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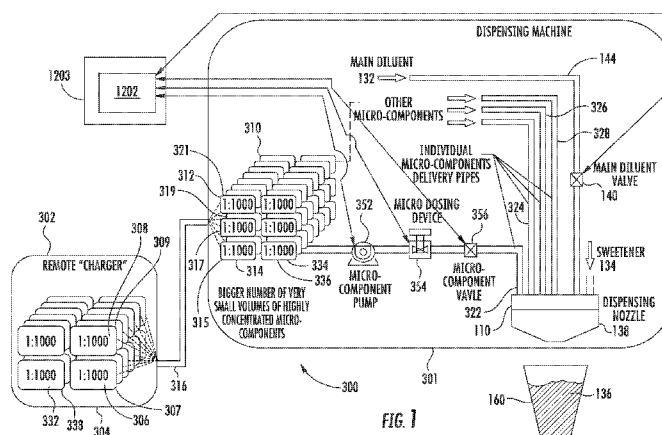


FIG. 1

(57) Abstract: The disclosure involves an apparatus comprising a charger subsystem, the charger subsystem comprising at least a first container having a first micro component, and a second container having a second micro component. The apparatus comprises a dispensing machine located downstream of the charger subsystem. The dispensing machine may comprise a third container, a fourth container, a fifth container, and a sixth container, wherein the volume of each is smaller than the volume of the first container and the second container. The first micro component may be conveyed from the first container of the charger subsystem to either the third container or the fourth container of the dispensing machine when either of them is at a predetermined threshold. The second micro component may be conveyed from the second container of the charger subsystem to either the fifth container or the sixth container when either of them is at a predetermined threshold.



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CHARGER FOR A DISPENSING MACHINE

CROSS REFERENCE TO RELATED APPLICATIONS

- [01] This application claims priority to U.S. Provisional Application No. 61/695,151, filed August 30, 2012, entitled “Charger for a Dispensing Machine,” the entire disclosure of which is hereby incorporated by reference in its entirety and for all purposes.

FIELD OF THE INVENTION

- [02] This disclosure relates generally to a dispensing apparatus and method for the dispensing of beverages, e.g., for cafeterias, restaurants (including fast food restaurants), theatres, convenience stores, gas stations, and other entertainment and/or food service venues.

BACKGROUND

- [03] Various beverage dispensers, such as those at cafeterias, restaurants, theatres, and other entertainment and/or food service venues, typically have either a “drop in” dispenser apparatus or a counter top type dispenser apparatus. In a drop in dispenser apparatus, the dispenser apparatus is self-contained and may be dropped into an aperture of a counter top. In a counter top type dispenser apparatus, the dispenser apparatus is placed on a counter top. In conventional beverage dispensers, a dispensing head is coupled to a particular drink syrup supply source via a single pipe dedicated to supply the particular drink syrup to that dispensing head, wherein the particular drink syrup supply source is typically located near the counter top, i.e., directly under the counter top, or directly over the counter top.
- [04] A user will typically place a cup under the signage of the selected beverage and either press a button or press the cup against a dispensing lever to activate the dispenser so that the selected beverage is delivered from the dispensing head corresponding to the selected beverage and into the cup until pressure is withdrawn from the button or lever.

- [05] Conventional dispensing machines may dispense a number of beverages. Each of dispensed beverages may consist of a number of components, such as flavors, acidulants, sweeteners, and diluents (e.g., water). In conventional dispensing machines, the required components of a beverage are dispensed via a common dispensing nozzle and each component is typically delivered to the dispensing nozzle via a separate delivery pipe. All the required highly concentrated components of the beverages are stored in individual cartridges within the dispensing machine. As the variety of the dispensed beverages increases, correspondingly the number of various beverage components and the number of the required individual cartridges also increases. As a result, the useful volume of a single cartridge decreases so that to fit the increased number of cartridges into the same volume of the dispensing machine becomes problematic. This results in an increase of occasions when the dispensing machine is out of some micro component and requires service by authorized personnel.
- [06] In a conventional system, large volumes of low concentrated micro components are typically maintained in separate cartridges. Low concentrated micro components in each cartridge typically have a ratio by weight of micro component to a diluent of about 6:1. Each low concentrated micro component is conveyed via a corresponding, individual delivery pipe. A diluent is conveyed to a dispenser. A sweetener is also conveyed to the dispenser. A finished product is formed in the dispenser and dispensed through a dispensing nozzle, e.g., into a container or cup placed underneath the dispensing nozzle.
- [07] In another conventional system, smaller volumes of highly concentrated components are placed either inside or in close proximity to the dispensing machine. As the number of various highly concentrated components increases, the total footprint of the dispensing system may increase correspondingly. In addition, the total volume of each stored component decreases to fit the increased number of components into the same volume of the dispensing machine. This results in more frequent incidents of inability of the beverage machine to dispense some of the requested beverages because some of the highly concentrated component cartridges become empty. In addition, this requires more frequent service by authorized personnel.

- [08] In a conventional method, the final product is obtained as a result of mixing of two or more continuous flows of the product components. This conventional method may work well when only low concentrated components are used. In the case when one or more of the components is a highly concentrated, the flow rate of such components required for continuous mixing becomes very small. In order to create and maintain such tiny and stable flows, a very precise and thus expensive dosing and dispensing equipment are required.
- [09] Conventional beverage dispensers are typically limited to dispensing drinks having flavoring supply sources located at their respective counters. Thus, a limited number of drinks are typically available at a conventional beverage dispenser. For example, drinks typically available at a conventional beverage dispenser are a regular cola beverage, a diet cola beverage, perhaps one or several non-cola carbonated beverages, such as a lemon-lime flavored carbonated beverage or some other fruit-flavored drink (e.g., orange flavored carbonated beverage, and/or root beer), and perhaps one more non-carbonated beverage(s), such as a tea and/or a lemonade.
- [10] Conventional dispensers are not typically configured to permit a user generate or receive from a single dispensing head a custom-ordered beverage that a consumer may wish to purchase, e.g., a cola flavored with cherry, vanilla, lemon, or lime, etc., or a tea flavored with lemon, orange, peach, raspberry, etc., or a tea having one or more teaspoons of sweetener (sugar, or some other nutritive sweetener or non-nutritive sweetener).
- [11] Conventional dispensers typically require servicing and resupply of flavoring sources at the counter.
- [12] Conventional dispensers typically require a dedicated dispensing head for each particular beverage.
- [13] What is needed is a beverage dispensing system and method that does not have the limitations and disadvantages of conventional beverage dispensers and methods.

SUMMARY

- [14] In an aspect, an apparatus is provided, the apparatus comprising a charger subsystem. The charger subsystem comprises at least a first container having a first volume of a first micro component, and at least a second container having a second volume of a second micro component. The apparatus comprises a dispensing machine. The dispensing machine comprises at least a third container defining a third volume, a fourth container defining a fourth volume, a fifth container defining a fifth volume, and a sixth container defining a sixth volume. The third volume, the fourth volume, the fifth volume, and the sixth volume are each smaller than each of the first volume and the second volume of the charger subsystem. The apparatus comprises a charging pipe manifold.
- [15] In an aspect, the charging pipe manifold is configured to convey the first micro component from the first volume to the third container when the amount of the first micro component in the third volume is at a first predetermined minimum threshold. The charging manifold is further configured to convey the first micro component from the first volume to the fourth container when the amount of the first micro component in the fourth volume is at a second predetermined minimum threshold. The charging manifold is further configured to convey the second micro component from the second volume to the fifth container when the amount of the second micro component in the fifth volume is at a third predetermined threshold. The charging manifold is further configured to convey the second micro component from the second volume to the sixth container when the amount of the second micro component in the sixth volume is at a fourth predetermined threshold.
- [16] In an aspect, the dispensing machine further comprises a dispenser. The dispensing machine further comprises at least one delivery pipe configured to deliver a micro component from at least one of the third container, the fourth container, the fifth container, or the sixth container to the dispenser.

- [17] The above and other aspects, features and advantages of the present disclosure will be apparent from the following detailed description of the illustrated embodiments thereof which are to be read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

- [18] FIG. 1 illustrates a schematic view of an embodiment of the dispensing system in accordance with various aspects of the disclosure.
- [19] FIG. 2 illustrates a schematic view of an embodiment of the dispensing system in accordance with various aspects of the disclosure.
- [20] FIG. 3 illustrates a view of an embodiment in accordance with various aspects of the disclosure.
- [21] FIG. 4 illustrates a view of an embodiment in accordance with various aspects of the disclosure.
- [22] FIG. 5 illustrates a view of an embodiment in accordance with various aspects of the disclosure.
- [23] FIG. 6 illustrates a schematic view of an embodiment of the dispensing system in accordance with various aspects of the disclosure.
- [24] FIG. 7 illustrates an embodiment of an auto-configured cartridge in accordance with various aspects of the disclosure.
- [25] FIG. 8 illustrates a flow diagram of a method in accordance with various aspects of the disclosure.
- [26] FIG. 9 illustrates a dosing control unit in accordance with various aspects of the disclosure.

DETAILED DESCRIPTION

- [27] The embodiments discussed below may be used to form a wide variety of beverages, including but not limited to cold and hot beverages, and including but not limited to beverages known under any PepsiCo branded name, such as Pepsi-Cola®.
- [28] Those of skill in the art will recognize that in accordance with the disclosure a transfer unit or dosing system and/or portions thereof that feed a dispenser with a free flowing product may be located remotely from a counter, such as in a back room, or at the counter, such as below or over the counter.
- [29] In an aspect of the disclosure, an apparatus is provided, the apparatus comprising a charging unit or charger. The charger may be configured to automatically refill a cartridge, such as a built-in cartridge that is about to become empty. The charger may be located remotely from a dispensing machine. For example, the charger may be located in a back room, rather than at a counter where the dispensing machine may be located.
- [30] In an aspect, an apparatus is provided, the apparatus comprising a charger subsystem. The charger subsystem comprises at least a first container having a first volume of a first micro component, and at least a second container having a second volume of a second micro component. The apparatus comprises a dispensing machine. The dispensing machine comprises at least a third container defining a third volume, a fourth container defining a fourth volume, a fifth container defining a fifth volume, and a sixth container defining a sixth volume. The third volume, the fourth volume, the fifth volume, and the sixth volume are each smaller than each of the first volume and the second volume of the charger subsystem.
- [31] In an aspect, the apparatus comprises a charging pipe manifold. In an aspect, the charging pipe manifold is configured to convey the first micro component from the first volume to the third container when the amount of the first micro component in the third volume is at a first predetermined minimum threshold. The charging pipe manifold is further configured to convey the first micro component from the first volume to the

fourth container when the amount of the first micro component in the fourth volume is at a second predetermined minimum threshold. The charging pipe manifold is further configured to convey the second micro component from the second volume to the fifth container when the amount of the second micro component in the fifth volume is at a third predetermined threshold. The charging pipe manifold is further configured to convey the second micro component from the second volume to the sixth container when the amount of the second micro component in the sixth volume is at a fourth predetermined threshold.

