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Claesson et al.

(54) **CONTOLLER AND METHOD OF CONTROLLING AN INTEGRATED SYSTEM FOR DISPENSING AND BLENDING/MIXING BEVERAGE INGREDIENTS**

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(73) Assignee: **Enodis Corporation**, New Port Richey, FL (US)

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Related U.S. Application Data

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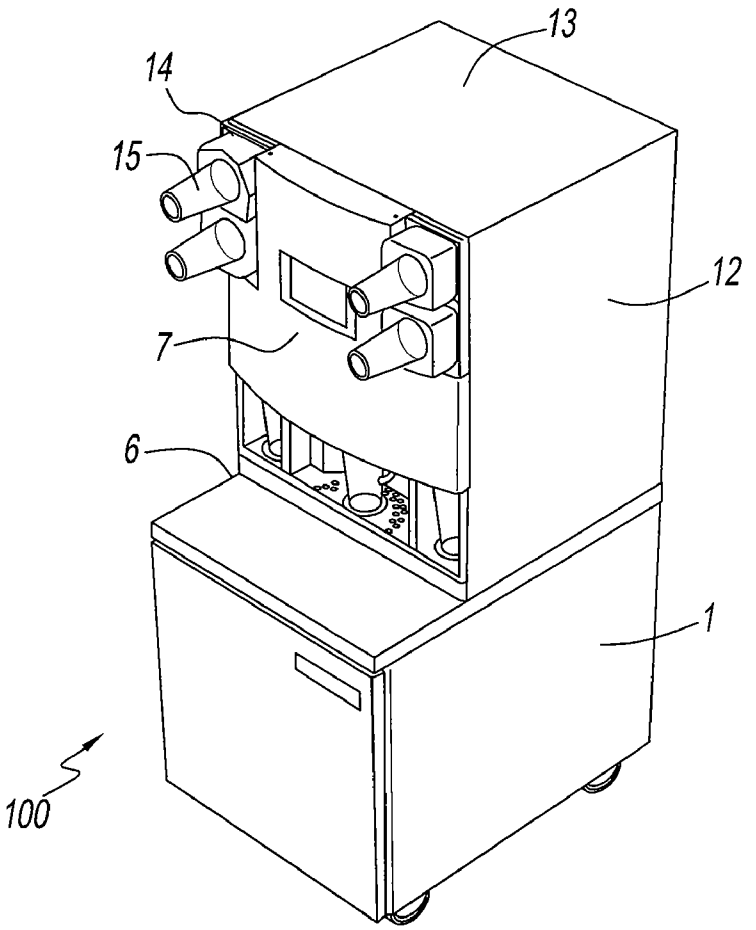
(52) **U.S. Cl.**

CPC ***A23G 9/045*** (2013.01); ***A47J 31/002*** (2013.01)

USPC **426/506**; 99/275; 62/331

(57) **ABSTRACT**

A method of controlling an integrated beverage system that comprises a dispensing module that dispenses one or more ingredients into a beverage container and a blending/mixing module that blends and/or mixes the ingredients in the beverage container, the method comprising: controlling the dispensing module and the blending/mixing module to prepare first and second beverages concurrently or sequentially.



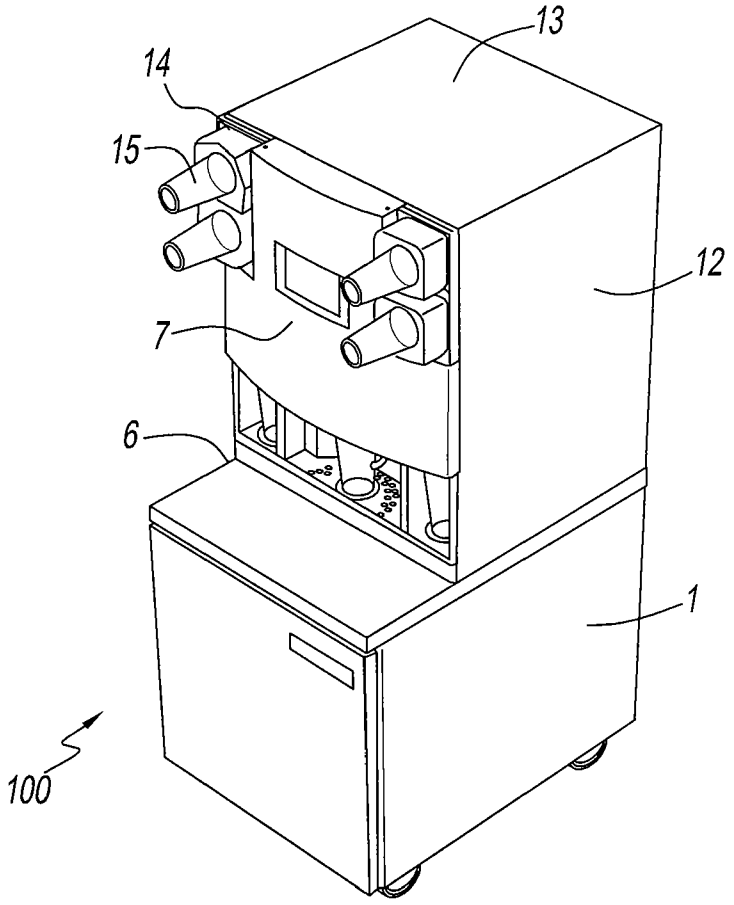


Fig. 1

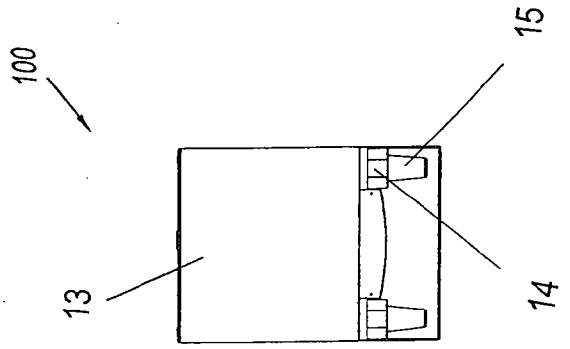


Fig. 4

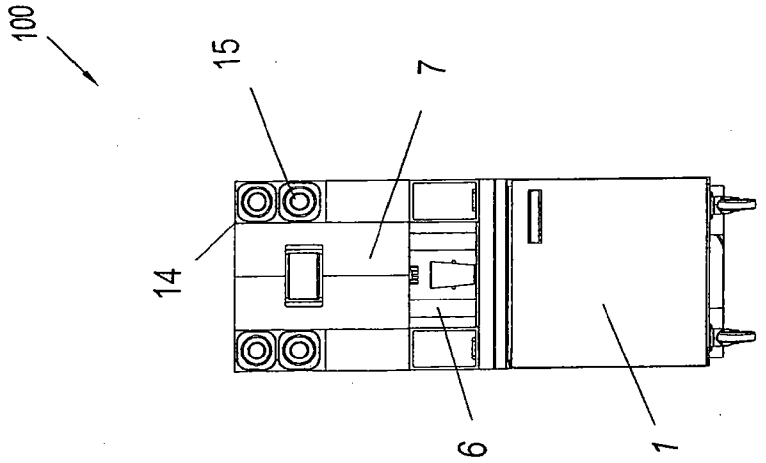
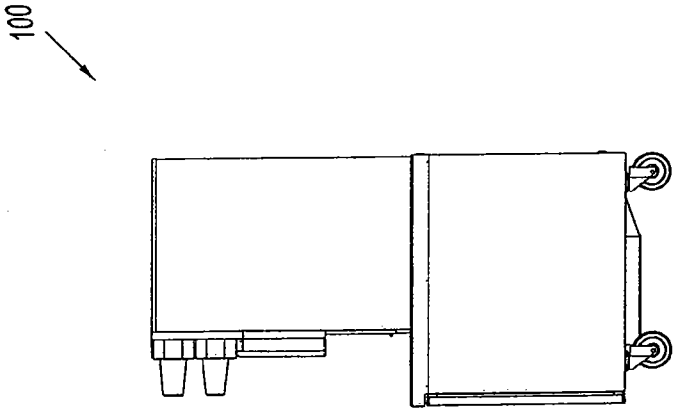


Fig. 3



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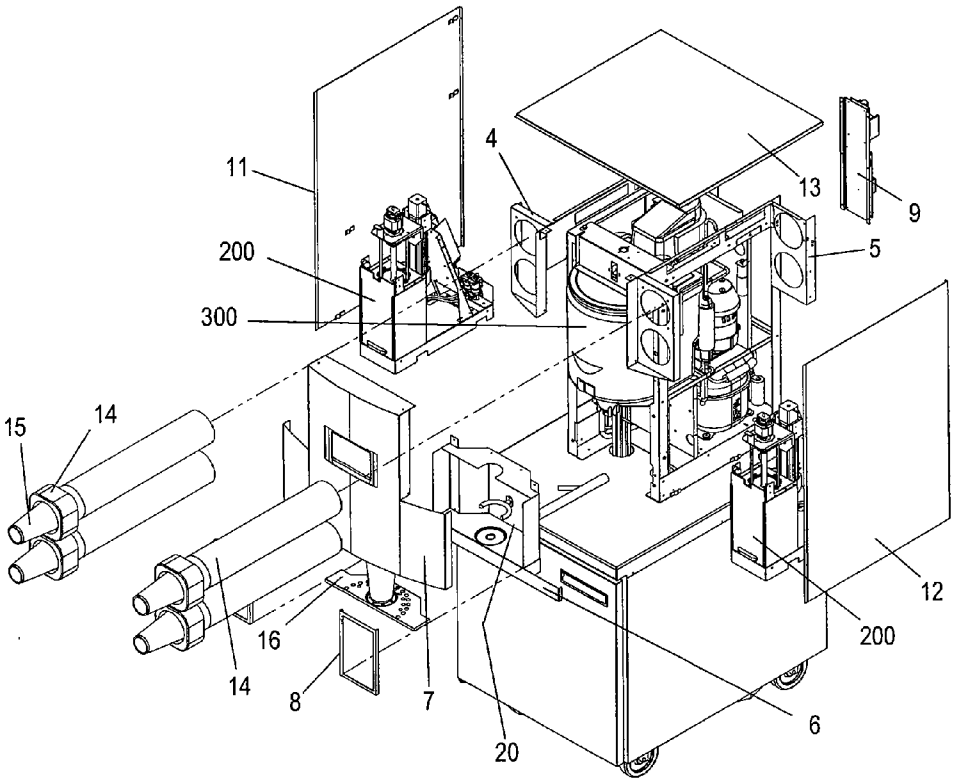

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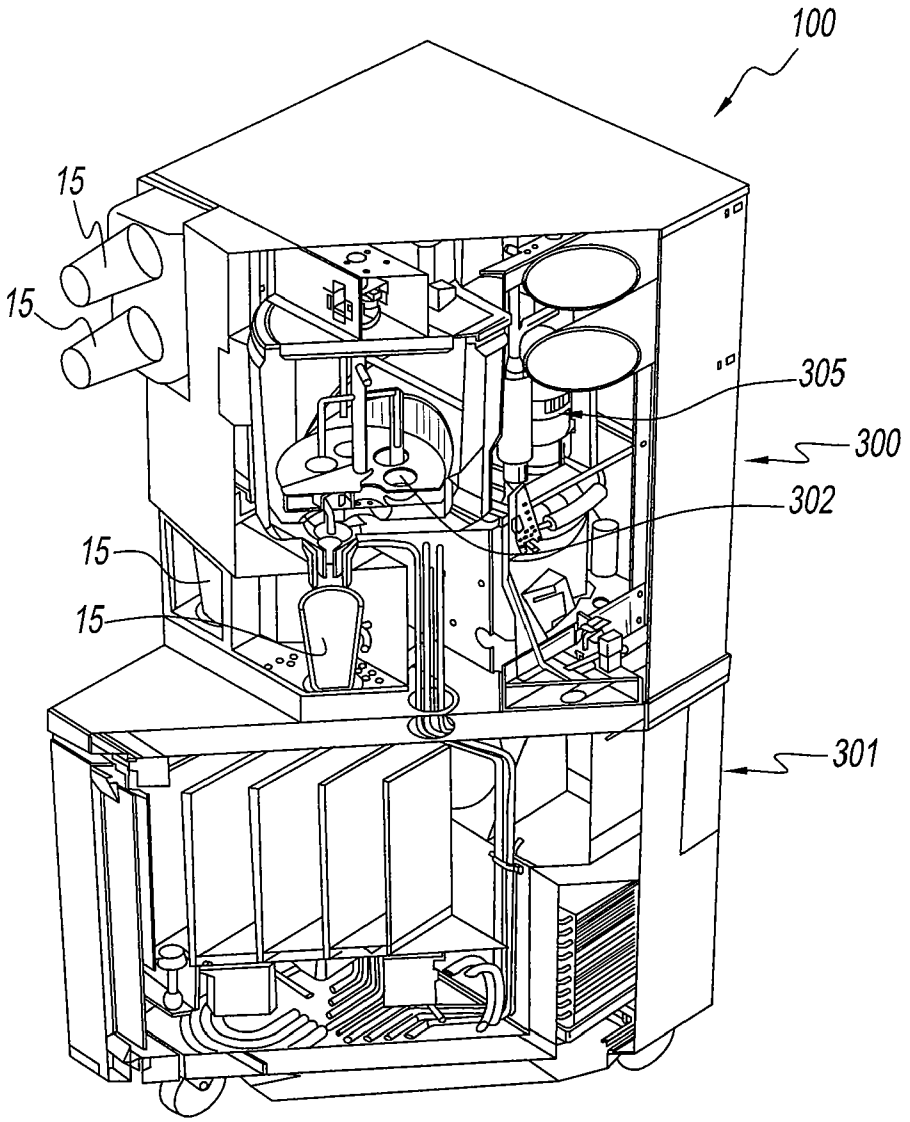

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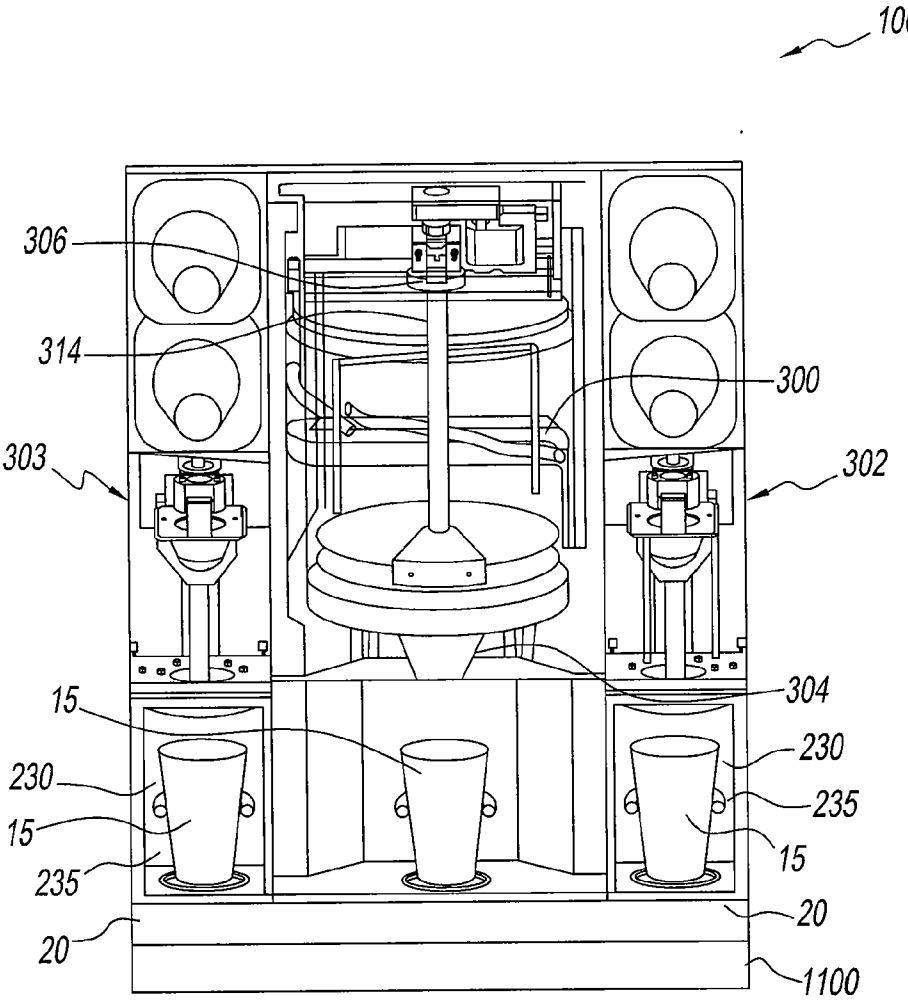

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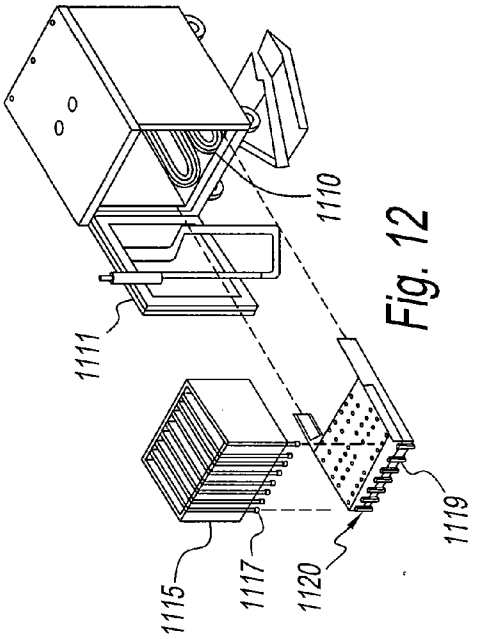

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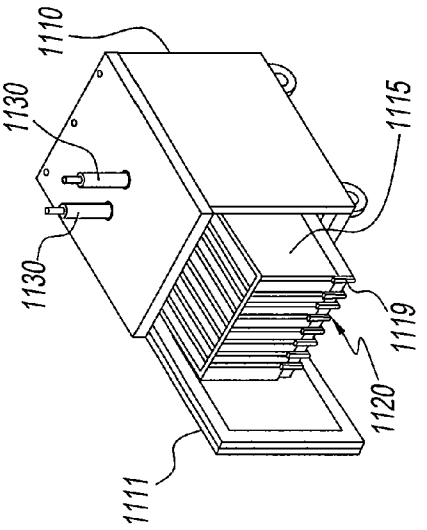

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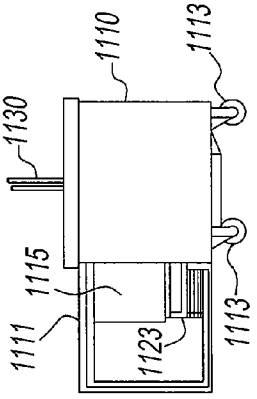

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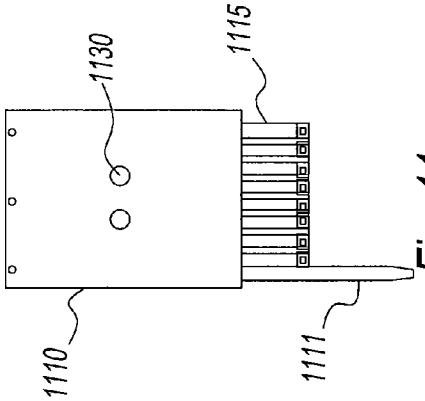

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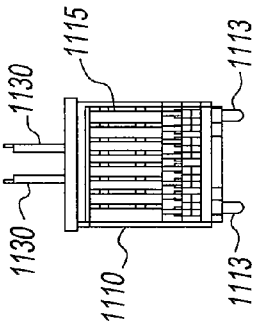

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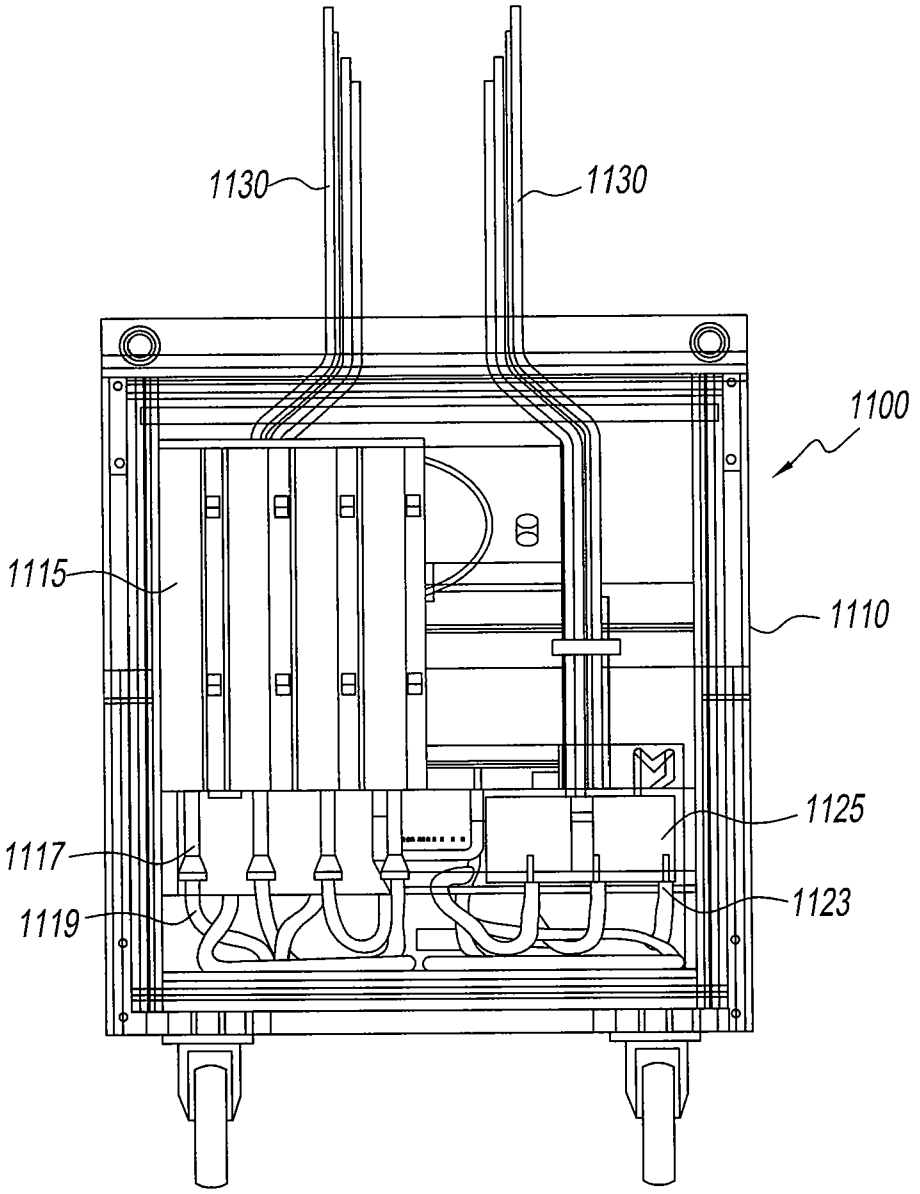

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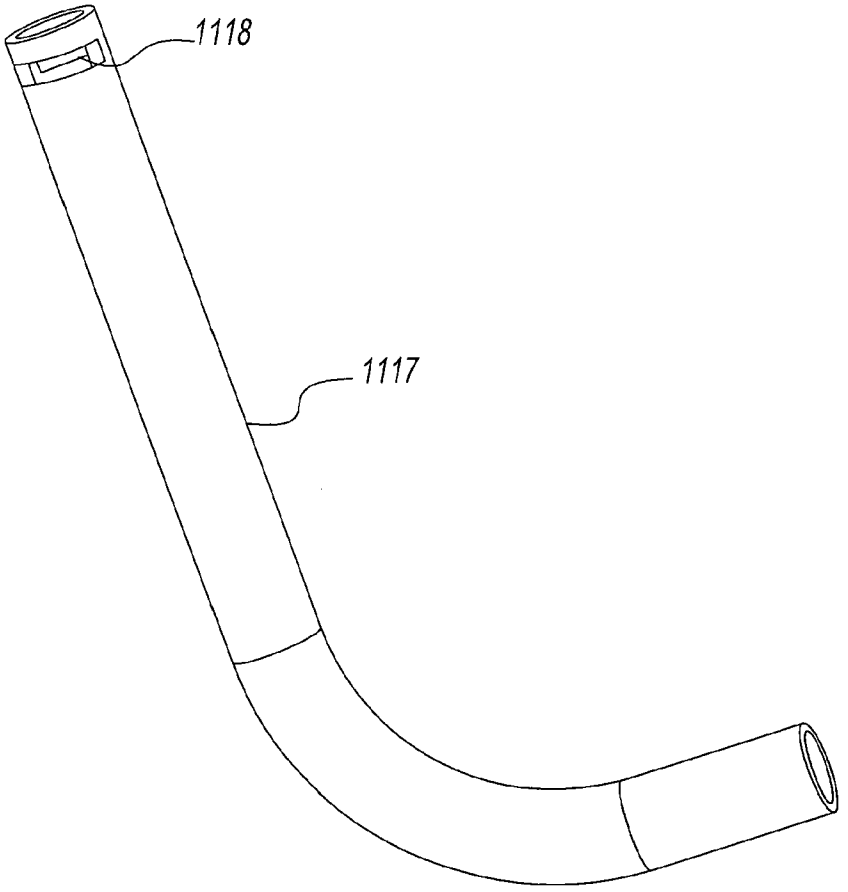
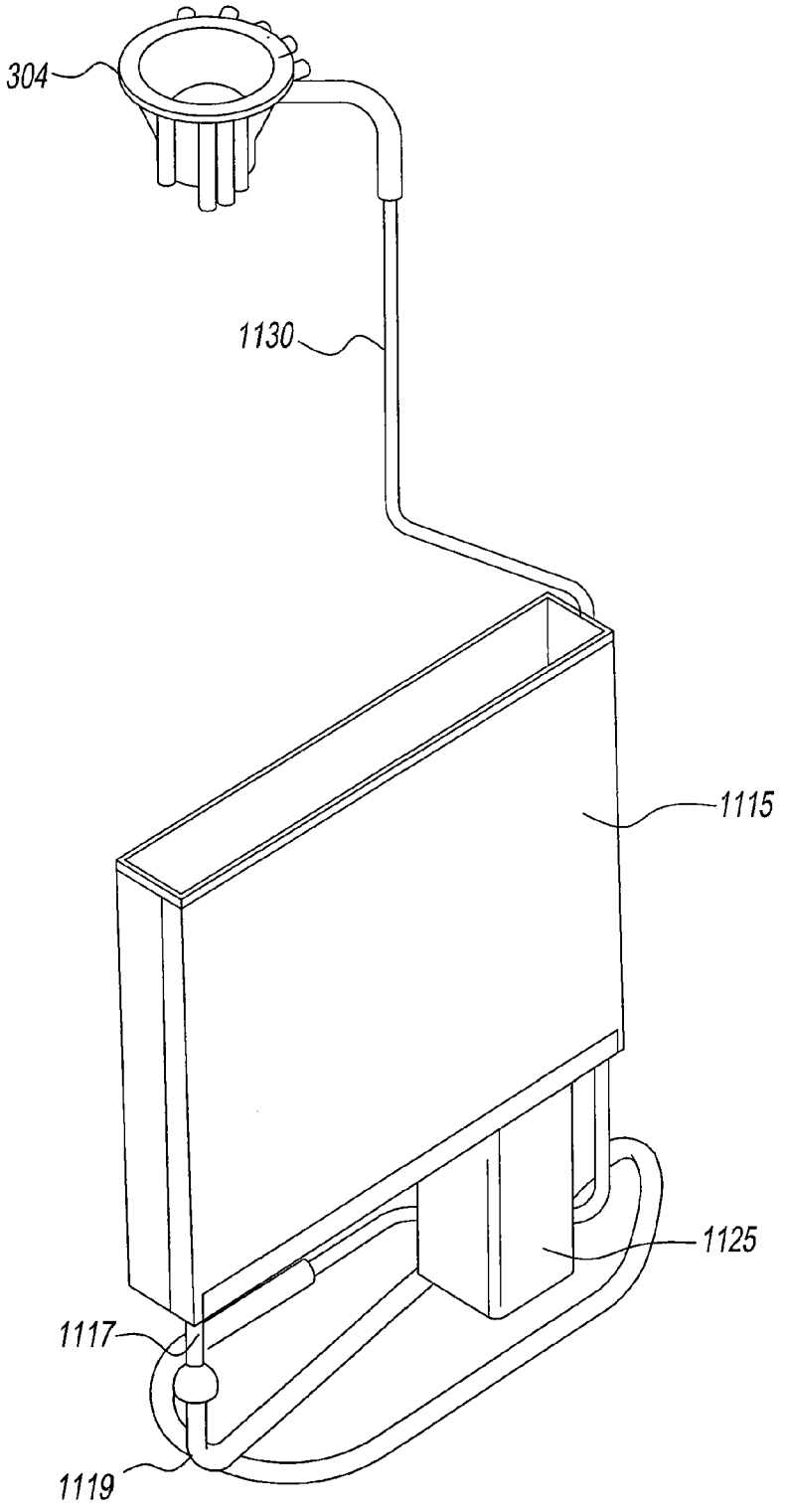


Fig. 13a



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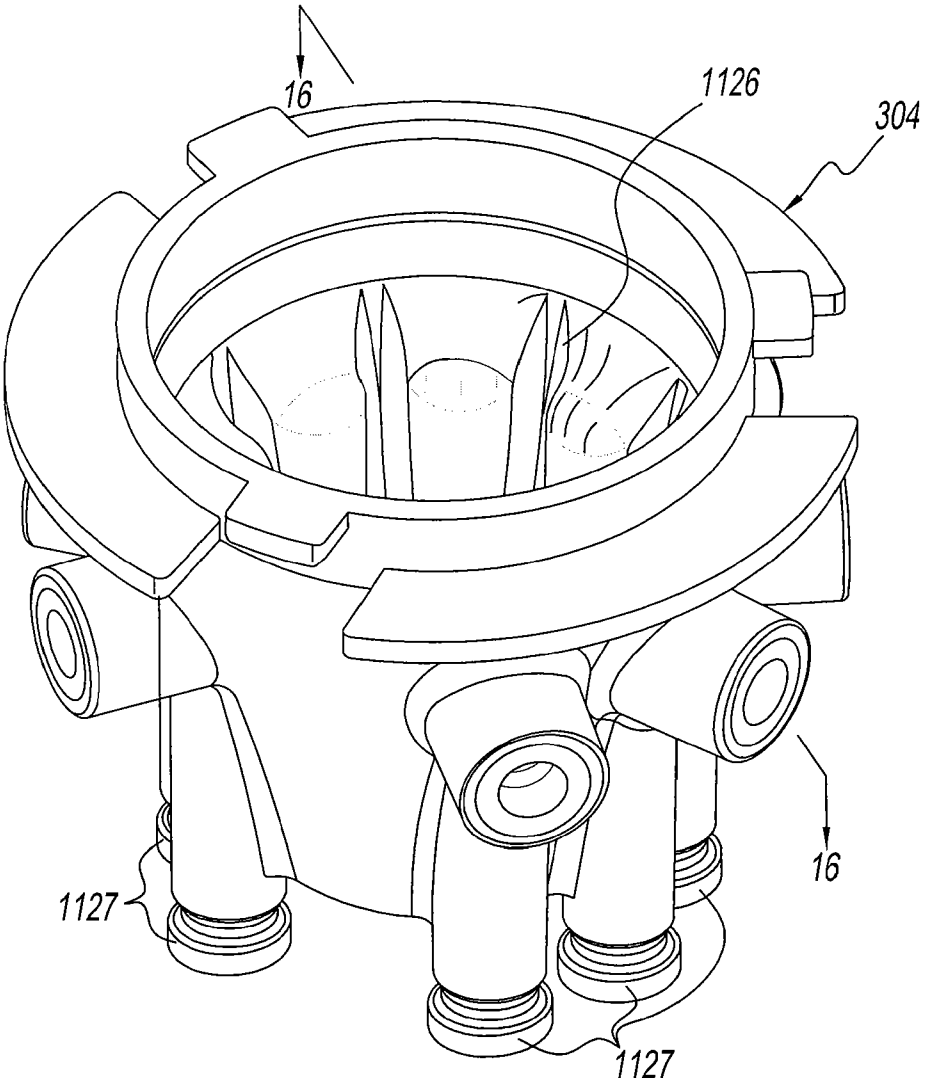

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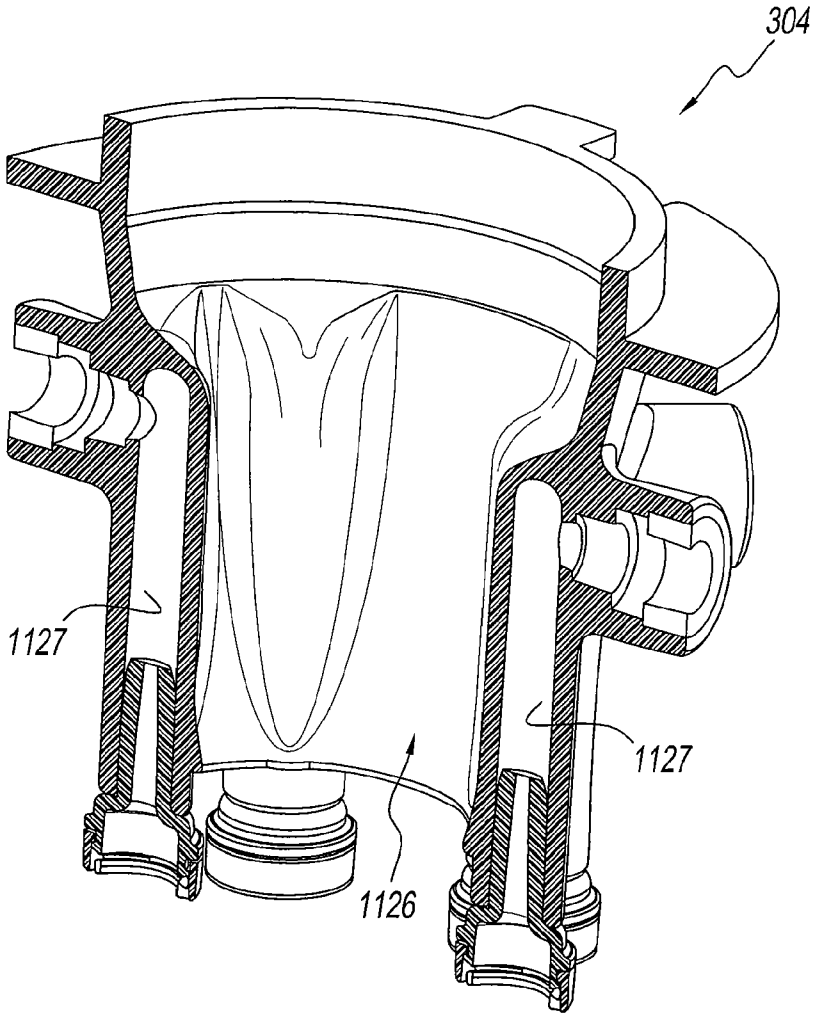

