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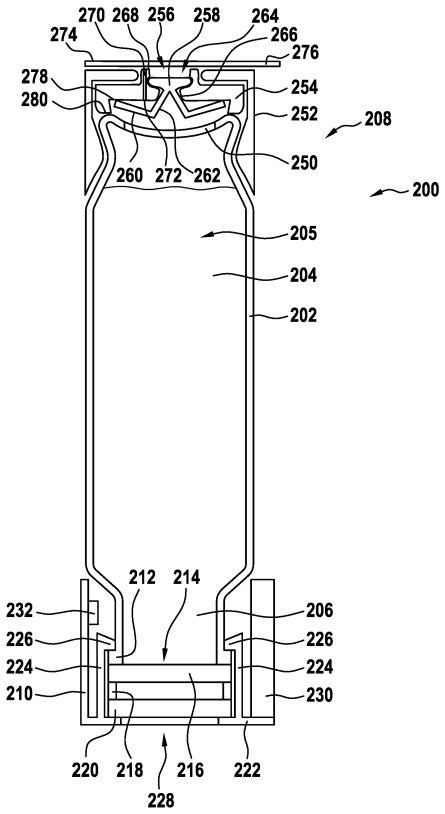
(54) **FOOD SUPPLEMENTATION VESSEL WITH IMPROVED VENTING**

(57) Food supplementation vessel 200 comprising,
- a vessel body 204 adapted to store a liquid;
- a first opening 214 at the vessel body through which liquid can be drawn from the vessel body 204;
- a first septum 216 closing the first opening;
- a second opening 250 at the vessel body 204; and
- a first valve 256 arranged at the second opening 250, wherein the first valve 256 allows ambient air to enter the vessel body 204 thorough a vent opening, if the pressure difference between the ambient air and the vessel body exceeds a predetermined threshold;
- wherein the first valve 256 comprises an umbrella valve having an umbrella membrane 260.

Fig. 2



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Description

[0001] The present invention relates to a vessel a vessel extraction apparatus for use in a beverage dispenser for extracting a fluid from the vessel. The vessel may comprise a flavoring fluid and/or minerals solved in water to be metered into beverages such as water.

[0002] Particularly, the present invention relates to a beverage dispenser for use in households, restaurants, hotels, offices, hospital, nursing points or the like. The beverage dispenser is adapted for dispensing a beverage into a user vessel such as a glass, a carafe or a portable bottle. Particularly, the present invention relates to a beverage dispenser adapted to dispense beverage by a nozzle for a single person or for small groups of persons into a portable vessel such as a glass, a carafe or bottle. Small groups are considered to be formed by 2 to 10 persons. The beverage is output by a nozzle into the user vessel.

Prior art

[0003] Beverage dispensers are known to persons skilled in the art. In one type of beverage dispensers a small barrel or a bag, both made of plastics, are inserted into an inlet of a beverage dispenser and beverage from the barrel or bag is output by a nozzle. Some beverage dispensers can provide carbonized water upon request or cool the water upon request. Another type of beverage dispensers is connected to a water source such as tap water. The water is filtered by a sediment filter, an active carbon filter, an ion exchange filter or the like.

[0004] WO 2016/090235 A1 discloses an apparatus for a portable hydration system including a mechanical or an electromechanical mechanism for dispensing additives into a liquid. Such mechanism is not well suited for water dispensers.

[0005] DE 20 2010 006 679 U1 discloses an apparatus for producing mineral water comprising at least one mineral container located between a filter and a water outlet. A pump supplies the minerals from the tank into the filtered water.

[0006] US 2011/0159150 A1 discloses a method for producing mineral water by use of a mineral substance container including a pump.

[0007] EP 2 565 165 B1 discloses an apparatus and method for producing remineralized water.

[0008] WO 2007/001488 A1 discloses a cartridge for an additive dispensing system for dispensing a consumable additive to water.

[0009] WO 2007/088523 A2 discloses a fluid container having an additive dispensing system for dispensing a consumable additive to water.

[0010] WO 2008/129260 A1 discloses a water treatment cartridge, wherein the water to be treated passes the cartridge and wherein the cartridge comprises means for automatically releasing an additive into the water in the cartridge.

[0011] High efforts are required for producing the cartridges of the prior art. Further, prior art cartridges comprise undesired materials, such as plastic. Since the prior art cartridges comprise plastic and are formed by many different parts, they cannot fulfill high hygienic standards, because plastic can be used as nutrient by bacteria which results in rapid multiplication of bacteria.

[0012] Consequently, there is a need for a vessel for mineralization fluids and/or flavoring fluids and an extraction apparatus for such vessels that can fulfill high hygienic standards for beverage dispensers.

Summary of the invention

[0013] The object of the present invention is achieved by a food supplementation vessel according to claim 1 and a vessel extraction device according to claim 14. The depending claims are directed to preferred embodiments.

[0014] The present invention discloses a food supplementation vessel comprising a vessel body adapted to store a liquid, and a first opening at the vessel body through which liquid can be drawn from the vessel body. A first septum closes the first opening. The food supplementation vessel further comprises a second opening at the vessel body. In one embodiment, the second opening may be arranged opposite to the first opening. A first valve is arranged at the second opening, wherein the first valve allows ambient air to enter the vessel body, if the pressure difference between the ambient air and the vessel body exceeds a predetermined threshold. Thereby, the vessel body can be held at ambient pressure, if liquid is drawn from the vessel body. This is highly relevant, if the fluid in the vessel body has to be metered in low quantities such as microliters with a correspondingly low tolerance. If the pressure in the vessel body does not correspond to the ambient pressure, an inaccurate volume of liquid may be drawn from the vessel body by a metering pump. If the pressure in the vessel body is higher than the ambient pressure, fluid from the vessel body can exit the vessel body through a hollow needle piercing the septum and connected to the metering pump, even if the metering pump does not operate.

