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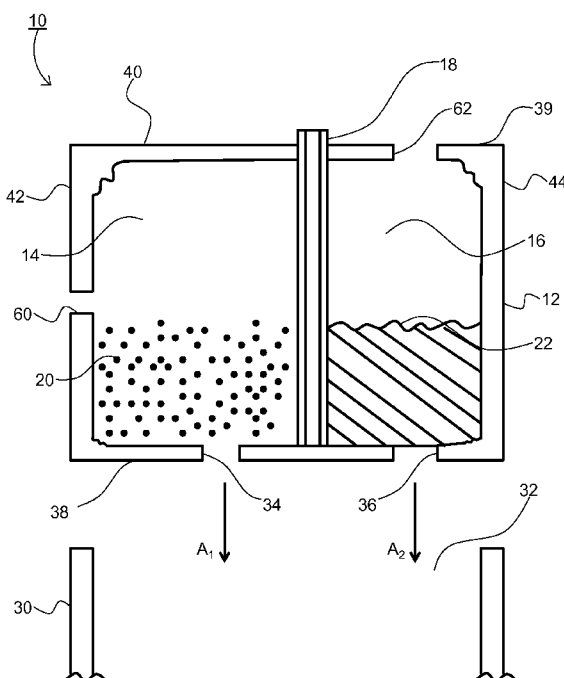


FIG. 1

(57) Abstract: A pod (10) for preparation of a nutritional liquid composition. The pod (10) includes a powder (20) and a liquid (22) which are separated within the pod (10). One or more inlets (60, 62) into the pod introduce fluid to mix with at least some of the contents of the pod. The contents of the pod (10) exit through one or more outlets (34, 36).



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MULTI-COMPONENT PRODUCT POD

Background

[001] Many drinks, nutritional products, and other beverages can be made by mixing water, steam or some combination thereof with a powder or a liquid. Other nutritional products require both powder and liquid ingredients. Some exemplary nutritional liquid products made from ingredients including a powder are infant formula, soup, and hot chocolate.

[002] Certain known nutritional products are prepared as a single serving product. For example, a nutritional powder may be mixed with water to create a product suitable for consumption. The choice of the nutritional powder requires the preparer to manage certain criteria related to the preparation of the nutritional product, such as for example, the temperature of the finished product, the time to prepare the finished product, the size of the serving, the calories per ounce of the finished product, and the threat of contamination within the finished product. Further, the powder must be reconstituted to a predetermined level within an amount of water prior to serving.

[003] A nutritional powder or a nutritional liquid or liquid concentrate may be mixed with water several different ways, including manually shaking a closed container containing some combination of a powder, a liquid, and water. Other prior art techniques to reconstitute consumable powders with a liquid, such as water, to render the powders fit for consumption are known. For example, WO 2006/015689 discloses reconstituting consumable powders with a liquid to provide a food liquid such as milk, cappuccino-type beverage, or soup. WO 2011/031294 discloses a method and apparatus that use a cartridge which includes a beverage medium, such as a dry fruit material. An interaction between water and the beverage medium within a single-serve machine produces a beverage. Other prior art techniques are known for producing a single-serve beverage.

Summary

[004] The present application describes a pod for preparation of a nutritional liquid composition.

[005] In an exemplary embodiment, a pod includes a first compartment and a second

compartment. The first compartment contains a powder and the second compartment contains a liquid. One or more inlets in the first compartment may introduce fluid into the first compartment to mix with the powder.

[006] Further features and advantages of the invention will become apparent from the following detailed description made with reference to the accompanying drawings.

Brief Description of the Drawings

[007] Figure 1 is a front sectional view of a pod, showing a first compartment containing a nutritional powder and a second compartment containing a nutritional liquid;

[008] Figure 2 is a front sectional view of another pod, showing a first compartment containing a nutritional powder and a second compartment a containing nutritional liquid, and illustrating optional locations for compartment inlets and outlets;

[009] Figure 3 is a front sectional view of yet another pod, showing a first compartment containing a nutritional powder and a second compartment containing a nutritional liquid, and illustrating optional locations for compartment inlets and outlets;

[010] Figure 4 is a front sectional view of a yet another pod, showing a first compartment containing a first nutritional powder, a second compartment containing a second nutritional powder, and a third compartment containing a first nutritional liquid; and

[011] Figure 5 is a front sectional, partial assembly view of yet another pod, showing a housing, a seal and a lid.

Detailed Description

[012] This Detailed Description merely describes exemplary embodiments in accordance with the general inventive concepts and is not intended to limit the scope of the invention or the claims in any way. Indeed, the invention as described by the specification is broader than and unlimited by the exemplary embodiments set forth herein, and the terms used in the claims have their full ordinary meaning.

[013] The general inventive concepts will now be described with occasional reference to the exemplary embodiments of the invention. The general inventive concepts may, however, be embodied in different forms and should not be construed as limited to the embodiments set

forth herein. Rather, these embodiments are provided so that this disclosure will be more thorough and complete, and will introduce the scope of the general inventive concepts to those skilled in the art.

[014] Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art encompassing the general inventive concepts. The terminology set forth in this detailed description is for describing particular embodiments only and is not intended to be limiting of the general inventive concepts. As used in this detailed description and the appended claims, the singular forms “a,” “an,” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise.

[015] Unless otherwise indicated, all numbers expressing quantities of ingredients, properties such as molecular weight, reaction conditions, percentages and so forth as used in the specification and claims are to be understood as being modified in all instances by the term “about.” Accordingly, unless otherwise indicated, the numerical properties set forth in the specification and claims are approximations that may vary depending on the suitable properties sought to be obtained in embodiments of the present invention. Notwithstanding that the numerical ranges and parameters setting forth the broad scope of the general inventive concepts are approximations, the numerical values set forth in the specific examples are reported as precisely as possible. Any numerical values, however, inherently contain certain errors necessarily resulting from error found in their respective measurements.

[016] When discussing the invention, the term “pod” is used in the specification and the claims. The term is generally used to mean a hermetically sealed body containing ingredients that, when mixed with water, yield a liquid beverage. A pod may have two or more compartments and each compartment may contain one of a soluble powder, a liquid or a liquid concentrate. A pod may be loaded into a machine in which water is automatically mixed with the ingredients to produce a single serving of a liquid beverage. The pod may be loaded into a machine in a commercial, healthcare, or residential environment.

[017] The term “nutritional composition” as used herein, unless otherwise specified, refers to dissolvable solids (e.g., nutritional powders) and dilutable liquids (e.g., concentrated liquids or liquids). The nutritional powders may be reconstituted to form nutritional liquids

suitable for oral consumption by a human. The concentrated liquids may be diluted or otherwise augmented to form nutritional liquids suitable for oral consumption by a human.