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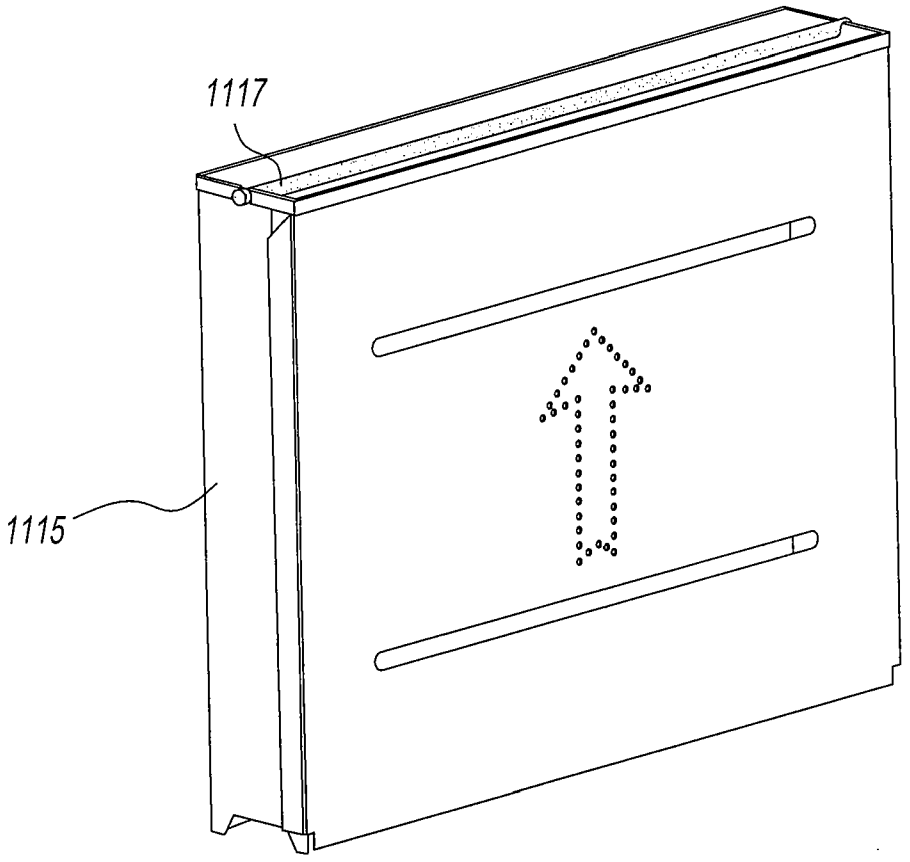

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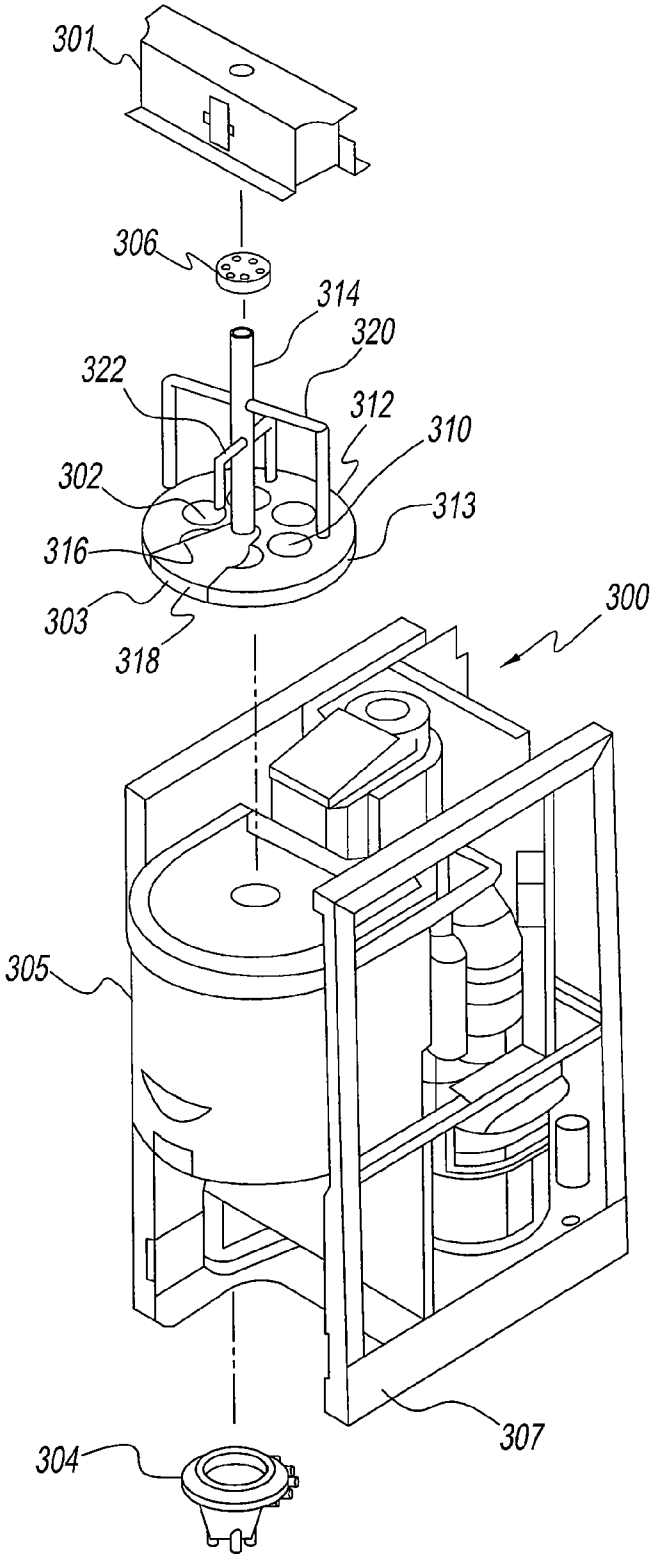

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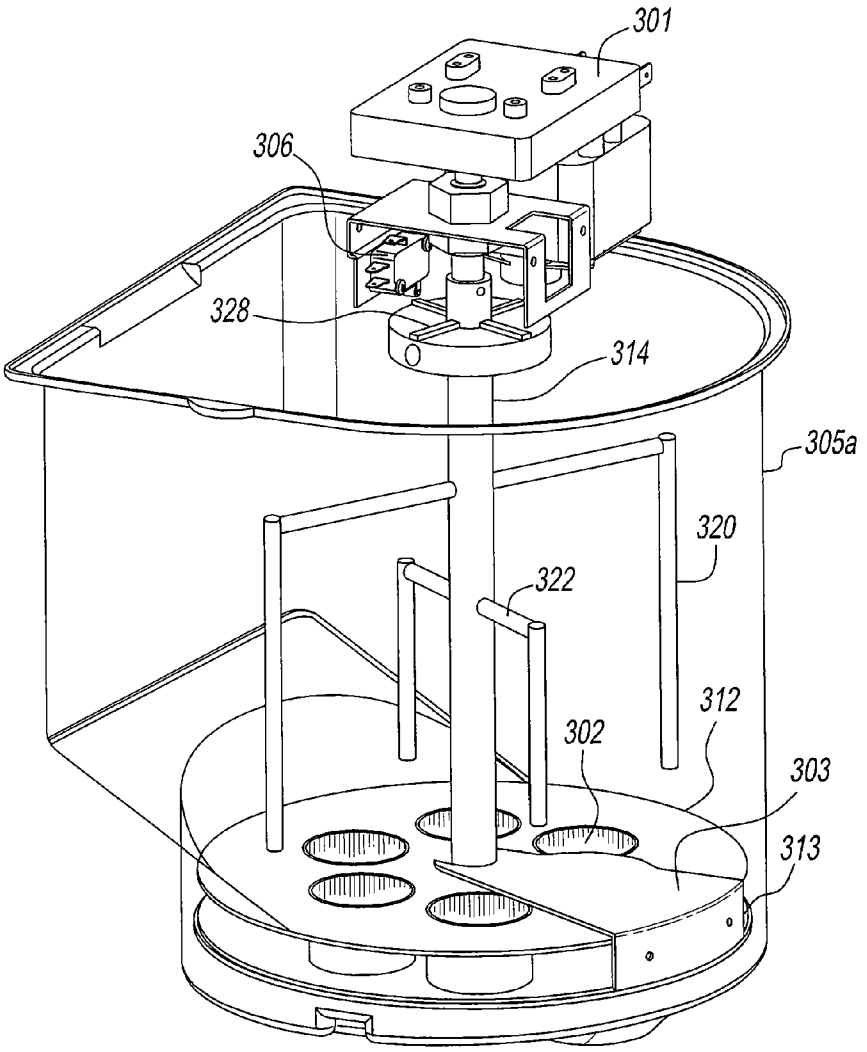

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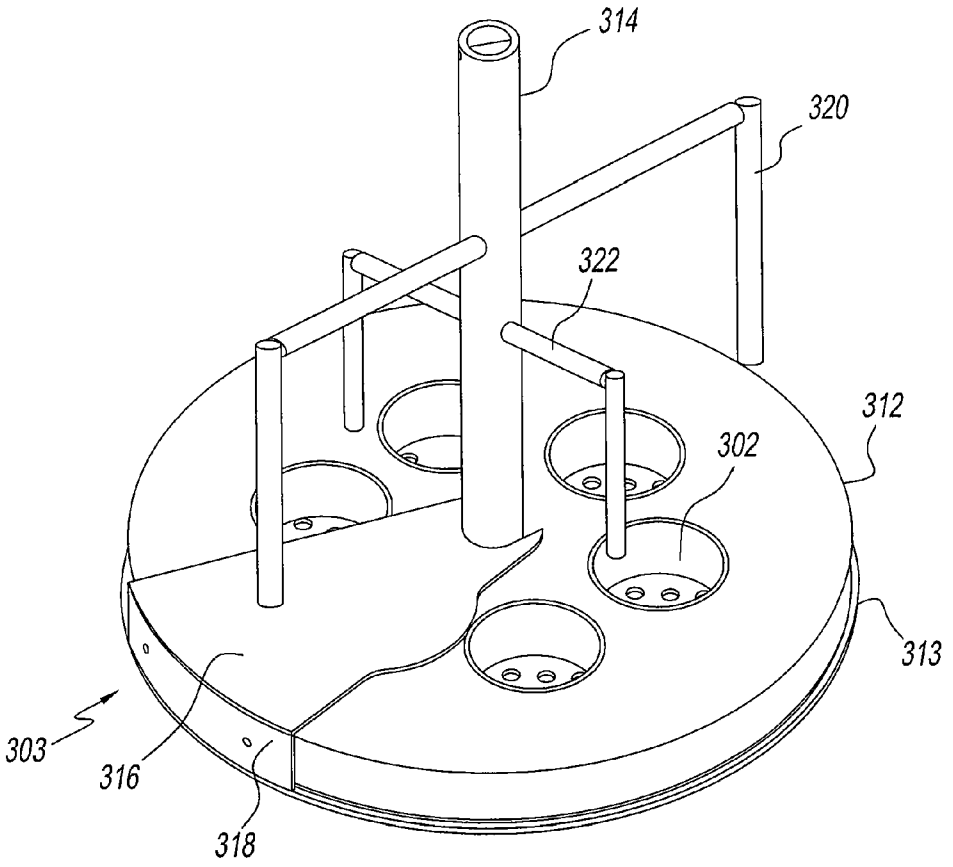

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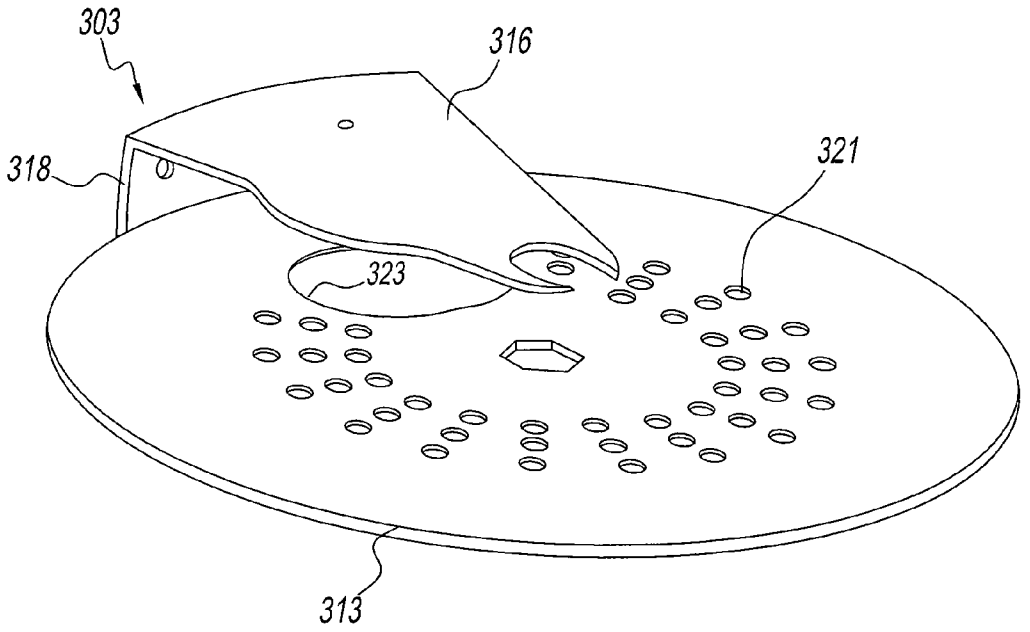

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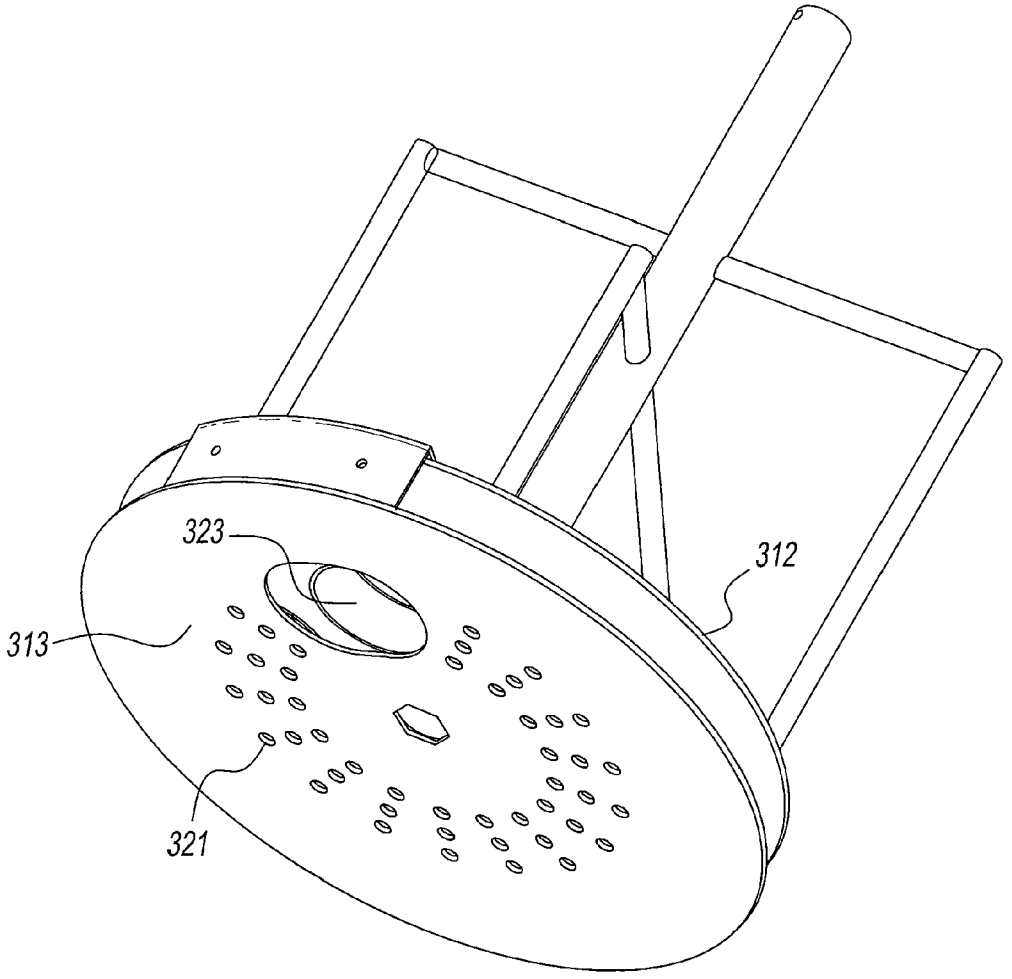

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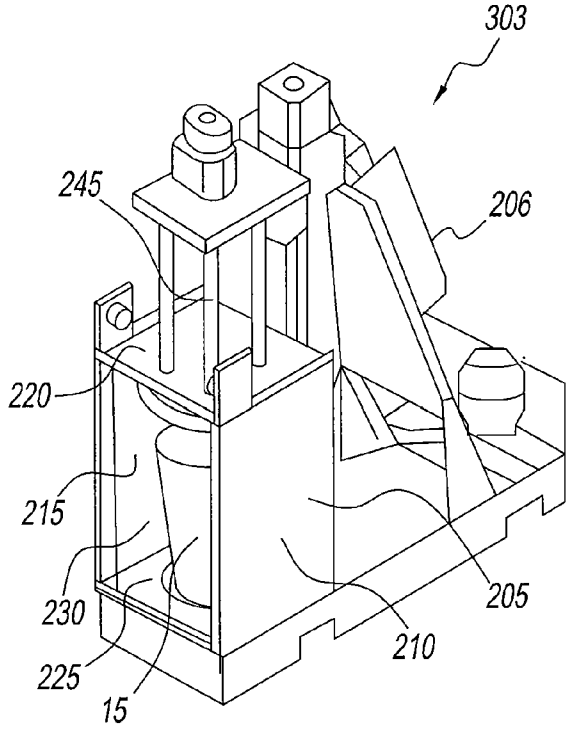

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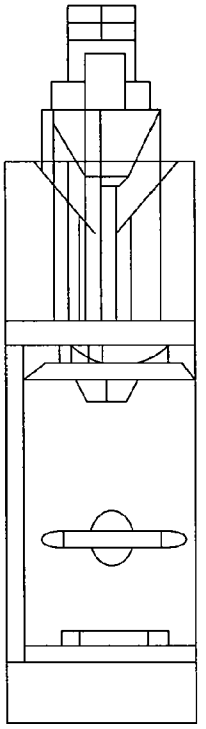

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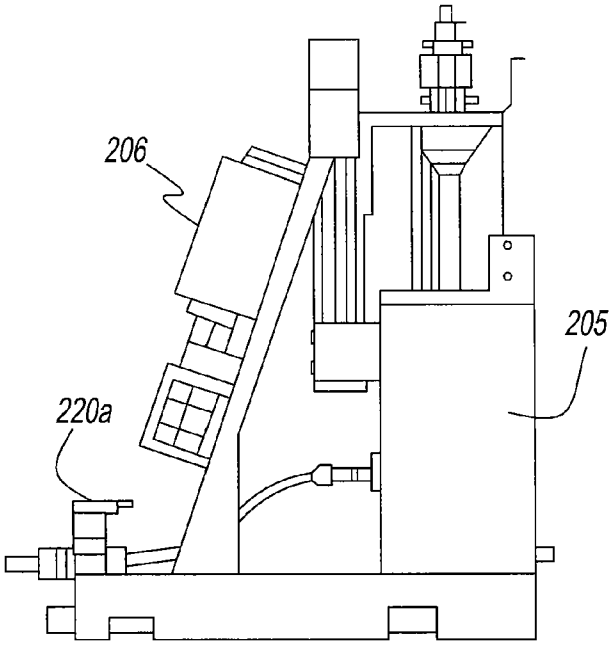

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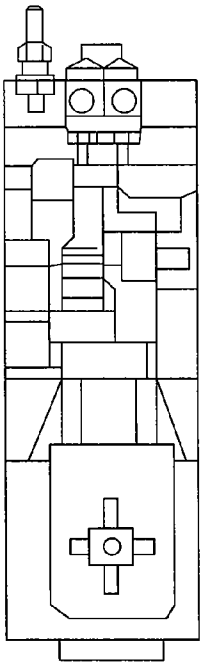

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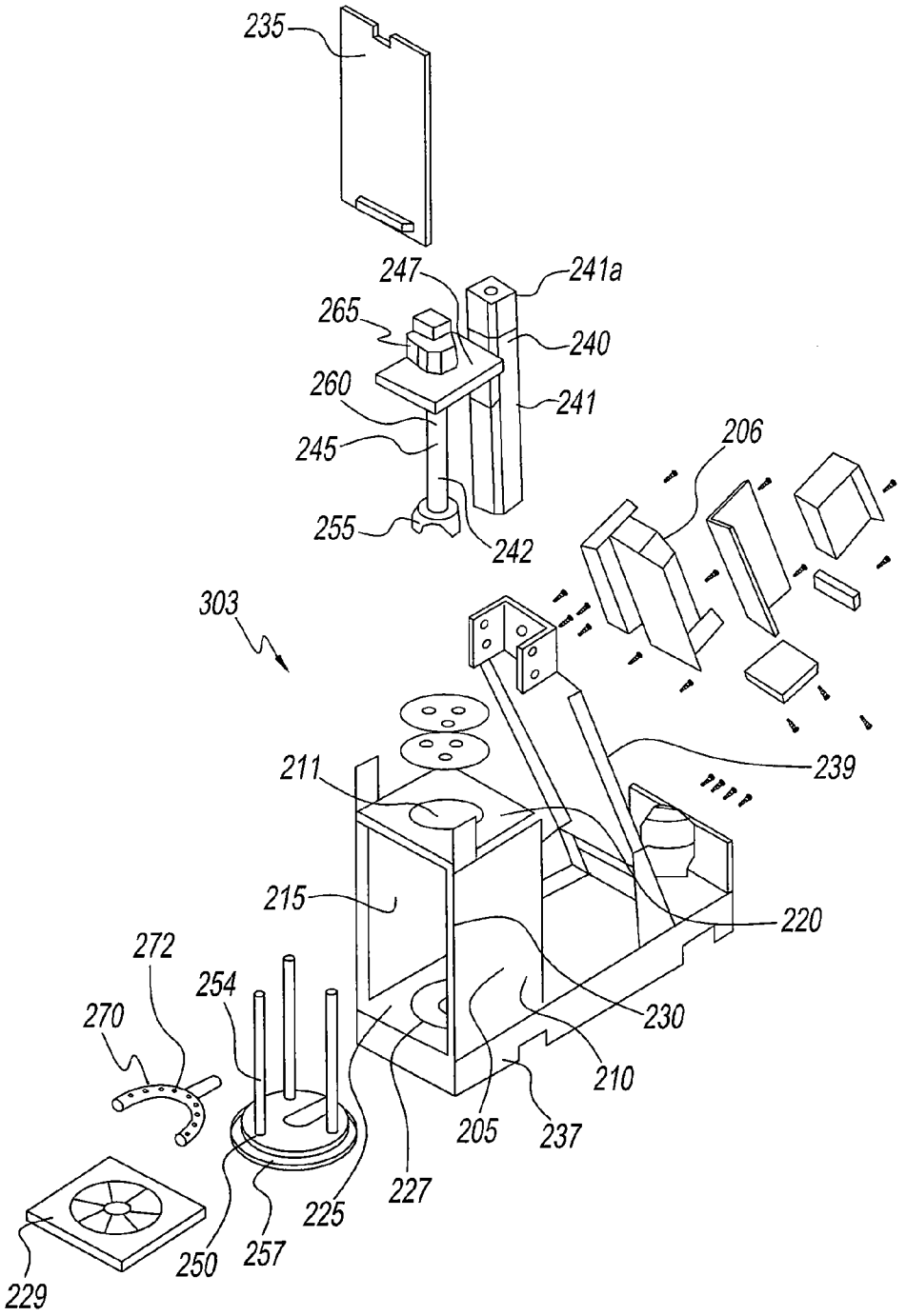
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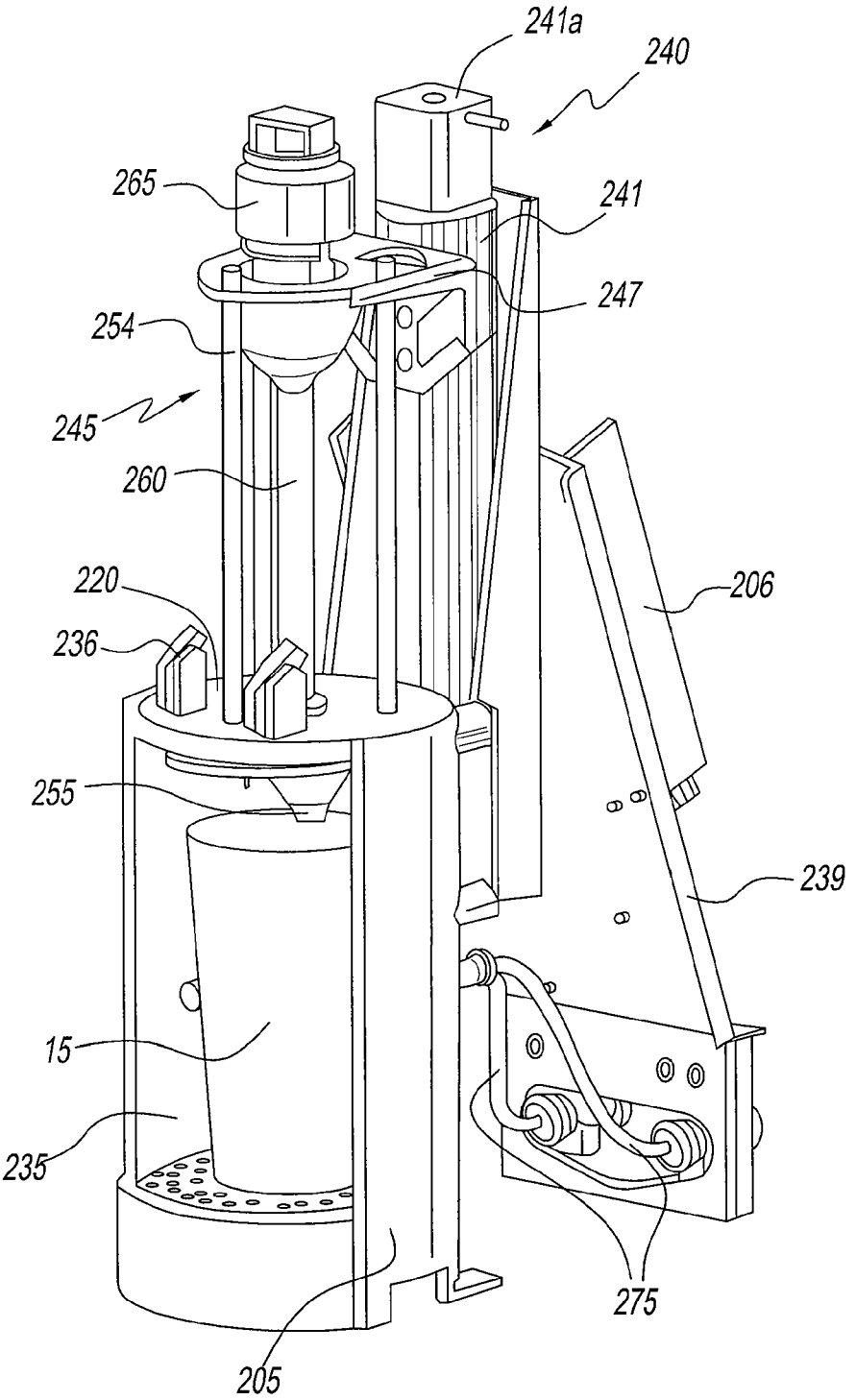
Fig. 27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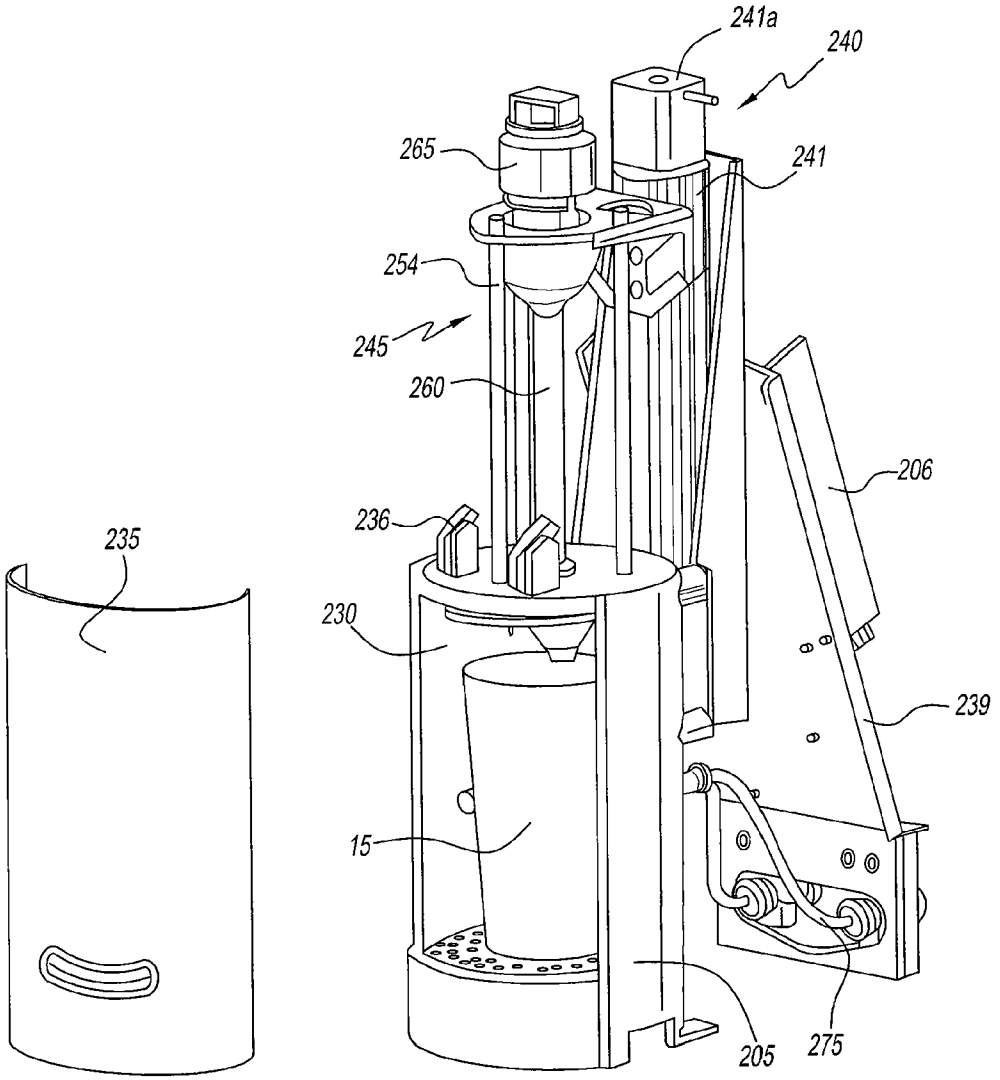

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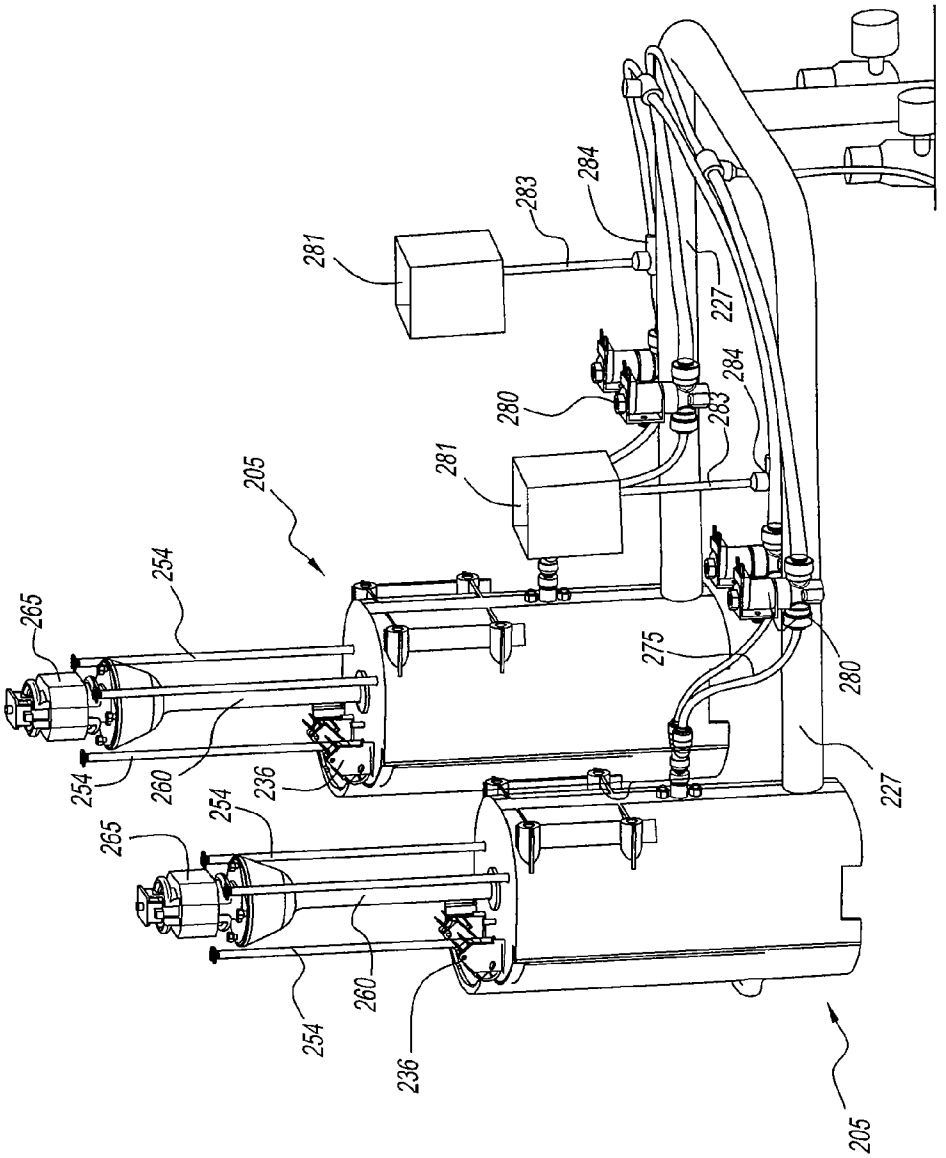