[0015] The first valve comprises an umbrella valve having an umbrella membrane. The umbrella valve has the advantage that it is sensitive to low pressure differences. The first valve may comprise a vent opening, through which ambient air may enter the vessel body. An umbrella valve is also termed X-fragm valve. The metering pump may meter approximately 1 µl to approximately 4.000 µl, preferably approximately 2 µl to approximately 1.000 µl during extracting liquid from the food supplementation vessel. These small volumes must be vented by the umbrella valve into the vessel body of the food supplementation bottle.

[0016] A ventilation control cap may be arranged at the second opening. The first valve may be arranged at the ventilation control cap.

[0017] The first valve may be adapted to allow gas also to exit the vessel body through the vent opening, if the pressure difference between the vessel body and the ambient air exceeds a predetermined threshold. This may be achieved by a duckbill umbrella valve.

[0018] In one embodiment the food supplementation vessel may further comprise a second valve allowing gas to exit the vessel body through a vent opening of the second valve, if the pressure difference between the vessel body and the ambient air exceeds a predetermined threshold.

[0019] The food supplementation vessel may further comprise a removable cover element covering the vent opening, wherein in use the removable cover element is removed from the vent opening. The removable cover element may be a sheet that is a detachable from the food supplementation vessel, particularly from the vent opening. Particularly, the cover element may be fixed by a detachable adhesion to the food supplementation vessel. After filling the vessel body with a liquid and during transport of the food supplementation vessel to the point of use the first valve and/or vent opening is sealed by the removable cover element, such that no fluid (gas) can exit the food supplementation vessel, as may be caused by variation of temperature, variation of pressure and/or vibration. The fluid may be evaporated liquid. The removable cover element is removed from the food supplementation vessel as soon as the food supplementation vessel is connected (inserted) into an extraction device at the point of use. The extraction device may comprise a hollow needle piercing the first septum for extracting fluid from the vessel body.

[0020] The vessel body may be filled with a solution of salt and/or minerals in water having a degree of saturation of at least 80%. The vessel body may be filled with a solution of salt and/or minerals in water having a degree of saturation of at least 90%. In one embodiment, the vessel body may be filled with a solution of trace elements in water having a degree of saturation of at least 80%, preferably 90%. In another embodiment the vessel body may be filled with a solution of flavoring agents having a degree of saturation of at least 80%, more preferred at least 90%.

[0021] The umbrella valve may be formed by a valve seat, an umbrella body comprising a valve stem locked into a locking passage in the valve seat and an umbrella shaped membrane formed at the stem and biased against a sealing surface of the valve seat. The locking passage extends from an upper portion of the valve seat to a lower portion of the valve seat.

[0022] The food supplementation vessel may comprise at least one vent passage comprising the vent opening extending from the upper portion of the valve seat to the lower portion of the valve seat and located in radial direction between the locking passage and the outer perimeter of the umbrella shaped membrane. Through the vent passage gas may flow into the vessel body. The vent passage is formed separately from the locking passage in which the valve stem is located.

[0023] In one embodiment the locking passage may also be configured as a vent passage for allowing passage of gas along the valve stem and the perimeter of the locking passage. In this embodiment a counterforce element may be located opposite to the umbrella shaped membrane. Openings may be formed in the counterforce element for allowing passage of gas there through.

[0024] In one embodiment, the top of the stem does not extend to the top of the valve seat. Thus, the removable element does not contact the top of the stem. Thereby, no adhesive of the removable element may jeopardize the function of the valve stem.

[0025] The valve seat may comprise a recess, in which the upper portion of the valve stem is located.

[0026] The top portion of the valve stem may comprise a bulge arranged in the recess of the valve seat and biasing the umbrella shaped membrane against the lower portion of the valve seat. The bulge is arranged opposite to the umbrella shaped membrane. The bulge acts as a counterforce element for pressing the radially outward portion of the umbrella shaped membrane against the lower portion of the valve seat.

[0027] The radially outward portion of the umbrella shaped membrane may contact the lower portion of the valve seat, if no fluid passes the umbrella shaped membrane. The radially inward portion of the umbrella shaped membrane does not contact the lower valve seat. Thus, a cavity is formed between the lower valve seat and the umbrella shaped membrane radially inward of the outer perimeter of the umbrella shaped membrane. The vent passage has an opening to the cavity formed between the lower portion of the valve seat and the umbrella shaped membrane as well as the valve stem.

[0028] The locking passage and the valve stem are tapered in the vertical direction. The upper portion of the valve stem and the locking passage have a smaller diameter than the lower portion of the locking passage and the valve stem. Thereby, the lower portion of the valve stem is biased against the locking passage, wherein the upper portion of the valve stem is biased against the recess of the valve seat. Thereby, a better sealing of the umbrella valve is achieved, if the pressure in the vessel body is higher than the ambient pressure.

[0029] The cover element covers the ventilation opening of the ventilation passage and the recess of the valve seat the cover element may be a sheet. The cover element may be adhered to the top of the valve seat and the top of the ventilation cap. The top of the valve seat and the top of the ventilation cap may be on the same level.