[018] The terms “powder,” “reconstitutable,” and “reconstitutable powder” as used herein, unless otherwise specified, each describe a physical form of a composition (including, but not limited to, a nutritional composition), or portion thereof, that is flowable or scoopable and can be reconstituted with water or other liquid prior to consumption.

[019] The term “reconstitute” as used herein, unless otherwise specified, refers to a process by which the nutritional powder is mixed with a liquid, typically water, to form an essentially homogeneous liquid product. Once reconstituted in the liquid, the ingredients of the nutritional powder may be any combination of one or more of dissolved, dispersed, suspended, colloidally suspended, emulsified, or otherwise blended within the matrix of the liquid product. Therefore, the resulting reconstituted liquid product may be characterized as any combination of a solution, a dispersion, a suspension, a colloidal suspension, an emulsion, or a homogeneous blend. A nutritional composition may be said to be “reconstituted” even if a nominal portion (e.g., less than 10%) of the powder remains un-reconstituted in the resulting liquid product. The process of the powder being “reconstituted” may take place entirely inside pod, or partially inside the pod and partially inside the container predetermined to hold the nutritional composition beverage.

[020] The term “pre-treat” as used herein, unless otherwise specified, refers to a process by which a liquid and/or gaseous fluid is applied to the nutritional powder to partially reconstitute the powder and/or to prepare the powder for reconstitution (e.g., by deagglomerating clumps of nutritional powder) while the powder is retained in the pod chamber, before an outlet aperture is produced in the pod chamber. This pre-treating phase, when applicable, at least partially precedes a reconstituting phase in which a reconstituting liquid mixes with the pre-treated nutritional powder, to complete reconstitution of the nutritional composition as the reconstituting liquid enters the pod chamber, passes through an outlet aperture produced in the pod chamber, and is discharged into a serving container that collects the nutritional liquid.

[021] The term “fluid flow” as used herein, unless otherwise specified, refers to movement of a fluid whether in response to manipulation of the fluid or in accordance with natural forces (e.g., gravity) acting thereon. The term “fluid flow” also encompasses movement

of a fluid that has been reshaped or otherwise altered, such as atomization of a stream of liquid water.

[022] When discussing the invention, the term “built-in” is used in the specification and the claims. The term “built-in” as used herein, unless otherwise specified, refers to a characteristic of a port, inlet or outlet, and more specifically, to the construction by which the port, inlet or outlet is interfaced, adhered, fixed, secured, molded, or otherwise made part of the pod itself. The term is used in the specification and the claims to describe both inlet ports and outlet ports.

[023] All percentages, parts and ratios as used herein, are by weight of the total product, unless otherwise specified. All such weights as they pertain to listed ingredients are based on the active level and, therefore, do not include solvents or by-products that may be included in commercially available materials, unless otherwise specified.

[024] The present application describes a pod which may be conveniently loaded into a single serving dispensing machine. For example, the pod may be loaded into a single serving dispensing machine to produce a liquid volume of nutritional composition, such as for example, infant baby formula. The formula could be outputted by the machine into and through the open neck of a clean baby bottle. Other advantages are discussed herein.

[025] The present invention may be practiced with a pod containing a powder and a dilutable liquid. For example, a combination of a nutritional powder and a nutritional liquid for an infant formula, a toddler formula, or an adult nutritional beverage may be used in the practice of this invention. The pod may vary in size, such as for example, the pod may have between 2 grams and 150 grams of powder within the body and may produce a beverage between 25 ml and 500 ml. Other powder and liquid combinations may be used in the practice of this invention.

[026] When discussing the exemplary embodiments of the invention, the exemplary pod may be an infant formula pod. In this type of nutritional liquid product, and others, the temperature of the finished product is product dependent. Infant formula is especially temperature dependent because of safety issues surrounding the infant, rather than for example, very hot coffee which is consumed by an adult. For example, the infant formula may be dispensed in the 25 to 40° C temperature range while an adult nutritional product may be dispensed in a wider temperature range, and in a range outside of the narrow infant formula

range, such as for example, a hotter temperature range, or in a colder temperature range, such as for styles of iced coffee, and in the 10 to 20° C temperature range.

[027] A pod system has other typical features. Any mixing, reconstitution, and dispensing may be assisted through the use of hot water and pressure. A combination of air, steam, and water may also be used. The reconstituted product leaves the pod through means of an outlet, which may be an exit valve, discharge unit, or other type of dispenser, designed into the pod or created through a mechanical action within a machine (e.g., piercing by a needle). The water entering the pod may be pre-filtered or filtered through filtration units assembled within the pod structure. The entry of water into the pod is through an inlet, which may be mechanical (e.g., injection through the piercing of the pod surface) or through inlet ports designed into the pod. For example, the inlet ports may be formed into the walls of the pod. Other features of a pod system will be discussed herein.

[028] The invention is directed to a pod or other single serving container having multiple compartments which are used to separate one or more liquid components and one or more powder components within the pod. The pod may have more than one compartment to separate more than one type of powder, and more than one compartment to separate more than one type of liquid. The pod is arranged to be loaded into a beverage preparation system for forming a nutritional composition from the powder and liquid housed in the pod by delivering a quantity of fluid to the pod, whereby a liquid nutritional composition is prepared. An exemplary embodiment may include an outer cartridge, a lid, and a separating wall at least partially defining a liquid compartment and a powder compartment. The liquid compartment may include fat ingredients within the liquid portion. The pod may be arranged to accept a quantity of fluid from an outside source to produce a nutritional composition. The fluid may be water, steam, or a combination of different fluids.

[029] One embodiment of the invention features a nutritional product pod. The pod has an outer cartridge and a separating wall within the outer cartridge at least partially defining a first compartment and a second compartment. The first compartment contains a powder and the second compartment contains a liquid. At least one first inlet in the first compartment introduces fluid into the first compartment to mix with the powder.

[030] Another embodiment of the invention features a nutritional product pod having a

housing, a first compartment within the housing, and a second compartment within the housing. The first compartment contains a powder. The second compartment contains a liquid. The pod includes one or more inlets for introducing fluid into the housing to mix with at least one of the powder and the liquid. The powder and the liquid are separated within the housing.

[031] Another embodiment of the invention features a pod for preparing a nutritional liquid composition. The pod includes a body having one or more walls, a first compartment within the body, a second compartment within the body, at least one first inlet formed within the one or more walls of the body, and at least one first outlet and at least one second outlet, each outlet formed within the one or more walls of the body. The first compartment contains a nutritional powder. The second compartment contains a nutritional liquid. The at least one first inlet is configured to introduce fluid from the outside of the first compartment to the inside of the first compartment. The at least one first outlet is configured to empty the contents of the first compartment to outside the body. The at least one second outlet is configured to empty the contents of the second compartment to outside the body.