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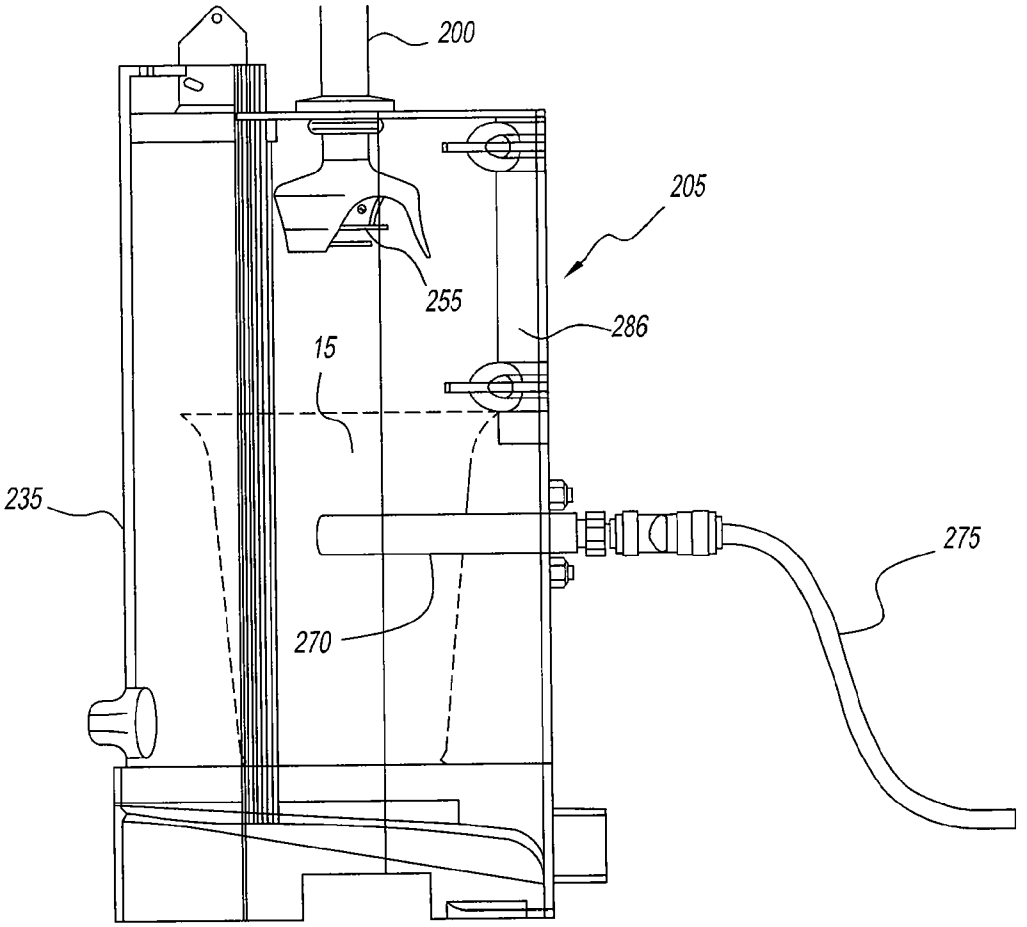

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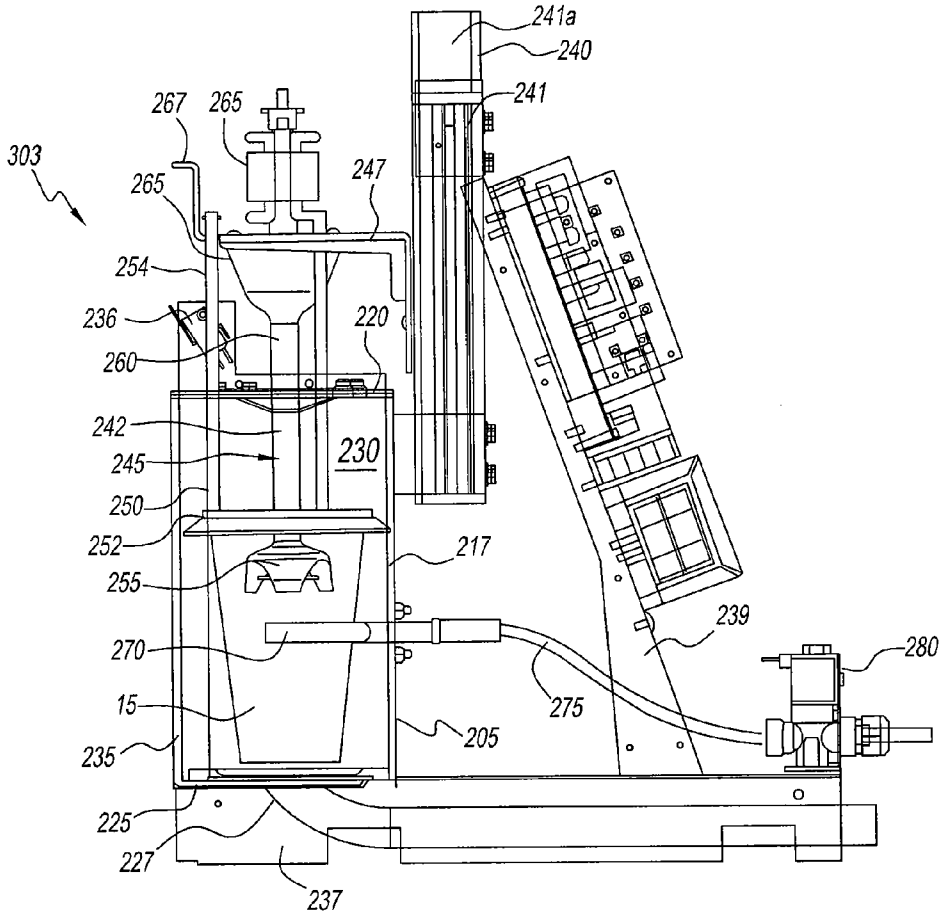
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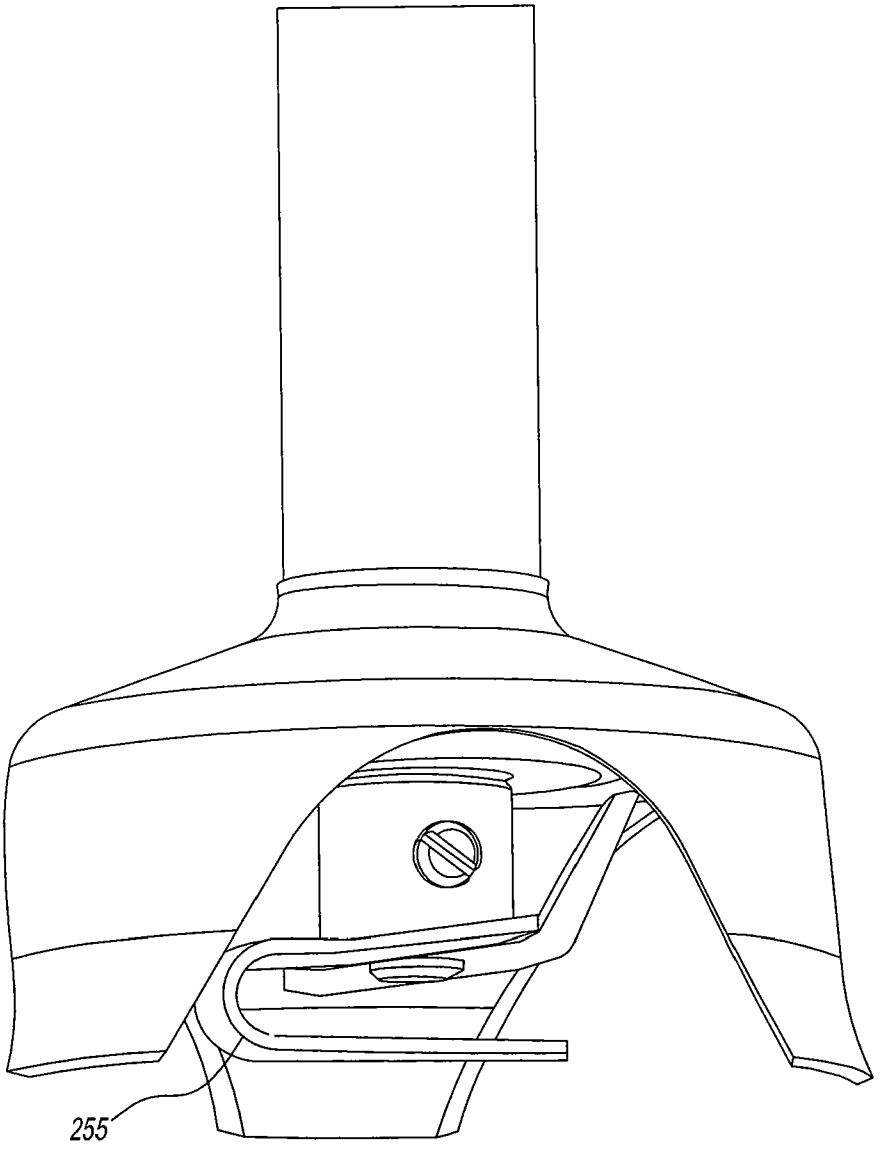
Fig. 32



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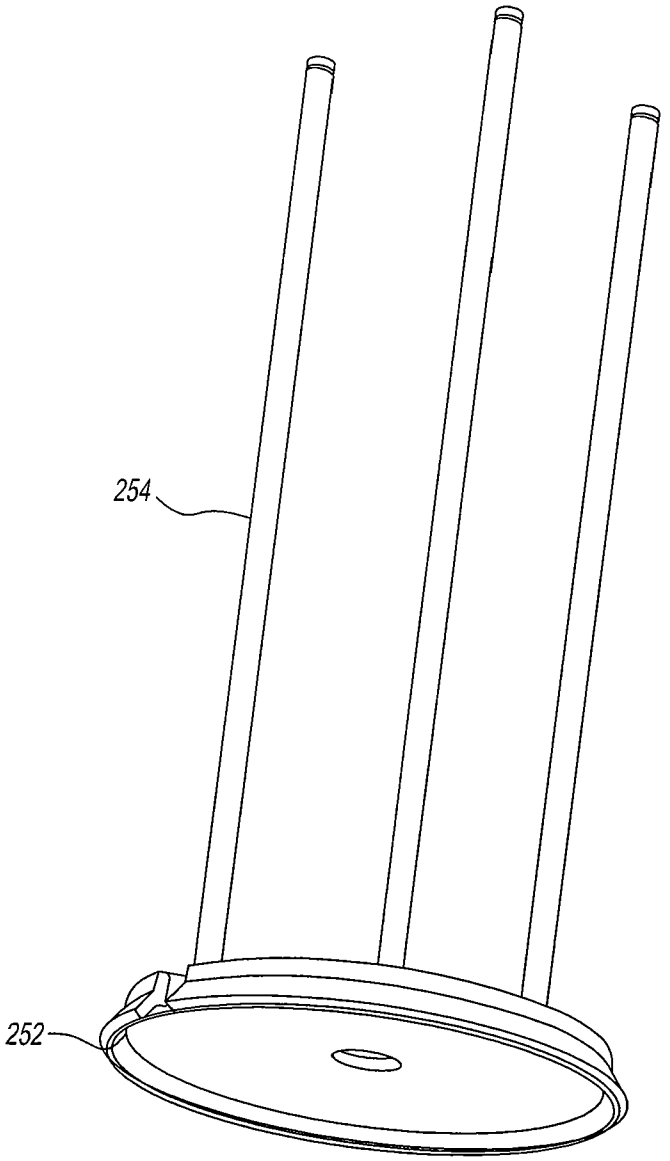

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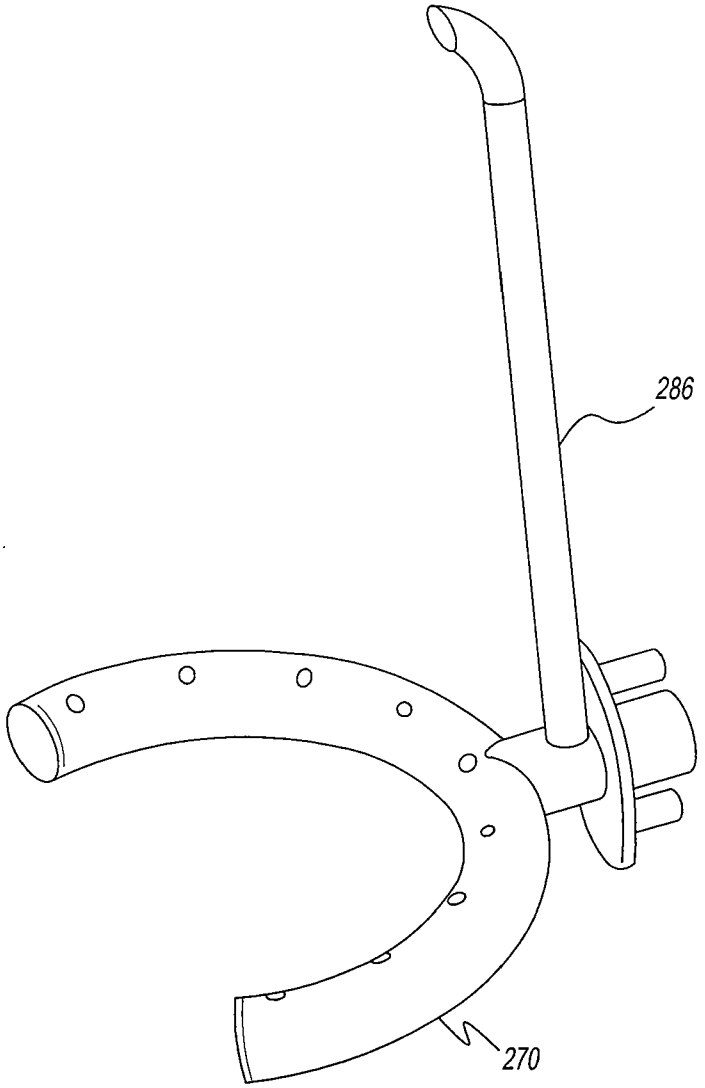

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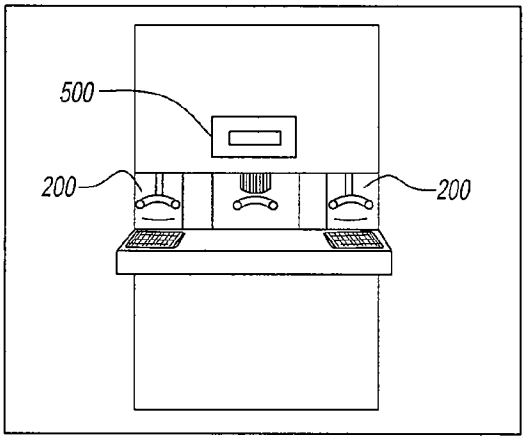
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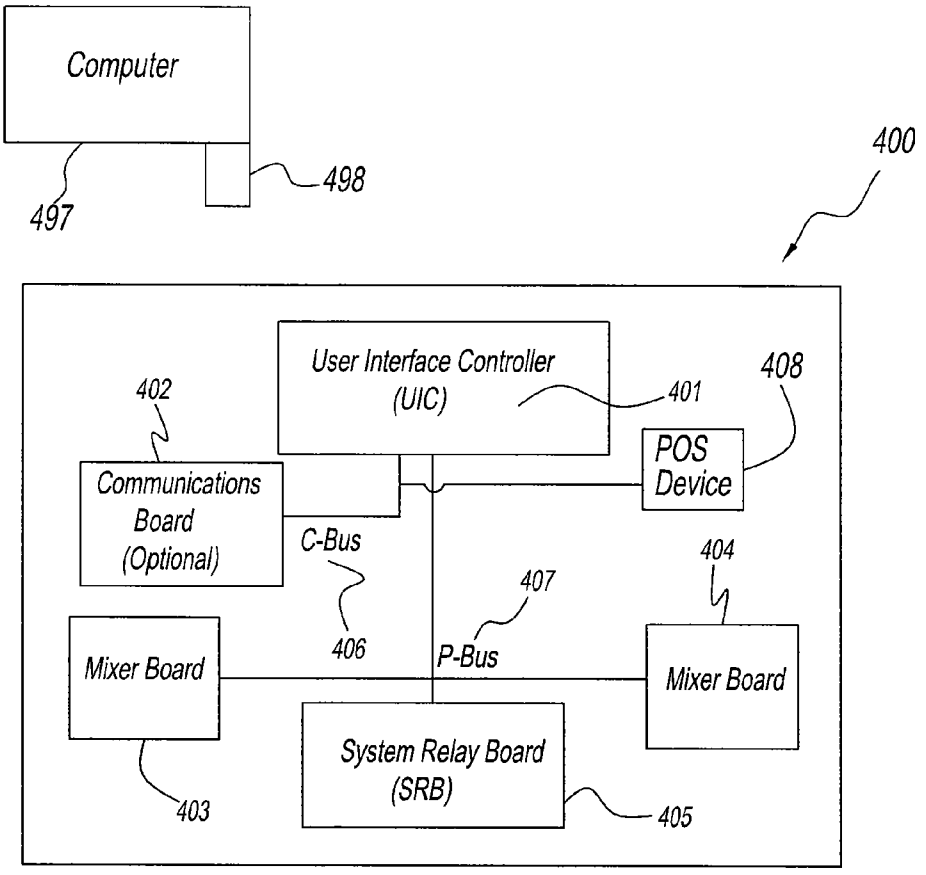
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User Interface Controller
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Device
Communications
Board
(Optional)
C-Bus
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407
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P-Bus
Mixer Board
Mixer Board
System Relay Board
(SRB)
403
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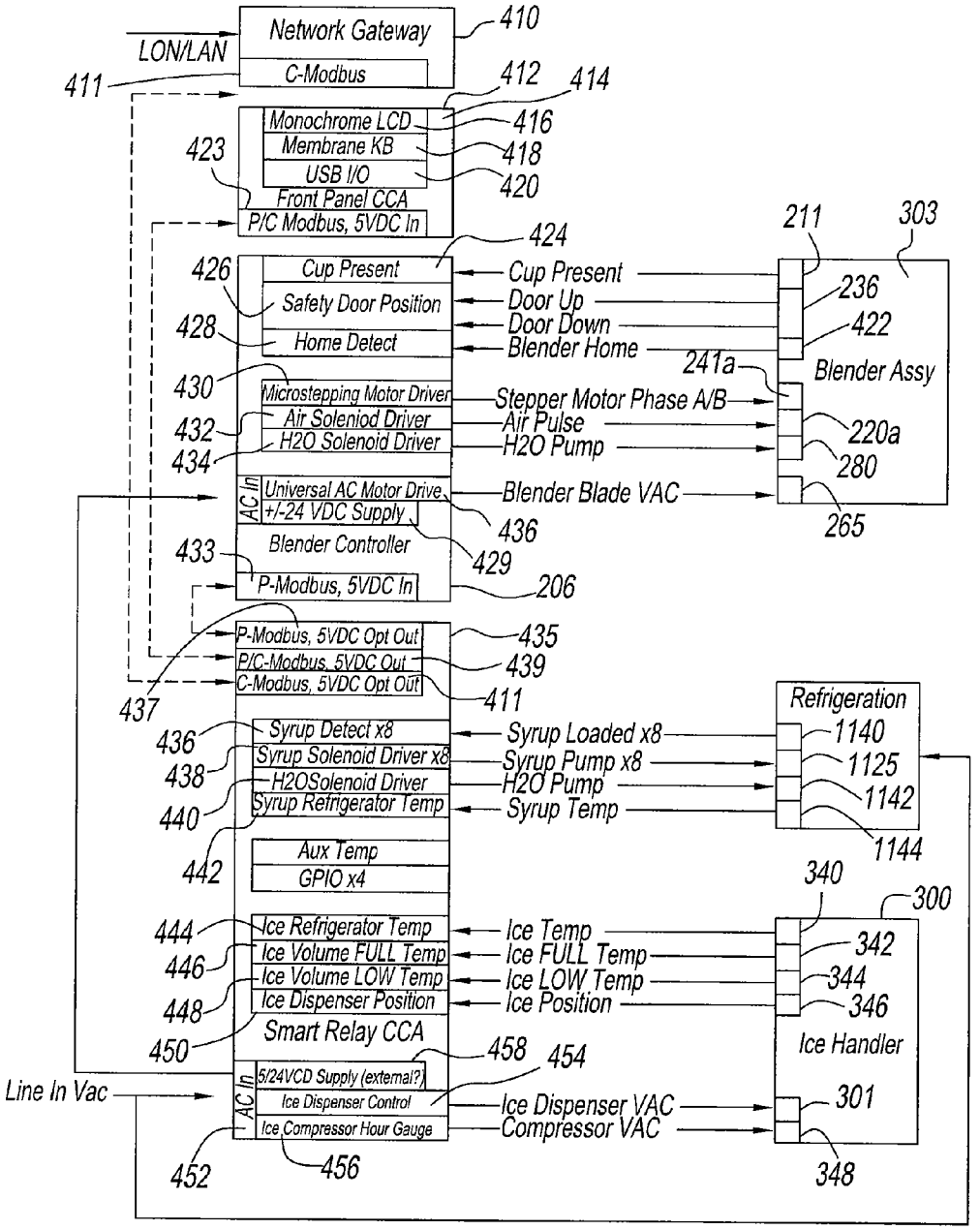
Fig. 37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P/C Modbus, 5VDC In
424
211
303
426
Cup Present
Cup Present
Safety Door Position
Door Up
236
428
Home Detect
Door Down
422
Blender Home
241a
Blender Assy
430
Microstepping Motor Driver
Stepper Motor Phase A/B
Air Soleniod Driver
Air Pulse
220a
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H2O Solenoid Driver
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AC In
Universal AC Motor Drive
Blender Blade VAC
+/-24 VDC Supply
436
265
Blender Controller
433
429
P-Modbus, 5VDC In
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P-Modbus, 5VDC Opt Out
435
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1142
Syrup Refrigerator Temp
Syrup Temp
440
1144
Aux Temp
442
GPIO x4
340
300
444
Ice Refrigerator Temp
Ice Temp
342
Ice Volume FULL Temp
Ice FULL Temp
446
Ice Volume LOW Temp
Ice LOW Temp
344
448
Ice Dispenser Position
Ice Position
346
Smart Relay CCA
Ice Handler
450
458
454
Line In Vac
AC In
5/24VCD Supply (external?)
Ice Dispenser Control
Ice Dispenser VAC
301
Ice Compressor Hour Gauge
Compressor VAC
452
456
348

Fig. 38

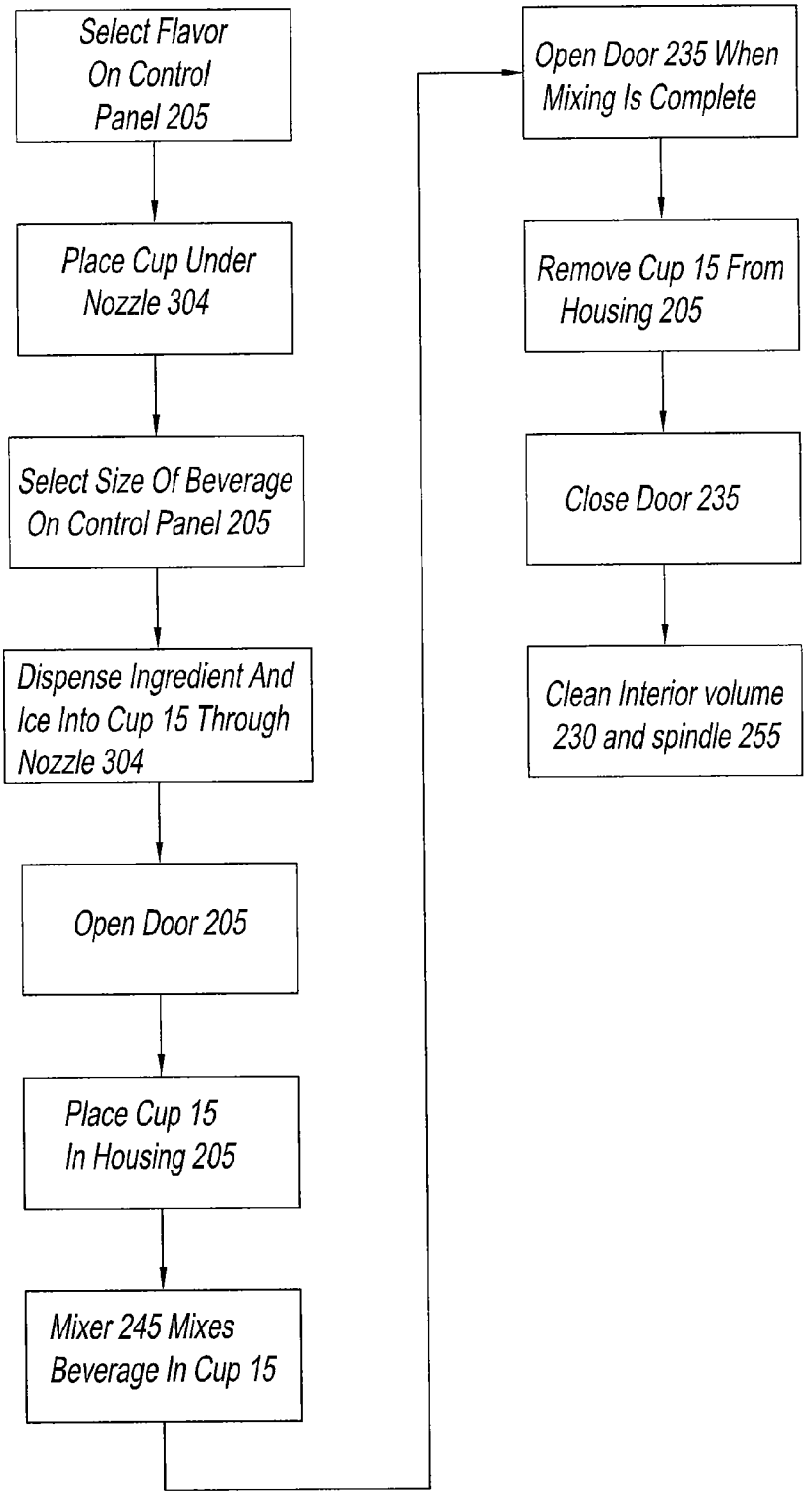
Select Flavor On Control Panel 205
Place Cup Under Nozzle 304
Select Size Of Beverage On Control Panel 205
Dispense Ingredient And Ice Into Cup 15 Through Nozzle 304
Open Door 205
Place Cup 15 In Housing 205
Mixer 245 Mixes Beverage In Cup 15
Open Door 235 When Mixing Is Complete
Remove Cup 15 From Housing 205
Close Door 235
Clean Interior volume 230 and spindle 255

Fig. 39

Product Mode					
	Idle -				
Display/Function	1. Computer displays "Select Up to 3 Flavors" 2. Computer displays up to 7 flavors (configurable) selections located in line with selection soft key and a "Water Only" and "ICE Only" selection located above the right most bottom soft keys respectively.				
Button		Press 1-3 flavors OR Ice Only soft keys not cannot select both Ice Only and flavors	Press X to go to system setup	Press check without flavor selections	Pression more than 3 flavors
Display/Function		Display highlights the flavors selected	Display un-highlight selections	Display does not change (stay in Idle)	Display reverse videos the first 3 and does not change unless the same item is selected in which case will toggle to un-select.
Botton	Press X to clear selections	Press check to select			
Dixplay/Function	—	1. Computer displays "Additives and Cup Size" 2. Computer displays "Flavor: sel1, and sel3" below where sel1 - sel3 are the flavors previously selected. 3. Computer displays three additives available for selection below the top soft keys including Yogurt on the right top key. Note Computer displays additives crossed out if currently unavailable. 4. Computer displays four cup size selections "Small" above the bottom left key, "Medium" above the center bottom key, "Large" and "XLarge" above the bottom right most keys respectively.	—	—	—

Fig. 40

			Product Mode		Check is disabled	—	—	—
Button	—	Press X to go to previous Display	1. Place cup under dispenser 2. If additive desired 1st select up to three additives 3. Press soft key under Small, Medium, Large, or XLarge - this starts the dispensing!		—	—	—	—
Display/Function	—	—	Computer starts dispensing product and Computer displays "Dispensing" with display of cup size, flavors, and additives selected for duration of dispense cycle.			—	—	—
Botton	—	—	X goes back to Idle and stop dispensing		—	—	—	—
Dixplay/Function	—	—	1. Computer displays "Select Mixer" and "left" under the left most top soft key and "Right" under the right most top soft key for a two dispenser unit. 2. Computer will display "LEFTL" and "RIGHTL" and "RIGHTR" under the two right most soft keys if this system is configured with four dispenser modules. 3. If any of the mixers are busy or not functional the computer will display the appropriate left or right text crossed out.		—	—	—	—
Botton	—	—	Press X to go back to Idle, Check is disabled	1.Press Soft key above available mixer (not crossed out), then computer goes back to idle display. 2. Open blender door. 3. Place cup and close door 4. Computer starts blending with door closure. 5. Blending completes (no beep?) then user removes cup and door should close to allow cleaning cycle.	—	—	—	—

Fig. 41

System Setup Mode									
Botton	From Idle Press X								
Display/Function	Computer displays "System Setup" with "DISP. Setup", "LOAD Fluids", and "Service" displayed under the the top left, center and right soft keys.								
Botton	Press appropriate soft key (DISP Setup, LOAD FLUIDS, or Service) Note other soft keys are disabled				If Service was selected then the Computer displays "Status", "Calibrate", "Maint".			Press X to go back to Idle Mode	Check disabled ?
Display/Function	If DISP Setup was selected then the Computer displays "Brightness" on the left and "Contrast" on the right with + and - symbols on each side above and below the associated soft keys.	If LOAD Fluids was selected then the Computer displays "Load Fluids" with "Slot 1", "Slot 2", "Slot 3", "Slot 4", and "Slot 5" across the top of the display respectively and "Slot 6" and "Slot 7" across the bottom left of the display respectively.						—	—
Botton	Press X or Check to go back to Setup screen	Press appropriate soft keys to modify brightness and Contrast	Press one of the slot slections	Press X or Check to go back to Setup screen	If Status pressed	If Calibrate is pressed	If Maint. Pressed	—	—
Display/Function	—	Press X or Check to go back to service screen?	1. Computer displays "Assign Fluid Slot X" on the left side of the display where x is the slot number selected previously. 2. Computer displays list of up to 255? Fluid selections with current fluid highlighted with up down arrows under the top and bottom right most soft keys respectively.	—	Computer displays? 1. Temp sensor Values. 2. Error log. 3. # of cycles of each product. 4.	Fluid calibration needed?	1. Cleaning? 2. Dispensing cleaning fluid? 3. Cycle through modes for service testing?	—	—