[0030] Under a further aspect of the present invention the food supplementation vessel according to the present invention comprises a second septum arranged spaced apart from or at the first septum and arranged further spaced apart from the opening as compared to the first septum. The second septum may be arranged opposite to the first opening with respect to the first septum. The

liquid may be a mineralization liquid for mineralizing water. The liquid may be drawn from the vessel body by a hollow needle piercing the first and second septum. In one embodiment, the first and second septum may contact each other.

[0031] A hollow needle is used to draw liquid, in which minerals are solved from the food supplementation vessel. As soon as all the liquid has been drawn from the vessel body, the food supplementation vessel has to be removed from the needle. If the first septum passes the hollow needle, a small droplet of the liquid also passes the first septum. This droplet is fixed between the first septum and second septum and cannot drop out of the food supplementation vessel into the beverage dispenser or any other device. Thereby, malfunction of the beverage dispenser due to minerals accumulating in the interior of the beverage dispenser are prevented.

[0032] The vessel body may comprise a first section comprising a first diameter and a second section comprising a second diameter. The second diameter may be smaller than the first diameter. The second section may be a neck section of the food supplementation vessel (bottle). The opening is arranged at the second section. A extraction cap or lid is arranged at the second section. The extraction cap may comprise a proximal portion directed to the first section of the vessel body and a distal portion opposite to the proximal portion.

[0033] The first septum is contacting the opening and the second septum is arranged at the distal portion of the extraction cap. Thereby, the distance between the first portion and the second portion may be adjusted.

[0034] Between the first septum and the second septum a distance element may be arranged, such as a cylindrical ring. Thereby, the distance between the first septum and the second septum may be adjusted more accurately.

[0035] A flange may be arranged around the opening. The extraction cap may comprise an arm extending in the proximal direction of the extraction cap. The arm may extend from the distal portion of the extraction cap into the proximal direction. A protrusion extending in the radial inward direction of the food supplementation vessel is arranged at a portion of the arm directed to the proximal portion of the extraction cap. The protrusion may contact at least partially the flange at a side directed to the first section of the vessel body. The protrusion may at least partially extend circumferential around the flange. The arm may be curved as the flange. The arm may be part of a cylinder. The arm may act as an elastic spring and the protrusion may fix the extraction cap on the flange, such that the extraction cap cannot be removed from the flange and the vessel body, respectively. The protrusion may comprise a taper on the proximal side in order to ensure that the extraction cap can be pushed on the flange.

[0036] In one embodiment of the extraction cap may comprise a plurality of arms arranged equidistant around the longitudinal axis of the food supplementation vessel. The plurality of arms comprises the protrusion extending in the radial inward direction of the food supplementation vessel.

[0037] Under a further aspect of the present invention the extraction cap comprises at the circumferential surface at least two mechanical coding elements indicating a type of food supplementation vessel. Depending on the fluid to be stored in the food supplementation vessel the mechanical coding elements and/or the distance between the coding elements may differ.

[0038] In one embodiment two protrusions may be arranged on the outer and generally cylindrically surface of the extraction cap and extend in radial direction of the food supplementation vessel. In another embodiment two recess may be formed in the outer and generally cylindrically surface of the extraction cap in the radial direction of the supplementation vessel. In still another embodiment a protrusion may be arranged on the outer and generally cylindrically surface of the extraction cap and extend in the radial direction of the food supplementation vessel and a recess may be formed in the outer and generally cylindrically surface of the extraction cap in the radial direction of the food supplementation vessel.

[0039] The mechanical coding element may extend in the axial direction of the extraction cap at least 15% of the axial length of the extraction cap, preferably at least 30% of the axial length of the extraction cap, more preferred at least 50% of the axial length of the extraction cap, still more preferred at least 75% of the axial length of the extraction cap and most preferred the entire axial length of the extraction cap. The mechanical coding element may engage in a complementary mechanical coding of a vessel extraction device in order to ensure that the appropriate water supplementation vessel for storing the appropriate liquid is positioned at the appropriate position.

[0040] The food supplementation vessel may comprise a use indicator coding element representing a use indicator of the food supplementation vessel. The use indicator coding element may be positioned in the extraction cap. The use indicator coding element may be an RFID, a barcode, a matrix code, a chip or the like. The use indicator may be a serial number.

[0041] The object of the present invention is also achieved by a food supplementation vessel set comprising a plurality of food supplementation vessels as described above. The two mechanical coding elements of the first food supplementation vessel may comprise a first angular distance. The two mechanical coding elements of a second food supplementation vessels comprise a second angular distance. The first angular difference is larger than the second angular distance. Thereby, different types of food supplementation vessels can be distinguished. In one embodiment the food supplementation vessel set may comprise more than two food supplementation vessels and each food supplementation vessel may comprise a different angular distance between the two mechanical coding elements.

[0042] It is to be understood that the food supplementation vessel may comprise more than two coding elements. However, independent of the number of coding elements the angular difference between the mechanical coding elements may differ based on the type of food supplementation vessel according to the present invention.

[0043] The angular distance of the mechanical coding elements defines a food supplementation vessel type, wherein in each type of food supplementation vessel a different food supplementation fluid (mineralization liquid) is filled.

[0044] The present invention also relates to a vessel extraction device adapted to extract a fluid from a food supplementation vessel and/or food supplementation set as described above. The vessel extraction apparatus comprises a plurality of guides, wherein each guide is adapted to guide a food supplementation vessel from an insertion position, at which the food supplementation vessel is inserted into the guide to an extraction position, in which the fluid in the food supplementation vessel is extracted. The vessel extraction device further comprises a single hollow needle extending from a base in the direction of one of the guides. The single hollow needle extends through the first septum into the food supplementation vessel, when the food supplementation vessel is in the extraction position.