[032] Exemplary embodiments of the invention will now be discussed. In the exemplary embodiments shown in the Figures, the contents include a nutritional powder, such as infant baby formula. In the practice of the invention, other powder may be used, and the liquid contents may be a nutritional liquid concentrate. By physically segregating the nutrients into powder and liquid components, the rate of dissolution in preparation of the nutritional composition is believed to be increased.

[033] When discussing the invention, a pod will be discussed for use in a single serve machine. The exemplary discussion and figures are directed to a pod which a caregiver may easily load and unload from a machine. For example, the pod may produce formula to fill one baby bottle. The exemplary pod includes nutritional powder. Powder of a variety of sizes may be used, such as for example, infant formula powder, which may have a particle size range of 10-500 microns.

[034] The pod may include more than one compartment which contains a powder. For example, one compartment may contain a powder and another compartment may contain a power. The two powders may be the same, or the two powders may be different. In one embodiment, the two powders are different powders, one powder with a different level of

nutrients than the other powder. For example, the powder in a first compartment may be of a higher fat content than the powder in a second compartment. Further, the powder in a first compartment may be of a higher protein content than the powder in a second compartment. Further, the powder in a first compartment may reconstitute at a faster rate than the powder in a second compartment. One skilled in the art will appreciate that other differences may exist between the powders in the practice of the invention.

[035] The pod may have various constructions. For example, an outer cartridge may have an internal separating wall which at least partially defines a first compartment and a second compartment. One or more additional separating walls may at least partially define additional compartments. In another example, the outer cartridge may include a housing. The housing may have side walls and a bottom wall, the side walls defining a top opening of the outer cartridge. In another example, the pod may include a body having walls. The walls may define two or more compartments. The body may be formed of a plastic, such as for example, a single piece of thermoplastic. The body may be a container that includes polypropylene or polyethylene. The container may be a single molded piece. The container may be a multiple layer structure which incorporates an oxygen barrier.

[036] The outer cartridge or body of the pod may have other invention features which are advantageous to the preparation of a nutritional liquid composition. For example, the body may be shaped to allow mechanical grasping by a machine, i.e., the single serve machine which produces the beverage. The grasping can be grabbing, pinching, squeezing, or other temporary securing in an effort to hold the pod in place.

[037] The machine may engage the pod at other surface areas. For example, the machine will engage the pod near or around the outside surface of one or more of the inlets. This area immediately around the inlet will likely undergo mechanical grasping by a machine, i.e., the single serve machine which produces the beverage. For example, the machine contact may be by tubing or other machinery which engages or otherwise contacts the inlet.

[038] Referring now to the drawings, a front sectional view of a pod is shown in Figure 1. The pod 10 includes an outer cartridge 12 having two compartments 14, 16. A separating wall 18 within the outer cartridge 12 at least partially defines the two compartments 14, 16. When discussing this exemplary embodiment, the individual compartments are identified as a

first compartment 14 and a second compartment 16. The first compartment 14 contains a powder 20 and a second compartment 16 contains a liquid 22. In the exemplary embodiment shown in Figure 1, the contents are a nutritional powder 20, such as infant baby formula. In the practice of the invention, other powder may be used, and the liquid contents may be a nutritional liquid concentrate. The invention may be practiced with a first compartment and second compartment as discussed in this exemplary embodiment, and in addition, may also have other compartments in addition to the first compartment and second compartment. For example, if the product mixture required two types of powders and two types of liquids, then four compartments would be utilized, one compartment for each type of ingredient.

[039] The pod is shown in an upstream position above a container in Figure 1. The container 30 may be a baby bottle, a coffee cup, a beverage glass, or any other container suitable for the type of single-serve product which the pod and beverage machine will produce. As shown, the container 30 defines a cavity 32. Material exits the pod through a first outlet and a second outlet and each is orientated in the same direction for formation of a nutritional liquid composition outside of the outer cartridge and inside the container. As shown in Figure 1, finished product, or finished product ingredients, exits the pod 10 from two outlets 34, 36, in a bottom wall 38 of the cartridge with the exiting material traveling in parallel directions A1, A2. As such, the fluid flow from each compartment 14, 16 enters the cavity 32 within the container 30.

[040] Still referring to Figure 1, the outer cartridge 12 includes a housing 40 having side walls 42, 44 and a bottom wall 38. As seen in the partial assembly view in Figure 5, the side walls 42, 44 may define a top opening 46 to the outer cartridge. The top opening may be covered by a seal. The seal 50 is hermetically sealed to the housing 40 to protect the contents of the pod 10 from the atmosphere before and during the mixing, reconstituting, and discharging. The seal may be made of foil, a plastic film, metal, or any suitable material to form a hermetic seal over the housing 40. The top opening may also be closed by a lid 50.

[041] As discussed herein, the invention separates the powder and liquid components of a product mixture within a pod. Each powder component is within a separate compartment, and each liquid component is within a separate compartment. With these multiple compartments, the pod includes multiple inlets to introduce fluid to the contents of the compartment and multiple

outlets to empty the contents of each compartment.

[042] In the exemplary pod shown in Figure 1, the pod 10 includes a first inlet 60 to the first compartment 14 and a second inlet 62 to the second compartment 16. The first inlet 60 is shown above the level of the powder 20 and in the side wall 42 of the cartridge. The second inlet 62 is shown above the level of the fluid 22 and in the top wall 39 of the cartridge. Air, steam, or water may be added through either of the inlets, and may be added at ambient temperature or pressure, or may be added at a temperature above or below ambient temperature, or at a pressure above ambient pressure. The first inlet 60 may be used to introduce fluid, such as water, steam or gas, into the first compartment 14 to mix with the powder 20. The second inlet 62 may be used to introduce fluid, such as water, steam or gas, into the second compartment 16 to mix with the liquid 22.

[043] The location of and number of the inlets to each compartment may vary in the practice of the invention. For example, Figure 2 shows another exemplary embodiment of a pod. The pod 100 shares many of the same features of the pod 10 shown in Figure 1, but has inlet in different places. The pod 100 has a first compartment 114 containing a powder 20 and a second compartment 116 containing a liquid 22. As shown, the first compartment 114 has a first inlet 60 located in a side wall 42 of the housing 40, and the second compartment has a second inlet 102 located in an opposing side wall 44 of the housing 40.

[044] The height of the inlet relative to the bottom wall of the pod may vary. For example, the inlet may be above or below the height of the contents of the compartment. In Figure 1, the first inlet 60 of the first compartment 14 is above the top surface of the powder 20. In Figure 2, the first inlet 60 is below the top surface of the powder 20, and the second inlet 102 is above the level of the top surface of the liquid.