- [32] In an aspect, the dispensing machine further comprises a dispenser. The dispensing machine further comprises at least one delivery pipe configured to deliver a micro component from at least one of the third container, the fourth container, the fifth container, or the sixth container to the dispenser.
- [33] In an aspect, the at least one delivery pipe may be a first delivery pipe configured to deliver the first micro component from at least the third container or the fourth container to the dispenser. In an aspect, the apparatus may further comprise at least a second delivery pipe configured to deliver the second micro component from at least the fifth container or the sixth container to the dispenser. In an aspect, the dispenser may comprise a dispensing nozzle. In an aspect, the dispenser may be located at a counter. In an aspect, the charger subsystem may be located further away from the counter than the third container, the fourth container, the fifth container, and the sixth container.
- [34] In an aspect, the dispensing machine may further comprise a main diluent valve configured to convey a main diluent to the dispenser. The dispenser may be configured to combine the main diluent with a micro component conveyed from at least one of the third container, the fourth container, the fifth container, or the sixth container. The dispensing machine may comprise more containers than the number of containers of the charger subsystem. For example, the dispensing machine may comprise at least twice the number of container than the number of containers of the charger subsystem.

- [35] In an aspect, the apparatus may further comprise a controller. The controller may be configured to control charging of the first micro component from the first container of the charger subsystem to the third and fourth containers of the dispensing machine, and to control charging of the second micro component from the second container of the charger subsystem to the fifth and sixth containers of the dispensing machine.
- [36] In an aspect, the dispensing machine may be configured to dose a predetermined amount of a micro component from at least one container of the dispensing machine to the dispenser, the at least one container selected from the group consisting of the third container, the fourth container, the fifth container, and the sixth container. The apparatus may further comprise a controller configured to control the dosing of the predetermined amount of a micro component from the at least one container of the dispensing machine to the dispenser by controlling operation of the dispensing machine.
- [37] In an aspect, the dispensing machine may comprise at least one of a micro component pump, a micro dosing device and a micro component valve. The controller may be configured to control dosing of a micro component from at least one container of the dispensing machine to the dispenser by controlling operation of at least one of a micro component pump, a micro dosing device and a micro component valve of the dispensing machine.
- [38] In an aspect, an apparatus comprises a charger subsystem, wherein the charger subsystem comprises at least a first container having a first volume of a first micro component, and at least a second container having a second volume of a second micro component. The charger subsystem may further comprise at least one of a dosing device or a flow restrictor corresponding to a micro component of the charger subsystem. The at least one dosing device or flow restrictor may be configured to dose a micro component to a corresponding flow combiner. Each flow combiner may be configured to combine a corresponding micro component with a diluent and dilute the corresponding micro component so that the effluent of the flow combiner has a smaller ratio by weight of micro component to diluent than before the micro component enters the flow combiner.

- [39] In an aspect, the apparatus comprises a dispensing machine wherein the dispensing machine comprises at least a third container defining a third volume, at least a fourth container defining a fourth volume, at least a fifth container defining a fifth volume, and at least a sixth container defining a sixth volume. The third volume, the fourth volume, the fifth volume, and the sixth volume may each be smaller than each of the first volume and the second volume of the charger subsystem. In an aspect, the ratio by weight of micro component to diluent in the third container and the fourth container is less than the ratio by weight of micro component to diluent in the first container. In an aspect, and the ratio by weight in the fifth container and the sixth container is less than the ratio by weight of micro component to diluent in the second container.
- [40] In an aspect, the apparatus may comprise a charging pipe manifold. The charging pipe manifold may be configured to convey the first micro component from the first volume to the third container when the amount of the first micro component in the third volume is below a first predetermined threshold. The charging pipe manifold may be further configured to convey the first micro component from the first volume to the fourth container when the amount of the first micro component in the fourth volume is below a second predetermined threshold. The charging pipe manifold may be further configured to convey the second micro component from the second volume to the fifth container when the amount of the second micro component in the fifth volume is below a third predetermined threshold. The charging pipe manifold may be further configured to convey the second micro component from the second volume to the sixth container when the amount of the second micro component in the sixth volume is below a fourth predetermined threshold. In an aspect, the dispensing machine further comprises a dispenser and at least one delivery pipe configured to deliver a micro component from at least one of the third container, the fourth container, the fifth container, or the sixth container to the dispenser.
- [41] In an aspect, the apparatus may comprise a main diluent source. The dispensing machine may be configured to combine main diluent from the main diluent source with at least the

first micro component from either the third container or the fourth container to form a first finished free flowing product.

- [42] In an aspect, the at least one delivery pipe is a first delivery pipe configured to deliver the first micro component from at least the third container or the fourth container to the dispenser. In an aspect, the apparatus may further comprise at least a second delivery pipe configured to deliver the second micro component from at least the fifth container or the sixth container to the dispenser. The dispensing machine may be configured to combine main diluent from the main diluent source with the second micro component from either the fifth container or the sixth container to form a second finished free flowing product.
- [43] In an aspect, the dispenser comprises a dispensing nozzle. In an aspect, the dispenser may be located at a counter. In an aspect, the charger subsystem may be located further away from the counter than the third container, the fourth container, the fifth container, and the sixth container. In an aspect, the dispensing machine may further comprise a main diluent valve, the main diluent valve configured to convey a main diluent to the dispenser. In an aspect, the dispenser may be configured to combine the main diluent with a micro component conveyed from at least one of the third container, the fourth container, the fifth container, or the sixth container. In an aspect, the dispensing machine comprises more containers than the number of containers of the charger subsystem. For example, the dispensing machine may comprise at least twice the number of container than the number of containers of the charger subsystem.
- [44] In an aspect, the apparatus further comprises a controller. The controller may be configured to control charging of the first and second micro components from the charger subsystem to containers of the dispensing machine. For example, the controller may be configured to control charging of the first micro component from the first container of the charger subsystem to the third and fourth containers of the dispensing machine. In a further example, the controller may be configured to control charging of the second

micro component from the second container of the charger subsystem to the fifth and sixth containers of the dispensing machine.

- [45] In an aspect, the dispensing machine may be configured to dose a predetermined amount of a micro component from at least one container of the dispensing machine to the dispenser, the at least one container selected from the group consisting of the third container, the fourth container, the fifth container, and the sixth container. The dispensing machine may comprise a controller, the controller configured to control the dosing of the predetermined amount of a micro component from at least one container of the dispensing machine to the dispenser by controlling operation of the dispensing machine. For example, the dispensing machine may be configured to control dosing by controlling operation of at least one of a micro component pump, a micro dosing device or a micro component valve of the dispensing machine. In an aspect, the dispensing machine is configured to combine main diluent from the main diluent source with the first micro component from either the third container or the fourth container and with the second micro component from either the fifth container or the sixth container to form a third finished free flowing product.
- [46] In an aspect, a method comprises filling at least a first container having a first volume with a first micro component, the first container located in a charger subsystem. The method further comprises filling at least a second container having a second volume with a second micro component, the second container located in the charger subsystem. The method may comprise conveying the first micro component from the first volume to a third container when the amount of the first micro component in the third container is at a first predetermined threshold. The third container may be located in a dispensing machine. The dispensing machine may be located downstream of the charger subsystem. In an aspect, the method may comprise conveying the first micro component from the first volume to a fourth container when the amount of the first micro component in the fourth container is at a second predetermined threshold. The fourth container may be located in the dispensing machine.

- [47] In an aspect, the method may comprise conveying the second micro component from the second volume to a fifth container when the amount of the second micro component in the fifth container is at a third predetermined threshold. The fifth container may be located in the dispensing machine. In an aspect, the method may comprise conveying the second micro component from the second volume to a sixth container when the amount of the second micro component in the sixth container is at a fourth predetermined threshold. The sixth container may be located in the dispensing machine.
- [48] In an aspect, the method may further comprise combining at least the first micro component from either the third container or the fourth container with a main diluent, or combining at least the second micro component from either the fifth container or the sixth container with a main diluent to form a finished free flowing product.
- [49] In an aspect, the method may further comprise diluting the first micro component with a diluent prior to conveying the first micro component to the third container and the fourth container, and diluting the second micro component with a diluent prior to conveying the second micro component to the fifth container and the sixth container.
- [50] The apparatus and method of the present disclosure may reduce expenses associated with dosing of highly concentrated liquid micro components, including the cost of dosing equipment and service expenses. Use of a charger may allow for the storing of small portions of low concentrated components within a dispensing machine. Use of a charger may allow for a preparing of beverages with the help of convenient, low cost dosing and dispensing equipment. In accordance with the present disclosure, use of a charger may facilitate preparing of low concentrated components within the charger from the highly concentrated liquid micro components.
- [51] The apparatus and method of the present disclosure may improve usability of multi-flavor dispensing machines while minimizing occasions when the dispensing machine is out of service, e.g., for filling cartridges that have run out of micro components. Embodiment(s) of the present disclosure may allow for dosing of high concentration

micro components using less expensive equipment designed for dosing low concentration micro components.

