



(11) **EP 2 537 793 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
26.12.2012 Bulletin 2012/52

(51) Int Cl.:
B67C 3/00 (2006.01)

(21) Application number: **11170950.7**

(22) Date of filing: **22.06.2011**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME

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(54) **NEW FILLING METHOD AND APPARATUS THEREFORE**

(57) The present invention relates to packaging of liquid products in form of liquid food preparations. More specifically, the invention relates to methods for mixing and filling liquid food preparations in consumer containers, where the products are comprised of at least two

different liquid constituents. The invention also provides an apparatus for mixing and filling the liquid food preparations in consumer containers and a plant comprising said filling apparatus.

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Description

[0001] The present invention relates to packaging of liquid products in form of liquid food preparations. More specifically, the invention relates to methods for mixing and filling liquid food preparations in consumer containers, where the products are comprised of at least two different liquid constituents. The invention also provides an apparatus for mixing and filling the liquid food preparations in consumer containers and a plant comprising said filling apparatus.

Technical background

[0002] The amount of different liquid food products that is available on the market is large and it continues to grow. One important part of this market is the dairy industry. Not so long ago, dairy plants were local producers of a limited amount of basic food products such as milk, cream, butter and cheese. Now, dairy plants have grown in size and complexity and produce a wide variety of food products. Furthermore, the market for liquid food products including dairy products has become increasingly global, and it is increasingly more important to the industry to be able export in order to be able to increase return of investment in process equipment.

[0003] Production of dairy products is regulated in several countries. Such regulations may for instance dictate if it is allowed or required to add a certain additive to a product. Furthermore, such regulations could stipulate that the nutrition facts on a food package must be accurate and/or not deviate from the given information by more than a minimum amount. An example of such a regulation is that it is a governmental requirement in Sweden to add fat-soluble vitamins A and D to milk products having a reduced fat content. On the other hand, such additions could be prohibited in other countries.

[0004] Dairy products are typically prepared in large tanks. The ingredients are added under stirring. In case of a product change where production of a product containing a particular additive should be changed to production of a similar product not containing the additive, a large amount of product preparation containing decreasing amounts of the additive will be obtained. This product preparation has to be discarded as the content of additive does not fulfil requirements of the product specifications for the products before and after the change.

[0005] Another recent development within the dairy industry relates to the growth of the amount of fermented and liquid milk products such as yoghurt, soured milk, etc. Just because there are such an abundance of different variants, product changes have become quite frequent when producing these products. Typically, a fruit yoghurt is comprised of two main constituents, namely a basic yoghurt preparation and a flavouring additive. Examples of common flavouring additives are fruit and/or berry preserves, coffee preparations and chocolate prep-

arations. When flavoured yoghurt types are prepared, the two main constituents are typically combined in large tanks under stirring. The process may be batch-wise or continuous.

[0006] The increasing amount of yoghurt variants naturally leads to an increased amount of product changes. A complicating circumstance regarding such product changes is that a considerable amount of intermediate yoghurt preparations containing an undesired combination of at least two different flavouring additives is obtained. Such intermediate preparations without any specific and constant composition have to be discarded.

[0007] Accordingly, there is a need for improved methods and equipment rendering it possible to change products without obtaining large amounts of intermediate products that have to be discarded.

Summary of the invention

[0008] In a first aspect, the present invention provides an apparatus for mixing and filling a liquid food preparation into a closable container, said liquid food preparation comprising a mixture of a primary ingredient and a secondary ingredient, said apparatus comprising a tank for storing said primary ingredient, and a mixing chamber where there is an opening enabling passage of a liquid from said tank to said mixing chamber, and wherein there is a means for preventing liquid food preparation from moving from said mixing chamber through said opening back into said tank, said mixing chamber comprising a lower part having an outlet, and, and said mixing chamber having an inlet for adding said secondary ingredient, wherein the apparatus comprises a means for injecting said secondary ingredient through said inlet into said mixing chamber.

[0009] In a second aspect, the present invention provides a method for mixing and filling a liquid food preparation into a closable container, said liquid food preparation comprising a mixture of a primary ingredient and a secondary ingredient, said method comprising the steps of:

- a) providing an amount A of a primary ingredient, and providing an amount B of a secondary ingredient, wherein $A + B$ is equal to or slightly less than the volume of said closable container;
- b) providing a mixing chamber having an opening, an inlet and an outlet;
- c) adding said amount A of said primary ingredient to a mixing chamber through said opening;
- d) injecting said amount B of said secondary ingredient into said mixing chamber thereby obtaining a liquid food preparation; and
- e) transferring the liquid food preparation of step c) through said outlet into said closable container.

[0010] In a third aspect the present invention provides method for changing production of a first liquid food prep-

aration comprising a primary ingredient and a first secondary ingredient to a second liquid food production comprising said primary ingredient and a second secondary ingredient when carrying out the method of the second aspect, and subsequently filling said second liquid food product into a second closable container, comprising the steps of:

- 1) carrying out steps a) - d) the method of the second aspect in order to produce a first liquid food preparation;
- 2) transferring the liquid food preparation to said closable container by adding an amount A_2 of said primary ingredient through said opening, thereby pressing said first liquid food preparation out through said outlet;
- 3) injecting an amount B_2 of a second secondary ingredient, wherein $A_2 + B_2$ is equal to or slightly less than the volume of the second closable container, into said mixing chamber thereby obtaining an intermediate liquid food preparation containing the primary ingredient, traces of the first secondary ingredient and the secondary ingredient;
- 4) ejecting and discarding said intermediate liquid food preparation by adding an amount A_2 of said primary ingredient through said opening, thereby pressing said first liquid food preparation out through said outlet;
- 5) injecting an amount B_2 of said secondary ingredient into said mixing chamber thereby obtaining said second liquid food preparation; and
- 6) transferring said second liquid food preparation to said second closable container by adding an amount A_2 of said primary ingredient through said opening, thereby pressing said first liquid food preparation out through said outlet.