[045] In other embodiments, a compartment may have more than one inlet, and may have more than one inlet on the same wall. For example, Figure 3 shows another exemplary embodiment of a pod. The pod 120 includes a first compartment 124 containing powder 20 and a second compartment 126 containing a liquid 22. The first compartment includes one or more inlets. The first compartment includes a side wall inlet 60 in the side wall 42 of the housing 40, and a top wall inlet 128 in the top wall 39 of the housing 40. The same fluid may be distributed through each inlet during the preparation process, or a different fluid may be distributed. For

example, water or steam may be distributed out of the side wall inlet, and steam or air may be distributed out of the top wall inlet. The fluid introduced through each of the inlets may be at the same temperature, pressure, and volume, or one or more of the characteristics of temperature, pressure, and volume may be different between the fluid introduced through each of the inlets.

[046] The introduction of the fluid through any inlet to the first compartment promotes mixing of the fluid and the nutritional powder within the first compartment. The inlets to the pod may be apertures in the side of the housing wall which are correspondingly positioned to mate with tubing in the beverage machine. The inlets may also be a hole made by a needle piercing in the wall of the pod by a part of the beverage machine. Also, the inlets may be built-in ports which are secured on, or formed into, at a variety of positions throughout the outer surface of the pod. The variety of positions may cause a variety of flow patterns of material within the pod during pre-treating. The placement of the built-in ports may substantially eliminate any clumping of the nutritional powder. For example, the built-in ports may create turbulent flow within the pod. The variety of positions may cause a variety of flow of material within the pod during mixing and reconstitution.

[047] Reconstitution will occur at different locations within this inventive pod system. Reconstitution may occur within the pod, within the dispenser, or outside of the pod itself, i.e., within the bottle during filling. For example, the body of the pod may be configured to reconstitute at least 50 percent of the total amount of nutritional powder within the internal compartment by the fluid introduced through the plurality of built-in ports. Further, the pod may be configured to reconstitute at least 20 percent of the total amount of nutritional powder within the dispenser of the pod by the fluid introduced through the plurality of built-in ports. Also, the pod may be configured to reconstitute at least 70 percent of the total amount of nutritional powder within the pod by the fluid introduced through the plurality of built-in ports.

[048] The timing of reconstitution during this inventive pod system is also a feature of port characteristics. Under certain variables, at least 90 percent of the nutritional powder is pre-treated by the fluid introduced through the plurality of built-in ports within 90 seconds, and may be as low as within 30 seconds. Under other variables, it is believed that at least 90 percent of the nutritional powder is pre-treated by the fluid introduced through the plurality of built-in ports prior to any solution exiting the internal compartment through the dispenser. Also, it is believed

that at least 75 percent of the total amount of nutritional powder is reconstituted by the fluid introduced through the plurality of built-in ports within 45 seconds. More specifically, it is believed at least 75 percent of the total amount of nutritional powder is reconstituted by the fluid introduced through the plurality of built-in ports within 30 seconds. These times are given for exemplary discussion and the invention may be practiced under different times, some as for example, under faster or slower times.

[049] The built-in ports may offer a variety of flow rates or velocities. For example, a flow rate of fluid through at least one of the plurality of built-in ports may be variable. Also, a flow rate of fluid through at least one of the plurality of built-in ports may be pulsating. Further, the flow rates between two ports may be alternating.

[050] The built-in ports also offer a safety feature during operation of the pod system. The plurality of built-in ports prohibit the nutritional powder from exiting the pod through any and all of these built-in ports. In other words, a built-in port prohibits backflow of reconstituted material through the port. Also, each of the plurality of built-in ports prohibits fluid to travel in a direction from the inside of the pod to the outside of the pod. Further, each of the plurality of built-in ports prohibit fluid to travel in a direction from the inside the pod to the outside of the pod during treating, or pre-wetting, and reconstitution stages. In other words, the ports will not inhibit evacuation of the reconstituted product. Further, each of the plurality of built-in ports prohibit atmospheric introduction to the nutritional powder before the fluid introduction. The placement of one, or two, or more built-in inlet ports may vary in the practice of this invention. For example, two ports may be disposed on the top surface of the pod, two ports may be disposed on the bottom surface, one port may be on the bottom and one port may be on the top, etc. Other port locations are possible in the practice of this invention.

[051] As discussed, the invention may be practiced with a pod having more than two compartments. For example, the nutritional composition may be formed from three components, a first powder, a second powder, and a liquid. In this example, the pod would include three compartments, a component for each of the powders, and a component for the liquid.

[052] An exemplary pod having more than two compartments is shown in Figure 4. The pod 150 includes two compartments 152, 154 which contain a powder and one compartment 156 which contains a liquid. The compartments 152, 154, 156 are defined at least in part by a

vertical wall 218 which separates the two powder compartments and a horizontal wall 220 which separates between the powder compartments and the liquid compartments.

[053] The positioning and orientation between the three compartments, i.e. the two powder compartments side-by-side, and the liquid compartment below the powder compartments is for example only. In the practice of the invention, the three or more compartments may be orientated differently, for example, any liquid compartments may be on top of any powder compartments, or the liquid and powder compartments may maintain the side-by-side relationship as shown in Figure 1. Further, the multiple powder compartments may be in a stacked relationship. One skilled in the art will appreciate that with any specific orientation of the compartments, the location and path of any inlet and outlet into and out of each compartment will need to be considered.

[054] Referring still to Figure 4, the first compartment 152 contains a first powder 162. An inlet 164 in the top wall 39 of the housing 40 allows fluid to be introduced to the powder 162. The contents of the first compartment 152 exit out an outlet 166 formed in the horizontal wall 220. In this orientation, the contents of the first compartment flow into the third compartment 156. In other orientations, the contents of the first compartment may flow directly into a container suitable for the final product. The outlet 166 may be a valve, a weakness in the wall, or otherwise formed in the wall 220 in a predetermined location when pressure in the first compartment 152 reaches a predetermined level.

[055] Similarly, the second compartment 154 contains a second powder 172. An inlet 174 in the top wall 39 of the housing 40 allows fluid to be introduced to the powder 172. The contents of the second compartment 154 flow out an outlet 176 formed in the horizontal wall 220, and directly into the third compartment 156. The third compartment 156 has more than one outlet. Third compartment outlets 186, 188 are formed in the bottom wall 38 of the housing 40. The contents of the third compartment 156 flow into in a beverage container for formation of a nutritional liquid composition consisting from the first powder, the second powder, and the liquid.