- [52] In an aspect, a highly concentrated free flowing micro component having a ratio by weight of the highly concentrated free-flowing micro component to a diluent of at least about 30:1 may be provided. In an aspect, the ratio by weight of the highly concentrated free-flowing micro component to a diluent of at least about 1000:1 may be provided. The apparatus may comprise a dispensing machine, the dispensing machine configured to intermittently dose a predetermined amount of the highly concentrated free-flowing micro component at a predetermined flow rate. For example, the dispensing machine may comprise at least one of a micro component pump, a micro dosing device, and a micro component valve. The apparatus may comprise a controller configured to control the operation of the dispensing machine via two way communications. The controller may be configured to control operation of the apparatus and/or devices of the apparatus.
- [53] In one aspect, a dispensing system is provided that has a simplified design over conventional dispensing systems. The dispensing system disclosed herein may be configured to dispense a number of components, including but not limited to flavors, acidulants, sweeteners, and diluents (e.g., water).
- [54] As shown in FIG. 1, in an aspect of the present disclosure, dispensing system or apparatus 300 may comprise a dispensing machine 301 and a charger 302. Charger 302 may comprise a plurality of containers 307. Each container 307 may comprise a cartridge 338. Each cartridge 338 may comprise a micro component, e.g., a component for free flowing food product, e.g., a beverage component or ingredient. Each cartridge may comprise a Bag-in-Box ("BIB"), a pressurized vessel, or a polyethylene terephthalate ("PET") bottle. Charger 302 may comprise a first plurality 304 of at least two separate and distinctly different beverage components 306 and 308, each contained in a separate container 307. From charger 302, each beverage component 306 and 308 may be conveyed to a second plurality 310 of at least two separate and distinctly different beverage components 312 and 314 via a charging pipe(s) or charging pipe manifold 316.

The second plurality 310 of at least two separate and distinctly different beverage components 312 and 314 may comprise a larger number of smaller volumes 334 of highly concentrated micro components than the larger volumes 332 of the first plurality 304 of at least two separate and distinctly different beverage components 306 and 308 of the charger 302. For example, the second plurality 310 may comprise at least twice the number of volumes 334 than the volumes 332 of the first plurality 304. Smaller volumes 334 may each comprise a cartridge(s) 336. Cartridge(s) 336 may be built-in cartridges, such as built in cartridges at or near a dispensing counter (not shown).

- [55] Large volumes 332 of the first plurality 304 of at least two separate and distinctly different beverage components 306 and 308 may be provided at the charger 302. Large volumes 332 may each comprise a cartridge(s) 338. Cartridge(s) 338 may be built-in cartridges, such as built-in cartridges at a location that may be remote from the second plurality 310 of the at least two separate and distinctly different beverage components 312 and 314. The components 306 and 308 in large volumes 332 may comprise highly concentrated micro components, which may have a ratio by weight of micro component to a diluent of at least about 1000:1.
- [56] Each beverage component 312 and 314 may have a ratio by weight of micro component to a diluent of at least about 1000:1. Each beverage component of the second plurality 310 may be conveyed via a corresponding, individual delivery pipe, such as pipes 322, 324, 326, and 328, respectively to a dispenser 110. A micro component pump 352, dosing device 354, and micro component valve 356 may be provided to control conveyance of highly concentrated micro component 312 to individual delivery pipe 322. Similar micro component pumps, dosing devices, and micro component valves (not shown) may be provided to control conveyance of highly concentrated component(s) 314 to corresponding, individual delivery pipes 324, 326, and 328, respectively. Main diluent 132 may be conveyed in main diluent flow 144, through main diluent valve 140, to dispenser 110. Dispenser 110 may comprise dispensing nozzle 138. Sweetener 134 may be conveyed to dispenser 110. Dispenser 110 may be configured to combine at least beverage component 312, main diluent 132, and sweetener 134 to form a finished product

136. Dispensing nozzle 138 of dispenser 110 may be configured to dispense product 136 into a container or cup 160.

- [57] In accordance with the disclosure, the first micro component 306 may be conveyed from a first volume defined by a first container or cartridge 307 in the charger subsystem 302 through the charging pipe manifold 316. In accordance with the disclosure, a second micro component 308 may be conveyed from a second volume defined by a second container 309 in the charger subsystem 302 through the charging pipe manifold 316.
- [58] As shown in FIG. 1, the first micro component 306 may be conveyed from the first volume defined by the first container 307 in the charger subsystem 302 through the charging pipe manifold 316 to a third container 315 of dispensing machine 301 when the amount of the first micro component 306 in a volume defined by the third container 315 is at a first predetermined minimum threshold.
- [59] In accordance with the disclosure, the first micro component 306 may be conveyed from the first volume through the charging pipe manifold 316 to a fourth container 317 of the dispensing machine 301 when the amount of the first micro component 306 in the volume defined by the fourth container 317 is at a second predetermined minimum threshold.
- [60] In accordance with the disclosure, the second micro component 308 may be conveyed from the volume defined by the second container 309 through the charging pipe manifold 316 to a fifth container 319 of the dispensing machine 301 when the amount of the second micro component 308 in the volume defined by the fifth container 319 is at a third predetermined minimum threshold.
- [61] In accordance with the disclosure, the second micro component 308 may be conveyed from the volume defined by the second container 309 through the charging pipe manifold 316 to a sixth container 321 when the amount of the first micro component 308 in the volume defined by the sixth container 321 is at a second predetermined minimum threshold.

- [62] Charging pipe manifold 316 may comprise a bundle of a plurality of pipes wherein a least effluent from one cartridge 338 is transported to a cartridge of dispensing machine 301.
- [63] In an alternative, charging pipe manifold 316 may comprise a single delivery pipe wherein an effluent from a first cartridge 338 of the charger 302 is transported to a third cartridge of dispensing machine 301 during a first period of time, and effluent from a second cartridge 338 of the charger 302 is transported to a fourth cartridge of dispensing machine 301 during a second period of time that is not the same as the first period of time.
- [64] Those of skill in the art will recognize that in accordance with the disclosure liquids or materials remaining in piping or other apparatus of the system may be washed out with a diluent, such as auxiliary diluent, and any remaining liquids or materials may be purged using a gas.
- [65] Apparatus 300 may comprise dosing control unit 1203. Dosing control unit 1203 may comprise controller 1202. Controller 1202 may be operatively connected to micro component pump 352, micro dosing device 354, and/or micro component valve 356 via two-way communications as shown in FIG. 1. Controller 1202 may further be operatively connected to main diluent valve 140 via two-way communications as shown in FIG. 1. Those of skill in the art will recognize that in accordance with the disclosure a controller, such as controller 1202, may control operation of devices. Thus, controller 1202 may control operation of device(s) in FIG. 1 to charge cartridges 336 with micro components from charger 302, the dosing from cartridges 336 of components to a dispenser 110, and the combining of components to form a finished product, e.g., a finished free flowing food product, such as a beverage at dispenser 110.
- [66] FIG. 2 illustrates aspects of the present disclosure. FIG. 2 illustrates a dispensing system or apparatus 400. Apparatus 400 may be similar to apparatus 300 shown in FIG. 3. Apparatus 400 may comprise dosing control unit 1203 and controller 1202 as previously described with respect to FIG. 1. Controller 1202 may be operatively connected to devices in FIG. 2 via two-way communications (not shown in FIG. 2) to control

operation of device(s). Apparatus 400 may be different from apparatus 300 in that apparatus 400 may comprise a second plurality 410 of components that may have a larger number of smaller volumes of low concentrated micro components than the second plurality 310 of components shown in FIG. 1. The second plurality 410 may comprise low concentrated micro components, which may have a ratio by weight of micro component to a diluent of about 6:1.

- [67] The second plurality 410 may comprise at least two separate and distinctly different beverage components 412 and 414, which may comprise a larger number of smaller volumes 434 of low concentrated micro components than the larger volumes 332 of the first plurality 304 of at least two separate and distinctly different beverage components 306 and 308 of the charger 302. Smaller volumes 434 may each comprise a cartridge(s) 436. Cartridge(s) 436 may be built-in cartridges, such as built in cartridges at or near a dispensing counter (not shown).
- [68] Each beverage component 412 and 414 may have a ratio by weight of micro component to a diluent of at least about 6:1. Each beverage component of the second plurality 410 may be conveyed via a corresponding, individual delivery pipe, such as pipes 422, 424, 426, and 428, respectively to a dispenser 110. A micro component pump 452, dosing device 454, and micro component valve 456 may be provided to control conveyance of highly concentrated micro component 412 to individual delivery pipe 422. Similar micro component pumps, dosing devices, and micro component valves (not shown) may be provided to control conveyance of highly concentrated component(s) 414 to corresponding, individual delivery pipes 424, 426, and 428, respectively. Main diluent 132 may be conveyed in main diluent flow 144, through main diluent valve 140, to dispenser 110. Dispenser 110 may comprise dispensing nozzle 138. Sweetener 134 may be conveyed to dispenser 110. Dispenser 110 may be configured to combine at least beverage component 412, main diluent 132, and sweetener 134 to form a finished product 136. Dispensing nozzle 138 of dispenser 110 may be configured to dispense product 136 into a container or cup 160.

- [69] Apparatus 400 may comprise a dispensing machine 401. Dispensing machine 401 may provide storing of small portions of low concentrated components, which can be used to prepare beverages with the help of convenient, low cost dosing and dispensing equipment, as shown in FIG. 2. In accordance with the present disclosure, low concentrated components may be prepared within the charging unit from the highly concentrated liquid micro components. An example of how this preliminary dosing is accomplished is shown in the enlarged window of FIG. 2, and FIG. 3, FIG. 4, and FIG. 5. FIG. 3, FIG. 4, and FIG. 6 illustrate various embodiments for integration of preliminary dosing/dilution components into the charger cartridge.
- [70] Diluent 132 may be received in a doser or flow restrictor 460. Doser 460 may comprise a diluent preliminary dosing pump 462, a diluent preliminary dosing device 464, and a diluent preliminary dosing valve 466.
- [71] Component 308 may be received in a doser or flow restrictor 470. Doser 470 may comprise a first component preliminary dosing pump 472, a first component preliminary dosing device 474, and a first component preliminary dosing valve 476.
- [72] Preliminary flow combiner 480 may be configured to receive diluent flow 482 dosed by doser 460, and component flow 484 dosed by doser 470. Preliminary flow combiner 480 may be configured to combine diluent flow 482 and component flow 484 to form a mixture 486. Mixture 486 may have a may have a ratio by weight of micro component to a diluent of at least about 6:1. Mixture 486 may be beverage component 412 or 414.
- [73] FIG. 3 shows a built in construction wherein doser or flow restrictor 460, doser 470, and flow combiner 480 are positioned in the same housing 490.
- [74] FIG. 4 shows a design wherein doser or flow restrictor 460, doser 470, and flow combiner 480 are not positioned in the same housing.
- [75] FIG. 5 shows a built in construction wherein doser 470, and flow combiner 480 are positioned in the same housing 490, but doser or flow restrictor 460 is not.

