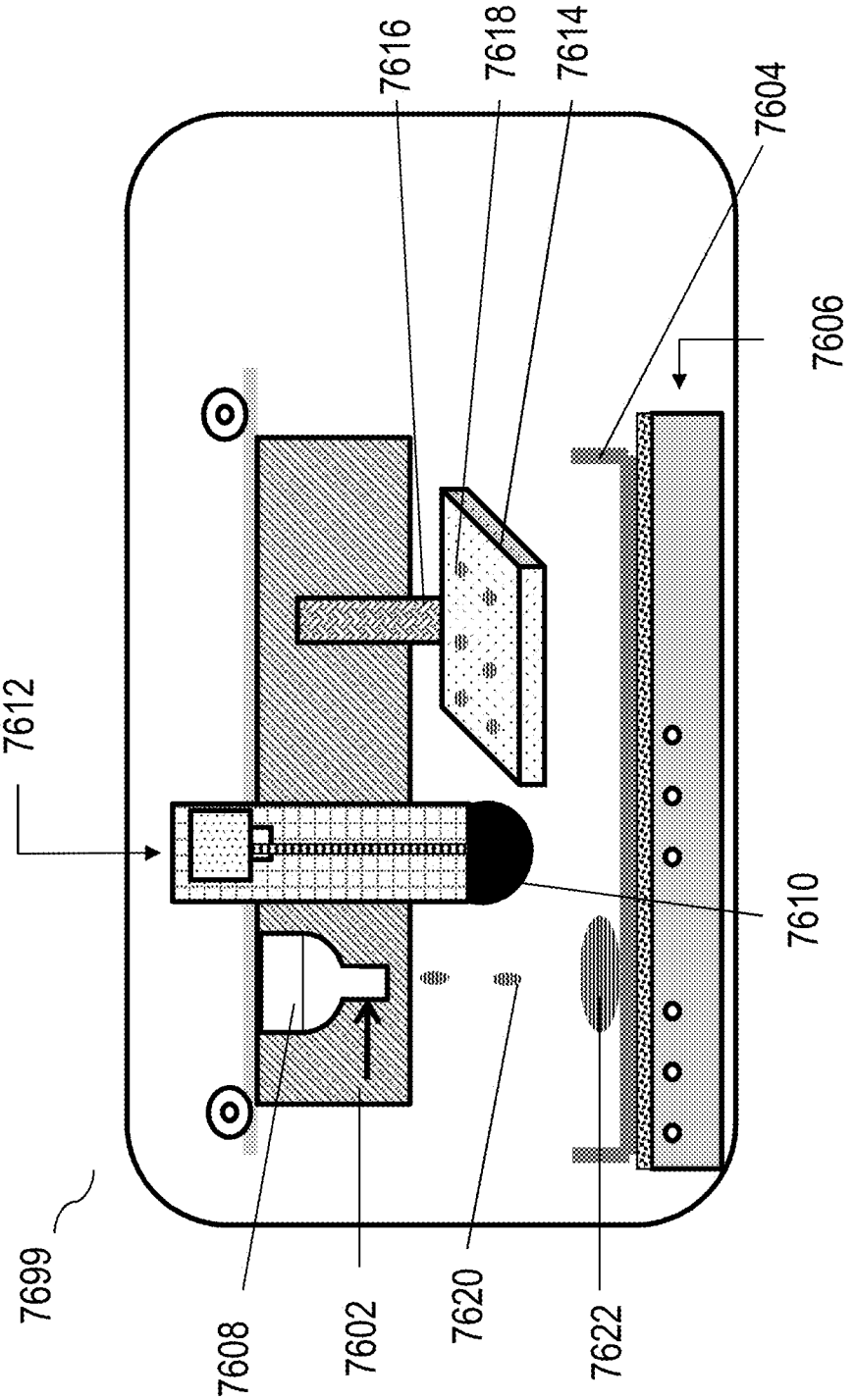


Fig. 75



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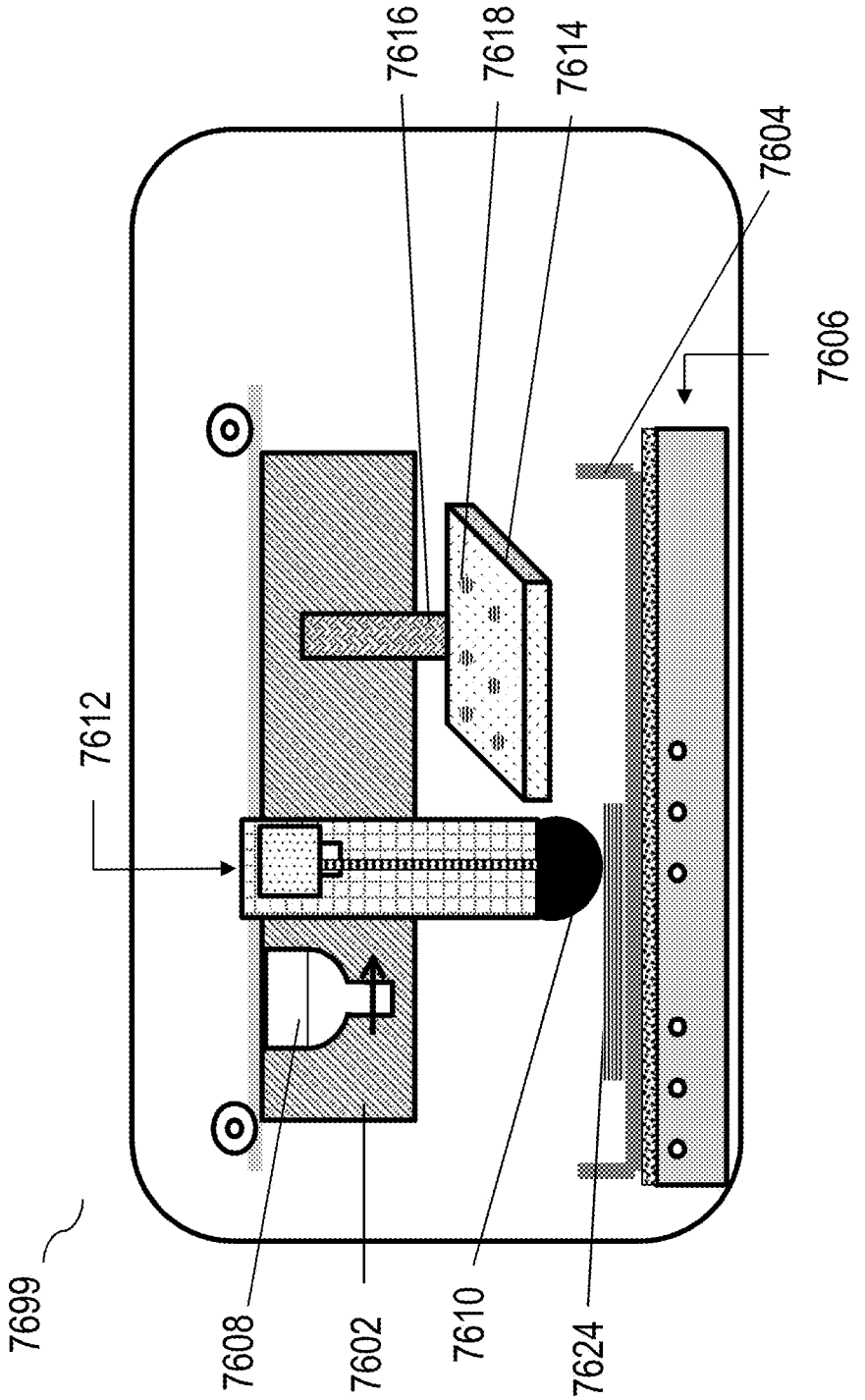

Fig. 76B

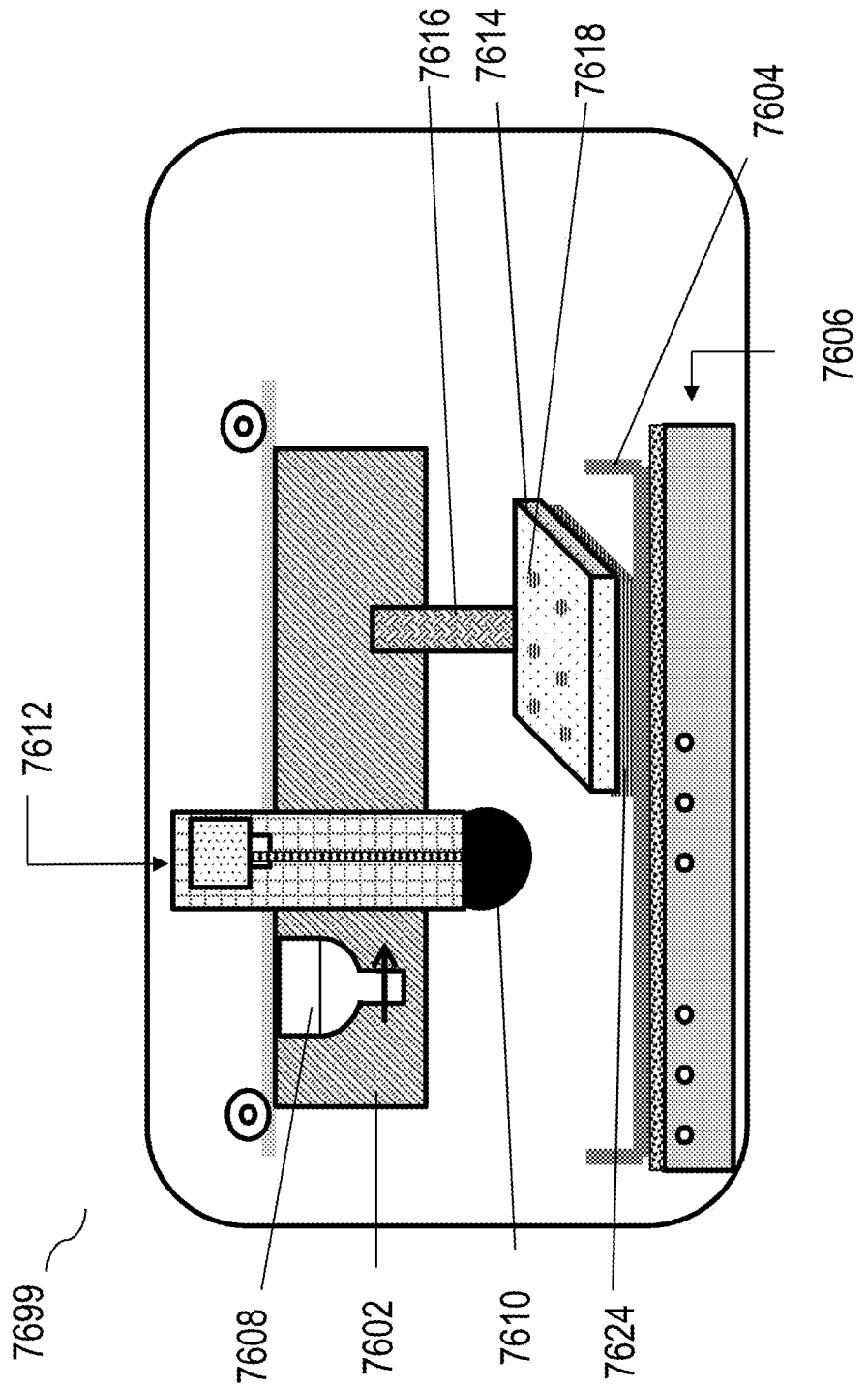

Fig. 76C

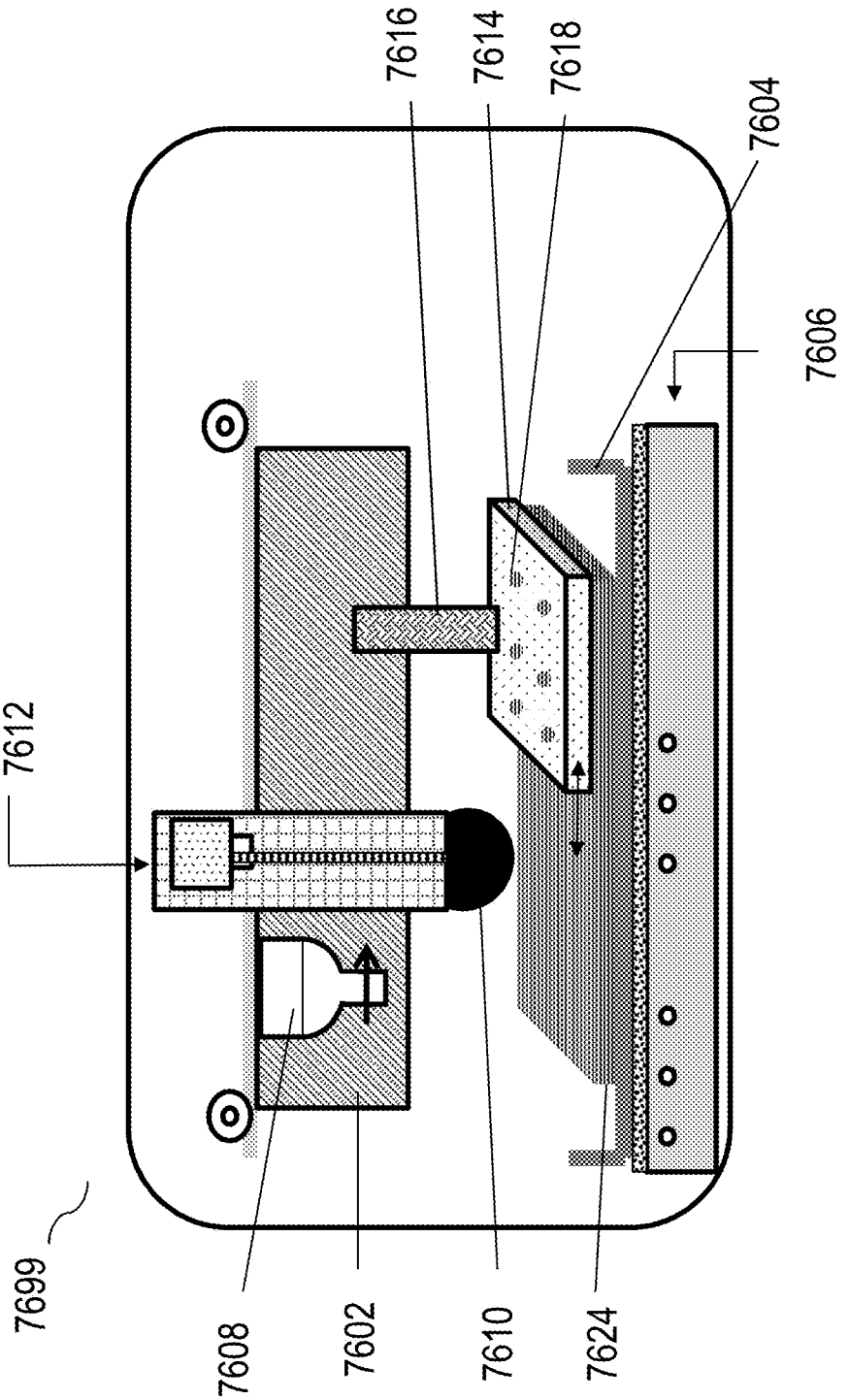

Fig. 76D

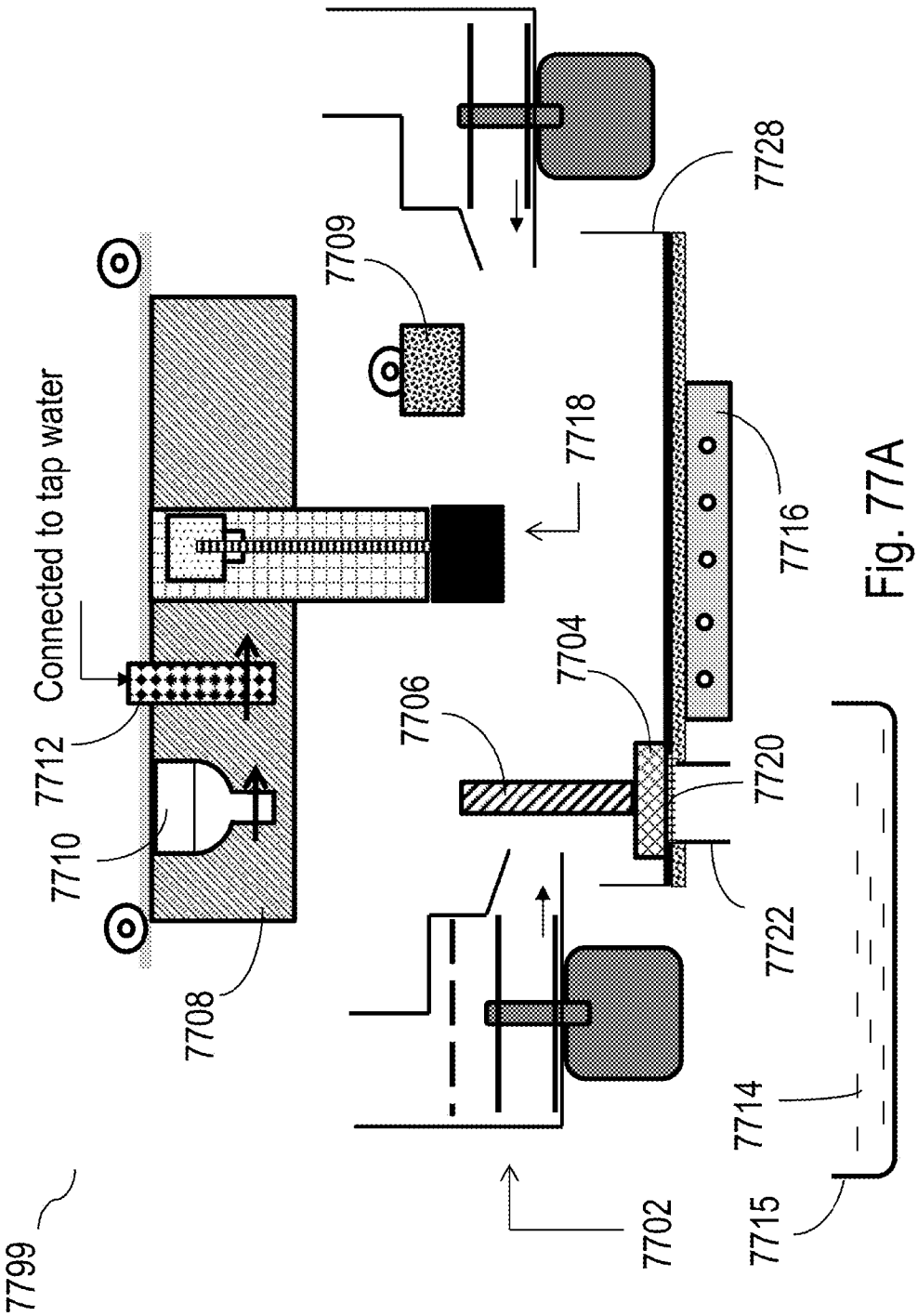
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Fig. 77A

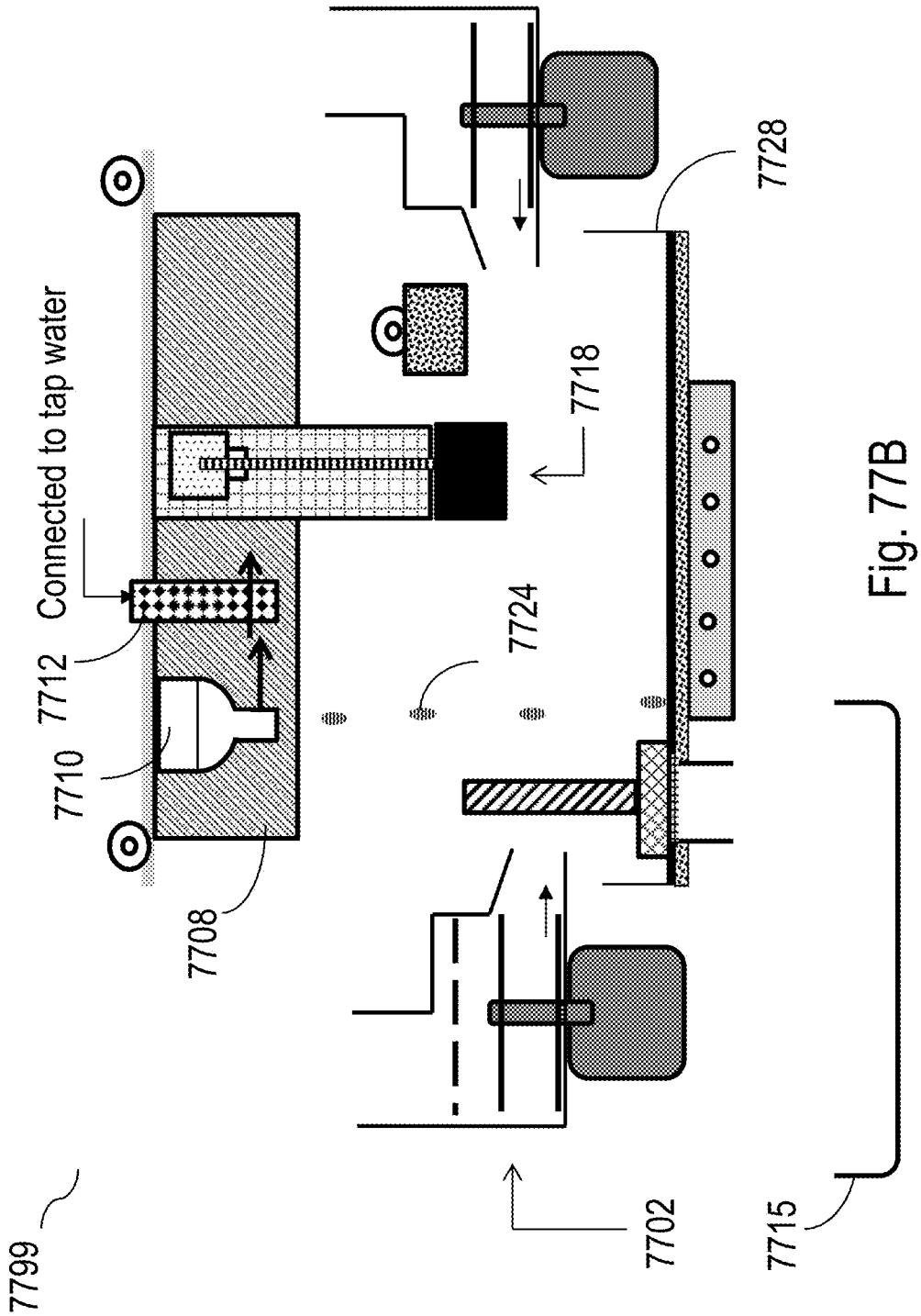
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Fig. 77B

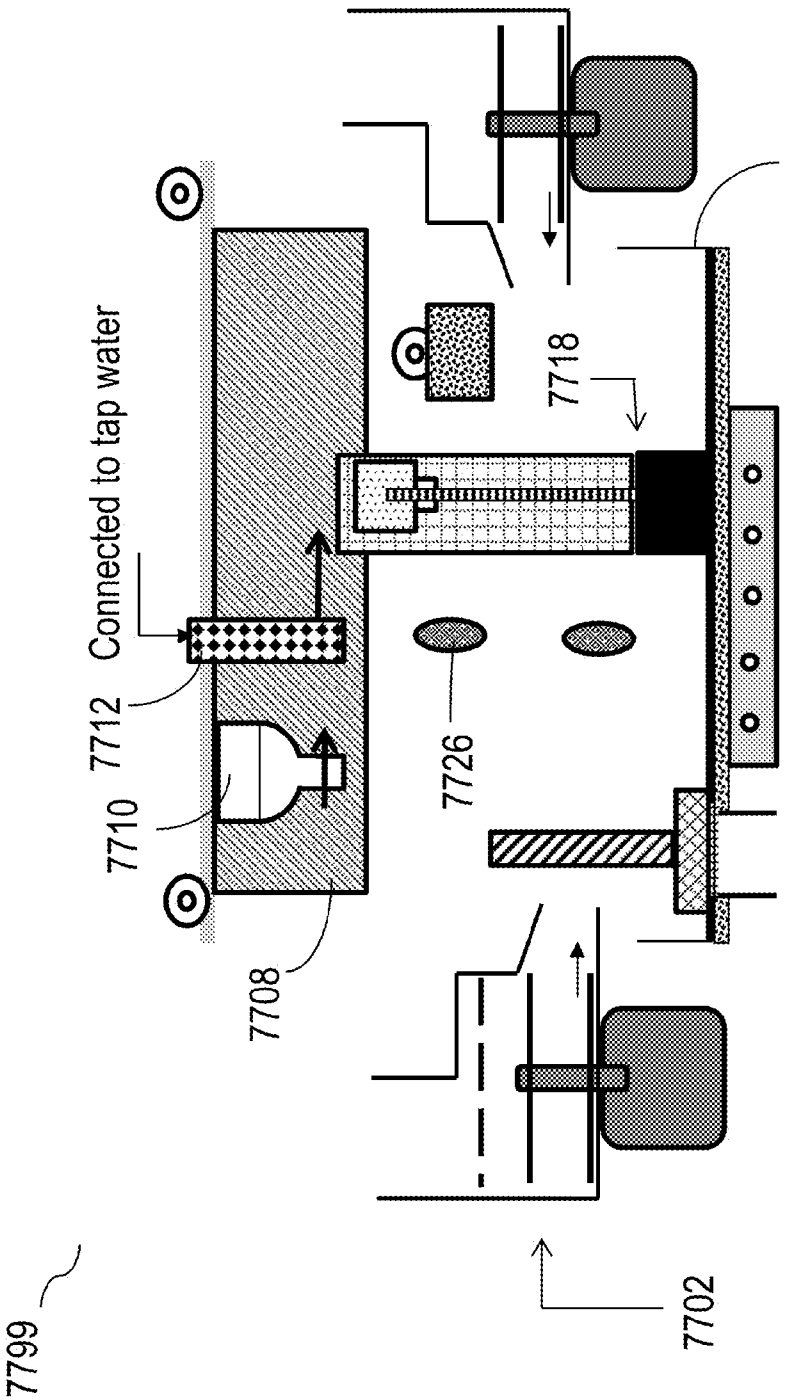
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Fig. 77C

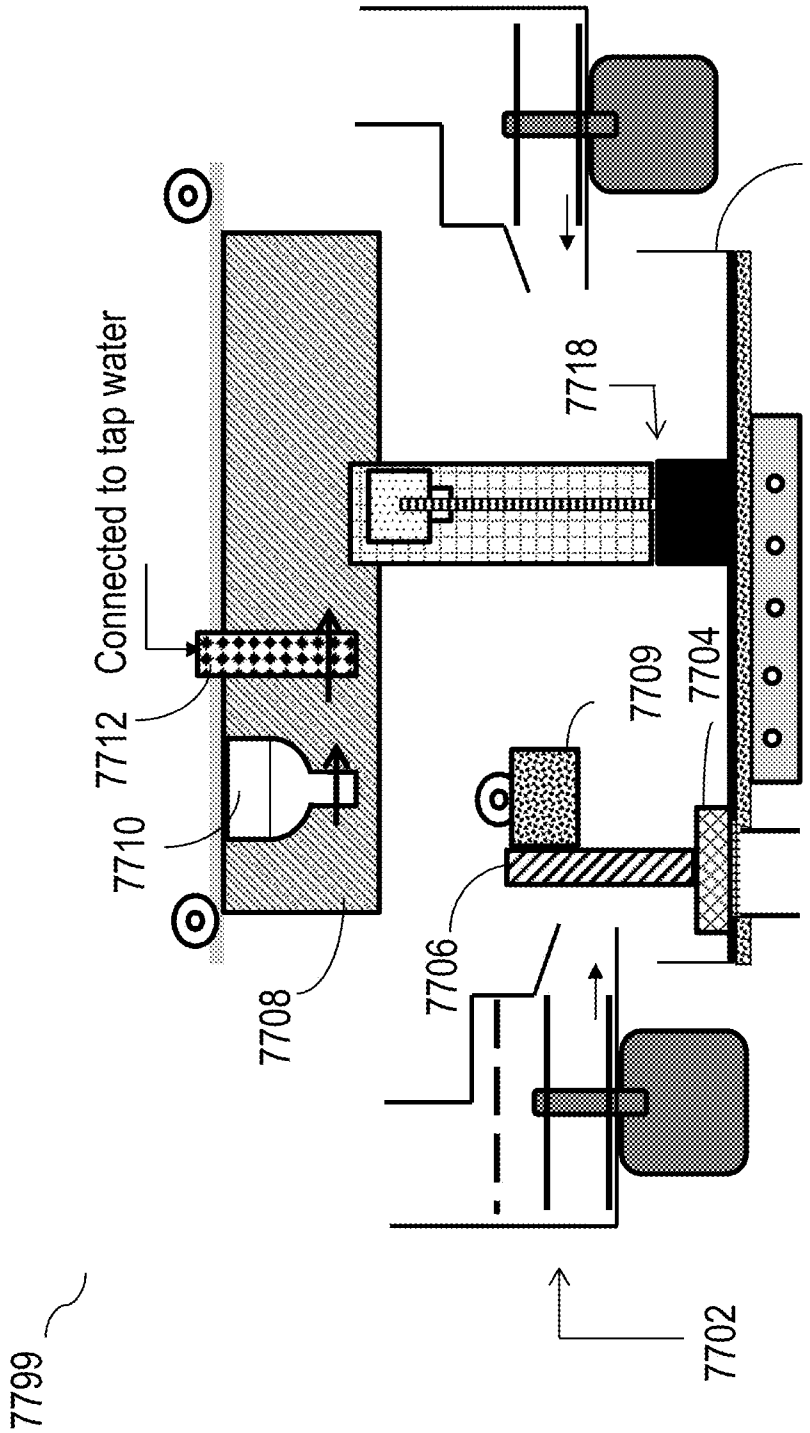
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Fig. 77D

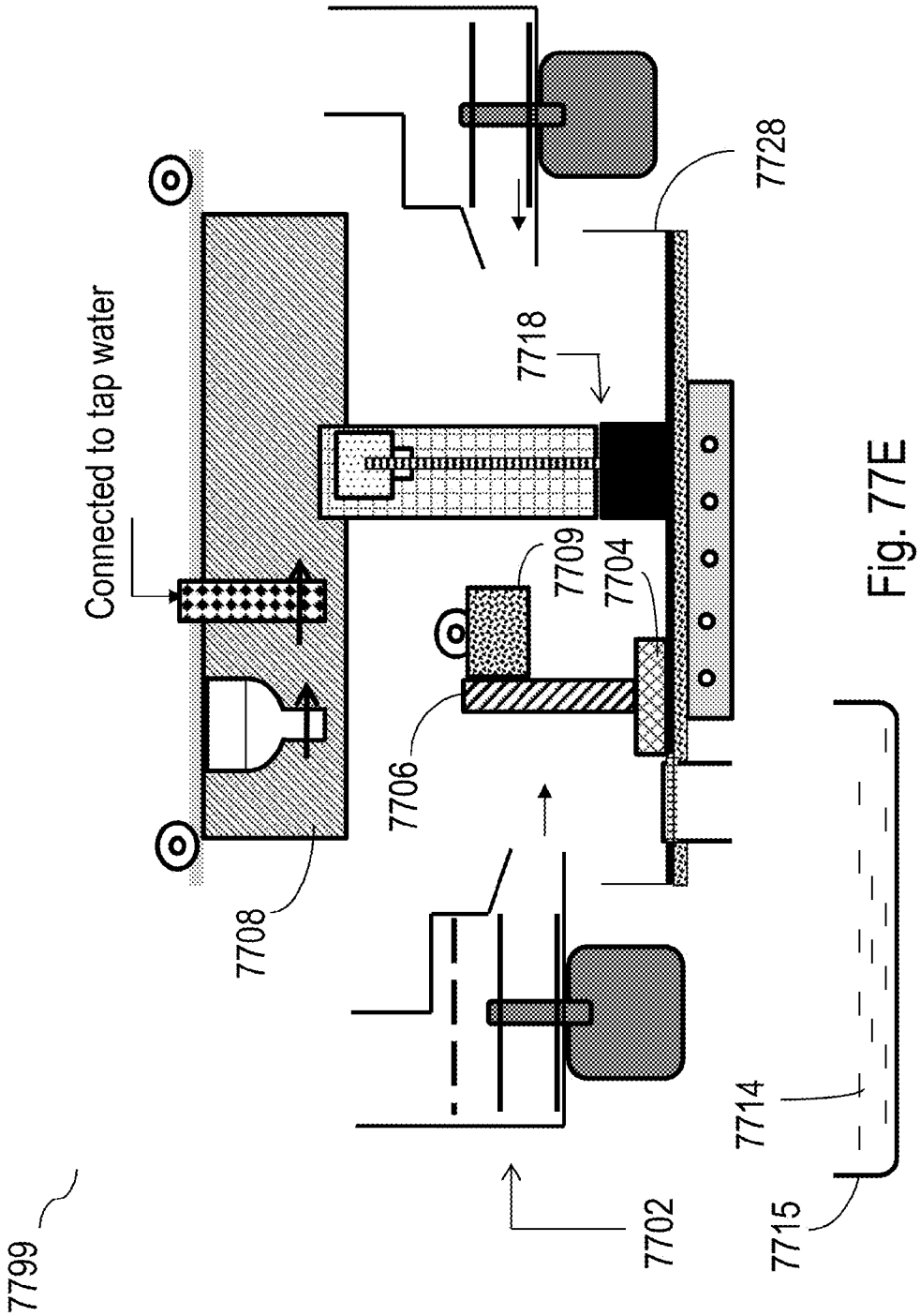
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Fig. 77E