[056] While various inventive aspects, concepts and features of the general inventive concepts are described and illustrated herein in the context of various exemplary embodiments, these various aspects, concepts, and features may be used in many alternative embodiments,

either individually or in various combinations and sub-combinations thereof. Unless expressly excluded herein all such combinations and sub-combinations are intended to be within the scope of the general inventive concepts. Still further, while various alternative embodiments as to the various aspects, concepts and features of the inventions (such as alternative materials, structures, configurations, methods, circuits, devices and components, alternatives as to form, fit, and function, and so on) may be described herein, such descriptions are not intended to be a complete or exhaustive list of available alternative embodiments, whether presently known or later developed. Those skilled in the art may readily adopt one or more of the inventive aspects, concepts or features into additional embodiments and uses within the scope of the general inventive concepts even if such embodiments are not expressly disclosed herein. Additionally, even though some features, concepts, or aspects of the inventions may be described herein as being a preferred arrangement or method, such description is not intended to suggest that such feature is required or necessary unless expressly so stated. Still further, exemplary or representative values and ranges may be included to assist in understanding the present disclosure; however, such values and ranges are not to be construed in a limiting sense and are intended to be critical values or ranges only if so expressly stated. Moreover, while various aspects, features, and concepts may be expressly identified herein as being inventive or forming part of an invention, such identification is not intended to be exclusive, but rather there may be inventive aspects, concepts, and features that are fully described herein without being expressly identified as such or as part of a specific invention. Descriptions of exemplary methods or processes are not limited to inclusion of all steps as being required in all cases, nor is the order that the steps are presented to be construed as required or necessary unless expressly so stated.

What is claimed is:

1. A nutritional product pod comprising:
an outer cartridge;
a separating wall within the outer cartridge at least partially defining a first compartment and a second compartment, wherein the first compartment contains a powder and the second compartment contains a liquid; and
at least one first inlet in the first compartment for introducing fluid into the first compartment to mix with the powder.
2. The pod of claim 1, further comprising at least one second inlet in the second compartment for introducing fluid into the second compartment to mix with the liquid.
3. The pod of claim 1, further comprising at least one first outlet in the first compartment.
4. The pod of claim 1, further comprising at least one second outlet in the second compartment.
5. The pod of claim 1, further comprising:
at least one first outlet in the first compartment and at least one second outlet in the second compartment;
wherein the at least one first outlet and the at least one second outlet each are orientated in the same direction for formation of a nutritional liquid composition outside of the outer cartridge.
6. The pod of claim 1, wherein the outer cartridge comprises a housing having side walls and a bottom wall, the side walls defining a top opening to the outer cartridge.
7. The pod of claim 6, further comprising a seal disposed over the top opening of the housing to hermetically seal the powder and the liquid in the outer cartridge.

8. The pod of claim 6, further comprising a lid positioned over the top opening of the outer cartridge.

9. A nutritional product pod comprising:
a housing;
a first compartment within the housing, the first compartment containing a powder;
a second compartment within the housing, the second compartment containing a liquid;
and
one or more inlets for introducing fluid into the housing to mix with at least one of the powder and the liquid;
wherein the powder and the liquid are separated within the housing.

10. The pod of claim 9, further comprising two or more outlets for formation of a nutritional liquid composition from the powder and the liquid.

11. The pod of claim 9, wherein the two or more outlets are orientated in the same direction for formation of a nutritional liquid composition outside of the outer cartridge.

12. The pod of claim 9, wherein the housing has side walls and a bottom wall, the side walls defining a top opening to the housing.

13. The pod of claim 12, further comprising a seal disposed over the top opening of the housing to hermetically seal the contents of the housings.

14. The pod of claim 9, wherein the introduction of the fluid through the one or more inlets promotes mixing of the fluid and the nutritional powder within the first compartment.

15. The pod of claim 9, further comprising:
a third compartment containing a second powder;
wherein the powder, the second powder, and the liquid are separated within the housing.

16. The pod of claim 15, further comprising two or more outlets for formation of a nutritional liquid composition from the powder, the second powder, and the liquid.

17. A pod for preparing a nutritional liquid composition, the pod comprising:
a body having one or more walls;
a first compartment within the body, said first compartment containing a nutritional powder;
a second compartment within the body, said second compartment containing a nutritional liquid;
at least one first inlet formed within the one or more walls of the body; and
at least one first outlet and at least one second outlet, each outlet formed within the one or more walls of the body;
wherein the at least one first inlet is configured to introduce fluid from the outside of the first compartment to the inside of the first compartment;
further wherein the at least one first outlet is configured to empty the contents of the first compartment to outside the body, and the at least one second outlet is configured to empty the contents of the second compartment to outside the body.

18. The pod of claim 17, wherein the contents of the first compartment within the body and the contents of the second compartment within the body are separated.

19. The pod of claim 17, further comprising:
at least one second inlet formed within the one or more walls of the body;
wherein the at least one second inlet is configured to introduce fluid from the outside of the second compartment to the inside of the second compartment.

20. The pod of claim 17, wherein the at least one first outlet and the at least one second outlet are orientated in the same direction.

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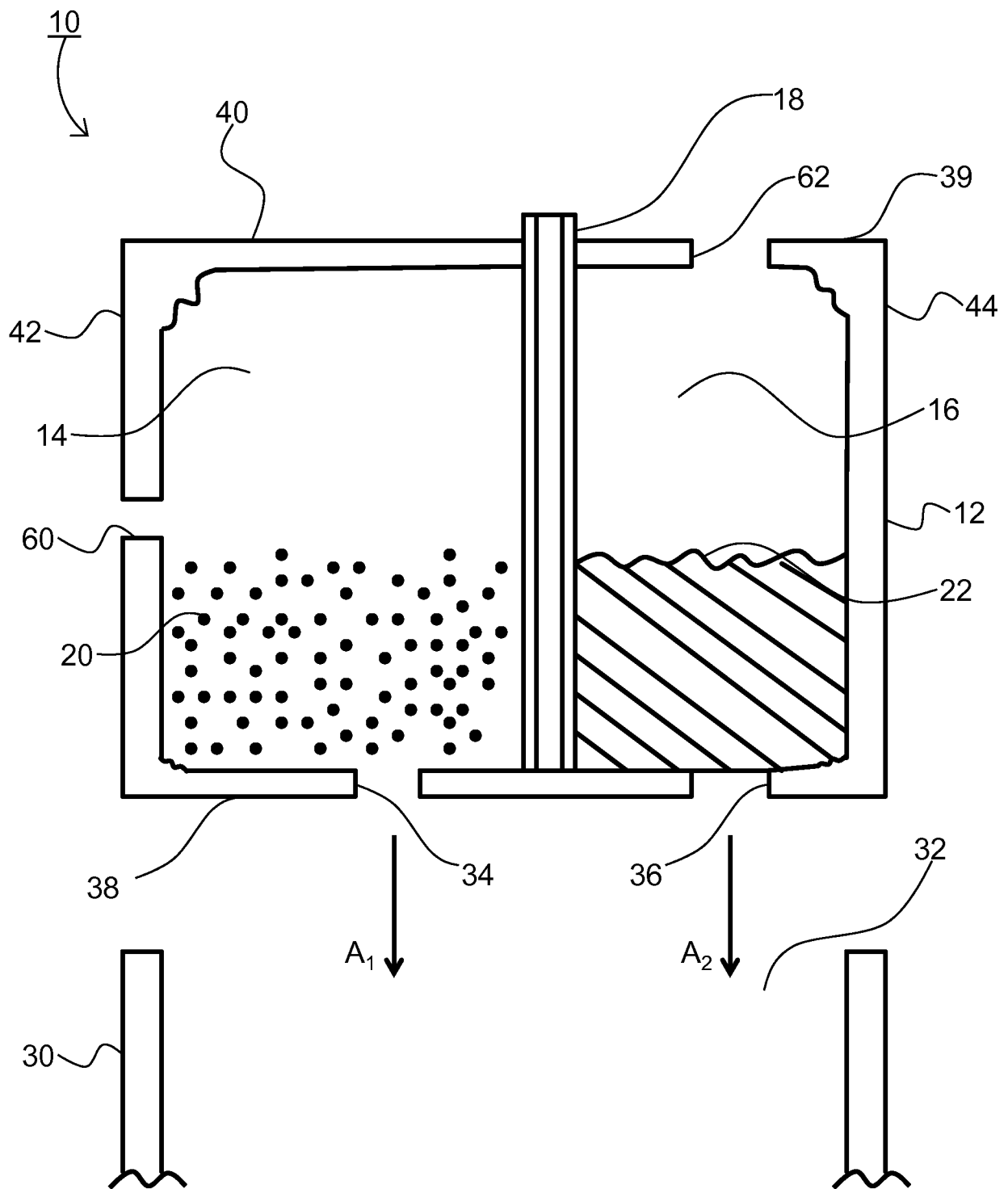