- [76] Benefits of the present disclosure include simplified design of dispensing systems or machines, including systems or machines for the dispensing of multiple beverages.
- [77] FIG. 6 is a schematic view of an embodiment of a dispensing system or apparatus 600 according to various aspects of the disclosure. Apparatus 600 comprises apparatus or charger subsystem 602. Apparatus 600 may also comprise dispensing machine 601. Dispensing machine 601 may be similar to dispensing machine 401 shown in FIG. 2. Charger subsystem 602 may comprise a first plurality of cartridges 604 and effluent manifold 605. Charger subsystem 602 may be similar to or the same as apparatus 302 depicted in FIG. 2. Controller 1202, as previously described with respect to FIG. 1 and FIG. 2 may be configured to control operation of devices in FIG. 6 via two-way communications (not shown in FIG. 6).
- [78] Dispensing machine 601 may comprise a dispenser 610. Dispenser 610 may comprise a dispensing nozzle 638. Charger subsystem 602 may serve as a “charger” of diluted micro components through pipe 616 to a second plurality of cartridges 606 and manifold apparatus 607. The second plurality of cartridges 606 may define volumes to receive a diluted micro component from charger subsystem 602. Those of skill in the art will recognize that, in accordance with the disclosure, the introduction of a “charger” facilitates the practice of micro dosing in combination with existing or legacy equipment. A gas, such as carbon dioxide, or other gas, e.g., nitrogen (N₂) may be supplied to charger subsystem 602 from line 642. Line 642 may split into lines 644 and 646. As shown in FIG. 6, line 646 is the line that supplies gas to the plurality of cartridges 604 of charger subsystem 601, and this gas applies pressure in the plurality of cartridges 604 to push micro components out of cartridges 604 to manifold 605 or pipe 616 as may be desired.
- [79] Diluent 618 may be conveyed via line 619 to dilute the weight of micro component to diluent in cartridges 604.
- [80] As shown in FIG. 6, the second plurality of cartridges 606 of dispensing machine 601 may receive diluted micro components having a ratio by weight of micro component to a

diluent, for example about 6:1, that is significantly less than the ratio by weight of micro component to diluent, for example about 1000:1, in the highly concentrated micro components in the plurality of cartridges 604 in charger subsystem 602.

- [81] Since micro components have been diluted from being highly concentrated micro components having a ratio by weight of micro component to diluent (e.g., of about 1000:1) in the plurality of cartridges 604 of charger subsystem 602 to a lower ratio (e.g., of about 6:1) in the plurality of cartridges 606, less complex devices 611, for example, positive displacement pumps, may be used to dose micro components and mix them with auxiliary diluent 928 in dispensing machine 601 to form effluent 632, than what may otherwise be required.
- [82] The effluent 632 may be fed through delivery pipe 608 to dispenser 610, which may comprise dispensing nozzle 638.
- [83] Diluent 618 may be pumped by diluent pump 620 through pipe 622. After being pumped by diluent pump 620 through pipe 622, diluent 618 may enter a diluent flow splitter 624. At diluent flow splitter 624, diluent 618 may be split into a main diluent flow pipe 626, and an auxiliary diluent flow pipe 628. In one embodiment, about 75-95% of the diluent 618 from pipe 622 goes to main diluent flow pipe 626, and about 5-25% of the diluent 618 goes to the auxiliary diluent flow pipe 628. Diluent 618 flowing through auxiliary diluent flow pipe 628 may flow through auxiliary diluent valve 630, and then flow to gas/diluent flow switcher 650. The effluent from gas/diluent flow switcher 650 may flow to the plurality of cartridges 606 and/or manifold 607, where it may be mixed with a micro component(s) as desired.
- [84] As shown in FIG. 6, line 642 may supply gas to valve 648, and the gas may then be supplied to gas/diluent flow switcher 650. Thus, gas may be supplied to gas/diluent flow switcher 650 when desired, for example, when it is desired to purge any liquid(s) in pipes or lines or dispensing nozzles downstream of gas/diluent flow switcher 650, including pipes or lines or other devices of dispensing machine 601, or to increase carbonation in a beverage.

- [85] As shown in FIG. 6, diluent 618 flowing through main diluent flow pipe 626 may flow through main diluent valve 140 before diluent 618 is delivered to dispenser 610. Sweetener 134 may also be delivered to dispenser 610. At dispenser 610, all of the components for a beverage may be combined into a finished product 636, e.g., a free flowing food product, such as a beverage, and then dispensed through the dispensing nozzle 638 of the dispenser 610 into a cup or container 660.
- [86] Cartridges described herein may be configured to be an auto-configured cartridge. An auto-configured cartridge 700 is depicted in FIG. 7. Auto-configured cartridge 700 may have a code 702, such as an RFID code, an alphanumeric code or bar code, which corresponds to a particular micro component and/or beverage ingredient 704 contained within cartridge 700. A reading of the code 702 by a detector 703, such as by an RFID code, alphanumeric code or bar code detector, enables a determination as to the correct location to load cartridge 700 comprising micro component 704, e.g., where to load cartridge 700 at the charger 302 or at charger subsystem 602 previously described. For example, charger 302 or charger subsystem 602 may include a code detector adjacent to at each location of a charger or charger subsystem that is configured to receive a cartridge. For example, detector 703 may be configured to provide an indication, such as a visual and/or audio indication when a particular cartridge is placed next to the location corresponding to the predetermined location for a predetermined micro component. A visual indication may be, e.g., a light 705 that turns on when code 702 matches or corresponds to the predetermined location of a charger or charger subsystem for a cartridge comprising micro component 704. Detector 703 may be placed on a frame or support 706, which is configured to receive cartridges. Other detector(s) may be provided at locations in a charger or charger subsystem, with each detector configured to provide an indication when a cartridge comprising a particular micro component is placed next that detector. For example, as shown in FIG. 7, detector 707 may be provided at a location different from the location of detector 703. Detector 707 may be configured to provide an indication, such as a visual and/or audio indication, e.g., a light 709 that turns on, when a cartridge comprising a particular micro component is placed

next to detector 707 wherein that particular micro component may be different than micro component 704.

- [87] A user and/or customer may login at a website and/or server and order free flowing food product, e.g., a beverage, including a custom beverage, such as their own recipe, including the amount of carbonation for the beverage, and complete the order with a purchase of the beverage (such as authorizing the purchase with inputted or previously inputted credit card information).
- [88] A user and/or customer may build a beverage using a communication device (such as a device at a remote kiosk, table, or other location), a smart phone or tablet device, and send their beverage order to a server, which upon receipt of the order, controls apparatus and/or devices to send the appropriate types and amounts of ingredients to a dispensing head or nozzle for the ordered beverage. The user and/or customer can go to the dispensing or banner area to get the ordered beverage.
- [89] A user and/or customer, after placing a beverage order with the server, may receive back from the server a code, e.g., an RFID code, an alphanumeric code or bar code, which corresponds to a finished beverage to be dispensed by a beverage dispenser and which can be read by the beverage dispenser. The beverage dispenser, upon reading the code, can send the code to a server that controls the dispensing of beverage ingredients from a nozzle into a cup or container.
- [90] A user and/or customer may receive a cup or container that has a code, and upon reading of the code, the beverage dispenser can send the code to a server that controls the dispensing of beverage ingredients from a nozzle into a cup or container.
- [91] The system may include an application, such as a smartphone or tablet application, wherein a user and/or customer can enter beverage order information to a server.
- [92] In one aspect, there is provided a dispensing system comprising a plurality of cartridges, each cartridge having a highly concentrated beverage micro component having a concentration of a micro component to diluent of at least about 30:1. The modular

dispensing system may comprise plurality of micro dosing devices, each micro dosing device corresponding to one of the highly concentrated beverage components, each micro dosing device configured to dose its corresponding highly concentrated beverage component at a predetermined flow rate or predetermined quantity. Upon being dosed by its corresponding micro dosing device, each highly concentrated micro component may be transported via a common delivery pipe to a dispensing nozzle. The micro dosing devices may be devices that are built-in or at each corresponding cartridge at for each micro component.

[93] In one aspect, there is provided a modular dispensing system comprising a first plurality of cartridges and manifold apparatus, each cartridge having a highly concentrated beverage micro component having a concentration of a micro component to diluent of at least about 30:1. The first plurality of cartridges and manifold apparatus may comprise a plurality of micro dosing devices, each micro dosing device corresponding to one of the highly concentrated beverage components, each micro dosing device configured to dose its corresponding highly concentrated beverage component at a predetermined flow rate or predetermined quantity. Upon being dosed by its corresponding micro dosing device, each highly concentrated micro component may be transported via a common delivery pipe to a dispensing nozzle. The micro dosing devices may be devices that are built-in or at each corresponding cartridge at for each micro component.

[94] In one aspect, a two-stage dosing is provided. In a first stage of dosing, a concentrated beverage ingredient having a ratio by weight beverage ingredient to water of at least 30:1 is mixed with a diluent to obtain a first stage component. In an embodiment, the concentrated beverage ingredient has a ratio by weight of beverage ingredient to diluent (e.g., water) of at least 200:1. In another embodiment, the concentrated beverage ingredient has a ratio by weight of beverage ingredient to diluent (e.g., water) of at least 500:1. In a further embodiment, the concentrated beverage ingredient has a ratio by weight of beverage ingredient to diluent (e.g., water) of at least 1000:1. In a second stage of dosing, the first stage component is mixed with a diluent to obtain a second stage component. In an embodiment, the second stage component has a ratio by weight of

beverage ingredient to diluent (e.g., water) of at least 5:1. . In an embodiment, the second stage component has a ratio by weight of beverage ingredient to diluent (e.g., water) of at least 6:1. In an embodiment, the first stage of dosing may occur at the transfer unit. In an embodiment, the second stage may occur at the counter, and the second stage component having a concentration of beverage ingredient that is a predetermined concentration of beverage ingredient for a finished beverage.