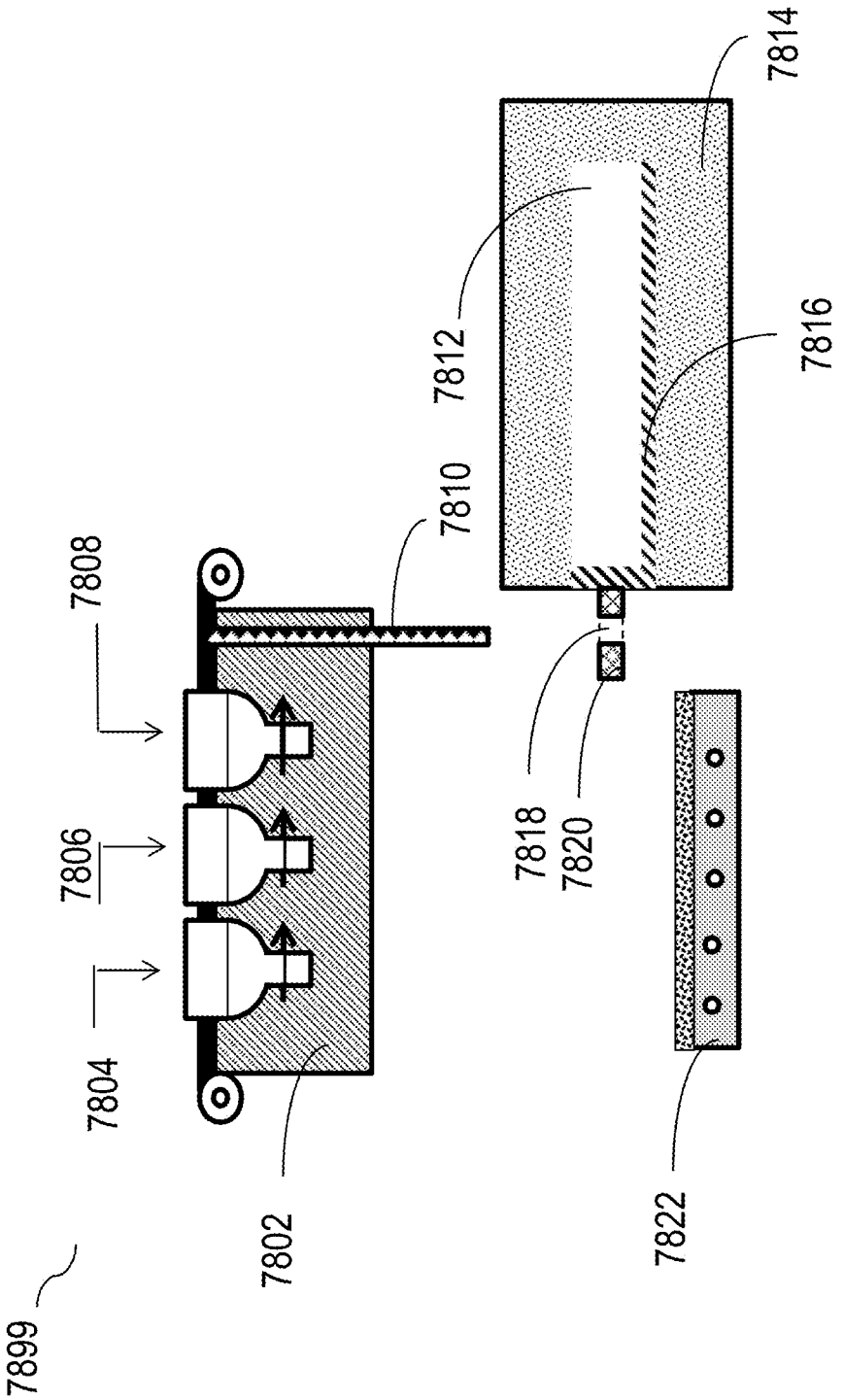

Fig. 78A

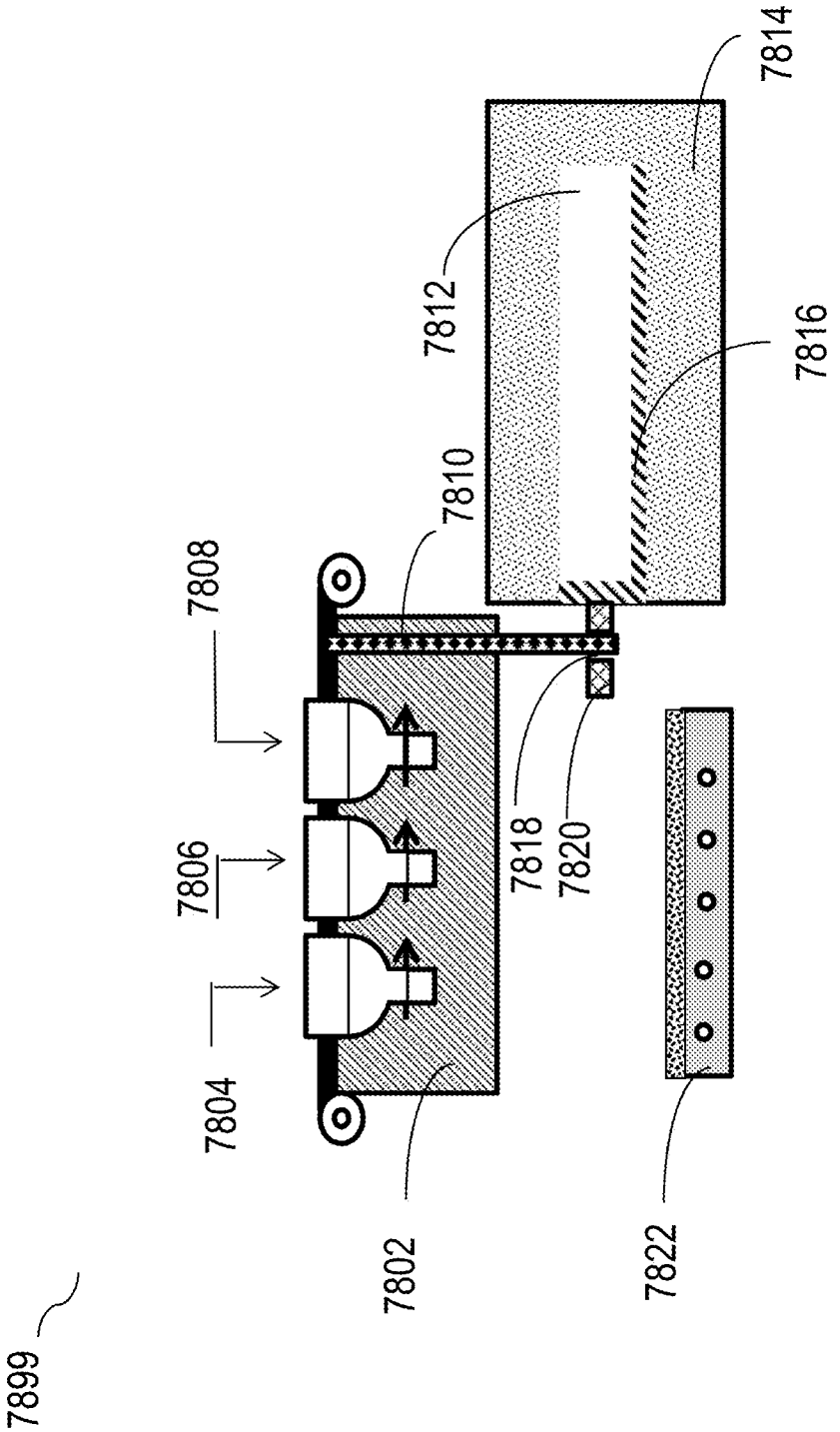

Fig. 78B

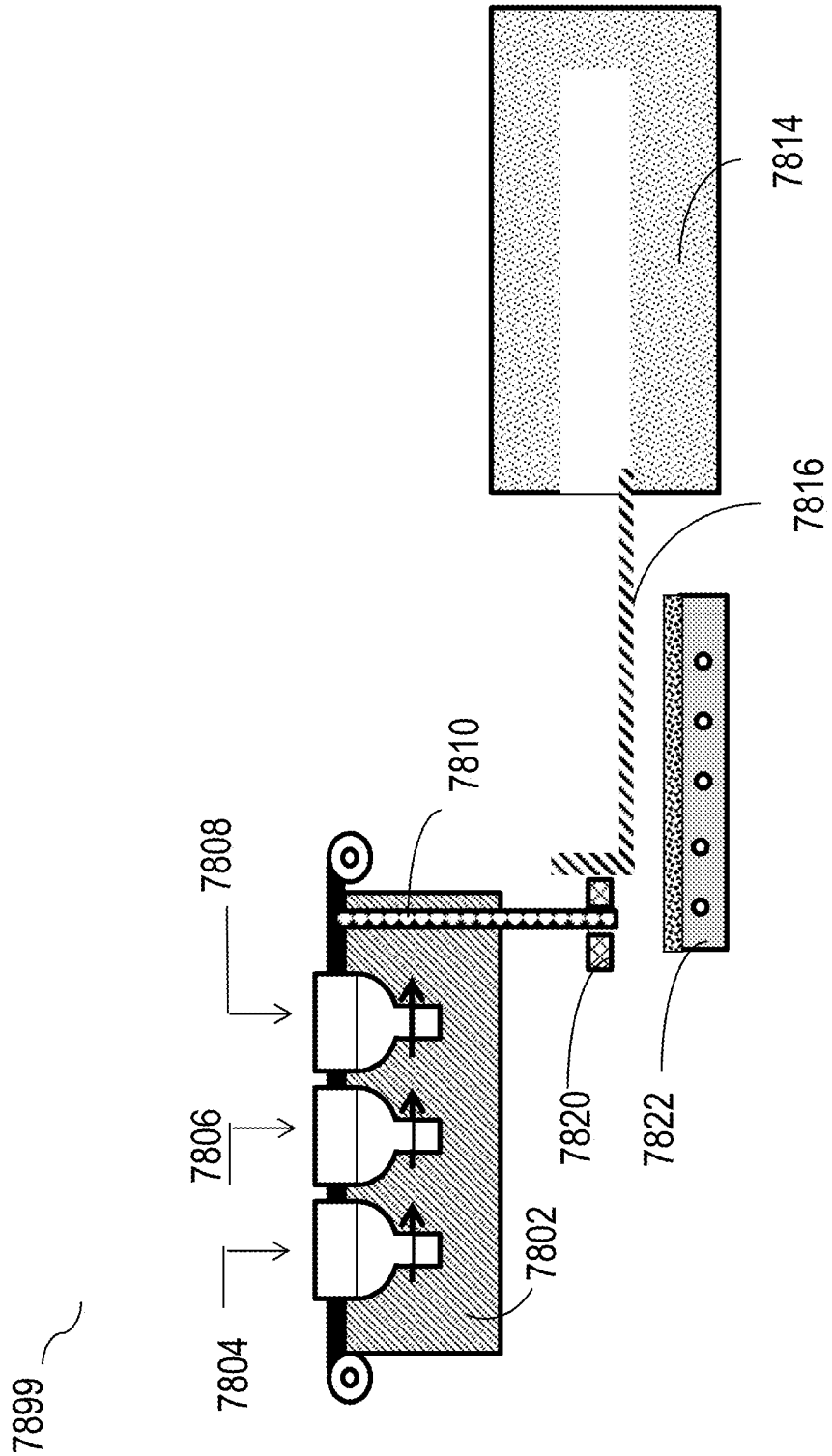

Fig. 78C

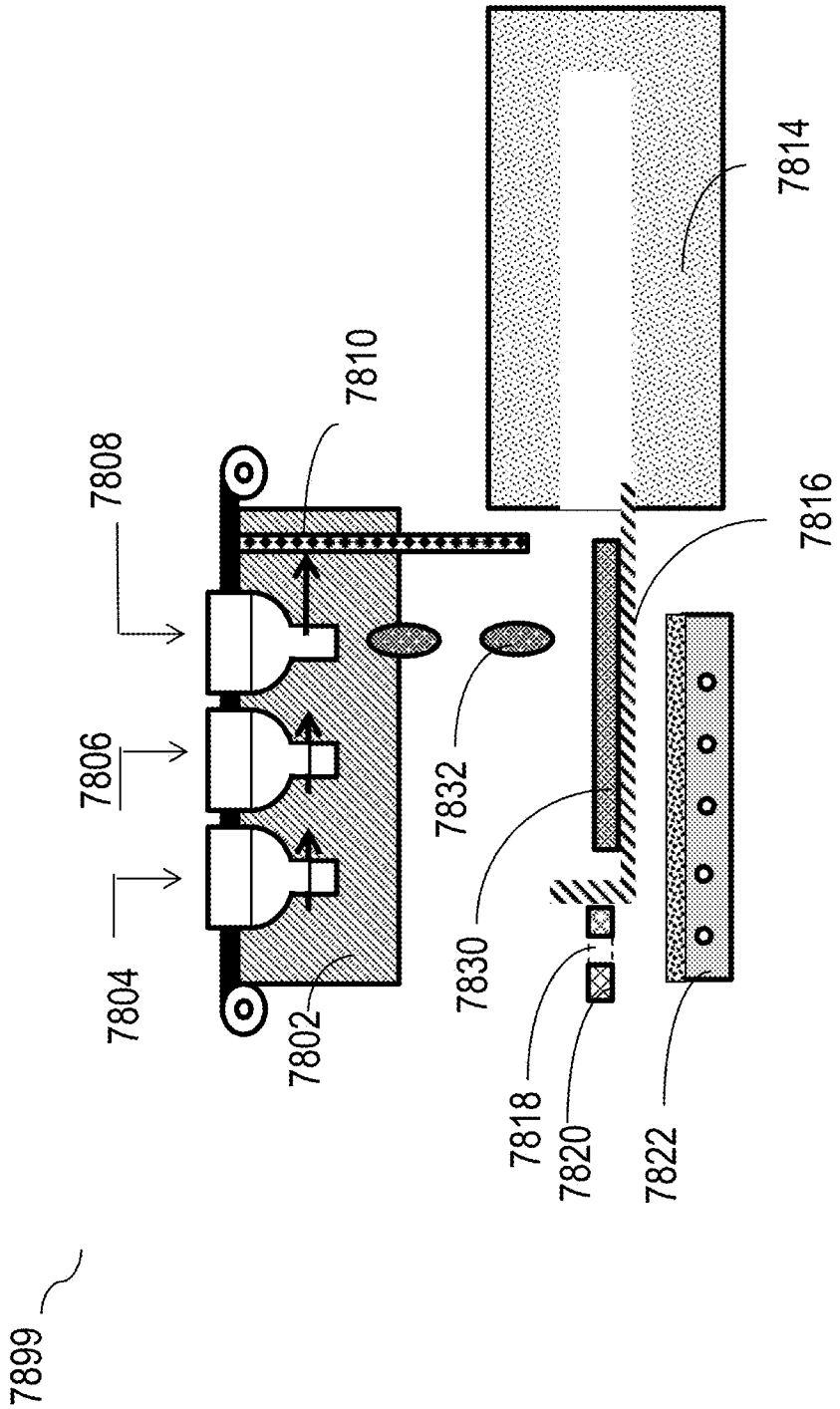
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Fig. 78D