FIG. 1

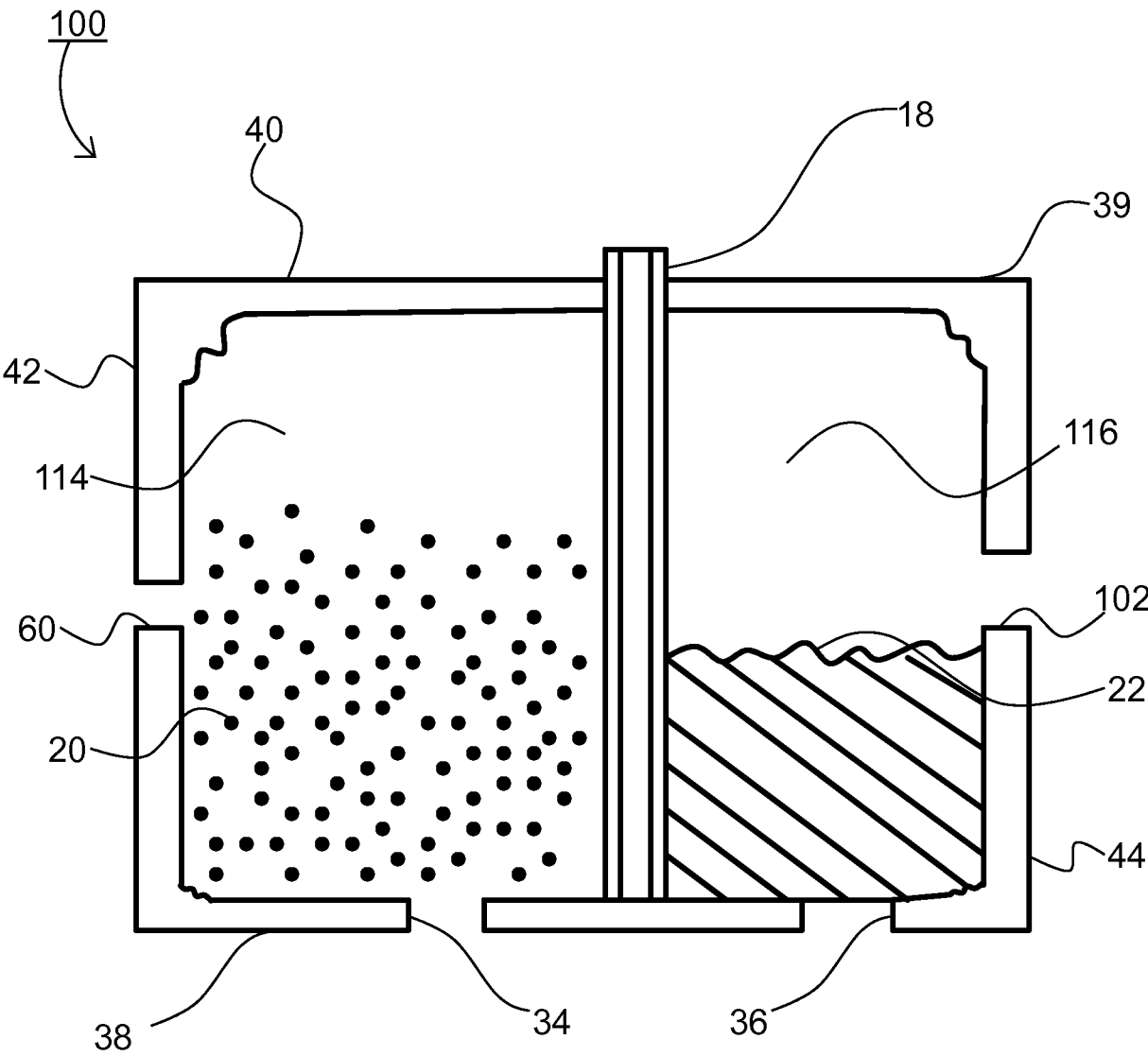


FIG. 2

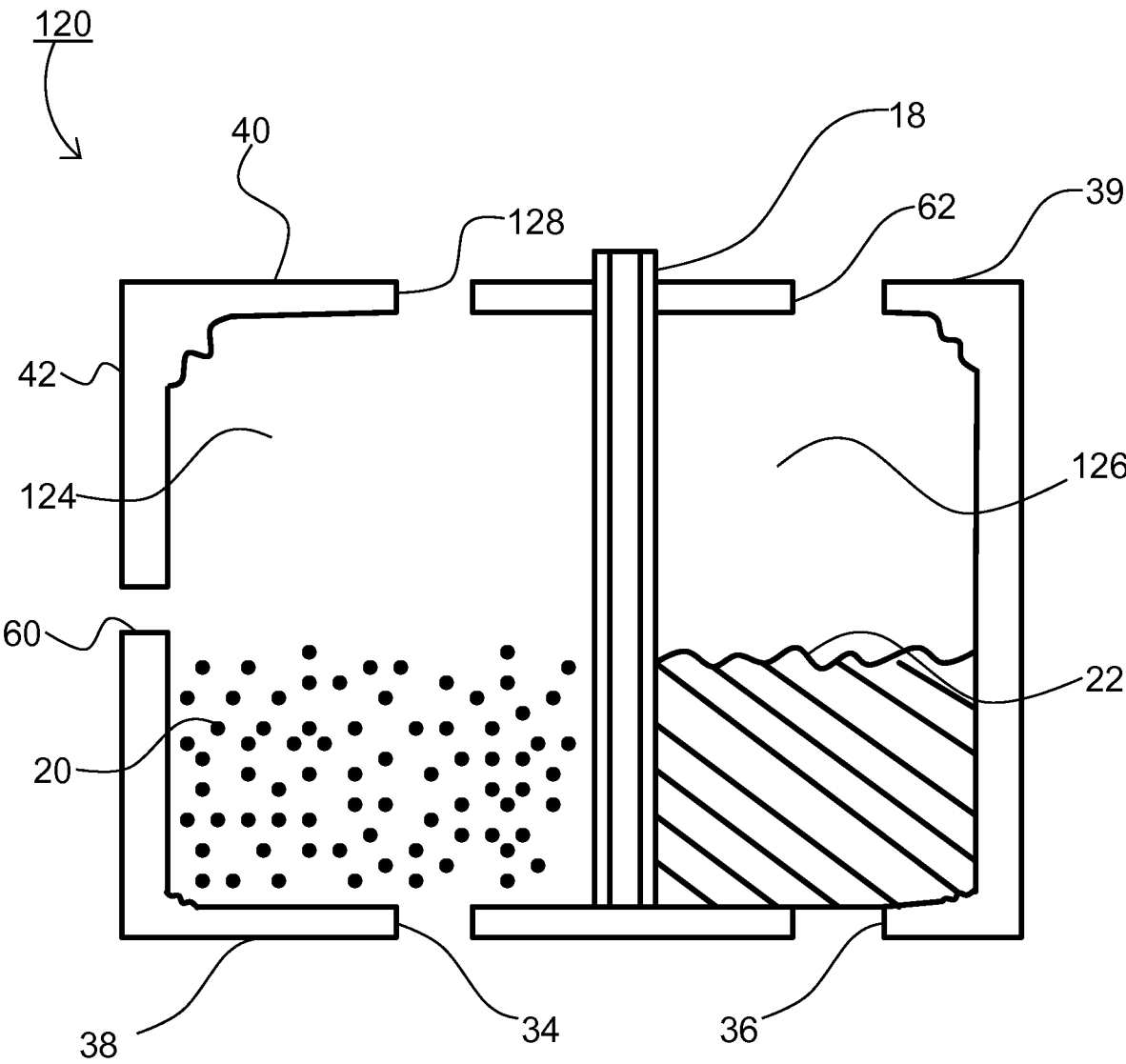