- [95] In one aspect, the intermediate mixing is provided. In an embodiment, intermediate mixing comprises the combining of micro-dosing technology for measuring high concentration flavors. Intermediate mixing may comprise agitation, ultrasound, etc.
- [96] In one aspect, pure micro-dosing is provided. In an embodiment, a concentrated beverage ingredient having a ratio by weight of beverage ingredient to water of at least 1000:1 is dosed using a micro dosing device, and is sent through a pipe at a predetermined flow rate to counter and is mixed at the counter with water to form a predetermined beverage.
- [97] FIG. 8 illustrates a flow diagram of a method in accordance with various aspects of the disclosure. FIG. 8 illustrates a method 1500. In step 1501 of method 1500, filling at least a first container having a first volume with a first micro component occurs, wherein the first container is located in a charger subsystem. In step 1502, filling at least a second container having a second volume with a second micro component occurs, wherein the second container is located in the charger subsystem. In step 1503, conveying the first micro component from the first volume to a third container when the amount of the first micro component in the third container is at a first predetermined threshold occurs, wherein the third container is located in a dispensing machine, the dispensing machine being located downstream of the charger subsystem. In step 1504, conveying the first micro component from the first volume to a fourth container when the amount of the first micro component in the fourth container is at a second predetermined threshold occurs, the fourth container being located in the dispensing machine. In step 1505, conveying the second micro component from the second volume to a fifth container when the

amount of the second micro component in the fifth container is at a third predetermined threshold occurs, the fifth container being located in the dispensing machine. In step 1506, conveying the second micro component from the second volume to a sixth container when the amount of the second micro component in the sixth container is at a fourth predetermined threshold occurs, the sixth container being located in the dispensing machine. In step 1507, combining at least the first micro component from either the third container or the fourth container with a main diluent, or combining at least the second micro component from either the fifth container or the sixth container with a main diluent to form a finished free flowing product occurs.

- [98] In an aspect, method 1500 may further comprise diluting the first micro component with a diluent prior to conveying the first micro component to the third container and the fourth container, and diluting the second micro component with a diluent prior to conveying the second micro component to the fifth container and the sixth container.
- [99] FIG. 9 illustrates a dosing control unit in accordance with various aspects of the disclosure. FIG. 9 illustrates an example of a dosing control unit 1203, as shown in FIG. 1, FIG. 2, and FIG. 6. Dosing control unit 1203 may comprise a controller 1202 as shown in FIG. 1, FIG. 2, FIG. 3, and FIG. 6. Controller 1202 may comprise a processor. Dosing control unit 1203 may further comprise at least one non-transitory memory 1602, a display 1604, and a communication interface 1608. Controller 1202 may execute computer-executable instructions present in non-transitory memory 1602 such that, for example, dosing control unit 1203 may send and receive information via a network (not shown).
- [100] Dosing control unit 1203 may further include or be in communication with a system bus (not shown). A system bus may be any of several types of bus structures including a memory bus or memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. The structure of system non-transitory memory is well known to those skilled in the art and may include a basic input/output system (BIOS) stored in a read only memory (ROM) and one or more program modules such as

operating systems, application programs and program data stored in random access memory (RAM). Dosing control unit 1203 may be configured to allow dosing control unit 1203 to communicate other devices, e.g., in apparatus 300 of FIG. 1, apparatus 400 of FIG. 2, and apparatus 600 of FIG. 6. For example, dosing control unit 1203 may be configured to communicate via two way communication with micro-component pump 352, micro dosing device 354, micro-component valve 356, a diluent pump (not shown), and a main diluent valve 140 as shown in FIG. 1. Similarly, dosing control unit 1203 may be configured to communicate via two way communication (not shown) with micro-component pump 452, micro dosing device 454, micro-component valve 456, a diluent pump (not shown), and a main diluent valve 140 as shown in FIG. 2. Similarly, dosing control unit 1203 may be configured to communicate via two way communication (not shown) with charger 602, device 611, valve 648, water pump 620, flow splitter 624, valve 630, flow switcher 650, and valve 140 as shown in FIG. 6. Dosing control unit 1203 may also include a variety of interface units and drives (not shown) for reading and writing data.

- [101] Those of skill in the art will recognize that, in accordance with the disclosure, any suitable network connections and other ways of establishing a communications link between dosing control unit 1203 and other devices in apparatus 300 of FIG. 1, apparatus 400 of FIG. 2, and apparatus 600 of FIG. 6. The existence of any of various well-known protocols, such as TCP/IP, Frame Relay, Ethernet, FTP, HTTP and the like, is presumed, and a central processor unit or computer may be operated in a client-server configuration to permit a user to retrieve web pages from a web-based server. Furthermore, any of various conventional web browsers may be used to display and manipulate data on web pages.
- [102] Those of skill in the art will recognize that, in accordance with the disclosure, dosing control unit 1203 may include an associated computer-readable medium containing instructions for controlling any of previously described apparatus 300, 400, and 600, and implement the exemplary embodiments that are disclosed herein.

- [103] Dosing control unit 1203 may also include various input devices 1610. Input devices 1610 may include keyboards, track balls, readers, mice, joy sticks, buttons, and bill and coin validators.
- [104] Those of skill in the art will recognize that in accordance with the disclosure any of the features and/or options in one embodiment or example can be combined with any of the features and/or options of another embodiment or example.
- [105] As will be recognized by those skilled in the art, the above described embodiments may be configured to be compatible with fountain system requirements, and can accommodate a wide variety of fountain offerings, including but not limited beverages known under any PepsiCo branded name, such as Pepsi-Cola®, and custom beverage offerings. The embodiments described herein offer speed of service at least as fast or faster than conventional systems. The embodiments described herein may be configured to be monitored, including monitored remotely, with respect to operation and supply levels. The embodiments described are compatible with for carbonated and non-carbonated beverages. The embodiments described herein are economically viable and can be constructed with off-the-shelf components, which may be modified in accordance with the disclosures herein.
- [106] The disclosure herein has been described and illustrated with reference to the embodiments of the figures, but it should be understood that the features of the disclosure are susceptible to modification, alteration, changes or substitution without departing significantly from the spirit of the disclosure. For example, the dimensions, number, size and shape of the various components may be altered to fit specific applications. Accordingly, the specific embodiments illustrated and described herein are for illustrative purposes only and the disclosure is not limited except by the following claims and their equivalents.

We claim:

1. An apparatus comprising:

a charger subsystem, the charger subsystem comprising at least a first container having a first volume of a first micro component, and at least a second container having a second volume of a second micro component;

a dispensing machine, the dispensing machine comprising at least a third container defining a third volume, a fourth container defining a fourth volume, a fifth container defining a fifth volume, and a sixth container defining a sixth volume, wherein the third volume, the fourth volume, the fifth volume, and the sixth volume are each smaller than each of the first volume and the second volume of the charger subsystem;

a charging pipe manifold, the charging pipe manifold configured to:

convey the first micro component from the first volume to the third container when the amount of the first micro component in the third volume is at a first predetermined minimum threshold,

convey the first micro component from the first volume to the fourth container when the amount of the first micro component in the fourth volume is at a second predetermined minimum threshold,

convey the second micro component from the second volume to the fifth container when the amount of the second micro component in the fifth volume is at a third predetermined threshold,

convey the second micro component from the second volume to the sixth container when the amount of the second micro component in the sixth volume is at a fourth predetermined threshold,

the dispensing machine further comprising a dispenser further comprising at least one delivery pipe configured to deliver a micro component from at least one of the third container, the fourth container, the fifth container, or the six container to the dispenser.

2. The apparatus of claim 1 wherein the at least one delivery pipe is a first delivery pipe configured to deliver the first micro component from at least the third container or the fourth container to the dispenser.

3. The apparatus of claim 2 further comprising at least a second delivery pipe configured to deliver the second micro component from at least the fifth container or the sixth container to the dispenser.

4. The apparatus of claim 1 wherein the dispenser comprises a dispensing nozzle.

5. The apparatus of claim 1 wherein the dispenser is located at a counter.

6. The apparatus of claim 5 wherein the charger subsystem is located further away from the counter than the third container, the fourth container, the fifth container, and the sixth container.

7. The apparatus of claim 1 wherein the dispensing machine further comprises a main diluent valve, the main diluent valve configured to convey a main diluent to the dispenser.

8. The apparatus of claim 7 wherein the dispenser is configured to combine the main diluent with a micro component conveyed from at least one of the third container, the fourth container, the fifth container, or the sixth container.

9. The apparatus of claim 1 wherein the dispensing machine comprises more containers than the number of containers of the charger subsystem.

10. The apparatus of claim 1 further comprising a controller, the controller configured to control charging of the first micro component from the first container of the charger subsystem to the third and fourth containers of the dispensing machine, and to control charging of the second micro component from the second container of the charger subsystem to the fifth and sixth containers of the dispensing machine.

11. The apparatus of claim 1 wherein the dispensing machine is configured to dose a predetermined amount of a micro component from at least one container of the dispensing machine to the dispenser, the at least one container selected from the group consisting of the third container, the fourth container, the fifth container, and the sixth container.

12. The apparatus of claim 11 further comprising a controller, the controller configured to control the dosing of the predetermined amount of a micro component from the at least one container of the dispensing machine to the dispenser by controlling operation of the dispensing machine.

13. The apparatus of claim 12 wherein the controller is configured to control the dosing of the predetermined amount of a micro component from the at least one container of the dispensing machine to the dispenser by controlling operation of at least one of a micro component pump, a micro dosing device, or a micro component valve of the dispensing machine.