Fig. 42a

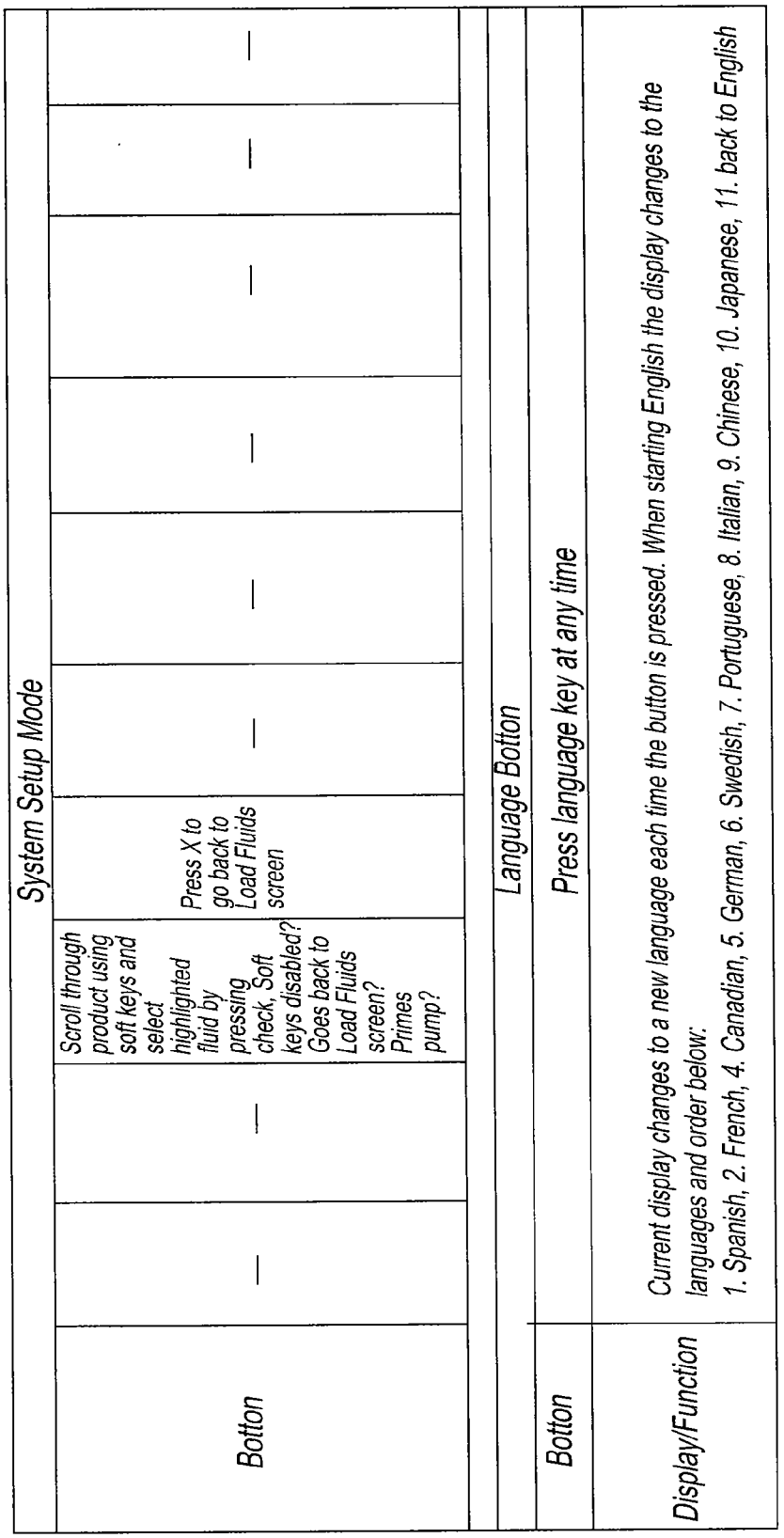
System Setup Mode
Botton
—
—
Scroll through product using soft keys and select highlighted fluid by pressing check, Soft keys disabled? Goes back to Load Fluids screen? Primes pump?
Press X to go back to Load Fluids screen
—
—
—
—
—
Language Botton
Botton
Press language key at any time
Display/Function
Current display changes to a new language each time the button is pressed. When starting English the display changes to the languages and order below:
1. Spanish, 2. French, 4. Canadian, 5. German, 6. Swedish, 7. Portuguese, 8. Italian, 9. Chinese, 10. Japanese, 11. back to English

Fig. 42b

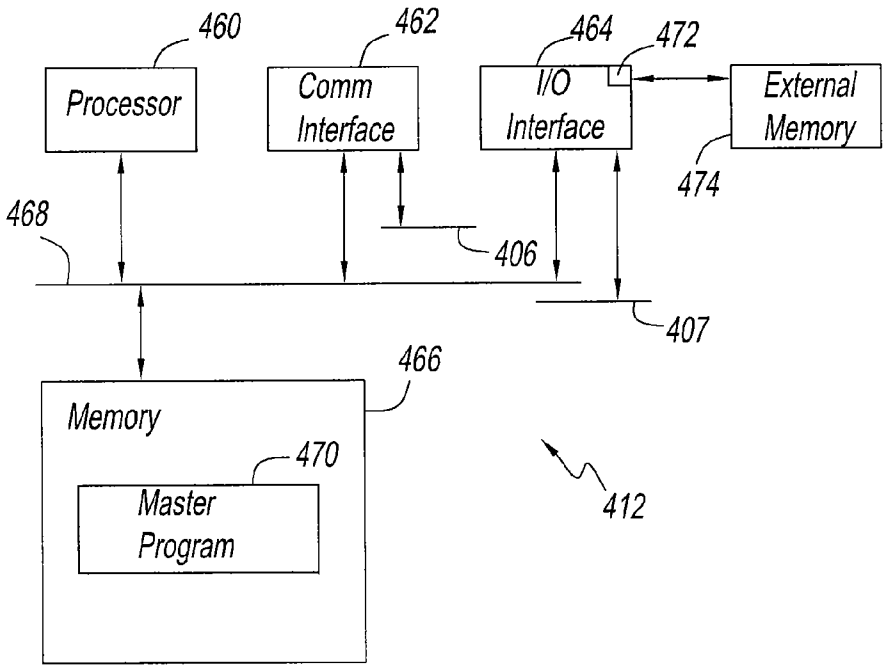
460
462
464
472
Processor
Comm Interface
I/O Interface
External Memory
474
468
406
407
466
Memory
470
Master Program
412

Fig. 43

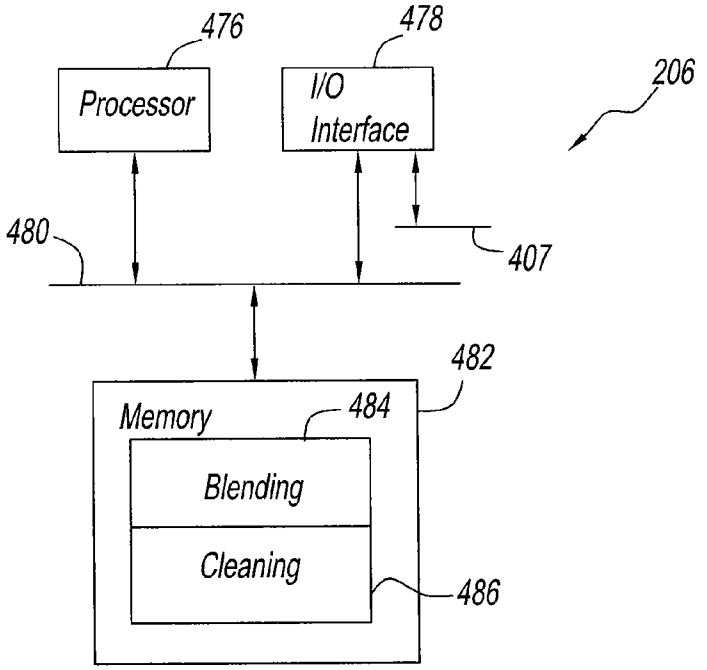
476
478
206
Processor
I/O Interface
480
407
482
Memory
484
Blending
Cleaning
486

Fig. 44

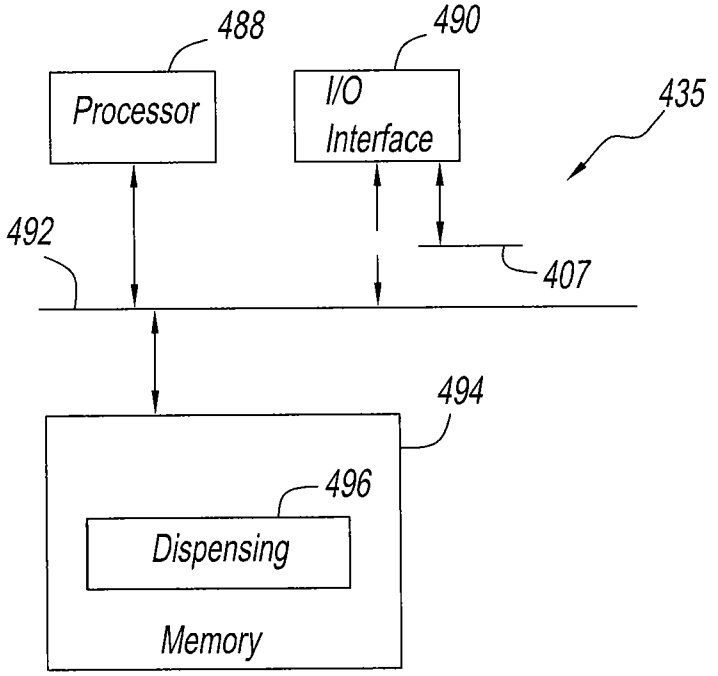
488
490
Processor
I/O
Interface
435
492
407
494
496
Dispensing
Memory

Fig. 45

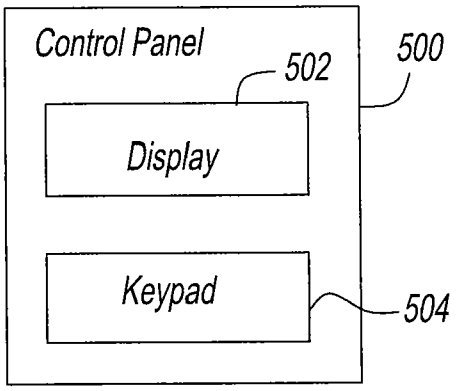
Control Panel
502
500
Display
Keypad
504

Fig. 46

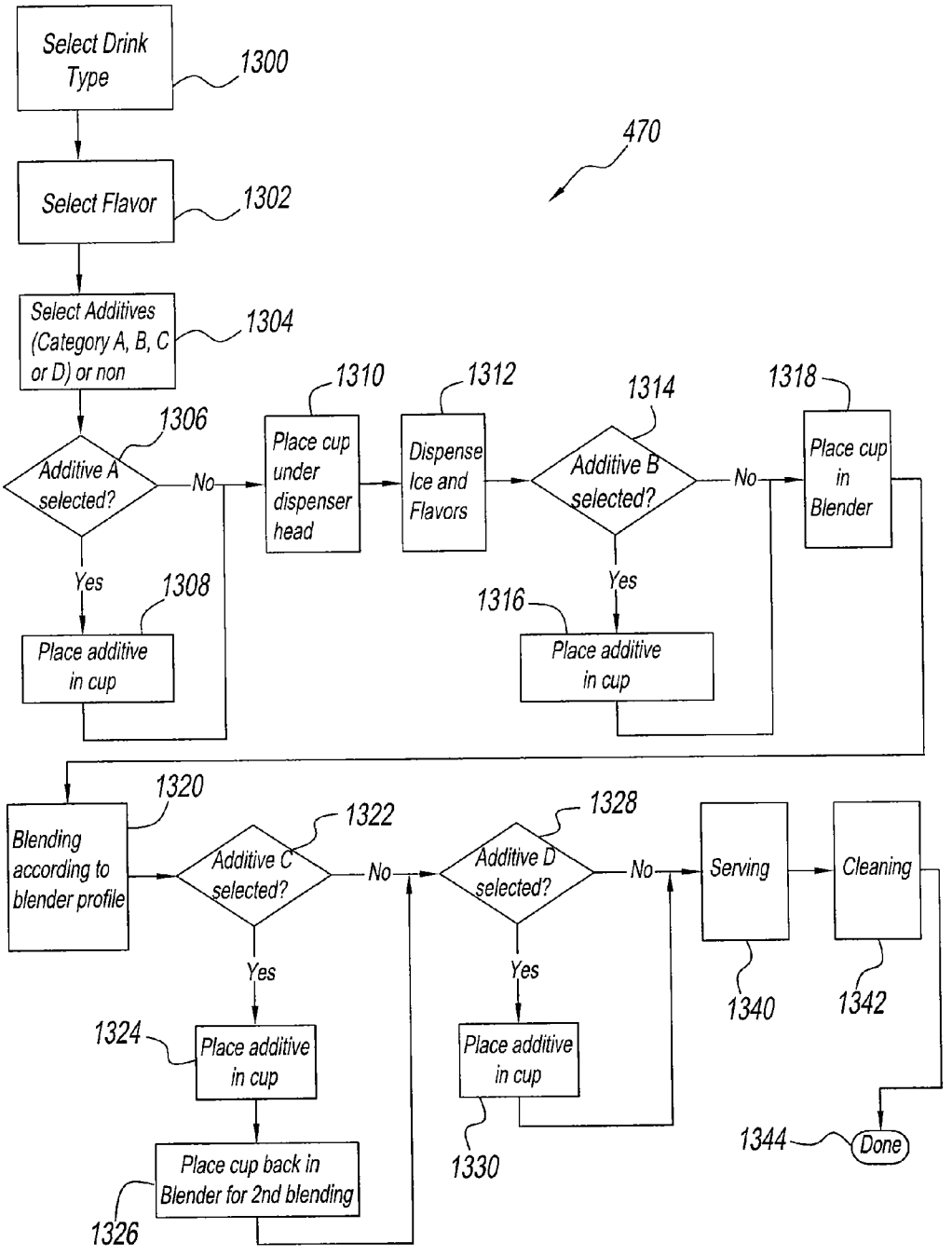
Select Drink Type
1300
470
Select Flavor
1302
Select Additives (Category A, B, C or D) or non
1304
1306
Additive A selected?
No
1310
Place cup under dispenser head
1312
Dispense Ice and Flavors
1314
Additive B selected?
No
1318
Place cup in Blender
Yes
1308
Place additive in cup
Yes
1316
Place additive in cup
1320
Blending according to blender profile
1322
Additive C selected?
No
1328
Additive D selected?
No
Serving
Cleaning
Yes
Yes
1340
1342
1324
Place additive in cup
Place additive in cup
1330
1344
Done
Place cup back in Blender for 2nd blending
1326

Fig. 47

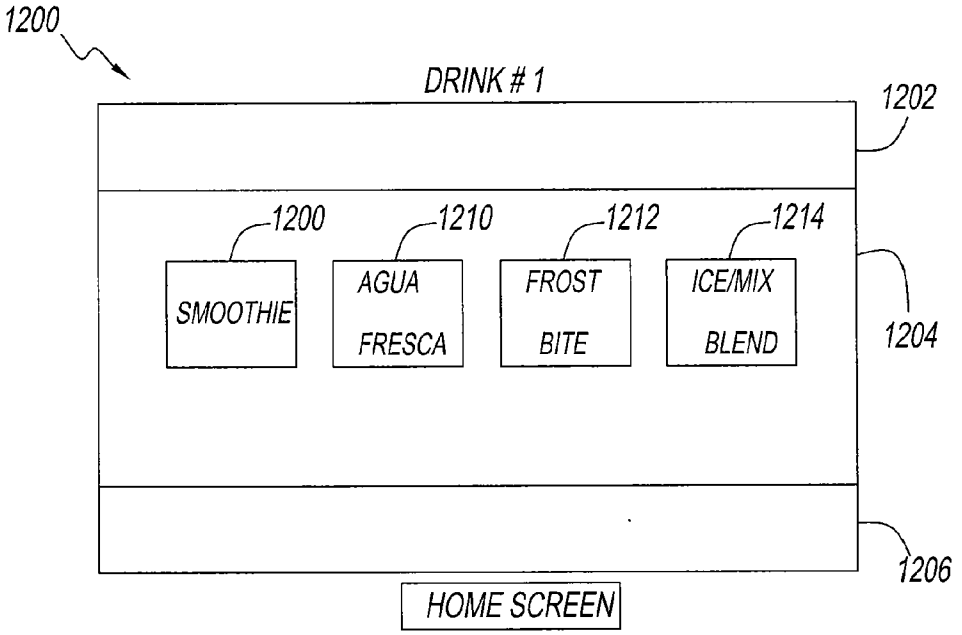
1200
DRINK # 1
1202
1200
1210
1212
1214
SMOOTHIE
AGUA FRESCA
FROST BITE
ICE/MIX BLEND
1204
1206
HOME SCREEN

Fig. 48

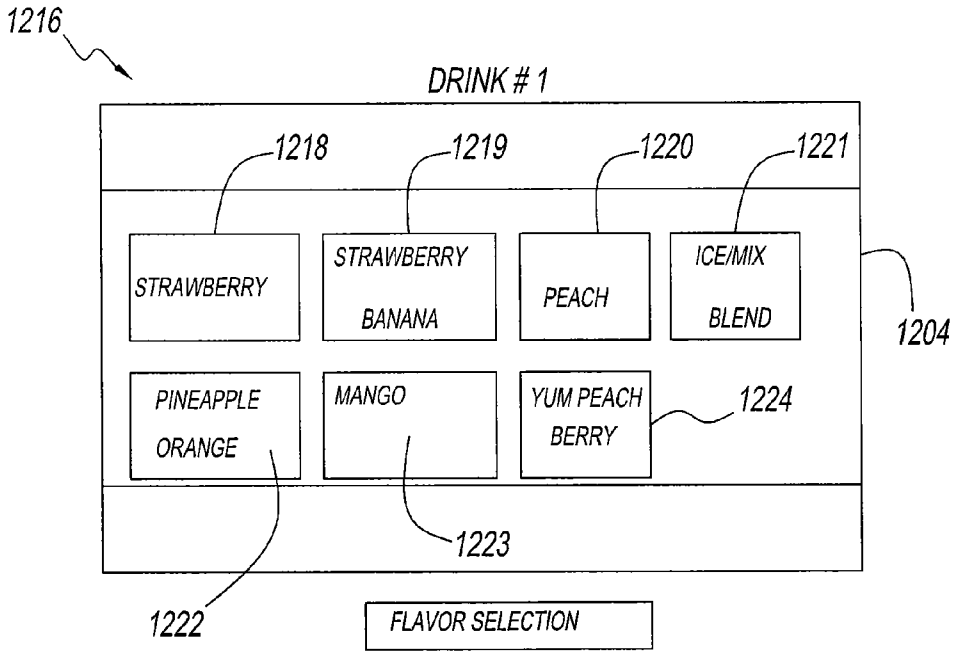
1216
DRINK # 1
1218
1219
1220
1221
STRAWBERRY
STRAWBERRY BANANA
PEACH
ICE/MIX BLEND
1204
PINEAPPLE ORANGE
MANGO
YUM PEACH BERRY
1224
1223
1222
FLAVOR SELECTION

Fig. 49

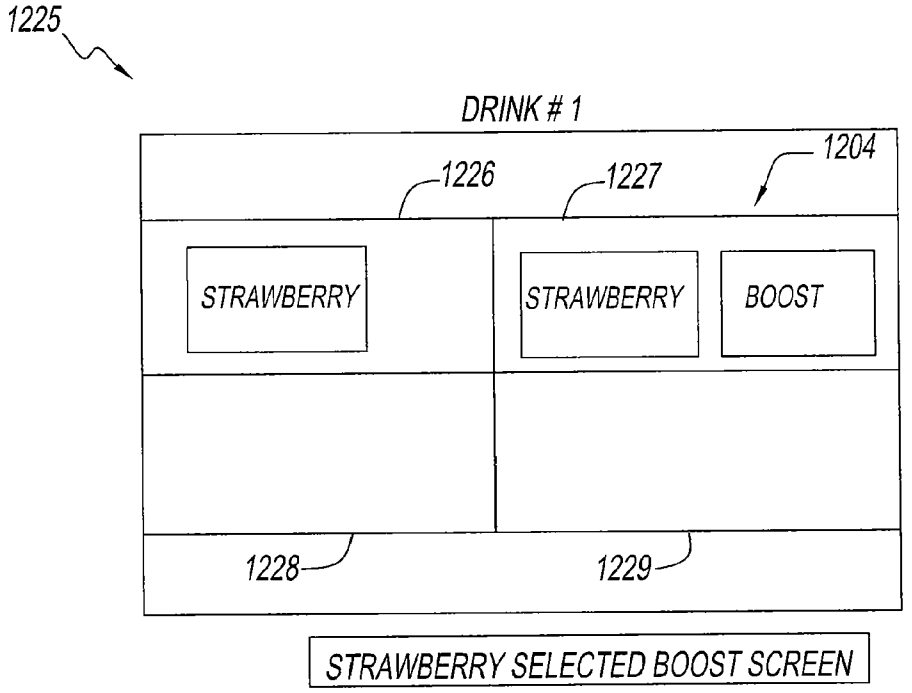
1225
DRINK # 1
1204
1226
1227
STRAWBERRY
STRAWBERRY
BOOST
1228
1229
STRAWBERRY SELECTED BOOST SCREEN

Fig. 50

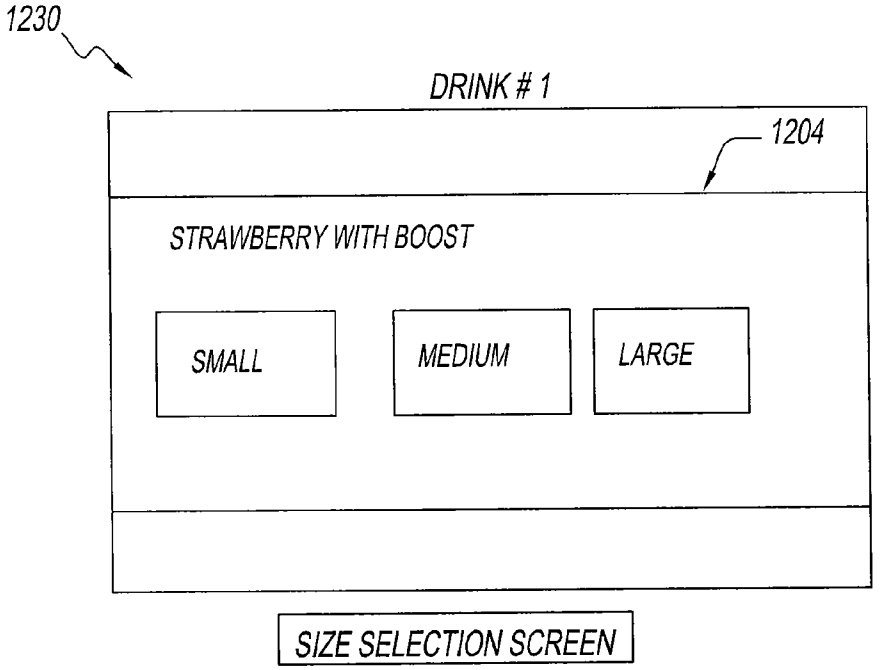
1230
DRINK # 1
1204
STRAWBERRY WITH BOOST
SMALL
MEDIUM
LARGE
SIZE SELECTION SCREEN

Fig. 51

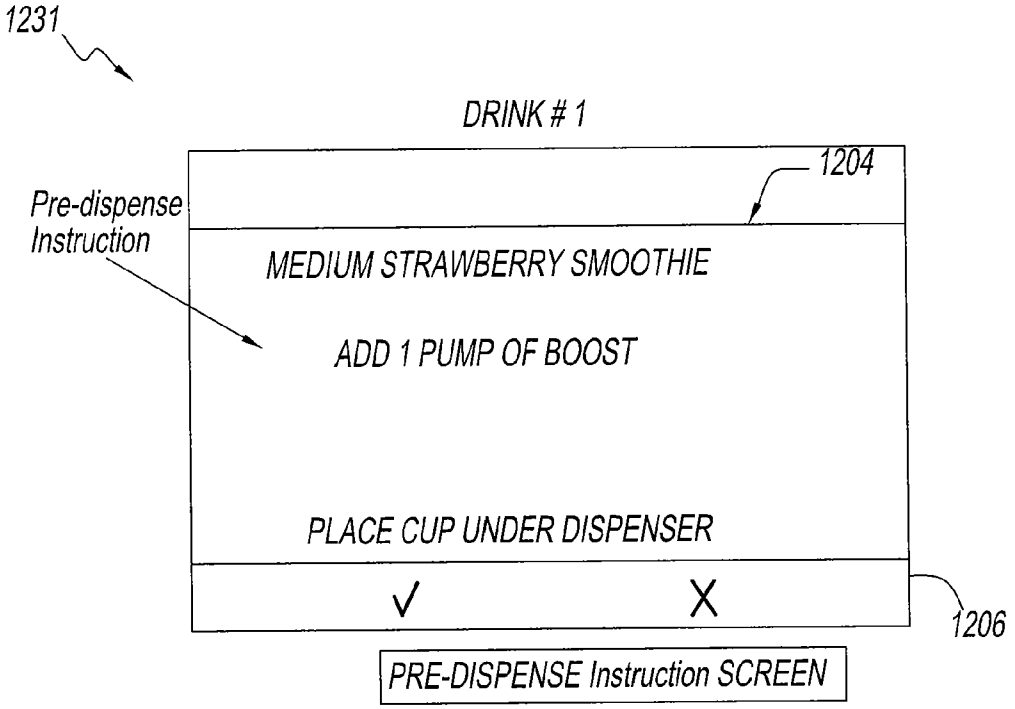
1231
DRINK # 1
1204
Pre-dispense Instruction
MEDIUM STRAWBERRY SMOOTHIE
ADD 1 PUMP OF BOOST
PLACE CUP UNDER DISPENSER
✓
X
1206
PRE-DISPENSE Instruction SCREEN

Fig. 52

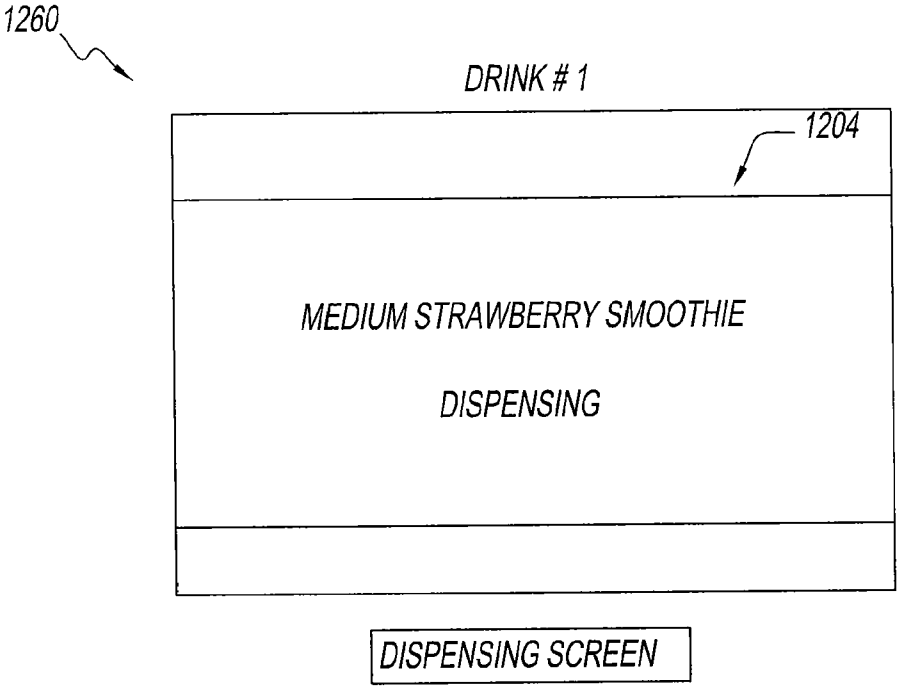
1260
DRINK # 1
1204
MEDIUM STRAWBERRY SMOOTHIE
DISPENSING
DISPENSING SCREEN

Fig. 53

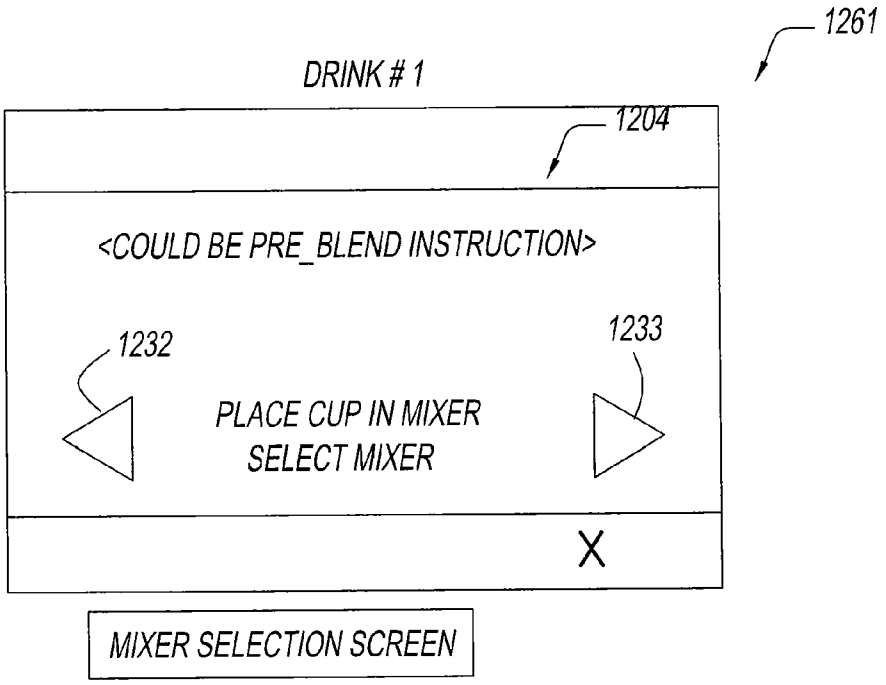
1261
DRINK # 1
1204
<COULD BE PRE_BLEND INSTRUCTION>
1232
1233
PLACE CUP IN MIXER
SELECT MIXER
X
MIXER SELECTION SCREEN

Fig. 54

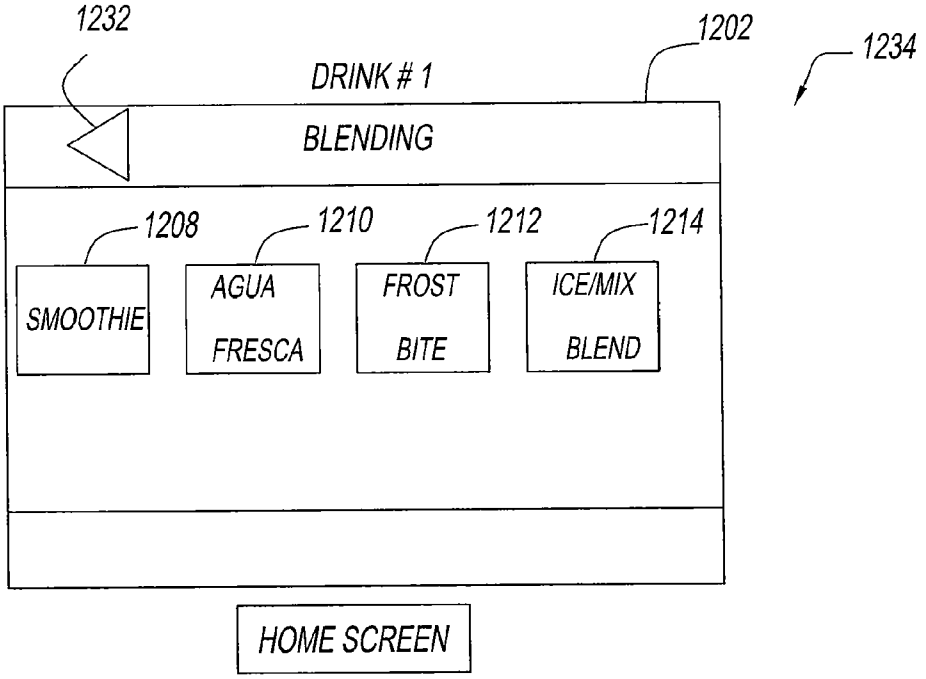
1232
1202
1234
DRINK # 1
BLENDING
1208
1210
1212
1214
SMOOTHIE
AGUA FRESCA
FROST BITE
ICE/MIX BLEND
HOME SCREEN

Fig. 55

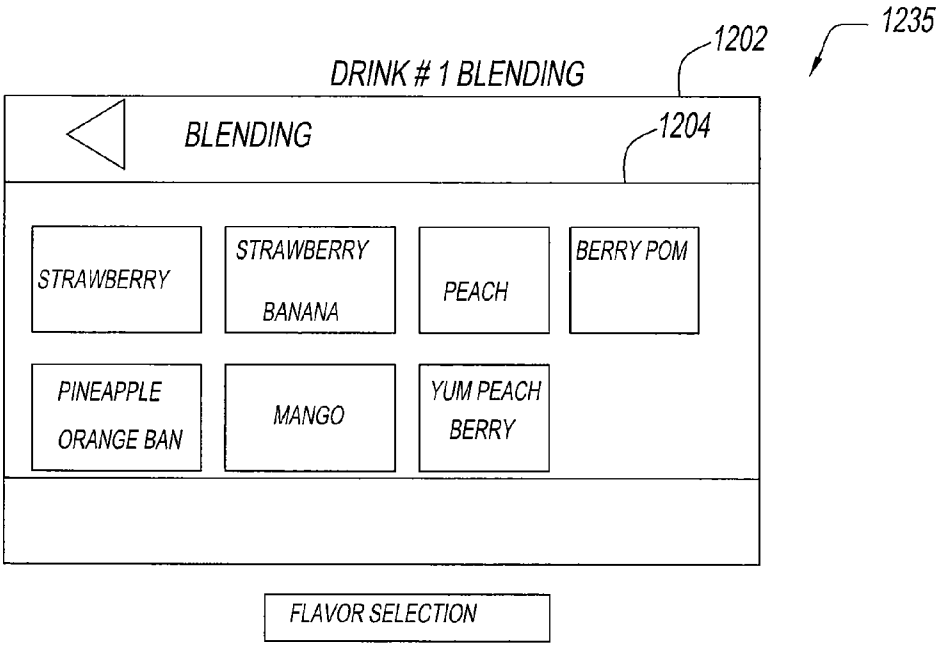
1235
1202
DRINK # 1 BLENDING
BLENDING
1204
STRAWBERRY
STRAWBERRY BANANA
PEACH
BERRY POM
PINEAPPLE ORANGE BAN
MANGO
YUM PEACH BERRY
FLAVOR SELECTION

