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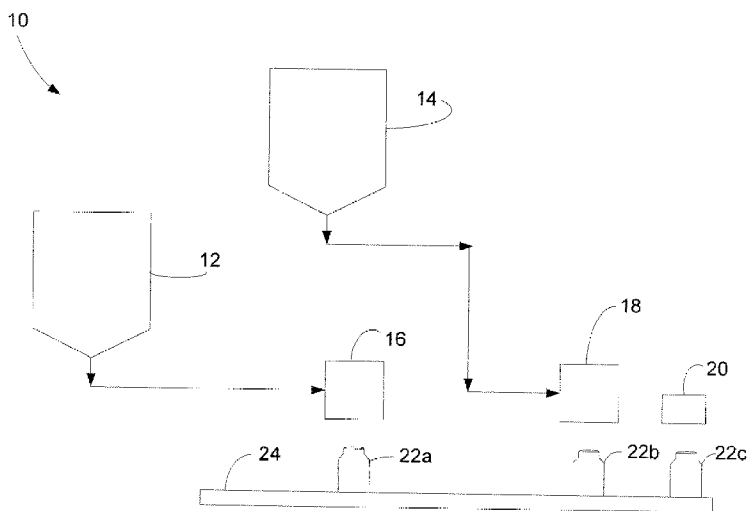
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- (71) Applicant (for US only): **THE COCA-COLA COMPANY** [US/US]; One Coca-cola Plaza Nw, Atlanta, GA 30313 (US).
- (72) Inventors: **SCHYBERT, Hubertus, U.**; 2248 Austin Lake Drive, Smyrna, GA 30082 (US). **SADEGHI, F. Fred**; 1003 Canton View Way, Marietta, GA 30068 (US). **VERBEKE, Alain**; Sukhumvit Road-Soi 53, House 52/2, 10110 Bangkok (TH).
- (74) Agent: **PAPPAS, Pete G.**; Sutherland Asbill & Brennan Llp, 999 Peachtree Street, Ne, Atlanta, GA 30309-3996 (US).

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(54) Title: DEVICES AND METHODS FOR PACKAGING BEVERAGES



(57) **Abstract:** A method for packaging a beverage comprising particulates in a liquid, the method comprising dispensing a first portion of the beverage from a first source into containers, wherein the first portion of the beverage comprises at least a majority of the particulates and a first portion of the liquid, dispensing from a counterpressure filler a second portion of the beverage from a second source into the containers, wherein the second portion of the beverage comprises a second portion of the liquid, and sealing the containers to form packaged beverages. An apparatus for packaging a beverage comprising particulates in a liquid. A method for packaging, in sequence, a first beverage comprising particulates in a liquid and a second beverage comprising a carbonated beverage. A method for packaging a beverage comprising a dairy component and a liquid.

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## Devices and Methods for Packaging Beverages

## Technical Field

[0001] This invention relates to packaging beverages comprising particulates in a liquid and packaging in sequence beverages comprising particulates in a liquid and carbonated beverages. This invention also relates to packaging beverages comprising a dairy component and a liquid and packaging in sequence beverages comprising a dairy component and a liquid and carbonated beverages or beverages comprising particulates.

## Background of the Invention

[0002] Beverages comprising high quantities of fibers, pulp, or other particulates have generally been dispensed into containers by special fillers. Such fillers are typically designed for non-carbonated beverages (NCBs). Correspondingly, the packaging process of carbonated beverages has been carried out on separate, counterpressure fillers such as carbonated soft-drink (CSD) fillers. The packaging of dairy products also has generally been carried out on fillers separate from counterpressure fillers for drinks such as carbonated beverages. Therefore, a bottling plant which produces both non-carbonated beverages comprising particulates and carbonated soft-drinks must utilize both the special fillers for the pulpos beverages and counterpressure fillers for the CSDs. Likewise, a bottling plant which produces both beverages containing dairy components and carbonated soft-drinks must utilize both the fillers for the beverages containing dairy components and counterpressure fillers for the CSDs.

[0003] Attempts to use counterpressure fillers to dispense beverages comprising particulates having an average size over about 3 millimeters (mm) and comprising particulates in an amount of about 0.5% by weight of the beverage have resulted in particulate buildup inside the counterpressure filling equipment. The particulate buildup clogs counterpressure filling equipment and leads to malfunctioning of the filling equipment. For example, clogged counterpressure filling valve vent tubes dispense unequal volumes of the beverage being dispensed into the beverage containers. Thus, the residual fiber clogs must be removed from the

counterpressure filler equipment by cleaning-in-place (CIP) procedures which result in a shorter operational up-time. In addition, the residual fiber clogs result in particulate and product loss.

[0004] Accordingly, there is a need for a simple and economically desirable method and apparatus for packaging beverages comprising particulates in a liquid with counterpressure fillers without the above mentioned shortcomings. In addition, there is a need for a simple and economically desirable method and apparatus for packaging beverages comprising dairy components and CSDs.

#### Summary of the Invention

[0005] This invention addresses the above described need in the art by providing a method for packaging a beverage comprising particulates in a liquid, the method comprising dispensing a first portion of the beverage from a first source into containers, wherein the first portion of the beverage comprises at least a majority of the particulates and a first portion of the liquid, dispensing from a counterpressure filler a second portion of the beverage from a second source into the containers, wherein the second portion of the beverage comprises a second portion of the liquid, and sealing the containers to form packaged beverages.