14. An apparatus comprising:

a charger subsystem, the charger subsystem comprising at least a first container having a first volume of a first micro component, and at least a second container having a second volume of a second micro component, the charger subsystem further comprising at least one of a dosing device or a flow restrictor corresponding to a micro component of the charger subsystem, the at least one dosing device or flow restrictor configured to dose a micro component to a corresponding flow combiner, wherein each flow combiner is configured to combine a corresponding micro component with a diluent and dilute the corresponding micro component so that the effluent of the flow combiner has a smaller ratio by weight of micro component to diluent than before the micro component enters the flow combiner;

a dispensing machine, the dispensing machine comprising at least a third container defining a third volume, at least a fourth container defining a fourth volume, at least a fifth container defining a fifth volume, and at least a sixth container defining a sixth volume, wherein the third volume, the fourth volume, the fifth volume, and the sixth volume are each smaller than each of the first volume and the second volume of the charger subsystem and wherein the ratio by weight of micro component to diluent in the third container and the fourth container is less than the ratio by weight of micro component to diluent in the first container, and the ratio by weight in the fifth container and the sixth container is less than the ratio by weight of micro component to diluent in the second container;

a charging pipe manifold, the charging pipe manifold configured to:

convey the first micro component from the first volume to the third container when the amount of the first micro component in the third volume is below a first predetermined threshold,

convey the first micro component from the first volume to the fourth container when the amount of the first micro component in the fourth volume is below a second predetermined threshold,

convey the second micro component from the second volume to the fifth container when the amount of the second micro component in the fifth volume is below a third predetermined threshold,

convey the second micro component from the second volume to the sixth container when the amount of the second micro component in the sixth volume is below a fourth predetermined threshold,

the dispensing machine further comprising a dispenser and at least one delivery pipe configured to deliver a micro component from at least one of the third container, the fourth container, the fifth container, or the sixth container to the dispenser; and

a main diluent source,

wherein the dispensing machine is configured to combine main diluent from the main diluent source with at least the first micro component from either the third container or the fourth container to form a first finished free flowing product.

15. The apparatus of claim 14 wherein the at least one delivery pipe is a first delivery pipe configured to deliver the first micro component from at least the third container or the fourth container to the dispenser.

16. The apparatus of claim 15 further comprising at least a second delivery pipe configured to deliver the second micro component from at least the fifth container or the sixth container to the dispenser, wherein the dispensing machine is configured to combine main diluent from the main diluent source with the second micro component from either the fifth container or the sixth container to form a second finished free flowing product.

17. The apparatus of claim 14 wherein the dispenser comprises a dispensing nozzle.

18. The apparatus of claim 14 wherein the dispenser is located at a counter.

19. The apparatus of claim 18 wherein the charger subsystem is located further away from the counter than the third container, the fourth container, the fifth container, and the sixth container.

20. The apparatus of claim 14 wherein the dispensing machine further comprises a main diluent valve, the main diluent valve configured to convey a main diluent to the dispenser.

21. The apparatus of claim 20 wherein the dispenser is configured to combine the main diluent with a micro component conveyed from at least one of the third container, the fourth container, the fifth container, or the sixth container.

22. The apparatus of claim 14 wherein the dispensing machine comprises more containers than the number of containers of the charger subsystem.

23. The apparatus of claim 14 further comprising a controller, the controller configured to control charging of the first micro component from the charger subsystem to the third and fourth containers of the dispensing machine, and to control charging of the second micro component from the second container of the charger subsystem to the fifth and sixth containers of the dispensing machine.

24. The apparatus of claim 14 wherein the dispensing machine is configured to dose a predetermined amount of a micro component from at least one container of the dispensing machine to the dispenser, the at least one container selected from the group consisting of the third container, the fourth container, the fifth container, and the sixth container.

25. The apparatus of claim 24 further comprising a controller, the controller configured to control the dosing of the predetermined amount of a micro component from the at least one container of the dispensing machine to the dispenser by controlling operation of the dispensing machine.

26. The apparatus of claim 25 wherein the controller is configured to control the dosing of the predetermined amount of a micro component from the at least one container to the dispenser by controlling operation of at least one of a micro component pump, a micro dosing device, or a micro component valve of the dispensing machine.

27. The apparatus of claim 14 wherein the dispensing machine is configured to combine main diluent from the main diluent source with the first micro component from either the third container or the fourth container and with the second micro component from either the fifth container or the sixth container to form a third finished free flowing product.

28. A method comprising:

filling at least a first container having a first volume with a first micro component, the first container located in a charger subsystem;

filling at least a second container having a second volume with a second micro component, the second container located in the charger subsystem;

conveying the first micro component from the first volume to a third container when the amount of the first micro component in the third container is at a first predetermined threshold, the third container located in a dispensing machine, the dispensing machine located downstream of the charger subsystem;

conveying the first micro component from the first volume to a fourth container when the amount of the first micro component in the fourth container is at a second predetermined threshold, the fourth container located in the dispensing machine;

conveying the second micro component from the second volume to a fifth container when the amount of the second micro component in the fifth container is at a third predetermined threshold, the fifth container located in the dispensing machine;

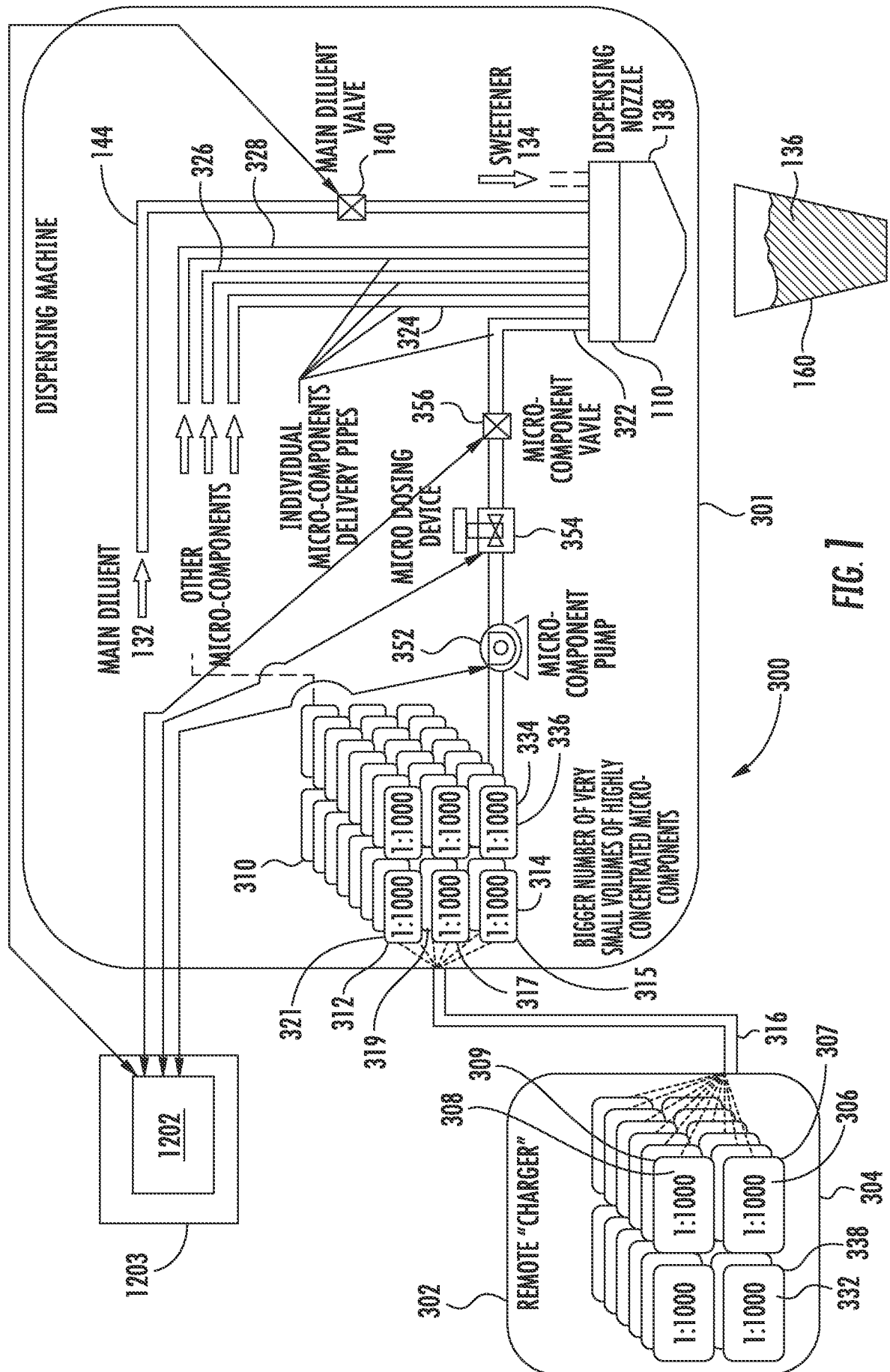
conveying the second micro component from the second volume to a sixth container when the amount of the second micro component in the sixth container is at a fourth predetermined threshold, the sixth container located in the dispensing machine; and

combining at least the first micro component from either the third container or the fourth container with a main diluent, or combining at least the second micro component from either the fifth container or the sixth container with a main diluent to form a finished free flowing product.