[0011] In a fourth aspect, the present invention provides a system for carrying out the method of the third aspect, said system comprising

- i) an apparatus according to said first aspect;
- ii) a source for providing a primary ingredient as well as pumping means, valves and conduits for directing said primary ingredient to a tank comprised in said apparatus;
- iii) a plurality of sources for providing a plurality of secondary ingredients as well as pumping means, valves and conduits for directing said secondary ingredients to at least one inlet comprised in said apparatus;
- iv) a transport means;
- v) an input means; and
- vi) a computer means for controlling pumps, valves, means for injection, means for connecting outlet to a disposal system, and transport means and for receiving input from input means;

said computer means being set up to instruct pump, valve, and, optionally means in such a way that an amount A of a primary ingredient is added to mixing chamber;

5 said computer means being set up to instruct pump, valve, and means for injection to inject an amount B of a secondary ingredient in mixing chamber when said amount A of said primary ingredient has been added to the mixing chamber;

10 said computer means being set up to move transport means one position and to instruct pump, valve, and optionally means in such a way that an amount A of a primary ingredient is added to mixing chamber; and in case of product change

15 said computer means being set up instruct pumps, valves and means for injection to inject an amount B of a second secondary ingredient in mixing chamber when an amount A of said primary ingredient has been added to the mixing chamber;

20 said computer means being set up to dispose with the content of mixing chamber by either instructing said means to connect outlet to disposal conduit or

to fill the content in a closable package and to instruct said transport means to dispose with that package.

25 **[0012]** In a fifth aspect the invention provides a plant for producing a liquid food preparation, which plant comprises an apparatus according to said first aspect, and a system according to said fourth aspect.

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Brief description of the drawings

[0013] The present invention will now be described with reference to the enclosed figures, in which:

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Figure 1 discloses an overview of known methods for producing and filling a liquid food preparation comprising a primary ingredient and a secondary ingredient in closable packages;

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Figure 2 shows an overview of a system according to the present invention for producing and filling a liquid food preparation comprising a primary ingredient and a secondary ingredient in closable packages;

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Figure 3 discloses an overview of a part of said system, said part including an apparatus for mixing said primary and secondary ingredients into said liquid food product; and

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Figure 4 provides an overview of a plant comprising an apparatus and a system in accordance with the present invention.

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Detailed description of the invention

[0014] Accordingly, in a first aspect the invention pro-

vides an apparatus (200) for mixing and filling a liquid food preparation into a closable container (236b), said liquid food preparation comprising a mixture of a primary ingredient and a secondary ingredient, said apparatus (200) comprising a tank (201) for storing said primary ingredient, and a mixing chamber (228) where there is an opening (215) enabling passage of a liquid from said tank (201) to said mixing chamber (228), and wherein there is a means (216) for preventing liquid food preparation from moving from said mixing chamber (228) through said opening (215) back into said tank (201), said mixing chamber (228) comprising a lower part (230) having an outlet (232), and, and said mixing chamber (228) having an inlet (210) for adding said secondary ingredient, wherein the apparatus (200) comprises a means (212) for injecting said secondary ingredient through said inlet (210) into said mixing chamber (228).

[0015] As disclosed herein, the term "liquid food preparation" may in principle relate to any kind of liquid food preparation, such as a milk product, a yoghurt, a fruit juice, a vegetable oil, an intermediate food preparation which is intended to be further processed or a probiotic food preparation. However, liquid food preparations for which the present invention is applicable are all comprised of a primary ingredient and at least one secondary ingredient which are mixed together in a final step before packaging.

[0016] As disclosed herein, the term "primary ingredient" relates to an ingredient constituting at least 50 %, preferably at least 80 % and more preferably at least 90 % of the final liquid food preparation. As disclosed herein, the term "secondary ingredient" relates to an ingredient constituting at most 50 %, and preferably at most 80%, more preferably at most 90 % of the final product. Typically, the liquid food product is a flavoured yoghurt, the primary ingredient is a plain yoghurt preparation and the secondary ingredient is a fruit preserve, fruit base or another flavouring additive. Alternatively, the liquid food product may be a fruit juice, the primary ingredient may be water and the secondary ingredient concentrated fruit juice. The present invention is not restricted to yoghurt and fruit juices but is applicable to all situations where a liquid food preparation is prepared by mixing a primary and a secondary ingredient.

[0017] As disclosed herein, the terms "closable container" or "closable package" relates to any kind of consumer container suitable for a liquid food preparation, such as carton containers, plastic containers, glass containers or metal containers. Other types of suitable containers such as flexible pouches may also be used.

[0018] As disclosed herein, the term "mixing chamber" relates to a cavity which may function as a static mixer when a liquid ingredient is injected in said cavity. The skilled person knows about such static mixers and is capable of designing a suitable mixing chamber after having studied this description. It is advantageous that the mixing chamber has about the same volume as the type of closable container that is used for packaging the liquid

food preparation.

[0019] As disclosed herein, the term "means for injecting" relates to any device that can be used for injecting a specific amount of a certain preparation. Typically, such a means is a piston having the same cross-section as the inlet, which piston is moved forward by any suitable driving mechanism, such as a motor. Alternatively, said means for injecting is capable of continuously injecting said preparation and could then be a pump.