[0006] More particularly, this invention encompasses a method for decreasing container-to-container variation in pulp content in a packaged pulpous beverage and reducing pulp buildup in an apparatus comprising a counterpressure filler, the method comprising dispensing a first portion of the pulpous beverage from a first chamber into containers, wherein the first portion of the pulpous beverage comprises substantially all of the pulp and a first portion of beverage liquid, dispensing from the counterpressure filler a second portion of the pulpous beverage from a second chamber into the containers, wherein the second portion of the pulpous beverage comprises a second portion of beverage liquid and is substantially pulp free, and sealing the containers to form packaged pulpous beverages.

[0007] In addition, this invention encompasses an apparatus for packaging a first beverage comprising particulates in a liquid, the apparatus comprising a first source for providing a first portion of the first beverage comprising at least a majority of the particulates and a first portion of the liquid, a second source for providing a second portion of the first

beverage comprising a second portion of the liquid, a dispenser for dispensing the first portion of the first beverage from the first source into a first plurality of containers, a counterpressure filler for dispensing the second portion of the first beverage from the second source into the first plurality of containers, and a sealer for sealing the first plurality of containers to form packaged first beverages.

[0008] Furthermore, this invention encompasses a method for packaging in sequence a first beverage comprising particulates in a liquid and a second beverage comprising a carbonated beverage, the method comprising (1) packaging the first beverage in a first process comprising dispensing a first portion of the first beverage from a first source into first containers, wherein the first portion of the first beverage comprises at least a majority of the particulates and a first portion of the liquid, dispensing from a counterpressure filler a second portion of the first beverage from a second source into the first containers, wherein the second portion of the first beverage comprises a second portion of the liquid, and sealing the first container to form packaged first beverages and (2) packaging the second beverage in a second process comprising dispensing from the counterpressure filler the carbonated beverage from a third source into second containers and sealing the second containers to form packaged second beverages.

[0009] This invention addresses the above described need in the art by providing a method for packaging a beverage comprising a dairy component and a liquid. The method comprises dispensing a first portion of the beverage from a first source into containers, dispensing from a counterpressure filler a second portion of the beverage from a second source into the containers, and sealing the containers to form packaged beverages. The first portion of the beverage comprises the dairy component and the second portion of the beverage comprises the liquid.

[0010] More particularly, this invention encompasses a method for decreasing container-to-container variation in dairy component content in a beverage. The method comprises dispensing a first portion of the beverage from a first chamber into containers, dispensing from the counterpressure filler a second portion of the beverage from a second chamber into the containers, and sealing the containers to form packaged beverages. The first portion of the

beverage comprises the dairy component and the second portion of the beverage comprises a liquid.

[0011] In addition, this invention encompasses an apparatus for packaging a first beverage comprising a dairy component and a liquid. The apparatus comprises a first source for providing a first portion of the first beverage comprising the dairy component, a second source for providing a second portion of the first beverage comprising the liquid, a dispenser for dispensing the first portion of the first beverage from the first source into a first plurality of containers, a counterpressure filler for dispensing the second portion of the first beverage from the second source into the first plurality of containers, and a sealer for sealing the first plurality of containers to form packaged first beverages.

[0012] Furthermore, this invention encompasses a method for packaging in sequence a first beverage comprising a dairy component and a liquid and a second beverage comprising a carbonated beverage. The method comprises (1) packaging the first beverage in a first process comprising dispensing a first portion of the first beverage from a first source into first containers, dispensing from a counterpressure filler a second portion of the first beverage from a second source into the first containers and sealing the first container to form packaged first beverages and (2) packaging the second beverage in a second process comprising dispensing from the counterpressure filler the carbonated beverage from a third source into second containers and sealing the second containers to form packaged second beverages. The first portion of the first beverage comprises the dairy component and the second portion of the first beverage comprises the liquid.

[0013] Other objects, features, and advantages of this invention will be apparent from the following detailed description, drawing, and claims.

#### Brief Description of Drawings

[0014] Fig. 1 is schematic illustration of an apparatus for packaging a beverage comprising particulates in a liquid made in accordance with an embodiment of the present invention.

### Detailed Description of Embodiments

**[0015]** As summarized above, this invention encompasses a method for packaging a beverage comprising particulates in a liquid, a method for decreasing container-to-container variation in pulp content in a packaged pulpous beverage and reducing pulp buildup in an apparatus comprising a counterpressure filler, an apparatus for packaging a first beverage comprising particulates in a liquid, a method for packaging in sequence a first beverage comprising particulates in a liquid and a second beverage comprising a carbonated beverage, a method for packaging a beverage comprising a dairy component and a liquid, a method for decreasing container-to-container variation in dairy component content in a packaged beverage, an apparatus for packaging a first beverage comprising a dairy component and a liquid, and a method for packaging in sequence a first beverage comprising a dairy component and a liquid and a second beverage comprising a carbonated beverage. Embodiments of this invention are described in detail below and illustrated in Fig. 1.