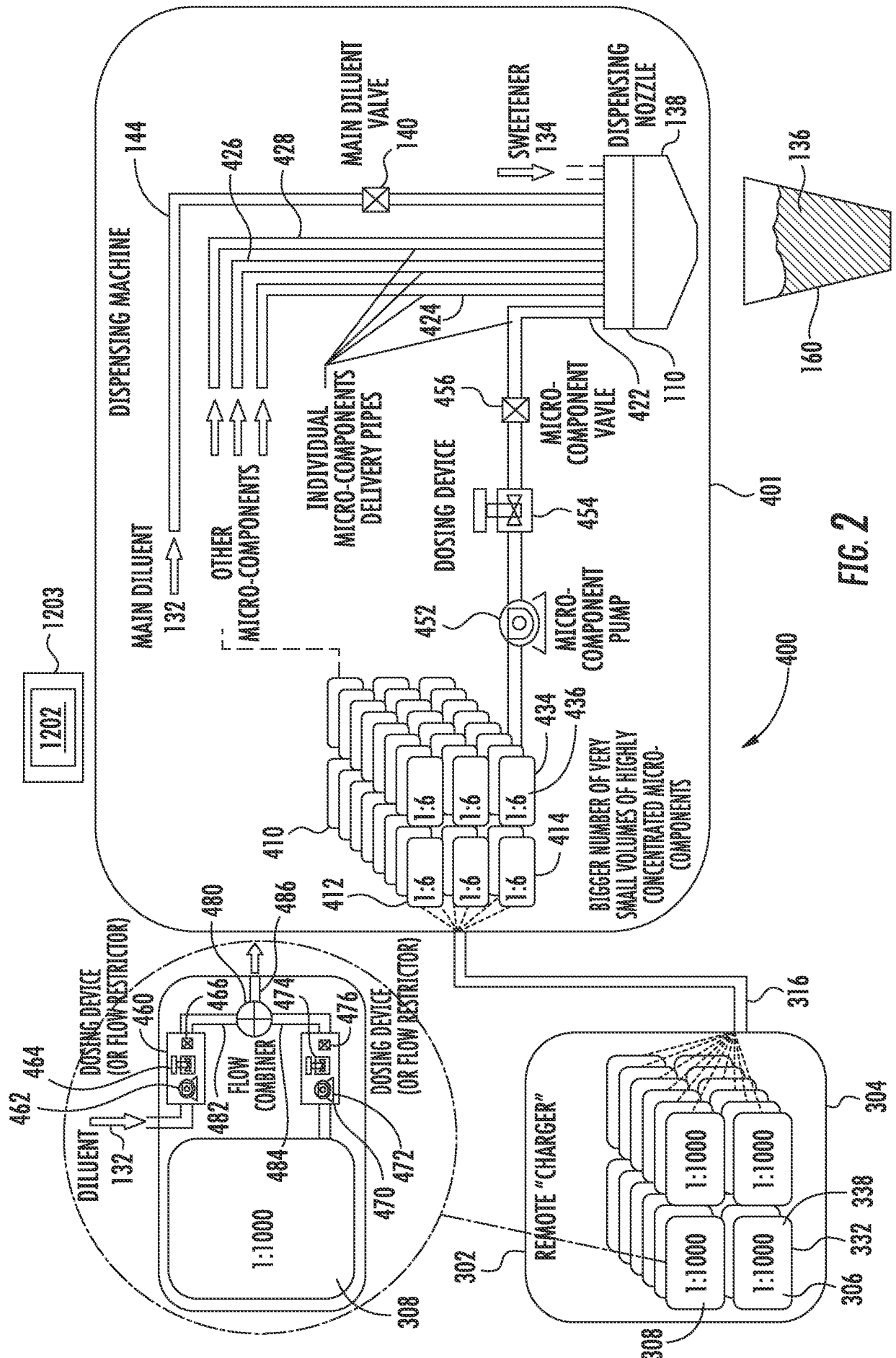
29. The method of claim 28, further comprising diluting the first micro component with a diluent prior to conveying the first micro component to the third container and the fourth

container, and diluting the second micro component with a diluent prior to conveying the second micro component to the fifth container and the sixth container.

1/7



2/7



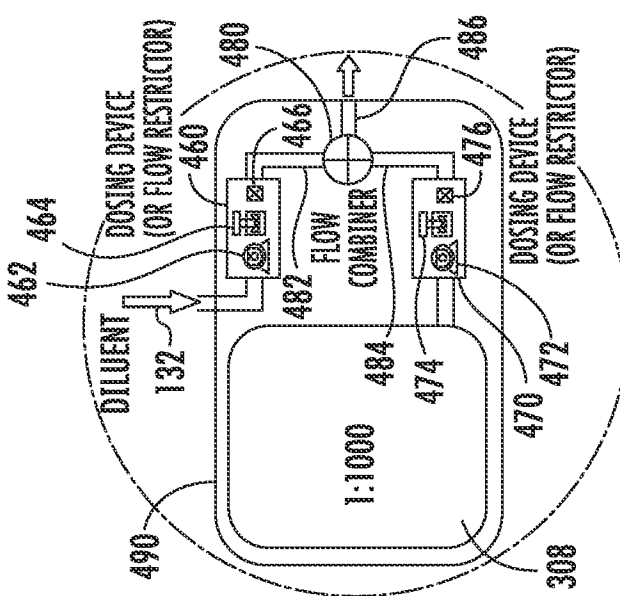


FIG. 3

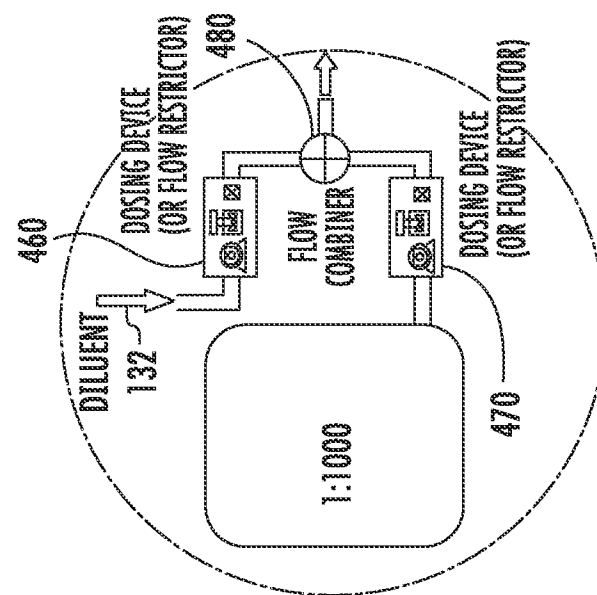


FIG. 4

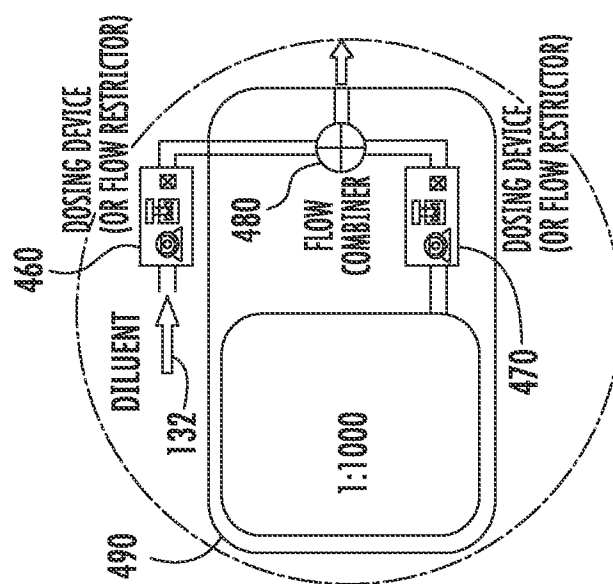
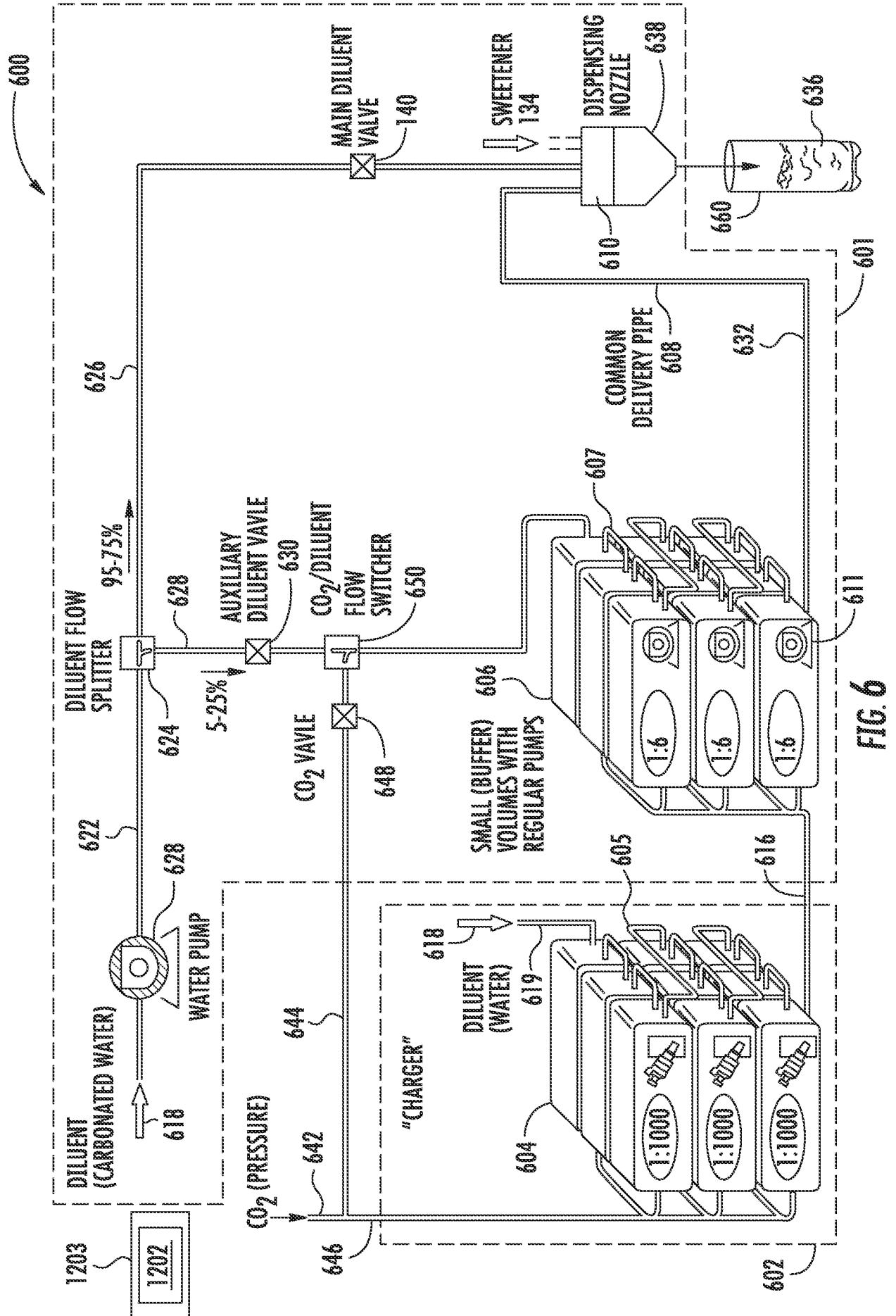