[0045] A conduit is connected to the single extraction needle, wherein the fluid extracted by the single hollow needle from the food supplementation vessel flows to the conduit. A first electrode is arranged in the conduit. A fluid level sensor is arranged in the conduit downstream of the first electrode. A fill level controller is electrically connected to the fluid level sensor and adapted to monitor the fluid level in the conduit. If the fluid level sensor determines that the level of fluid in the conduit has fallen below a predetermined level, the fill level controller outputs a signal indicating that the fill level of the food supplementation vessel is lower than a predetermined threshold and has to be replaced. The fluid level sensor may be a liquid level sensor, such an optical sensor and/or an electric sensor.

[0046] In one embodiment the fill level controller is electrically connected to a first and a second electrode in the conduit, wherein the fill level controller is adapted to monitor current flowing between the first and second electrode. If the current flowing between the first electrode and second electrode falls under a predetermined value and/or the voltage between the first and second electrode exceeds a predetermined value, the controller outputs a signal indicating that the fill level of the food supplementation vessel is lower than a predetermined threshold. The current and/or voltage between the first electrode and second electrode is measured. If the electric resistance between the first and second electrode increases over a predetermined threshold value, the fill level controller determines that the conduit is not filled with liquid from the vessel body and that the food supplementation vessel has to be replaced.

[0047] At single hollow needle extends from a base into one of the guides. The single hollow needle extends through the first septum and the second septum of the food supplementation vessel, when the food supplementation vessel is in the extraction position. The first and second septum can ensure that a droplet passing the first septum, when the food supplementation vessel is removed from the hollow needle is encased between the first septum, the second septum and the extraction cap. Thereby, the operation of the vessel extraction device and a beverage preparation device is not affected by droplets of a mineralization fluid entering the vessel extraction device.

[0048] Each type of food supplementation vessel comprises a different angular distance between two mechanical coding elements. Complementary mechanical coding means arranged at the guide may extend in the axial direction of the guide. The complementary mechanical coding means may comprise two recess in one embodiment. In another embodiment the complementary coding means may comprise two protrusions. In still another embodiment the mechanical coding means may comprise one recess and one protrusion. Each guide may comprise complimentary mechanical coding means having a different predetermined angular distance. Thereby, it may be ensured that only one type of beverage supplementation vessel may be inserted in a particular guide.

[0049] The vessel extraction device further comprises a reader adapted to read the use indicator from the use indicator coding element of the food supplementation vessel. The reader may be a RFID reader, a barcode reader, a matrix code reader, a chip reader or the like.

[0050] An exaction element may be connected to the hollow needle and adapted to extract a fluid from the food supplementation vessel. The extraction device may be a pump, a valve or the like. A controller may be connected with the reader and the extraction device.

[0051] The controller may be adapted to instruct the reader to read the use indicator from the use indicator coding element of the food supplementation vessel and to receive the use indicator from the reader. In one embodiment the controller may instruct the reader to read the use indicator from the use indicator coding element, if the controller detects by a sensor that a food supplementation vessel is inserted into the guide and has reached the extraction position. The controller is adapted to determine in a data storage, whether the use indicator is listed as a used food supplementation vessel. In other words, the controller determines, whether the food supplementation vessel has already been inserted into a guide up to the extraction position. If a food supplementation vessel was inserted into the extraction position, the first septum and the second septum have been pierced by the hollow needle and thus, this particular food supplementation vessel must not be reused. The data storage may be a local database of a beverage preparation device comprising the vessel extraction device.

The database may also be a remote database accessible by network means, such as the internet.

[0052] The data storage may also be implemented in the use indicator coding element and the reader may comprise a writing device that can amend the data in the use indicator coding element in order to indicate that the food supplementation vessel has already been inserted into the extraction position and that the first septum and the second septum have been pierced by the hollow needle. If the use indicator is not listed as used food supplementation vessel, the controller is adapted to enable the extraction device to extract the food supplementation vessel and to list the use indicator as used food supplementation vessel in the data storage. If the use indicator is listed as used food supplementation vessel, the controller is adapted to disable the extraction device.

[0053] The first septum and the second septum ensure that no droplet drawn by a hollow needle from the vessel body may exit the food supplementation vessel, since the droplet is encased between the first septum, the second septum and the extraction cap. The mechanical coding means provide that a particular food supplementation vessel may only be inserted in a particular guide, opening, slot of the vessel extraction device. The use indicator coding element may ensure that each food supplementation vessel is barred from further usage, if the food supplementation vessel has been removed from a hollow needle

Short description of the drawings

[0054]

Figure 1 shows a schematic overview of a water dispenser according to the present invention;

Figure 2 shows a sectional view of a food supplementation vessel according to the present invention;

Figures 3 shows a top view of a first type of a food supplementation vessel according to the present invention;

Figures 4 shows a top view of a second type of a food supplementation vessel according to the present invention;

Figures 5 shows a top view of a third type of a food supplementation vessel according to the present invention;

Figure 6 shows a top view of the vessel extraction apparatus according to the present invention; and

Figure 7 shows a schematic sectional partial view of the vessel extraction apparatus according to the present invention.