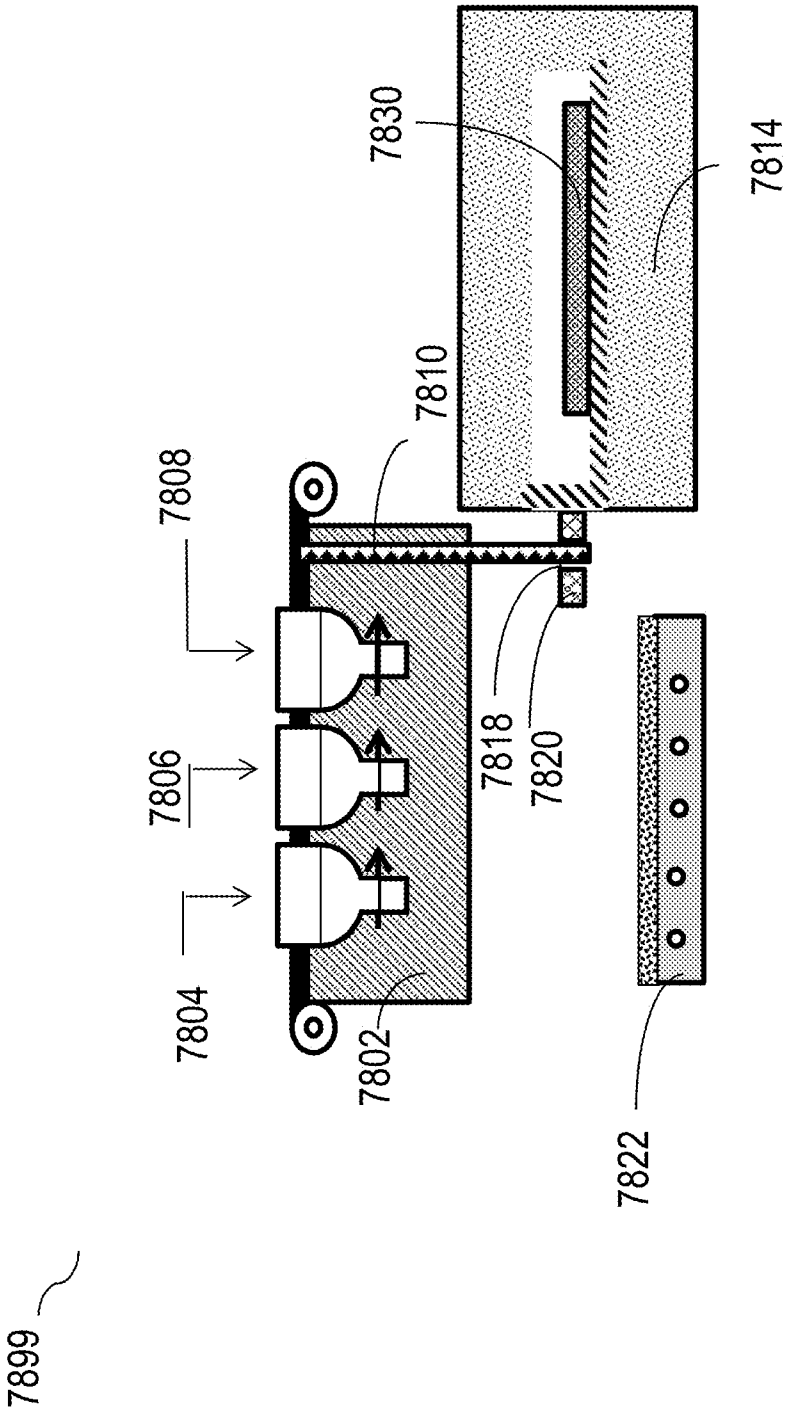

Fig. 78E

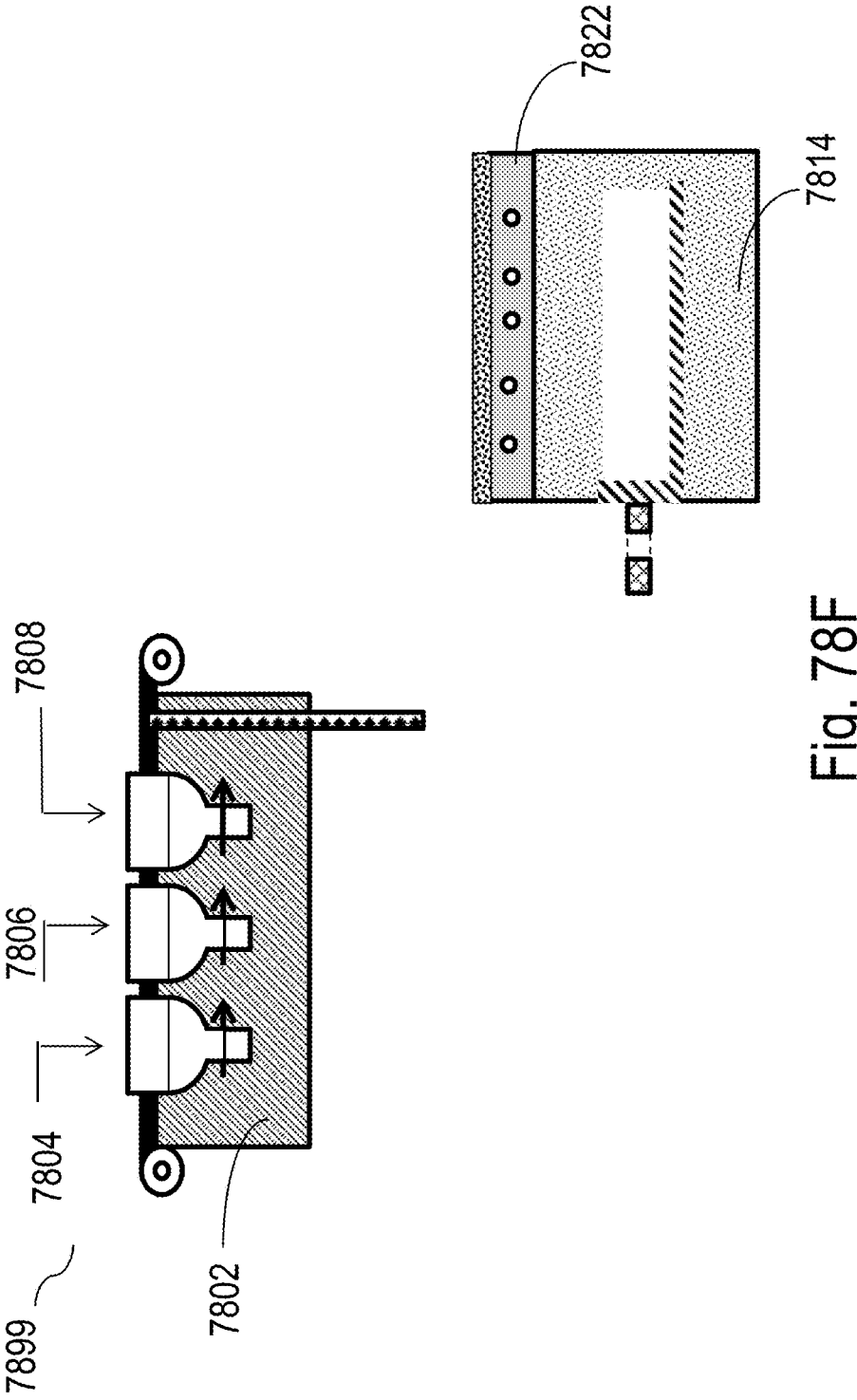

Fig. 78F

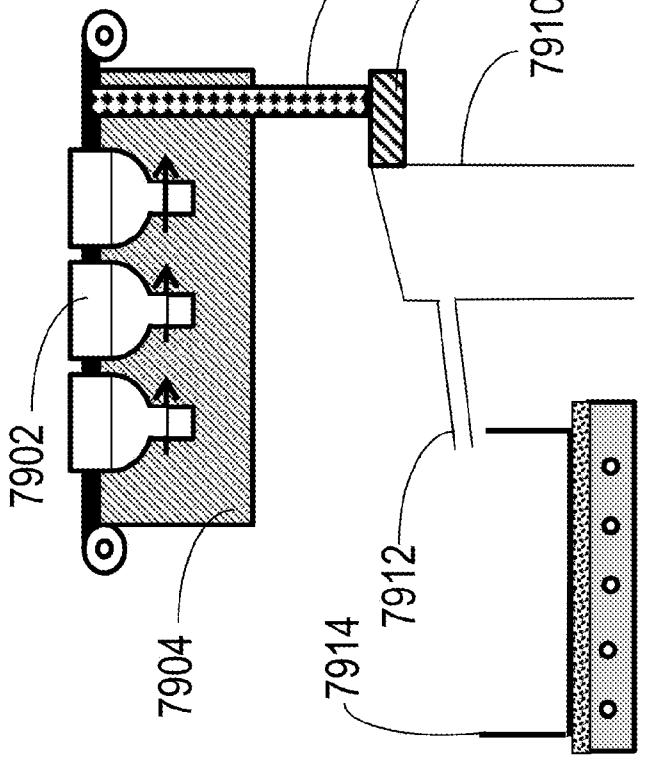

Fig. 79

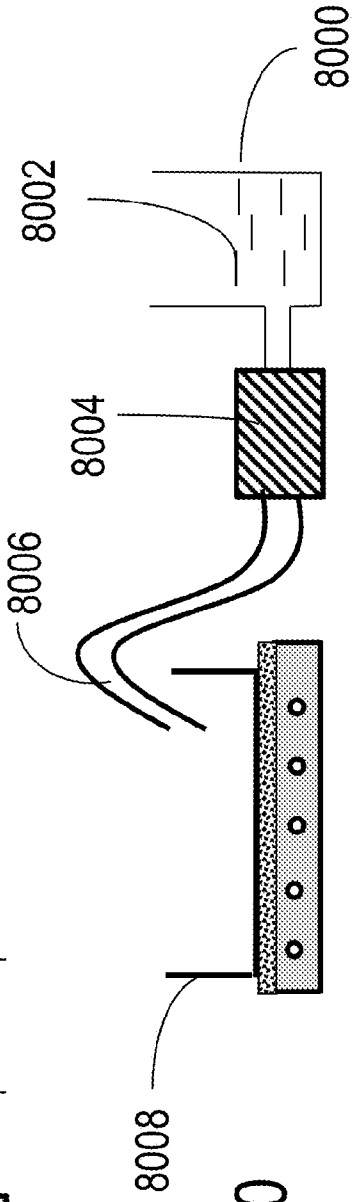

Fig. 80

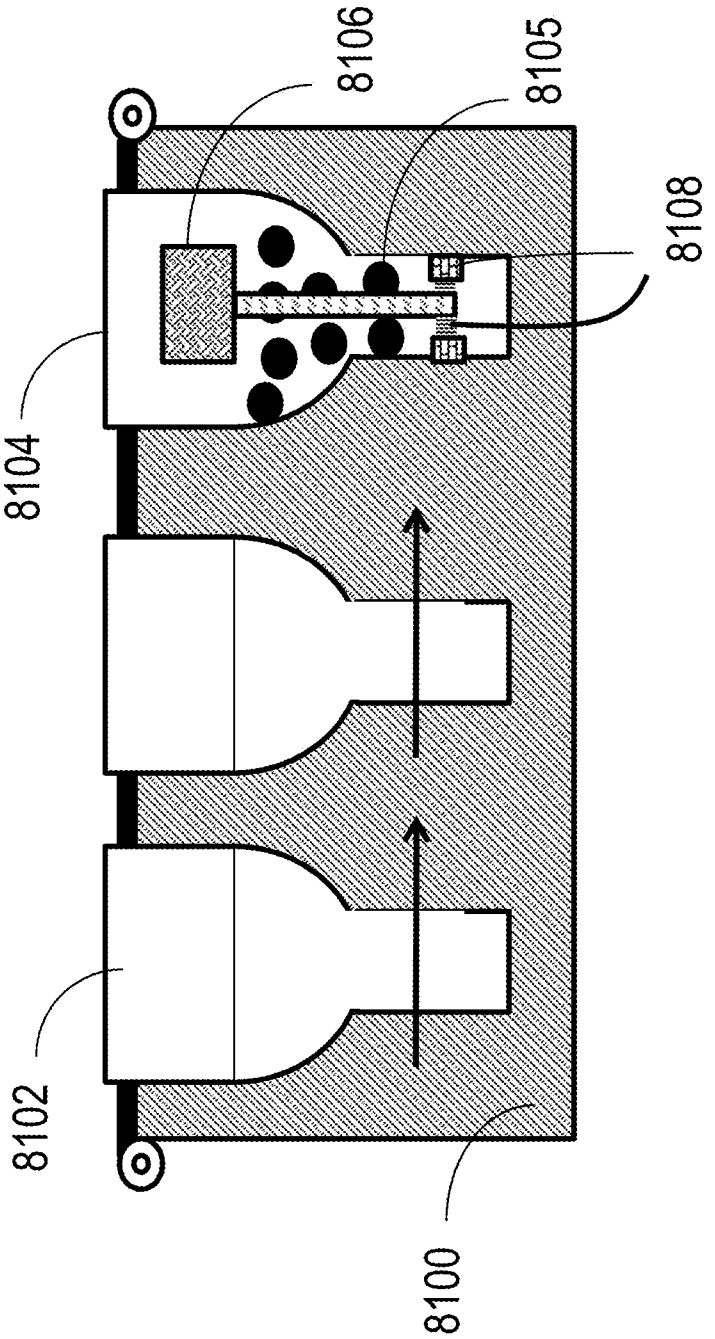

Fig. 81

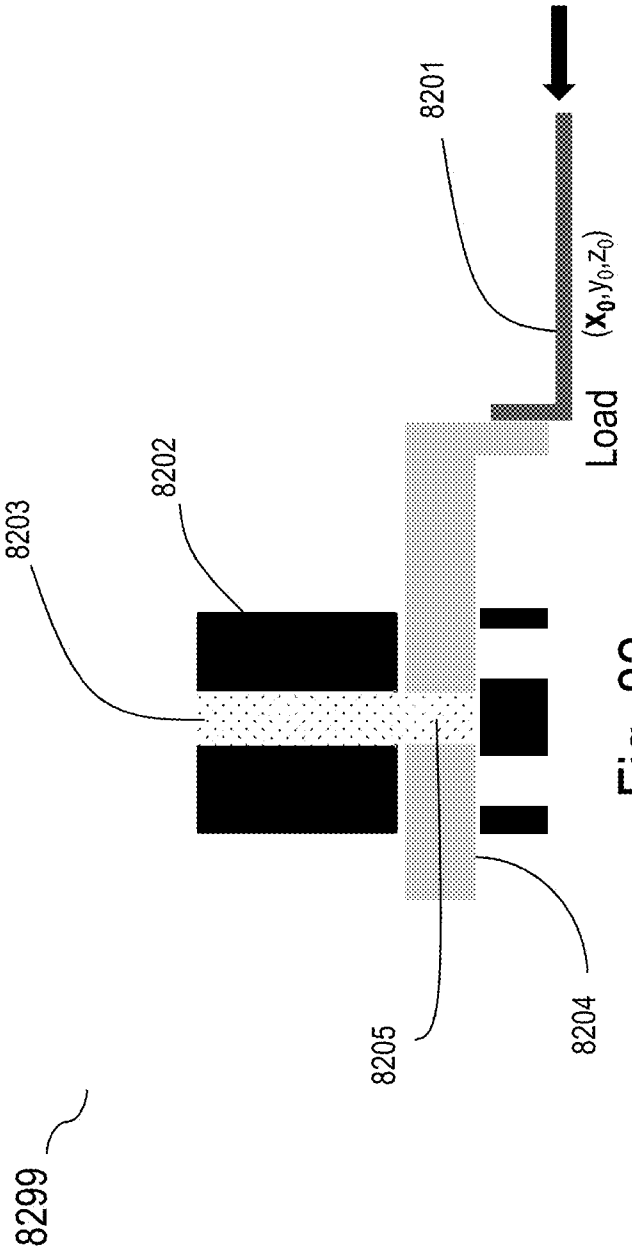

Fig. 82

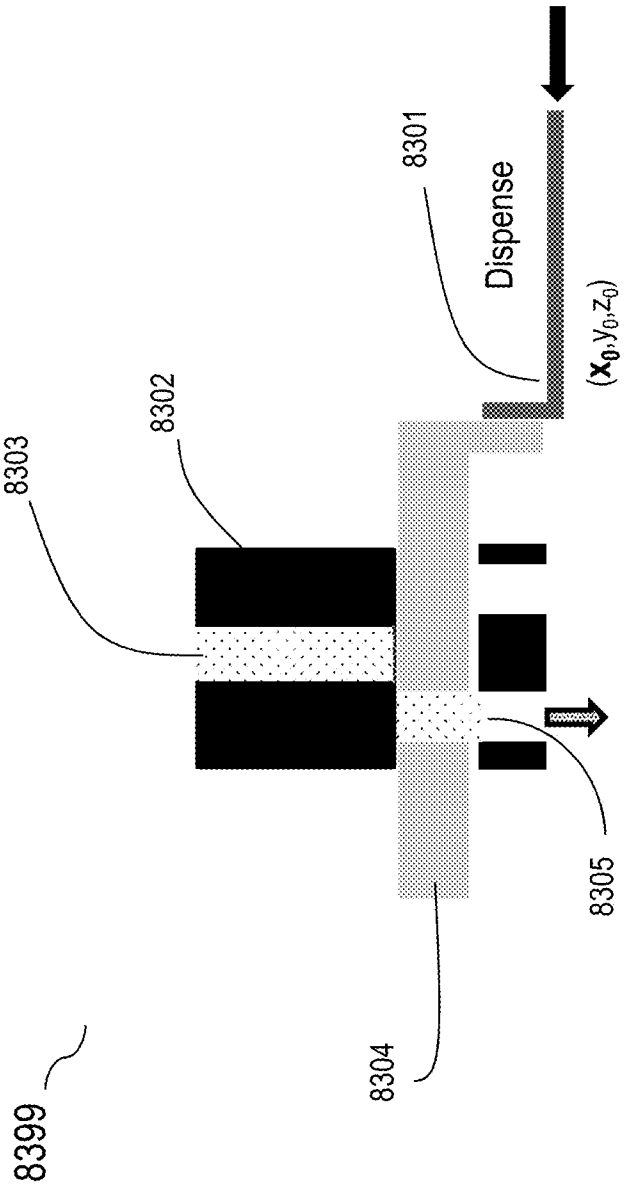

Fig. 83

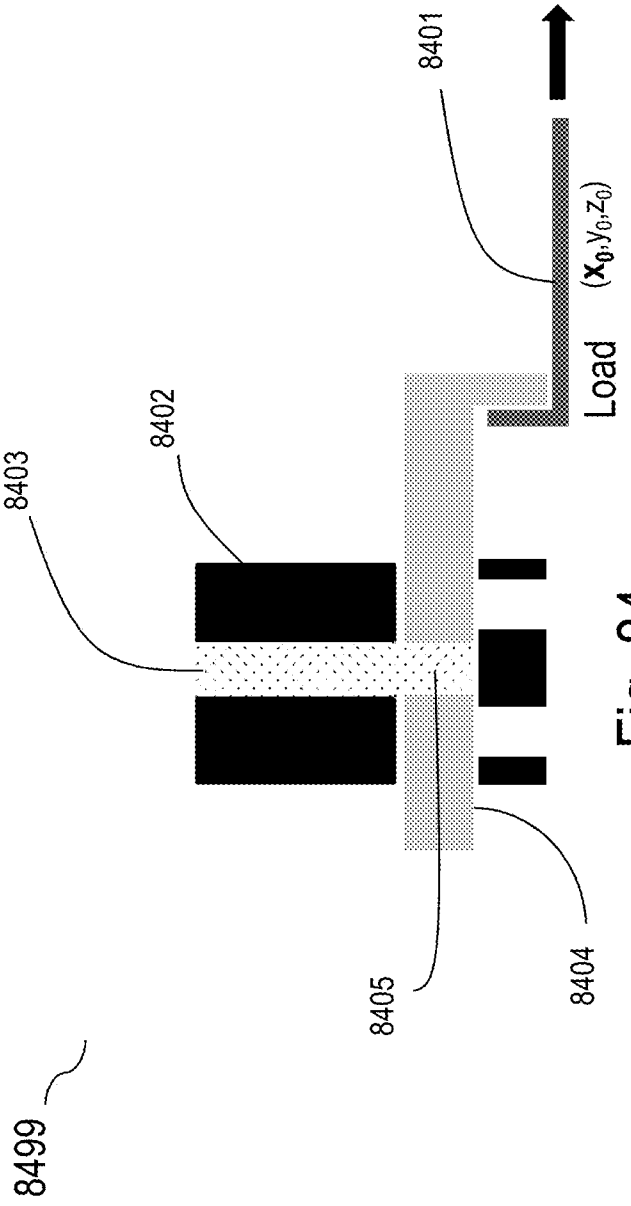

Fig. 84

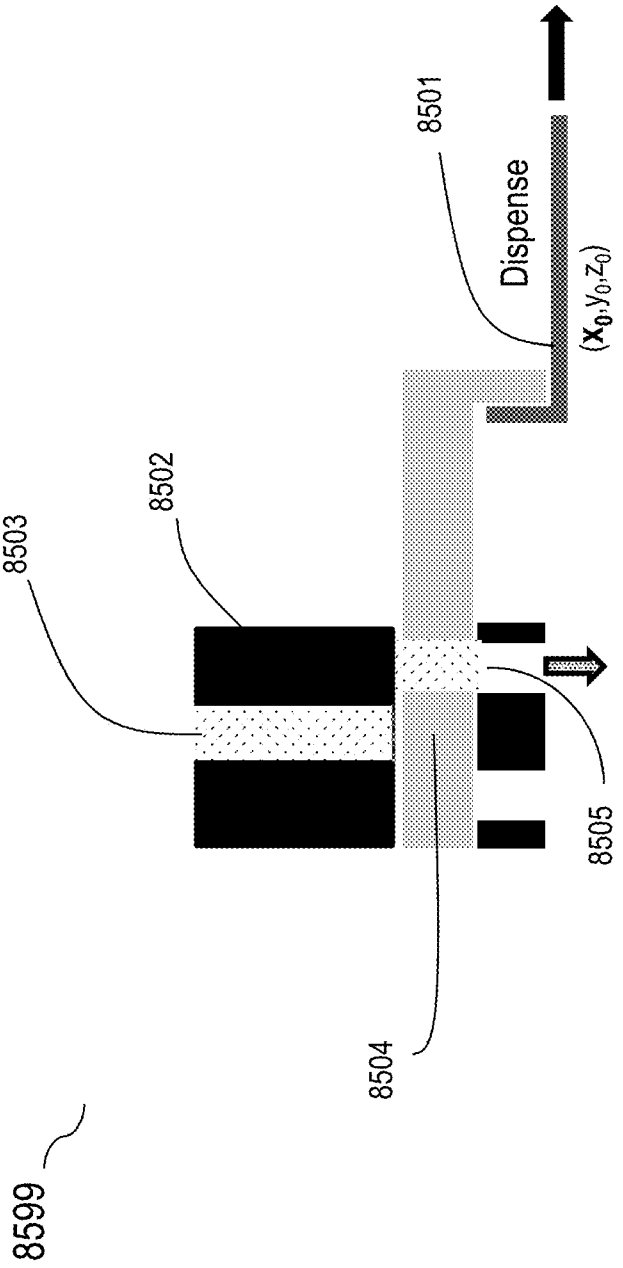

Fig. 85

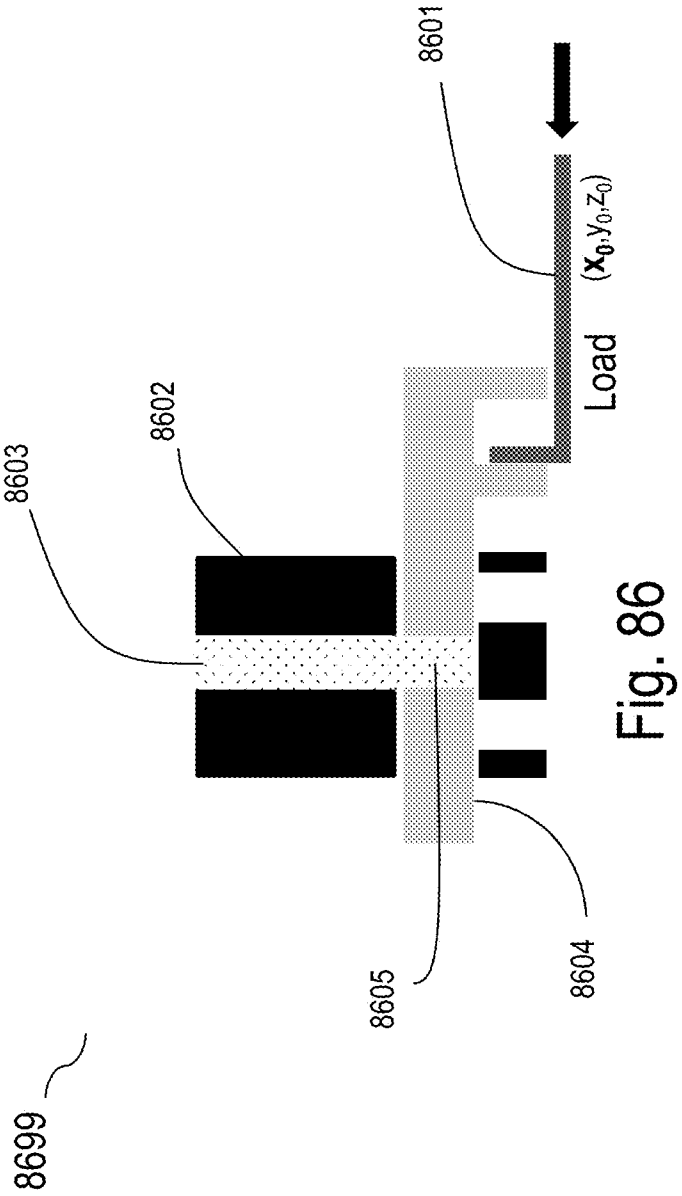

Fig. 86

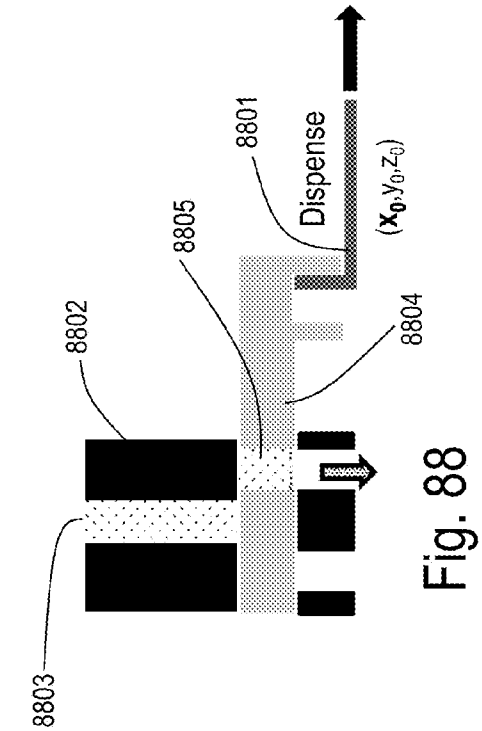

Fig. 88

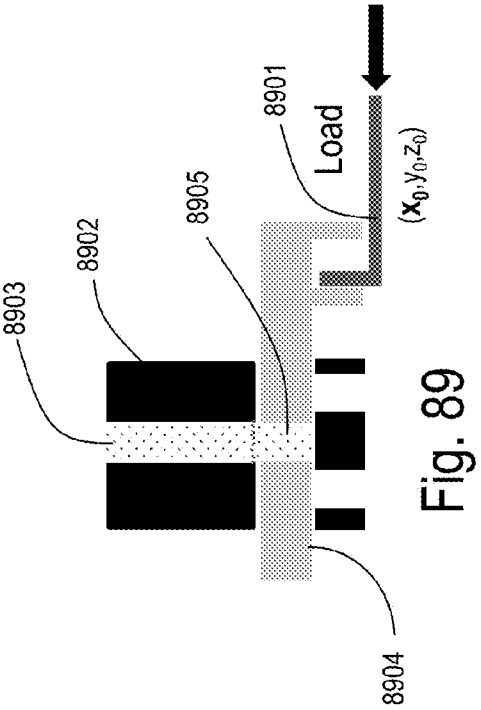

Fig. 89

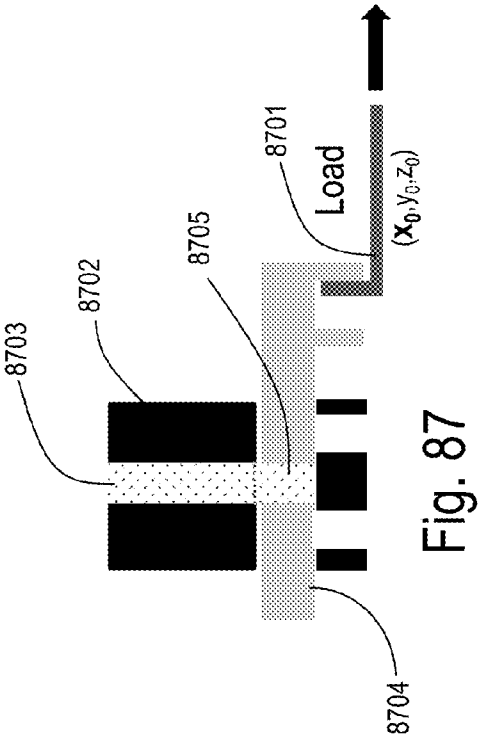

Fig. 87

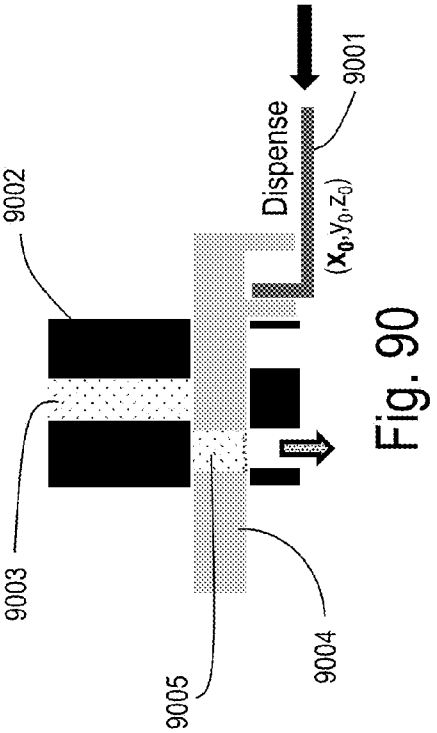

Fig. 90

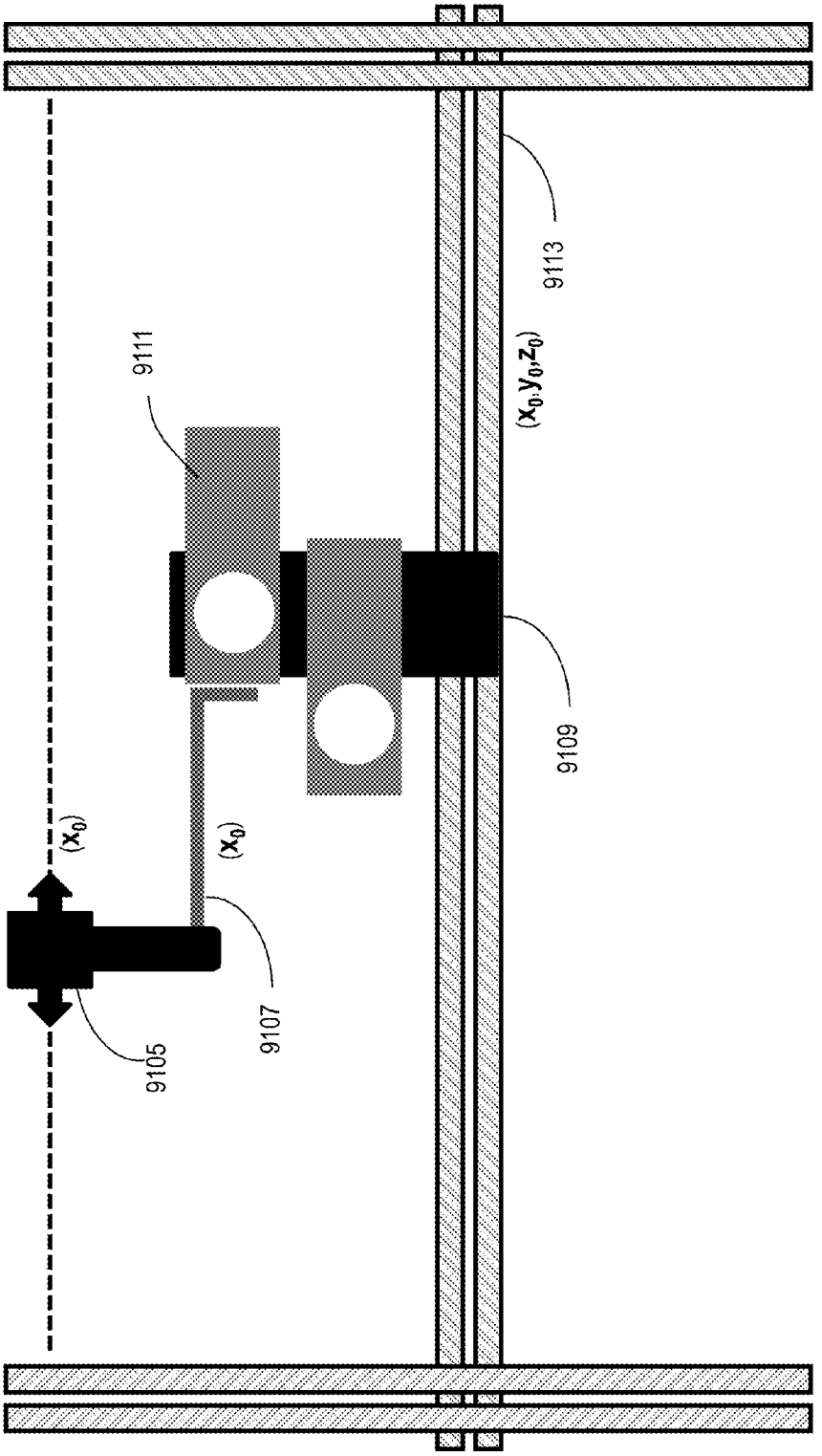

Fig. 91

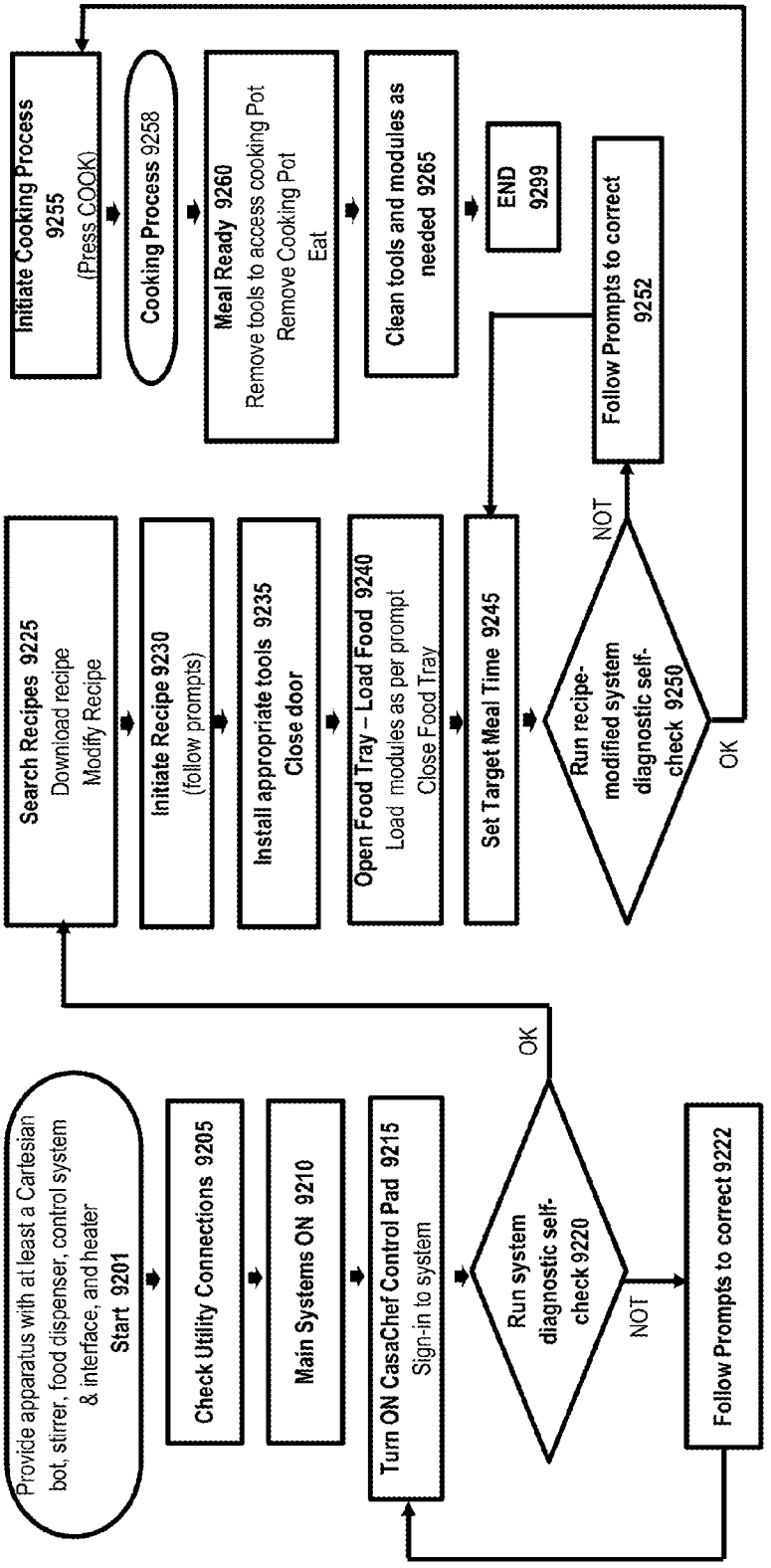
Provide apparatus with at least a Cartesian bot, stirrer, food dispenser, control system & interface, and heater
Start 9201
Check Utility Connections 9205
Main Systems ON 9210
Turn ON CasaChef Control Pad 9215
Sign-in to system
Run system diagnostic self-check 9220
NOT
OK
Follow Prompts to correct 9222
Search Recipes 9225
Download recipe
Modify Recipe
Initiate Recipe 9230
(follow prompts)
Install appropriate tools 9235
Close door
Open Food Tray – Load Food 9240
Load modules as per prompt
Close Food Tray
Set Target Meal Time 9245
Run recipe-modified system diagnostic self-check 9250
NOT
OK
Follow Prompts to correct 9252
Initiate Cooking Process 9255
(Press COOK)
Cooking Process 9258
Meal Ready 9260
Remove tools to access cooking Pot
Remove Cooking Pot
Eat
Clean tools and modules as needed 9265
END 9299

Fig. 92

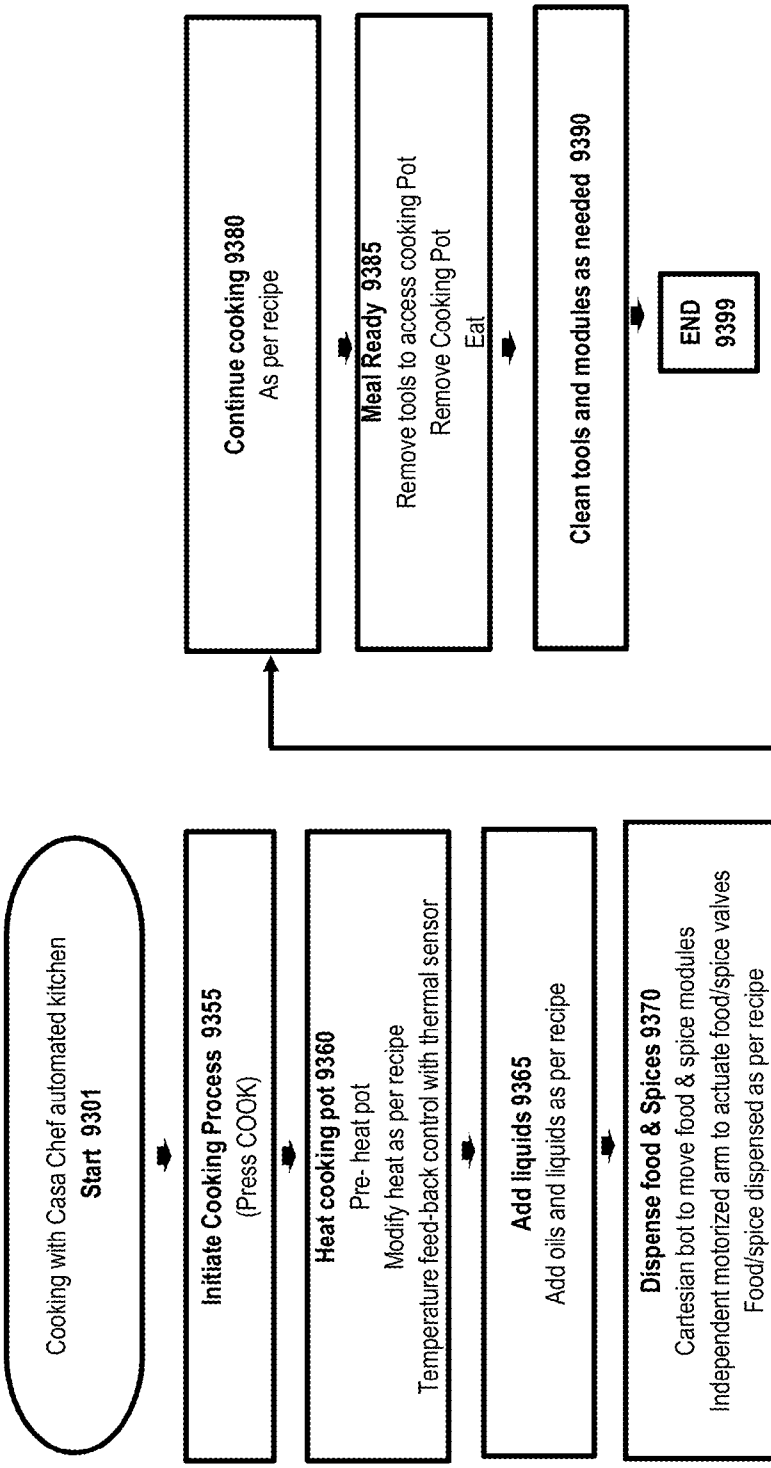
Cooking with Casa Chef automated kitchen
Start 9301
Initiate Cooking Process 9355
(Press COOK)
Heat cooking pot 9360
Pre- heat pot
Modify heat as per recipe
Temperature feed-back control with thermal sensor
Add liquids 9365
Add oils and liquids as per recipe
Dispense food & Spices 9370
Cartesian bot to move food & spice modules
Independent motorized arm to actuate food/spice valves
Food/spice dispensed as per recipe
Stirring 9375
Cartesian bot programmed stirring path and speed
Continue cooking 9380
As per recipe
Meal Ready 9385
Remove tools to access cooking Pot
Remove Cooking Pot
Eat
Clean tools and modules as needed 9390
END
9399

Fig. 93

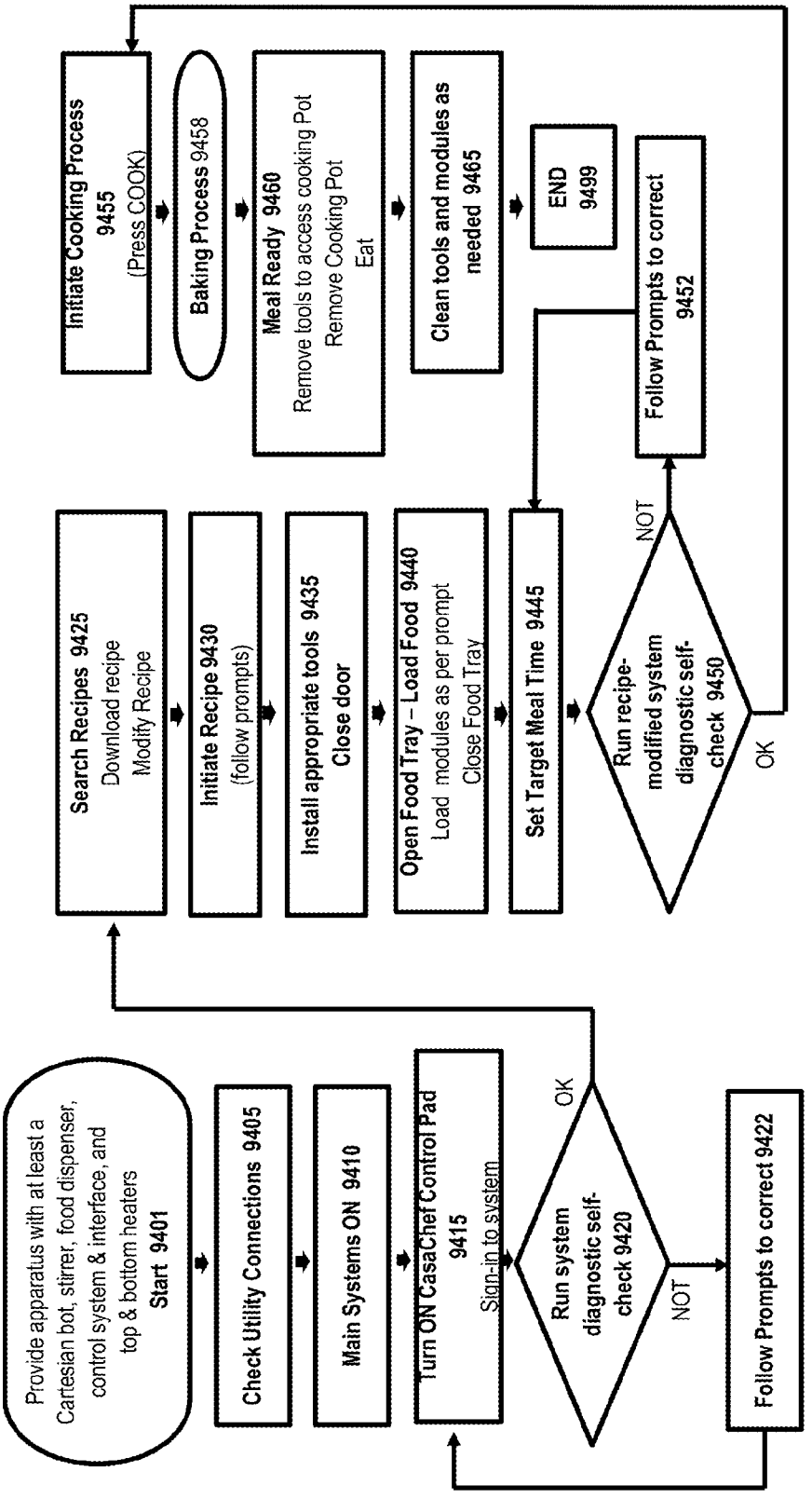
Provide apparatus with at least a Cartesian bot, stirrer, food dispenser, control system & interface, and top & bottom heaters
Start 9401
Check Utility Connections 9405
Main Systems ON 9410
Turn ON CasaChef Control Pad 9415
Sign-in to system
Run system diagnostic self-check 9420
OK
NOT
Follow Prompts to correct 9422
Search Recipes 9425
Download recipe
Modify Recipe
Initiate Recipe 9430
(follow prompts)
Install appropriate tools 9435
Close door
Open Food Tray – Load Food 9440
Load modules as per prompt
Close Food Tray
Set Target Meal Time 9445
Run recipe-modified system diagnostic self-check 9450
OK
NOT
Follow Prompts to correct 9452
Initiate Cooking Process 9455
(Press COOK)
Baking Process 9458
Meal Ready 9460
Remove tools to access cooking Pot
Remove Cooking Pot
Eat
Clean tools and modules as needed 9465
END 9499

Fig. 94

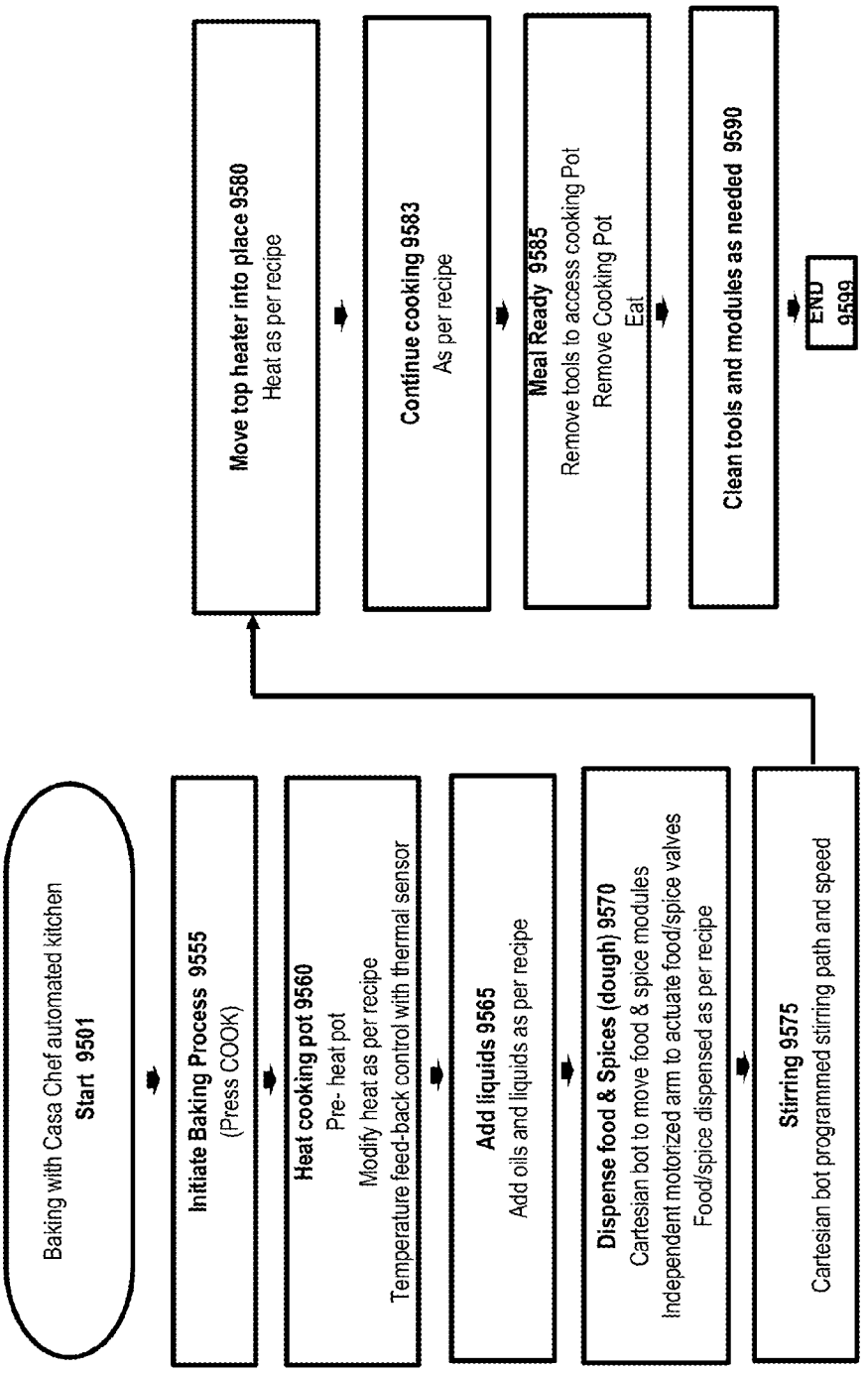
Baking with Casa Chef automated kitchen
Start 9501
Initiate Baking Process 9555
(Press COOK)
Heat cooking pot 9560
Pre- heat pot
Modify heat as per recipe
Temperature feed-back control with thermal sensor
Add liquids 9565
Add oils and liquids as per recipe
Dispense food & Spices (dough) 9570
Cartesian bot to move food & spice modules
Independent motorized arm to actuate food/spice valves
Food/spice dispensed as per recipe
Stirring 9575
Cartesian bot programmed stirring path and speed
Move top heater into place 9580
Heat as per recipe
Continue cooking 9583
As per recipe
Meal Ready 9585
Remove tools to access cooking Pot
Remove Cooking Pot
Eat
Clean tools and modules as needed 9590
END
9599

Fig. 95

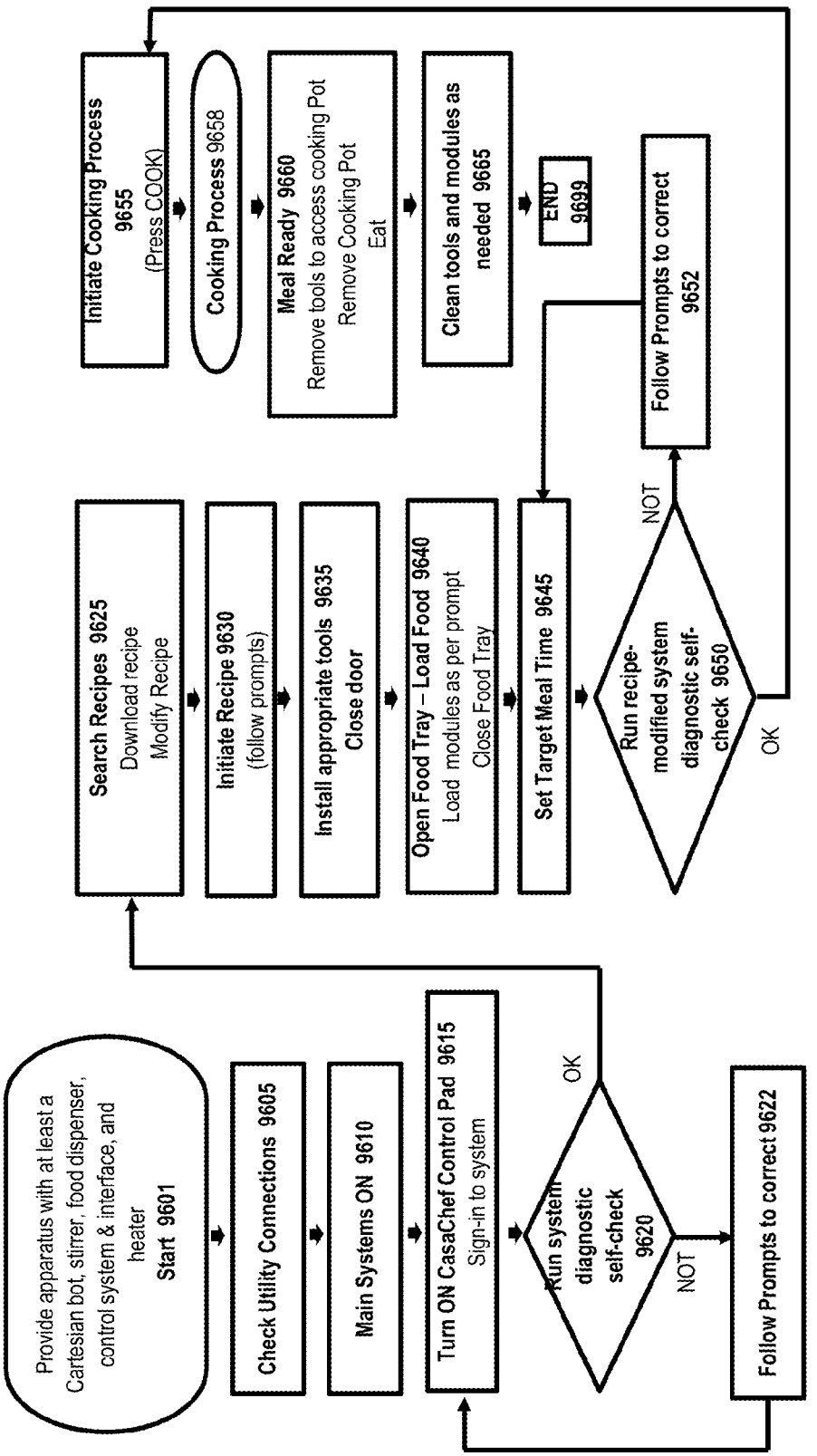
Provide apparatus with at least a Cartesian bot, stirrer, food dispenser, control system & interface, and heater
Start 9601
Check Utility Connections 9605
Main Systems ON 9610
Turn ON CasaChef Control Pad 9615
Sign-in to system
Run system diagnostic self-check 9620
NOT
OK
Follow Prompts to correct 9622
Search Recipes 9625
Download recipe
Modify Recipe
Initiate Recipe 9630
(follow prompts)
Install appropriate tools 9635
Close door
Open Food Tray – Load Food 9640
Load modules as per prompt
Close Food Tray
Set Target Meal Time 9645
Run recipe-modified system diagnostic self-check 9650
NOT
OK
Follow Prompts to correct 9652
Initiate Cooking Process 9655
(Press COOK)
Cooking Process 9658
Meal Ready 9660
Remove tools to access cooking Pot
Remove Cooking Pot
Eat
Clean tools and modules as needed 9665
END 9699