[0020] Preferably, said means (216) for preventing liquid food preparation from moving from said mixing chamber (228) back into tank (201) is a valve.

[0021] As disclosed herein, the term "valve" relates to a valve in its broadest sense and includes conventional valves as well as sliding lids. Preferably all valves used in connection with the present invention are remotely controlled, for instance by a computer means. As valves suitable for being used in connection with a liquid food preparation are well-known and commercially available, it is easy for the skilled person to find a suitable valve when carrying out the present invention.

[0022] In a preferred embodiment said inlet (210) is located adjacent to said opening (215).

[0023] In a preferred embodiment, said means (216) for preventing liquid food preparation from moving from said mixing chamber (228) back to tank (201) is a screen, or a grid. Especially when the liquid food product and the primary ingredient are viscous, such as a fruit yoghurt or a base yoghurt, it could be sufficient to arrange a screen or a grid between the mixing chamber (228) and the tank (201) in order to prevent back flow. It could also be sufficient to arrange a screen or a grid between the mixing chamber (228) and the tank (201) when both the primary and the secondary ingredient are continuously forwarded into the mixing chamber (228).

[0024] In a preferred embodiment, there is valve (238) in said lower part above said opening (232).

[0025] In a preferred embodiment, there is at least another inlet (222) comprising an injection means (224) for injecting another secondary ingredient through said inlet (222) into said mixing chamber (228).

[0026] In a preferred embodiment, there is a valve (214) separating said inlet (210) from said mixing chamber (228), and optionally, in case there is another inlet (222), a valve (226) separating inlet (222) from mixing chamber (228).

[0027] In a preferred embodiment, the inlet means (210, 222) are adapted for receiving a plurality of different secondary ingredients.

[0028] In a preferred embodiment, there is a means (239) for connecting said outlet (232) to a conduit (240) leading to a disposal system. Such a means could be a three-way valve where branch goes to the filling of the closable container and one branch leads to the disposal system. Alternatively, said means could be a device such as a robot that temporarily connects the conduit (240) leading to the disposal system to said outlet (232).

[0029] In a second aspect, the present invention pro-

vides a method for mixing and filling a liquid food preparation into a closable container (236b), said liquid food preparation comprising a mixture of a primary ingredient and a secondary ingredient, said method comprising the steps of:

- a) providing an amount A of a primary ingredient, and providing an amount B of a secondary ingredient, wherein $A + B$ is equal to or slightly less than the volume of said closable container (236b);
- b) providing a mixing chamber (228) having an opening (215), an inlet (210) and an outlet (232);
- c) adding said amount A of said primary ingredient to a mixing chamber (228) through said opening (215);
- d) injecting said amount B of said secondary ingredient into said mixing chamber (228) thereby obtaining a liquid food preparation; and
- e) transferring the liquid food preparation of step c) through said outlet (232) into said closable container (236b).

[0030] In a preferred embodiment, the liquid food preparation is transferred to said closable container (236b) by adding another amount A of said primary ingredient through said opening (215), thereby pressing said liquid food preparation out through said outlet (232).

[0031] In a third aspect, the present invention provides a method for changing production of a first liquid food preparation comprising a primary ingredient and a first secondary ingredient to a second liquid food production comprising said primary ingredient and a second secondary ingredient when carrying out the method of said second aspect, and subsequently filling said second liquid food product into a second closable container (236c), comprising the steps of:

- 1) carrying out steps a) - d) the method of claim 8 in order to produce a first liquid food preparation;
- 2) transferring the liquid food preparation to said closable container by adding an amount A_2 of said primary ingredient through said opening (215), thereby pressing said first liquid food preparation out through said outlet (232);
- 3) injecting an amount B_2 of a second secondary ingredient, wherein $A_2 + B_2$ is equal to or slightly less than the volume of the second closable container (236c), into said mixing chamber (228) thereby obtaining an intermediate liquid food preparation containing the primary ingredient, traces of the first secondary ingredient and the secondary ingredient;
- 4) ejecting and discarding said intermediate liquid food preparation by adding an amount A_2 of said primary ingredient through said opening (215), thereby pressing said first liquid food preparation out through said outlet (232);
- 5) injecting an amount B_2 of said secondary ingredient into said mixing chamber (228) thereby obtain-

ing said second liquid food preparation; and
6) transferring said second liquid food preparation to said second closable container (236c) by adding an amount A_2 of said primary ingredient through said opening (215), thereby pressing said first liquid food preparation out through said outlet (232).

[0032] In a preferred embodiment, the intermediate liquid food preparation is discarded by ejecting it through said conduit (240) leading to a disposal system using said means (239) for connecting said outlet (232) to the conduit (240).

[0033] In a preferred embodiment, the intermediate liquid food preparation is added to a closable container of the same type as the second or first closable containers (236b, 236c) and that this container is discarded.