Detailed description of the drawings

[0055] The vessel and the vessel extraction apparatus according to the present invention are described such that the vessel is introduced in the vessel extraction apparatus in a downward movement. It is be understood that the vessel can be moved in any direction such as horizontal, at any angle between horizontal and vertical, in the upward direction or the like into the vessel extraction apparatus. Consequently, the scope of protection of the appending claims covers all embodiments, independent of the absolute angle with respect to the world coordinate system in which the vessel is introduced into the vessel extraction apparatus. Drawings are not to scale and merely exemplary for understanding the principals of the present invention.

[0056] Figure 1 shows a schematic of a water dispenser 100 using a vessel extraction device 300 according to the present invention. Tap water is filtered by a filtering device 102, such as a reverse osmosis filter, demineralizing the tap water. A plurality of metering pumps 104a to 104g meter mineralization fluid and/or flavoring fluid stored a fluid vessel 200 via conduits 325a to 325g into the water demineralized by the filter 102. The water is dispensed by a nozzle 108 into a user vessel, such as a glass. A controller 106 controls the metering pumps 104a to 104g for delivering an appropriate amount of mineralization fluid and/or flavoring fluid into the demineralized water.

[0057] European patent application EP 17202640.3 entitled "vessel extraction apparatus and vessel therefore" discloses food supplementation vessels and an apparatus for extracting a liquid from the food supplementation vessels, wherein the disclosure of EP 17202640.3 is incorporated by reference in its entirety into this application. European patent application EP 19164366.7 entitled "vessel extraction apparatus and vessel therefore" discloses food supplementation vessels and an apparatus for extracting a liquid from the food supplementation vessels, wherein the disclosure of EP 19164366.7 is incorporated by reference in its entirety into this application.

[0058] With reference to figures 2, 3, 4 and 5 the fluid vessel and food supplementation vessel 200, respectively is described. Figure 2 shows a schematic sectional view of the fluid vessel 200 and figures 3, 4 and 5 shows a top view of the food supplementation vessel 200. The fluid vessel 200 comprises a vessel body having a first section 204 having a first diameter and a second section 206 having a second diameter, wherein the first diameter is larger than the second diameter. A mineralization liquid 205 comprising the water and minerals to solved therein is stored in the vessel body 204, 206. Around the second portion 206 a extraction cap 210 is arranged. A wall 202 of the fluid vessel 200 may be made of glass, ceramics, metal or the like. The extraction cap 210 may be made of plastics, metal or the like.

[0059] The extraction cap 210 comprises a proximal

portion directed to the first section 204 of the vessel body. The extraction cap 210 further comprises a distal section opposite to the proximal section of the extraction cap 210. At the second section 206 of the vessel body an opening 214 is arranged. Around the opening 214 a flange 212 is arranged. The extraction cap 210 contacts at its proximal portion the wall 202 of the fluid vessel 200.

[0060] A first septum 216 is arranged at the opening 214 of the vessel body 204, 206. The first and second septum may comprise PTFE and silicon.

[0061] Opposite to the opening 214 an essentially cylindrical distance element 218 contacts the first septum. Opposite to the first septum a second septum 220 contacts the distance element 218.

[0062] The first septum and second septum 216, 220 may be glued to the flange 212 and extraction cap 210, respectively.

[0063] The extraction cap 210 comprises at its distal portion 222 a lid element having an opening 226, wherein the lid element 222 contacts the second septum 220 opposite to the distance element 218. The lid portion 222 presses the second septum 220 against the distance element 218 and the presses the distance element 218 against the first septum 216. The distance element 218 may be glued to the second septum 216.

[0064] The extraction cap is fixed to the flange 212 by at least one arm 224 extending from the distal portion of the extraction cap 210, particularly from the lid portion 222 into the proximal direction. The at least one arm 224 may be an elastic arm that is elastic in the radial direction of the fluid vessel 200. At the proximal portion of the at least one arm 224 a protrusion 226 extending into the radial inward direction is arranged. The protrusion 226 contacts the flange 212 at a side of the flange directed to the proximal portion of the extraction cap 210 and directed to the first section 204 of the vessel body. Each of the protrusions 226 may comprise a taper in the radial direction, wherein the thickness of the protrusion 226 increases in the radial outward direction. The extraction cap is fixed by the at least one arm 224 and the at least one protrusion 226 on the flange 212 and the last on the vessel body 204, 206. The lid portion 222 comprises an opening 228 through which a hollow needle may pass.

[0065] At the extraction cap a plurality of mechanic coding elements 230, 230a, 230b and 230c, respectively are arranged. As shown in figure 3 two mechanical coding elements 230 and 230a are arranged on a lid 210 of a fluid vessel 200 defining a first type of fluid vessel 200, in which a first type of mineralization fluid 205 is stored.

[0066] Figure 4 shows a second type of fluid vessel 200' at the having the mechanical coding elements 230 and 230b. A second type of mineralization fluid 205 is stored in the second type of fluid vessel 212.

[0067] Figure 5 shows a third type of fluid vessel 200" comprising the mechanical coding elements 230 and 230c. A third type of mineralization fluid 205 is stored in the third type of mineralization vessel.

[0068] The first type of fluid vessel 200 comprises the mechanical coding elements 230, 230a with a first angular distance. With respect to the second type of fluid vessel 200 the mechanical coding elements 230 and 230b comprise a second angular distance. With respect to the third type of mineralization vessel 200" the mechanical coding elements 230 and 230c comprise a third angular distance. Generally, the mechanical coding elements 230, 230a, 230b and 230c are arranged at the peripheral portion of the extraction cap 210, particularly on a cylinder portion (cylindric wall) of the extraction cap 210. The mechanical coding elements are formed as protrusions extending in the axial direction of the fluid vessel 200.