Fig. 96

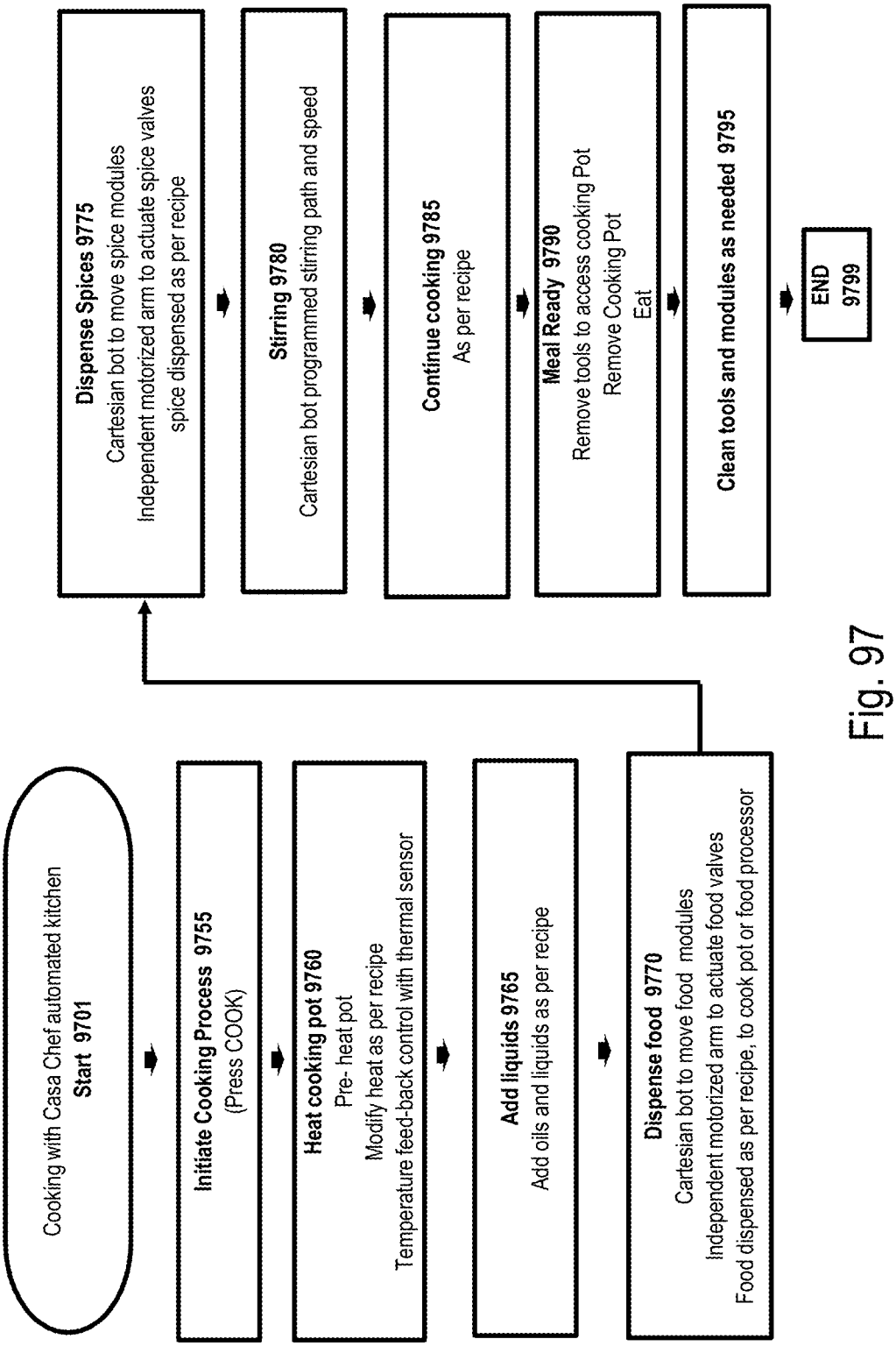
Cooking with Casa Chef automated kitchen
Start 9701
Initiate Cooking Process 9755
(Press COOK)
Heat cooking pot 9760
Pre- heat pot
Modify heat as per recipe
Temperature feed-back control with thermal sensor
Add liquids 9765
Add oils and liquids as per recipe
Dispense food 9770
Cartesian bot to move food modules
Independent motorized arm to actuate food valves
Food dispensed as per recipe, to cook pot or food processor
Dispense Spices 9775
Cartesian bot to move spice modules
Independent motorized arm to actuate spice valves
spice dispensed as per recipe
Stirring 9780
Cartesian bot programmed stirring path and speed
Continue cooking 9785
As per recipe
Meal Ready 9790
Remove tools to access cooking Pot
Remove Cooking Pot
Eat
Clean tools and modules as needed 9795
END
9799

Fig. 97

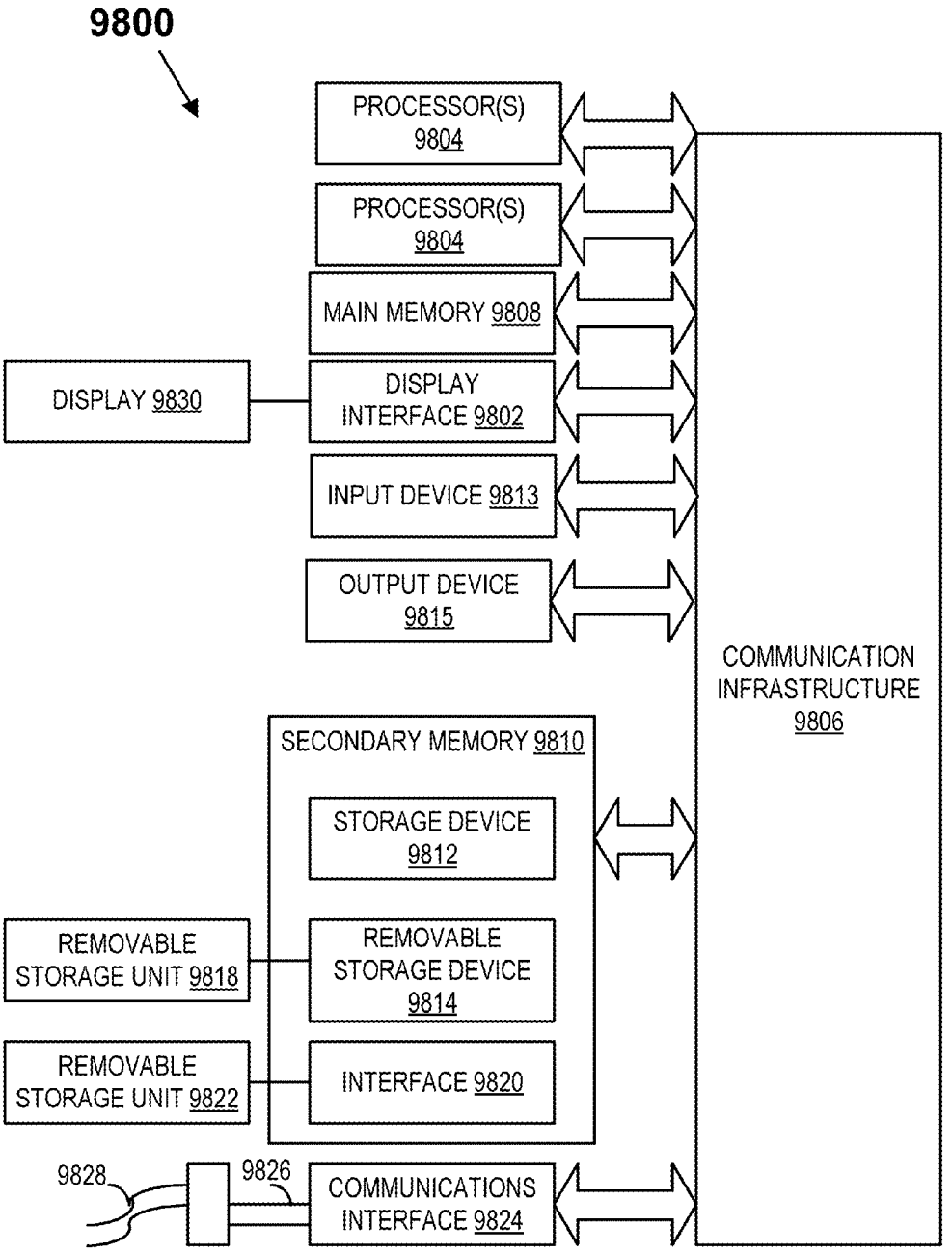
9800
PROCESSOR(S) 9804
PROCESSOR(S) 9804
MAIN MEMORY 9808
DISPLAY 9830
DISPLAY INTERFACE 9802
INPUT DEVICE 9813
OUTPUT DEVICE 9815
COMMUNICATION INFRASTRUCTURE 9806
SECONDARY MEMORY 9810
STORAGE DEVICE 9812
REMOVABLE STORAGE UNIT 9818
REMOVABLE STORAGE DEVICE 9814
REMOVABLE STORAGE UNIT 9822
INTERFACE 9820
9828
9826
COMMUNICATIONS INTERFACE 9824

Fig. 98

AUTOMATED COOKING MACHINE USING A CARTESIAN BOT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 62/047,785, filed Sep. 9, 2014, U.S. Provisional Patent Application No. 62/056,368, filed Sep. 26, 2014, U.S. Provisional Patent Application No. 62/094,595, filed Dec. 19, 2014, U.S. Provisional Patent Application No. 62/150,303, filed Apr. 21, 2015, U.S. Provisional Patent Application No. 62/185,524, filed Jun. 26, 2015, and U.S. Provisional Patent Application No. 62/201,105, filed Aug. 4, 2015. The contents of the foregoing applications are incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] This application relates to the general field of electronically-aided apparatuses, systems, methods and techniques to conduct the cooking process in a home or a business.

[0004] 2. Discussion of Background Art

[0005] Over the years, a number of innovations have come in to help with the cooking process. Food processors are now available to chop vegetables and meat. Induction cooktops allow a faster cooking process. Microwave ovens allow efficient reheating. However, despite these innovations, many of us spend an hour a day, or sometimes even more, cooking food for ourselves and our families. Cooking also requires a significant learning curve before one can do it in a tasty manner. Ways to reduce the "human time" needed for cooking as well as the learning curve associated with cooking could be quite useful. As well, direct and indirect economic benefits may accrue for a business by transferring some of the human time costs to a machine, robot, and such.

[0006] U.S. Patent Application Publication No. 2013/0112683 from Hegedis, Davenport and Hoare apparently describes a cooking apparatus where a heating element works with a user interface and temperature sensors and provides prompts to the user during cooking. However, this requires user input to provide all the ingredients needed for cooking and requires the user to stand near the cooktop for large periods of time to respond to the prompts provided by the cooking apparatus. There is no mixing function available automatically, so the user needs to stand near the cooktop for large periods of time as well.

[0007] U.S. Patent Application Publication No. 2011/0108546 from Cho and Chen apparently describes an intelligent heating mechanism which adaptively provides power to an induction cooktop based on temperature sensor data as well as a user-defined temperature profile. However, this requires the user to provide all the ingredients needed for cooking manually and requires the user to stand near the cooktop to mix the food items periodically.

[0008] Foodini, a prototype and soon-to-be-released product from Natural Machines, apparently 3D prints food items by heating food pastes and dispensing them on to a stage. However, this requires food to be in paste form before being dispensed, which could be cumbersome and costly.

[0009] Everycook, a prototype made in Europe, apparently promises to cut and mix food items and cook them with a recipe. However, the user still needs to be present near the Everycook cooking apparatus and dump additional food items every so often.

[0010] Sereneti Kitchen, a prototype in the US, apparently wants to automate the cooking process but does not conduct any chopping of the ingredients and utilizes pre-chopped food instead. Neither does it put measured quantities of ingredients into the cooking vessel.

[0011] It is clear based on the background that invention of a cooking apparatus and method that allow food preparation with minimal human intervention during the cooking process will be quite beneficial.

SUMMARY

[0012] Cooking is often considered a complex process and one which requires the complex functionality that human hands provide. For example, Moley Robotics, a company based in Europe, tries to mimic human hands as closely as possible. Their prototype apparently requires 24 motors and more than 100 sensors. It is an object of this invention to automate the cooking process with intelligent use of simple robot arms thereby having a significantly reduced number of motors and sensors (vis-à-vis an approach which mimics human hands).

[0013] In this invention, Cartesian robot arms, also called Cartesian bots, are used. Based on intelligent use of a Cartesian bot as well as additional hardware and software, we show that one can perform various functions such as ingredient dispensing, stovetop cooking, baking, chopping and stirring.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Various embodiments of the invention will be understood and appreciated more fully from the following detailed description, taken in conjunction with the drawings in which:

[0015] FIG. **1** is an example illustration of an automated cooking machine using an induction cooking apparatus, a mixer, an automated ingredient delivery system and a user interface in an embodiment of the present invention;

[0016] FIG. **2** is an example illustration of an ingredient delivery system in an embodiment of the present invention;

[0017] FIG. **3** is an example illustration of the automated ingredient delivery system dispensing ingredients into the cooking vessel in an embodiment of the present invention;

[0018] FIG. **4** is an example illustration of a valve system for the automated ingredient delivery system in an embodiment of the present invention;

[0019] FIG. **5** is an example illustration of a configuration for the valve system in an embodiment of the present invention;

[0020] FIG. **6** is an example illustration of a configuration for the valve system in an embodiment of the present invention;

[0021] FIG. **7** is an example illustration of a configuration for the valve system in an embodiment of the present invention;

[0022] FIG. **8** is an example illustration of another design for the cooking machine in an embodiment of the present invention;

[0023] FIG. **9** is an example illustration of the cooking machine utilizing feedback from various sensors in an embodiment of the present invention;

[0024] FIG. **10** is an example illustration of how the cooking machine can provide information about food that is going to be cooked in an embodiment of the present invention;

[0025] FIG. **11** is an example illustration of a food processor in an embodiment of the present invention;

[0026] FIG. **12** is an example illustration of a blade used in the food processor of FIG. **11** in an embodiment of the present invention;

[0027] FIG. **13** is an example illustration of a top view of the food processor of FIG. **11** in an embodiment of the present invention;

[0028] FIG. **14** is an example illustration of a cooking machine in an embodiment of the present invention;

[0029] FIG. **15** is an example illustration of an example cooking processor using the machine in FIG. **14** in an embodiment of the present invention;

[0030] FIG. **16** is an example illustration of an example cooking processor using the machine in FIG. **14** in an embodiment of the present invention;

[0031] FIG. **17** is an example illustration of an example cooking processor using the machine in FIG. **14** in an embodiment of the present invention;

[0032] FIG. **18** is an example illustration of an example cooking processor using the machine in FIG. **14** in an embodiment of the present invention;

[0033] FIG. **19** is an example illustration of a cooking machine with multiple burners in an embodiment of the present invention;

[0034] FIG. **20** is an example illustration of an apparatus for ingredient dispensing in an embodiment of the present invention;

[0035] FIG. **21** is an example illustration of an initial step of the ingredient dispensing process in an embodiment of the present invention;

[0036] FIG. **22** is an example illustration of a step of the ingredient dispensing process that may follow FIG. **21** in an embodiment of the present invention;

[0037] FIG. **23** is an example illustration of a step of the ingredient dispensing process that may follow FIG. **22** in an embodiment of the present invention;

[0038] FIG. **24** is an example illustration of a step of the ingredient dispensing process that may follow FIG. **23** in an embodiment of the present invention;

[0039] FIG. **25** is an example illustration of how Cartesian bot motion may be used to push ingredients to be dispensed in an embodiment of the present invention;

[0040] FIG. **26**A is an example illustration of a configuration for a two-position, spring-loaded, mechanically actuated, sliding valve system for a cooking machine in an embodiment of the present invention;

[0041] FIG. **26**B is an exploded view of a configuration for a two-position, spring-loaded, mechanically actuated, sliding valve system for a cooking machine in an embodiment of the present invention;

[0042] FIG. **27** is an example illustration of a configuration for a sliding valve system for a cooking machine in an idle state in an embodiment of the present invention;

[0043] FIG. **28** is an example illustration of a configuration for a sliding valve system for a cooking machine in the load state in an embodiment of the present invention;

[0044] FIG. **29** is an example illustration of a configuration for a sliding valve system for a cooking machine in the dispense state in an embodiment of the present invention;

[0045] FIG. **30** is an example illustration of a configuration for a rotary assembly of a sliding valve system with remote manual actuator for a cooking machine in the idle state in an embodiment of the present invention;

[0046] FIG. **31** is an example illustration of a configuration for a rotary assembly of a sliding valve system with remote manual actuator for a cooking machine in the load state in an embodiment of the present invention;

[0047] FIG. **32** is an example illustration of a configuration for a rotary assembly of a sliding valve system with remote manual actuator for a cooking machine in the dispense state in an embodiment of the present invention;

[0048] FIG. **33** is an example illustration of an example of taste sensors and their associated feedback mechanism for the cooking machine in an embodiment of the present invention;

[0049] FIG. **34** is an example illustration of an example of gas sensors and the associated feedback mechanism for the cooking machine in an embodiment of the present invention;

[0050] FIG. **35** is an example illustration of an example of light (visible and infrared) sensors and the associated feedback mechanism for the cooking machine in an embodiment of the present invention;

[0051] FIG. **36** is an example illustration of a configuration of a dual-slider, spice valve system with sliders in the load position in an embodiment of the present invention;

[0052] FIG. **37** is an example illustration of a configuration of a dual-slider, spice valve system with sliders in the dispense position, at a step in the dispensing process that may follow FIG. **36** in an embodiment of the present invention;

[0053] FIG. **38** is an example illustration of a configuration of spring-loaded, dual slider, spice valve system with sliders in the load position in an embodiment of the present invention;

[0054] FIG. **39** is an example illustration of a configuration of a spring-loaded, dual slider, spice valve system with sliders in the dispense position, at a step in the dispensing process that may follow FIG. **38** in an embodiment of the present invention;

[0055] FIG. **40** is an example illustration of a configuration of a single slider, spice valve system with slider in the load position in an embodiment of the present invention;

[0056] FIG. **41** is an example illustration of a configuration of a single slider, spice valve system with slider in the dispense position, at a step in the dispensing process that may follow FIG. **40** in an embodiment of the present invention;

[0057] FIG. **42** is an example illustration of a configuration of a dual via, single slider, spice valve system, with slider in the load position in an embodiment of the present invention;

[0058] FIG. **43** is an example illustration of a configuration of a dual delivery via, single slider, spice valve system with slider in the load position in an embodiment of the present invention;

[0059] FIG. **44** is an example illustration of a configuration of a dual delivery via, single slider, spice valve system with slider in the dispense position, at a step in the dispensing process that may follow FIG. **43** in an embodiment of the present invention;

[0060] FIG. **45** is an example illustration of a configuration of a dual delivery via, single slider, spice valve system with slider in the load position, at a step in the dispensing process that may follow FIG. **44** in an embodiment of the present invention;

[0061] FIG. **46** is an example illustration of a configuration of a dual delivery via, single slider, spice valve system with

slider in the dispense position, at a step in the dispensing process that may follow FIG. **45** in an embodiment of the present invention;

[0062] FIG. **47** is an example illustration of a configuration of a dual delivery via, single slider, spring loaded spice valve system with slider in the dispense position in an embodiment of the present invention;

[0063] FIG. **48** is an example illustration of a configuration of a dual delivery via, single slider, spring loaded spice valve system with slider in the load position, at a step in the dispensing process that may follow FIG. **47** in an embodiment of the present invention;

[0064] FIG. **49** is an example illustration of a configuration of a dual delivery via, single slider, spring loaded spice valve system with slider in the dispense position, at a step in the dispensing process that may follow FIG. **48** in an embodiment of the present invention;

[0065] FIG. **50** is an example illustration of a configuration of a motor driven screw auger spice valve system in an embodiment of the present invention;

[0066] FIG. **51** is an example illustration of a configuration of a motor driven screw auger spice valve system with a funnel shaped reservoir in an embodiment of the present invention;

[0067] FIG. **52** is an example illustration of a configuration of a motor driven screw auger spice valve system with a funnel shaped reservoir in an embodiment of the present invention;

[0068] FIG. **53** is an example illustration of a configuration of a rotary assembly of eight motor driven screw auger spice valves with funnel shaped reservoirs, on a rotating index plate, with auger #3 aligned with the auger drive motor in an embodiment of the present invention;

[0069] FIG. **54** is an example illustration of a configuration of an ingredient delivery system with a horizontal actuator assembly to transfer horizontal force downward to a vertical pusher which pushes food into a food processor and automated cooker in an embodiment of the present invention;

[0070] FIG. **55** is an example illustration of a top-down view of a configuration to park cassettes of spices and food ingredients out of the way of the food processing and cooking areas of an automated cooking appliance in an embodiment of the present invention;

[0071] FIG. **56** is an example illustration of the configuration of an ingredient dispenser which can keep food items chilled for periods of time in an embodiment of the present invention;

[0072] FIG. **57** is an example illustration of an ingredient dispenser whose dispensing mechanism may make use of a robot arm in an embodiment of the present invention;

[0073] FIG. **58** is an example illustration of another configuration for parts of the ingredient dispenser in an embodiment of the present invention;

[0074] FIG. **59** is an example illustration of a configuration for the ingredient dispenser in an embodiment of the present invention;

[0075] FIG. **60** is an example illustration of a side view of a configuration for an automated cookpot having perimeter slicing and cutting modules, and a chopping and stirring module in the bottom of the pot in an embodiment of the present invention;

[0076] FIG. **61** is an example illustration of a top-down view of a configuration for an automated cookpot having perimeter slicing and cutting modules, and a chopping and stirring module in the bottom of the pot in an embodiment of the present invention;

[0077] FIG. **62** is an example illustration of a top-down view of a configuration for an automated cookpot with perimeter slicing and cutting modules, a chopping and stirring module in the bottom of the pot, and a food drawer with food modules and a spice cassette in an embodiment of the present invention;

[0078] FIG. **63** is an example illustration of a configuration of a dual-purpose cutting/stirring blade in an embodiment of the present invention;

[0079] FIG. **64** is an example illustration of a cross-sectional view of the dual-purpose cutting/stirring blade shown in FIG. **63** in an embodiment of the present invention;

[0080] FIG. **65** is an example illustration of a configuration of a dual-purpose cutting/stirring blade in an embodiment of the present invention;

[0081] FIG. **66** is an example illustration of a cross-sectional view of a dual-purpose cutting/stirring blade shown in FIG. **63**, simulating rotation of the blade in a direction that results in cutting in an embodiment of the present invention;

[0082] FIG. **67** is an example illustration of a cross-sectional view of a dual-purpose cutting/stirring blade shown in FIG. **65**, simulating rotation of the blade in a direction that results in stirring in an embodiment of the present invention;

[0083] FIG. **68** is an example illustration of a pre-assembly configuration of a dual-purpose cutting/stirring blade in an embodiment of the present invention;

[0084] FIG. **69** is an example illustration of a post-assembly configuration of the dual-purpose cutting/stirring blade shown in FIG. **68** in an embodiment of the present invention;

[0085] FIG. **70** is an example illustration of a side view of a configuration for an automated cookpot having side-mounted perimeter slicing and cutting modules, and a top-down chopping and stirring module coming from above the cooking pot to the bottom of the pot where the shaft engages a shaft stabilizer in an embodiment of the present invention;

[0086] FIG. **71** is an example illustration of a side view of a configuration for an automated cookpot having side-mounted perimeter slicing and cutting modules, and an articulated stirring arm module coming from above the cooking pot to the bottom of the pot in an embodiment of the present invention;

[0087] FIG. **72** is an example illustration of the front view of a Cartesian bot system used for stirring in an embodiment of the present invention;

[0088] FIG. **73** is an example illustration of the side view of a Cartesian bot system used for stirring in an embodiment of the present invention;

[0089] FIGS. **74**A-**74**C are example illustrations of an automated system that handles baked food in an embodiment of the present invention;

[0090] FIG. **75** is an example illustration of a system that may be used for cooking various food items that may benefit from two sided heating in an embodiment of the present invention;

[0091] FIGS. **76**A-**76**D are example illustrations of various steps for providing two sided heating in an embodiment of the present invention;

[0092] FIGS. **77**A-**77**E are example illustrations of a system and procedure for automated cleaning of a cooking machine in an embodiment of the present invention;

[0093] FIGS. **78**A-**78**F are example illustrations of a system and procedure for making baked food with an automated cooking machine in an embodiment of the present invention;

[0094] FIG. **79** is an example illustration of a liquid delivery system in an embodiment of the present invention;

[0095] FIG. **80** is an example illustration of a liquid delivery system in an embodiment of the present invention;

[0096] FIG. **81** is an example illustration of a spice delivery system in an embodiment of the present invention;

[0097] FIG. **82** shows a configuration of a dual via, L-shaped single slider, spice valve system, with slider in the load position in an embodiment of the present invention;

[0098] FIG. **83** shows a configuration of a dual via, L-shaped single slider, spice valve system, with slider in the Dispense position in an embodiment of the present invention;

[0099] FIG. **84** shows a configuration of a dual via, L-shaped single slider, spice valve system, with slider in the load position in an embodiment of the present invention;

[0100] FIG. **85** shows a configuration of a dual via, L-shaped single slider, spice valve system, with slider in the Dispense position in an embodiment of the present invention;

[0101] FIG. **86** shows a configuration of a dual via, F-shaped single slider, spice valve system, with slider in the load position in an embodiment of the present invention;

[0102] FIG. **87** shows a configuration of a dual via, F-shaped single slider, spice valve system, with slider in the load position in an embodiment of the present invention;

[0103] FIG. **88** shows a configuration of a dual via, F-shaped single slider, spice valve system, with slider in the Dispense position, at a step in the dispensing process that may follow FIG. **87** in an embodiment of the present invention;

[0104] FIG. **89** shows a configuration of a dual via, F-shaped single slider, spice valve system, with slider in the load position, at a step in the dispensing process that may follow FIG. **88** in an embodiment of the present invention;

[0105] FIG. **90** shows a configuration of a dual via, F-shaped single slider, spice valve system, with slider in the Dispense position, at a step in the dispensing process that may follow FIG. **89** in an embodiment of the present invention;

[0106] FIG. **91** shows a configuration of a Cartesian bot and a motor-mounted actuator. An assembly of two food modules is shown attached to the Cartesian bot and the motor-mounted actuator is shown to have opened one of the food module slider valves in an embodiment of the present invention;

[0107] FIG. **92** illustrates a method for using the cooking robot in an embodiment of the present invention;

[0108] FIG. **93** illustrates a method for using the cooking robot in an embodiment of the present invention;

[0109] FIG. **94** illustrates a method for using the cooking robot to perform baking functions in an embodiment of the present invention;

[0110] FIG. **95** illustrates a method for using a cooking robot having both a bottom and a top heater in an embodiment of the present invention;

[0111] FIG. **96** illustrates a method for using a cooking robot in an embodiment of the present invention;

[0112] FIG. **97** illustrates a method for using a cooking robot in an embodiment of the present invention;

[0113] FIG. **98** depicts an example computer processing system that may be used in implementing an illustrative embodiment of the present invention.

DETAILED DESCRIPTION

[0114] Embodiments of the present invention are now described with reference to at least the above figures. Persons of ordinary skill in the art will appreciate that the description and figures illustrate rather than limit the invention and that in general the figures are not drawn to scale for clarity of presentation. Such skilled persons will also realize that many more embodiments are possible by applying the inventive principles contained herein and that such embodiments fall within the scope of the invention which is not to be limited except by any appended claims.

[0115] As illustrated in FIG. **1**, an example automated cooking machine/apparatus **199** may be constructed and may include an induction cooking apparatus, a mixer, an automated ingredient delivery system and a user interface, and describes at least an embodiment of this invention. Automated cooking machine/apparatus **199**, depending on design, manufacturing and feature considerations, may include food material **102**, vessel **104**, induction coil **106**, cover plate **108**, portion of the electronics **110**, containers **112**, ingredients **114**, valve systems **116**, user interface **118**, ventilation **120**, blades **122**, stir/mix apparatus **124**, chamber wall **126**, and rails **127**. Food material **102** may be cooked in a vessel **104** using an induction cooking apparatus, which may include induction coil **106**, a cover plate **108** and a portion of the electronics **110**. To allow for good transfer of heat using induction cooking, vessel **104** may include a metal or metallic composition, such as, for example, stainless steel. One drawback with conventional cooking apparatus is that a user needs to be present near the cooktop to stir the food and prevent burning. To avoid this, automated cooking machine/apparatus **199** may use a mixer which may consist of blades **122** and stir/mix apparatus **124** which may help the blades **122** to rotate and mix the food. The stir/mix apparatus **124** may include a rod, a motor to rotate the rod, fasteners for joining the rod to the bottom assembly and other items (not shown). One skilled in the art will appreciate that the stir/mix apparatus **124** may stretch below the vessel as shown in FIG. **1**; alternatively, stir/mix apparatus **124** may stretch above the vessel onto a fixture (not shown). Stir/mix apparatus **124** may rotate at various speeds to potentially mimic human movements. Ingredients **114** needed for the food being cooked may be present in containers **112**. Containers **112** may be mounted to the Cartesian bot system which may include rails **127**. Containers **112** may be movable, can move atop vessel **104** and may utilize one or more valve systems **116** to drop ingredients **114** into vessel **104** according to the recipe being used for cooking. It may be appreciated by one skilled in the art that the valve system **116** is depicted with a symbol (arrow) for simplicity in FIG. **1**. Several ways exist to physically implement the valve system, and examples of that will be shown later in this patent application. The recipe used for cooking may be entered into user interface **118**, for example, a touchscreen display or into some other type of user interface. Ventilation **120** may be used to take away a portion or substantially all of the gaseous effluents from the cooking process. Ventilation **120** may include several components, for example, such as a filter, a fan and other items. A chamber wall **126** may be used to separate the region of the apparatus used for cooking the food, and which is exposed to gaseous effluents and heat, from other parts of the apparatus. It can be observed that two chambers are present in the cooking apparatus in FIG. **1** due to the chamber wall. Automated cooking machine/apparatus **199** may be described as a two chamber

system wherein the resting location of the ingredient delivery system may be in another chamber compared to the chamber where the food is cooking. The electronics in portion of the electronics **110** may include some part or all of the electronics needed for induction cooking, it may include the power supply to the whole apparatus, it may include controllers or other integrated circuits for the user interface **118**, electronics for motors to move the ingredient containers such as containers **112**, controllers for the valve systems **116**, integrated circuits for connecting to the internet, controllers for the mixer as well as electronics for several other functions of automated cooking machine/apparatus **199**. FIG. **1** may include an induction cooking apparatus, a food mixer, a user interface, ventilation and an automated ingredient delivery system. It will be appreciated by those skilled in the art that the invention is not limited to what has been particularly shown and described hereinabove and that several variations of the concepts in FIG. **1** may be possible. For example, one may use a conventional cooking hot plate instead of the induction cooking apparatus. Furthermore, the user interface may be constructed in several ways. Many other modifications within the scope of the illustrated embodiments of the invention described herein will suggest themselves to such skilled persons after reading this specification. Thus the invention is to be limited only by the appended claims

[0116] As illustrated in FIG. **2**, an automated ingredient delivery system **299** (e.g., a dispensing sub-system) may be constructed and may include ingredients **202** in containers **204**, may include valve systems **206** which control the ingredient delivery, as well as mechanisms for moving the stage, such as wheels **210** and rails **208**, and describes at least an embodiment of this invention. Automated ingredient delivery system **299** may also be referred to as a movable ingredient stage. It will be appreciated by those skilled in the art that several mechanisms for moving the stage are possible.

[0117] As illustrated in FIG. **3**, an example of how the movable ingredient stage may be brought atop the vessel **304** to deliver ingredients **330** to the food being cooked **302** is described. For the illustration in this figure, dispensed food container **326** has its valve system open while other containers, such as food container **328**, have their valve systems closed. Example automated cooking machine/apparatus **399** may include the elements of the movable ingredient stage described above, and may also include mixer blades **322**, stir/mix apparatus **324**, portion of the electronics **310**, induction coil **306**, user interface **318**, movable stage **314**, ventilation **320**, and cover plate **308**. The chamber wall is not shown in this figure for simplicity.

[0118] Several challenges exist for providing a good automated ingredient delivery system. The valve system, if controlled electronically, could allow an integrated circuit to control the ingredient delivery systems. Conventional electronically controlled valve systems (e.g. solenoid valves) may be used. However, since the ingredient containers may need to be washed in a dishwasher periodically, the electronically controlled valve system may need to be made waterproof for at least the electronic wires, or some other solution needs to be found. Also, conventional valves may not provide a controlled/measured amount of ingredients to the vessel being cooked. FIG. **4**-FIG. **7** describes an embodiment of this invention, which describe the design and working of a valve system in an automated ingredient delivery system that may provide a controlled amount of ingredients to the vessel being cooked and which may be washed in a dishwasher without the electronic wires getting spoiled by exposure to water, and may provide for an easier sterilization procedure and more complete sterilization achievement level.