Fig. 56

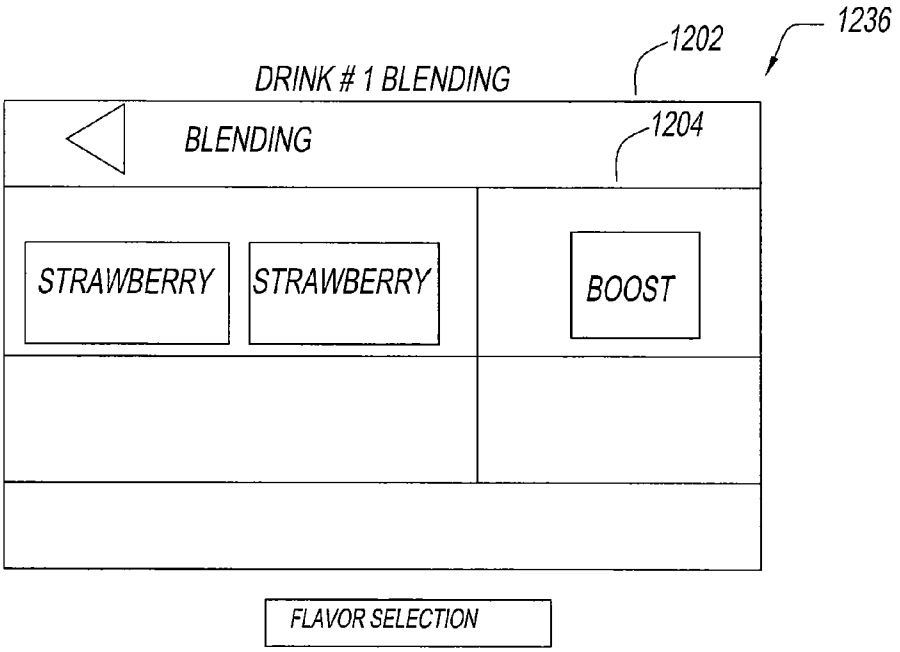
1236
1202
DRINK # 1 BLENDING
BLENDING
1204
STRAWBERRY
STRAWBERRY
BOOST
FLAVOR SELECTION

Fig. 57

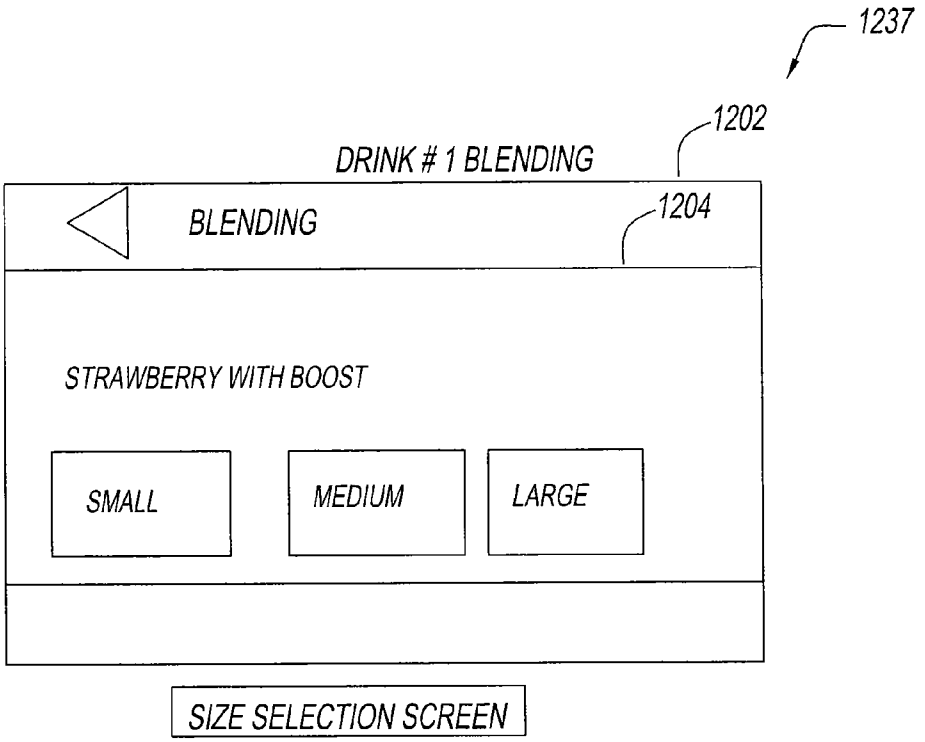
1237
1202
DRINK # 1 BLENDING
BLENDING
1204
STRAWBERRY WITH BOOST
SMALL
MEDIUM
LARGE
SIZE SELECTION SCREEN

Fig. 58

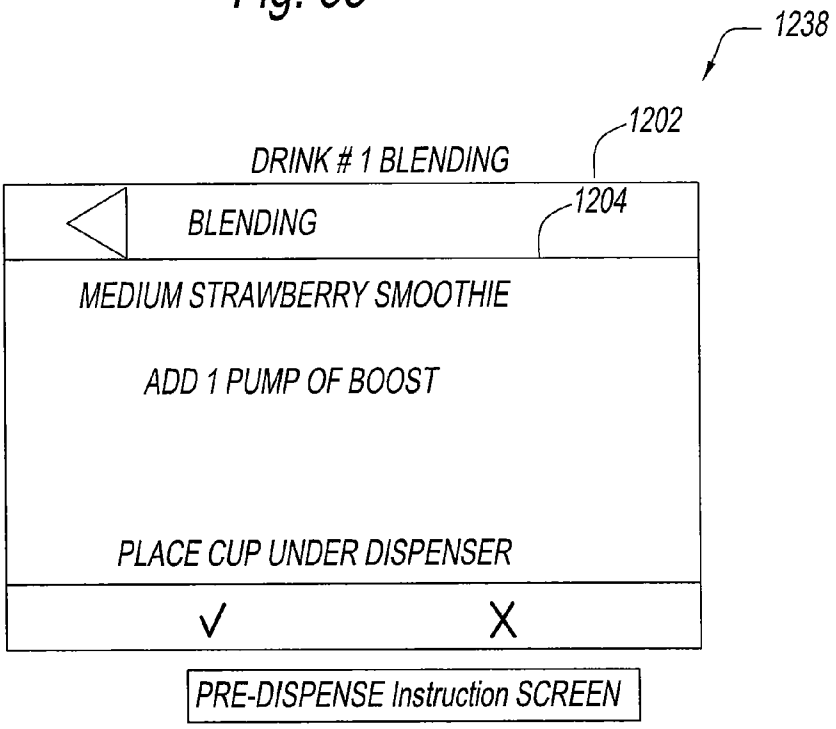
1238
1202
DRINK # 1 BLENDING
BLENDING
1204
MEDIUM STRAWBERRY SMOOTHIE
ADD 1 PUMP OF BOOST
PLACE CUP UNDER DISPENSER
✓
X
PRE-DISPENSE Instruction SCREEN

Fig. 59

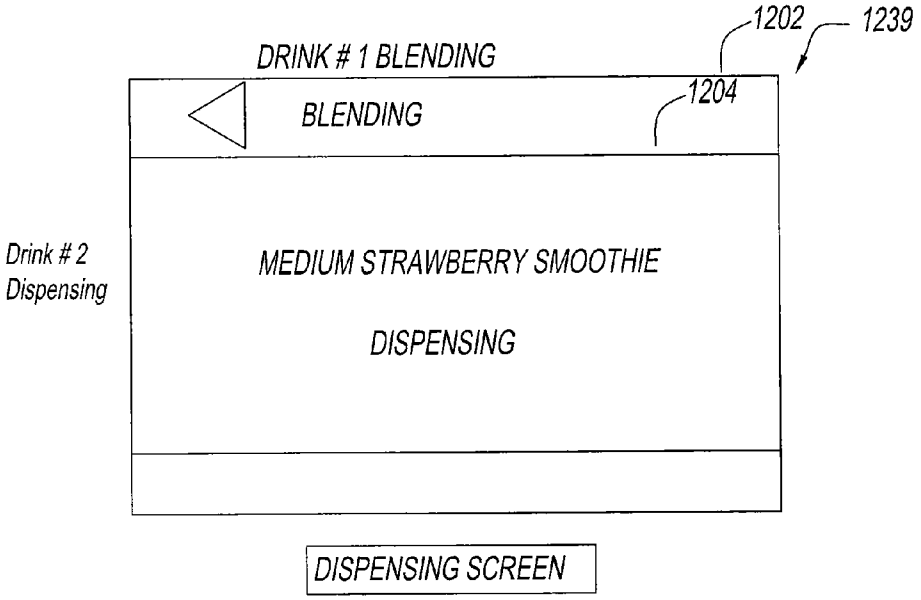
1202
1239
DRINK # 1 BLENDING
1204
BLENDING
Drink # 2
Dispensing
MEDIUM STRAWBERRY SMOOTHIE
DISPENSING
DISPENSING SCREEN

Fig. 60

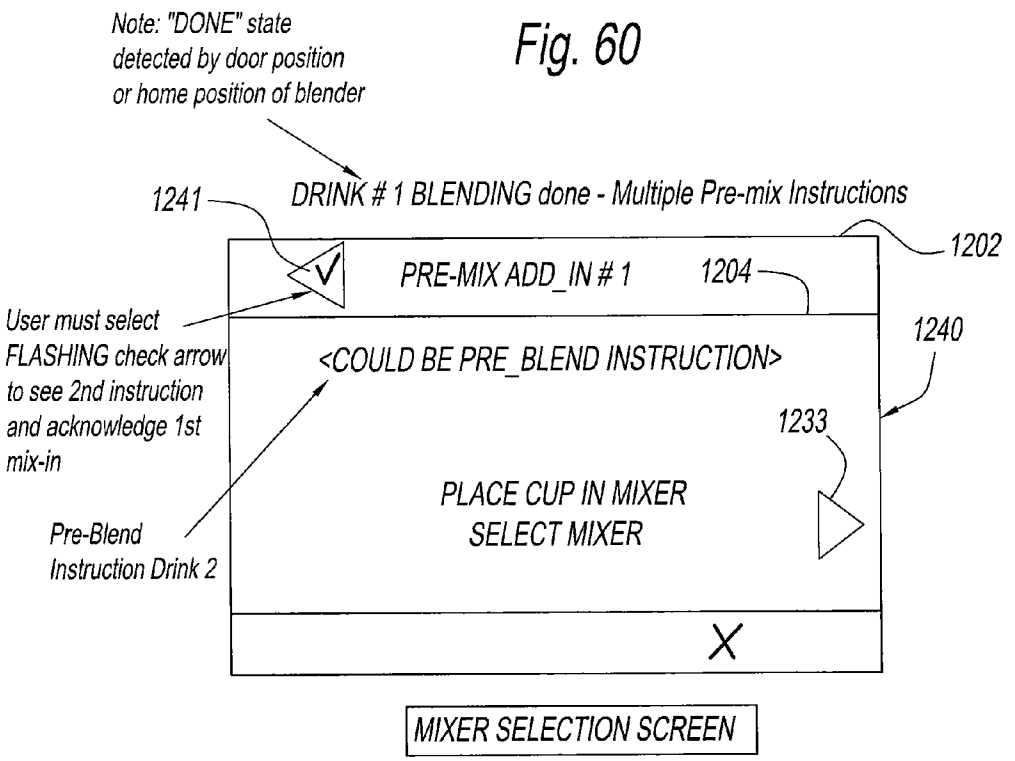
Note: "DONE" state
detected by door position
or home position of blender
1241
DRINK # 1 BLENDING done - Multiple Pre-mix Instructions
1202
PRE-MIX ADD_IN # 1
1204
User must select
FLASHING check arrow
to see 2nd instruction
and acknowledge 1st
mix-in
<COULD BE PRE_BLEND INSTRUCTION>
1240
1233
PLACE CUP IN MIXER
SELECT MIXER
Pre-Blend
Instruction Drink 2
MIXER SELECTION SCREEN

Fig. 61

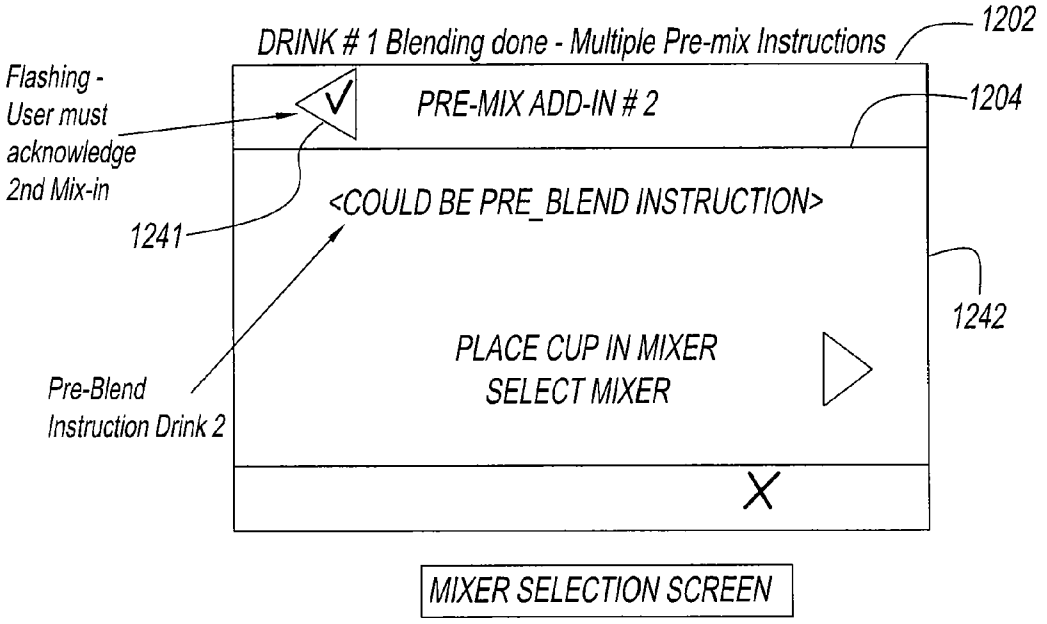
DRINK # 1 Blending done - Multiple Pre-mix Instructions
1202
Flashing - User must acknowledge 2nd Mix-in
PRE-MIX ADD-IN # 2
1204
1241
<COULD BE PRE_BLEND INSTRUCTION>
1242
PLACE CUP IN MIXER
SELECT MIXER
Pre-Blend Instruction Drink 2
MIXER SELECTION SCREEN

Fig. 62

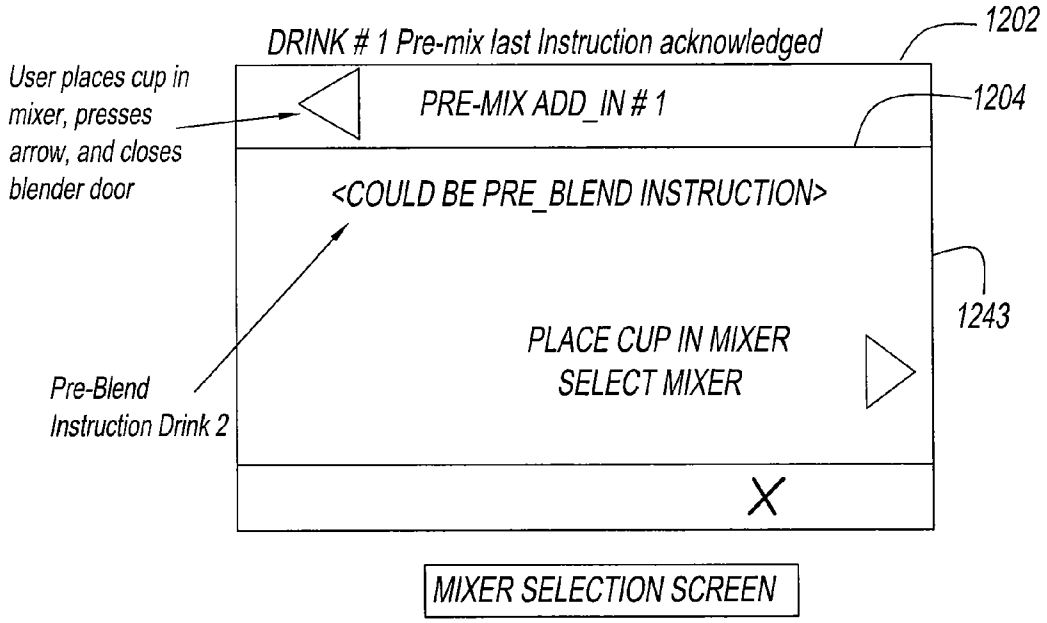
DRINK # 1 Pre-mix last Instruction acknowledged
1202
User places cup in mixer, presses arrow, and closes blender door
PRE-MIX ADD_IN # 1
1204
<COULD BE PRE_BLEND INSTRUCTION>
1243
PLACE CUP IN MIXER
SELECT MIXER
Pre-Blend Instruction Drink 2
MIXER SELECTION SCREEN

Fig. 63

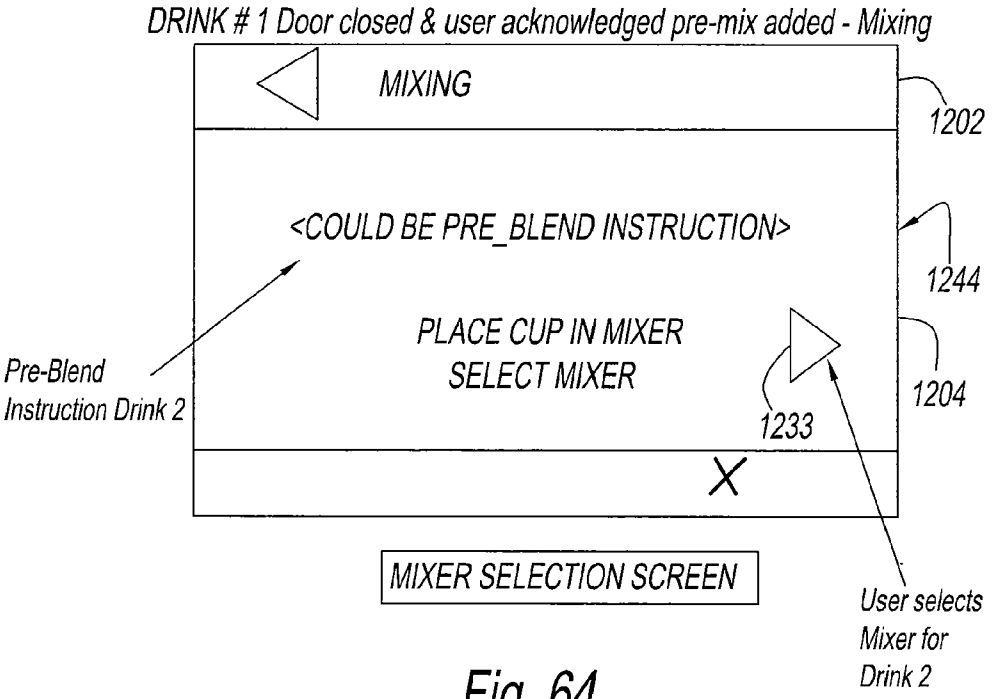
DRINK # 1 Door closed & user acknowledged pre-mix added - Mixing
MIXING
1202
<COULD BE PRE_BLEND INSTRUCTION>
1244
PLACE CUP IN MIXER
SELECT MIXER
1204
Pre-Blend
Instruction Drink 2
1233
MIXER SELECTION SCREEN
User selects
Mixer for
Drink 2

Fig. 64

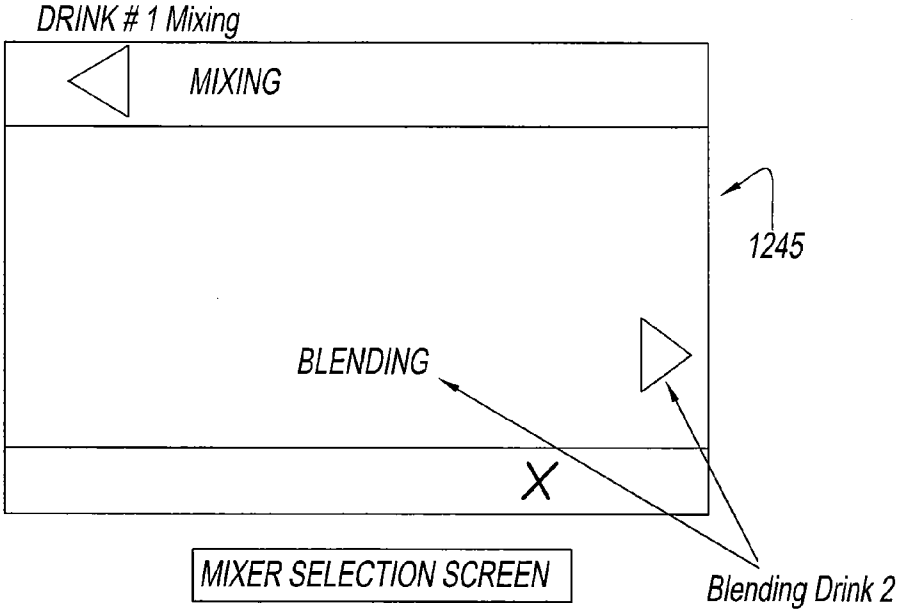
DRINK # 1 Mixing
MIXING
1245
BLENDING
MIXER SELECTION SCREEN
Blending Drink 2

Fig. 65

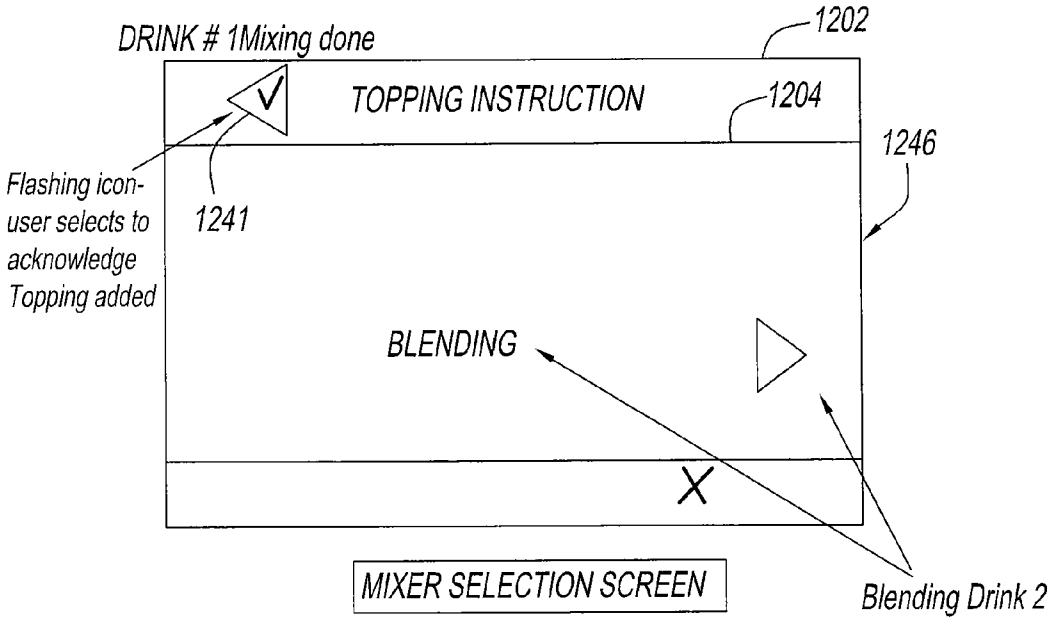
DRINK # 1Mixing done
1202
TOPPING INSTRUCTION
1204
1246
Flashing icon-
user selects to
acknowledge
Topping added
1241
BLENDING
MIXER SELECTION SCREEN
Blending Drink 2

Fig. 66

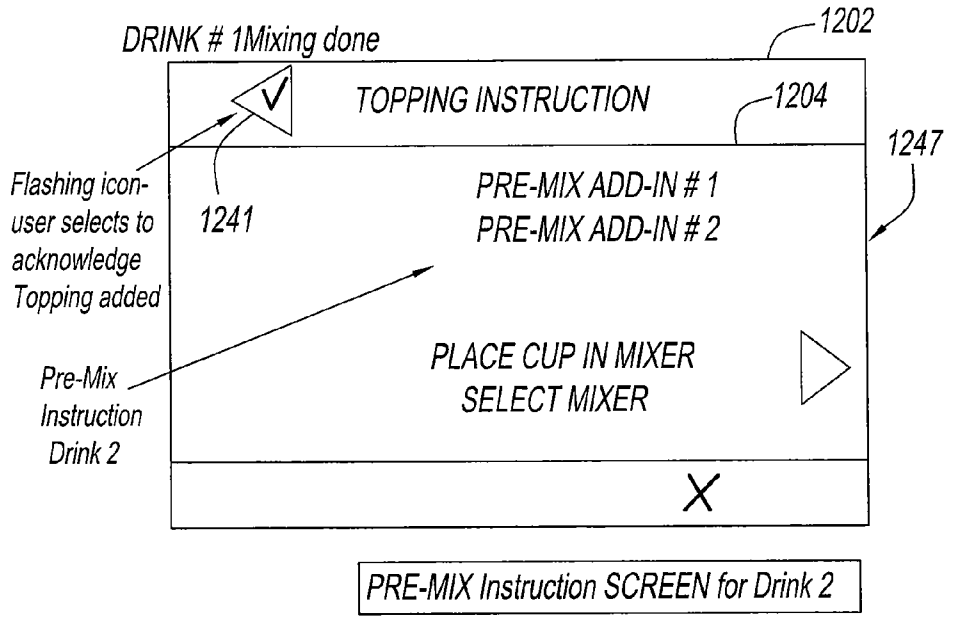
DRINK # 1Mixing done
1202
TOPPING INSTRUCTION
1204
1247
Flashing icon-
user selects to
acknowledge
Topping added
1241
PRE-MIX ADD-IN # 1
PRE-MIX ADD-IN # 2
Pre-Mix
Instruction
Drink 2
PLACE CUP IN MIXER
SELECT MIXER
PRE-MIX Instruction SCREEN for Drink 2

Fig. 67

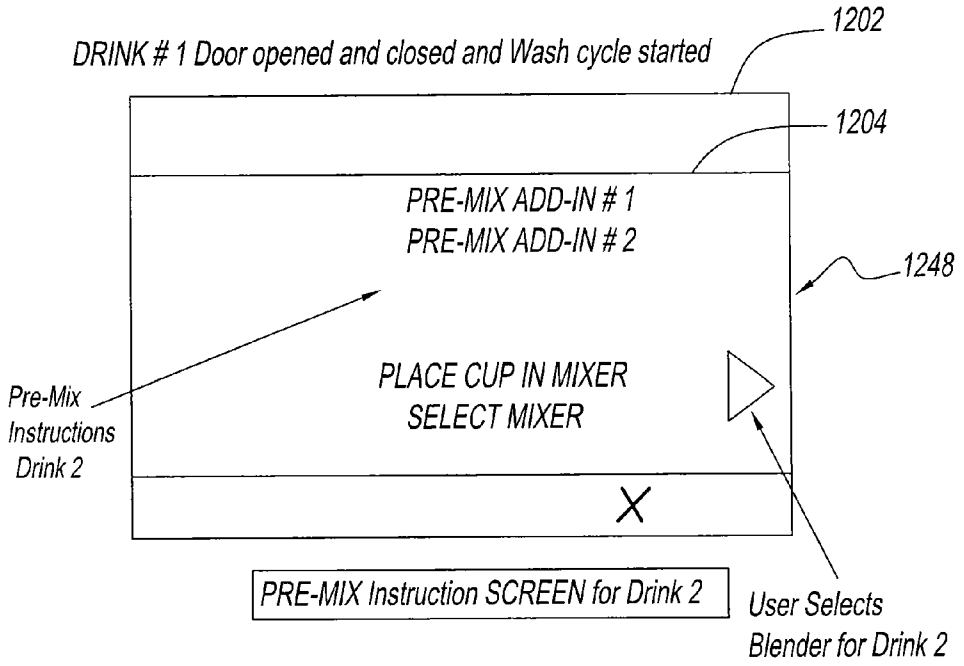
DRINK # 1 Door opened and closed and Wash cycle started
1202
1204
PRE-MIX ADD-IN # 1
PRE-MIX ADD-IN # 2
1248
Pre-Mix Instructions Drink 2
PLACE CUP IN MIXER
SELECT MIXER
X
PRE-MIX Instruction SCREEN for Drink 2
User Selects Blender for Drink 2

Fig. 68

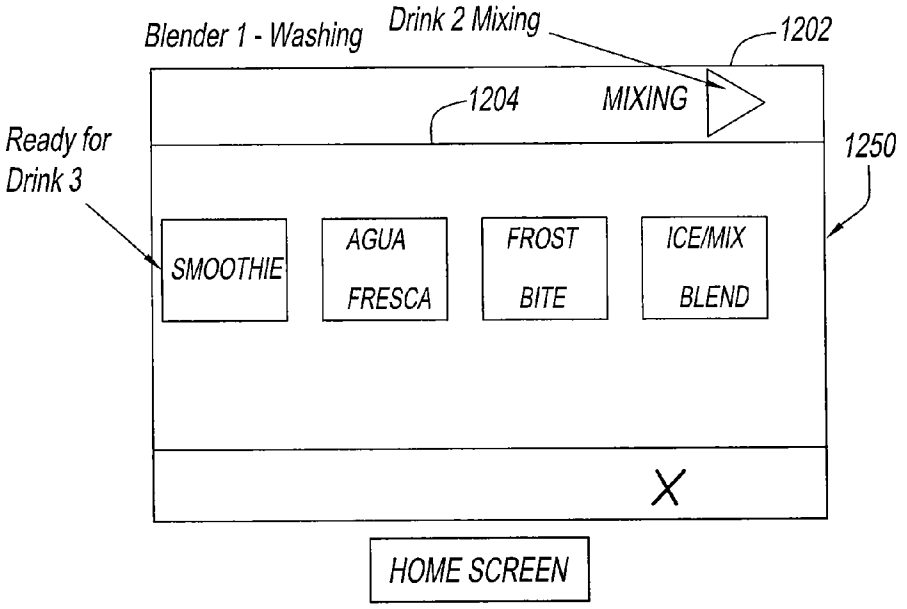
Blender 1 - Washing
Drink 2 Mixing
1202
1204
MIXING
Ready for Drink 3
1250
SMOOTHIE
AGUA FRESCA
FROST BITE
ICE/MIX BLEND
X
HOME SCREEN

Fig. 69

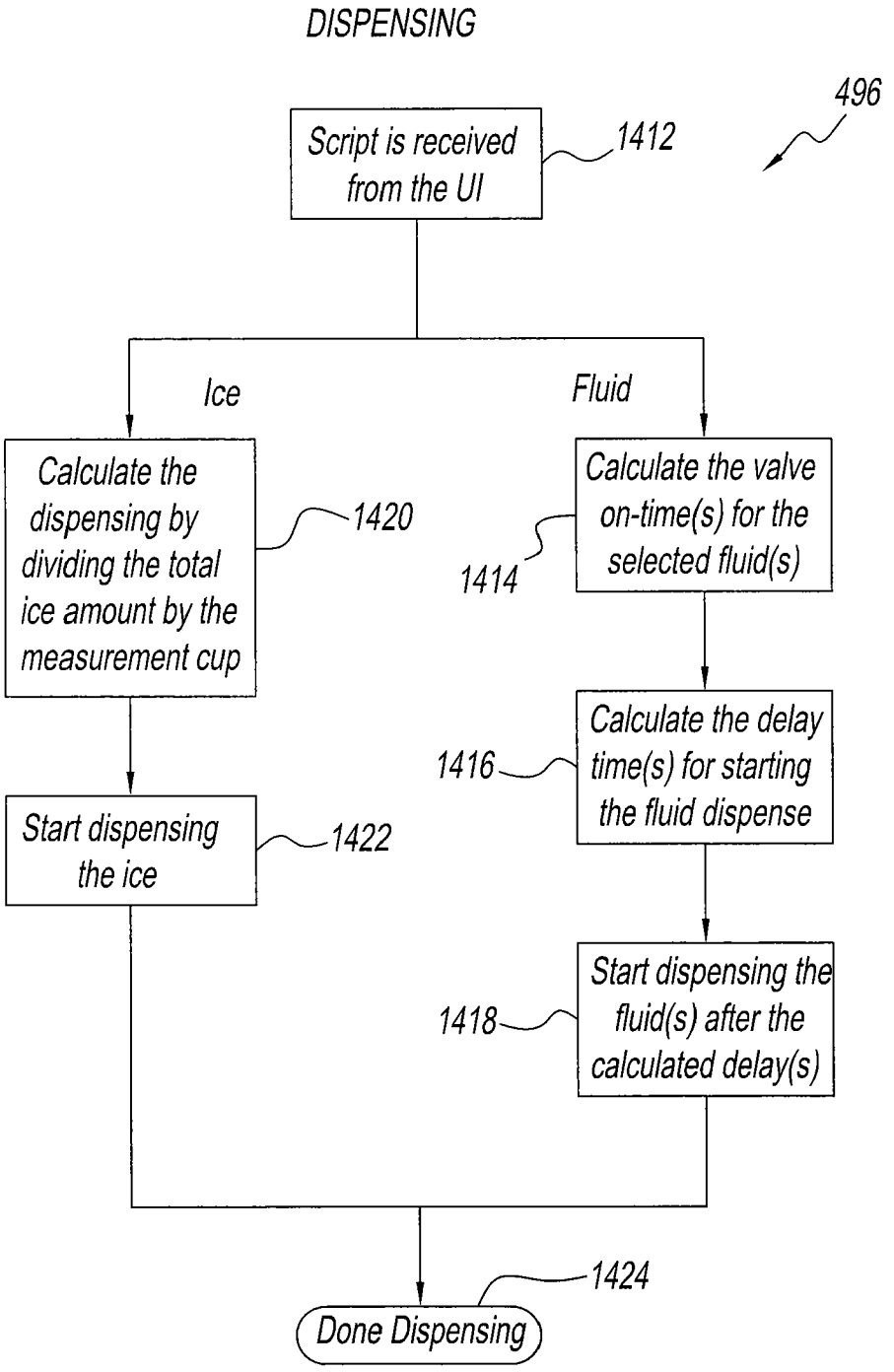
DISPENSING
496
Script is received from the UI
1412
Ice
Fluid
Calculate the dispensing by dividing the total ice amount by the measurement cup
1420
Calculate the valve on-time(s) for the selected fluid(s)
1414
Calculate the delay time(s) for starting the fluid dispense
1416
Start dispensing the ice
1422
Start dispensing the fluid(s) after the calculated delay(s)
1418
1424
Done Dispensing