[0034] In a fourth aspect, the present invention provides a system for carrying out the method of any of claims second and third aspects, said system comprising

- i) an apparatus (142, 200) according to said first aspect;
- ii) a source (100) for providing a primary ingredient as well as pumping means (108), valves (110) and conduits (106, 124) for directing said primary ingredient to a tank (126, 201) comprised in said apparatus (142, 200);
- iii) a plurality of sources (102, 104) for providing a plurality of secondary ingredients as well as pumping means (114, 120), valves (116, 122) and conduits (112, 130, 118, 134, 146) for directing said secondary ingredients to at least one inlet (132, 210) comprised in said apparatus (142, 200);
- iv) a transport means (140, 234);
- v) an input means (148); and
- vi) a computer means (144) for controlling pumps (108, 114, 120), valves (110, 116, 122, 214, 216, 226, 238), means (212, 224) for injection, means (239) for connecting outlet (232) to a disposal system, and transport means (140, 234) and for receiving input from input means (148);

said computer means (144) being set up to instruct pump (108), valve (110), and, optionally means (216) in such a way that an amount A of a primary ingredient is added to mixing chamber (228);

said computer means means (144) being set up to instruct pump (114), valve (116), and means (212) for injection to inject an amount B of a secondary ingredient in mixing chamber (228) when said amount A of said primary ingredient has been added to the mixing chamber (228);

said computer means (144) being set up to move transport means (234) one position and to instruct pump (108), valve 110), and optionally means (216) in such a way that an amount A of a primary ingredient is added to mixing chamber (228); and in case of product change said computer means (144) being set up instruct pumps

(114, 120), valves (116, 122, 123) and means (212, 224) for injection to inject an amount B of a second secondary ingredient in mixing chamber (228) when an amount A of said primary ingredient has been added to the mixing chamber (228);

said computer means (144) being set up to dispose with the content of mixing chamber (228) by either instructing said means (239) to connect outlet (232) to disposal conduit (240) or to fill the content in a closable package (236c) and to instruct said transport means (234) to dispose with that package.

[0035] As disclosed herein, the term "source" relates to any kind of source for providing an ingredient, such as a tank or a production line where the ingredient is produced. In case the ingredient is a fermented milk product such as yoghurt, sour cream, crème fraîche, or sour milk, the source could be a process line for producing such an ingredient. In case the ingredient is a flavouring ingredient that has not been produced in proximity to the production site, the source could be a tank. In this case the tank is regularly supplied with that ingredient. Typical examples of ingredients of this type are fruit preserves and bases, berry preserves and bases and other flavouring additives of any kind.

[0036] As disclosed herein, the term "pumping means" relates to any kind of pumping means that is suitable and acceptable for pumping a liquid food preparation. In a preferred embodiment all pumping means included in the system of the invention are remotely controlled by a computer means. As such pumping means are well-known in the art, it is easy for the skilled person to find a suitable and commercially available pumping means when carrying out the present invention.

[0037] As disclosed herein, the term "computer means" relates to a computer means suitable for controlling the equipment needed to automatically carry out the method of the present invention. Computer systems suitable for controlling process equipment in general and in particular process equipment for producing liquid food preparations are well-known in the art and it is easy for the skilled person to find a suitable such computer system when wanting to carry out the present invention.

[0038] As disclosed herein, the term "transport means" relates to a means for transporting empty packages to a filling position adjacent to outlet 232, and filled packages from said position adjacent to outlet 232. Preferably, said packages are transported stepwise so that the packages are filled when they are standing still. Typically, the transport means is a transport belt or similar adapted for stepwise motion. The transport means is preferably remotely controlled by said computer means. Such transport means are well-known in the art and commercially available, and it should be easy for the skilled person to obtain such a transport means when carrying out the present invention.

[0039] As disclosed herein, the term "input means" relates to a means for submitting information and com-

mands to said computer means. Typically, the input means is a keypad. In some embodiments, the key pad only comprises numerical keys, but in other embodiments, the key pad may also comprise letter keys. Alternatively, the input means could be a connection to a computer network, such as the internet. Such input means are well-known in the art and commercially available. It should therefore be easy for the skilled person to obtain such an input means when carrying out the present invention.

[0040] In a fifth aspect, the present invention provides a plant (300) for producing a liquid food preparation, which comprises an apparatus (142, 200) according to the first aspect, and a system according to the fourth aspect.

[0041] Figure 1 discloses a simplified outline of a typical plant for producing fruit yoghurt according to the state of the art. A basic yoghurt preparation not containing any flavouring ingredients is added through conduit 12 to a large tank 10. Tank 10 contains stirring means (not shown). Flavouring ingredients, such as fruit or berry preserves, may be added through conduits 14 or 16. When the flavouring ingredients have been added to the tank 10, the resulting mixture is stirred in order to obtain a homogenous final product. This final product is fed out from the tank 10 through conduit 18 to a packaging unit 20, where it is filled in closable packages.

[0042] In case of change of product from a yogurt containing a first flavouring ingredient to yoghurt containing a second flavouring ingredient, the supply of the first flavouring ingredient is interrupted, and the supply of the second flavouring ingredient is initiated. As a result the tank 10 contains yoghurt comprising two flavouring ingredients where the content of the first ingredient is decreasing and the content of the second is increasing. Such yoghurt containing mixed flavouring additives cannot be sold on the market and is consequently discarded. The discarded amounts of such intermediate yoghurt could be substantial when large tanks 10 are used. Accordingly, it is important to find ways to minimize the discarded amounts.

[0043] Figure 2 shows an overview of a system according to the present invention for producing and filling a liquid food preparation comprising a primary ingredient and a secondary ingredient. Accordingly, the system comprises sources 100, 102, 104 for providing ingredients. These sources 100, 102, 104 may be tanks for storing said ingredients, but they may also independent of each other be process lines for manufacturing an ingredient to be included in the final liquid food preparation. It should be noted that it is possible to include more such sources than is shown in the figures. All three sources 100, 102, 104 may comprise sensor means 146, 148, 150 measuring the amount of corresponding ingredients in the sources, and this information is transferred to computer means 144.