[0119] As illustrated in FIG. **4**, an example valve system **499** may be constructed that may be utilized for dispensing measured quantities of a multiplicity of ingredients. Valve system **499** may include two valves, first valve **406** and second valve **408**, ingredient **402**, chamber **404**, valve seat/body **410**, initial chamber **412**, first linear actuator **414**, second linear actuator **416**, fastener **418**, connector **420**, and chute **424**. For example, first valve **406** and second valve **408** can be of a gate valve type (e.g., slide gate valves). Both first valve **406** and second valve **408** are illustrated in a "closed" position in FIG. **4**. In this position, ingredient **402** may largely be disposed in initial chamber **412** since first valve **406** blocks ingredient **402** from proceeding into chamber **404**. The chamber **404** may be relatively or substantially clear of ingredients. Chamber **404** may be disposed between initial chamber **412** and chute **424**. Valve seat/body **410** may include a metal, a polymer or a combination of both. Valve seat/body **410** may be formed with different materials if mated with either first valve **406** or second valve **408**, or similar materials, depending on design and engineering choices. First linear actuator **414** and second linear actuator **416**, when they move, may move its associated connector **420** and in turn move the corresponding valve between "open" and "closed" positions, or in-between open and closed positions. Fasteners **418** may be used to separate the linear actuators from the ingredient containers such as initial chamber **412** and chamber **404**. When the ingredient containers need to be washed, the fastener, which may be a screw-less fastener, may be removed to allow the ingredient containers to be washed without risk of wires getting wet. Note that, in this case, the washed parts of FIG. **4** may not include electrical/electronic components such as, for example, first linear actuator **414** and second linear actuator **416**. Movement of ingredient **402** from initial chamber **412** to chamber **404** and eventually to chute **424** and elsewhere in the overall system, may utilize force either alone or in combination(s), for example, gravity, pushing via a plunger, pneumatic and/or vacuum, depending on design and engineering choices and considerations. Additionally, at least the interior walls of initial chamber **412**, chamber **404**, and chute **424** may utilize materials to provide at least a slippery/low friction interior surface, and/or one of high surface tension, and/or high physical phobic tendency, and/or may have small holes shaped to effect a pneumatic push, all of which may assist movement of ingredient **402** for dispensing purposes and cleaning purposes. The extent of initial chamber **412**, chamber **404**, and chute **424** may extend into its associated valve seat/body **410** so that the material and structure of valve seat/body **410** may not touch ingredient **402**. Initial chamber **412** may include a controllable attachment such as a grinder, to provide 'fresh ground' ingredient **402** into other area of initial chamber **412**.

[0120] As illustrated in FIG. **5**, the valve system **499** of FIG. **4** may be controlled/manipulated to where first valve **506** is in "open" position and second valve **508** is in "closed" position, and illustrates a step in providing the ingredients in a controlled manner to the cooking area of the overall system. In this case, ingredient **502** moves from the initial chamber **512** to the chamber **504**, thus a first portion **522** of ingredient **502** is now disposed within chamber **504**. Analogously numbered and/or illustrated objects in FIG. **5** may have similar meanings and functions as described in FIG. **4**, for example, valve

seat/body **510** is analogous to valve seat/body **410** of FIG. **4**, and so on. Note that the size of chamber **504** may be determined by the application. For example, if the valve system in FIG. **5** is used to deliver salt, the size of the chamber **504** may be a quarter of a teaspoon. If a particular food item needs 5 teaspoons, the valve system would have to work about 20 times to provide the 5 teaspoons.

[0121] As illustrated in FIG. **6**, the valve system **499** of FIG. **4** may be further controlled/manipulated to provide the next step of providing the ingredients, where both first valve **606** and second valve **608** are in the "closed" position. A controlled amount of ingredient first portion **622** is present in the chamber **604**. The amount of first portion **622** may be controlled by at least approximately the volume of chamber **604** or the time first valve **606** was open previously, or the shape and size of first valve **606**, the opening size/shape of **612** into **610**, or combinations thereof. The linear actuators (first linear actuator **614** and second linear actuator **616** in this figure) could be a solenoid actuator, a mechanism that includes a motor (e.g., a built-in motor) or some other equivalent mechanism, for example, a piezoelectronic type actuator. Analogously numbered and/or illustrated objects in FIG. **6** may have similar meanings and functions as described in FIG. **4** or FIG. **5**, for example, valve seat/body **610** is analogous to valve seat/body **410** of FIG. **4**, valve seat/body **510** of FIG. **5**, and so on.

[0122] As illustrated in FIG. **7**, the valve system **499** of FIG. **4** may be further controlled/manipulated to provide the next step of providing the ingredients, where first valve **708** is in the "open" position while second valve **706** is in the "closed" position. The ingredient first portion **722** may then be transferred into the food vessel thru chute **724**. Analogously numbered and/or illustrated objects in FIG. **7** may have similar meanings and functions as described in FIG. **4**, FIG. **5** or FIG. **6**, for example, valve seat/body **710** is analogous to valve seat/body **410** of FIG. **4**, valve seat/body **510** of FIG. **5**, valve seat/body **610** of FIG. **6**, and so on.

[0123] FIG. **4**-**7** therefore illustrate an example valve system which has two chambers and two valves to provide a controlled amount of ingredients to at least a cooking vessel. Actuators may be separated from the valve mechanism using fasteners so that wires in actuators do not have risk of getting wet during washing of the ingredient containers. It will be appreciated by one skilled in the art that several variations of FIG. **4**-FIG. **7** are possible. The valve types need not be gate valves, the valves and valve seats and valve bodies themselves may have different configurations to reduce leakage and the mechanism for connecting the linear actuator to the valve may be different. FIG. **20** herein illustrates an example of an alternative embodiment of a valve system in an automated ingredient delivery system.

[0124] FIG. **1** described a two chamber system wherein the resting location of the ingredient delivery system was in another chamber compared to the vessel where the food was cooking. As illustrated in FIG. **8**, an example automated cooking machine/apparatus **899** which uses a single chamber ingredient delivery system may be constructed and may include an induction cooking apparatus, a mixer, an automated ingredient delivery system (which may be mounted on/to a Cartesian bot system) and a user interface, and describes at least an embodiment of this invention. Example automated cooking machine/apparatus **899** may include cooking vessel **804**, food being cooked **802**, induction heating coil **806**, a cover plate **808**, mixer blades **822**, stir/mix apparatus **824**, an ingredient **814**, a valve system **816** for providing ingredients, ingredient container **812**, and ventilation **826**. Ventilation **826** may be provided along the sides of the unit, bottom of the unit or on the top of the unit, and may be divided in multiple manifolds which may be independently controlled. Gaps (not shown) may be designed into ventilation **826** such that ingredient **814** may fall from an ingredient container **812** into cooking vessel **804**. Portions of ventilation **826** may be designed to movable.

[0125] Sensors for tracking food quality, such as calories, water content, firmness, bacteria, burning, temperature and various other items/characteristics are available. As illustrated in FIG. **9**, an example automated cooking machine/apparatus **999** where sensor **928** may be used to sense quality of the food and provide feedback **950** to the controller electronics present in portion of the electronics **910** to modulate the cooking process, and may include an induction cooking apparatus, a mixer, an automated ingredient delivery system and a user interface, and describes at least an embodiment of this invention. Automated cooking machine/apparatus **999** with sensor **928**, depending on design, manufacturing and feature considerations, may include food material **902**, vessel **904**, induction coil **906**, cover plate **908**, portion of the electronics **910**, containers **912**, ingredients **914**, valve systems **916**, user interface **918**, ventilation **920**, blades **922**, stir/mix apparatus **924**, chamber wall (not shown) and rail **927**. Modulation of the cooking process may include, for example, changing the temperature of the cooking process, changing the recipe (e.g. changing the amount of oil added to the food if the calorie count is high already or reducing the amount of water added for cooking the food if the moisture content is high, changing a seasoning dispense/cook temperature gradient to achieve a color/browning effect desired), etc. The recipe can be tailored to optimize the food quality using the controller circuits. The controller may be a proportional controller, a PD controller, a PID controller or some other type. The blades **922** may be optimized for the cooking application. For example, the blades may go close to the bottom or even to the bottom of the cooking vessel to prevent food accumulating near the bottom of the vessel and getting burnt. The blades **922** may also be optimized for cutting food items. One may use different blades or rotation speeds for cutting various materials. Communication between sensor **928** and portion of the electronics **910** to effect feedback **950** may utilize conductive wires or may be wireless. It will be clear to one skilled in the art that alternative embodiments, where sensors are present for safety reasons, may be used, for example, motion sensors and/or IR sensors (cook temp and/or presence of human hand), and so on.

[0126] As illustrated in FIG. **10**, a user of an automated cooking machine/apparatus presented herein may obtain information **1004** about the prepared food based on at least the ingredients used in the recipe **1002**, and describes at least an embodiment of this invention. For example, this could include calorie count, amount of different vitamins in the food, effect of the temperature cycle chosen on the vitamin amount remaining and various other information, such as water content, allergic check with user specified substances, and so on. After the food is cooked, the user can provide feedback to personalize and/or improve the cooking process of the food item for the next round of cooking. The user may also be able to select the type of cooking (e.g. low calorie, low fat, etc.) before the cooking process starts based on the pre-

dictive information given by the user interface for various recipes. Recipes which allow the user's preference may be preferentially selected.

[0127] According to an embodiment of this invention, the recipe may be downloaded from a network and the cooking apparatus could be designed to be secure and not reveal some or all the details of the recipe to the user. For example, the temperature profiles used during the cooking process may not be revealed. This could allow "recipe rentals" that give high-quality food and potentially help protect the intellectual property of the recipe-holder.

[0128] Conventional food processors use several cutting/chopping blades, and can cause a user inconvenience due to frequent and cumbersome changing of blades. For example, while preparing a food item where some ingredients need to be grinded into fine pieces, while other ingredients need to be diced, the user may need to change the blades manually in between. This also makes designing an automated cooking machine difficult. FIGS. **11-13** describe an embodiment of this invention, which describes a machine that may be used for cutting, grinding, dicing or other alternative food processing applications.

[0129] As illustrated in FIG. **11**, food processor **1199** may be constructed (e.g., a chopping system or sub-system). Food processor **1199** may include vessel **1102**, first shaft **1104**, first blade **1106** and second blade **1108**, first opening **1110**, second opening **1112**, third opening **1114**, fourth opening **1116**, second shaft **1118**. First blade **1106** and second blade **1108** may include multiple types of blades. For example, FIGS. **11-13** show first blade **1106** as an S blade, which could be used for grinding and fine chopping, and show second blade **1108** as a slicing blade. While these types of blades are used as an example in this explanation, one skilled in the art will realize that multiple types of blades and cutting operations are possible. FIG. **12** illustrates a top view of second blade **1108** as a slicing blade option. First shaft **1104** and second shaft **1118** may include shafts which may be connected to one or more motors to rotate and thereby cause the food processing operation to be performed. First shaft **1104** and second shaft **1118** may be rotationally spun and may also include a vertical motion component (vertical direction being along the shaft, substantially perpendicular to the rotational motion—if any). Depending on design considerations, first shaft **1104** and second shaft **1118** may be adapted to run at different speeds and motions; for example, first shaft **1104** may run clockwise at **100** rpm and second shaft **1118** may be running at **50** rpm counter-clockwise). First blade **1106** may be connected/coupled to second shaft **1118** and run at substantially the same speeds and motions as second shaft **1118**. Second blade **1108** may be connected/coupled to first shaft **1104** and run at substantially the same speeds and motions as first shaft **1104**. Food ingredients that may need to be processed may be dropped through first opening **1110**, second opening **1112**, third opening **1114**, and/or fourth opening **1116**, depending on the type of food processing operation that may need to be performed. FIG. **13** illustrates a top view of the openings of example food processor **1199** of FIG. **11**. Some of these openings may have attachments (e.g. dicing grids of different dimensions) placed in them. For example, first opening **1302** and second opening **1304** may have two sizes of dicing grids, while third opening **1306** and fourth opening **1308** may not have dicing grids, allowing the food to fall directly to first blade **1106** (thereby missing second blade **1108** but not first blade **1106**) or optionally thru the blade portion of the processor entirely (not shown); hence missing both first blade **1106** and second blade **1108**. For the example illustrated in FIG. **11-13**, if a food ingredient needs to be diced into fine pieces, it may be dropped down first opening **1302** or if a food ingredient needs to be finely ground, it may be dropped down fourth opening **1116** and the S blade of first blade **1106** may be rotated. The food ingredient may be pushed down fourth opening **1116**, for example, with a plunger (not shown), a mechanical device which applies downward pressure. Other methods may be used to move the food to and thru an opening, and to and thru a blade; for example, gravity, pneumatic and/or vacuum, depending on design and engineering choices and considerations. First blade **1106** and second blade **1108** may be removable. One skilled in the art will recognize that various mechanisms may be used to connect blades first blade **1106** and second blade **1108** to shafts first shaft **1104** and second shaft **1118** and to the motors (not shown). One or more of the blades first blade **1106** and second blade **1108** may optionally be rotated in a reverse direction if needed or swapped with other blades. While FIG. **11** used two blades and four openings as an example, various other numbers of blades and openings may be used.

[0130] As illustrated in FIG. **14**, an example automated cooking machine/apparatus **1499** may be constructed and may include an induction cooking apparatus, a mixer, an automated ingredient delivery system and a user interface, and describes at least an embodiment of this invention. Automated cooking machine/apparatus **1499** may include a Cartesian bot system for delivering ingredients to the cooking vessel **1404**. Automated cooking machine/apparatus **1499**, depending on design, manufacturing and feature considerations, may include food material **1402**, vessel **1404**, induction coil **1406**, cooktop cover **1408**, portion of the electronics **1410**, containers **1412**, ingredients **1414**, valve systems **1416**, user interface **1418**, ventilation **1420**, first blade **1422**, plunger **1424**, first shaft **1426**, second blade **1428**, rail (not shown), first opening **1430**, second opening **1432**, third opening **1434**, dicing grid **1436**, and second shaft **1442**. Analogously numbered and/or illustrated objects in FIG. **14** may have similar meanings and functions as described in FIG. **1**, for example, induction coil **1406** is analogous to induction coil **106** of FIG. **1**, and so on.

[0131] Ingredients **1414** to be used for cooking may be placed in containers **1412** which may include valve systems **1416** which control the amount of ingredients **1414** to be dispensed into the cooking vessel **1404**. The assembly which includes food ingredients and valves may be mounted atop a Cartesian bot system, which may include motors and position control mechanisms which move the food ingredient containers to various locations in the automated cooking machine/apparatus **1499**, include above the cooking vessel **1404**. Cartesian bot systems are familiar to those skilled in the art, since they are widely used in 3D printers, Computer Numerical Control Machinery, biomedical instruments and various other applications. They can move to points in the X, Y and/or Z co-ordinate systems. Cooktop cover **1408** may be made of glass or ceramic or other materials or combinations of them. Induction coil **1406** may include the coil used for induction cooking. Cooktop cover **1408** may be constructed, for example, with a metal which may lead to induction heating occurring on the metal. Portion of the electronics **1410** may include various electronic components for controlling the cooking, user interface **1418**, the Cartesian bot and various other electronic functions needed for the automated cooking

machine in FIG. **14**. Many of the elements of FIG. **1** may be similarly labeled in FIG. **14** and those shapes would have a similar function in FIG. **14** as in FIG. **1**.

[0132] Various elements of the food processing machine shown in FIG. **13** are also illustrated in FIG. **14**. First opening **1430**, second opening **1432**, and third opening **1434** are examples of openings through which ingredients may be dispensed. Dicing grid **1436** may have similar functions and characteristics as the dicing grids of FIGS. **11-13** herein. Second blade **1428** and first blade **1422** may be blades used for food processing or mixing the food. First shaft **1426** may be a shaft coupling second blade **1428** to a motor (not shown). The blades second blade **1428** and/or first blade **1422** may be connected to two shafts (first shaft **1426** and second shaft **1442**) that may be driven by multiple motors or a single motor alone with a gearbox (not shown). The blade first blade **1422** may be designed to allow both stirring and cutting. For example, the shaft connected to first blade **1422** may be set up so that it may rotate in two directions. When rotated in one direction, the first blade **1422** may have sharp blades meant for cutting food items get into contact with the food, while when rotated in the opposite direction, the first blade **1422** may have "stirrer-type edges" that may not substantially cut the food and may be useful for at least stirring it. For the stirrer functions and motions, the speed of rotation may be slower than for the cutter function. It will be clear to one skilled in the art that more than two blades may potentially be used. The plunger **1424** in the automated ingredient delivery system of automated cooking machine/apparatus **1499** may be used to apply downward pressure on the ingredients dispensed down an opening in the cooking vessel. It will be clear to one skilled in the art that various alternative embodiments for the food processing and mixing functions are feasible and may be combined with the automated ingredient delivery system. It will also be clear to one skilled in the art that the Cartesian bot may be customized to move in 1 dimension (e.g. X, Y or Z), 2 dimensions (e.g. XY, YZ or XZ), 3 dimensions (e.g. XYZ) or more dimensions based on the configuration of the automated cooking machine. The recipe used for cooking may be entered in or shown on the user interface **1418**. Based on the recipe, a sequence of operations may be performed on the automated cooking machine. An example sequence of operations for the automated cooking machine/apparatus **1499** in FIG. **14** will now be described in FIG. **15**-FIG. **18**.

[0133] FIG. **15**-FIG. **18** illustrate an example sequence of operations on the automated cooking machine/apparatus **1499** shown in FIG. **14**. In these figures, for ease of illustration, several items may be labeled in FIG. **15** and those shapes would have a similar function in FIG. **16**-FIG. **18**.

[0134] Ingredients to be cooked (e.g. first ingredient **1538**, second ingredient **1514**) may be loaded into the automated ingredient delivery system at the start of the cooking process as shown in FIG. **15**. This may be done by the machine's user. The recipe for cooking may be loaded onto the automated cooking machine at this point as well. Containers **1512** for the ingredients may have valves **1516** to control the flow of material. A mass (e.g., weight) measurement sensor (not shown) may be located on the automated ingredient delivery system, and flow controllers may be optionally used. These systems may optionally be used to help the user put in only a specific quantity of ingredients into the automated ingredient delivery system initially. The system may optionally include systems shown, for example, earlier in this patent application, such as, for example, the system in FIG. **4-7**. Represented in this figure, the example automated cooking machine/apparatus **1499** may include plunger **1524**, ventilation **1520**, user interface **1518** which may include a display and associated electronics, induction cooking apparatus **1506**, cooktop cover **1508** may be a plate made of glass or ceramic or other material, portion of electronics **1510** may be electronics for controlling various tasks in the automated cooking machine, cooking vessel **1504**, first blade **1522** and second **1528** may be blades used for cutting or mixing the food in future steps, first shaft **1526** and second shaft **1542** may be shafts which may be coupled to motors (not shown), first opening **1530**, second opening **1532** and third opening **1534** may be openings in the cooking vessel **1504**, and dicing grid **1536**.

[0135] FIG. **16** illustrates an example next step in the example cooking process. Based on the recipe, a controlled amount of ingredient **1614** may be put into one of the openings by moving the Cartesian bot which holds the ingredient containers and other parts of the automated ingredient delivery system. In this example, the recipe indicates ingredient **1614** needs to be diced, thus ingredient **1614** may be dispensed into the opening **1634**. As illustrated in FIG. **16**, automated cooking machine/apparatus **1499** may include dicing grid **1636** and blade **1628**.

[0136] FIG. **17** illustrates an example next step in the example cooking process in which the plunger **1724** may be moved by the Cartesian bot to push the ingredient to be diced **1740** down the opening **1734**. The dicing grid **1736** and blade **1728** can then dice the material, ingredient to be diced **1740**. Other ingredients to be put into the cooking vessel may also be dispensed using methods that will become apparent to one skilled in the art based on at least FIG. **16** and FIG. **17**.

[0137] FIG. **18** illustrates the next step in the example cooking process where all the ingredients may be added into the cooking vessel **1804** and food **1802** may be prepared and cooked using the induction cooking burner **1806**. Mixing/stirring can be done during cooking using the blades present in the automated cooking machine, as well as before or after cooking.

[0138] The steps in FIGS. **15-18** may be run automatically by following a recipe stored electronically. The recipe may be stored, for example, in the cloud, in local memory, on a user's phone or other personal device. Various alternative recipes could result in a different sequence of operations. It will be clear to one skilled in the art that FIG. **15**-FIG. **18** represents just one example of how the automated cooking machine/apparatus **1499** of FIG. **14** may be used. For example, the cooking and ingredient delivery can be split and can proceed at various points in the cooking process (which would be different from what is depicted in FIG. **15**-FIG. **18**). Several other variations and embodiments may be possible, which would be apparent to one skilled in the art based on the teaching herein.

[0139] While FIGS. **1-18** showed a single burner automated cooking machine/apparatus, an embodiment of the invention may have multiple heating devices. For example, automated cooking machine/apparatus **1499** of FIG. **14**, may have more than one heating device, for example multiple burners, multiple induction heaters, IR heaters, and so on. The automated ingredient delivery system may be shared between heating device in such cases. One or more of the heating devices may be utilized for pre-heating, searing, cool down, quench, and other functions within a recipe or multiplicity of recipes. As illustrated in FIG. **19**, an example automated cooking machine/apparatus **1499** may be constructed and

may include more than one heating device and describes at least an embodiment of this invention. Automated cooking machine/apparatus **1499** may include cooktop **1914**, which may include a first heating device **1904** and a second heating device **1906**. The automated ingredient delivery system **1902** may include a Cartesian bot which may be positioned atop any burner in the cooktop, deliver recipe necessary ingredients such as first ingredient **1910** and second ingredient **1912** and stir the food. It may optionally include a plunger **1908**. Temperatures and performance of first heating device **1904** and second heating device **1906** may be controlled using a recipe which may either be directly loaded on the cooktop or loaded onto the Cartesian bot/Automated ingredient delivery system. Communication between the Cartesian bot/automated ingredient delivery system and the Cooktop may proceed wirelessly and/or with wires.

[0140] As illustrated in FIG. **20**, an example automated cooking machine/apparatus may be constructed and operated wherein the ingredient dispensing process may be conducted without requiring solenoid actuators on the ingredient dispensing system, and describes at least an embodiment of this invention. The sections of the automated cooking machine/apparatus, for example, automated cooking machine/apparatus **1499** of FIG. **14**, that help explain the ingredient dispensing process are shown in FIG. **20**, while some other parts of the automated cooking machine **1499** are not shown for simplicity. The example portions of automated cooking machine/apparatus **1499** illustrated in FIG. **20** may include heating coils **2004** for induction cooking, cooktop cover **2006** may be a plate made of glass, plastic, metal, ceramic or some other material, portion of the electronics **2002** and/or other parts of the induction cooktop, cooking vessel **2010**, a blade **2008** of the food processor, opening **2012** through which ingredients may be dispensed, and protrusion **2014** which may be used advantageously during the ingredient dispense operation, and at least one Cartesian bot with ingredient dispenser **2015**, which may include first gate valve **2018** and second gate valve **2019**, material to be dispensed **2016**, openings in the gate valve **2022** system through which material may be dispensed, and gate valve seats **2020**. It will be clear to one skilled in the art that several variations of the gate valve system shown in FIG. **20** are possible. It will also be clear to one skilled in the art that various types of cooking vessel **2010** may be used. This may include open vessels, closed ones, pressure-cooking friendly vessels, woks and entirely different vessels.

[0141] Example methods of operation of the apparatus in FIG. **20** will now be described in FIG. **21**-FIG. **24**.

[0142] FIG. **21**-FIG. **24** illustrate at least one embodiment of this invention which describe a process for dispensing ingredients of an example automated cooking machine/apparatus. The sections of the automated cooking machine/apparatus, for example, automated cooking machine/apparatus **1499** of FIG. **14**, that help explain the ingredient dispensing process are shown in FIGS. **21**-**24**, while some other parts of the automated cooking machine are not shown for simplicity. The portions of the apparatus which are essential for describing the working of the ingredient dispense function are shown in these figures.

[0143] The example portions of automated cooking machine/apparatus **1499** illustrated in FIG. **21** may include food item being cooked **2108**, cooking vessel **2110**, opening **2112** through which ingredients may be dispensed, and protrusion **2114** which may be used advantageously in the cooking process, and at least one Cartesian bot with ingredient dispenser **2115**, which may include ingredient **2116**, first gate valve **2118** and second gate valve **2120**, chamber **2122**, first opening **2124**, second opening **2126** and third opening **2128**. In the step shown in FIG. **21**, both first gate valve **2118** and second gate valve **2120** are in a closed position and only a negligible amount of material may be present in chamber **2122**.

[0144] FIG. **22** illustrates a next step in the ingredient dispensing function. The example portions of automated cooking machine/apparatus **1499** illustrated in FIG. **22** may include food item being cooked **2208**, cooking vessel **2210**, opening **2212** through which ingredients may be dispensed, and protrusion **2214** which may be used advantageously in the cooking process, and at least one Cartesian bot with ingredient dispenser **2215**, which may include ingredient **2216**, first gate valve **2218** and second gate valve **2220**, chamber **2222**, first opening **2224**, second opening **2226** and third opening **2228**. In the step shown in FIG. **22**, the Cartesian bot's position has been moved so that the protrusion **2214** may fit into the opening **2228**. In the step shown in FIG. **22**, both first gate valve **2218** and second gate valve **2220** are in a closed position and thus only a negligible amount of material may be present in chamber **2222**.

[0145] FIG. **23** illustrates a next step in the ingredient dispensing function. The example portions of automated cooking machine/apparatus **1499** illustrated in FIG. **23** may include food item being cooked **2308**, cooking vessel **2310**, opening **2312** through which ingredients may be dispensed, and protrusion **2314** which may be used advantageously in the cooking process, and at least one Cartesian bot with ingredient dispenser **2315**, which may include ingredient **2316**, first gate valve **2318** and second gate valve **2320**, chamber **2322**, first opening **2324**, second opening **2326** and third opening **2328**. FIG. **23** indicates a stage in the ingredient dispensing function wherein the Cartesian bot with ingredient dispenser **2315** has been moved such that first gate valve **2318** may be in an open position and second gate valve **2320** may be in a closed position, thus chamber **2322** may be filled with a portion of ingredient **2316**.

[0146] FIG. **24** illustrates a next step in the ingredient dispensing function. The example portions of automated cooking machine/apparatus **1499** illustrated in FIG. **24** may include food item being cooked **2408**, cooking vessel **2410**, opening **2412** through which ingredients may be dispensed, and protrusion **2414** which may be used advantageously in the cooking process, and at least one Cartesian bot with ingredient dispenser **2415**, which may include ingredient **2416**, first gate valve **2418** and second gate valve **2420**, chamber **2422**, first opening **2424**, second opening **2426** and third opening **2428**. FIG. **24** indicates a stage in the ingredient dispensing function wherein the Cartesian bot with ingredient dispenser **2415** has been moved such that first gate valve **2418** may be in closed position and second gate valve **2420** may be in an open position (second opening **2426** is substantially aligned with chamber **2422**), so that material **2430** (previously portion of ingredient **2316**) may be dispensed into the opening **2412**, and ultimately be joined with food item being cooked **2408**.

[0147] The procedure in FIGS. **21**-**24** provides a procedure and apparatus which makes it possible to dispense ingredients by intelligently using the motion of the Cartesian bot system and thereby avoiding the need to have solenoid valves in the ingredient dispensing system.

[0148] As illustrated in FIG. **25**, the motion of the Cartesian bot may be used to help push ingredients down the ingredient dispensing system, and describes at least an embodiment of this invention. Ingredients often tend to get stuck to the sides of the ingredient dispenser and they need a force to push material down into the cooking vessel. FIG. **25** describes a way of using the Cartesian bot motion to apply force and push material down into the cooking vessel. The example portions of automated cooking machine/apparatus **1499** illustrated in FIG. **25** may include portion of electronics **2502**, coils for the induction cooktop **2504**, cooking vessel **2510**, Cartesian bot system having an ingredient dispenser **2515**, food material to be dispensed **2516**, frame of the automated cooking machine/apparatus **2520** and protrusion **2518** which may, for example, be attached to the frame of the automated cooking machine **2520**. Using a procedure similar to the one described in FIGS. **21-24**, the Cartesian bot may be moved/located such that a force is applied to push food material to be dispensed **2516** down the ingredient dispenser system, thus ultimately into cooking vessel **2510**.

A Valve System, which may be Associated with a Food Module

[0149] FIG. **26**-FIG. **32** illustrate at least one embodiment of this invention, which describe the design and working of a valve system that may be attached to a food module in an automated ingredient delivery system, thus providing a controlled amount of ingredients to the cooking vessel of an automated cooking machine, the components of which may be all be washed in a dishwasher without the electronic wires getting spoiled by exposure to water. It being appreciated that the figures that illustrate the subject matter may not be to scale or to measure. Analogously numbered and/or illustrated objects in FIG. **26**-FIG. **32** may have similar meanings and functions.

[0150] FIGS. **26**A and **26**B describe an embodiment of this invention, a sliding valve to control the delivery of food ingredients to an automated cooking device. As illustrated in FIG. **26**A, example sliding valve **2699** may include a sliding valve assembly for attachment to a food module at the filler funnel **2630** on the top of the valve housing and filler funnel **2602**. As shown, the actuator is in the remote idle default position, allowing a substantially full extension of the sliding valve spring **2608**, thus pushing the sliding valve **2601** to the idle, or post-dispenses position.

[0151] As illustrated in FIG. **26**B, an exploded view of example sliding valve **2699** of one form of a sliding valve assembly for delivering food ingredients. This figure shows that this valve may be disassembled for cleaning. Sliding valve **2699** may easily be separated into four parts; screw-cap cover **2607**, tensioning spring **2608**, slide valve **2601**, valve housing and filler funnel **2602**.

[0152] The slider valve **2601** in this assembly may include O-rings at/on the inside surface of each of the two sliding valve apertures to seal the interface and improve sliding motion.

[0153] Sliding valve **2699** may also include a remote actuator **2603** to control the operation of the valve for ingredient delivery. The remote actuator **2603** is shown parked out of the way, at a default idle position (x_0, y_0, z_0), with the sliding valve spring **2608** fully extended, thus the valve in its default position.

[0154] It may be appreciated by those skilled in the art that several designs exist for a movable ingredient stage, and also several mechanisms for moving a stage of food modules with attached sliding valves are possible.

[0155] FIG. **27** illustrates a sliding valve assembly for attachment to a food module at the filler funnel on the top of the valve housing and filler funnel **2702**. The actuator is in the remote idle position, allowing full extension of the sliding valve spring **2708**, pushing the sliding valve **2701** to the default idle position.

[0156] FIG. **28** illustrates an actuator **2803** that moved from its "idle position" (x_0, y_0, z_0) to the "load position" (x_1, y_0, z_0). In doing so, the actuator **2803** may make contact with the pusher shaft **2809**, moving the sliding valve **2801** from its idle position to the load position, aligning the top hole **2804** in the sliding valve **2801** with the filler funnel of the valve housing **2802**, and the calibrated reservoir **2805** of the valve housing **2802**. The resulting vibration, from impact of the sliding valve with the sliding valve spring **2808** and the valve housing screw-on cover **2807**, may facilitate maximum transfer of food ingredients from the food module above to load the calibrated reservoir **2805** in the sliding valve assembly.

[0157] FIG. **29** illustrates an actuator **2903** that is moved from the "Load position" (x_1, y_0, z_0) to the "Dispense position" (x_2, y_0, z_0). In doing so, the actuator **2903**, in contact with the pusher shaft **2909**, may allow the compressed sliding valve spring **2908** to expand and move the sliding valve **2901** from its load position to the dispense position, now aligning the bottom hole in the sliding valve **2901** with the calibrated reservoir **2905** of the valve housing **2902** and a cooking pot below. The resulting vibration from impact of the sliding valve **2901** with the sliding valve housing **2902**, may facilitate total transfer of food ingredients from the calibrated reservoir **2905** in the sliding valve housing and filler funnel **2902** assembly to a cooking pot or other vessel.

[0158] It may be appreciated by those skilled in the art that larger quantities of food ingredients may be achieved (in multiples of the calibrated reservoir), when the sliding valve **2901** is cycled between the Load state and Dispense state multiple times.

[0159] In the default idle position (x_0, y_0, z_0), the actuator **2903** is in a remote location to minimize interference with other operations in the automated cooking machine. Movement of the actuator **2903** to either of the other two defined positions, the load position (x_1, y_0, z_0) or the dispense position (x_2, y_0, z_0), may be achieved with a change in the x-position alone. With suitable design of the size of the sliding valve shaft **2909** end and the actuator **2903** head, the system may be adapted to be insensitive to significant misalignments in the y, z axis. It may be appreciated by those skilled in the art that several designs exist for a movable ingredient stage, and several mechanisms for moving a stage of food modules with attached sliding valves are possible.

[0160] As illustrated in FIG. **30**, an example configuration for a rotary assembly of a sliding valve system with a remote manual actuator for a cooking machine in the idle state may be formed, and describes at least an embodiment of this invention. A multiplicity of sliding valve and valve housing **3002** assemblies may be mounted on a rotary platen **3010**, with the valve pusher shaft **3009** extending substantially perpendicular to the tangent of the rotary platen **3010**.

[0161] Each sliding valve and valve housing **3002** assembly may be loaded with a food module. The platen may be rotated to align the desired food module and valve assembly with the remote actuator.

[0162] Movement of the actuator **3003** from the idle position (x_0, y_0, z_0) to at least either of the other two defined valve positions, the load position (x_1, y_0, z_0) or the dispense position (x_2, y_0, z_0), may be achieved with a change in the x-position alone. With suitable design of the size of the sliding valve pusher shaft **3009** end and the actuator **3003** head, the system may be insensitive to significant misalignments in the y, z axis.

[0163] FIG. **31** illustrates one example configuration for a rotary assembly of a sliding valve system with a remote manual actuator for a cooking machine in the load state. The sliding valve and valve housing **3102** assembly is shown mounted on a rotary platen **3110**, with the valve pusher shaft **3109** extending perpendicular to the tangent of the rotary platen **3110**.

[0164] Each sliding valve and valve housing **3102** assembly may be loaded with a food module. The platen may be rotated to align the desired food module and valve assembly with the remote actuator.

[0165] Movement of the actuator **3103** from the idle position (x_0, y_0, z_0) to the load position (x_1, y_0, z_0) may be achieved with a change in the x-position alone. With suitable design of the size of the sliding valve pusher shaft **3109** end and the actuator **3103** head, the system may be insensitive to significant misalignments in the y, z axis.