**[0016]** Fig. 1 illustrates an apparatus 10 for continuously packaging a beverage comprising particulates in a liquid made in accordance with an embodiment of the present invention and, as described in more detail herein below. The apparatus 10 can also be used for continuously packaging a beverage comprising a dairy component in accordance with an embodiment of the present invention. Thus, the apparatus 10 can also be used to manufacture both carbonated beverages and non-carbonated beverages (with or without particulates or a dairy component) in sequence, switching from one to the other and back again. The apparatus 10 comprises a first source 12 for providing a first portion of the beverage and a second source 14 for providing a second portion of the beverage, a dispenser 16 for dispensing the first portion of the beverage, a filler 18 for dispensing the second portion of the beverage, and a sealer 20, such as a bottle capper, for sealing a container 22c filled with the beverage to form packaged beverages for later consumption. The first and second sources 12 and 14 can be any article or vessel suitable for providing the first and second portions of the beverage separate from one another such as tanks, vats, drums, hoppers, pipes, and the like. First and second sources 12 and 14 in accordance with this embodiment 10 are chambers which store the first and second portions of the beverage, respectively, separate from one another.

[0017] Filler 18 for dispensing the second portion of the beverage in accordance with this embodiment 10 is a continuous counterpressure filler, which normally would not be suitable for dispensing a liquid containing particulates. More particularly, the counterpressure filler in Fig. 1 is a CSD filler, but it should be understood that this invention also encompasses other counterpressure fillers such as beer fillers. It should be understood, however, that the filler 18 for dispensing the second portion of the beverage could also be a filler, other than a counterpressure filler, that also is not normally suitable for dispensing a liquid containing particulates.

[0018] Examples of suitable beverages which may be packaged using embodiments of this invention include, but are not limited to different types of water, fruit juices, vegetable juices, or combinations thereof. For instance, the fruit juices may include, but are not limited to, a citrus juice such as orange juice, grapefruit juice, lime juice, lemon juice, pineapple juice, or combinations thereof. In some embodiments, juice is present in the beverage in an amount ranging from about 10% by weight of the beverage to about 100% by weight of the beverage. In other embodiments, the beverage may comprise whole milk, skim milk, lowfat milk, fat-free milk, reconstituted powdered milk, a milk drink, whey, coffee, espresso, chocolate, a soy product, or combinations thereof. In some embodiments, the liquid portion of the beverage comprises additional components including, but not limited to, water, sugar, pectin, nutritive sweeteners, preservatives, vitamins, flavorings, phytosterols, probiotics, or prebiotics, or combinations thereof. In some embodiments, the particulates in the beverage may comprise, but are not limited to, pulp, fibers, gels, fruit particles, vegetable particles, or combinations thereof. In addition, the particulates may be water insoluble in some embodiments. Furthermore, in some embodiments, the particulates may have an average particulate size greater than about 3 millimeters (mm).

[0019] According to particular embodiments of the invention, the first portion of the beverage, which is stored in the first chamber 12, comprises at least a majority of the particulates and a first portion of the liquid. In alternate embodiments (not shown), the first portion of the liquid may be provided to the first chamber 12 from the second chamber 14 in a separation step where particulates and some liquid are separated from contents in the second chamber using

separation techniques well known to those skilled in the art. The quantity of particulates in the first portion of the beverage should be such that the first portion of the beverage is transferable to the dispenser 16. For example, the quantity of particulates could be such that the first portion of the beverage has a viscosity which makes it pumpable to the dispenser 16 from the first chamber 12. Generally, the particulate quantity in the first portion of the beverage is dependant upon the desired composition of the beverage. In particular, the particulates may be present in first portion of the beverage in an amount ranging from 10% by weight of the first portion of the beverage to about 80% by weight of the first portion of the beverage. More particularly, the particulates are present in the first portion of the beverage in an amount ranging from about 25% by weight of the first portion of the beverage to about 75% by weight of the first portion of the beverage. Still more particularly, the particulates are present in the first portion of the beverage in an amount ranging from about 50% by weight of the first portion of the beverage to about 60% by weight of the first portion of the beverage.

**[0020]** According to other embodiments of the present invention, the first portion of the beverage, which is stored in the first chamber 12, comprises a dairy component. For example, the dairy component may comprise milk fat, curds, powdered milk, yogurt, whole milk, skim milk, lowfat milk, fat-free milk, whey, or combinations thereof. In some embodiments, the dairy component may comprise a powder, a solution, a dispersion, a colloid, or an emulsion. In particular embodiments, the dairy component may be present in the beverage in each container in an amount ranging from about 0.5 % by weight of the beverage to about 50 % by weight of the beverage. More particularly, the dairy component may be present in the beverage in each container in an amount ranging from about 0.5 % by weight of the beverage to about 25 % by weight of the beverage. Still more particularly, the dairy component may be present in the beverage in each container in an amount ranging from about 3 % by weight of the beverage to about 10 % by weight of the beverage.

**[0021]** In yet other embodiments of the present invention, the first portion of the beverage may comprise additives such as vitamins, flavorings, phytosterols, probiotics, or prebiotics, or combinations thereof. In alternate embodiments of the present invention, the first portion of the beverage may comprise additives in combination with a dairy component.