[0044] In a preferred embodiment, a liquid food preparation having a high viscosity, such as a fermented milk

product, is produced by the system. In this case, the source may be a conventional process line for processing and fermenting raw milk in order to obtain a fermented milk product having a specific fat content, such as yoghurt, sour milk, sour cream, crème fraîche etc. Liquid food preparations that could be produced by the present system, apparatus and method do not have to include any milk-based constituents at all. However, for simplicity, the present figures are based on production of milk-based liquid food products, and in particular viscous milk-based liquid food products, such as those mentioned above, and in particular yoghurt containing a flavouring ingredient such as a fruit or berry preserve.

[0045] Source 100 is a tank for storing or alternatively a process line for providing said primary ingredient. The primary ingredient is the main ingredient of the liquid food preparation and typically makes up more than 50 %, preferably more than 80 %, still more preferably 90 % of the finished product. A typical primary ingredient is plain yoghurt having a specific fat content and not containing any extra additives. The primary ingredient is transported out into conduit 106 using pump 108. Conduit 106 directs the primary ingredient to one or more units 142 for further processing. Figure 2 only shows one such unit 142. However, it should be clear to the skilled person that several such units could be included in parallel. Three-way valve 110 directs the primary ingredient into conduit 124 and subsequently into unit 142, and more specifically into tank 126. Said tank 126 has a sensor 128 for monitoring the amount of the primary ingredient in tank 126. Information from sensor 128 is forwarded to computer means 144 or an operator. The operator may remotely control all of the above mentioned process equipment. In a preferred embodiment, computer means 144 is, among all, set up to control pump 108 and valve 110 in order to maintain a predetermined amount of primary ingredient in tank 126.

[0046] The primary ingredient is then forwarded to a mixing chamber 138 where it is mixed with at least one secondary ingredient. Said secondary ingredient is added from an inlet 132, 136. Two such inlets are shown in Figure 1 although it is not necessary to include two or more such inlets in order to carry out the invention. One such inlet 132 is necessary in order to carry out the present invention. In this case, there are normally at least two conduits and corresponding valves (not shown) for supplying a plurality of different second ingredients to said inlet 132. The valves, which preferably are remotely controlled by the computer means 144, ensure that only one kind of second ingredient at a time is forwarded to inlet means 132. However, it could also be advantageous to a second inlet in order to further facilitate product change. Figures 2 and 3 both show two inlets but it is of course possible to include further inlets as well as to include only one inlet. When the final liquid product has been mixed in the mixing chamber 138, it is forwarded into a consumer container 140.

[0047] The secondary ingredient is obtained from one

of sources 102 and 104. The secondary ingredient of source 102 is transported out into conduit 112 using pump 114. Conduit 112 directs the secondary ingredient to one or more units 142 for further processing. Figure 2 only shows one such unit 142. However, it should be clear to the skilled person that several such units could be included in parallel. Three-way valve 116 directs the secondary ingredient into conduit 130 and subsequently into unit 142, and more specifically into inlet 132. The secondary ingredient of source 104 is transported out into conduit 118 using pump 120. Conduit 118 directs the secondary ingredient to one or more units 142 for further processing. Figure 2 only shows one such unit 142. However, it should be clear to the skilled person that several such units could be included in parallel. Three-way valve 122 directs the secondary ingredient into conduit 134 in the direction of unit 142.

[0048] Figure 2 discloses some further embodiments of the invention that could be regarded as optional. Accordingly, the secondary ingredient originating from source 104 could either be directed towards inlet 132 (in addition to the secondary ingredient from source 102) or towards inlet 136. The embodiment of figure 2 includes both these options but it is of course sufficient and within the scope of the present invention to choose only one of these options. In order to be able to include both options, conduit 134 leads to a three-way valve 123. From three-way valve 123, there is a conduit 146 to inlet 132 and a conduit 148 to inlet 136. As already mentioned, it is possible to allow conduit 134 to go directly to only one of inlet 132 or inlet 136.

[0049] From inlet 132 and/or inlet 136, the secondary product or products are injected into mixing chamber 138 where the primary product is mixed with the secondary product(s). Subsequently, the final liquid food preparation is forwarded to packaging site 140 where it is filled into closable containers.

[0050] Preferably, pumps 114, 120, and valves 116, 122, 146 are remotely controlled by an operator or, more preferably, by computer means 144.

[0051] Referring now also to figure 3, the unit 142, 200 will now be more described in detail. The primary ingredient is forwarded to tank 126, 201 through conduit 124, 202. Preferably, tank 126, 201 is equipped with a sensor 128, 204 monitoring the amount of the primary ingredient in the tank 126, 201. In the lower end of tank 126, 201, there is at least one opening 215 to the mixing chamber 138, 228. In connection with this opening, there is a means 216 for preventing liquid food preparation from moving from the mixing chamber 138, 228 through opening 215 back into the tank 201. The means may be a preferably remotely controlled valve, or a preferably remotely controlled lid that temporarily could close opening 215, or similar. Alternatively, in case the liquid food preparation as well as the primary product are viscous, the means 216 could simply be a screen or a grid.

[0052] There is at least one, but sometimes two or more inlets 132, 136, 210, 222 for leading secondary ingredi-

ents into the mixing chamber 138, 228. This inlet or inlets 210, 222 is/are located at a distance d from opening 215. In case means 216 is capable of closing opening 215, d is typically small and the inlet(s) 210, 222 is/are typically located adjacent to said opening. In case means 216 is a screen or a grid, d is typically larger in order to minimize the risk that secondary ingredient could reach tank 201. Accordingly the inlet(s) 210, 222 is/are typically located near the centre of the mixing chamber 228.