[0166] FIG. **32** illustrates one configuration for a rotary assembly of a sliding valve system with a remote manual actuator for a cooking machine in the dispense state. The sliding valve and valve housing **3202** assembly is shown mounted on a rotary platen **3210**, with the valve pusher shaft **3209** extending perpendicular to the tangent of the rotary platen **3210**.

[0167] Each sliding valve and valve housing **3202** assembly may be loaded with a food module. The platen may be rotated to align the desired food module and valve assembly with the remote actuator.

[0168] Movement of the actuator **3203** from the load position (x_1, y_0, z_0) to the dispense position (x_2, y_0, z_0) may be achieved with a change in the x-position alone. With suitable design of the size of the sliding valve pusher shaft **3209** end and the actuator **3203** head, the system may be insensitive to significant misalignments in the y, z axis.

[0169] The automated cooking machines described in this patent application may include a number of power hungry components: induction heaters, stepper motors, AC motors/universal motors and other components. Lowering the overall power consumption of the automated cooking machine is important. In this scenario, designing the system such that multiple power hungry components are not activated at the same time may be useful. For example, when grinding of food is necessary for a certain recipe, one could turn off the induction heater during the time the AC motor/universal motor for grinding may be activated. This could reduce system maximum power levels. The fast turn-on and fast turn-off abilities of induction heaters makes this possible.

[0170] As illustrated in FIG. **33**, example automated cooking machine/apparatus **3399** may be constructed with and adapted to use chemical sensors placed in physical contact with the food to measure attributes of the food being cooked, for example, such as measure the flavor of the food being cooked, the extent of cooking (such as carbohydrate to sugar conversion), and then modify the cooking procedure accordingly. An array of sensors **3303** may be present inside the cooking vessel **3304** or on the shaft **3301**, or immersed in the food being cooked **3302** (which may be stirred by blade **3305**). The sensors **3303** may also be mounted on a moving arm that can be immersed into the food temporarily to take a reading. The moving arm may move in 1, 2 or 3 dimensions, and optionally the sensors **3303** may be mounted on a Cartesian bot system. These sensors **3303** may measure the presence and concentration of chemicals, such as, for example, sodium chloride, glucose, acetic acid, amino acid and other chemicals that contribute to the basic flavor of the food being cooked (e.g., saltiness, sweetness, bitterness, sourness, savoriness (or umami)), as well as other gustatory components such as pungency, astringency and so on. The data measured by the sensors **3303** may optionally be fed back to the control mechanism **3307**. This may be used to adjust the temperature of the induction heater **3306** to prevent ingredients from being burnt and thereby turning bitter. This data may also be used to control the ingredient dispensers' first dispenser **3308** and second dispenser **3309** to incrementally add spices or other ingredients to obtain the desired flavor.

[0171] As illustrated in FIG. **34**, example automated cooking machine/apparatus **3499** may be constructed with and adapted to use a system of gas sensors which may be used to determine the degree to which the ingredients have been cooked and thereby adjust the time and temperature of cooking until the ingredients have been appropriately cooked or cooked to desired characteristics. Automated cooking machine/apparatus **3499** may be equipped with an array of gas sensors **3401** that may measure the concentration of gases above the cooking vessel such as, but not limited to, carbon monoxide, carbon dioxide, ammonia hydrogen, water vapor, methane, alcohols, hydrocarbons, etc. As the ingredients **3402** change chemically due to the application of heat, they may emit a combination of gases **3403**. The gas sensor readings may be fed to the control system **3404** for processing through an expert system **3406**. The expert system may consist of (a) a knowledge base of fingerprints **3407** (e.g., elements) of gases emitted when ingredients are cooked, including the varying the concentration of gases over time, and (b) a decision engine **3408** that may use various pattern recognition and classification algorithms to determine the level to which ingredients have been cooked (for example undercooked, cooked, over-cooked, burnt). The heat applied through the induction heater **3405** may be controlled based on this information till ingredients reach a level of preparation as required by the recipe. Ingredients may be dropped in to fix or cover the result as well.

[0172] The expert system described earlier may have the ability to extrapolate the fingerprints of ingredients and adjust its decision making algorithms to account for different quantities of ingredients, for instance when food is being prepared for a different serving size. This allows the avoiding the need to build a knowledge base for every possible ingredient quantity (a time consuming activity) as well as makes the knowledge base smaller.

[0173] As illustrated in FIG. **35**, example automated cooking machine/apparatus **3599** may be constructed with and adapted to use light or image sensors placed above the food to measure how cooked the ingredients are based on the change in color and modify the cooking procedure accordingly. An array of sensors **3503** (e.g., photo-sensors) may be present inside the cooking vessel **3504**, but above the food being cooked **3502**. A light source **3501** may optionally be present to shine light on the ingredients in the vessel. The photo sensors may read the light and detect the change in color of

the ingredients, such as but not limited to the browning of onions or meat, blanching of vegetables, etc. The data measured by the sensors **3503** may be fed back to the control mechanism **3507** which may apply image processing algorithms that identify the change in color of the areas of interest. This may be used to determine whether the ingredients are cooked to the desired level and move to the next step of the recipe. This may also be used to detect whether the ingredients are getting burnt and then adjust the temperature of the induction heater **3506**. If required, additional steps may also be taken to add certain spices from the ingredient dispenser's first dispenser **3308** and second dispenser **3309** to, for example, accelerate the browning process, retard the browning process, control blanching, and so on.

[0174] It may be desired to adapt the automated cooking machine/apparatus to use heat sensors placed above the food to measure how cooked the ingredients are and optionally modify the cooking procedure. Hence, alternatively or additionally, the sensors **3503** of FIG. **35** may include an array of infrared sensors **3503** which may be disposed, for example, inside the cooking vessel **3504**, but above the food being cooked **3502**. The data measured by the array of infrared sensors **3503** may be fed back to the control mechanism **3507** which may apply image processing algorithms to generate a heat map of the contents of the cooking vessel. This may be used to determine whether large pieces of the ingredients, such as large and or dense pieces of meat or vegetables, have been heated uniformly, and therefore cooked to the desired level. Based on this, the control system may choose to move to the next step of the recipe or adjust the temperature of the induction heater **3506** or time of the cooking, and so on. The illustration includes the ingredient dispenser's first dispenser **3508** and second dispenser **3509**

[0175] It may be desired to adapt the automated cooking machine/apparatus to use a spectrometer as sensor **3503** to measure various parameters of the food being cooked **3502**. Hence, alternatively or additionally, the sensors **3503** of FIG. **35** may include a spectrometer **3503** (or sensor end of a spectrometer) which may be disposed above the food being cooked **3502**. Based on the spectrometer reading, nutritional information on the food may be obtained. This may be used to operate a control system **3507** to control the nutritional value of the food being cooked, or to modify the cooking procedure, or to just display the nutritional content of the food, or to do something else. It will be appreciated by one skilled in the art that several variations of these embodiments may be possible. For example, sensors for detecting food spoilage may be present in the automated cooking machine, as could other types of sensors.

[0176] As illustrated in FIG. **36**, a dual-slider valve system **3699** with sliders may be constructed and operated, and is drawn in the load position, and describes at least an embodiment of this invention. Dual-slider valve system **3699** may be utilized to dispense many types of ingredients, for example, spices, which will be used as an example illustration herein. The linear actuator **3601** may be used to push the slider **3604** to a position, such that the upper slider opening may align with the spice reservoir **3603** in the valve body **3602**, which may allow spices stored in the reservoir **3603** to fall and substantially fill the calibrated space **3605**.

[0177] As illustrated in FIG. **37**, the dual-slider valve system **3699** of FIG. **36** is shown in the dispense position, at a step in the dispensing process which may follow FIG. **36**. The linear actuator **3701** may be used to push the slider **3704** to a position, such that the upper slider opening may no longer be aligned with the spice reservoir **3703**, and the lower slider opening may align with open via/chute below, which may allow the calibrated amount of spice stored in the calibrated space **3705** to fall into a cooking vessel (not shown). The illustration includes valve body **3702**.

[0178] An alternative to the dual-slider spice valve system described in FIG. **36** and FIG. **37** may include a spring mechanism assembly on one side of the dual slider, to reduce the approach of an actuator to one side only. As illustrated in FIG. **38**, a spring-loaded, dual slider, spice valve system **3899** with sliders may be constructed and operated, and is drawn in the load position, and describes at least an embodiment of this invention. The linear actuator **3801** may be used to push the slider **3804**, compressing the spring in the spring assembly **3806**, while moving the slider **3804** to a position, such that the upper slider opening may align with the spice reservoir **3803** in the valve body **3802**, which may allow spices stored in the reservoir **3803** to then fall and substantially fill the calibrated space **3805**.

[0179] As illustrated in FIG. **39**, the spring-loaded, dual slider, spice valve system **3899** of FIG. **38** is shown in the dispense position, at a step in the dispensing process that may follow FIG. **38**. The linear actuator **3901** may be used to release pressure on the compressed spring in the spring assembly **3906**, which may allow the spring to move the slider **3904** to a position, such that the upper slider opening may no longer align with the spice reservoir **3903**, and the lower slider opening may align with the open via below, which may allow the calibrated amount of spice stored in the calibrated space **3905**, to drop into a cooking vessel (not shown). The illustration includes valve body **3902**.

[0180] An additional alternative to the dual-slider, spice valve system described in FIG. **36** and FIG. **37**, may be to use only one slider thus reducing the number of moving parts. As illustrated in FIG. **40**, a single slider, spice valve system **4099** may be constructed and operated, and is drawn with the slider in the load position, and describes at least an embodiment of this invention. The linear actuator **4001** may be used to push the slider **4004** to a position, such that the slider opening may align with the spice reservoir **4003** in the valve body **4002**, which may allow spices stored in the reservoir **4003** to fall and substantially fill the calibrated space **4005** within the slider **4004**.

[0181] As illustrated in FIG. **41**, the single slider, spice valve system **4099** is shown with the slider in the dispense position, at a step in the dispensing process that may follow FIG. **40**. The linear actuator **4101** may be used to push the slider **4104** to a position, such that the slider opening may align with the open via/chute below, which may allow the calibrated amount of spice stored in the calibrated space **4105**, within the slider **4104**, to fall into a cooking vessel (not shown). The illustration includes spice reservoir **4103** in the valve body **4102**.

[0182] An alternative to the one slider, spice valve system described in FIG. **40** and FIG. **41**, may be to add one more via/chute. As illustrated in FIG. **42**, a dual via, single slider, spice valve system **4299** may be constructed and operated, and is drawn with the slider in the load position, and describes at least an embodiment of this invention. The linear actuator **4201** may be used to push the slider **4204** to a position, such that the slider opening may align with the spice reservoir **4203**

in the valve body **4202**, which may allow spices stored in the reservoir **4203** to fall and substantially fill the calibrated space **4205**, within the slider **4204**.

[0183] As illustrated in FIG. **43**, the dual via, single slider, spice valve system **4299** is shown with the slider in the load position. The linear actuator **4301** may be used to push the slider **4304** to a position, such that the slider opening may align with the spice reservoir **4303** in the valve body **4302**, which may allow spices stored in the reservoir **4303** to fall and substantially fill the calibrated space **4305**, within the slider **4304**.

[0184] As illustrated in FIG. **44**, the dual via, single slider, spice valve system **4299** is shown with the slider in the dispense position, at a step in the dispensing process that may follow FIG. **43**. The linear actuator **4401** may be used to push the slider **4404** to a position, such that the slider opening may align with an open via/chute below, which may allow the calibrated amount of spice stored in the calibrated space **4405**, within the slider **4404**, to fall into a cooking vessel (not shown). The illustration may include valve body **4402** and reservoir **4403**.

[0185] As illustrated in FIG. **45**, the dual via, single slider, spice valve system **4299** is shown with the slider in the load position, at a step in the dispensing process that may follow FIG. **44**. The linear actuator **4501** may be used to push the slider **4504** to a position, such that the slider opening may align with the spice reservoir **4503** in the valve body **4502**, which may allow spices stored in the reservoir **4503** to fall and substantially fill the calibrated space **4505**, within the slider **4504**.

[0186] As illustrated in FIG. **46**, the dual via, single slider, spice valve system **4299** is shown with the slider in the dispense position, at a step in the dispensing process that may follow FIG. **45**. The linear actuator **4601** may be used to push the slider **4604** to a position, such that the slider opening may align with an open via/chute below, which may allow the calibrated amount of spice stored in the calibrated space **4605**, within the slider **4604**, to fall into a cooking vessel (not shown). The illustration includes valve body **4602** and reservoir **4603**.

[0187] An alternative to the dual via, single slider, spice valve system described in FIG. **42**, FIG. **43**, FIG. **44**, FIG. **45** and FIG. **46**, may include a spring mechanism assembly on one side of the single slider, which may reduce the approach of an actuator to one side only. As illustrated in FIG. **47**, a dual delivery via, single slider, spring loaded, spice valve system **4799** may be constructed and operated, and is drawn with slider in the dispense position, and describes at least an embodiment of this invention. The linear actuator **4701** may be used to push the slider **4704**, compressing the spring in the spring assembly **4706**, while moving the slider **4704** to a position, such that the slider opening may align with an open via/chute below, to allow the calibrated amount of spice stored in the calibrated space **4705**, within the slider **4704**, to fall into a cooking vessel (not shown).

[0188] As illustrated in FIG. **48**, the dual delivery via, single slider, spring loaded, spice valve system **4799** is shown with slider in the load position, at a step in the dispensing process that may follow FIG. **47**. The linear actuator **4801** may be used to release pressure of the slider **4801** on the compressed spring in the spring assembly **4806**, which may allow the spring to move the slider **4804** to a position, such that the slider opening may align with the spice reservoir **4803**, in the valve body **4802**, which may allow spices stored in the reservoir **4803** to substantially fill the calibrated space **4805**, within the slider **4804**.

[0189] As illustrated in FIG. **49**, the dual delivery via, single slider, spring loaded spice valve system **4799** is shown with slider in the dispense position, at a step in the dispensing process that may follow FIG. **48**. The linear actuator **4901** may be used to release pressure of the slider **4901** on the compressed spring in the spring assembly **4906**, which may allow the spring to move the slider **4904** to a position, such that the slider opening may align with an open via/chute below, which may allow the calibrated amount of spice stored in the calibrated space **4905**, within the slider **4904**, to fall into a cooking vessel (not shown).

[0190] An alternative to the slider spice valve system described in FIG. **36** through FIG. **49** may include replacing the slider valve with a screw-auger, for easier control, more precise dispensing of amounts of spices, and reduced clogging. As illustrated in FIG. **50**, a motor driven screw-auger spice dispensing system **5099** may be constructed and operated, and describes at least an embodiment of this invention. The screw-auger motor **5008**, may connect to the screw-auger **5007**, by means of a shaft coupler **5009**. The spice reservoir **5003**, in the valve body **5002**, may be located directly above the screw-auger. As the screw-auger motor **5008** turns the screw-auger **5007**, the screw-auger may move spice from the spice reservoir **5003** to the end of the screw-auger **5003** to an open via/chute below to dispense spice to a cooking vessel (not shown) below. It will be clear to one skilled in the art that several variations of the embodiment shown in FIG. **50** are possible. For example, the screw auger **5007** may be coupled to a rack and pinion mechanism to convert linear motion of an external actuator to motion of the screw auger.

[0191] An alternative to the motor driven screw-auger spice dispensing system **5099** shown in FIG. **50** may include a funnel shaped reservoir. The funnel geometry of the spice reservoir may improve flow characteristics of the spice powders, and reduce the height of the vertical space required for the spice dispenser. As illustrated in FIG. **51**, a motor driven screw-auger spice dispensing system **5199** with a funnel shaped reservoir may be constructed and operated, and describes at least an embodiment of this invention. The screw-auger motor **5108**, may connect to the screw-auger **5107** by means of a shaft coupler **5109**. The spice reservoir **5110**, in the valve body **5102**, may be located directly above the screw-auger. As the screw-auger motor **5108** turns the screw-auger **5107**, the screw-auger may move spice from the spice reservoir **5110** to the end of the screw-auger **5107** and to an open via/chute below, to dispense spice to a cooking vessel (not shown) below.

[0192] An alternative to the motor driven screw-auger spice dispensing systems shown in FIG. **50** and FIG. **51** may include a rotary assembly of multiple motor driven screw-auger spice valves with funnel shaped reservoirs, on a rotating index plate, which may take up less space and operate more efficiently. As illustrated in FIG. **52**, a motor driven screw auger spice valve system **5299** with a funnel shaped reservoir may be constructed and operated, and describes at least an embodiment of this invention. The screw-auger motor **5208**, may connect to the screw-auger **5207** by means of a shaft coupler **5209**. The spice reservoir **5210**, in the valve body **5202**, may be directly above the screw-auger **5207**. As the screw-auger motor **5208** turns the screw-auger **5207**, the screw-auger may move spice from the spice reservoir **5210** to

the end of the screw-auger **5207**, dropping spice through an open via/chute to a cooking vessel (not shown) below.

[0193] As illustrated in FIG. **53**, a rotary assembly **5399** of, for example, eight motor driven screw-auger spice valves with funnel shaped reservoirs mounted on a rotating index plate may be constructed and operated, with auger #3 (a single motor driven screw auger spice valve system **5299**) aligned to the auger drive motor, and describes at least an embodiment of this invention. Each valve body **5302**, with individual spice reservoir **5310** may be attached to the rotating indexing plate **5311**, which may be driven by an indexing motor (not shown), through an indexing plate coupler shaft **5312**. Shown is screw-auger #3 valve body **5302**, which may be aligned to the auger drive motor **5308**. The screw-auger motor **5308**, may connect to the indexed screw-auger (**5207**) by means of a screw-auger drive shaft coupler **5309**. The spice reservoir **5310**, in valve body **5302**, may be located directly above the screw-auger **5307**. As the screw-auger motor **5208** turns the screw-auger **5207**, the screw-auger may move spice from the spice reservoir **5210** to the end of the screw-auger **5307**, and the spice may drop through an open via/chute, to a cooking vessel (not shown) below.

[0194] Vertical space in an automated appliance may be tight. As illustrated in FIG. **54**, an ingredient delivery system with a horizontal actuator assembly **5499** to transfer horizontal force downward to a vertical pusher which may push food into a food processor and automated cooker, may be constructed and operated, and describes at least an embodiment of this invention. Ingredient delivery system with a horizontal actuator assembly **5499** may save vertical space. An array of food modules **5406** may be located to a preselected position using an automated Cartesian bot **5408**. The pusher assembly mechanism may be composed of a solid flexible polymer rod **5404** (for example), which may be Teflon, with an attached solid metal rod **5402** at one end, which may provide rigidity and a good connection to a Cartesian bot **5401**, and a pusher plate **5405** at the other end of the flexible polymer rod **5403**, all inside a metal tube with a **90** degree bend at one end **5403**. Proper alignment of the food module **5406** with the pusher assembly may allow the Cartesian bot **5408** to supply suitable horizontal force to provide suitable vertical downward force, to push food through the food module **5406** into a food processor and automated cooker. It will be clear to one skilled in the art that several variations of the proposed embodiment may be possible. One may use air pressure to push food, and other mechanisms may also be possible.

[0195] FIG. **55** shows a top-down view of a configuration to park cassettes of spices and food ingredients out of the way of the food processing and cooking areas of an automated cooking appliance. Food items and spices may need to be isolated for short term storage in a food-safe area, which may provide protection from airborne contamination, mechanical processes, and potential problems of heat and cooking vapors. FIG. **55** shows a cooking vessel **5501**, which may be disposed and isolated to one side of the available space within an automated cooking appliance, but within the frame and/or locating extent of the Cartesian bot **5507**. An array of food modules **5504** may be loaded on a cassette **5505** that may be mounted to a food tray **5503**. Also mounted on this food tray may be a spice cassette **5502**. This food tray **5503** may be in the form of a drawer that may slide out from the front of the automated cooking appliance for convenient access for loading and unloading. Food tray **5503** may also be adapted to be a temperature and/or humidity controlled unit, such as a refrigerator and/or dehumidifier, and may have temperature, humidity, motion, and gas sensors for monitoring the food and tray status.

[0196] Some users of an automated cooking machine may want to load their ingredients into the machine in the morning when they leave for work, and would like to come home and see hot food waiting for them. The challenge with this paradigm is that meat items such as chicken and other items may often become spoiled if left at room temperature for too long. As illustrated in FIG. **56**, an example ingredient dispenser **5699** may be constructed and operated (top view shown), and describes at least an embodiment of this invention. First ingredient container **5601** and second ingredient container **5602** are where food items may not need to be kept cool until use, while cooled ingredient containers **5603** are where food items may need to be kept cool until use. The regions **5604** around cooled ingredient containers **5603** may have space and fittings available for housing ice packs and thereby preserve perishable food items until these are used. It will be clear to one skilled in the art that other passive or active cooling schemes may be used. These could include refrigeration systems, Peltier cooling systems, etc.

[0197] As illustrated in FIG. **57**, an alternative system for the ingredient dispenser **5799** function may be constructed an operated, and describes at least an embodiment of this invention. Ingredient dispenser **5799** may include food **5701** that needs to be dispensed, first slide gate valve **5702** and second slide gate valve **5703**, and opening **5704** which may be moved (for example, along rail **5705**) to in turn move the slider valves back and forth. Moving the slider valves first slide gate valve **5702** and second slide gate valve **5703** back and forth may allow the ingredient to be dispensed. The actuator **5706** may be used to move the opening **5704**. The actuator **5706** may be fitted onto a system **5707** that can be moved in one direction (in X, Y or Z), in two directions (in XY, YZ and ZX) or three directions (XYZ) using a robot arm fitted with one or more motors. In some embodiments, the system **5707** may not be movable. To one skilled in the art, it will be apparent how the system in FIG. **57** operates, based on this description and the description provided for in FIGS. **20-24** herein.

[0198] As illustrated in FIG. **58**, an ingredient container may be placed/coupled with/in an ingredient dispenser, thus forming an ingredient dispenser **5899** which may be constructed and operated, and describes at least an embodiment of this invention. A single slider valve **5806** may be present which may dispense food item **5808** from ingredient container **5802**. This may be used for multiple applications. Such as, for example, dispensing perishable quantities that may not be reused. It will be clear to one skilled in the art that several alternative embodiments may be possible. This may include a trapdoor at the bottom of the container which helps dispense the food item instead of having a slider as shown in FIG. **58**. Liquid ingredients, may, for example, be dispensed using a system with solenoid valves. Various other embodiments may be possible.

[0199] As illustrated in FIG. **59**, an example ingredient dispenser system **5999** may be constructed and operated, and describes at least an embodiment of this invention. Ingredient dispenser system **5999** may include solid dispenser **5904**, powder dispenser **5906**, and liquid dispenser **5908** (a "black-box view"). Although just these three dispensers solid dispenser **5904**, powder dispenser **5906**, and liquid dispenser **5908** are shown in FIG. **59**, it will be clear to one skilled in the art that various other dispensers may also be present. Dis-

pensers solid dispenser **5904**, powder dispenser **5906**, and liquid dispenser **5908** may be mounted on a Cartesian robot arm **5902** (i.e., may share the same robot arm) which may be moved to various points in the (x, y, z) plane using motors (not shown). Solid ingredients **5912** may be dispensed on to a cooking vessel (not shown) by moving a slide gate valve **5914**. Slide gate valve **5914** may be attached to piece **5916** which may be actuated, for example, using a robot arm **5910**. Robot arm **5910** may push region **5918** back and forth to move the slide gate valve **5914**, which in turn could result in dispensing solid ingredients **5912** into the cooking vessel (not shown). Robot arm **5910** may optionally be a non-moving arm. The powder dispenser **5906** may operate using principles shown in FIGS. **4-7** herein, for example. The powder dispensed **5920** may be a spice, sugar, salt or some other powder used in food applications. The sliders first slider **5922** and second slider **5924** may be connected to the arm **5926** which may be actuated using robot arm **5910**. By pushing robot arm **5910** against the arm region **5928**, the sliders solid ingredients may be used for dispensing the powder **5920**. The heights of the solid dispenser **5904** and powder dispenser **5906** may be strategically chosen to make best use of the available space in the machine. For example, by making the solid dispenser **5904** taller than the powder dispenser **5906**, one may be able to pack the dispensers more tightly into the automated cooking machine. The liquid dispenser **5908** may include solenoid valves or may be built using other techniques. Ingredient dispenser system **5999** may be integrated into at least the automated cooking machine/apparatus described herein.

[0200] As illustrated (side view) in FIG. **60**, a portion of an automated cooking system/apparatus (for example, such as described in at least FIGS. **1**, **3**, **8**, **9**, **14**, **33**, **34** and **35** herein, which includes perimeter food slicing modules **6001** and a chopping and stirring module **6013** in the bottom of the cooking pot/vessel **6010** may be constructed and operated, and describes at least an embodiment of this invention. Food slicing modules **6001** may also include dicing and cutting apparatuses and functions. These perimeter food slicing modules **6001** may be strategically located about the perimeter of the automated cook pot/vessel **6010** to facilitate the delivery of food to the loading hopper **6002**, by an ingredient dispenser (not shown) mounted on a Cartesian bot system (not shown). Outfitted with a suitable spinning blade **6004**, food delivered to the loading hopper **6002** may be sliced, and then ejected by a rotating food ejector plate **6005**, through the ejection port **6007** optimized to deliver food to the cooking pot/vessel **6010**. Spinning blade **6004** and food ejector plate **6005** may be attached/coupled to motor **6006**.

[0201] The food slicing modules **6001** may also include a pre-slicing gridded knife **6003**. Each individual food slicing module **6001** may have a different size of pre-slicing gridded knife **6003**. The pre-slicing gridded knives **6003** may be have openings as small as ⅛"×⅛" and larger. Food pressed through a food slicing and cutting module **6001**, with a gridded knife and no spinning blade **6004**, may result in strips of food with a cross-section defined by the geometry of the gridded knife. Food pressed through a food slicing and cutting module **6001** with a gridded knife and a spinning blade **6004** may result in cubes of food with a cross-section defined by the geometry of the gridded knife and a length defined by the distance between the two blades.

[0202] Each individual food slicing module **6001** may be driven by separate motors **6006**, or they may be driven by a single motor and a system of gears, belts and cables.

[0203] The multi-purposed stirring and cutting module **6013** at the bottom of the cook pot/vessel **6010** may include a chopping blade **6011** and a stirring module **6012**, and may be driven by a separate motor system **6014**. The variable motor **6014** may be switched to operate in either a clockwise or counter-clockwise direction. The chopping blade **6011** may be designed using a suitable food chopping blade design, such that the cutting and chopping process may be optimized in one preferred direction and at an optimized speed used for cutting food. The stirring module **6012** may be designed using a suitable polymer such as silicone or other soft durable food-safe polymer, in a shape that may be optimized to mix and scrape food, mounted and integrated into to a cutting blade, such that the stirring process may be optimized in the reverse direction and at a lower speed than what might be used for cutting food.

[0204] As illustrated (top-down view) in FIG. **61**, a configuration for an automated cookpot/vessel **6110** having perimeter slicing and cutting modules **6101**, and a chopping and stirring module **6113** in the bottom of the pot/vessel may be constructed and operated, and describes at least an embodiment of this invention. The perimeter slicing and cutting modules may also be referred to as continuous flow food processors in this patent application. The perimeter food slicing modules **6101** may be strategically located about the perimeter of the automated cook pot **6110** to facilitate the delivery of food to the loading hopper **6102**, by an ingredient dispenser (not shown) mounted on a Cartesian bot system (not shown). Food delivered to the loading hopper **6102** of a perimeter food slicing module **6101** configured with a suitable spinning blade **6114**, may be sliced, and then ejected by a rotating food ejector plate, through the ejection port **6107**, optimized to deliver food to the cooking pot/vessel **6110**. The perimeter food slicing modules **6101** may also include a pre-slicing gridded knives such as first gridded knife **6103** and second gridded knife **6104**. Each individual food slicing modules **6101** may have a different size of pre-slicing gridded knives first gridded knife **6103** and second gridded knife **6104** to provide unique food shapes and sizes. The pre-slicing gridded knives first gridded knife **6103** and second gridded knife **6104** may have openings as small as ⅛"×⅛" and larger. Food pressed through a food slicing and cutting module **6101**, with a gridded knife and no spinning blade **6114**, may result in strips of food with a cross-section defined by the geometry of the gridded knives first gridded knife **6103** and second gridded knife **6104**. Food pressed through a food slicing and cutting module **6101**, with gridded knives first gridded knife **6103** and second gridded knife **6104**, and a spinning blade **6114**, may result in cubes of food with a cross-section defined by the geometry of the gridded knife and a length defined by the distance between the two blades. Each individual food slicing module **6101** may be driven by separate motors, or they may be driven by a single motor and a system of belts and cables.

[0205] The multi-purposed stirring and cutting module **6113** at the bottom of the cook pot/vessel **6110**, includes a chopping blade **6111** that may include a stirring module, mounted and integrated into one arm of the cutting blade **6111**. The stirring and cutting module **6113** may be driven by a variable motor system that may operate in either the clockwise or counter-clockwise direction. The chopping blade

6111 may be designed using a suitable food chopping blade design, such that the cutting and chopping process may be optimized in one preferred direction and at an optimized speed used for cutting food. The attached stirring module may be designed using a suitable polymer, such as silicone or other soft durable food-safe polymer, in a shape that may be optimized to mix and scrape food, mounted and integrated into to a cutting blade, such that the stirring process may be optimized in the reverse direction and at a lower speed than what might be used for cutting food.

[0206] It will be clear to one skilled in the art that several variations of the embodiments in FIG. **61** are possible. For example, one may use just a stirrer (device, functions and motions) for the bottom of the cookpot **6110** and not include any cutting functions or dual purpose blades. Moreover, the food processor shown in FIG. **11** may be used in the perimeter of the automated cookpot **6110**.

[0207] FIG. **62** shows a top-down view of an example configuration for an automated cookpot/vessel **6210** with perimeter slicing and cutting modules **6201**, a chopping and stirring module **6211** in the bottom of the cooking pot/vessel **6210**, a food drawer **6218** with food modules **6219**, a spice cassette **6220** with individual spice modules **6221**, and a Cartesian food delivery system **6217**. These perimeter food slicing modules **6201** may be strategically located about the perimeter of the automated cook pot **6210** to facilitate the delivery of food and spices to the loading hopper **6201** by an automated Cartesian food delivery system **6217** which may be controlled by a recipe based program. Configured with a suitable spinning blade **6214**, food delivered to the loading hopper **6201**, may be sliced, and then ejected by a rotating food ejector plate, through the ejection port **6207** optimized to deliver food to the cooking pot/vessel **6210**. The perimeter food slicing modules **6201** may also include pre-slicing gridded knives first gridded knife **6203** and second gridded knife **6204**. Each individual food slicing module **6201** may have a different size of pre-slicing gridded knives first gridded knife **6203** and second gridded knife **6204** to provide unique food shapes and sizes. The pre-slicing gridded knives first gridded knife **6203** and second gridded knife **6204** may have openings as small as ⅛"×⅛" and larger. Food pressed through a food slicing and cutting module **6201**, with a gridded knives first gridded knife **6203** and second gridded knife **6204** and no spinning blade **6214**, may result in strips of food with a cross-section defined by the geometry of the gridded knives first gridded knife **6203** and second gridded knife **6204**. Food pressed through a food slicing and cutting module **6201**, with a gridded knives first gridded knife **6203** and second gridded knife **6204**, followed by a spinning blade **6214**, may result in cubes of food with a cross-section defined by the geometry of the gridded knives first gridded knife **6203** and second gridded knife **6204** and a length defined by the distance between the two blades. Recipes defined within the automated cooking control system may specify the cutting required to provide unique food shapes and sizes for each food stored in the food tray **6218**. The Cartesian food delivery system **6217** may allow the automated cooking system to direct the correct food module **6219**, stored on the food tray **6218**, to the correct perimeter slicing and cutting modules **6201** for the recipe defined food shape and size, or directly to the cooking pot/vessel **6217** with no pre-cutting. The Cartesian food delivery system **6217**, which can also be referred to by the term Cartesian bot, may push the food item to be chopped down the continuous flow food processor's inlet. Each individual food slicing module **6201** may be driven by separate motors, or they may be driven by a single motor and a system of gears, belts and cables (e.g., a motor shared).

[0208] The multi-purposed stirring and cutting module **6211** at the bottom of the cook pot **6210**, may include a one purpose chopping blade, a one purpose stirring blade or it may also include a multi-purposed stirring and cutting blade with a stirring module, mounted and integrated into one arm of the cutting blade in the bottom of the cooking pot **6210**. The stirring and cutting module **6211** may be driven by a variable motor system that may operate in either clockwise or counter-clockwise directions. The chopping blade may be designed using a suitable food chopping blade, such that the cutting and chopping process may be optimized in one preferred direction at an optimized speed used for cutting food. The attached stirring module may be designed using a suitable polymer such as silicone or other soft durable food-safe polymer, in a shape that may be optimized to mix and scrape food, mounted and integrated into to a cutting blade, such that the stirring process may be optimized in the reverse direction at a lower speed than might be used for cutting food.

[0209] As illustrated (top-down view) in FIG. **63**, a dual-purpose cutting/stirring blade **6399** may be constructed and operated, and describes at least an embodiment of this invention. Clock-wise rotational power may be applied to dual-purpose cutting/stirring blade **6399** by a motor drive shaft **6304**. Clock-wise rotation of the dual-purpose cutting/stirring blade **6399** in FIG. **63** may provide sufficient cutting capability for the sharpened leading edge **6301** to chop or slice food. Counter-clock-wise rotational power may be applied to a dual-purpose cutting/stirring blade by a motor drive shaft **6304**. Counter-clock-wise rotation of the dual-purpose cutting/stirring blade in FIG. **63** may provide sufficient pushing capability for the leading edge **6302** to mix and/or stir food. One configuration of this leading edge **6302** to mix and/or stir food may include an augmentation of the leading edge **6302** to mix and/or stir food, in the form of a molded polymer scraper **6303**, which may be made of silicone, or other soft durable food-safe polymer, in a shape that may be optimized to mix and scrape food in a cooking pot. The line of perforations **6308** along the stirring edge **6302** of the dual-purpose cutting/stirring blade may provide a method to securely attach a directly molded polymer scraper **6303** to the stirring edge **6302** of the dual-purpose cutting/stirring blade.

[0210] FIG. **64** shows a cross-sectional view of the dual-purpose cutting/stirring blade **6399** shown in FIG. **63**, oriented to show top surface **6405** of the dual-purpose cutting/stirring blade **6399**, sharpened cutting edge **6401** of the augmented stirring edge dual-purpose cutting/stirring blade **6399**, and dual-purpose cutting/stirring blade **6402**. One configuration of this stirring edge, **6402** to mix and/or stir food, may include an augmentation of edge **6402** to mix and/or stir food, in the form of a molded polymer scraper **6403**, which may be made of silicone, or other soft durable food-safe polymer, in a shape that may be optimized to mix and scrape food in a cooking pot. The perforations **6406** of the stirring edge **6402** of the dual-purpose cutting/stirring blade may provide a method to securely attach a directly molded polymer scraper **6303** to the stirring edge **6302** of the dual-purpose cutting/stirring blade **6399**.