[0069] Reference is made to figure 2 showing the umbrella valve 256 according to the present invention for venting the vessel body 204. The vessel body 204 comprises a second opening 250. Around the second opening 250, a ventilation control cap 252 is arranged, such as by flanging, clamping or gluing. At the upper portion of the ventilation control cap 252 a valve seat 254 of an umbrella valve 256 is arranged.

[0070] The umbrella valve 256 comprises a valve stem 262. At the lower portion of the valve stem 262 an umbrella shaped membrane 260 is arranged. At the upper portion of the valve stem 262 a counterforce element 258 formed by a bulge 258 is arranged. The bulge 256 is accommodated in a recess 264 formed in the valve seat 254. The valve stem 262 is accommodated in a tapered locking passage 266. The tapper of the locking passage 266 is formed such that the diameter of the locking passage 266 is larger at the lower portion than at the upper portion of the locking passage 266. The umbrella shaped membrane 260 is biased against the lower portion 278 of the valve seat 254. This bias is achieved by the counterforce element 258 accommodated in the recess 264 in the valve seat 254. The valve stem 262, the umbrella shaped membrane 260 and the counterforce element 258 form the umbrella body arranged in the valve seat 254.

[0071] A bottom portion 280 of the valve seat is sealingly supported by the top portion of the wall 202 of the fluid vessel 200. The outer perimeter of the generally circular umbrella shaped membrane 260 contacts the lower portion 278 of the valve seat 254. The radially inward portion of the umbrella shaped membrane 260 does not contact the lower portion 278 of the valve seat 254. A cavity is formed between the umbrella shaped membrane 260, the lower portion 278 of the valve seat 254 and the valve stem.

[0072] Due to the bias of the outer perimeter of the umbrella shaped membrane 260 against the lower portion 278 of the valve seat 250 no gas can pass between the valve seat 254 and the umbrella shaped membrane 260. In the embodiment shown in figure 2 the valve stem 262 is generally cone shaped and biased against the locking passage 266 having the tapper described above.

[0073] The mineralization liquid 205 in the vessel body 204 may comprise a salt and/or mineral solution that is close to saturation. The mineralization liquid 205 may

comprise a solution of salt and/or minerals having a degree of saturation of at least 80%, preferably at least 90%. Further, the mineralization liquid 205 may be a solution of trace elements in water having a degree of saturation of at least 80%, preferably at least 90%. In another embodiment the mineralization liquid 205 may be a solution of flavoring agents having a degree of saturation of at least 80%, preferably at least 90%. The mineralization fluid 205 is filled into the food supplementation vessel 200 in a location remote to the point of use. During transport of the food supplementation vessel from the remote filling location to the point of use the mineralization liquid 205 may be exposed heat. Further, the food supplementation vessel 205 may be exposed low ambient pressure, such as during transport by aircraft. Thus, it must be ensured that during transport no water evaporated from the mineralization liquid 205 may exit the vessel body 204 for preventing precipitation of salts, minerals or the like.

[0074] Therefore, after filling the beverage supplementation vessel 200 with mineralization liquid 206 and positioning the extraction cap 210 and the ventilation control cap 252 a cover element 274 formed by a detachable sheet adhered to the ventilation control cap 252 is positioned at the top of the ventilation control cap 252 covering at least partly the top portion of the valve seat 254 and a vent passage 270 having a vent opening 272. This ensures that no evaporation products (water, steam or the like) of the mineralization liquid 205 exit the food supplementation vessel 200. Thereby the concentration of salts, minerals, trace elements and flavoring agents may be kept at a constant level and preventing precipitation of the solved salts, minerals, trace elements and/or flavoring agents.

[0075] At the point of use the removable cover element 274 is removed by pulling the protrusion 276 of the removable cover element 274. Thereby, the detachable cover element 274 is removed from the valve seat 254 and/or at least a part of the upper portion of the ventilation control cap 252. Thereby, the recess 264 of the valve seat 254 and the ventilation passage are exposed to the ambient. If the pressure in the vessel body 204 is lower than the ambient pressure, gas (air) may enter through the ventilation passage 270, the ventilation opening 272 into the cavity formed by the umbrella shaped membrane 260, the valve stem 262 and the lower portion 278 of the valve seat. Since the pressure in the cavity is higher than the pressure in the fluid supplementation vessel 204, the outer perimeter 260 of the umbrella shaped membrane is lifted from the lower portion 278 of the valve seat 254 and gas (air) enters the vessel body 204 until an equilibrium between ambient pressure and pressure in the vessel body 204 is achieved. The pressure in the vessel body may drop, if mineralization fluid is drawn out of the first membrane.

[0076] The metering pump 104a - 104g may meter approximately 5 μl to approximately 4.000 μl, preferably approximately 10 μl to approximately 1.000 μl per liter beverage generated by the beverage dispenser 100 during extracting liquid from the fluid vessel 200. These small volumes must be vented by the umbrella valve into the vessel body 204 of the fluid vessel 200.

[0077] As soon as the equilibrium between ambient pressure and the pressure in the vessel body 204 is achieved, the outer perimeter of the umbrella shaped membrane 260 contacts the lower portion 278 of the valve seat and the umbrella valve seals the vessel body 204 from the ambience, such that no liquid may evaporate and exit the fluid vessel 200 as steam by the second opening 215.