[0053] Especially when there are more than one inlet 210, 222, there are preferably remotely controlled valves or a lids 214, 226 capable of temporarily sealing off the inlet(s) 210, 222 from the mixing chamber 228. In the lower part 230 of the mixing chamber 228, there is an outlet 232. In a preferred embodiment, said lower part 230 also contains a valve 238 capable of at least partially closing outlet 232.

[0054] Inlet(s) 210, 222 are connected to sources of secondary ingredients which are forwarded to the inlet (s) 210, 222 by one or more conduits 206a, 206b, 218a, 218b, which optionally are branched in order to render it possible to include a multitude of different secondary ingredients. Preferably, each conduit 206a, 206b, 218a, 218b could be temporarily sealed off by preferable remotely controlled valves 208a, 208b, 220a, 220b. Furthermore, each inlet 210, 222 comprises an injection means 212, 224 such as a piston for injecting secondary product into the mixing chamber 228.

[0055] Accordingly, the liquid food preparation is produced by forcing a specific amount of primary ingredient from tank 201 into the mixing chamber 228. Subsequently or simultaneously, a specific amount of secondary ingredient is injected into the primary product from the inlet (s) 210, 222. Finally, the mixed and finished liquid food preparation is forwarded out through outlet 232 by forcing another portion of said primary ingredient into the mixing chamber 228. The production process may be facilitated by closing valve(s)/lid(s) 216, 226 and opening means 216 and 238 when forcing a specific amount of primary product into the mixing chamber 228 in the same time as a finished preparation is forced out through opening 232, especially if the primary ingredient and the finished liquid food preparation are viscous.

[0056] Preferably, injection means 212, 222, means 214, 216, 226, valves 208a, 208b, 220a, 220b, and 238 are all remotely controlled and still more preferable remotely controlled by computer means 144.

[0057] Outlet 232 is located above transport means 234. Said transport means 234 is typically a transport belt or a similar arrangement and is adapted for stepwise transport of closable containers 236a, 236b, 236c in such a way that a closable container 236b is transported into filling position and remains there during filling of liquid food preparation. When the filling of a specific closable container has been terminated, that container is removed and another one is transported into filling position. Preferably, the transport means 234 is remotely controlled by computer means 144.

[0058] In case of product change from a first liquid food preparation containing a first secondary ingredient to a second liquid food preparation containing a second secondary ingredient, the conduit selected from conduits 206a, 206b, 218a, 218b containing the secondary ingredient is closed by closing a suitable valve selected from 208a, 208b, 220a, 220b. Subsequently, the second secondary ingredient is forwarded into one of inlets 210, 222 from a suitable conduit selected from conduits 206a, 206b, 218a, 218b, by opening a suitable valve selected from 208a, 208b, 220a, 220b. The last portion of the first liquid food preparation is forwarded out through outlet 232 and into a closable container in the same time as a new portion of the primary ingredient is forwarded into the mixing chamber. The second secondary ingredient together with small amounts of the first secondary ingredient is injected into the mixing chamber from one of said inlets 210, 222, thereby obtaining an intermediate liquid food preparation. This intermediate liquid food preparation is forced out through outlet 232 by forwarding another portion of the primary ingredient into the mixing chamber 228.

[0059] There are alternative ways of disposing the intermediate liquid food preparation. In a first alternative, the intermediate liquid food preparation is filled into a closable container followed by disposal of that particular container. This disposal operation is not disclosed in detail in this application. In a second alternative, the outlet 232 is connected by a connecting means 239 to a conduit 240 leading to a sewage disposal system. Such a connecting means could be a valve in connection with outlet 232. Alternatively, it could be robot or similar set up to connect conduit 240 to outlet 232.

[0060] Figure 4 discloses a simplified overview of a production plant 300 containing a system according to the present invention which in turn contains an apparatus according to the present invention. The skilled person realizes that the apparatus, system and plant of the present invention can occur in many different variants and embodiments.

[0061] The description of the invention is merely exemplary in nature and, thus, variations that do not depart from the gist of the invention are intended to be within the scope of the invention. Such variations are not to be regarded as a departure from the spirit and scope of the invention.

Claims

1. An apparatus (200) for mixing and filling a liquid food preparation into a closable container (236b), said liquid food preparation comprising a mixture of a primary ingredient and a secondary ingredient, said apparatus (200) comprising a tank (201) for storing said primary ingredient, and a mixing chamber (228) where there is an opening (215) enabling passage of a liquid from said tank (201) to said mixing

chamber (228), and wherein there is a means (216) for preventing liquid food preparation from moving from said mixing chamber (228) through said opening (215) back into said tank (201), said mixing chamber (228) comprising a lower part (230) having an outlet (232), and, and said mixing chamber (228) having an inlet (210) for adding said secondary ingredient, **characterized in that** the apparatus (200) comprises a means (212) for injecting said secondary ingredient through said inlet (210) into said mixing chamber (228).

2. An apparatus (200) according to claim 1, **characterized in that** said means (216) for preventing liquid food preparation from moving from said mixing chamber (228) back into tank (201) is a valve.

3. An apparatus (200) according to claim 2, **characterized in that** the inlet (210) is located adjacent to said opening (215).

3. An apparatus (200) according to claim 1, **characterized in that** said means (216) for preventing liquid food preparation from moving from said mixing chamber (228) back to tank (201) is a screen, or a grid.

4. An apparatus (200) according to any of claims 1 - 3, **characterized in that** there is valve (238) in said lower part (230) above said opening (232).