Fig. 70

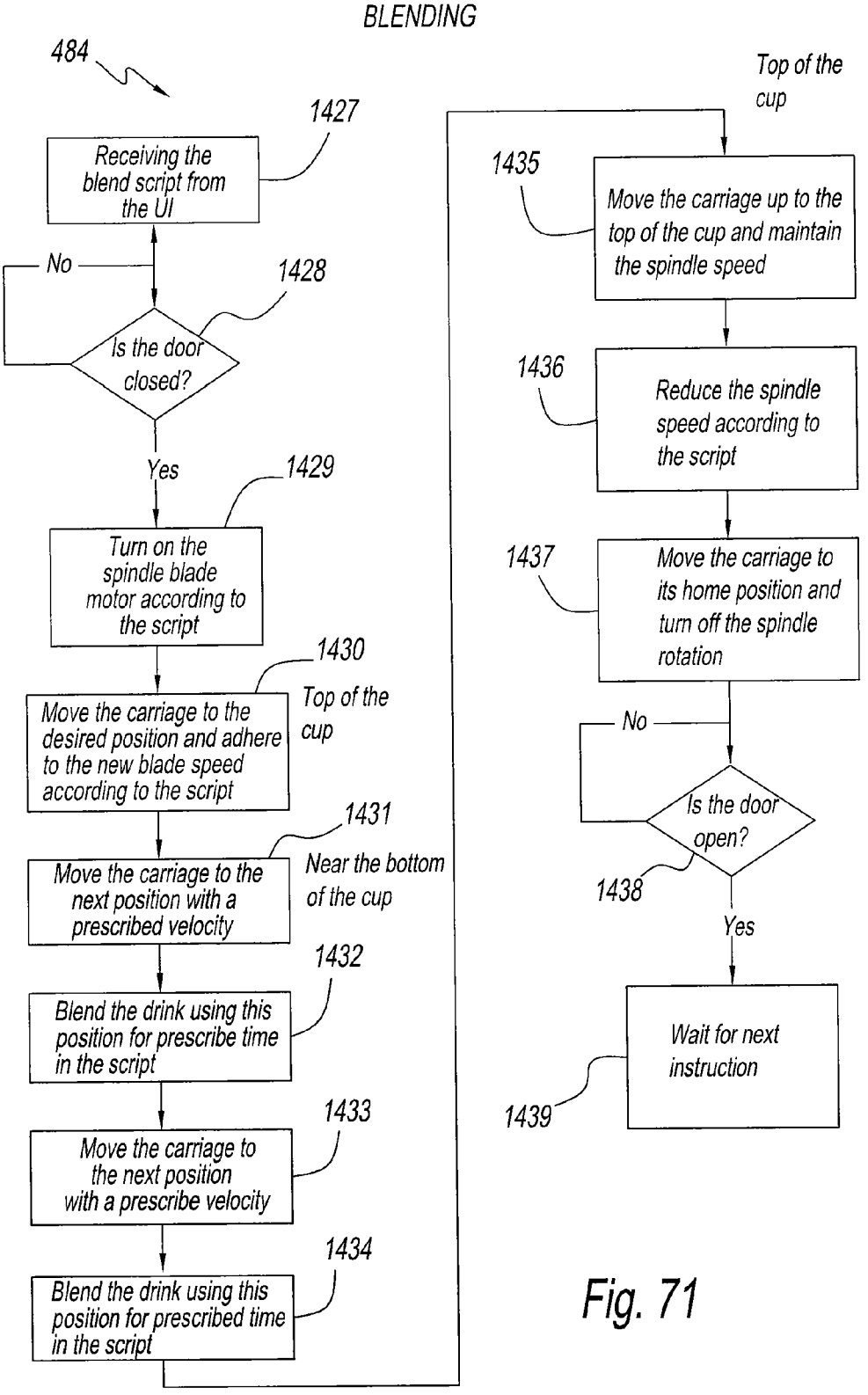
BLENDING
484
1427
Receiving the blend script from the UI
No
1428
Is the door closed?
Yes
1429
Turn on the spindle blade motor according to the script
1430
Move the carriage to the desired position and adhere to the new blade speed according to the script
Top of the cup
1431
Move the carriage to the next position with a prescribed velocity
Near the bottom of the cup
1432
Blend the drink using this position for prescribe time in the script
1433
Move the carriage to the next position with a prescribe velocity
1434
Blend the drink using this position for prescribed time in the script
Top of the cup
1435
Move the carriage up to the top of the cup and maintain the spindle speed
1436
Reduce the spindle speed according to the script
1437
Move the carriage to its home position and turn off the spindle rotation
No
Is the door open?
1438
Yes
Wait for next instruction
1439

Fig. 71

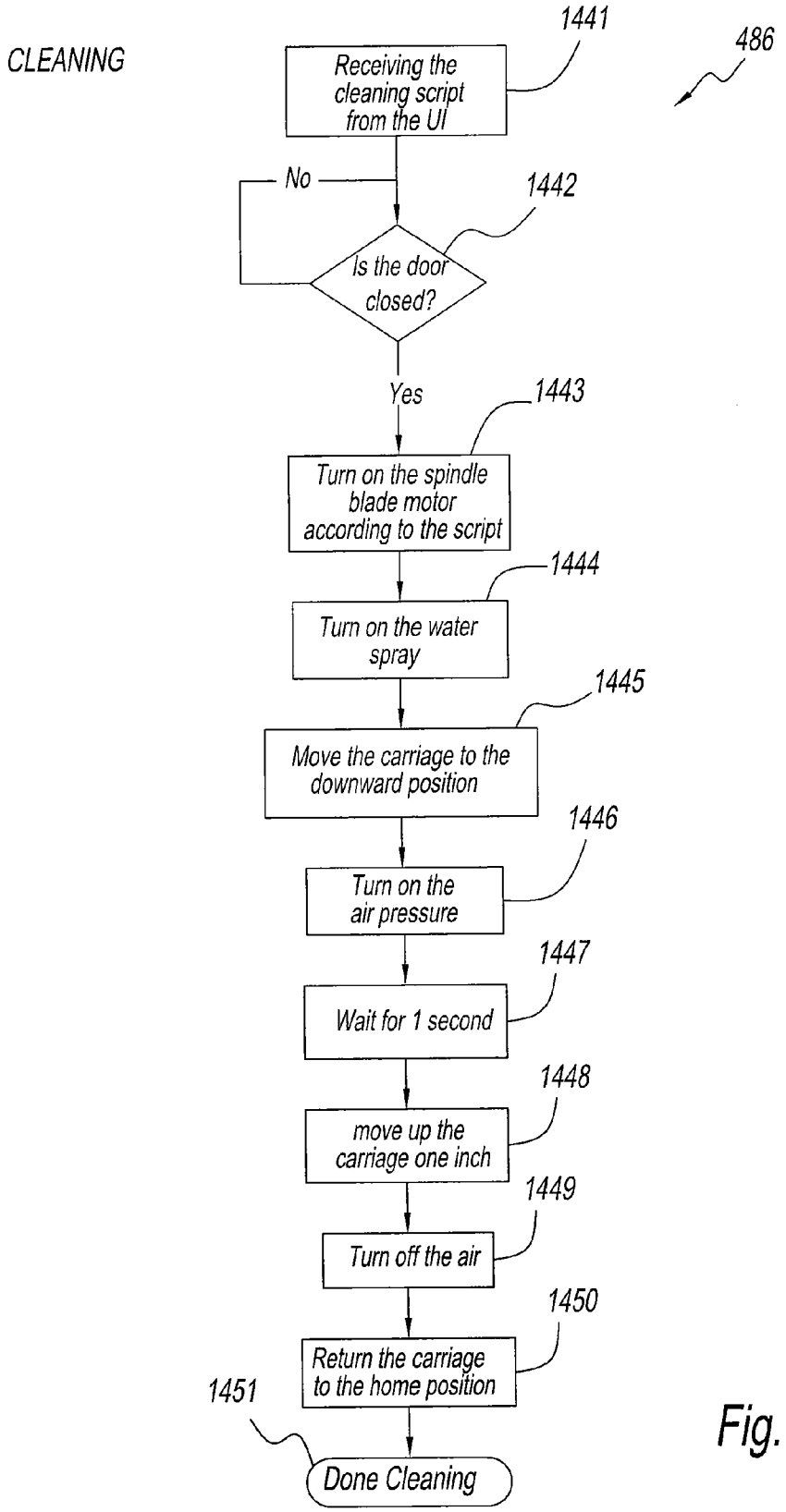
CLEANING
1441
Receiving the cleaning script from the UI
486
No
1442
Is the door closed?
Yes
1443
Turn on the spindle blade motor according to the script
1444
Turn on the water spray
1445
Move the carriage to the downward position
1446
Turn on the air pressure
1447
Wait for 1 second
1448
move up the carriage one inch
1449
Turn off the air
1450
Return the carriage to the home position
1451
Done Cleaning

Fig. 72

CONTOLLER AND METHOD OF CONTROLLING AN INTEGRATED SYSTEM FOR DISPENSING AND BLENDING/MIXING BEVERAGE INGREDIENTS

CROSS-REFERENCED APPLICATION

[0001] This application is a continuation of prior application Ser. No. 13/541,307, filed Jul. 3, 2012, which is a divisional of application Ser. No. 12/633,793, filed on Dec. 8, 2009, which claims the benefit of U.S. Provisional Application No. 61/120,772, filed on Dec. 8, 2008. Application Ser. No. 13/541,307, filed Jul. 3, 2012, application Ser. No. 12/633,793, filed on Dec. 8, 2009, and U.S. Provisional Application No. 61/120,772, filed on Dec. 8, 2008 are incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present disclosure relates generally to an integrated method and system for dispensing and blending/mixing beverage flavor/ingredients, thereby producing a beverage, e.g., a smoothie. More particularly, the present disclosure relates to a controller and method for controlling an integrated assembly that includes a flavor/ingredient dispensing module, an ice making and portion control module, and a blender/mixer/cleaner module which is capable of dispensing all primary flavor/ingredients and, optionally, portioning and dispensing onboard manufactured ice into a single serving cup; blending and/or mixing such flavor/ingredients and ice to form a pre-selected beverage; and cleaning the blender shaft, blade and mixing compartment post mixing to avoid flavor contamination and to satisfy health and sanitary regulations.

[0004] 2. Description of Related Art

[0005] Multiple steps are involved in creating a beverage or drink, for example, a smoothie drink, from beginning to end, and potential issues can occur at all stages. Smoothie making requires the use of blender pots to create the drink, meaning that the operator is required to purchase, maintain, and then store small wares (blender pots). Limitations of current technology also require the labor intensive transportation of ice to the smoothie machine from a separate icemaking machine in order to maintain a level of usable ice in the smoothie machine. This ice transfer is an issue for many reasons. First, labor is required to transport the ice typically from a back storage room to the point of sale (POS) counter area of a restaurant, where the smoothie machines are typically located. This ice transfer can create a safety hazard for employees who could slip and fall on wet floors or injure themselves by improperly carrying a heavy bucket. It can also increase the likelihood of ice contamination through mishandling.

[0006] Once the ice is stocked, the employee must manually add an estimated amount to the blender pot. Since the amount of ice is not measured, but rather "guesstimated" by each employee, this ingredient is not precise and, therefore, makes it difficult to create the same franchised drink time after time.

[0007] After the ice is manually added, the juice and any additional fruit or flavor "mix-in" is added by the operator as well. Finally, a size of cup is chosen, and the drink is poured. This last step presents the largest chance for waste. Since the employee must portion the ingredients by hand, any overspill of the drink is left in the blender pot. At each step during this manual process, portion control is compromised, and money is potentially wasted on excess ingredients.

[0008] Once the order is complete and the customer has his or her drink, there is one last step to finalize the process—the method of manually cleaning the blender pot after each use to prevent the transfer of flavors and germs. Often, to save time, the blender pots are rinsed in a sink, which can compromise sanitation. While this might seem insignificant, flavor contamination can be a serious threat if customers have food allergies. Another drawback to the washing process is that it involves a substantial amount of time and labor on the part of the operator.

[0009] Each step in this process to create a smoothie takes time, typically four to five minutes, and that time could be better spent serving customers or taking more food and beverage orders, directly contributing to the bottom line.

[0010] Although premium beverages such as smoothies are growing in popularity, most quick-service restaurants (QSRs) are unable to offer customers these options due to the time limitations of the quick-serve world. Those QSR owners that do opt to serve smoothies are confronted with a common set of challenges—mainly how to sell the same franchised drink time after time with existing labor and equipment limitations.

[0011] Accordingly, it has been determined by the present disclosure, there is a need for an assembly that dispenses and mixes beverage flavors/ingredients with ice in one integrated system, and thereafter self cleans for immediate reuse without subsequent flavor contamination. It has been further determined by the present disclosure, there is a need for an assembly for dispensing ice that uniformly dispenses ice. It has been further determined by the present disclosure, there is an additional need for an assembly for mixing a beverage which is capable of automatically rinsing/cleaning/sanitizing the blender housing, blender shaft and blender blade.

SUMMARY

[0012] In an embodiment of the controller of the present disclosure, the controller controls an integrated beverage system that comprises a dispensing module that dispenses one or more ingredients into a container and a blending/mixing module that blends and/or mixes the ingredients in the container. The controller comprises a controller apparatus that controls the dispensing module and the blending/mixing module to prepare a first beverage and a second beverage concurrently.

[0013] In another embodiment of the controller of the present disclosure, the controller apparatus controls the dispensing module to dispense a first set of one or more ingredients for the first beverage into a first container and then controls the blending/mixing module to blend and/or mix the first set of ingredients in the first container and simultaneously controls the dispensing module to start dispensing a second set of one or more ingredients for the second beverage into a second container.

[0014] In another embodiment of the controller of the present disclosure, the first and second containers are beverage cups.

[0015] In another embodiment of the controller of the present disclosure, the controller apparatus controls the dispensing module and the blending/mixing module based on beverage requests received from a user operated entry device.

[0016] In another embodiment of the controller of the present disclosure, the controller apparatus controls the dis-

pensing module to dispense ice and fluid simultaneously or in a layered manner with a layer of ice first and then a layer of fluid and optionally by another layer of ice and/or fluid.

[0017] In another embodiment of the controller of the present disclosure, the one or more of ingredients are selected from the group consisting of: ice, water, flavor and additive.

[0018] In another embodiment of the controller of the present disclosure, the controller apparatus monitors conditions of the integrated beverage system via connections to one or more sensors of the integrated beverage system.

[0019] In another embodiment of the controller of the present disclosure, the integrated beverage system further comprises an ice maker. At least one of the ingredients is ice. The controller apparatus controls the dispensing module to deliver the ice to at least of the first and second containers.

[0020] In another embodiment of the controller of the present disclosure, the dispensing module comprises a plurality of storage containers. A plurality of the ingredients is stored in separate ones of the storage containers. The controller apparatus controls the dispensing module to deliver at least one of the plurality of ingredients from a corresponding storage container to the first or second container.

[0021] In another embodiment of the controller of the present disclosure, the storage containers are flexible bags.

[0022] In another embodiment of the controller of the present disclosure, the dispensing module further comprises a single dispensing nozzle for the storage containers. The controller apparatus controls the dispensing module to deliver the selected ingredients from the separate storage containers via separate delivery paths to the nozzle for dispensing to the first or second container.

[0023] In another embodiment of the controller of the present disclosure, the controller apparatus comprises a plurality of micro-controllers that control the dispensing module and the blending/mixing module to prepare the first and second beverages based on a first and a second recipe script, respectively.

[0024] In another embodiment of the controller of the present disclosure, the script of the first and second recipe scripts comprises a beverage container size, a user selected beverage, and a first ingredient. At least one of the micro-controllers, based on the beverage container size, the first ingredient and the user selected beverage type, controls the dispenser module to portion the first ingredient.

[0025] In another embodiment of the controller of the present disclosure, the micro-controllers comprise: a first micro-controller that responds to user data entered via a user entry device to provide the first and second recipe scripts; a second micro-controller that uses the first and second recipe scripts to control the dispensing module in the dispensing of a first set of the ingredients into a first container and a second set of the ingredients into a second container, respectively; and a third micro-controller that uses the first and second recipe scripts to blend and/or mix the first and second sets of ingredients in the first and second containers to produce the first and second beverages, respectively.

[0026] In another embodiment of the controller of the present disclosure, the blending/mixing module comprises a spindle assembly that is rotatable and that is movable vertically into and out of the beverage container. The third micro-controller uses the first or second script to drive a first motor that rotates the spindle assembly and a second motor that moves the spindle assembly vertically.

[0027] In another embodiment of the controller of the present disclosure, one of the ingredients is ice. The third micro-controller uses the first or second script to rotate the spindle assembly in a first manner chop an ice particle size from coarse to fine and/or in a second manner leaves the ice in a coarse particle size.

[0028] In another embodiment of the controller of the present disclosure, the first or second script includes a size of the beverage container, a speed and dwell time for each of a plurality of blending levels in the beverage container. The third micro-controller uses the first or second script to control to move the spindle assembly vertically to each of the levels and to rotate the spindle assembly at each level with the speed and for the dwell time for that level according to the first or second script.

[0029] In another embodiment of the controller of the present disclosure, the blending/mixing module further comprises a door and a position sensor, wherein the position sensor is selected from the group consisting of: spindle assembly home, door open, and spindle assembly home and door open.

[0030] In another embodiment of the controller of the present disclosure, the blending/mixing module further comprises a cleaning assembly. The third micro-controller using the first or second script operates the cleaning assembly to inject a cleaning fluid into a beverage container volume after the beverage has been removed therefrom with the first or second beverage.

[0031] In another embodiment of the controller of the present disclosure, the cleaning assembly comprises a spray device located to inject the cleaning fluid, a cleaning fluid valve and an air valve in communication with a delivery conduit to the spray device. The third micro-controller uses the script to operate the cleaning fluid valve to provide the cleaning fluid to the spray device via a conduit and the air valve to inject air into the conduit to increase a velocity of flow of the cleaning fluid in the beverage container volume.

[0032] In another embodiment of the controller of the present disclosure, the cleaning assembly comprises a spindle assembly. The third micro-controller responds to the first or second script to lower the spindle assembly into the volume to enhance a coverage of the cleaning fluid within the volume.

[0033] In another embodiment of the controller of the present disclosure, the cleaning fluid is selected from the group consisting of: water and sanitizing fluid.

[0034] In another embodiment of the controller of the present disclosure, the blending/mixing module is a first blending/mixing module. The integrated beverage system further comprises a second blending/mixing module. The controller apparatus executes a program to concurrently prepare the first and second beverages by controlling the first and second blending/mixing modules to time share the dispensing module.

[0035] In another embodiment of the controller of the present disclosure, the integrated beverage system further comprises an interactive display. The program causes the controller apparatus to present a series of interactive screens on the display, to respond to user entries via the interactive screens to define first and second sets of ingredients for the first and second beverages, to provide a first script and a second script for the first and second beverages, respectively, and to use the first and second scripts to control the dispensing

module to dispense the first and second sets of ingredients into a first container and a second container, respectively, on a time shared basis.

[0036] In an embodiment of the method of the present disclosure, the method controls am integrated beverage system that comprises a dispensing module that dispenses one or more ingredients into a beverage container and a blending/mixing module that blends and/or mixes the ingredients in the beverage container. The method controls the dispensing module and the blending/mixing module to prepare first and second beverages concurrently.

[0037] In another embodiment of the method of the present disclosure, the method further comprises: controlling the dispensing module to dispense a first set of one or more ingredients for the first beverage into a first container; controlling the blending/mixing module to blend and/or mix the first set of ingredients in the first container; and simultaneously controlling the dispensing module to start dispensing a second set of one or more ingredients for the second beverage into a second container while the first set of ingredients is blending in the blending/mixing module.

[0038] In another embodiment of the method of the present disclosure, the first and second containers are beverage cups.

[0039] In another embodiment of the method of the present disclosure, the dispensing module and the blending/mixing module are controlled based on beverage requests received from a user operated entry device.

[0040] In another embodiment of the method of the present disclosure, the dispensing module is controlled to dispense ice and fluid simultaneously or in a layered manner with a layer of ice first and then a layer of fluid and optionally by another layer of ice and/or fluid.

[0041] In another embodiment of the method of the present disclosure, the one or more of ingredients are selected from the group consisting of: ice, water, flavor and additive.

[0042] In another embodiment of the method of the present disclosure, the controller apparatus monitors conditions of the integrated beverage system via connections to one or more sensors of the integrated beverage system.

[0043] In another embodiment of the method of the present disclosure, the integrated beverage system further comprises an ice maker. At least one of the ingredients is ice. The dispensing module is controlled to deliver the ice to at least of the first and second containers.

[0044] In another embodiment of the method of the present disclosure, the dispensing module comprises a plurality of storage containers. A plurality of the ingredients is stored in separate ones of the storage containers. The dispensing module is controlled to deliver at least one of the plurality of ingredients from a corresponding storage container to the first or second container.

[0045] In another embodiment of the method of the present disclosure, the storage containers are flexible bags.

[0046] In another embodiment of the method of the present disclosure, the dispensing module further comprises a single dispensing nozzle for the storage containers. The method further controls the dispensing module to deliver the selected ingredients from the separate storage containers via separate delivery paths to the nozzle for dispensing to the first or second container.

[0047] In another embodiment of the method of the present disclosure, the controller apparatus comprises a plurality of micro-controllers. The method further controls the dispensing module and the blending/mixing module to prepare the first and second beverages based on a first and a second recipe script, respectively.

[0048] In another embodiment of the method of the present disclosure, the script of the first and second recipe scripts comprises a beverage container size, a user selected beverage, and a first ingredient. At least one of the micro-controllers, based on the beverage container size, the first ingredient and the user selected beverage type, controls the dispenser module to portion the first ingredient.

[0049] In another embodiment of the method of the present disclosure, the micro-controllers comprise a first micro-controller, a second micro-controller and a third micro-controller. The method further comprises: using the first micro-controller that responds to user data entered via a user entry device to provide the first and second recipe scripts; using the second micro-controller that uses the first and second recipe scripts to control the dispensing module in the dispensing of a first set of the ingredients into a first container and a second set of the ingredients into a second container, respectively; and using a third micro-controller that uses the first and second recipe scripts to blend and/or mix the first and second sets of ingredients in the first and second containers to produce the first and second beverages, respectively.

[0050] In another embodiment of the method of the present disclosure, the blending/mixing module comprises a spindle assembly that is rotatable and that is movable vertically into and out of the beverage container. The method further comprises using the third micro-controller with the first or second script to drive a first motor that rotates the spindle assembly and a second motor that moves the spindle assembly vertically.

[0051] In another embodiment of the method of the present disclosure, one of the ingredients is ice. The method further comprises using the third micro-controller with the first or second script to rotate the spindle assembly in a first manner chop an ice particle size from coarse to fine and/or in a second manner leaves the ice in a coarse particle size.

[0052] In another embodiment of the method of the present disclosure, the first or second script includes a size of the beverage container, a speed and dwell time for each of a plurality of blending levels in the beverage container. The method further comprises using third micro-controller with the first or second script to control to move the spindle assembly vertically to each of the levels and to rotate the spindle assembly at each level with the speed and for the dwell time for that level according to the first or second script.

[0053] In another embodiment of the method of the present disclosure, the blending/mixing module further comprises a door and a position sensor. The position sensor is selected from the group consisting of: spindle assembly home, door open, and spindle assembly home and door open.

[0054] In another embodiment of the method of the present disclosure, the blending/mixing module further comprises a cleaning assembly. The method further comprises using the third micro-controller with the first or second script to operate the cleaning assembly to inject a cleaning fluid into a beverage container volume after the beverage has been removed therefrom with the first or second beverage.

[0055] In another embodiment of the method of the present disclosure, the cleaning assembly comprises a spray device located to inject the cleaning fluid, a cleaning fluid valve and an air valve in communication with a delivery conduit to the spray device. The method further comprises using the third

micro-controller with the first or second script to operate the cleaning fluid valve to provide the cleaning fluid to the spray device via a conduit and the air valve to inject air into the conduit to increase a velocity of flow of the cleaning fluid in the beverage container volume.

[0056] In another embodiment of the method of the present disclosure, the cleaning assembly comprises a spindle assembly. The method further comprises using the third micro-controller to respond to the first or second script to lower the spindle assembly into the volume to enhance a coverage of the cleaning fluid within the volume.

[0057] In another embodiment of the method of the present disclosure, the cleaning fluid is selected from the group consisting of: water and sanitizing fluid.

[0058] In another embodiment of the method of the present disclosure, the blending/mixing module is a first blending/mixing module. The integrated beverage system further comprises a second blending/mixing module. The method further comprises using a controller apparatus to execute a program to concurrently prepare the first and second beverages by controlling the first and second blending/mixing modules to time share the dispensing module.

[0059] In another embodiment of the method of the present disclosure, the integrated beverage system further comprises an interactive display. The program causes the controller apparatus to present a series of interactive screens on the display, to respond to user entries via the interactive screens to define first and second sets of ingredients for the first and second beverages, to provide a first script and a second script for the first and second beverages, respectively, and to use the first and second scripts to control the dispensing module to dispense the first and second sets of ingredients into a first container and a second container, respectively, on a time shared basis.

[0060] In an embodiment of the memory media of the present disclosure, The memory media contains a program for controlling an integrated beverage system that comprises a dispensing module that dispenses one or more selected ingredients into a container and a blending/mixing module that blends and/or mixes the ingredients in the container. The memory media comprises executing with a computer apparatus instructions of the program to control the dispensing module and the blending/mixing module to prepare first and second beverages concurrently.

[0061] In another embodiment of the memory media of the present disclosure, the memory media further comprises: executing with the computer apparatus instructions of the program for controlling the dispensing module to dispense a first set of one or more ingredients for the first beverage into a first container; executing with the computer apparatus instructions of the program for controlling the blending/mixing module to blend and/or mix the first set of ingredients in the first container; and executing with the computer apparatus instructions of the program for simultaneously controlling the dispensing module to start dispensing a second set of one or more ingredients for the second beverage into a second container while the first set of ingredients is blending in the blending/mixing module.

[0062] In another embodiment of the memory media of the present disclosure, the first and second containers are beverage cups. The dispensing module and the blending/mixing module are controlled based on beverage requests received from a user operated entry device.

[0063] In another embodiment of the memory media of the present disclosure, the memory media further comprises executing with the computer apparatus instructions of the program for controlling the dispensing module to dispense ice and fluid simultaneously or in a layered manner with a layer of ice first and then a layer of fluid and optionally by another layer of ice and/or fluid.

[0064] In another embodiment of the memory media of the present disclosure, the one or more of ingredients are selected from the group consisting of: ice, water, flavor and additive.

[0065] In another embodiment of the memory media of the present disclosure, the controller apparatus monitors conditions of the integrated beverage system via connections to one or more sensors of the integrated beverage system.

[0066] In another embodiment of the memory media of the present disclosure, the integrated beverage system further comprises an ice maker. At least one of the ingredients is ice. The dispensing module is controlled to deliver the ice to at least of the first and second containers.

[0067] In another embodiment of the memory media of the present disclosure, the dispensing module comprises a plurality of storage containers. A plurality of the ingredients is stored in separate ones of the storage containers. The memory media further comprises executing with the computer apparatus instructions of the program for controlling the dispensing module to deliver at least one of the plurality of ingredients from a corresponding storage container to the first or second container.

[0068] In another embodiment of the memory media of the present disclosure, the storage containers are flexible bags.

[0069] In another embodiment of the memory media of the present disclosure, the dispensing module further comprises a single dispensing nozzle for the storage containers. The memory media further comprises executing with the computer apparatus instructions of the program for controlling the dispensing module to deliver the selected ingredients from the separate storage containers via separate delivery paths to the nozzle for dispensing to the first or second container.

[0070] In another embodiment of the memory media of the present disclosure, the controller apparatus comprises a plurality of micro-controllers. The memory media further comprises controlling the dispensing module and the blending/mixing module to prepare the first and second beverages based on a first and a second recipe script, respectively.

[0071] In another embodiment of the memory media of the present disclosure, the script of the first and second recipe scripts comprises a beverage container size, a user selected beverage, and a first ingredient. At least one of the micro-controllers, based on the beverage container size, the first ingredient and the user selected beverage type, controls the dispenser module to portion the first ingredient.

[0072] In another embodiment of the memory media of the present disclosure, the micro-controllers comprise a first micro-controller, a second micro-controller and a third micro-controller. The memory media further comprises: executing with the computer apparatus instructions of the program for using the first micro-controller that responds to user data entered via a user entry device to provide the first and second recipe scripts; executing with the computer apparatus instructions of the program for using the second micro-controller that uses the first and second recipe scripts to control the dispensing module in the dispensing of a first set of the ingredients into a first container and a second set of the ingredients into a second container, respectively; and execut-

ing with the computer apparatus instructions of the program for using a third micro-controller that uses the first and second recipe scripts to blend and/or mix the first and second sets of ingredients in the first and second containers to produce the first and second beverages, respectively.

[0073] In another embodiment of the memory media of the present disclosure, the blending/mixing module comprises a spindle assembly that is rotatable and that is movable vertically into and out of the beverage container. The memory media further comprises executing with the computer apparatus instructions of the program for using the third micro-controller with the first or second script to drive a first motor that rotates the spindle assembly and a second motor that moves the spindle assembly vertically.

[0074] In another embodiment of the memory media of the present disclosure, one of the ingredients is ice. The memory media further comprises executing with the computer apparatus instructions of the program for using the third micro-controller with the first or second script to rotate the spindle assembly in a first manner chop an ice particle size from coarse to fine and/or in a second manner leaves the ice in a coarse particle size.

[0075] In another embodiment of the memory media of the present disclosure, the first or second script includes a size of the beverage container, a speed and dwell time for each of a plurality of blending levels in the beverage container. The memory media further comprises using the third micro-controller with the first or second script to control to move the spindle assembly vertically to each of the levels and to rotate the spindle assembly at each level with the speed and for the dwell time for that level according to the first or second script.

[0076] In another embodiment of the memory media of the present disclosure, the blending/mixing module further comprises a door and a position sensor. The position sensor is selected from the group consisting of: spindle assembly home, door open, and spindle assembly home and door open.

[0077] In another embodiment of the memory media of the present disclosure, the blending/mixing module further comprises a cleaning assembly. The memory media further comprising executing with the computer apparatus instructions of the program for using the third micro-controller with the first or second script to operate the cleaning assembly to inject a cleaning fluid into a beverage container volume after the beverage has been removed therefrom with the first or second beverage.

[0078] In another embodiment of the memory media of the present disclosure, the cleaning assembly comprises a spray device located to inject the cleaning fluid, a cleaning fluid valve and an air valve in communication with a delivery conduit to the spray device. The memory media further comprises executing with the computer apparatus instructions of the program for using the third micro-controller with the first or second script to operate the cleaning fluid valve to provide the cleaning fluid to the spray device via a conduit and the air valve to inject air into the conduit to increase a velocity of flow of the cleaning fluid in the beverage container volume.

[0079] In another embodiment of the memory media of the present disclosure, the cleaning assembly comprises a spindle assembly. The memory media further comprises executing with the computer apparatus instructions of the program for using the third micro-controller in response to the first or second script to lower the spindle assembly into the volume to enhance a coverage of the cleaning fluid within the volume.

[0080] In another embodiment of the memory media of the present disclosure, the cleaning fluid is selected from the group consisting of: water and sanitizing fluid.

[0081] In another embodiment of the memory media of the present disclosure, the blending/mixing module is a first blending/mixing module. The integrated beverage system further comprises a second blending/mixing module. The memory media further comprises executing with the computer apparatus instructions of the program for concurrently preparing the first and second beverages by controlling the first and second blending/mixing modules to time share the dispensing module.

[0082] In another embodiment of the memory media of the present disclosure, the integrated beverage system further comprises an interactive display. The memory media further comprises executing with the computer apparatus instructions of the program to present a series of interactive screens on the display, to respond to user entries via the interactive screens to define first and second sets of ingredients for the first and second beverages, to provide a first script and a second script for the first and second beverages, respectively, and to use the first and second scripts to control the dispensing module to dispense the first and second sets of ingredients into a first container and a second container, respectively, on a time shared basis.

BRIEF DESCRIPTION OF THE DRAWINGS

[0083] FIG. **1** is a front perspective view of an exemplary embodiment of a system that dispenses and mixes beverages according to the present disclosure;

[0084] FIG. **2** is a side view of the assembly that dispenses and mixes beverages of FIG. **1**;

[0085] FIG. **3** is a front view of the assembly that dispenses and mixes beverages of FIG. **1**;

[0086] FIG. **4** is a top view of the assembly that dispenses and mixes beverages of FIG. **1**;

[0087] FIG. **5** is an exploded view of the assembly that dispenses and mixes beverages of FIG. **1**;

[0088] FIG. **6** is a top front left-side perspective view of the system of the present disclosure wherein the front left-side portion has been cut away to depict each of the ice making and portioning module, and dispensing module.