[0211] FIG. **65** shows a top-down view of a configuration of a dual-purpose cutting/stirring blade **6599**. Clock-wise rotational power may be applied to a dual-purpose cutting/stirring

blade **6599** by a motor drive shaft **6504**. Clock-wise rotation of the dual-purpose cutting/stirring blade **6599** in FIG. **65** may provide sufficient cutting capability for the sharpened leading edge **6501** to chop or slice food. Counter-clock-wise rotational power may be applied to a dual-purpose cutting/stirring blade by a motor drive shaft **6504**. Counter-clock-wise rotation of the dual-purpose cutting/stirring blade in FIG. **65** may provide sufficient pushing capability for the leading edge **6502** to mix and/or stir food. One configuration of this stirring edge **6502** to mix and/or stir food may include an augmentation of the stirring edge **6502** to mix and/or stir food, in the form of a molded polymer scraper **6503**, which may be made of silicone, or other soft durable food-safe polymer, in a shape that may be optimized to mix and scrape food in a cooking pot/vessel (not shown). The line of perforations **6508** along the stirring edge **6502** of the dual-purpose cutting/stirring blade **6599** may provide a method to securely attach a directly molded polymer scraper **6503** to the stirring edge **6502** of the dual-purpose cutting/stirring blade.

[0212] FIG. **66** shows a cross-sectional view of the dual-purpose cutting/stirring blade shown in FIG. **65**, simulating rotation of the dual-purpose cutting/stirring blade **6599** with movement in direction **6607**, such that the leading sharpened edge **6601** results in cutting. The shape of the augmented polymer scraper **6603** molded to the trailing stirring edge **6602** of the dual-purpose cutting/stirring blade **6599**, may be optimized to allow cut food **6609** to pass under the stirring scraper **6603**.

[0213] FIG. **67** shows a cross-sectional view of the dual-purpose cutting/stirring blade **6599** shown in FIG. **65**, simulating rotation of the of the dual-purpose cutting/stirring blade **6599** with movement in direction **6707**, such that the leading augmented edge **6702** results in stirring and mixing of food **6708**. The shape of the augmented polymer scraper **6703** molded to the stirring edge **6702** of the dual-purpose cutting/stirring blade **6599**, may be optimized to scrape and stir food **6709** in a cooking pot/vessel (not shown). The blade may include leading sharpened edge **6701**.

[0214] FIG. **68** shows a top down view of a pre-assembly configuration of a dual-purpose cutting/stirring blade **6899**. Counter-clock-wise rotational power may be applied to a dual-purpose cutting/stirring blade **6899** by a motor drive shaft **6804**. Counter-clock-wise rotation of the dual-purpose cutting/stirring blade **6899** in FIG. **68** may provide sufficient cutting capability for the sharpened leading edge **6801** to chop or slice food. Clock-wise rotational power may be applied to a dual-purpose cutting/stirring blade **6899** by a motor drive shaft **6804**. Clock-wise rotation of the dual-purpose cutting/stirring blade **6899** may provide sufficient pushing capability for the leading edge **602** to mix and/or stir food. One configuration of this stirring edge **6802** to mix and/or stir food may include an augmentation of the stirring edge **6802** to mix and/or stir food, in the form of a molded polymer scraper **6803**, which may be made of silicone, or other soft durable food-safe polymer, in a shape that may be optimized to mix and scrape food in a cooking pot/vessel (not shown). The molded scraper **6803** is shown in FIG. **68** prior to direct molding to the dual-purpose cutting/stirring blade. The line of perforations **6808** along the stirring edge **6802** of the dual-purpose cutting/stirring blade may provide a method to securely attach a directly molded polymer scraper **6803** to the stirring edge **6802** of the dual-purpose cutting/stirring blade **6899**.

[0215] FIG. **69** shows a top down view of a post-assembly configuration of a dual-purpose cutting/stirring blade **6899**. Counter-clock-wise rotational power may be applied to a dual-purpose cutting/stirring blade **6899** by a motor drive shaft **6904**. Counter-clock-wise rotation of the dual-purpose cutting/stirring blade in FIG. **69** may provide sufficient cutting capability for the sharpened leading edge **6901** to chop or slice food. Clock-wise rotational power may be applied to a dual-purpose cutting/stirring blade by a motor drive shaft **6904**. Clock-wise rotation of the dual-purpose cutting/stirring blade in FIG. **69** may provide sufficient pushing capability for the leading edge **702** to mix and/or stir food. One configuration of this stirring edge **6902** to mix and/or stir food may include an augmentation of the stirring edge **6902** to mix and/or stir food, in the form of a molded polymer scraper **6903**, which may be made of silicone, or other soft durable food-safe polymer, in a shape that may be optimized to mix and scrape food in a cooking pot/vessel (not shown). The molded scraper **6903** is shown in FIG. **69** after direct molding to the dual-purpose cutting/stirring blade. The line of perforations **6908** along the stirring edge **6902** of the dual-purpose cutting/stirring blade may provide a method to securely attach a directly molded polymer scraper **6903** to the stirring edge **6902** of the dual-purpose cutting/stirring blade.

[0216] As illustrated (side view) in FIG. **70**, a portion of an automated cooking system/apparatus which includes side-mounted perimeter slicing modules **7001**, and a chopping and stirring module **7013** in the bottom of the cooking pot/vessel **7010** may be constructed and operated, and describes at least an embodiment of this invention. Food slicing modules **7001** may also include dicing and cutting apparatuses and functions. These perimeter food slicing modules **7001** may be strategically located about the perimeter of the automated cook pot/vessel **7010** to facilitate the delivery of food to the loading hopper **7002**, by an ingredient dispenser (not shown) mounted on a Cartesian bot system (not shown). Outfitted with a suitable spinning blade **7004**, food delivered to the loading hopper **7002**, may be sliced, and then ejected by a rotating food ejector plate **7005**, through the ejection port **7007** optimized to deliver food to the cooking pot/vessel **7010**.

[0217] The food slicing modules **7001** may also include a pre-slicing gridded knife **7003**. Each individual food slicing module **7001** may have a different size of pre-slicing gridded knife **7003**. The pre-slicing gridded knives **7003** may be have openings as small as ⅛"×⅛" and larger. Food pressed through a food slicing and cutting module **7001**, with a gridded knife and no spinning blade **7004**, may result in strips of food with a cross-section defined by the geometry of the gridded knife. Food pressed through a food slicing and cutting module **7001** with a gridded knife and a spinning blade **7004**, may result in cubes of food with a cross-section defined by the geometry of the gridded knife and a length defined by the distance between the two blades.

[0218] Each individual food slicing module **7001** may be driven by separate motors **7006**, or they may be driven by a single motor and a system of gears, belts and cables.

[0219] The multi-purposed top-down chopping and stirring module **7013**, coming from above the cooking pot/vessel **7010** to substantially the bottom of the pot/vessel, where the shaft **7020** may engage a shaft stabilizer **7030**, may include a chopping blade **7011** and a stirring module **7012**, and may be driven by a separate motor system **7014**. The variable motor **7014** may operate in either a clockwise or counter-clockwise

direction. The chopping module **7011** may be designed using a suitable food chopping blade design, such that the cutting and chopping process may be optimized in one preferred direction and at an optimized speed used for cutting food. The stirring module **7012** may be designed using a suitable polymer such as silicone or other soft durable food-safe polymer, in a shape that may be optimized to mix and scrape food, mounted and integrated into to a cutting blade, such that the stirring process may be optimized in the reverse direction and at a lower speed than might be used for cutting food. Alternatively, the module **7013** may have just stirring functions and may not be involved in chopping.

[0220] FIG. **71** shows a side view of a configuration for an automated cookpot having side-mounted perimeter slicing and cutting modules **7101**, and a stirring module **7113** that extends substantially to the bottom of the cooking pot/vessel **7110**. The perimeter food slicing modules **7101** may be strategically located about the perimeter of the automated cook pot/vessel **7110** to facilitate the delivery of food to the loading hopper **7102**, by an ingredient dispenser (not shown) mounted on a Cartesian bot system (not shown). Outfitted with a suitable spinning blade **7104**, food delivered to the loading hopper **7102**, may be sliced, and then ejected by a rotating food ejector plate **7105**, through the ejection port **7107** optimized to deliver food to the cooking pot **7110**.

[0221] The food slicing modules **7101** may also include a pre-slicing gridded knife **7103**. Each individual food slicing module **7101** may have a different size of pre-slicing gridded knife **7103**. The pre-slicing gridded knives **7103** may be have openings as small as ⅛"×⅛" and larger. Food pressed through a food slicing and cutting module **7101**, with a gridded knife and no spinning blade **7104**, may result in strips of food with a cross-section defined by the geometry of the gridded knife. Food pressed through a food slicing and cutting module **7101** with a gridded knife and a spinning blade **7104**, may result in cubes of food with a cross-section defined by the geometry of the gridded knife and a length defined by the distance between the two blades.

[0222] Each individual food slicing module **7101** may be driven by separate motors **7106**, or they may be driven by a single motor and a system of belts and cables.

[0223] The top-down articulated stirring arm module **7113**, coming from above the cooking pot/vessel **7110**, may consist of a an extended articulated-arm **7121** driven by a separate motor system **7114**, with a stirring module **7112** mounted at the end to stir substantially to the bottom of the cooking pot/vessel **7110**. The stirring module **7112** may be designed using a suitable polymer such as silicone or other soft durable food-safe polymer, in a shape that may be optimized to mix and scrape food. The variable motor **7114** may operate in either a clockwise or counter-clockwise direction and with adequate articulation control electronics may be able to mix, beat, froth or flip food.

[0224] As illustrated (front view) in FIG. **72**, an automated cooking machine/apparatus **7299** which uses a stirring mechanism whose motion may be controlled by a Cartesian bot may be constructed and operated, and describes at least an embodiment of this invention. The stirrer **7203** may be mounted on a Cartesian bot such as rails **7217**, which may control the movement of the stirrer **7203** in multiple axes, including X, Y and Z, while the stirrer blade **7205** may be in contact with the food being cooked **7204**. Such an arrangement may allow the stirrer's motion to be mechanically coupled to the Cartesian bot's motion, in part or in whole. A Cartesian bot portion **7201** can be moved to any point in the X, Y, Z plane using a set of motors and other robotic arm components. The Cartesian bot may be programmed to move the stirrer **7203** and the ingredients in the pot/vessel along with it, thereby ensuring that the food may be uniformly cooked and ingredients do not stick to the pot/vessel. The stirrer may optionally be attached to a robot arm, which may optionally control the position of the stirrer by retracting it, that is, lifting the blades away from the cooking pot when unnecessary, for example, while ingredients are being dispensed, and lowering the stirring blades into the food when stirring is required. Having this robot arm may allow the motion of the stirrer to be decoupled from the motion of the ingredient containers in at least one axis, which may help with flexibility and size issues. The motor **7207** and leadscrew **7203** may form part of the robot arm, and the robot arm may be attached to the Cartesian bot using an attachment **7202**. Attaching (including mechanically coupled) the stirrer to the robot arm and the Cartesian bot may allow the stirrer to scrape the sides of the cooking vessel and the bottom when required, and may not do that otherwise. Thus the stirrer may have or be adapted to have many functions and motions in the automated cooking machine/apparatuses described at least herein. It will be clear to one skilled in the art that several types of robot arms are possible, and one is not limited to using the robot arm arrangement shown in FIG. **72**. One skilled in the art will know the robot arm shown in FIG. **72** is a high-level pictorial view to show the concept. FIG. **73** illustrates the side view of the automated cooking machine/apparatus **7299** which uses a stirring mechanism whose motion may be controlled by a Cartesian bot. FIG. **73** shows the robot arm described in FIG. **72** retracting and moving the stirrer blades **7305** above the cooking pot/vessel and the ingredients **7304** when stirring is not required. The motor **7307** may be attached to the aforementioned Cartesian bot and the attachment may include leadscrew **7303** and attachment **7302**. A portion of the Cartesian bot system is depicted as **7301**, and it may be moved to any point in the X, Y, Z plane using a set of motors and other robotic arm components. The Cartesian bot may lift the blades **7305** above the cooking pot and the ingredients **7304**, when stirring is not required.

[0225] As illustrated in FIGS. **74**A-**74**C, an automated cooking machine/apparatus **7499** including a multi-sided heating arrangement may be constructed and operated, which may be used to cook food, and describes at least an embodiment of this invention. Such an arrangement may be used, for example, for baking food. Automated cooking machine/apparatus **7499** may include baking chamber **7402**, heating elements **7404** for the baking chamber **7402**, portion of a Cartesian robot arm **7406**, ingredient dispensers **7408**, element **7410**, pushers **7412**, example food item being cooked **7414**, cooking machine boundary **7422**, and baking chamber top cover **7424**. The system may be designed to heat on 1 side, 2 sides, 3 sides and/or all 4 slides of the baking chamber **7402**. Portion of a Cartesian robot arm **7406** may include a multiplicity of elements, for example, ingredient dispensers **7408** and pushers **7412**. The Cartesian bot may use multiple motors and other robotic components to get to most any point in the X, Y, Z plane within the cooking machine boundary **7422**. Baking chamber top cover **7424** may be designed so that it may slide, and may slide, for example, by pushing the element **7410** with the pusher **7412**. Baking chamber top cover **7424** may include top heating elements **7405**, which may act as a top heater for baking chamber **7402**. Top heating ele-

ments **7405** may be utilized to pre-heat and/or ingredients in ingredient dispensers **7408**. Alternatively, one may use techniques utilized in robot arms, such as, for example, the use of motors to slide the top cover **7424**. Alternatively, instead of using part of the Cartesian bot arm **7406** to push the element **7410**, one may use another separate robot arm to push the element **7410**. In FIG. **74**A, the baking chamber top cover **7424** covers the baking chamber and may produce multi-sided heating to cook food item **7414**. FIG. **74**B illustrates the pusher **7412** pushing the baking chamber top cover **7424**. FIG. **74**C illustrates that once the baking chamber top cover **7424** is moved, then the food ingredients **7420** may be dispensed atop the food item **7414**. For example, dough may be dispensed, or toppings for pizza may be dispensed, or something else. It will be clear to one skilled in the art that several variations of the proposed embodiments may be possible. Furthermore, the ideas described in FIG. **74**A-**74**C may be combined with other elements of this disclosure herein, such as the stirrer concept described in FIG. **72** and FIG. **73**, the chopping mechanism described in FIG. **60**-FIG. **62** and other concepts. It will also be clear to one skilled in the art that FIG. **74**A-**74**C are simplified drawings meant to show the concept. One skilled in the art will also realize that the heating on all 4 sides of the cooking machine may be configurable. That is, the heating on the bottom may be stronger when some foods are cooked, the heating on the sides may be turned off, and in general, the heating to the 4 sides of the vessel may be independently turned on or turned off or made higher or made lower in temperature.

[0226] As illustrated in FIG. **75**, a cooking machine/apparatus **7599** including a multi-sided heating arrangement may be constructed and operated, which may be used for cooking crepes, pancakes, dosas, rotis, pizzas and other food items which benefit from two sided heating, and describes at least an embodiment of this invention. Cooking machine/apparatus **7599** may include Cartesian bot system **7502**, cooking surface/vessel **7504**, heating system **7506**, ingredient dispenser **7508**, spatula **7510**, first robot arm **7512**, plate **7514**, second robot arm **7516** and heaters **7518**. For the rest of this description, we will use the term "crepe" for indicating the food item being cooked, for simplicity. One skilled in the art will realize cooking machine/apparatus **7599** and cooking methods herein may be applied to other types of food. The dough for the crepe may be dispensed using the ingredient dispenser system **7508** using techniques described herein this patent application. Cooking machine/apparatus **7599** may include spatula **7510**, which may be used for spreading the crepe dough on the cooking surface/vessel **7504**. The spatula **7510** may be optionally mounted on a first robot arm **7512**, or it may be mounted on a non-movable arm (not shown). Plate **7514** may be a plate which may be heated using heaters **7518**. One skilled in the art will realize various techniques and systems may be used to form and heat plate **7514** and one is not limited to just one type of heating apparatus. The plate **7514** may be mounted on a second robot arm **7516**. Plate **7514** may be formed in many shapes and formats, for example, such as a substantially flat circle or ellipse or square, or a substantially convex circle or ellipse or square, perforated, and so on. Alternatively, the second robot arm **7516** may be non-movable or movable by human intervention only (not shown). The ingredient dispenser **7508**, spatula **7510** with first robot arm **7512** and plate **7514** with second robot arm **7516** may all be mounted on a Cartesian bot system **7502** which may move to points in the x, y, z plane using a set of motors and rails. Heating system **7506** may be utilized for forming/cooking the crepe.

[0227] FIGS. **76**A-**76**C illustrate an example method for how a system, such as cooking machine/apparatus **7599** in FIG. **75** herein, may be used for making crepes. Cooking machine/apparatus **7699** may include Cartesian bot system **7602**, cooking surface/vessel **7604**, heating system **7606**, ingredient dispenser **7608**, spatula **7610**, first robot arm **7612**, plate **7614**, second robot arm **7616** and heaters **7618**. Plate **7614** may be used for heating the top side of the crepe. First robot arm **7612** may be a robot arm that may move spatula **7610** in at least the up/down direction. Cartesian bot system **7602** may be part of the overall Cartesian bot system within cooking machine/apparatus **7699**.

[0228] At the start of the cooking process, the ingredient dispenser **7608** may dispense dough **7620** to form a pile of dough **7622** as shown in FIG. **76**A. FIG. **76**B illustrates the next step in the cooking process where the ingredient dispenser **7608** is closed and the first robot arm **7612** moves the spatula **7610** as required to convert the pile of dough **7622** in FIG. **76**A into the "crepe-like" shape crepe **7624** in FIG. **76**B. Movement of spatula **7610** may include x, y and z directions, either individually or in combination. FIG. **76**C illustrates the next step in the process where the heated plate **7614** may be used to heat the crepe on the top side and the heating system **7606** may be used to heat the crepe on the bottom side. The heated plate **7614** may be moved atop the crepe **7624** by using motion of the Cartesian bot or alternatively, by using a movable second robot arm **7616**. One may even use a combination of the Cartesian bot motion and robot arm motion to move the heated plate **7614** atop the crepe. The heating to the top plate **7614** and the bottom heating system **7606** may be configured in different ways to obtain optimal cooking of the crepe **7624**. These may include use of different temperatures in the top and bottom heaters. It may also include the top plate **7614** being smaller in size than the crepe being cooked, as shown in FIG. **76**D. The top plate **7614** may then be moved using the Cartesian bot system over different parts of the crepe **7624** to heat it. This allows space saving compared to using a top plate that is the same size as the crepe. The top heater may use one of multiple types of heating sources: radiative heat, infra-red heat, conductive heat or convective heat or some other heating system altogether. Infra-red heating may allow precise application of heat on the food being cooked and may result in less heating of other parts of the system such as the ingredient dispenser **7608** or the surrounding air. The use of a robot arm for second robot arm **7616** may allow the heater to move close to the food being cooked thereby resulting in less heat loss to the surroundings. Sensors may be used to detect how tall the food item being cooked is and adjust the Z position of the top heating plate **7614**. It will be clear to one skilled in the art that several variations of the proposed embodiments may be possible. One may add toppings atop the crepe using other dispensers. One may add oil on the pan using an ingredient dispenser system to prevent the crepe from sticking to the pan. One may use the system shown in FIG. **75** and FIG. **76** for food items other than crepes, such as for example, pizzas, entrees and other items which may require two sided heating systems. One may use the ideas in FIG. **75** and FIG. **76** along with other ideas in the patent application. One may even prepare the dough needed for the crepe by using the Cartesian bot to dispense ingredients for the dough into the cooking vessel and have a stirrer mix it. One may use mass sensors

atop the ingredient dispenser to control the amount of dough being dispensed. One may use a solenoid operated valve or some other valve to control the amount of dough being dispensed. Various other embodiments may be possible.

[0229] As illustrated in FIGS. **77**A-**77**E, a cooking machine/apparatus **7799** including an automated cleaning system may be constructed and operated, which may be used for cleaning a portion of the cooking machine/apparatus, and describes at least an embodiment of this invention. The portion of cooking machine/apparatus **7799** illustrated in FIGS. **77**A-**77**E may include continuous flow food processor **7702**, cover **7704**, rod **7706**, portion of Cartesian bot system **7708**, robot arm **7709**, dispenser **7710**, water source **7712**, residue **7714**, pan **7715**, heat source **7716**, stirring system **7718**, filter **7720**, hole **7722** and cooking vessel **7728**. Continuous flow food processor **7702** may be a continuous flow food processor, such as, for example, the system described in FIG. **60**-**62**. Portion of Cartesian bot system **7708** may be part of a Cartesian bot system that may move to points in the (x, y, z) plane. Stirring system **7718** may be a stirring system, such as, for example, the system described in FIG. **72**-**73**. Cover **7704** may be a cover for the hole **7722** in the cooking vessel **7728**. Rod **7706** may be a rod connected to the hole **7722**. Filter **7720** may be a filter that blocks certain particle sizes from exiting the cooking vessel **7728**. Robot arm **7709** may be a robot arm that may either be coupled to/part of the portion of Cartesian bot system **7708** or may move independently. Residue **7714** may be the residue left after the cleaning process is complete and maybe gathered in pan **7715** or may be connected to a utility/facility drain. Dispenser **7710** for cleanser may be filled with a cleanser compatible with the interior and fittings of the machine/apparatus which it may be applied to, for example, a low-sudsing soap, a light grit cleanser, a stainless steel cleanser, and so on. The word soap shall be used to represent the cleanser in the following.

[0230] FIG. **77**B may illustrate the first step in the cleaning process. Soap **7724** may be dispensed from the dispenser **7710** into the cooking vessel **7728**. Soap **7724** may optionally also be dispensed into the food processor **7702** that may have been used, for example, for chopping. FIG. **77**C may illustrate the next step in the cleaning process. Water **7726** may be dispensed from the water source **7712**. The water source **7712** may be connected to tap water, or may be connected to an alternative water source, such as, for example, an ozinated water source. The stirring system **7718** may be moved by the portion of Cartesian bot system **7708** and may be used to scrap/remove away particles from the cooking vessel **7728**. Water may be optionally dispensed into the food processor **7702** and the food processor **7702** may be operated to circulate the water and soap. Following this, additional water may be dispensed into the food processor **7702** to rinse clean of soap **7724**. FIG. **77**D may illustrate the next step in the cleaning process. The robot arm **7709** may be pushed against the rod **7706** to move it away from the hole **7722**. The soap **7724** and water **7726** left in the vessel **7728** after cleaning may then leave the system using hole **7722**. The stirring system **7718** may be used to push water and particles towards the hole **7722** and the residue **7714** may collect in pan **7715**. FIG. **77**E may show the system when this is complete. The process shown in FIG. **77**C, FIG. **77**D and FIG. **77**E may be repeated multiple times until the system is clean. Soap may optionally be dispensed as well to allow further cleaning. One skilled in the art will understand that several variations of these embodiments are possible. For example, one may use a different drainage system and mechanism that may be controlled by the motion of the Cartesian bot. A portion of the method may not use the Cartesian bot system, for example, an electric or pneumatic valve to control the residue flow from cooking vessel **7728** to pan **7715**. Pressurized water with directional nozzles may be used to dispense the water **7726** and/or soap **7724**. The nozzles may also be adapted to utilize ultra or mega sonic action to promote cleaning and lessen the use of soap **7724**. The drainage system and mechanism shown in FIGS. **77**A-**77**E may be used for cooking types of food where water drainage may be required, such as, for example, pastas.

[0231] As illustrated in FIGS. **78**A-**78**E, a cooking machine/apparatus **7899** may be constructed and operated, which may be used for making baked food such as, for example, pizza, and describes at least an embodiment of this invention. The portion of cooking machine/apparatus **7899** illustrated in FIGS. **78**A-**78**E may include portion of a Cartesian bot system **7802**, first ingredient delivery capsule **7804**, second ingredient delivery capsule **7806**, third ingredient delivery capsule **7808**, actuator arm **7810**, heated region **7812**, baking chamber **7814**, drawer **7816**, opening **7818**, handle **7820**, and bottom side heater **7822**. Portion of a Cartesian bot system **7802** may be a part of a Cartesian bot system of cooking machine/apparatus **7899**. First ingredient delivery capsule **7804**, second ingredient delivery capsule **7806**, third ingredient delivery capsule **7808** may contain different toppings for the food to be baked. Bottom side heater **7822** may be a bottom side heater which may be used for making some types of food. Baking chamber **7814** may be a baking chamber with a drawer **7816** which may slide in and out of the baking chamber **7814**. The handle **7820** of the baking chamber **7814** may include an opening **7818**. Heated region **7812** may be the volume region within the baking chamber that is heated. FIG. **78**B-**78**E may illustrate different steps in the baking process. FIG. **78**B may indicate the first step in the baking process, wherein actuator arm **7810** may be inserted into the opening **7818** by the portion of a Cartesian bot system **7802**. FIG. **78**C indicates the next step in the process. Using the Cartesian bot's motion, the drawer **7816** may be pulled out. FIG. **78**D indicates the next step. The user may place some food item to be cooked **7830**, for example, pizza base or pizza dough or some other food item, atop the drawer **7816**. Following this, different toppings and ingredients **7832** may be dispensed onto the example pizza base food item to be cooked **7830** using ingredient dispensers first ingredient delivery capsule **7804**, second ingredient delivery capsule **7806**, third ingredient delivery capsule **7808**. FIG. **78**E indicates the next step in the process where the actuator arm **7810** may be inserted into the opening **7818** and push the drawer **7816** and food item being cooked **7830** into the baking chamber **7814**. The cooking, such as baking, then may occur, and then the drawer **7816** may be opened using the actuator arm **7810**. The drawer **7816** may then be closed. One skilled in the art may recognize that several variations of this embodiment are possible. For example, instead of using a drawer system, a rotary system may be used for the baking oven and that may be opened by the Cartesian bot using its motion and may include a special attachment on the Cartesian bot or baking chamber. FIG. **78**F illustrates an embodiment of this invention wherein the baking chamber **7814** may lie below the bottom side heater **7822**. Alternatively, the baking chamber **7814** and the bottom side heater **7822** may be disposed side by side. The actuator arm **7810** may include a robot arm which may independently move upwards and downwards, in addi-

tion to utilizing the Cartesian bot system's motion. Various other embodiments may be possible.

[0232] FIG. **79** describes an embodiment of this present invention, which illustrates a technique to dispense liquids which may be integrated into the automated cooking machine/apparatuses herein. Ingredient dispenser containers **7902** may be an ingredient dispenser system mounted on a Cartesian bot **7904**. Cooking vessel **7914** may be where the coking primarily takes place, and container **7910** may be used for storing liquids. When a part of the Cartesian bot system **7906** pushes a part of the liquid container **7910** at the region **7908**, liquids may be dispensed into the cooking vessel **7914** using the spout **7912**. The mechanism of dispensing the liquid may be similar to the mechanism commonly used in soap dispensers. Alternatively, some other mechanism may be used. Multiple pushes may be conducted atop the region **7908** in order to dispense the amount of liquid desired. It will be clear to one skilled in the art that several variations of this embodiment are possible. One may use a sensor activated liquid dispenser, for example. Moreover, a pressurized system may be utilized to dispense the liquids. The region **7908** that is pushed for dispensing may require a horizontal motion instead of a vertical motion such as described in FIG. **79**.

[0233] FIG. **80** describes an embodiment of this invention, which illustrates an alternative method to deliver liquid ingredients to the cooking robot. Cooking vessel **7914** may be where the coking primarily takes place in the cooking robot. Source **8000** may be a source for the liquid **8002**. Pump **8004** may move liquid **8002** and pipe **8006** may be a pipe used to deliver liquid **8002** to the cooking vessel **8008**. Based on electronic signals applied to the pump **8004**, liquid **8002** may be delivered to the cooking vessel **8008**. It will be clear to one skilled in the art that the pump **8004** can be of several types, for example, peristaltic pumps, and various other types of pumps.

[0234] FIG. **81** describes an embodiment of this invention, which may be a way to deliver spices to the cooking robot. Portion of an ingredient dispenser system **8100** may be a mounted on a Cartesian robot. First ingredient dispenser containers **8102** and spice dispenser container **8104** may be coupled to portion of an ingredient dispenser system **8100**. Spice dispenser container **8104** may include motor **8106**, drive mechanism **8105** and parts of the spice dispensing mechanism **8108**. A motor, such as motor **8106**, may be a used in each spice container in the ingredient dispenser to allow dispensing spices. The motor and actuation mechanism for dispensing spices may be similar to the ones used in pepper grinders and salt grinders.

[0235] An improvement to the one slider, spice valve system may be to add one more delivery via which may improve the efficiency of delivery. Another improvement may be to shape the end of the slider in such a way as to make operation from only one side feasible. An L-shaped slider and an F-shaped slider may offer this option, and may allow the Cartesian bot and a motor-mounted actuator, a push and pull operation to operate the dispensing of calibrated quantities of food and spices.

[0236] FIG. **82** illustrates an example configuration of a dual via, single L-shaped slider valve system **8299** with the slider **8204** in the load position. The Cartesian bot and a motor-mounted linear actuator **8201** may be used to push the slider **8204** to a position, such that the slider opening may align with the spice reservoir **8203** in the valve body **8202**, which may allow food and spices stored in the reservoir **8203** to fall and fill the calibrated space **8205**, within the slider **8204**.

[0237] FIG. **83** illustrates an example configuration of a dual via, single L-shaped slider valve system **8399** with the slider **8304** in the dispense position. The Cartesian bot and a motor-mounted linear actuator **8301** may be used to push the slider **8304** to a position, such that the slider opening may align with one of the dispensing vias in the valve body **8302**, which may allow food and spices contained in the calibrated space **8305** of the L-shaped slider **8304** to fall and dispense spices to the cooking vessel/pot (not shown). The illustration includes reservoir **8303**.

[0238] FIG. **84** illustrates an example configuration of a dual via, single L-shaped slider valve system **8499** with the slider **8404** in the load position. The Cartesian bot and a motor-mounted linear actuator **8401** may be used to pull the slider **8404** to a position, such that the slider opening **8405** may align with the reservoir **8403** in the valve body **8402**, which may allow food and spices stored in the reservoir **8403** to fall and fill the calibrated space **8405**, within the slider **8404**.

[0239] FIG. **85** illustrates an example configuration of a dual via, single L-shaped slider valve system **8599** with the slider **8504** in the dispense position. The Cartesian bot and a motor-mounted linear actuator **8501** may be used to pull the slider **8504** to a position, such that the slider opening **8505** may align with the one of the dispensing vias in the valve body **8502**, which may allow food and spices contained in the calibrated space **8505** of the L-shaped slider **8504** to fall and dispense food and spices to the cooking vessel/pot (not shown). The illustration includes reservoir **8503**.

[0240] FIG. **86** illustrates an example configuration of a dual via, single F-shaped slider valve system **8699** with the slider **8604** in the load position. The Cartesian bot and a motor-mounted linear actuator **8601** may be used to push the slider **8604** to a position, such that the slider opening may align with the spice reservoir **8603** in the valve body **8602**, which may allow food and spices stored in the reservoir **8603** to fall and fill the calibrated space **8605**, within the F-shaped slider **8604**.

[0241] FIG. **87** through FIG. **90** shows an example sequential operation of dual vias, with a single F-shaped slider valve system to efficiently deliver food and spices with a Cartesian bot and a motor-mounted slider using actuation from one side only. This sequential operation with dual vias may also result in self-cleaning and reduced clogging.

[0242] FIG. **87** illustrates an example configuration of a dual via, single F-shaped slider valve system with the slider **8704** in the load position. The Cartesian bot and a motor-mounted linear actuator **8701** may be used to pull the slider **8704** to a position, such that the slider opening **8705** may align with the spice reservoir **8703** in the valve body **8702**, which may allow food and spices stored in the reservoir **8703** to fall and fill the calibrated space **8705**, within the F-shaped slider **8704**.

[0243] FIG. **88** illustrates an example configuration of a dual via, single F-shaped slider valve system with the slider in the dispense position, which may follow FIG. **87**. The Cartesian bot and a motor-mounted linear actuator **8801** may be used to pull the slider **8804** to a position, such that the slider opening **8805** may align with one of the dispensing vias in the valve body **8802**, which may then allow food and spices contained in the calibrated space **8805** of the F-shaped slider

8804 to fall and dispense food and spices to the cooking vessel/pot (not shown). The illustration includes reservoir **8803**.

[0244] FIG. **89** illustrates an example configuration of a dual via, single F-shaped slider valve system with the slider **8904** in the load position, which may follow FIG. **88**. The Cartesian bot and a motor-mounted linear actuator **8901** may be used to push the slider **8904** to a position, such that the slider opening **8904** may align with the spice reservoir **8903** in the valve body **8902**, which may allow food and spices stored in the reservoir **8903** to fall and fill the calibrated space **8905**, within the F-shaped slider **8904**.

[0245] FIG. **90** illustrates an example configuration of a dual via, single F-shaped slider valve system with the slider in the dispense position, which may follow FIG. **89**. The Cartesian bot and a motor-mounted linear actuator **9001** may be used to push the slider **9004** to a position, such that the slider opening **9005** may align with one of the dispensing vias in the valve body **9002**, which may then allow food and spices contained in the calibrated space **9005** of the F-shaped slider **9004** to fall and dispense food and spices to the cooking vessel/pot (not shown). The illustration includes spice reservoir **9003**.

[0246] FIG. **91** illustrates an example of a number of possible configurations for a Cartesian bot **9113** with an actuator **9107** attached to an independent motorized robot arm **9105**. The Cartesian bot may be used to position food modules in any position within the cooking robot's space (x_0, y_0, z_0). The motorized robot arm **9105** with an attached actuator **9107** may add an independent movement capability in one direction (x_0). An assembly of two food modules **9109** is shown attached to the Cartesian bot **9113** and the motor-mounted actuator **9107** is shown to have opened one of the food module slider valves **9111**. The robot arm **9105** may therefore be considered as being shared by all food modules in the ingredient dispenser. The food modules may have solid, liquid or powdered ingredients as mentioned earlier in this patent application. It will be clear to one skilled in the art that several variations of the embodiment in FIG. **91** may be possible. The ideas described in FIG. **1-90** may be used as is or adapted for an apparatus similar to FIG. **91**.

[0247] Embodiments and improvements of the present invention are now described with reference to FIG. **92**, it being appreciated that the figure illustrates the process flow of the cooking robot, which may be referred to by the term CasaChef. Such an automated cooking appliance may include a control system with user interface, an induction or IR cooking apparatus, an automated ingredient delivery system, a food stirring system, and ventilation. It will be appreciated by those skilled in the art that several variations of the concepts may be possible.