5. An apparatus (200) according to any of claims 1-4, **characterized in that** there is at least another inlet (222) comprising an injection means (224) for injecting another secondary ingredient through said inlet (222) into said mixing chamber (228).

6. An apparatus (200) according to any of claims 1 - 5, **characterized in that** there is a valve (214) separating said inlet (210) from said mixing chamber (228), and optionally, in case there is another inlet (222), a valve (226) separating inlet (222) from mixing chamber (228).

7. An apparatus (200) according to any of claims 1 - 6, **characterized in that** the inlet means (210, 222) are adapted for receiving a plurality of different secondary ingredients.

8. An apparatus (200) according to any of claims 1 - 7, **characterized in that** there is a means (239) for connecting said outlet (232) to a conduit (240) leading to a disposal system.

9. A method for mixing and filling a liquid food preparation into a closable container (236b), said liquid food preparation comprising a mixture of a primary ingredient and a secondary ingredient, said method

comprising the steps of:

a) providing an amount A of a primary ingredient, and providing an amount B of a secondary ingredient, wherein $A + B$ is equal to or slightly less than the volume of said closable container (236b);

b) providing a mixing chamber (228) having an opening (215), an inlet (210) and an outlet (232);

c) adding said amount A of said primary ingredient to a mixing chamber (228) through said opening (215);

d) injecting said amount B of said secondary ingredient into said mixing chamber (228) thereby obtaining a liquid food preparation; and

e) transferring the liquid food preparation of step c) through said outlet (232) into said closable container (236b).

10. A method according to claim 9, **characterized in that** the liquid food preparation is transferred to said closable container (236b) by adding another amount A of said primary ingredient through said opening (215), thereby pressing said liquid food preparation out through said outlet (232).

11. A method for changing production of a first liquid food preparation comprising a primary ingredient and a first secondary ingredient to a second liquid food production comprising said primary ingredient and a second secondary ingredient when carrying out the method of claim 8, and subsequently filling said second liquid food product into a second closable container (236c), comprising the steps of:

1) carrying out steps a) - d) the method of claim 8 in order to produce a first liquid food preparation;

2) transferring the liquid food preparation to said closable container by adding an amount A_2 of said primary ingredient through said opening (215), thereby pressing said first liquid food preparation out through said outlet (232);

3) injecting an amount B_2 of a second secondary ingredient, wherein $A_2 + B_2$ is equal to or slightly less than the volume of the second closable container (236c), into said mixing chamber (228) thereby obtaining an intermediate liquid food preparation containing the primary ingredient, traces of the first secondary ingredient and the secondary ingredient;

4) ejecting and discarding said intermediate liquid food preparation by adding an amount A_2 of said primary ingredient through said opening (215), thereby pressing said first liquid food preparation out through said outlet (232);

5) injecting an amount B_2 of said secondary ingredient into said mixing chamber (228) thereby

obtaining said second liquid food preparation;
and

6) transferring said second liquid food preparation to said second closable container (236c) by adding an amount A_2 of said primary ingredient through said opening (215), thereby pressing said first liquid food preparation out through said outlet (232).

12. A method according to claim 11, **characterized in that** the intermediate liquid food preparation is discarded by ejecting it through said conduit (240) leading to a disposal system using said means (239) for connecting said outlet (232) to the conduit (240).

13. A method according to claim 11, **characterized in that** the intermediate liquid food preparation is added to a closable container of the same type as the second or first closable containers (236b, 236c) and that this container is discarded.

14. A system for carrying out the method of any of claims 9-13, said system comprising

i) an apparatus (142, 200) according to any of claims 1 - 8;

ii) a source (100) for providing a primary ingredient as well as pumping means (108), valves (110) and conduits (106, 124) for directing said primary ingredient to a tank (126, 201) comprised in said apparatus (142, 200);

iii) a plurality of sources (102, 104) for providing a plurality of secondary ingredients as well as pumping means (114, 120), valves (116, 122) and conduits (112, 130, 118, 134, 146) for directing said secondary ingredients to at least one inlet (132, 210) comprised in said apparatus (142, 200);

iv) a transport means (140, 234);

v) an input means (148); and

vi) a computer means (144) for controlling pumps (108, 114, 120), valves (110, 116, 122, 214, 216, 226, 238), means (212, 224) for injection, means (239) for connecting outlet (232) to a disposal system, and transport means (140, 234) and for receiving input from input means (148);

said computer means (144) being set up to instruct pump (108), valve (110), and, optionally means (216) in such a way that an amount A of a primary ingredient is added to mixing chamber (228);

said computer means means (144) being set up to instruct pump (114), valve (116), and means (212) for injection to inject an amount B of a secondary ingredient in mixing chamber (228) when said amount A of said primary ingredient has been added to the mixing chamber (228);

said computer means (144) being set up to move transport means (234) one position and to instruct pump (108), valve (110), and optionally means (216) in such a way that an amount A of a primary ingredient is added to mixing chamber (228); and in case of product change

said computer means (144) being set up to instruct pumps (114, 120), valves (116, 122, 123) and means (212, 224) for injection to inject an amount B of a second secondary ingredient in mixing chamber (228) when an amount A of said primary ingredient has been added to the mixing chamber (228);

said computer means (144) being set up to dispose with the content of mixing chamber (228) by either instructing said means (239) to connect outlet (232) to disposal conduit (240) or

to fill the content in a closable package (236c) and to instruct said transport means (234) to dispose with that package.