[0089] FIG. **7** is a partial front cross-sectional view of the integrated ice maker bin and portion control assembly, dispensing nozzle and pair of oppositely disposed mixer/cleaning modules according to the present disclosure;

[0090] FIG. **8** is a front perspective view of an ingredient dispensing module according to the present disclosure;

[0091] FIG. **9** is a side view of the ingredient dispensing module of FIG. **8**;

[0092] FIG. **10** is a front view of the ingredient dispensing module of FIG. **8**;

[0093] FIG. **11** is a top view of the ingredient dispensing module of FIG. **8**;

[0094] FIG. **12** is an exploded view of the ingredient dispensing module of FIG. **13**;

[0095] FIG. **13** is a front perspective view of an ingredient dispensing module according to the present disclosure;

[0096] FIG. **13***a* is a connection apparatus for use with the ingredient dispensing module of FIG. **13**;

[0097] FIG. **14** is a front perspective view of an flavor/ingredient dispensing module according to the present disclosure;

[0098] FIG. **15** is a top front side perspective view of a ice chute and ingredient dispensing nozzle according to the present disclosure;

[0099] FIG. **16** is a cross-sectional view of the nozzle of FIG. **15** along line **16-16**;

[0100] FIG. **17** is a top front right side perspective view of a ingredient dispensing cassette with a support bar according to the present disclosure;

[0101] FIG. **18** is a top front right side perspective view of an ice dispensing module according to the present disclosure, wherein the ice portion control assembly has been removed therefrom and shown in an exploded view;

[0102] FIG. **19** is top left side perspective view of an ice bin, rake and portion control assembly according to the present disclosure;

[0103] FIG. **20** is a top front perspective view of the rake and portion control assembly of FIG. **19**;

[0104] FIG. **21** is a top front perspective view of an ice leveler and bottom plate components of the portion control assembly of FIG. **20**;

[0105] FIG. **22** is a bottom front perspective view of the rake and portion control assembly of FIG. **19**;

[0106] FIG. **23** is a top front right side perspective view of a blender/mixer/cleaning module according to the present disclosure;

[0107] FIG. **24** is a side view of the blender/mixer/cleaning module of FIG. **23**;

[0108] FIG. **25** is a front view of the blender/mixer/cleaning module of FIG. **23**;

[0109] FIG. **26** is a top view of the blender/mixer/cleaning module of FIG. **23**;

[0110] FIG. **27** is an exploded view of the blender/mixer/cleaning module of FIG. **23**;

[0111] FIG. **28** is a front right side perspective view of the blender/mixer/cleaning module according to the present disclosure with a serving cup disposed therein, the blending blade in the retracted position and the door in the closed position;

[0112] FIG. **29** is front right side perspective view of the blender/mixer/cleaning module of FIG. **28**, wherein the door has been removed from the module;

[0113] FIG. **30** is a back right side perspective view of a pair of blender/mixer/cleaning modules according to another embodiment of the present disclosure with associated cleaner storage receptacles;

[0114] FIG. **31** is a right side view of the blender/mixer/cleaning housing unit according to FIG. **28** with a cleaner snorkel dispensing member;

[0115] FIG. **32** is a right side view of the entire blender/mixer/cleaning module according to FIG. **28** without the cleaner snorkel dispensing member;

[0116] FIG. **33** is a bottom front perspective view of a blender blade according to the present disclosure;

[0117] FIG. **34** is a bottom front perspective view of the serving cup lock and seal lid used in the blender/mixer/cleaning module of FIG. **28**;

[0118] FIG. **35** is a top right side perspective view of the combination serving cup holder and cleaner dispensing unit with the cleaner snorkel dispensing member according to the present disclosure;

[0119] FIG. **36** is a front planar view of an exemplary embodiment of the system according to the present disclosure;

[0120] FIG. **37** is a block diagram of an exemplary embodiment of a system controller according to the present disclosure;

[0121] FIG. **38** is a block diagram of the network gateway, front panel display controller, blender/mixer and cleaner module controller and ice making and portion controller according to the present disclosure;

[0122] FIG. **39** is a process flow diagram of an exemplary embodiment of a method for dispensing, blending/mixing and cleaning according to the present disclosure;

[0123] FIG. **40** is a listing of controller steps for selecting ingredients/flavors, additives and serving cup size according to the present disclosure;

[0124] FIG. **41** is a listing of controller steps for dispensing ingredients into a pre-selected serving cup size, selecting which blending/mixer module is to be activated and activating the selected blender according to the present disclosure;

[0125] FIGS. **42***a* and *b* are a listing of controller steps and displays for a system setup mode according to the present disclosure;

[0126] FIG. **43** is a block diagram of a user interface controller of the system controller of FIG. **38**;

[0127] FIG. **44** is a block diagram of a blending controller of the system controller of FIG. **38**;

[0128] FIG. **45** is a block diagram of a relay controller of the system controller of FIG. **38**;

[0129] FIG. **46** is a block diagram of the control panel of system of FIG. **36**:

[0130] FIG. **47** is a flow diagram for the system controller of FIG. **37**;

[0131] FIGS. **48-69** are user interactive display screens presented by the user interface controller of FIG. **38**;

[0132] FIG. **70** is a flow diagram of the dispensing program of the relay controller of FIG. **45**;

[0133] FIG. **71** is a flow diagram of the blending program of the blending controller of FIG. **44**; and

[0134] FIG. **72** is a flow diagram of the cleaning program of the blending controller of FIG. **45**.

DETAILED DESCRIPTION OF THE INVENTION

[0135] Referring to the drawings and in particular to FIGS. **1-5**, an exemplary embodiment of an assembly that dispenses and mixes beverages ("assembly"), according to the present disclosure is generally referred to by reference numeral **100**. Assembly **100** makes ice, dispenses flavors/ingredients and ice into a serving cup **15**, and then blends or mixes to form a beverage. One such beverage, for example, is a smoothie that preferably includes a flavor ingredient and ice mixed together. Assembly **100** has an onboard ice maker, ice storage and portion control module **300**, a flavor/ingredient dispensing module **1100**, and a blender/mixer/cleaning module **303**. Assembly **100** shows ice maker, ice storage and portion control module **300**, flavor/ingredient dispensing module **1100**, and blender/mixer/cleaning module **303** as one integrated assembly. It is contemplated by the present disclosure that one or more of ice maker, ice storage and portion control module **300**, flavor/ingredient dispensing module **1100**, and blender/mixer/cleaning module **303** may be separate from assembly **100**, however, it is preferable that they are all integrated into a single assembly **100**. That is, vertical placement of ice maker, ice storage and portion control module **300**, flavor/ingredient dispensing module **1100**, and blender/mixer/cleaning module **303** reduces a size of assembly **100**

and its associated flooring footprint in comparison to three separate and distinct machines.

[0136] Assembly **100** has a housing that includes a lower wall **6**, an upper wall **7**, side walls **11** and **12**, and a top wall **13**. Lower wall **6** has a container holder portion **20**. The housing connects cup supports **4** and **5** that secure cup holders **14** to assembly **100**. Cup holders **14** removably hold cups **15** therein. Cup **15** may be disposable or reusable single serving cups. If cup **15** is disposable, such as, for example, paper or plastic cups, the beverage dispensed and mixed within cup **15** may be served directly to a customer eliminating the step of pouring the beverage into a serving cup and eliminating labor needed to wash an additional container. Cup **15** may be any size, such as, for example, about 8 ounces to about 32 ounces.

[0137] FIGS. **6** and **7** provide an overview of the integrated assembly **100** according to the present disclosure, wherein assembly **100** comprises: flavor/ingredient dispensing module **301**, ice maker, ice storage and portion control module **300** and a pair of blender/mixer/cleaning modules **303** disposed on opposite sides of dispensing nozzle **304**. Ice maker, ice storage and portion control module **300** includes an ice maker **305**. Ice maker **305** may be any ice maker, and, preferably an ice maker that forms flakes of ice. For example, ice maker **305** may include an ice making head of cylindrical configuration in which a water container that is filled with water from a water source has at least one refrigerated wall forming a freezing chamber cooled by a flow of refrigerant gas, and a motor driven scraper which continuously breaks up ice forming on the refrigerated surface into ice flakes. The refrigerant gas may be cooled by a refrigeration cycle, such as, for example, a vapor compression cycle that includes a compressor, condenser, expansion valve, and evaporator. One or more of the compressor, condenser, expansion valve, and evaporator may be integral with assembly **100** or remote from the rest of assembly **100**. For example, compressors may create undesirable noise and may be remotely located from the rest of assembly **100**. Ice maker **305** may include an axially-extending auger or auger assembly that is rotatably disposed within the freezing chamber and generally includes a central body portion with one or more generally spirally-extending flight portions thereon disposed in the space between the central body portion and the refrigerated wall in order to rotatably scrape ice particles from the cylindrical freezing chamber. A drive means assembly rotatably drives the auger such that when make-up water is introduced into the freezing chamber through a suitable water inlet and frozen therein, the rotating auger forcibly urges quantities of ice particles through the freezing chamber to be discharged through an ice outlet end.

[0138] Nugget ice may be made from the flakes by passing the flakes of ice through an extruder head where a nugget shape is formed. Nugget ice is different from cube style ice in that the nugget is not homogenous but is multiple flakes of ice compressed into a nugget. Nugget ice is softer ice (easier to chew) that requires less power to mix into a beverage. Ice maker, ice storage and portion control module **300** is shown as mounted as an integral part of assembly **100** but can be located remotely and ice mechanically transported to assembly **100**. The nuggets of ice are pushed through the extruder head and this force can be used to transport the ice to assembly **100**, which may allow for larger ice output. Ice maker **305** reduces an overall sound level and allows for operation near a front counter or drive-through window without impacting communications. The use of nugget ice also allows the operator to use a single serving cup for dispensing, blending and serving the consumer because the stress of blending cubed ice is reduced.

[0139] Referring to FIGS. **8-17**, flavor/ingredient dispensing module **1100** is shown. Referring to FIG. **12**, flavor/ingredient dispensing module **1100** has a refrigerated housing **1110**. Refrigerated housing **1110** includes a refrigeration cycle, such as, for example, a vapor compression cycle that includes a compressor, condenser, expansion valve, and evaporator. One or more of the compressor, condenser, expansion valve, and evaporator may be integral with flavor/ingredient dispensing module **1100** or remote from the rest of flavor/ingredient dispensing module **1100**. For example, compressors may create undesirable noise and may be remotely located from the rest of assembly **100**.

[0140] Refrigerated housing **1110** cools one or more holders or cassettes **1115**. Holders **1115** each hold a flexible container via a hanging rod **1117** (see FIG. **17**, such as, for example, a bag, that contains an ingredient for the beverage. The bag may be a 2.5 gallon bag. The ingredient may be a flavored liquid or mix. The ingredient is cooled while stored in holders **1115** by refrigerated housing **1110** having a door **1111** and wheels **1113**. Each of holder has a connection aperture **1117** with a gap **1118** (see FIG. **13***a*) for allowing substantially all of the flavor/ingredient disposed in container **1115** to be removed without concern regarding the collapsing of the bag (not shown). Connection aperture **1117** of each of holders **1115** is connected to a conduit **1119** that passes through a base **1120**. As shown in FIG. **13**, conduit **1119** may connect to a pump rack **1123**. Pump rack **1123** has one or more pumps **1125** that selectively move a portion of the ingredient from the bag/container in holders **1115** through connection aperture **1117**, to conduit **1119**, to a line conduit **1130**, and to dispenser nozzle **304** to dispense the ingredient out of assembly **100**, for example, to cup **15**. The ice and the ingredient are dispensed into cup **15** but are segregated from each other until dispensed into cup **15** to prevent contamination. There is an ingredient dispense tube for each ingredient in each of holders **1115** and one ice nozzle in nozzle **304**. See FIGS. **15** and **16** for a view of nozzle **304** formed by injection molding of a plastic material to provide an ice chute conduit **1126** centrally disposed within nozzle **304** and a plurality of flavor/ingredient dispensing apparatus **1127**

[0141] As shown in FIG. **14**, conduit **1119** may connect to a pump **1125**. Pump **1125** selectively moves a portion of the ingredient from the container in holders **1115** through connection aperture **1117**, to conduit **1119**, to a line conduit **1130**, and to dispenser nozzle **304** to dispense the ingredient out of assembly **100**, for example, to cup **15**. Pump **1125** may be an air powered pump that may include a diaphragm.

[0142] A portion of the ingredient, such as, for example, a fruit base, may be controlled by time. A controller maintains accuracy by determining an amount of the fruit base that has been delivered from the container in holder **1115**. As a fluid level decreases within the container within holder **1115**, the controller allocates a longer delivery time to compensate for a decrease in head pressure within the container within holder **1115**. Pump **1125** may be positive displacement and a controller controls the pumps on a time basis. The time can be adjusted to control portion accuracy. Assembly **100** may only dispense ice from ice maker, ice storage and portion control module **300** into cup **15** and not an ingredient from flavor/ingredient dispensing module **1100**.

[0143] As shown in FIGS. **18-22**, ice maker, ice storage and portion control module **300** has one or more portion cups **302** that are fillable with ice. Portion cups **302** are formed by apertures **310** through a top plate **312**. Plate **312** may have a circular shape. Each of apertures **310** has a sidewall that extends from top plate **312**. Top plate **312** is positioned on a bottom plate **313** so that the sidewall of each aperture **310** abuts bottom plate **313** forming an interior volume for each of portion cups **302**. Portion cups **302** have a predetermined size to hold a predetermined volume of ice. Portion cups **302** may be any size, such as, for example, about 1 ounce. Bottom plate **313** has a dispensing aperture **323** that is aligned with a nozzle **304**. As shown in FIG. **7**, dispenser nozzle **304** extends through a top side of container holder portion **20**.

[0144] Top plate **312** is connected to a drive assembly **301** by a connector bar **314** to rotate portion cups **302**. Drive assembly **301** may be, for example, a gear drive motor. Portion cups **302** that are filled with ice rotate with connector bar **314** on bottom plate **313** while bottom plate **313** remains stationary. Each of portion cups **302** remains filled with ice on bottom plate **313** until the portion cup passes over the dispenser aperture in bottom plate **313**. The ice in the portion cup passes through the dispenser aperture in bottom plate **313** to dispenser nozzle **304** that dispenses the ice out of assembly **100**, for example, into cup **15**. Water is removed from cups **302** via perforated holes **321** disposed in bottom plate **313**.

[0145] Connector bar **314** connects to drive assembly **301** through a sensor **306**. Connector bar **314** may include a cam or one or more protrusions **328** that fit within sensor **306** to form a cam follower and micro-switch for counting the number of portion cups **302** which dispense ice via dispensing aperture **323**. Connector bar **314** may be connected to stirrer bars **320** and **322**. Bars **320** and **322** are ice agitators that rotate through the ice in a storage bin **305***a* shown in FIG. **6** of ice dispenser **305**. Their purpose is to keep the nugget ice from clumping together which would prevent the ice from filling into the ice cups.

[0146] The ice from ice dispenser **305** fills cups **302**. Ice dispensing assembly **300** controls an amount of ice dispensed out of assembly **100** by controlling an amount of portion cups **302** that pass over a dispenser nozzle **304**. Portion cups **302**, for example, are round and hold a predetermined amount of ice. The number of portion cups **304** that pass over dispenser nozzle **304** determine the size of the drink being prepared. Portion cups **302** hold the predetermined amount of ice in the interior volume and as the size of the volume of ice increases or decreases a number of portion cups **302** that pass over dispenser nozzle **304** increases or decreases based on the predetermined amount of ice needed for each beverage. The cam follower and micro-switch are used to count a number of portion cups **302** that pass over dispenser nozzle **304**. Counting a number of portion cups **302** that pass over dispenser nozzle **304** prevents positioning one of portion cups **302** partially over dispenser nozzle **304**. A weight of the ice in storage bin **305***a* of ice dispenser **305** causes the ice cups to fill. As the assembly rotates the ice is leveled by a wedge **303** to provide accurate portioning. Portion control wedge **303** closes off a top of portion cups **302** as they pass towards a dispense chute above dispenser nozzle **304** after being filled with ice, thereby ensuring that a consistent portion of ice is present in each cup **302** before is releases its content into dispense chute **1126** disposed within nozzle **304**. Wedge **303** may be a sheet metal wedge with a top portion **316**, a side portion **318**, and a bottom portion (not shown) that surround top plate **312** and bottom plate **313**.

[0147] FIGS. **23-35** depict a, blender/mixer/cleaning module **303** of assembly **100**. It is contemplated that assembly **100** may include, for example, from one blender/mixer/cleaning module up to six or more blender/mixer/cleaning modules. More than one blender/mixer/cleaning module **303** allows for creation of a second beverage while mixing a first beverage, contributing to higher beverage output by assembly **100**.

[0148] As shown in FIG. **27**, blender/mixer/cleaning module **303** has a mixer housing **205**. Mixer housing **205** has a first side wall **210**, a second side wall **215**, a back wall **217**, a top wall **220**, and a bottom wall **225** forming an interior volume **230**. Interior volume **230** may be enclosed by a door **235** that moves to a closed position when in blending, mixing or cleaning mode, shown in FIGS. **7** and **28**, and an open position uncovering interior volume **230** when blender/mixer/cleaning module **303** is in a load or unload mode. Optionally, door **235** may be a material that is transparent or translucent so that interior volume **230** is visible when door **235** is in the closed position. Door **235** is removable for maintenance as shown in FIG. **29**. Bottom wall **225** may have a drain aperture **227**. Drain aperture **227** may be covered by a filter cover **229**.

[0149] Mixer housing **205** is optionally supported on a support structure **237**. Support structure **237** has a motor support **239** that extends therefrom. Motor support **239** is connected to a motor **240**. Motor **240** may be a stepper motor **241***a* with a linear slide **241** that is connected to motor support **239**. Motor **240** is connected to a mixer **245**. Motor **240** may be connected to mixer **245** by a bracket **247** that is moved by motor **240**. Motor **240** moves spindle shaft **260** of mixer **245** in a reciprocal vertical movement through top wall **220** into or out of interior volume **230**.

[0150] Mixer **245** may be connected to a lid assembly **250**, as shown in FIG. **34**. Lid assembly **250** has a lid **252** and a plurality of alignment rods **254**. Lid **252** is complementary in shape to a container, for example, a cup **15** having liquid therein placed within interior volume **230**. Lid assembly **250** may move with mixer **245** into interior volume **230** into contact with cup **15**. Lid assembly **250** remains in contact with cup **15**, once lid assembly **250** is in contact with cup **15** while mixer **245** may move further into interior volume **230** along a length of connection rods **254**. Spindle shaft **260** does not engage or spin until lid assembly **250** is in contact with cup **15** to prevent and spray or splatter. When mixer **245** is retracted toward top wall **220**, mixer **245** moves along the length of alignment rods **254** until an end of alignment rods **254** is reached and then lid assembly **250** moves with mixer **245**.

[0151] Mixer **245** has a spindle assembly **242** having a blender blade **255** that is wider than a spindle shaft **260**. Blender blade **255** has projections that facilitate mixing of liquid within the cup **15**. Spindle shaft **260** connects to a mixer motor **265** that spins blender blade **255** and spindle shaft **260**.

[0152] Mixer **245** may be attached to linear slide **241** so that linear slide **241** moves mixer **245** vertically. A controller provides a mixing profile that insures proper mixing of the beverage. Linear slide **241** is driven by the stepper motor **241***a* that provides precise control of movement of linear slide **241**. Controller may move lid assembly **250** (blender carriage) until lid **252** touches the rim of the cup **15** before mixer **245** is energized to spin blender blade **255**. By moving blender blade **255** about 25% into the liquid within cup **15** before mixer **245** is energized to spin blender blade **255**, splatter from mixer

245 energizing before entering into the beverage is reduced and/or eliminated. After blender blade **255** is energized a customizable program indexes blender blade **255** down into cup **15**. Blender blade **255** may be energized with a customizable program that indexes blender blade **255** down into cup **15** to insure that the nugget ice has a particle size that is reduced to beverage specifications defined by the user. Blender blade **255** dwells at a bottom of cup **215** for a predetermined amount of time. Blender blade **255** is raised and lowered for a predetermined period of time to provide complete blending of components of the beverage. After mixing is complete spindle assembly **242** returns to a home position, as shown in FIGS. **7** and **28**. Stepper motor **240***a* and linear slide **240** may have a controller that counts a number of steps that motor travels allowing precise location of blender blade **255** leading to uniform beverages each time a beverage is dispensed and mixed from assembly **100**. Preferably, blender blade **255** is an emulsifying blade as shown in FIG. **33**.

[0153] Door **235** may have a safety switch **236**. Microswitches are located on mixer housing **205**. When door **235** is raised a microswitch **211**, as shown in FIG. **27**, is switched and blender blade **255** is disengaged from cup **15** retracting to it off position. Additionally, there is a tab **267**, as shown in FIG. **32**, that is a door interlock on mixer **245** that prevents door **235** from being opened when blender blade **255** is lowered.

[0154] Referring to FIG. **32**, back wall **217** may have a container or cup holder or guide **270** connected thereto. Holder **270** may hold cup **15** in position during mixing by mixer **245**. Holder **270** may be shaped complimentary to the shape of cup **15**, for example, a U-shape.

[0155] Holder **270** may also be connected to a liquid source (not shown) by tubing **275**. Tubing **275** may be connected to the liquid source through a solenoid **280**. The liquid is dispensed through one or more apertures **272** (shown in FIG. **27**) in holder **270** into interior volume **230**. The liquid may be water and/or a sanitizer. The water and/or sanitizer drains through drain aperture **227**. FIG. **30** depicts a pair of sanitizer supply vessels **281** connected via tubes or conduits **283** to tubes **275**, respectively. Preferably, a rinse or cleaning snorkel **286**, as shown in FIGS. **31** and **35**, is in fluid communication with holder **270** so that cleaning fluid may be dispensed substantially near the top of interior volume **230** of mixer housing **205**.

[0156] After cup **15** is removed from interior volume **230**, door **235** may be moved to a closed position so that interior volume **230** and/or mixer **245** may be rinsed/cleaned and/or sanitized. Water solenoid **280** and air solenoid **220***a* (FIG. **24**) are energized. Mixer **245** is energized spinning blender blade **255** and lowered into interior volume **230** by stepper motor **241***a* and linear slide **241**. Blender blade **255** is indexed up and down causing rinse liquid to spray entire interior volume **230** or mix compartment. Mixer **245** is de-energized stopping blender blade **255** from spinning and returns to the home location. Air continues and is used to help in removal of water residue. Another cup having another beverage therein may be mixed by mixer **245**.

[0157] Mixer **245** and interior volume **230** may be rinsed with water only after mixing each beverage, mixer **245** and interior volume **230** may be rinsed with water and/or sanitized with a sanitizing liquid, such as, for example, soap or detergent, after mixing each beverage, or mixer **245** and interior volume **230** may be rinsed with water only after mixing each beverage and periodically mixer **245** and interior volume **230** are sanitized. A "Y" fitting **284** (see FIG. **30**) may be placed into a water line **275** upstream of solenoid **280** to connect a source of sanitizing liquid **281**. The sanitizing liquid may be metered into the water to sanitize mixer **245** and interior volume **230**. The amount of sanitizing liquid may be controlled by a flow restriction (not shown) in tubing **283** of the source of sanitizing liquid **281** that connects to the "Y" fitting **284**. A solenoid valve may be connected to tubing **283** of the source of sanitizing liquid **281** that connects to the "Y" fitting **284**. The solenoid valve may be controlled so as to provide water only to rinse mixer **245** and interior volume **230** after mixing each beverage, and to periodically (e.g., daily) add the sanitizing liquid with the water to sanitize rinse mixer **245** and interior volume **230**. Interior volume **230** and/or mixer **245** being rinsed and/or sanitized as described herein after each use prevents flavor transfer, eliminates germs, and eliminates the need for manual washing.

[0158] Referring to FIG. **7**, in use, cup **15** is placed on container holder portion **20** of assembly **100**. Ice maker, ice storage and portion control module **300** dispenses ice to cup **15** through nozzle **304** and ingredient dispenser assembly **1100** dispenses an ingredient, such as, for example, a fruit base to cup **15** through nozzle **304**. Cup **15** is then transferred into interior volume **230** of blender/mixer/cleaning module **303**. Door **235** is moved to the closed position and mixer **245** mixes the ice and fruit base. Upon completion of the mixing, door **235** is moved to the opened position and cup **15** is removed and delivered to the consumer. Door **235** is then closed and interior volume **230** is rinsed and/or sanitized.

[0159] Each beverage may be mixed in a single serving cup **15** that is served directly to a consumer, allowing the entire beverage to be delivered to the consumer raising product yield and reducing wasted beverage, e.g., when blending the beverage in a blender pot. Having each beverage blended in its own cup improves flavor control and reduces allergy issues caused through cross-contamination.

[0160] Referring to FIGS. **23**, **24**, **27** and **28**, a controller **206**, which, for example, may be disposed on a printed circuit board, controls blender/mixer/cleaning module **303**. When the beverage is dispensed into the cup and placed in mixer housing **205**, a microswitch, such as microswitch **211** in door **235**, is switched indicating the presence of the cup. Controller **206** energizes stepper motor **241***a* on linear slide **241** or linear actuator and mixer **245** is lowered into the cup to a predetermined level (typically by counting a number of steps that stepper motor **241***a* is operated). When blender blade **255** reaches a pre-determined level controller **206** energizes stepper motor **241***a* to rotate blender blade **255**. Blender blade **255** dwells at the pre-determined level for a time and then linear slide **241** is energized and is lowered further into the beverage to insure proper blending of the beverage. During the mixing blender blade **255** is raised and lowered in a sequence defined by the end user. Upon completion of the mixing process controller **206** disengages stepper motor **241***a* and energizes linear slide **241** to remove blender blade **255** from the beverage. The beverage is removed from the mix chamber or interior volume **230** and trips a door microswitch **236**. Upon the switching of door microswitch **236** controller **206** begins the rinse process.

[0161] Referring to FIG. **37**, a controller **400** comprises a structure of control or printed circuit boards **401**, **402**, **403**, **404** and **405** identifying that they are separate but interconnected. This provides flexibility in the design allowing additional boards to be added without re-designing the entire

controller of assembly **100**. Printed circuit board **401** carries a user interface controller **412** (see FIG. **37**) that incorporates a button panel, such as a control panel **500** shown in FIGS. **36** and **46**, that an operator uses to select the drink as well as a computer that interconnects to other control boards. Printed circuit board **402** provides a gateway for communication to various methods (web, modem, USB, and the like). Printed circuit boards **403** and **404** carry blender controllers (for example, blender controller **206** in FIG. **38**) for blending, mixing and cleaning activities of blending/mixing/cleaning module **303** and will house controllers for mixer spindle motor **240**, linear slides **241**, water solenoid **280**, and air solenoid **220***a*. Printed circuit board **405** houses switching relays for ice maker, ice storage and portion control module **300**, and flavor/ingredient dispensing module **1100**. C-bus **406** is a communication interconnect between printed circuit boards **401** and **402**. A P-bus **407** is a wiring interconnect between printed circuit boards **401**, **403**, **404** and **405**.

[0162] Controller **34** may optionally include a Point Of Sale (POS) device **408**. POS device **408** may be connected to C-bus **406** as shown and provide user input to user interface controller circuit board **401** or could act as a server providing input via communications board **402** to controller **400**. Alternatively, POS device **408** can provide a selection of a beverage, container size, ingredients and additives, which point to a matching script of a matching beverage in a menu library. The matching script is then conveyed to circuit boards **403**, **404** and **405**. The menu library could be located in POS device **408** and/or in user interface board **401**.

[0163] Referring to FIG. **38**, controller **400** has inputs and outputs connected to assembly **100**. A Network Gateway C modbus Communication module **410** allows communication via modem, Internet, and the like. Network gateway **410** includes a C-modbus feature **411** for communicating via C-bus **406**. User interface controller **412** includes a Front Panel CCA User interface **414** that includes interfaces **416** and **418** to a Monochrome LCD display and a Membrane keyboard (KB) or a color LCD display with a touch screen and further includes a USB port **420** and a P/C modbus protocol feature for communicating via C-bus **406** with communications board **402** (FIG. **37**) and via P-bus **407** with mixer boards **403** and **404** and smart relay board **405**.

[0164] Controller **400** comprises a blender controller **206** for each blending/mixing/cleaning module **303** in assembly **100**. As these blending controllers are identical, only one blending controller is shown in FIG. **38**. Blender controller **206** comprises a cup present feature **424** that receives from blending/mixing/cleaning module **303** an input from sensor **211** that indicates the presence of cup **15**. Blender controller **206** also comprises a safety door position feature **426** that receives an input from a sensor **236** that indicates a door up or door down position. Blender controller **206** further comprises a home detect feature **428** that receives an input from a sensor **422** that indicates spindle assembly **242** is in the home position. Blender controller **206** further includes control logic for a micro stepping motor driver feature **430** that initiates or provides control signals to linear drive motor **241***a* of blender assembly **303**. Blender controller **206** further includes control logic for an air solenoid driver feature **432** that provides an air pulse to pump **220***a* of blender assembly **303**. Blender controller **206** further includes control logic for a water solenoid driver that provides a control signal to water solenoid **280** of blender assembly **303**. Blender controller **206** further includes control logic for a motor drive feature **436** that provides drive voltage/current to mixer motor **265** of blender assembly **303**. Blender controller **206** also includes a P-modbus feature **433** for communicating with user interface controller board **401**, mixer board **404** and system relay board **405** via P-bus **407**. Blender controller **206** further includes a ½4 VDC supply **429** that may be either internally derived from incoming AC power from a smart relay controller **435** or supplied from an external DC power supply.

[0165] Smart relay controller **435** handles control of refrigeration system **1110** with a syrup detection feature **436** that receives an input from a syrup bag loaded sensor **1140** (not shown) of refrigeration system **1110**. Smart relay controller **435** further includes control logic for a syrup solenoid driver feature **438** that provides a control signal to operate a selected flavor or syrup pump **1125** of refrigeration system **1110**. Smart relay controller **435** further includes control logic for a water solenoid feature **440** that provides a control signal to operate water solenoid **1142** of refrigeration system **1110**. Smart relay controller **435** further includes a syrup refrigeration temperature feature that receives an input from a temperature sensor **1144** of refrigeration system **1110**.

[0166] Smart relay controller **435** further includes monitoring features of ice storage and portion control module **300** (hereafter sometimes referred to as ice handler module **300**). Smart relay controller **435** includes an ice refrigerator temperature feature **444** that receives an input from an ice temperature sensor **340** (not shown) of ice handler module **300**. Smart relay controller **435** includes an ice volume (or bin) full temperature feature **446** that receives an input from an ice volume (or bin full) temperature sensor **342** of ice handler module **300**. Smart relay controller **435** includes an ice volume (or bin) low temperature alarm feature **448** that receives an input from an ice low temperature sensor **344** of ice handler module **300**. Smart relay controller **435** includes an ice dispenser position feature **450** that receives an input from an ice position sensor **346** of ice handler module **300**. Smart relay controller **435** further includes an ice dispenser control feature **454** that supplies AC power to drive assembly **301** of ice handler module **300**. Smart relay controller **435** further includes an ice compressor hour gauge feature **456** that controls the application of AC power to a compressor **348** of ice handler module **300**.

[0167] Smart relay controller **435** also includes an AC power interface **452** that receives an AC line voltage which is supplied to blender controller **206**, refrigeration system **1110** and ice handler **300** as shown by the boldface lines in FIG. **38**. Smart relay controller **435** further includes a 5/24 VDC supply that may be either internally derived from incoming AC power (by an AC to DC converter) or supplied from an external DC power supply.

[0168] Smart relay controller **435** also includes a P-modbus feature **437** for communicating with the user interface board **401** and mixer boards **403**, **404** via P-bus **407**. Smart relay controller **435** also includes a P/C-modbus feature **439** for communicating with user interface controller board **401** via the P-bus.

[0169] Referring to FIG. **43**, user interface controller **412** comprises a processor **460**, a communication interface **462**, an input/output (I/O) interface **464** and a memory **466** interconnected via a bus **468**. Communication interface **462** is connected to C-bus **406** for communicating with servers via a network such as the Internet. For example, interface controller **412** may receive from an external server downloads of program changes, new programs, and/or various other com-

mands, programs or data and may send to an external server various status data concerning operational data, maintenance data, and the like.

[0170] I/O interface **472** comprises connections to control panel **500** (FIGS. **36** and **38**) and at least one UBS port **472** for connection to an external memory **474**, which, for example, may be a memory stick, an external memory drive or other external memory. I/O interface **464** also comprises a connection to P-bus **407** for communications with blender controllers **206** and relay controller **435**.

[0171] Memory **466** comprises a master program **470** for control of assembly **100** and various other programs, such as, an operating system, utility programs and other programs. Processor **460** is operable to execute master program **470** and the other programs as well.

[0172] Referring to FIG. **44**, blender controller **206** comprises a processor **476**, an input/output (I/O) interface **478** and a memory **482** interconnected via a bus **480**. I/O interface **478** includes connections to blender module **303** as shown in FIG. **38**. I/O interface **478** comprises a connection to P-bus **407** for communications with user interface controller **412** and relay controller **435**. Memory **482** comprises a blending program **484** and a cleaning program **486** for control of blender module **303** and various other programs, such as, an operating system, utility programs and other programs. Processor **476** is operable to execute blending program **484**, cleaning program **486** and the other programs as well. Other blender controllers **206** in assembly **100** include an architecture identical to blender controller **206** for control of associated blending/mixing/cleaning modules **303**.

[0173] Referring to FIG. **45**, relay controller **422** comprises a processor **488**, an input/output (I/O) interface **490** and a memory **494** interconnected via a bus **492**. I/O interface **490** includes connections to refrigeration module **1110** and ice handler module **300** as shown in FIG. **38**. I/O interface **490** also includes a connection to P-bus **407** for communicating with interface controller **412** and blender controllers **206** of assembly **100** (FIGS. **37** and **38**). I/O interface **490** also includes a connection to P-bus **407** for communicating with user interface controller **412** and blender controller **206**. Memory **494** comprises a dispensing program **496** for control of refrigeration module **1110** and various other programs, such as, an operating system, utility programs and other programs. Processor **488** is operable to execute dispensing program **496** and the other programs as well.

[0174] Referring to FIG. **46**, control panel **500** comprises a display **502** and a keypad **504**. User interface controller **412** interacts with a user to present display screens on display **502** and responds to user entries made with keypad **504** or by touch, cursor voice or other input. Display **502** may be any suitable display and, preferably, is a Liquid Crystal Display (LCD). Keypad **504** may be any suitable keypad, keyboard or touch screen and, preferably is a touch screen.

[0175] In a preferred embodiment the display screens comprise the screens shown in FIGS. **48-69**. It will be appreciated by those of skill in the art that other display screens can be used. Referring to FIG. **48**, a display screen **1200** comprises three sections **1202**, **1204** and **1206** that are used in each of the display screens of FIGS. **48-69** to display information to the user.

[0176] Controller **400** of the present disclosure will be described for a beverage assembly **100** as shown in FIG. **36**, in which controller **400** comprises user interface controller **412**, relay controller **435** and two blender controllers **206** for a right blending/mixing/cleaning module **303** and a left blending/mixing/cleaning module **303**. Referring to FIG. **47**, user interface controller **412** is executing master program **470**. At step **1300**, user interface controller **412** presents on display **502** a home screen **1200** that displays in section **1204** a plurality of beverage categories **1208**, **1210**, **1212** and **1214** labeled, for example, as smoothie, agua fresca, frost bite and ice/mix blend, respectively. The user selects one of the categories, for example, smoothie, for a Drink #1.