FIG. 3

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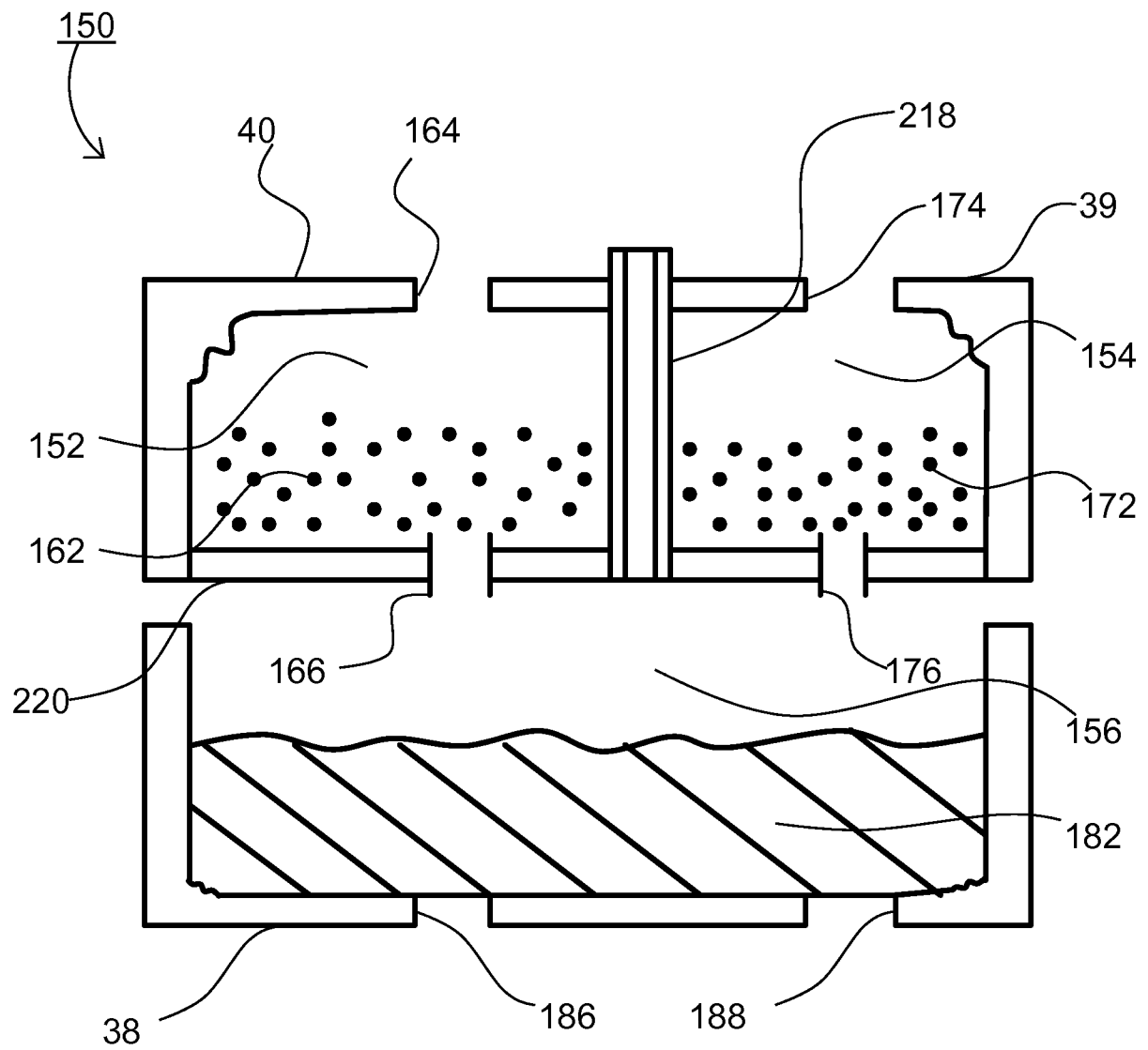