[0248] FIG. **92** illustrates a simple process flow diagram of the Casa Chef automated cooking appliance suitably equipped to cook at Start (**9201**). At Start (**9201**) it may be important to verify the utility connections (**9205**) and sources for the automated cooking appliance. This may include power, water, air, and a suitable computer network connection. Main Systems On (**9210**) may include turning on the electrical power switch to the system, opening water and air valves, and providing power to a wireless router for internet connection. The Casa Chef automated cooking appliance may rely on a wireless (e.g., Wi-Fi) connected touch screen tablet to download and store recipes and to control all procedures in the cooking process. Turn ON Casa Chef Control Pad (**9215**) may bring up the tablet control system, connection to the wireless Wi-Fi and request to sign-in. After sign-in, the system may initiate a Run System Diagnostic Self-check (**9220**). Diagnostics may include: Wi-Fi internet check for adequate signal and bandwidth; Electronic checks for line voltage and ground leaks; Water pressure check; Heating system load check; and a mechanical check of the Cartesian bot and other moving components to confirm they have a clear path, they can move freely, and have been homed. A failure in the Run System Diagnostic Self-check (**9220**) may initiate a series of prompts to check faults, Follow Prompts to Correct (**9222**) connections and proper installation of components, and then loop back to re-run Run System Diagnostic Self-check (**9220**). A successful Run System Diagnostic Self-check (**9220**) may open access to Search Recipes (**9225**). Recipes may be stored in the tablet memory or found on-line. A recipe may be downloaded and then modified with regard to the number of servings, serving size, and substitutions to the foods and spices based on personal tastes, diet, or nutritional needs.

[0249] To facilitate the system to run this defined recipe, one may Initiate Recipe (**9230**) and follow the prompts. These prompts may include Install Appropriate tools (**9235**); which may include a specific pot, stirring device, food processors, food and spice trays, and other recipe-specific tools, and it may include a final prompt to close up the system when finished. These prompts may also include Open Food Tray—Load Food (**9240**); which may include loading small food modules, large food modules, spice modules, and liquid modules as per recipe-specified prompts, and it may include a final prompt to close the food tray when finished. One may want to set up the Casa Chef automated cooking appliance in advance of the time for cooking a meal. Once the recipe is defined and the system is prepared to cook, one may Set Target Meal Time (**9245**) and the system may calculate the start time in order to be completed at the specified target meal time. This may also initiate a final Recipe-modified System Diagnostic Self Check (**9250**). A failure in the final Recipe-modified System Diagnostic Self-check (**9250**) may initiate a series of prompts to check faults, Follow Prompts to Correct (**9252**) connections and proper installation of components, and then loop back to re-run Run System Diagnostic Self-check (**9220**). A successful Recipe-modified System Diagnostic Self-check (**9250**) may open access to Initiate Cooking Process (**9255**), a prompt to Press COOK, and to begin the Cooking Process (**9258**) as per the specified target meal time and the Recipe-defined cooking process.

[0250] At the specified Target Meal Time the Casa Chef may go to an idle resting state, with reduced warming temperatures only. Meal Ready (**9260**) may initiate a series of prompts to remove tools in order to access the cooking pot, to remove the cook pot and turn off the heater, and to eat. Clean Tools and Modules as Needed (**9265**) may suggest the tools and modules that need to be removed and cleaned. The variety of tools, components, and modules may vary between recipes and so may the cleaning procedures required. End (**9299**) may prompt the shutdown of the main systems, which may include; the control tablet, air, water and the main electrical power switch.

[0251] FIG. **93** illustrates a simple process flow diagram of Cooking with the cooking robot which may be referred to by the term Casa Chef. It may begin at Start (**9301**) with Initiate

Cooking Process (**9355**) Press Cook, of a defined recipe from FIG. **92**, and may expand the Cooking Process (**9258**) of FIG. **92**.

[0252] The cooking pot may be heated with an induction heater, resistive heater or an IR source heater. Heat Cooking Pot (**9360**) may heat the cook vessel/pot and change the cooking temperature of the cook pot as per the selected recipe. The temperature of the cooking pot may be monitored with a thermal sensor and controlled with temperature sensor feed-back. The selected recipe may define what liquids to add to the pot, how much liquid to add, and when to add the liquid throughout the cooking process in Add Liquids (**9365**). These liquids may be delivered in a controlled quantity by a variety of pumping methods that may include pneumatic, peristaltic, piston, and displacement pumping.

[0253] The selected recipe may also define what foods and spices to add to the pot thorough out the cooking process, in Dispense Food & Spices (**9370**). The Casa Chef Automated Kitchen may include a Cartesian bot system that may be used to accurately position tools in the system very precisely in 3D space x_0, y_0, z_0. This Cartesian bot system may also be used to move a food or spice modules from a food storage tray to a specific position over the cooking pot in much the same way that a CNC machine picks up a tool and positions it. In addition, the Casa Chef Automated Kitchen includes an independent motorized arm that only operates in one axis, x_0. This independent motorized arm, in concert with the Cartesian bot's accurate positioning of a food module, may be used to actuate the food/spice valves in order to deliver a calibrated quantity of food or spice. When the food and spices have been dispensed as per the recipe, the Casa Chef Cartesian bot system may move the food & spice modules back from above the cook pot to the food storage tray in much the same way that a CNC machine returns a tool to its tool storage rack.

[0254] Stirring may be an important part of the cooking process and may be used to mix food, distribute flavors, provide texture to the food, distribute heat, and prevent burning. The Casa Chef Cartesian bot system may also be used to move a tool, such as a stirring implement, in a programmed path and speed as per the recipe in Stirring (**9375**).

[0255] Continue Cooking (**9380**); the defined recipe may set in motion the cooking process and the timing of the temperature changes, adding liquids, adding food, adding spices, and stirring.

[0256] At the specified Target Meal Time the Casa Chef may go to an idle resting state, with reduced warming temperatures only. Meal Ready (**9385**) may initiate a series of prompts to remove tools in order to access the cooking pot, to remove the cook pot and turn off the heater, and to eat. Clean Tools and Modules as Needed (**9390**) may suggest the tools and modules that need to be removed and cleaned. The variety of tools, components, and modules may vary between recipes and so may the cleaning procedures required. End (**9399**) may prompt the shutdown of the main systems, which may include; the control tablet, air, water and the main electrical power switch.

[0257] Embodiments and improvements of the present invention are now described with reference to FIG. **94**, it being appreciated that the figure illustrates the process flow of the Casa Chef automated cooking appliance. Such an automated cooking appliance may include a control system with user interface, an induction or IR cooking apparatus, an automated ingredient delivery system, a food stirring system, and ventilation. It will be appreciated by those skilled in the art that several variations of the concepts may be possible.

[0258] FIG. **94** may illustrate a simple process flow diagram of the Casa Chef automated cooking appliance suitably equipped to cook at Start (**9401**). At Start (**9401**) it may be important to verify the utility connections (**9405**) and sources for the automated cooking appliance. This may include power, water, air, and a suitable computer network connection. Main Systems On (**9410**) may include turning on the electrical power switch to the system, opening water and air valves, and providing power to a wireless router for internet connection. The Casa Chef automated cooking appliance may rely on a Wi-Fi connected touch screen tablet to download and store recipes and to control all procedures in the cooking process. Turn ON Casa Chef Control Pad (**9415**) may bring up the tablet control system, connection to the wireless Wi-Fi and request to sign-in. After sign-in, the system may initiate a Run System Diagnostic Self-check (**9420**). Diagnostics may include: Wi-Fi internet check for adequate signal and bandwidth; Electronic checks for line voltage and ground leaks; Water pressure check; Heating system load check; Air pressure check; and a mechanical check of the Cartesian bot and other moving components to confirm they have a clear path, they can move freely, and have been homed. A failure in the Run System Diagnostic Self-check (**9420**) may initiate a series of prompts to check faults, Follow Prompts to Correct (**9422**) connections and proper installation of components, and then loop back to re-run Run System Diagnostic Self-check (**9420**). A successful Run System Diagnostic Self-check (**9420**) may open access to Search Recipes (**9425**). Recipes may be stored in the tablet memory or found on-line. A recipe may be downloaded and then modified with regard to the number of servings, serving size, and substitutions to the foods and spices based on personal tastes, diet, or nutritional needs.

[0259] To facilitate the system to run this defined recipe, one may Initiate Recipe (**9430**) and follow the prompts. These prompts may include Install Appropriate tools (**9435**); which may include a specific pot, stirring device, food processors, food and spice trays, recipe-specified heaters, and other recipe-specific tools, and it may include a final prompt to close up the system when finished. In order to bake in the Casa Chef automated kitchen, one may provide a closed heating environment with a bottom induction or resistance heater and a top heater that may be an IR or resistance heater.

[0260] These recipe prompts may also include Open Food Tray—Load Food (**9440**); which may include loading small food modules, large food modules, spice modules, and liquid modules as per recipe-specified prompts, and it may include a final prompt to close the food tray when finished.

[0261] One may want to set up the Casa Chef automated cooking appliance in advance of the time for cooking a meal. Once the recipe is defined and the system is prepared to cook, one may Set Target Meal Time (**9445**) and the system may calculate the start time in order to be completed at the specified target meal time. This may also initiate a final Recipe-modified System Diagnostic Self Check (**9450**). A failure in the final Recipe-modified System Diagnostic Self-check (**9450**) may initiate a series of prompts to check faults, Follow Prompts to Correct (**9452**) connections and proper installation of components, and then loop back to re-run Run System Diagnostic Self-check (**9450**). A successful Recipe-modified System Diagnostic Self-check (**9450**) may open access to Initiate Cooking Process (**9455**), a prompt to Press COOK,

and to begin the Cooking or Baking Process (**9458**) as per the specified target meal time and the Recipe-defined cooking process.

[0262] At the specified Target Meal Time the Casa Chef may go to an idle resting state, with reduced warming temperatures only. Meal Ready (**9460**) may initiate a series of prompts to remove tools in order to access the cooking pot, to remove the cook pot and turn off the heater, and to eat. Clean Tools and Modules as Needed (**9465**) may suggest the tools and modules that need to be removed and cleaned. The variety of tools, components, and modules may vary between recipes and so may the cleaning procedures required. End (**9499**) may prompt the shutdown of the main systems, which may include; the control tablet, air, water and the main electrical power switch.

[0263] FIG. **95** illustrates a process flow diagram for Baking with the Casa Chef Automated Kitchen at Start (**9501**). It begins with Initiate Baking Process (**9555**) Press Cook, of a defined recipe from FIG. **94**, and expands the Cooking Process (**9458**) of FIG. **94**.

[0264] The cooking pot may be heated with an induction heater, resistive heater or an IR source heater. Heat Cooking Pot (**9560**) may heat the cook vessel/pot and change the cooking temperature of the cook pot as per the selected recipe. The temperature of the cooking pot may be monitored with a thermal sensor and controlled with temperature sensor feed-back. The selected recipe may define what liquids to add to the pot, how much liquid to add, and when to add the liquid thorough out the cooking process in Add Liquids (**9565**). These liquids may be delivered in a controlled quantity by a variety of pumping methods that may include pneumatic, peristaltic, piston, and displacement pumping.

[0265] The selected recipe may also define what foods, spices, or dough to add to the pot thorough out the cooking process, in Dispense Food & Spices (**9570**). The Casa Chef Automated Kitchen includes a Cartesian bot system that may be used to accurately position tools in the system very precisely in 3D space x_0, y_0, z_0. This Cartesian bot system may also be used to move a food, spice, or dough module from a food storage tray to a specific position over the cooking pot in much the same way that a CNC machine picks up a tool and positions it. In addition, the Casa Chef Automated Kitchen includes an independent motorized arm that only operates in one axis, x_0. This independent motorized arm, in concert with the Cartesian bot's accurate positioning of a food module, may be used to actuate the food/spice valves in order to deliver a calibrated quantity of food, spice, or dough. When the food, spice, and dough have been dispensed as per the recipe, the Casa Chef Cartesian bot system may move the food & spice modules back from above the cook pot to the food storage tray in much the same way that a CNC machine returns a tool to its tool storage rack.

[0266] Stirring may be an important part of the cooking process and may be used to mix and distribute food or dough, distribute flavors, provide texture to the food, distribute heat, and prevent burning. The Casa Chef Cartesian bot system may also be used to move a tool, such as a stirring implement, in a programmed path and speed as per the recipe in Stirring (**9575**).

[0267] In order to bake in the Casa Chef automated kitchen, one may provide a closed heating environment with a bottom induction or resistance heater and a top heater that may be an IR or resistance heater. The Casa Chef Automated Kitchen includes a Cartesian bot system that may be used to very precisely position a recipe-defined top heater (**9580**) in the system, in 3D space x_0, y_0, z_0, above the cook pot. Throughout the baking process the recipe-defined temperature and positioning of the top heater may be critical for uniform baking of food.

[0268] Continue Cooking (**9583**); the defined recipe sets in motion the cooking process and the timing of the temperature changes, adding liquids, adding food, adding spices, stirring, and positioning of heaters.

[0269] At the specified Target Meal Time the Casa Chef may go to an idle resting state, with reduced warming temperatures only. Meal Ready (**9585**) may initiate a series of prompts to remove tools in order to access the cooking pot, to remove the cook pot and turn off the heaters, and to eat. Clean Tools and Modules as Needed (**9590**) may suggest the tools and modules that need to be removed and cleaned. The variety of tools, components, and modules may vary between recipes and so may the cleaning procedures required. End (**9599**) may prompt the shutdown of the main systems, which may include; the control tablet, air, water and the main electrical power switch.

[0270] Embodiments and improvements of the present invention are now described with reference to FIG. **96**, it being appreciated that the figure illustrates the process flow of the Casa Chef automated cooking appliance. Such an automated cooking appliance may include a control system with user interface, an induction or IR cooking apparatus, an automated ingredient delivery system, a food stirring system, and ventilation. It will be appreciated by those skilled in the art that several variations of the concepts may be possible.

[0271] FIG. **96** illustrates a simple process flow diagram of the Casa Chef automated cooking appliance suitably equipped to cook at Start (**9601**). At Start (**9601**) it may be important to verify the utility connections (**9605**) and sources for the automated cooking appliance. This may include power, water, air, and a suitable computer network connection. Main Systems On (**9610**) may include turning on the electrical power switch to the system, opening water and air valves, and providing power to a wireless router for internet connection. The Casa Chef automated cooking appliance may rely on a Wi-Fi connected touch screen tablet to download and store recipes and to control all procedures in the cooking process. Turn ON Casa Chef Control Pad (**9615**) may bring up the tablet control system, connection to the wireless Wi-Fi and request to sign-in. After sign-in, the system may initiate a Run System Diagnostic Self-check (**9620**). Diagnostics may include: Wi-Fi internet check for adequate signal and bandwidth; Electronic & GFI checks for line voltage and ground leaks; Water pressure check; Heating system load check; Air pressure check; and a mechanical check of the Cartesian bot and other moving components to confirm they have a clear path, they can move freely, and have been homed. A failure in the Run System Diagnostic Self-check (**9620**) may initiate a series of prompts to check faults, Follow Prompts to Correct (**9622**) connections and proper installation of components, and then loop back to re-run Run System Diagnostic Self-check (**9620**). A successful Run System Diagnostic Self-check (**9620**) may open access to Search Recipes (**9625**). Recipes may be stored in the tablet memory or found on-line. A recipe may be downloaded and then modified with regard to the number of servings, serving size, and substitutions to the foods and spices based on personal tastes, diet, or nutritional needs.

[0272] To facilitate the system to run this defined recipe, one may Initiate Recipe (**9630**) and follow the prompts. These prompts may include Install Appropriate tools (**9635**); which may include a specific pot, stirring device, food processors, food and spice trays, and other recipe-specific tools, and it may include a final prompt to close up the system when finished. These prompts may also include Open Food Tray—Load Food (**9640**); which may include loading small food modules, large food modules, spice modules, and liquid modules as per recipe-specified prompts, and it may include a final prompt to close the food tray when finished.

[0273] One may want to set up the Casa Chef automated cooking appliance in advance of the time for cooking a meal. Once the recipe is defined and the system is prepared to cook, one may Set Target Meal Time (**9645**) and the system may calculate the start time in order to be completed at the specified target meal time. This may also initiate a final Recipe-modified System Diagnostic Self Check (**9650**). A failure in the final Recipe-modified System Diagnostic Self-check (**9650**) may initiate a series of prompts to check faults, Follow Prompts to Correct (**9652**) connections and proper installation of components, and then loop back to re-run Run System Diagnostic Self-check (**9620**). A successful Recipe-modified System Diagnostic Self-check (**9650**) may open access to Initiate Cooking Process (**9655**), a prompt to Press COOK, and to begin the Cooking Process (**9658**) as per the specified target meal time and the Recipe-defined cooking process.

[0274] At the specified Target Meal Time the Casa Chef may go to an idle resting state, with reduced warming temperatures only. Meal Ready (**9660**) may initiate a series of prompts to remove tools in order to access the cooking pot, to remove the cook pot and turn off the heater, and to eat. Clean Tools and Modules as Needed (**9665**) may suggest the tools and modules that need to be removed and cleaned. The variety of tools, components, and modules may vary between recipes and so may the cleaning procedures required. End (**9699**) may prompt the shutdown of the main systems, which may include; the control tablet, air, water and the main electrical power switch.

[0275] FIG. **97** illustrates a process flow diagram of Cooking with the Casa Chef Automated Kitchen, Start (**9701**). It begins with Initiate Cooking Process (**9755**) Press Cook, of a defined recipe from FIG. **96**, and expands the Cooking Process (**9658**) of FIG. **96** to include chopping of food.

[0276] The cooking pot may be heated with an induction heater, resistive heater or an IR source heater. Heat Cooking Pot (**9760**) may heat the cook vessel/pot and change the cooking temperature of the cook pot as per the selected recipe. The temperature of the cooking pot may be monitored with a thermal sensor and controlled with temperature sensor feed-back. The selected recipe may define what liquids to add to the pot, how much liquid to add, and when to add the liquid thorough out the cooking process in Add Liquids (**9765**). These liquids may be delivered in a controlled quantity by a variety of pumping methods that may include pneumatic, peristaltic, piston, and displacement pumping.

[0277] The selected recipe may also define what foods to add to the pot thorough out the cooking process in Dispense Food (**9770**). The Casa Chef Automated Kitchen includes a Cartesian bot system that may be used to accurately position tools in the system very precisely in 3D space x_0, y_0, z_0. This Cartesian bot system may also be used to move food modules from a food storage tray to a specific position over the cooking pot or to a specific food processor for chopping, in much the same way that a CNC machine picks up a tool and positions it. If chopping, the recipe-driven process may at this time supply power to the specified food processor. The Casa Chef Automated Kitchen also includes an independent motorized arm that only operates in one axis, x_0. This independent motorized arm, in concert with the Cartesian bot's accurate positioning of a food module, may be used to actuate the food valves in order to deliver a calibrated quantity of food directly to the cook pot or to a recipe-specified food processor. When the foods have been dispensed as per the recipe, and chopping is completed, the Casa Chef Cartesian bot system may shut down power to the food processor and move the food modules back to the food storage tray in much the same way that a CNC machine returns a tool to its tool storage rack.

[0278] The selected recipe may also define what spices to add to the pot thorough out the cooking process. In Dispense Spices (**9775**). The Casa Chef Automated Kitchen includes a Cartesian bot system that may be used to accurately position tools in the system very precisely in 3D space x_0, y_0, z_0. This Cartesian bot system may also be used to move spice modules from a food storage tray to a specific position over the cooking pot in much the same way that a CNC machine picks up a tool and positions it. In addition, the Casa Chef Automated Kitchen includes an independent motorized arm that only operates in one axis, x_0. This independent motorized arm, in concert with the Cartesian bot's accurate positioning of a food module, may be used to actuate the spice valves in order to deliver a calibrated quantity of spice. When the spices have been dispensed as per the recipe, the Casa Chef Cartesian bot system may move the spice modules back from above the cook pot to the food storage tray in much the same way that a CNC machine returns a tool to its tool storage rack.

[0279] Stirring may be an important part of the cooking process and may be used to mix food, distribute flavors, provide texture to the food, distribute heat, and prevent burning. The Casa Chef Cartesian bot system may also be used to move a tool, such as a stirring implement, in a programmed path and speed as per the recipe in Stirring (**9775**).

[0280] Continue Cooking (**9780**); the defined recipe sets in motion the cooking process and the timing of the temperature changes, adding liquids, adding food, adding spices, and stirring.

[0281] At the specified Target Meal Time the Casa Chef may go to an idle resting state, with reduced warming temperatures only. Meal Ready (**9785**) may initiate a series of prompts to remove tools in order to access the cooking pot, to remove the cook pot and turn off the heater, and to eat. Clean Tools and Modules as Needed (**9790**) may suggest the tools and modules that need to be removed and cleaned. The variety of tools, components, and modules may vary between recipes and so may the cleaning procedures required. Cleaning (**9795**) may proceed if needed. End (**9799**) may prompt the shutdown of the main systems, which may include; the control tablet, air, water and the main electrical power switch.

[0282] With an automated cooking machine as described in this patent application, recipes may need to be entered into the machine. According to an embodiment of this invention, consumers could rent or buy recipes from an online or cloud recipe repository, which may be a recipe storage system. The recipes may be encrypted so that a user who may rent a recipe, for example for a day, may not reverse engineer and figure out aspects of the recipe such as temperature, cooking time, sensor readings for various tasks, etc.

[0283] While the figures in this patent application were sometimes described using an induction cooktop as the cooking medium, it will be clear to one skilled in the art that the ideas in this patent application are applicable to other types of cooktops which may be gas or electric or some other type.

[0284] For the ingredient dispenser embodiments described in this invention, one may use unique "non-stick" materials that reduce the amount of powder or other food items that stick to the sides of the ingredient dispenser. Parts of the ingredient dispenser may be made of different materials based on the type of food item it may store. Examples of non-stick materials may include Teflon.

[0285] Regions heated to high temperatures in an automated cooking machine may often need to be thermally insulated from other parts of the machine. This could be done using thermal insulation materials, which may be materials having thermal conductivity less than 2 W/mK. This may include materials such as PEEK, borosilicate glass and several others, for example.

[0286] While the figures in this patent application showed the cooking vessel staying stationary and other parts of the system such as the ingredient dispenser moving, one skilled in the art will realize that the cooking vessel may optionally be mounted on a robot arm and move as well.

[0287] FIG. **98** depicts an example computer system that may be used in implementing an illustrative embodiment of the present invention. Specifically, FIG. **98** depicts an illustrative embodiment of a computer system **9800** that may be used in computing devices such as, e.g., but not limited to, standalone, client, server devices, or system controllers. FIG. **98** depicts an illustrative embodiment of a computer system that may be used as client device, a server device, a controller, etc. The present invention (or any part(s) or function(s) thereof) may be implemented using hardware, software, firmware, or a combination thereof and may be implemented in one or more computer systems or other processing systems. In one illustrative embodiment, the invention may be directed toward one or more computer systems capable of carrying out the functionality described herein. An example of a computer system **9800** is shown in FIG. **98**, depicting an illustrative embodiment of a block diagram of an illustrative computer system useful for implementing the present invention. Specifically, FIG. **98** illustrates an example computer **9800**, which in an illustrative embodiment may be, e.g., (but not limited to) a controller, tablet, and/or a personal computer (PC) system running an operating system such as, e.g., (but not limited to) MICROSOFT® WINDOWS® NT/98/2000/XP/Vista/Windows 7/Windows 8, etc. available from MICROSOFT® Corporation of Redmond, Wash., U.S.A., an Apple computer executing MAC® OS or iOS from Apple® of Cupertino, Calif., U.S.A., or a Linux derivative. However, the invention is not limited to these platforms. Instead, the invention may be implemented on any appropriate computer system running any appropriate operating system. In one illustrative embodiment, the present invention may be implemented on a computer system operating as discussed herein. An illustrative computer system, computer **9800** is shown in FIG. **98**. Other components of the invention, such as, e.g., (but not limited to) a computing device, a communications device, a telephone, a personal digital assistant (PDA), an iPhone, a 3G/4G, LTE wireless device, a wireless device, a personal computer (PC), a handheld PC, a laptop computer, a smart phone, a mobile device, a netbook, a handheld device, a portable device, an interactive television device (iTV), a digital video recorder (DVR), client workstations, thin clients, thick clients, fat clients, proxy servers, network communication servers, remote access devices, client computers, server computers, peer-to-peer devices, routers, web servers, data, media, audio, video, telephony or streaming technology servers, etc., may also be implemented using a computer such as that shown in FIG. **98**. Computer system **9800** may be used to implement the network and/or components as described above. For example, the various components in FIGS. **1-97**, such as the automated ingredient delivery system and the user interface, and in particular, portion of the electronics **110** and user interface **118**, for example.

[0288] The computer system **9800** may include one or more processors, such as, e.g., but not limited to, processor(s) **9804**. The processor(s) **9804** may be connected to a communication infrastructure **9806** (e.g., but not limited to, a communications bus, cross-over bar, interconnect, or network, etc.). Processor **9804** may include any type of processor, microprocessor, or processing logic that may interpret and execute instructions (e.g., for example, a field programmable gate array (FPGA)). Processor **9804** may comprise a single device (e.g., for example, a single core) and/or a group of devices (e.g., multi-core). The processor **9804** may include logic configured to execute computer-executable instructions configured to implement one or more embodiments. The instructions may reside in main memory **9808** or secondary memory **9810**. Processors **9804** may also include multiple independent cores, such as a dual-core processor or a multi-core processor. Processors **9804** may also include one or more graphics processing units (GPU) which may be in the form of a dedicated graphics card, an integrated graphics solution, and/or a hybrid graphics solution. Various illustrative software embodiments may be described in terms of this illustrative computer system. After reading this description, it will become apparent to a person skilled in the relevant art(s) how to implement the invention and/or parts of the invention using other computer systems and/or architectures.

[0289] Computer system **9800** may include a display interface **9802** that may forward, e.g., but not limited to, graphics, text, and other data, etc., from the communication infrastructure **9806** (or from a frame buffer, etc., not shown) for display on the display unit **9830**. The display unit **9830** may be, for example, a television, a computer monitor, a touch sensitive display device, an LCD device, or a mobile phone screen. The output may also be provided as sound through a speaker.

[0290] The computer system **9800** may also include, e.g., but is not limited to, a main memory **9808**, random access memory (RAM), and a secondary memory **9810**, etc. Main memory **9808**, random access memory (RAM), and a secondary memory **9810**, etc., may be a computer-readable medium that may be configured to store instructions configured to implement one or more embodiments and may comprise a random-access memory (RAM) that may include RAM devices, such as Dynamic RAM (DRAM) devices, flash memory devices, Static RAM (SRAM) devices, etc.

[0291] The secondary memory **9810** may include, for example, (but is not limited to) a hard disk drive **9812** and/or a removable storage drive **9814**, representing a floppy diskette drive, a magnetic tape drive, an optical disk drive, a compact disk drive CD-ROM, flash memory, etc. The removable storage drive **9814** may, e.g., but is not limited to, read from and/or write to a removable storage unit **9818** in a well-known manner. Removable storage unit **9818**, also called a program storage device or a computer program prod-

uct, may represent, e.g., but is not limited to, a floppy disk, magnetic tape, optical disk, compact disk, etc. which may be read from and written to removable storage drive **9814**. As will be appreciated, the removable storage unit **9818** may include a computer usable storage medium having stored therein computer software and/or data.

[0292] In alternative illustrative embodiments, secondary memory **9810** may include other similar devices for allowing computer programs or other instructions to be loaded into computer system **9800**. Such devices may include, for example, a removable storage unit **9822** and an interface **9820**. Examples of such may include a program cartridge and cartridge interface (such as, e.g., but not limited to, those found in video game devices), a removable memory chip (such as, e.g., but not limited to, an erasable programmable read only memory (EPROM), or programmable read only memory (PROM) and associated socket, and other removable storage units **9822** and interfaces **9820**, which may allow software and data to be transferred from the removable storage unit **9822** to computer system **9800**.

[0293] Computer **9800** may also include an input device **9813** which may include any mechanism or combination of mechanisms that may permit information to be input into computer system **9800** from, e.g., a user or operator. Input device **9813** may include logic configured to receive information for computer system **9800** from, e.g. a user or operator. Examples of input device **9813** may include, e.g., but not limited to, a mouse, pen-based pointing device, or other pointing device such as a digitizer, a touch sensitive display device, and/or a keyboard or other data entry device (none of which are labeled). Other input devices **9813** may include, e.g., but not limited to, a biometric input device, a video source, an audio source, a microphone, a web cam, a video camera, and/or other camera.

[0294] Computer **9800** may also include output devices **9815** which may include any mechanism or combination of mechanisms that may output information from computer system **9800**. Output device **9815** may include logic configured to output information from computer system **9800**. Embodiments of output device **9815** may include, e.g., but not limited to, display **9830**, and display interface **9802**, including displays, printers, speakers, cathode ray tubes (CRTs), plasma displays, light-emitting diode (LED) displays, liquid crystal displays (LCDs), printers, vacuum florescent displays (VFDs), surface-conduction electron-emitter displays (SEDs), field emission displays (FEDs), etc. Computer **9800** may include input/output (I/O) devices such as, e.g., (but not limited to) input device **9813**, communications interface **9824**, connection **9828** and communications path **9826**, etc. These devices may include, e.g., but are not limited to, a network interface card, onboard network interface components, and/or modems.

[0295] Communications interface **9824** may allow software and data to be transferred between computer system **9800** and external devices or other computer systems. Computer system **9800** may connect to other devices or computer systems via wired or wireless connections. Wireless connections may include, for example, WiFi, satellite, mobile connections using, for example, TCP/IP, 802.15.4, high rate WPAN, low rate WPAN, 6loWPAN, ISA100.11a, 802.11.1, WiFi, 3G, WiMAX, 4G and/or other communication protocols.

[0296] In this document, the terms "computer program medium" and "computer readable medium" may be used to generally refer to media such as, e.g., but not limited to, removable storage drive **9814**, a hard disk installed in hard disk drive **9812**, flash memories, removable discs, non-removable discs, etc. These computer program products may provide software to computer system **9800**. It should be noted that a computer-readable medium that comprises computer-executable instructions for execution in a processor may be configured to store various embodiments of the present invention. Computer system **9800** may be specialized by storing programming logic that enables one or more processors to perform the techniques indicated herein and one or more of the steps of FIGS. **92-97**, for example.

[0297] References to "one embodiment," "an embodiment," "example embodiment," "various embodiments," etc., may indicate that the embodiment(s) of the invention so described may include a particular feature, structure, or characteristic, but not every embodiment necessarily includes the particular feature, structure, or characteristic.

[0298] Further, repeated use of the phrase "in one embodiment," or "in an illustrative embodiment," do not necessarily refer to the same embodiment, although they may. The various embodiments described herein may be combined and/or features of the embodiments may be combined to form new embodiments.

[0299] Unless specifically stated otherwise, as apparent from the following discussions, it is appreciated that throughout the specification discussions utilizing terms such as "processing," "computing," "calculating, " "determining," or the like, refer to the action and/or processes of a computer or computing system, or similar electronic computing device, that manipulate and/or transform data represented as physical, such as electronic, quantities within the computing system's registers and/or memories into other data similarly represented as physical quantities within the computing system's memories, registers or other such information storage, transmission or display devices.

[0300] In a similar manner, the term "processor" may refer to any device or portion of a device that processes electronic data from registers and/or memory to transform that electronic data into other electronic data that may be stored in registers and/or memory. A "computing platform" may comprise one or more processors.

[0301] Embodiments of the present invention may include apparatuses for performing the operations herein. An apparatus may be specially constructed for the desired purposes, or it may comprise a general purpose device selectively activated or reconfigured by a program stored in the device.

[0302] It will also be appreciated by persons of ordinary skill in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather, the scope of the present invention includes both combinations and sub-combinations of the various features described hereinabove as well as modifications and variations which would occur to such skilled persons upon reading the foregoing description. Thus the invention is to only be limited by the claims.

What is claimed is:

1. An automated cooking machine, comprising:

a Cartesian bot;

one or more dispensing sub-systems connectable to the Cartesian bot adapted to dispense solid, liquid, or powdered ingredients;

a stirrer adapted to stir said dispensed ingredients; and

a heater adapted to cook a food after said ingredients are dispensed.

2. The automated cooking machine of claim **1**, further comprising: a chopping sub-system adapted to chop one or more ingredients.

3. The automated cooking machine of claim **1**, further comprising: a spectrometer or a gas sensor.

4. The automated cooking machine of claim **1**, wherein the one or more dispensing sub-systems dispense measured quantities of greater than one ingredient.

5. The automated cooking machine of claim **1**, further comprising a temperature sensor.

6. The automated cooking machine of claim **1**, wherein at least one container whose contents are dispensed is mounted atop the Cartesian bot.

7. The automated cooking machine of claim **1**, wherein at least part of a motion of the stirrer is mechanically coupled to a motion of the Cartesian bot.

8. An ingredient dispenser, comprising:

a plurality of ingredients,

wherein at least one of said plurality of ingredients is dispensed by a motion of a shared robot arm; and

wherein said ingredient dispenser is mounted on a Cartesian bot system and disposed within an automated cooking machine.

9. The ingredient dispenser of claim **8**, wherein the plurality of ingredients comprise at least one of:

a solid,

a liquid, or

powdered ingredients.

10. The ingredient dispenser of claim **8**, wherein at least one of said plurality of ingredients is dispensed using at least one slide gate valve.

11. The ingredient dispenser of claim **8**, wherein at least one of said plurality of ingredients is dispensed with a system which includes at least two slide gate valves.

12. The ingredient dispenser of claim **8**, further comprising at least one solenoid valve.

13. The ingredient dispenser of claim **8**, further comprising a weight measurement sensor.

14. The ingredient dispenser of claim **8**, further comprising at least one ingredient container with a built-in motor.

15. The ingredient dispenser of claim **8**, further comprising a screw-Auger mechanism.

16. An automated cooking machine comprising:

a Cartesian bot system; and

at least one continuous flow food processor adaptable to couple to the Cartesian bot system,

wherein said at least one continuous flow food processor chops up a food and delivers said food into a cooking vessel.

17. The automated cooking machine of claim **16**,

wherein said Cartesian bot system dispenses an ingredient into one of said at least one continuous flow food processor.

18. The automated cooking machine of claim **16**,

wherein said Cartesian bot system pushes at least a portion of said food to be chopped down an inlet of the continuous flow food processor.

19. The automated cooking machine of claim **16**, comprising a plurality of continuous flow processors, each with a cutting blade.

20. The automated cooking machine of claim **16**, comprising a plurality of continuous flow food processors, wherein a motor is shared by at least two continuous flow food processors.

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