15. A plant (300) for producing a liquid food preparation, **characterized in that** it comprises an apparatus (142, 200) according to any of claims 1 - 8, and a system according to claim 14.

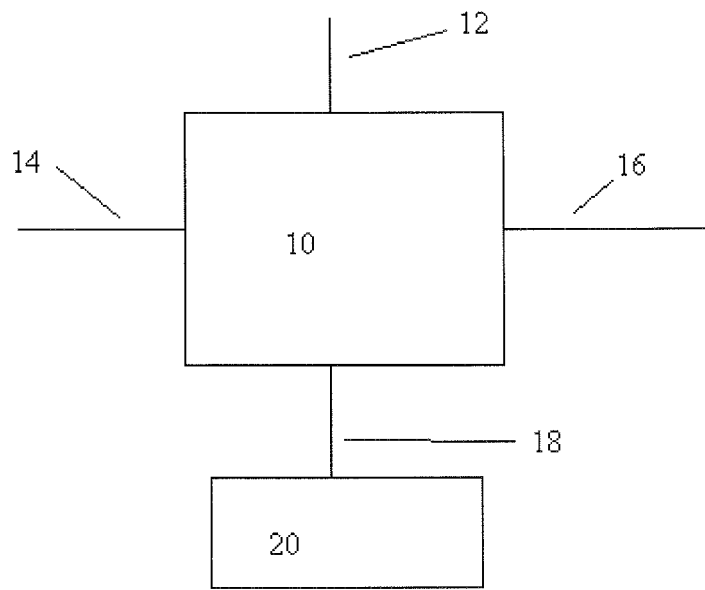


Fig. 1

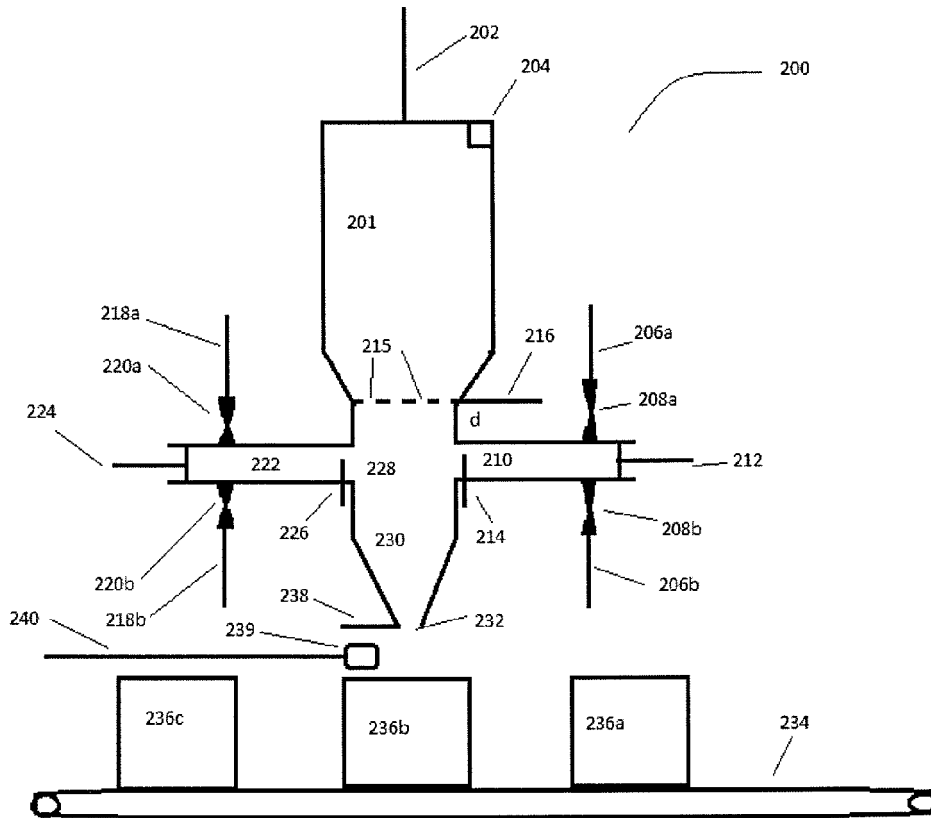


Fig. 3

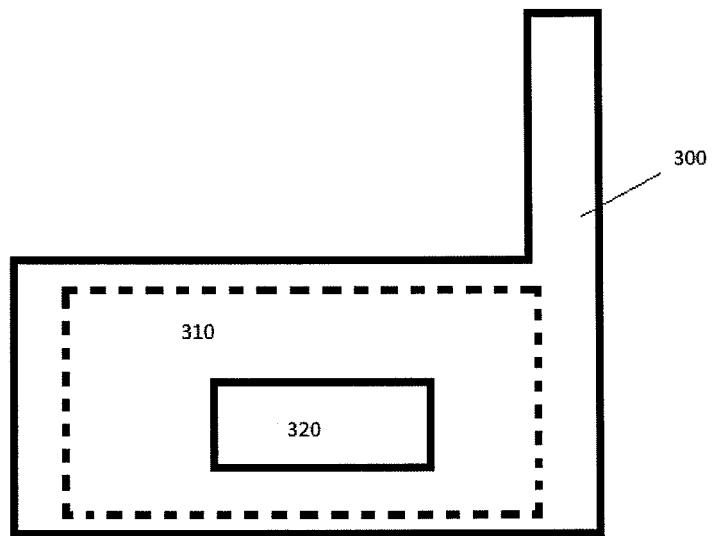


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 11 17 0950

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 December 2011	Examiner Vernier, Frédéric
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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