[0022] The second portion of the beverage, which is stored in the second chamber 14, comprises a second portion of the liquid. The composition of the second portion of the liquid may be different from the composition of the first portion of the liquid. For example, the first portion of the liquid may comprise a juice concentrate and the second portion of the liquid may comprise water. In some embodiments, the second portion of the beverage may comprise a "white paint" composition, while the first portion of the beverage comprises any of a juice, a dairy component, a flavor, texture, additive, sweetener, or combinations thereof or the like which imparts the taste of the beverage perceived by the consumer. In particular embodiments, the first portion of the beverage comprises substantially all of the particulates and the second portion of the beverage is substantially particulate free. For instance, in accordance with particular embodiments, the particulates may be present in the first portion of the beverage in an amount ranging from about 10% by weight of the first portion of the beverage to about 80% by weight of the first portion of the beverage and the particulates may be present in the second portion of the beverage in an amount ranging from about 0% by weight of the second portion of the beverage to about 1% by weight of the second portion of the beverage. In general, the particulate concentration in the second portion of the beverage should be such that particulate buildup inside the counterpressure filling equipment is eliminated or substantially reduced.

[0023] In other embodiments, where the first portion of the beverage comprises a dairy component, the second portion of the beverage, which is stored in the second chamber 14, generally comprises the liquid. Suitable examples of the liquid include, but are not limited to, whole milk, skim milk, lowfat milk, fat-free milk, whey, water, a fruit juice, a vegetable juice, coffee, espresso, chocolate, a soy product, or combinations thereof. It should be understood, however, that the dairy component may include constituents which are also contained in the liquid. For example, in one embodiment, the dairy component may comprise milk fat and fat-free milk while the liquid comprises fat-free milk.

[0024] In alternate embodiments, the apparatus 10 may further comprise a particulate separator (not shown) upstream from the first and second chambers 12 and 14 which produces the first and second portions of the beverage by separating at least a majority of the particulates and a portion of the liquid from a second portion of the liquid. In such embodiments, the

beverage comprising particulates in a liquid is first supplied to the particulate separator. Next, the particulate separator produces the first and second portions of the beverage which are stored in the first and second chambers 12 and 14, respectively. It should be understood that the particulate separator can be any device suitable for separating a beverage comprising particulates in a liquid into a first portion comprising at least a majority of particulates and a portion of the liquid and a second portion comprising a second portion of the liquid. Thus, in some embodiments, the apparatus 10 separates a beverage comprising particulates in a liquid, such as orange juice, for example, into the first and second portions of the beverage for packaging of the beverage in accordance with embodiments of the present invention.

[0025] In the embodiment of the present invention illustrated in Fig. 1, the packaging of the beverage comprises a continuous, high volume beverage packaging process wherein the first portion of the beverage is transferred from the first chamber 12 to the dispenser 16, where the first portion of the beverage is dispensed into a container 22a. The quantity of the first portion of the beverage which is dispensed or dosed into each container 22a depends upon the composition of the first portion of the beverage and the desired resultant composition of the beverage. In particular embodiments, the first portion of the liquid can be present in the container 22a in an amount ranging from about 1% by volume of the container to about 15% by volume of the container.

[0026] Examples of suitable dispensers 16 for dispensing the first portion of the beverage in accordance with particular embodiments include, but are not limited to, piston valve fillers, net weight fillers, or volumetric fillers with flow meters. For example, piston valve fillers can be configured to dispense the first portion of the beverage at the desired dosing volumes with little or no buildup of the particulates or dairy components. In particular embodiments, the configuration of the piston valve fillers may comprise ball valves which mechanically open and close to dose the desired amount of the first portion of the beverage into the container 22a. In addition, cleaning-in-place (CIP) may be carried out through the same channel from which the first portion of the beverage is fed into the piston valve. In other embodiments, the configuration of the piston valve fillers may additionally comprise a circulation line which circulates a portion of the first portion of the beverage back to the first chamber 12. In particular embodiments, the

dispensing of the first portion of the beverage from the dispenser 16 can be carried out on an inline rotary filling device or on a linear multiple station filling system, where filling is activated to a population of containers intermittently.

[0027] Next, the container 22a is conveyed by a conveyer 24 to the CSD filler 18, where the second portion of the beverage is dispensed from the second chamber 14 by the CSD filler 18 into the container 22b, which already contains the appropriate dose of the first portion of the beverage. As with the dispensing of the first portion of the beverage, the dispensing of the second portion of the beverage from the CSD filler 18 may be carried out on an inline rotary filling device or on a linear multiple station filling system. In addition, it should be understood that though the conveyer 24 is illustrated as a belt system in this embodiment, other conveying means may be used, including rotary or linear neck handling devices. The second portion of the beverage fills the remainder of the container 22b volume. Thus, in particular embodiments, the first portion of the beverage and the second portion of the beverage may constitute the final beverage. In particular embodiments, since at least a majority of the particulates are in the first portion of the beverage, particulate buildup in the CSD filler 18 is reduced or eliminated during the dispensing of the second portion. As a result of the reduction or elimination of the particulate buildup, problems such as clogged vent tubes of filler valves are avoided and the container-to-container variation in pulp content in each container is also decreased. It should also be understood by a person of ordinary skill in the art that an inert gas such as nitrogen or nitrous oxide may be added to the non-carbonated beverage being packaged.

[0028] Additionally, having the first chamber 12 for storing the first portion of the beverage and the second chamber 14 for storing the second portion of the beverage results in greater processing flexibility, since a variety of beverages having various particulates and particulate quantities and dairy components and dairy component quantities may be processed on the same apparatus. For example, changes to the amount of particulate in the beverage may be effectuated by changing the amount of particulate in the first portion of the beverage or by changing the dose of the first portion of the beverage dispensed. In addition, having a higher concentration of particulates in the first portion of the beverage generally contributes to a more accurate and consistent dosing of the particulates in the packaged beverage in each container.