[0177] At step **1302**, master program **470** responds to the user's selection of smoothie to present a flavor selection screen **1216** shown in FIG. **49**. A plurality of flavors **1218-1224** is presented in section **1204** for selection by the user. In this example, the user selects flavor **1218**, which is strawberry. Also at step **1302** (FIG. **47**), program **470** presents a strawberry boost selection screen **1225** as shown in FIG. **50**. Section **1204** is divided into four subsections **1226**, **1227**, **1228** and **1229**. The choices for the user to select are strawberry in subsection **1226** and strawberry with boost in subsection **1227**. In this example, the user selects strawberry with boost. Master program **407** responds by presenting a cup size selection screen **1230** shown in FIG. **51** with choices "small", "medium" and "large" set forth in section **1204**. In this example, the user selects "medium".

[0178] Master program **470** at step **1304** of FIG. **47** responds with a screen **1231** in FIG. **52** with a pre-dispense instruction (not shown) in which additive type choices A, B, C and D are presented in section **1204** for user selection. Dependent of the type of additives (A, B, C or D) it can be added in different stages of the drink making, which will give the drink different attributes dependent on where it is added. The user may select none of the additives or up to four of the additives. At step **1306**, master program **470** determines if additive A has been selected. If not, the user is prompted to activate an advance button shown in section **1206** as check arrow. If so, the user at step **1308** is prompted to place one or multiple additive type A into a cup, place the cup under the dispenser head or nozzle **304** and then activate the advance button. At step **1310** master program **470** responds to the user activation of the advance button at step **1306** or step **1308** to prepare a script that contains dispensing instruction data that comprises the selected flavor, additive (if any), and cup size. At step **1312**, user interface controller **412** communicates this script to relay controller **435** via P-bus **407** (FIGS. **37** and **38**) and presents on display **502** a dispensing screen **1260** shown in FIG. **53**, which displays in section **1204** the status message "Medium Strawberry Smoothie Dispensing".

[0179] Relay controller **435** at this time executes a dispensing program **496** (FIG. **70**) based on the script received from user interface controller **412**. When the dispensing program is finished, relay controller **435** sends a dispensing complete message via P-bus **407** to user interface controller **412**. Master program **470** at step **1314** determines if additive B has been selected. If so, the user at step **1316** is prompted in a screen **1261** shown in FIG. **54** to place one or multiple additive type B into the cup with a pre-blend instruction in section **1204**. If additive type B was not selected, no pre-blend instruction is displayed in section **1204** of screen **1260**.

[0180] Also displayed in section **1204** of FIG. **54** is a prompt to the user to place the cup in one of the two blending/mixing/cleaning modules **303** by activating one of the left and right buttons **1232** and **1233**. In this example, the user selects the left blending/mixing/cleaning module **303** for drink #1 by activating button **1232** and places the cup in the left mixer

assembly **303**. Master program **470** prepares a script for left controller **206** of left blender assembly **303**. This script contains blending instruction data that comprises the cup size and the spindle speed and dwell time for each level of blending for the selected beverage and additives A and/or B (if any). User interface controller **412** communicates this script to left blender controller **206** via P-bus **407**. At step **1320**, left blender controller **206** for left blending/mixing/cleaning module **303** (FIGS. **36** and **37**) executes a blending program **484** (FIG. **71**) based on the drink #1 blending script for blending the contents of the cup for drink #1. At this point, user interface controller **412** presents on display **502** a home screen **1234** shown in FIG. **55**.

[0181] Home screen **1234** displays in section **1204** the status message "Blending" together with left icon button **1232** for drink #1. In section **1204**, categories **1208**, **1210**, **1212** and **1214** are displayed for selection for a drink #2. Program **470** then repeats steps **1300** through **1312** for drink #2 using screens **1234** through **1239** of FIGS. **55-60** in which the displayed content of display sections **1204** correspond to the displayed content of sections **1204** of screens **1200**, **1216**, **1225**, **1230**, **1261** and **1262** of FIGS. **48-53** for drink #2.

[0182] Referring to FIGS. **47** and **61**, left blender controller **206** for left blending/mixing/cleaning module **303** senses the return of the spindle to the home position based on a signal from home sensor **422** (FIG. **38**) or a door up or open position and sends a blending done message to user interface controller **412** via P-bus **407**.

[0183] User interface controller **412** responds at step **1322** by presenting a mixer selection screen **1240** on display **502** as shown in FIG. **61**. In section **1204**, instructions for drink #2 can be a pre-blend instruction for an additive or merely to move drink #2 cup from the dispenser module to the right blending/mixing/cleaning module **303** as indicated by right mixer symbol **1233**. In section **1202**, instructions for drink #1 include a flashing check arrow **1241**. The user must select flashing check arrow **1241** to acknowledge a first mix-in of additive type A and/or type B and to see the next mix-in instruction for additive type C. Master program **470** responds by presenting another mixing selection screen **1242** as shown in FIG. **62**. In step **1324**, if additive type C has been selected in step **1304**, the user is prompted by flashing arrow **1241** to acknowledge additive type C and remove the cup from left blending/mixing/cleaning module **303** and add one or multiple additive type C to the cup. In step **1326**, the user is prompted by screen **1243** to place the drink #1 cup in the left blending/mixing/cleaning module **303**, select the check arrow and close the blender door. Master program **470** prepares the script for blending drink #1 with additive type C and sends it via P-bus **407** to left blender controller **206**. Left blender controller **206** uses this script to execute step **1326** to blend the contents of drink #1 cup for a second blending.

[0184] With respect to drink #2, master program **470** is concurrently (with step **1326** for drink #1) executing steps **1314** and **1315** (FIG. **47**) for additive type B in section **1204** of screens **1240**, **1242** and **1243**. In section **1204** of a screen **1244** in FIG. **64**, the user is prompted to place the drink #2 cup in the right blending/mixing/cleaning module **303**. Master program **470** packages the script for blending drink #2 and sends it via P-bus **407** to the right blender controller **206**. Right blender controller **206** uses this script to blend drink #2 at step **1318** of master program **470**. At this time, master program **470** also presents on display **502** a screen **1245** that shows in section **1202** a status of "mixing" for drink #1 and in section 2 a status of "blending" for drink #2. For this case, the script for drink #1 includes a mixing instruction. Mixing chops up coarse ice particles into fine particles. On the other hand, blending blends the coarse particles without substantially changing the granularity. This can be accomplished in two manners. The first manner is by changing the blade speed. In the second manner, mixing and/or blending blade **255** has a sharp side and a dull side. For a mixing operation, the spindle assembly is rotated in a direction win which the sharp side chops the coarse ice particles. For a blending operation, the spindle assembly is rotated in the opposite direction so the dull face of blade **255** stirs the ingredients without substantially changing the granularity of the ice particles.

[0185] When the mixing procedure is finished, left blending controller **206** sends a complete message via P-bus **407** to user interface controller **412**. Master program **470** executes step **1328** by presenting a screen **1246** on display **502** shown in FIG. **66**. In section **1202**, the user is prompted by flashing check arrow **1241** to acknowledge a selected additive D (topping). Selecting the flashing check arrow **1241** causes topping instructions to be presented in section **1202**. For example, the user is prompted to remove the drink #1 cup from the left blending/mixing/cleaning module **303** and place the topping on drink #1. When drink cup #1 is removed from left blending/mixing/cleaning module **303**, a cup presence sensor **211** provides a signal to left blender controller **206**, which signifies the cup has been removed. Left blender controller **206** sends a message of the cup removal via P-bus **407** to user interface controller **412**. Master program **470** then executes step **1340** by presenting a screen **1247** on display **502**. In section **1202** of screen **1247**, a topping instruction requests the user to acknowledge that the topping has been added by selecting flashing check arrow **1241** and to serve drink #1.

[0186] Concurrently with execution of step **1340** for drink #1, master program **470** executes step **1324** for drink #2 as shown in section **1204** of screen **1247** and presents a screen **1248** shown in FIG. **68**. Screens **1247** and **1248** prompt the user to add a selected additive C to the drink #2 cup, select the right blending/mixing/cleaning module **303** and place the drink #2 cup in the selected right blending/mixing/cleaning module **303**. Master program **470** then presents on display **502** a home screen **1250** (FIG. **69**) that shows in section **1202** a mixing status of drink #2 and in section **1204** the beverage categories for user selection for a drink #3.

[0187] Master program **470** then waits for execution of a cleaning procedure **1342** (FIG. **47**) by left blender controller **206**, which will be described hereinafter. When the cleaning procedure is finished, master program **470** completes its execution for drink #1 at box **1344**.

[0188] Referring to FIG. **70**, a dispensing program **496** is stored in memory **494** and executed by processor **488** of relay controller **435** (FIG. **45**) at step **1412** of master program **470** of FIG. **47**. At step **1412**, script is received from user interface controller **412** via P-bus **407**. This script comprises a cup size, selected flavor(s), selected additive(s) and an ice amount. At step **1420** dispensing program **496** calculates dispensing by dividing the total amount of ice (from the received script) by the size of the portion cups **302** of FIGS. **18-20**. For example, these amounts can be measured by volume or weight. In a preferred embodiment, the amounts are measured by weight. This calculation yields the number of portion cups **302** that need to be filled. At step **1422** relay controller **435** dispenses the ice to dispenser nozzle **304** via portion cups **302** with appropriate drive voltage to drive assembly **301**.

[0189] At step **1414**, the valve on-times are calculated based on the selected flavors contained in the received script. The valves are the valves that control air flow from a pressurized air source to air powered pumps **1125** of the selected flavor fluids. The on-time of the valve is calculated by multiplying the desired amount by the calibration dispense rate constant for that fluid and add the calibration lag time to achieve the total on-time. At step **1416** dispensing program **496** calculates delay times for starting the dispensing of the flavor fluids. The delay times for the fluid dispense is there to avoid that we end up with a lot of ice on top of the drink (since the ice dispense time is much longer than the fluid dispense). With a lot of ice on top of the drink, it makes it difficult to blend properly. The delay times is normally set as a portion of the ice dispense time with a typical value of 50%. At step **1418**, the fluids are dispensed by operating the selected pumps after the calculated time delays and for the calculated times. At step **1424** the dispensing is completed and relay controller **435** sends a dispensing complete message to user interface controller **412** via P-bus **407**.

[0190] Referring to FIG. **71**, a blending program **484** is stored in memory **482** and executed by processor **476** of blending controller **206** (FIG. **44**) at steps **1320** and **1326** of master program **470** of FIG. **47**. At step **1427**, script is received from user interface controller **412** via P-bus **407**. This script comprises cup size, blending positions, initial blade speed, blade speed for each blending position, blend time for each blend position and reduced blade speed. At step **1428**, blending program **484** determines if door **235** is closed. This is accomplished by checking the status of the door sensor **409** of the associated blending/mixing/cleaning module **303**. If the status is open or up, blending program **484** awaits detection of door **235** in a closed or down position. When the door **235** is closed, blending program **484** turns on spindle motor **265** to rotate spindle shaft **260** and blade **255** at the initial speed prescribed in the script.

[0191] At step **1430**, blending program **484** uses micro stepping motor driver feature **430** to provide drive signals to operate micro stepping motor **241***a* and linear slide **241** to lower spindle shaft **260** and blade to a top blending position in the cup. At this point the rotational speed is changed from the initial speed to the top blend speed for the top blending position and maintained for the prescribed time according to the script. When blending for the prescribed time at the top blending position has expired, blending program **484** uses micro stepping motor driver feature **430** to provide drive signals to operate micro stepping motor **241***a* and linear slide **241** to lower spindle shaft **260** and blade **255** to a next blending position in the cup (e.g., near the bottom of the cup). At this point in step **1431** the rotational speed is changed from the top position blending speed to a bottom blend speed for the bottom blending position. Step **1432** maintains the bottom blend speed for the prescribed time according to the script.

[0192] When blending for the prescribed time at the bottom blending position has expired, blending program **484** at step **1433** uses micro stepping motor driver feature **430** to provide drive signals to operate micro stepping motor **241***a* and linear slide **241** to raise spindle shaft **260** and blade **255** to a next blending position in the cup (e.g., near the middle of the cup). At this point the rotational speed is changed from the bottom position blending speed to a middle blend speed for the middle blending position. Step **1432** maintains the blend speed for the prescribed time according to the script.

[0193] When blending for the prescribed time at the middle blending position has expired, blending program **484** at step **1435** uses micro stepping motor driver feature **430** to provide drive signals to operate micro stepping motor **241***a* and linear slide **241** to raise spindle shaft **260** and blade **255** to the top of the cup and maintain the spindle speed. At step **1436** the spindle speed is reduced according to the script. At step **1437** blending program **484** uses micro stepping motor driver feature **430** to provide drive signals to operate micro stepping motor **241***a* and linear slide **241** to raise spindle shaft **260** and blade to the home position and turn of motor **265** to stop rotation of spindle shaft **260** and blade **255**. At step **1438**, blending program **484** determines if door **235** is open by checking the status of the door sensor **409** of the associated blending/mixing/cleaning module **303**. If the status is closed or down, blending program **484** awaits detection of door **235** up or open position. When this occurs, blending program **484** at step **1439** awaits the next instruction or script from user interface controller **412**.

[0194] Referring to FIG. **72**, a cleaning program **486** is stored in memory **482** and executed by processor **476** of blending controller **206** (FIG. **44**) at step **1342** of master program **470** of FIG. **47**. At step **1441**, script for cleaning is received from user interface controller **412** via P-bus **407**. This script comprises spindle speed and predetermined vertical position. At step **1442**, by cleaning program **486** determines if door **235** is closed. This is accomplished by checking the status of the door sensor **409** of the associated blending/mixing/cleaning module **303**. If the status is open or up, blending program **484** awaits detection of door **235** closed or down position. When the door **235** is closed, blending program **486** turns on spindle motor **265** to rotate spindle shaft **260** and blade **255** at the spindle speed prescribed in the script. At step **1444**, blending program **486** turns on the water spray by operating water solenoid **280** to provide water to holder **270** which emits a water spray via apertures **272** or snorkel **286** (FIGS. **31** and **35**) into interior volume **230** of blending/mixing/cleaning module **303**. At step **1445**, blending program **486** moves the rotating spindle shaft **260** and blade **255** downward in interior volume **230**, thereby dispersing the water spray to rinse a wide area of the wall and door of the interior volume **230**. When spindle shaft **260** and blade **255** reach the predetermined vertical position in interior volume **230**, cleaning program **486** at step **1446** turns on air solenoid **220***a* to provide a blast of air pressure in interior volume **230**. The air will also boost the water spray as well as blowing off excessive water from the interior of the chamber in the spindle parts. An added benefit is that the air will enhance the evacuation of the drain and reduce the risk of clogging.

[0195] Cleaning program **486** at step **1447** waits one second and then moves spindle shaft **260** and blade **255** up a distance (e.g., about one inch) at step **1448**. At step **1449**, sir solenoid **220***a* is operated to turn off the air flow. At step **1450**, spindle shaft **260** and blade **255** is returned to the home position. At step **1451**, cleaning program **486** is finished and sends a cleaning complete message to user interface controller **412** via P-bus **407**.

[0196] It has been found by the present disclosure that assembly **100** allows operators to produce and dispense consistently prepared smoothie drinks in less than 40 seconds. Advantageously, assembly **100** generates ice through a fully integrated on-board ice system, ice maker, ice storage and portion control module **300**. Ice maker, ice storage and por-

tion control module **300** may, for example, have a 20-pound ice storage system that has the capability to create an additional 10 pounds of ice each hour, with a peak total of 270 pounds per day. Having ice generation on board removes the risk of injury through slips and falls, and it decreases the chance of bacterial contamination through mishandling. Additionally, the ice used in this machine is nugget-style ice, which is easier to fracture and blend down into the smoothie consistency. All of this allows for a perfectly blended beverage, for example, smoothie that fits within a normal QSR delivery time.

[0197] Each beverage, for example, smoothie is blended in its own cup, allowing the entire beverage or drink to be delivered to the customer and, in turn, raising product yield. Having each drink blended in its own cup improves flavor control and reduces allergy issues caused through cross-contamination. Assembly **100** may, for example, consistently provide twenty 16-ounce drinks per hour and, at peak capabilities, forty-five 16-ounce drinks for one-hour bursts. Money is also saved through the elimination of small wares or blender pots that were purchased and stored by restaurant owners in the past.

[0198] Advantageously, spindle assembly **242** goes through a rinse and/or sanitation process after each use to prevent flavor transfer and eliminate the need for manual dishwashing. Additionally, for example, two blending/mixing/cleaning module **303** included in assembly **100** to allow for the creation of a second drink while mixing the first, contributing to higher drink output and, consequently, to the bottom line of the operation. To overcome this challenge, nugget-style ice may be used with assembly **100**. Nugget ice is softer than the more commonly known cube ice, and it is formed in a freeze barrel with an internal auger that continually scrapes the freeze surface. This flake-style ice is moved to the top of the freeze barrel by the ice auger, where it is extruded into the ice nugget. The resulting smaller ice greatly reduces the amount of blending required to create the drink. Additionally, the noise generated from the blending process is reduced by using this smaller nugget ice. This becomes especially important when the equipment is placed in the proximity of the front counter or near a drive-through window.

[0199] The blender pots in current smoothie machines are designed to fully mix the drink and grind the ice to a grain size that meets customer taste profiles. When mixing in a cup, there is no geometry to assist the mixing and grinding of the ice. To achieve the proper drink consistency, linear slide **241** moves blender blade **255** up and down in cup **15**. This process simulates how a drink is made using a handheld stick mixer. Blender blade **255** lowers into the drink (about 25%), at which point blender blade **255** is energized. Once engaged, the spindle is lowered fully into the cup and allowed to dwell. This process grinds the majority of the ice, but at that point, the drink is not fully developed. The spindle is then raised and lowered following a profile created for the specific drink, taking into account the viscosity of the fluids, ice-to-fluid ratio, and the drink cup size.

[0200] It has been found by the present inventors that size limitations (footprint) may be achieved by a configuration of the components of assembly **100**. While a traditional machine creates drinks in a blender pot to mix more than one flavor, assembly **100** dispenses and mixes each drink in a serving cup, and may have dual spindles to maintain throughput and delivery times. Assembly **100** may address size requirements by vertical placement of the components.

[0201] Assembly **100** may maintain the accuracy of mixer **245**—used to create drink consistency—by stepper drive motors **241***a* control the linear slides **241**. Stepper motors **241***a* provide the ability to create different blending profiles for the various types of drinks (coffee-based, fruit-based, fruit-plus-yogurt drinks). Counting the number of steps that stepper motor **241***a* travels allows precisely locating blender blade **255** every time a drink is blended.

[0202] Ice maker, ice storage and portion control module **300** maintains ice dispense accuracy. The ice dispense was then divided into portion cups. As the drink size changes, the number of individual dispense cups dropping ice into the beverage increases or decreases to match. To measure the number of ice dispenses, micro switches (located outside of the ice bin) were incorporated to count the number of cups. This method provides consistent ice delivery regardless of the level of ice in the bin.

[0203] Blender pots that are currently used are made of hard plastic, with the ability to withstand the forces used to crush ice into an acceptable consistency for a smoothie drink. Grinding the cube-style ice, most commonly found in QSRs, would put too much stress on the machine's blender and the customer's cup.

[0204] Definitions, acronyms, and abbreviations may include:

Abbreviation	Definition
UIC	User Interface Controller
SRB	System Relay Board
P-BUS	Peripheral bus
C-Bus	Communication Bus
CCA	Circuit Card Assembly
SFR	System Functional Requirements

[0205] In an example of a preferred embodiment, assembly **100** may be a "Smoothie maker system" that comprises an integrated ingredient dispensing unit, up to 4 mixing units (expandable from 2 in normal configuration), and a control panel for user operation. As depicted in FIG. **38**, the system is designed using a Smart Relay CCA, two mixer CCAs (normal configuration), an optional communications board for external communications, and a user interface controller board. All of the subsystem boards communicate with each other using a MODBUS protocol and RS-485 physical link. Smart Relay CCA is responsible for dispensing control, monitoring and safety of the system ice-maker, and flavoring assembly/subsystem. Also the Smart Relay CCA provides the power and Modbus hub for the Smoothie System control electronics.

[0206] The Blender Controller CCA is responsible for position, speed, cleaning and safety control of the system blender assembly/subsystem, such as blender/mixer/cleaning module **303**. It controls the blender blade, water and air pumps and senses cup present and door switch. The user interface controller board consists of a monochrome LCD display, membrane keypad for control and configuration.

[0207] The functional requirements of the exemplary embodiment are configured for mixing profiles and particular fluid selections (x out of 254 displayed). The system automatically goes into a configuration download menu if in idle when an SD card is inserted. The User Interface shall have a degrees F/C selection for temperature display in the setup mode. The User Interface shall have a degrees F/C selection for temperature display in the setup mode. The maximum

number of flavors per serving shall be three and the minimum number of flavors per serving shall be one, unless dispensing ice only. A flavor selection status shall be toggled by pressing the button corresponding to the flavor in question. Upon reaching the maximum Number of Flavors per Serving, the system shall not allow selection of any additional flavors; unselected flavors become locked-out. The user shall be able to change the flavor selection(s) by pressing the CANCEL button and selecting desired flavor(s).

[0208] The user shall be able to change the flavor selection (s) by first de-selecting a (the) flavor(s), then selecting the desired flavor(s). The unit shall monitor use cycles of flavors and provide a user indication on the display of low level for each flavor for early warning of flavor out.

[0209] The additives comprise a selection of two types of fresh fruit and yogurt. Only the yogurt is dispensed automatically; instead of dispensed, the fresh fruit has to be manually added. The fresh-fruit selections are used to compute the amounts that are dispensed. Fruit is placed in cup prior to receiving the ice and fruit. The Maximum Number Of Selectable Additives shall be 3 and the Minimum Number Of Selected Additives shall be 0.

[0210] The Fruit flavors and yogurt shall be stored in a refrigerated base designed to maintain a product temperature between 34° F.-38° F. Base will be designed to accommodate up to 9 flavors. The base design will be such that flavors can be stored in "bag-in-box" packaging. The base will house flavor pumps (up to 9) and all associated delivery tubing, and air solenoid switches. The base will be designed to intake and discharge condenser air from the front of the unit. The base can be mounted on castors to allow access to rear of unit for cleaning. The base will be designed to meet NSF and UL requirements. The base will have openings in top to allow tubing to pass into dispense area. The base will provide a method air delivery and return to dispenser section to maintain product temperature to the dispense nozzle (per NSF). The base refrigeration system will require 120 v AC with the option for 220 v/50 hz (Europe requirement).

[0211] The Smoothie machine will have on-board ice making capabilities to store ice in addition to ice making capabilities. The ice machine will be designed to operate on 120V 60 hz+/−10%. The ice machine shall have provisions for 220 50 Hz operation for Europe +/−10%.

[0212] Ice is normally dispensed during the smoothie making process but could also be dispensed exclusively. The system shall allow dispensing of ice in an exclusive manner (i.e. without flavors or water). Ice shall be dispensed in a portion amount that allows scaling for various drink cup sizes. Upon selection of the ice-only button, the system shall proceed to cup size selection. The ice-only button shall only be available when no flavors are selected. Conversely, upon selection of a flavor the ice-only button shall be disabled.

[0213] There shall be a Service maintenance mode to allow cleaning on the dispenser fluid lines.

[0214] The system shall allow cup size selections of small, medium large and extra large, with a provision for additional cup sizes determined by customer. Provisions will be made for cup storage on the unit. Cup size selection shall trigger the dispensing process. There shall be up to five configurable cup sizes with configurable volumes. The cup shall be placed under the dispense nozzle prior to drink selection (no UI to tell you).

[0215] The dispensing process shall use the cup size as a scaling factor to compute ingredient amounts; water, ice and selected flavors/additives. The ingredients and quantities dispensed shall be used to determine the mixing profile. Fruit flavor ingredients shall be delivered using air driven condiment pumps. Condiment pumps shall be located in the refrigerated space and shall be removable for easy access for service. Condiment pumps shall be energized using solenoid valves mounted in the air flow to the pumps. Condiment Pumps shall deliver a portioned amount of flavor. The amounts of ingredients used for each smoothie including a total of 9 flavored fluids, water, ice and up to 4 manually added types of additives shall be determined by the Dispense Algorithm.

[0216] The mixing includes the actual mixing of the ingredients in a cup and a subsequent cleaning cycle to ensure that the blender's blades are clean for the next mixing cycle. The mixing operation shall be asynchronous to the dispensing operation. The mixing operation shall be determined by the current mixing profile and shall take no longer than 20 seconds. The mixing operation shall comprise at least 2 steps, blending & washing. The mixer shall be designed as a module that attaches to the ice machine and refrigerated base. The mixer module shall consist of a mixer spindle, blade, a linear slide, cup holder with water nozzles. To access the mixer module a protective door must be raised. The mixer module door shall contain micro-switches/sensors to locate the door position.

[0217] The drink is placed into the cup holder and the door is closed. When the closure of the door has been identified the mixer shall begin the mixing process. The mixer spindle shall index (via linear slide) down into the drink cup a predetermined distance from home position. The mixer blade should preferably be engaged before contacting the ingredients in the drink. The spindle shall then index into the drink to a depth of cup of approximately 75%. The spindle shall dwell in this location for a period of 15 seconds. The spindle shall then return to the initial location and continue to mix for a period. Upon completion the mixer blade shall be de-energized and the spindle returned to its home location. The door is then opened and the drink is then removed and served.

[0218] After the last mixer sequence the module shall begin the cleaning process when the mixer door is closed. The cleaning process shall start with the spindle being lowered into the mixing cavity and the spindle blade energized. A water solenoid shall be energized for 3 seconds and begin to spray rinse the spindle and cavity after the spindle blade is energized during a mixer cleaning cycle. An air solenoid connected to the water line shall be energized to provide a high pressure blast of water during the mixer cleaning cycle. The module can be designed to operate with sanitizing agents in addition to water. The unit shall be able to detect run out of sanitizer fluid. When the mixer cleaning cycle has ended, the solenoids are de-energized and rinse water is drained. The mixer cleaning cycle shall take no longer than 5 seconds.

[0219] A mixing profile determines the steps to be performed during the mixing operation. Each step in the mixing profile specifies spindle's speed and time (how fast for how long) as well as position (with dwell time). A normal and Additive included mixing profile shall be available for each cup size. The mixing profiles shall be customer configurable.

[0220] The UIC shall support handling of USB storage devices. The UIC shall be capable of connecting to the C-Bus. The UIC shall provide 1-press on-the-fly language switch. The UIC shall be the P-Bus master.

[0221] The peripheral bus or P-Bus shall connect the User Interface Controller to the system's peripherals (the System Relay Board and the Mixer Control Boards) via RS-485. The P-Bus shall use ModBus RTU.

[0222] It should also be noted that the terms "first", "second", "third", "upper", "lower", and the like may be used herein to modify various elements. These modifiers do not imply a spatial, sequential, or hierarchical order to the modified elements unless specifically stated.

[0223] While the present disclosure has been described with reference to one or more exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the present disclosure. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the disclosure without departing from the scope thereof. Therefore, it is intended that the present disclosure not be limited to the particular embodiment(s) disclosed as the best mode contemplated, but that the disclosure will include all embodiments falling within the scope of the appended claims.

What is claimed is:

1. A method of controlling an integrated beverage system that comprises:

a dispensing module that dispenses ice and at least one additional ingredient according to a first recipe script executed by a controller into a first container and dispenses said ice and said at least one additional ingredient according to a second recipe script executed by said controller into a second container, wherein said first and second recipe scripts can be the same or different scripts;

a first blending/mixing module that blends and/or mixes ice and said one additional ingredient in said first container; and

a second blending/mixing module that blends and/or mixes ice and said at least one additional ingredient in said second container,

said method comprising:

controlling said dispensing module, said first blending/mixing module to prepare a first beverage in said first container and said second blending/mixing module to prepare a second beverage in said second container, wherein the controller is capable of preparing the first beverage and the second beverage both concurrently and/or sequentially with blending and/or mixing said ice and said at least one additional ingredient.

2. The method of claim **1**, wherein said blending and/or mixing of said ice and at least one additional ingredient in said first container is initiated during or before said dispensing module dispenses said ice and said at least one additional ingredient into said second container.

3. The method of claim **1**, wherein said one or more other ingredients are selected from the group consisting of: water, at least one flavor, and at least one additive.

4. The method of claim **1**, wherein said first recipe script comprises a beverage container size, a user selected beverage, and a first ingredient, and, based on said beverage container size, said first ingredient and said user selected beverage type, controlling said dispenser module to portion said first ingredient.

5. The method of claim **1**, further comprising:

using a first micro-controller that responds to user data entered via a user entry device to provide said first recipe script and said second recipe script; and

using a second micro-controller that uses said first recipe script and said second recipe script to control said dispensing module in the dispensing of a first set of said at least one additional ingredient into said first container and a second set of said at least one additional ingredient into said second container, respectively; and

using a third micro-controller that uses said first recipe script and said second recipe script to blend and/or mix said first and second sets of ingredients in said first container and said second container to produce said first beverage and said second beverage, respectively.

6. The method of claim **5**, wherein said first and/or second blending/mixing modules comprises a spindle assembly that is rotatable and that is movable substantially vertically into and out of said first container or said second container, and further comprising with said third micro-controller using said first recipe script or said second recipe script to drive a first motor that rotates said spindle assembly and a second motor that moves said spindle assembly substantially vertically.

7. The method of claim **6**, wherein said first recipe script or said second recipe script includes a size of said first container, a speed and dwell time for each of a plurality of blending levels in said first container, and further comprising with said third micro-controller using said first recipe script or said second recipe script to move said spindle assembly substantially vertically to each of said levels and to rotate said spindle assembly at each level with the speed and for the dwell time for that level according to said first recipe script or said second recipe script.

8. The method of claim **1**, wherein said integrated beverage system further comprises an interactive display, and wherein said program causes said controller to present a series of interactive screens on said display, to respond to user entries via said interactive screens to define a first set of said one or more other ingredients and a second set of said one or more other ingredients for said first beverage and said second beverage, respectively, to provide said first recipe script and said second recipe script for said first beverage and said second beverage, respectively, and to use said first recipe script and said second recipe script to control said dispensing module to dispense said first set of ingredients and said second set of ingredients into said first container and said second container, respectively, on a time shared basis.

9. A controller for an integrated beverage system that comprises:

wherein said integrated beverage system comprises:

a dispensing module that dispenses ice and one or more other ingredients according to a first recipe script executed by the controller into a first container and dispenses said ice and said at least one additional ingredient according to a second recipe script executed by said controller into a second container, wherein said first and second recipe scripts can be the same or different scripts;

a first blending/mixing module that blends and/or mixes said ice and said one or more other ingredients in said first container; and

a second blending/mixing module that blends and/or mixes ice and said at least one additional ingredient in said second container;

wherein said controller comprises:

a controller apparatus that controls said dispensing module and said first and second blending/mixing mod-

ules to prepare a first beverage in a first container and a second beverage in a second container concurrently and/or sequentially.

10. The controller of claim **9**, wherein said controller apparatus controls said dispensing module and said first and/or second blending/mixing modules based on beverage requests received from a user operated entry device.

11. The controller of claim **9**, wherein said one or more other ingredients are selected from the group consisting of: water, flavor and additive.

12. The controller of claim **9**, wherein said controller apparatus monitors conditions of said integrated beverage system via connections to one or more sensors of said integrated beverage system.

13. The controller of claim **9**, wherein said integrated beverage system further comprises an ice maker, and wherein said controller apparatus controls said dispensing module to deliver said ice to at least one of said first container and said second container.

14. The controller of claim **9**, wherein said dispensing module comprises a plurality of storage containers, wherein said at least one additional ingredient is a plurality of other ingredients, wherein said plurality of said other ingredients are stored in separate ones of said plurality of storage containers, and wherein said controller apparatus controls said dispensing module to deliver at least one of said plurality of said other ingredients from a corresponding storage container to said first container or said second container.

15. The controller of claim **14**, wherein said plurality of storage containers are flexible bags.

16. The controller of claim **14**, wherein said dispensing module further comprises a single dispensing nozzle for said plurality of storage containers, wherein said controller apparatus controls said dispensing module to deliver a selection of said other ingredients from said separate ones of said plurality of storage containers via separate delivery paths to said nozzle for dispensing to said first container or said second container.

17. The controller of claim **9**, wherein said controller apparatus comprises a plurality of micro-controllers that control said dispensing module and said first and/or second blending/mixing modules to prepare said first beverage and said second beverage based on said first recipe script and said second recipe script, respectively.

18. The controller of claim **17**, wherein said first recipe script comprises such selectable elements as a beverage container size, a user selected beverage, optional fluid types and quantities, optional additive types and quantities, blender profiles, optional mixer profiles, operator instructions for the different additives and a first ingredient, and wherein at least one of said micro-controllers, based on said beverage container size, said first ingredient and said user selected beverage, controls said dispenser module to portion said first ingredient.

19. The controller of claim **17**, wherein said micro-controllers comprise:

a first micro-controller that responds to user data entered via a user entry device to provide said first and second recipe scripts; and

a second micro-controller that uses said first and second recipe scripts to control said dispensing module in the dispensing of a first set of said at least one additional ingredient into said first container and a second set of said at least one additional ingredient into said second container, respectively; and

a third micro-controller that uses said first and second recipe scripts to blend and/or mix said first and second sets of other ingredients in said first and second containers to produce said first and second beverages, respectively.

20. A non-transitory computer readable medium storing a program for controlling an integrated beverage system that comprises a dispensing module that dispenses ice and at least one additional ingredient according to a first recipe script into a first container and dispenses said ice and said at least one additional ingredient according to a second recipe script into a second container, wherein said first and second recipe scripts can be the same or different scripts; a first blending/mixing module that blends and/or mixes said ice and said at least one additional ingredient in said first container; and a second blending/mixing module that blends and/or mixes said ice and said at least one additional ingredient in said second container, said non-transitory computer readable medium comprising:

executable with a computer apparatus instructions of said program to control said dispensing module and said first and/or second blending/mixing modules to prepare a first beverage in a first container and/or a second beverage in a second container concurrently and/or sequentially.

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