FIG. 5

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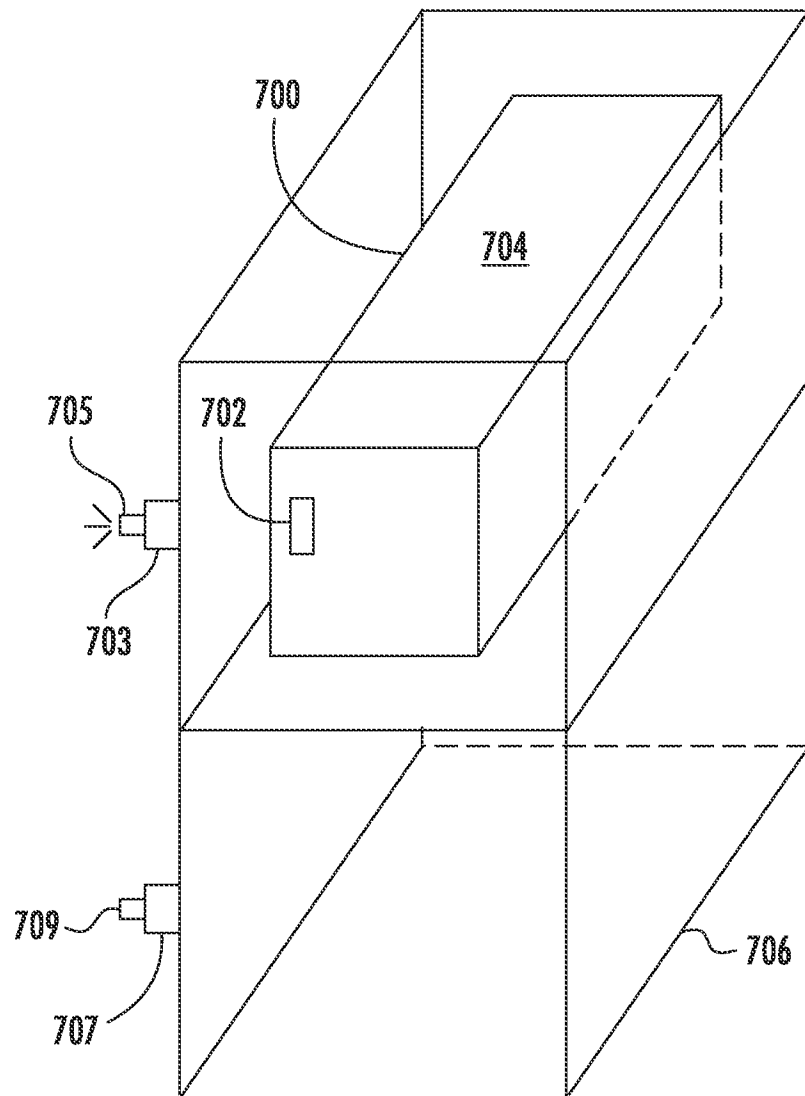


FIG. 7

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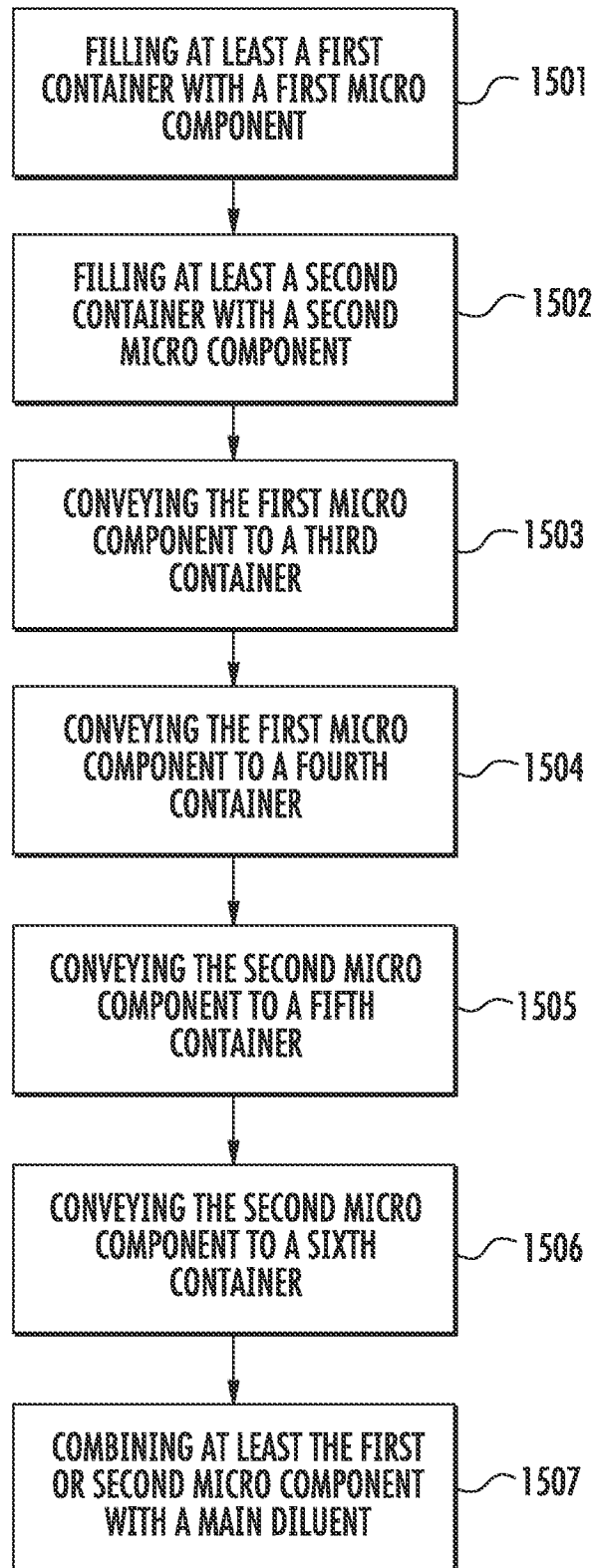
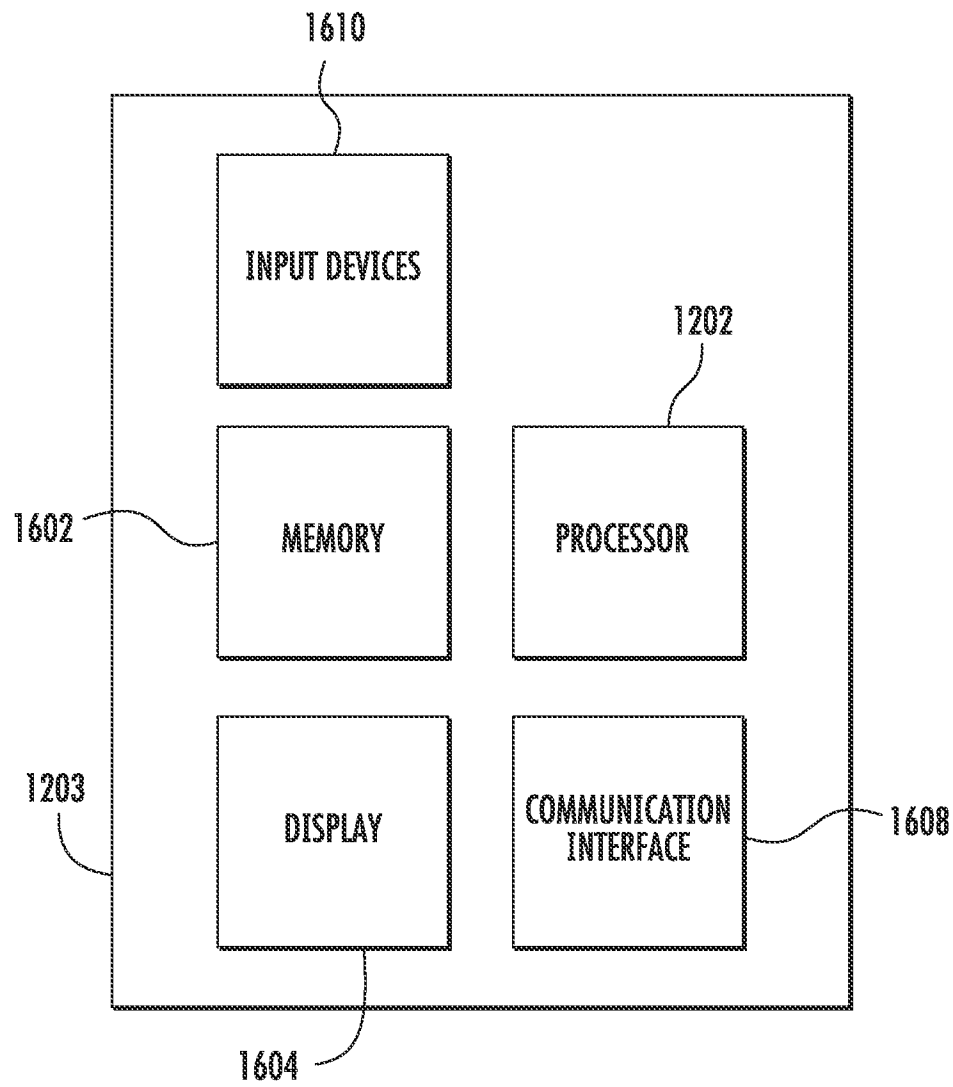


FIG. 8

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**FIG. 9**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US13/57061

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B67D 7/74, 7/78, 7/84 (2014.01)

USPC - 222/129.3, 129.4, 132

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) Classification(s): B03C 5/02; B67D 7/74, 7/78, 7/84 (2014.01)

USPC Classification(s): 222/52, 56, 59, 129, 129.1, 129.3, 129.4, 132, 133, 135, 145.1, 160

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

MicroPatent (US Granted, US Applications, EP-A, EP-B, WO, JP, DE-G, DE-A, DE-T, DE-U, GB-A, FR-A); ProQuest; Google; GoogleScholar; KEYWORDS: dispens*, charg*, sourc*, contain*, component*, fluid*, flavor*, beverag*, acidulant*, water*, diluent*, micro*, pepsico, cola cola

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2011/0049180 A1 (CARPENTER G et al.) March 3, 2011; figure 1; paragraphs [0006], [0034], [0036]-[0043]	1-5, 7-8, 10-13
Y	US 2010/0326562 A1 (SHEEHY RV et al.) December 30, 2010; figure 7; paragraphs [0057], [0058])	1-5, 7-8, 10-13
A	US 2010/0308078 A1 (SAVELIEV M et al.) December 9, 2010; entire document	1-29
P, X	US 2012/0298692 A1 (JERSEY S et al.) November 29, 2012; entire document	1-29

☐ Further documents are listed in the continuation of Box C.

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

13 January 2014 (13.01.2014)

Date of mailing of the international search report

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