The same considerations are applicable for the dairy component. Furthermore, various countries may have differing laws governing the labeling of a beverage as a "juiced drink", and thus, embodiments of the present invention allow for packaging of various juice drinks with the doses required to correspond to the appropriate governing laws.

[0029] According to particular embodiments of this continuous, high volume beverage packaging process, the apparatus could be configured to form packaged beverages at a rate of at least 100 per minute. In one embodiment, the apparatus is configured to form packaged beverages at a rate of at least 600 per minute.

[0030] In particular embodiments, dispensing of the first portion of the beverage into the container 22 before dispensing of the second portion of the beverage results in less splashing and/or partial filling of the container 22, since the second portion of the beverage is typically less viscous than the first portion of the beverage. In addition, it may be desirable to dispense the first portion of the beverage before dispensing the second portion of the beverage to achieve better mixing of the particulates or dairy component and the liquid in the container. However, it should be understood that the dispensing of the second portion of the beverage with the CSD filler 18 may be carried out before dispensing of the first portion of the beverage with the dispenser 16. In such embodiments, the arrangement of the apparatus 10 must take into consideration parameters such as, but not limited to, longer vent tubes on the CSD filler 18 to maintain the headspace volume required to dose the particulates or dairy component and decoupling of the sealer from the CSD filler.

[0031] According to particular embodiments of the invention, the particulates can be present in the beverage in the container 22c in an amount ranging from about 0.1% by weight of the beverage to about 80% of by weight of the beverage. More particularly, the particulates can be present in the beverage in the container 22c in an amount ranging from about 0.1% by weight of the beverage to about 40% of by weight of the beverage. Still more particularly, the particulates can be present in the beverage in the container 22c in an amount ranging from about 0.1% by weight of the beverage to about 6% of by weight of the beverage.

[0032] In other embodiments, the apparatus 10 may also comprise an agitator in the first chamber 12 for agitating the first portion of the beverage. It should be understood, however, that

other agitation means known in the art may be used, including the placement of stationary baffles within the first chamber 12. Agitation of the first portion of the beverage allows separation of the particulates from the liquid to be avoided inside the first chamber 12. In particular embodiments, the agitation of the first portion of the beverage may be effective to disperse the particulates in the first portion of the liquid substantially homogeneously. Since the particulates are dispersed in the first portion of the liquid, variation of the particulate concentration in the first portion of the beverage and in the resulting beverage is reduced or eliminated.

**[0033]** According to particular embodiments of the present invention, microbiological sterilization of the beverage can alternatively be performed. For example, high temperature short time treatment (HTST) of the first portion of the beverage and/or the second portion of the beverage may be performed before each are dispensed into the container 22 at ambient temperatures. In another embodiment, cold dispensing of the first portion of the beverage and/or the second portion of the beverage may be performed and a preservative may be added to the first portion of the beverage and/or the second portion of the beverage. In yet another embodiment, either the first portion of the beverage or the second portion of the beverage or both may be hot dispensed and the filled container 22b may be cooled, for example, in an evaporation cooler. In an alternate embodiment, the capped container 22c may be post-fill sterilized by, for example, tunnel pasteurization or retorting. It should be understood that multiple sterilization methods may be used in combination with each other. Use of sterilization methods such as tunnel pasteurization allow in particular embodiments of the present invention to produce a beverage comprising a milk drink having a pH less than about 4.6 which is shelf stable at room temperature. In alternate embodiments, first portion of the beverage, the second portion of the beverage, or both may be aseptic.

**[0034]** In addition to methods and apparatuses for packaging a beverage comprising particulates in a liquid, the present invention provides methods for packaging a carbonated beverage and a non-carbonated beverage (with or without particulates) on the same apparatus. Thus, the apparatus 10 may be used for packaging, in sequence, a first beverage comprising particulates in liquid and a second beverage comprising a carbonated beverage. For example, the apparatus 10 could be used to package the first beverage as described above. Then, when it is

desired to package the second beverage, the second chamber 14 may be emptied and cleaned so that it may be used to store the second beverage. Containers 22 are conveyed by the conveyer 24 directly to the counterpressure filler 18. At that point, the second beverage may be transferred from the second chamber to the counterpressure filler 18 and dispensed into the containers 22b. The containers 22c filled with the second beverage can be subsequently conveyed to the sealer 20 to be sealed to form packaged carbonated beverages.

[0035] When it is desired to again package the first beverage or any other beverage comprising particulates in a liquid, the second chamber 14 may be emptied and cleaned so that it may be used to store the first portion of the first beverage. Such a process can be repeated as desired for efficient packaging, in sequence, of beverages comprising particulates in liquid and carbonated beverages on the same apparatus. Likewise, the present invention provides methods for packaging a carbonated beverage and a non-carbonated beverage including a dairy component and a liquid on the same apparatus.

[0036] In alternate embodiments, the carbonated beverage may be stored or provided by a third chamber or source (not shown). In such embodiments, there may be a valve or control device which allows the flow of the second portion of a beverage comprising particulates to the counterpressure filler 18 to be stopped when flow of the carbonated beverage to the counterpressure filler is desired, and vice versa.

[0037] Examples of suitable carbonated beverages which may be packaged using embodiments of this invention include, but are not limited to, carbonated-soft drinks, carbonated water, or beer.