[0078] The umbrella valve may comprise an elastomer such as silicon, fluoroelastomer, fluorosilicon, ethylen propylene (EPDM), perfluoroelastomer. The valve seat may comprise an elastomer such as silicon, fluoroelastomer, fluorosilicone, ethylen propylene (EPDM), perfluoroelastomer. The opening pressure of the umbrella valve 256 may range between approximately 80 to approximately 200 mbar, preferably between approximately 120 mbar to 180 mbar. The residual pressure may range between approximately 10 to approximately 70 mbar, preferably between approximately 30 to approximately 60 mbar. The length of the vessel body 204 may range from approximately 90 mm to approximately 150 mm. The diameter of the vessel body 204 may range between approximately 15 mm to approximately 30 mm. The diameter of the valve seat 256 and the recess 264 may range between approximately 3 mm to approximately 4 mm. The diameter of the locking passage 266 may range between approximately 2 mm to approximately 3 mm. The diameter of the vent passage 270 may range between approximately 0,3 mm to approximately 1 mm.

[0079] In the embodiment shown in figure 2 the valve seat 254 and the umbrella valve 256 are drawn to be positioned outside the vessel body 204. It is conceivable that in another embodiment the valve seat and the umbrella valve 256 may be positioned within the vessel body 204.

[0080] In one embodiment the top portion of the ventilation control cap 252 is at the same level as the top portion 268 of the valve seat 254. Thereby, the removable element cover 274 covers the top portion 268 of the valve seat 254 and at least a portion of the top portion of the ventilation control cap 252. This ensures that the detachable closure element can be adhered to a larger area.

[0081] Figure 6 shows a top view of a vessel extraction device 300 comprising three openings 304a, 304b, 304c. Each opening 304a, 304b, 304c is connected to a slot having a guide 306a, 306b, 306c as will be explained in further detail with reference to figure 7. In the first slot 306a connected to the first opening 304a single hollow needle 324a for extracting a fluid from a fluid vessel 204 is arranged. In the second slot 306b connected to the second opening 304b a single hollow needle 324b for extracting a fluid from the fluid vessel 204 is arranged. In the third slot 306c connected to the third opening 304c a single hollow needle 324c for extracting a fluid from the fluid vessel 204 is arranged.

[0082] The first opening 304 comprises a complementary mechanical coding means 330a, 330a formed as recess in the guide and slot, respectively, wherein the complementary mechanical coding means 330a, 331a comprise a first angular distance. At the second opening 304b, at the second slot and at the second guide, respectively complementary mechanical coding means 330b, 331b are formed as a recess in the guide and slot, respectively. The complementary mechanical coding elements 330b, 331b comprise a second angular distance. The complementary mechanical coding element 330c and 331c formed in the slot and guide 306c, respectively at the third opening 304c comprise a third angular distance.

[0083] The angular distance between the complementary coding element 330a, 330b, 330c, 331a, 331b, 331c allows that only a particular type of fluid mineralization vessel may be introduced in a particular opening 304a, 304b, 304c. Thereby, it may be ensured that only one type of fluid vessel 200, 200', 200" may be inserted into a particular opening 304a, 304b, 304c.

[0084] With reference to figure 7 the vessel extraction device 300 is explained in detail. A fluid mineralization vessel 200 is inserted into a slot, guide 306, respectively. The guide 306 guides the extraction cap 210, the outer wall 202 of the first section 204 of the vessel body. The guide 306 also guides in a recess 330a embodying a complementary mechanical coding element the mechanical coding element 230 formed on the extraction cap 210 of the fluid vessel.

[0085] Figure 7 shows the fluid vessel 200 and its extraction position in the extraction device 300. A first hollow needle 324a passes through the opening 228 formed in the lid portion 222, the second septum 220 and the first septum 216 into the second section 206 of the vessel body. The first hollow needles 324a can extract a fluid 205 from the fluid vessel 200.

[0086] In the extraction cap 210 an RFID tag 232 is arranged. A controller 106 is adapted to instruct a reader 332 to read the RFID tag 232. The RFID tag 232 acts as a data storage element. The reader 332 can read data from the RFID tag 232, for example a unique serial number or data indicating, whether the fluid vessel 200 has already been inserted into an extraction mechanism 300. The data read by the reader 332 is passed to the controller 106.

[0087] If the controller 106 determines by the data read from the RFID tag 232 that the fluid vessel 200 has not been inserted into a vessel extraction mechanism 300, the controller 106 enables the metering pump 104a to extract a fluid 205 from the vessel 200, when required for mineralizing the beverage. The controller 106 also instructs the reader 332 to write data 232 on the RFID tag 232 indicating that the fluid vessel 200 has been inserted into a vessel extraction device 300 and that the first septum 216 and the second septum 220 have been pierced by the first hollow needle 324a. The vessel extraction device 300 may comprise a position sensor 334 determining that the fluid vessel 200 has reached the extraction position. If the position sensor 334 detects that the fluid vessel 200 has reached the extraction position, the above described procedure commences.

[0088] If the controller determines by the reader 332 that the data are stored on the RFID tag 232 indicates that the vessel has already been inserted into a vessel extraction device 300, the controller 106 disables the metering pump 104a such that no fluid can be extracted from the fluid vessel 200.

[0089] For hygienic reasons and safety reasons as well as for reasons of potential abuse the mineralization vessels 200 must not be reused, if a mineralization vessel 200 has already been inserted into the extraction position of a fluid extraction device 300.

[0090] As shown in figure 7, the first hollow needle 324a pierces the first septum 216 and the second septum 220. As soon as the fluid 205 in the vessel body 204, 206 is depleted, the fluid vessel 200 must be removed from the guide 306 of the vessel extraction device 300.