FIG. 4

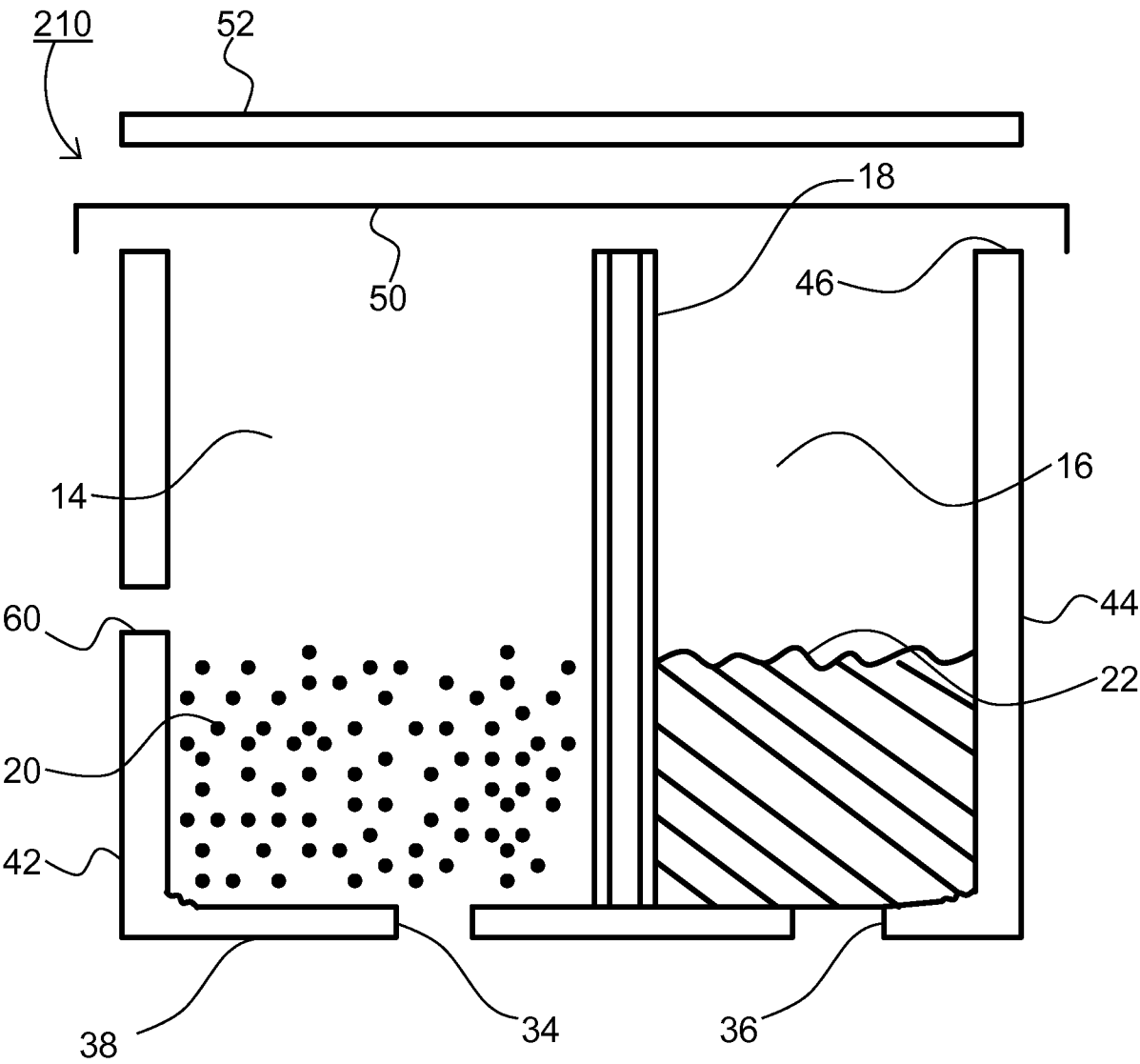


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/041379

A. CLASSIFICATION OF SUBJECT MATTER
INV. B65D85/804 A47J31/40 B65D81/32
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B65D A47J A23L B65B

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

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

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 030 915 A2 (GVB GES FUER VERMOEGENSBERATUN [CH]) 4 March 2009 (2009-03-04) paragraph [0036] - paragraph [0066] figures 1-5b -----	1-20
X	WO 2013/156932 A1 (SARONG SPA [IT]) 24 October 2013 (2013-10-24) page 3, line 23 - page 17, line 4 figures 1-9 -----	1-20
X	US 2002/078831 A1 (CAI EDWARD ZHIHUA [US]) 27 June 2002 (2002-06-27) paragraph [0042] - paragraph [0071] figures 1-7b ----- -/--	1-20

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

☒ See patent family annex.

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Date of the actual completion of the international search

22 December 2015

Date of mailing of the international search report

13/01/2016

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/041379

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/007796 A1 (RICOTTI MADDALENA [IT]) 8 January 2009 (2009-01-08) paragraph [0001] - paragraph [0047] figures 1-3	1-20

X	US 2014/161940 A1 (AVILES VICTOR M [US] ET AL) 12 June 2014 (2014-06-12) paragraph [0016] - paragraph [0046] figures 1-7	1-20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2015/041379

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 2030915	A2	04-03-2009	AT 529356 T 15-11-2011
		DE 102007041093 A1 05-03-2009	
		EP 2030915 A2 04-03-2009	

WO 2013156932	A1	24-10-2013	CA 2870507 A1 24-10-2013
		EP 2838814 A1 25-02-2015	
		US 2015068405 A1 12-03-2015	
		WO 2013156932 A1 24-10-2013	

US 2002078831	A1	27-06-2002	US 2002078831 A1 27-06-2002
		WO 02058522 A2 01-08-2002	

US 2009007796	A1	08-01-2009	AT 474487 T 15-08-2010
		CN 101384200 A 11-03-2009	
		CY 1111230 T1 11-06-2015	
		EP 1983871 A1 29-10-2008	
		ES 2349000 T3 21-12-2010	
		KR 20090006061 A 14-01-2009	
		PT 1983871 E 21-10-2010	
		US 2009007796 A1 08-01-2009	
		WO 2007093355 A1 23-08-2007	

US 2014161940	A1	12-06-2014	AU 2013359517 A1 23-07-2015
		CA 2894870 A1 19-06-2014	
		CN 104884367 A 02-09-2015	
		EP 2931625 A1 21-10-2015	
		KR 20150094694 A 19-08-2015	
		US 2014161940 A1 12-06-2014	
		WO 2014093321 A1 19-06-2014	