[0038] The present invention is further illustrated below in an example which is not to be construed in any way as imposing limitations upon the scope of the invention. On the contrary, it is to be clearly understood that resort may be had to various other embodiments, modifications, and equivalents thereof which, after reading the description therein, may suggest themselves to those skilled in the art without departing from the scope of the invention and the appended claims.

Example

[0039] In a particular embodiment of the present invention, an apparatus comprising piston valves and a CSD filler was used to dispense a beverage comprising pulp particulates in a liquid. The liquid comprised orange juice (15.59 Brix), pectin, sugar, Vitamin E, and preservatives (185 parts per million). The pulp was present in the beverage in an amount of 3% by weight of the beverage. The juice was present in the beverage in an amount of 10% by weight of the beverage. The first portion of the beverage was stored in a first chamber and comprised pulp in an amount of about 50% by weight of the first portion of the beverage. The beverage was packaged in 250 milliliter containers. The piston valves dosed about 35 milliliters of the first portion of the beverage into each of the containers.

[0040] It should be understood that the foregoing relates to particular embodiments of the present invention, and that numerous changes may be made therein without departing from the scope of the invention as defined from the following claims.

We claim:

1. A method for packaging a beverage comprising particulates in a liquid, the method comprising:
  - dispensing a first portion of the beverage from a first source into containers, wherein the first portion of the beverage comprises at least a majority of the particulates and a first portion of the liquid;
  - dispensing from a counterpressure filler a second portion of the beverage from a second source into the containers, wherein the second portion of the beverage comprises a second portion of the liquid; and
  - sealing the containers to form packaged beverages.
2. The method of claim 1, wherein the counterpressure filler comprises a carbonated soft-drink filler or a beer filler.
3. The method of claim 1, wherein the dispensing of the first portion of the beverage comprises dispensing the first portion of the beverage from a piston valve filler, a net-weight filler, or a volumetric filler with a flow meter.
4. The method of claim 1, wherein the dispensing of the first portion of the beverage occurs before the dispensing of the second portion of the beverage.
5. The method of claim 1, wherein the particulates have an average particulate size greater than about 3 mm.
6. The method of claim 1, wherein the particulates are water insoluble.
7. The method of claim 1, wherein the particulates comprise pulp, fibers, gels, fruit particles, vegetable particles, or combinations thereof.



8. The method of claim 1, wherein the liquid comprises water, a fruit juice, a vegetable juice, or combinations thereof.
9. The method of claim 1, wherein the particulates comprise pulp and the liquid comprises citrus juice.
10. The method of claim 1, wherein the liquid comprises a juice selected from the group consisting of orange juice, grapefruit juice, lime juice, lemon juice, pineapple juice, vegetable juice, and combinations thereof.
11. The method of claim 8, wherein the liquid further comprises water, sugar, pectin, nutritive sweeteners, preservatives, vitamins, flavorings, phytosterols, probiotics, prebiotics, or combinations thereof.
12. The method of claim 1, wherein the first portion of the liquid has a first composition and the second portion of the liquid has a second composition different from the first composition.
13. The method of claim 1, wherein the first portion of the beverage comprises substantially all of the particulates.
14. The method of claim 1, wherein the first portion of the beverage comprises substantially all of the particulates and the second portion of the beverage is substantially particulate free.
15. The method of claim 1, wherein the particulates are present in the first portion of the beverage in an amount ranging from about 10% by weight of the first portion of the beverage to about 80% by weight of the first portion of the beverage.

16. The method of claim 1, wherein the particulates are present in the first portion of the beverage in an amount ranging from about 25% by weight of the first portion of the beverage to about 75% by weight of the first portion of the beverage.
17. The method of claim 1, wherein the particulates are present in the first portion of the beverage in an amount ranging from about 50% by weight of the first portion of the beverage to about 60% by weight of the first portion of the beverage.
18. The method of claim 1, wherein the particulates are present in the beverage in each container in an amount ranging from about 0.1% by weight of the beverage to about 80% by weight of the beverage.
19. The method of claim 1, wherein the particulates are present in the beverage in each container in an amount ranging from about 0.1% by weight of the beverage to about 40% by weight of the beverage.
20. The method of claim 1, wherein the particulates are present in the beverage in each container in an amount ranging from about 0.1% by weight of the beverage to about 6% by weight of the beverage.
21. The method of claim 1, wherein the first source is a chamber and the method further comprises agitating the first portion of the beverage in the first chamber.
22. The method of claim 21, wherein the agitating is effective to disperse the particulates in the first portion of the liquid substantially homogenously.
23. Method as in claim 1, wherein the method is continuous.

24. Method as in claim 23, wherein the method forms packaged beverages at a rate of at least 100 per minute.

25. A method for decreasing container-to-container variation in pulp content in a packaged pulpous beverage and reducing pulp buildup in an apparatus comprising a counterpressure filler, the method comprising:

dispensing a first portion of the pulpous beverage from a first chamber into containers, wherein the first portion of the pulpous beverage comprises substantially all of the pulp and a first portion of beverage liquid;

dispensing from the counterpressure filler a second portion of the pulpous beverage from a second chamber into the containers, wherein the second portion of the pulpous beverage comprises a second portion of beverage liquid and is substantially pulp free; and

sealing the containers to form packaged pulpous beverages.

26. An apparatus for packaging a first beverage comprising particulates in a liquid, the apparatus comprising:

a first source for providing a first portion of the first beverage comprising at least a majority of the particulates and a first portion of the liquid;

a second source for providing a second portion of the first beverage comprising a second portion of the liquid;

a dispenser for dispensing the first portion of the first beverage from the first source into first containers;

a counterpressure filler for dispensing the second portion of the first beverage from the second source into the first containers; and

a sealer for sealing the first containers to form packaged first beverages.

27. Apparatus as in claim 26 for packaging in sequence the first beverage and a second beverage comprising a carbonated beverage, further comprising a third source for providing the carbonated beverage, wherein the counterpressure filler is adapted to dispense the second portion of the first beverage from the second source into the first containers or the carbonated beverage from the third source into second containers, and wherein the sealer is adapted to seal the first containers to form packaged first beverages or the second containers to form packaged second beverages.
28. Apparatus as in claim 26, wherein the first dispenser comprises one or more piston valves configured to dispense the first portion of the beverage.
29. Apparatus as in claim 26, wherein the first source comprises a chamber, tank, vat, drum, hopper or pipe and the second source comprises a chamber, tank, vat, drum, hopper, or pipe.
30. Apparatus as in claim 26, wherein the counterpressure filler comprises a carbonated soft-drink filler or a beer filler.

31. A method for packaging in sequence a first beverage comprising particulates in a liquid and a second beverage comprising a carbonated beverage, the method comprising:
- packaging the first beverage in a first process comprising,
    - dispensing a first portion of the first beverage from a first source into first containers, wherein the first portion of the first beverage comprises at least a majority of the particulates and a first portion of the liquid;
    - dispensing from a counterpressure filler a second portion of the first beverage from a second source into the first containers, wherein the second portion of the first beverage comprises a second portion of the liquid; and
    - sealing the first container to form packaged first beverages; and
  - packaging the second beverage in a second process comprising,
    - dispensing from the counterpressure filler the carbonated beverage from a third source into second containers; and
    - sealing the second containers to form packaged second beverages.
32. The method of claim 31 , further comprising repeating the step of packaging the first beverage and the step of packaging the second beverage.
33. A method for packaging a beverage comprising a dairy component and a liquid, the method comprising:
- dispensing a first portion of the beverage from a first source into containers, wherein the first portion of the beverage comprises the dairy component;
  - dispensing from a counterpressure filler a second portion of the beverage from a second source into the containers, wherein the second portion of the beverage comprises the liquid; and
  - sealing the containers to form packaged beverages.
34. The method of claim 33, wherein the dairy component comprises a powder, a solution, a dispersion, a colloid, or an emulsion.

35. The method of claim 33, wherein the dairy component comprises milk fat, curds, powdered milk, yogurt, whole milk, skim milk, lowfat milk, fat-free milk, whey, or combinations thereof.
36. The method of claim 33, wherein the liquid comprises whole milk, skim milk, lowfat milk, fat-free milk, whey, water, a fruit juice, a vegetable juice, coffee, espresso, chocolate, a soy product, or combinations thereof.
37. The method of claim 36, wherein the liquid further comprises water, sugar, pectin, nutritive sweeteners, preservatives, vitamins, flavorings, phytosterols, probiotics, prebiotics, or combinations thereof.
38. The method of claim 33, wherein the counterpressure filler comprises a carbonated soft-drink filler or a beer filler.
39. The method of claim 33, wherein the dispensing of the first portion of the beverage comprises dispensing the first portion of the beverage from a piston valve filler, a net-weight filler, or a volumetric filler with a flow meter.
40. The method of claim 33, wherein the dispensing of the first portion of the beverage occurs before the dispensing of the second portion of the beverage.
41. The method of claim 33, wherein the dairy component is present in the beverage in each container in an amount ranging from about 0.5 % by weight of the beverage to about 50 % by weight of the beverage.

42. The method of claim 33, wherein the dairy component is present in the beverage in each container in an amount ranging from about 0.5 % by weight of the beverage to about 25 % by weight of the beverage.
43. The method of claim 33, wherein the dairy component is present in the beverage in each container in an amount ranging from about 3 % by weight of the beverage to about 10 % by weight of the beverage.
44. The method of claim 33, wherein the first source is a chamber and the method further comprises agitating the first portion of the beverage in the first chamber.
45. The method of claim 44, wherein the agitating is effective to disperse constituents of the dairy component substantially homogeneously.
46. Method as in claim 33, wherein the method is continuous.
47. Method as in claim 46, wherein the method forms packaged beverages at a rate of at least 100 per minute.
48. A method for decreasing container-to-container variation in dairy component content in a packaged beverage, the method comprising:  
dispensing a first portion of the beverage from a first chamber into containers, wherein the first portion of the beverage comprises the dairy component;  
dispensing from the counterpressure filler a second portion of the beverage from a second chamber into the containers, wherein the second portion of the beverage comprises a liquid; and  
sealing the containers to form packaged beverages.

49. An apparatus for packaging a first beverage comprising a dairy component and a liquid, the apparatus comprising:
- a first source for providing a first portion of the first beverage comprising the dairy component;
  - a second source for providing a second portion of the first beverage comprising the liquid;
  - a dispenser for dispensing the first portion of the first beverage from the first source into first containers;
  - a counterpressure filler for dispensing the second portion of the first beverage from the second source into the first containers; and
  - a sealer for sealing the first containers to form packaged first beverages.
50. Apparatus as in claim 49 for packaging in sequence the first beverage and a second beverage comprising a carbonated beverage, further comprising a third source for providing the carbonated beverage, wherein the counterpressure filler is adapted to dispense the second portion of the first beverage from the second source into the first containers or the carbonated beverage from the third source into second containers, and wherein the sealer is adapted to seal the first containers to form packaged first beverages or the second containers to form packaged second beverages.
51. Apparatus as in claim 49, wherein the first dispenser comprises one or more piston valves configured to dispense the first portion of the beverage.
52. Apparatus as in claim 49, wherein the first source comprises a chamber, tank, vat, drum, hopper or pipe and the second source comprises a chamber, tank, vat, drum, hopper, or pipe.
53. Apparatus as in claim 49, wherein the counterpressure filler comprises a carbonated soft-drink filler or a beer filler.



54. A method for packaging in sequence a first beverage and a second beverage, the first beverage comprising a liquid and a dairy component, the second beverage comprising a carbonated beverage, the method comprising:

packaging the first beverage in a first process comprising,

dispensing a first portion of the first beverage from a first source into first containers, wherein the first portion of the first beverage comprises the dairy component;

dispensing from a counterpressure filler a second portion of the first beverage from a second source into the first containers, wherein the second portion of the first beverage comprises the liquid; and

sealing the first container to form packaged first beverages; and packaging the second beverage in a second process comprising,

dispensing from the counterpressure filler the carbonated beverage from a third source into second containers; and

sealing the second containers to form packaged second beverages.

55. The method of claim 54, further comprising repeating the step of packaging the first beverage and the step of packaging the second beverage

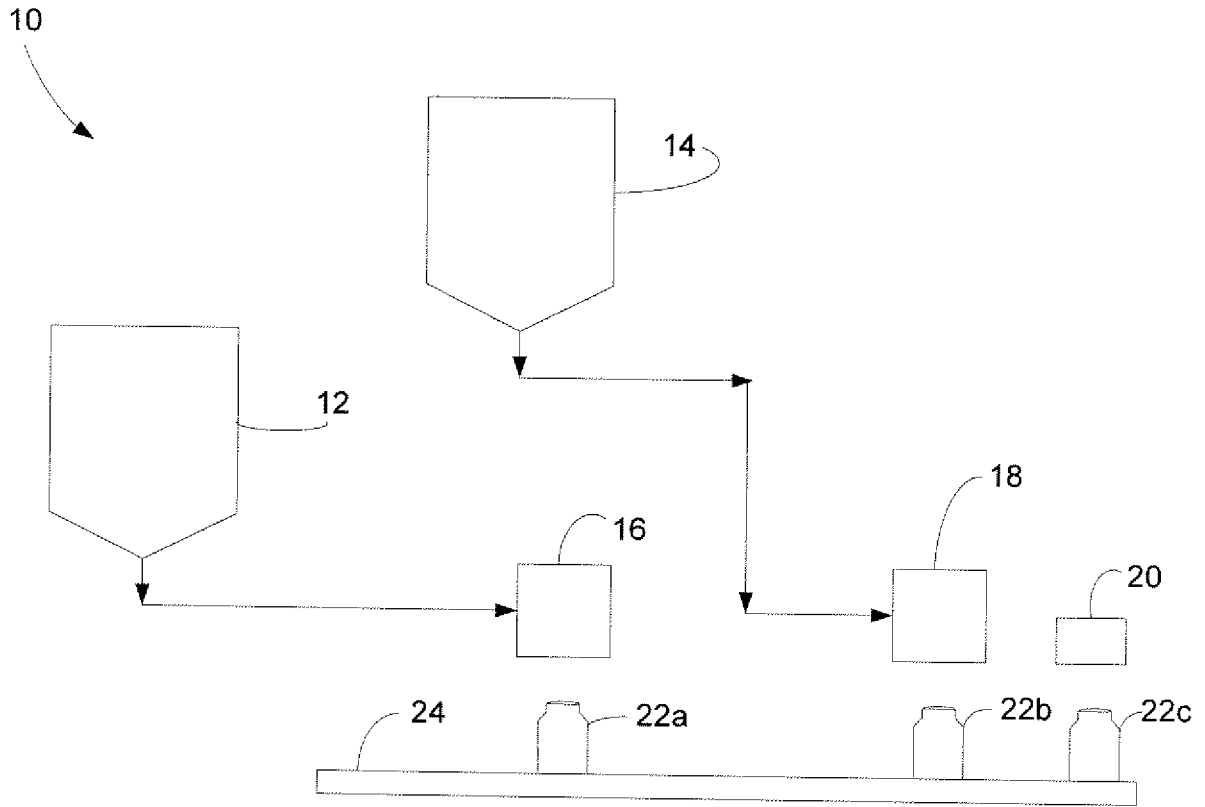
56. A method for packaging a beverage comprising a dairy component and a liquid, the method comprising:

dispensing a first portion of the beverage from a first source into containers, wherein the first portion of the beverage comprises the dairy component;

dispensing from a counterpressure filler a second portion of the beverage from a second source into containers to form a beverage having a pH less than 4.6, wherein the second portion of the beverage comprises the liquid;

sealing the containers to form packaged beverages; and

tunnel pasteurizing the packaged beverages, wherein the packaged beverages are shelf stable.



**FIG. 1**