[0091] In use, mineralization fluid collects at the first hollow needles 324a. As soon as the first hollow needle passes the first septum a droplet of mineralization fluid also passes the first septum 216. Such droplets are undesired in the vessel extraction device 300, since the droplets and particularly the minerals in the droplets may jeopardize the operation of the vessel extraction device. Therefore, a second septum 228 is arranged spaced apart from the first septum 216. The small droplets are encased between the first septum 216 and the second septum 220 and do not enter the vessel extraction device 300. Thereby, operation of the vessel extraction device 300 is improved.

[0092] As can be seen in figure 7 the removable cover element 274 (see figure 2) has been removed from the valve seat 254, and thus the vent passage 270 and vent opening 272 as well as the recess 264 are exposed to the environment. During operation the metering pump 104a removes mineralization liquid 205 from the vessel body 204. Therefore, the pressure in the mineralization body 204 falls under the ambient pressure. If the pressure in the vessel body 204 is significantly lower than the ambient pressure, accuracy of the metering pump 104a is reduced.

[0093] As soon as the pressure in the vessel body 204 is lower than the ambient pressure by a predetermined threshold (opening pressure), the outer perimeter of the umbrella shaped membrane 260 is lifted from the lower portion 278 of the valve seat 254 and gas (air) may enter the vessel body 204 through the vent passage, vent opening and the cavity formed between the umbrella shaped membrane 260, the lower portion 278 of the valve seat and the valve stem 262, until the pressure difference between the ambient and within the vessel body 204 is compensated. After this pressure compensation there will be a small pressure difference between the vessel body 204 and the ambience will remain, which is termed residual pressure.

[0094] In one embodiment, the fill level of the mineralization liquid 205 is monitored. In this embodiment the invention tries to dispense with additional electrodes piercing the first septum 216 and the second septum 220. To this end a fill level sensor 350, 352 is formed in the conduit 325a. As soon as the fill level sensor 350, 352 detects that no mineralization liquid is in the conduit 325a, the controller 106 determines that the food supplementation vessel 200 has to be replaced.

[0095] The fill level sensors 350, 352 may be formed by any suitable sensor, such as an optical sensor, a plurality of electrodes.

[0096] In the embodiment shown in figure 7, a first electrode 350 is arranged closer to the hollow needle 324 than a second electrode 352, wherein both electrodes 350 and 352 electrically contact the fluid in the conduit 325a. The first electrode 350 and the second electrode 352 are electrically connected to the controller. If the controller determines that the electric resistance between the electrodes 350 and 352 increases a predetermined level, and/or the voltage between the first electrode 350 and second electrode 352 exceeds a predetermined level and/or the current flowing between the first electrode 350 and the second electrode 352 falls under a predetermined threshold, the controller 106 determines that the level of the mineralization fluid 205 has fallen under a predetermined level and that the food supplementation vessel 200 has to be exchanged. The controller 106 of the vessel extraction device 100 informs a user to change the vessel 200. The controller of the vessel extraction device 100 can also store on a memory device, such as an RFID tag 232, attached to the vessel that the vessel is empty.

[0097] The present invention has the advantage that no droplet of mineralization fluid can enter the vessel extraction apparatus 300. Further, appropriate insertion of a fluid vessels into the vessel extraction device can be assured. Further, each fluid vessel can only be used once, and abuse is prevented. The invention also ensures proper ventilation of the food supplementation vessel 200.

Claims

1. A food supplementation vessel, comprising,

- a vessel body adapted to store a liquid;
- a first opening at the vessel body through which liquid can be drawn from the vessel body;
- a first septum closing the first opening;
- a second opening at the vessel body; and
- a first valve arranged at the second opening, wherein the first valve allows ambient air to enter the vessel body thorough a vent opening, if the pressure difference between the ambient air and the vessel body exceeds a predetermined threshold;
- wherein the first valve comprises an umbrella valve having an umbrella membrane.

2. The food supplementation vessel according to claim 1, wherein the first valve is also adapted to allow gas to exit the vessel body through the vent opening, if the pressure difference between the vessel body and the ambient air exceeds a predetermined threshold.

3. The food supplementation vessel according to claim 1, further comprising a second valve allowing gas to exit the vessel body though a vent opening of the second valve, if the pressure difference between the vessel body and the ambient air exceeds a predetermined threshold.

4. The food supplementation vessel according to any one of claims 1 to 3, further comprising a removable cover element covering the vent opening, wherein the removable cover element is removable from the vent opening.

5. The food supplementation vessel according to any one of claims 1 to 4, wherein the vessel body is filled with at least one of the following:

- a solution of salt in water having a degree of saturation of at least 80 %;
- a solution of salt in water having a degree of saturation of at least 90 %;
- a solution of minerals in water having a degree of saturation of at least 80 %;
- a solution of minerals in water having a degree of saturation of at least 90 %;
- a solution of trace elements in water having a degree of saturation of at least 80 %;
- a solution of trace elements in water having a degree of saturation of at least 90 %;
- a solution of flavoring agents having a degree of saturation of at least 80 %;
- a solution of flavoring agents having a degree of saturation of at least 90 %.

6. The food supplementation vessel according to any one of claims 1 to 5, wherein the umbrella valve is formed by a valve seat, an umbrella body comprising a valve stem locked into a locking passage in the valve seat and an umbrella shaped membrane formed at the stem and biased against a sealing surface of the valve seat, wherein the locking passage extends from an upper portion of the valve seat to a lower portion of the valve seat.

7. The food supplementation vessel according to claim 6, **characterized by** at least one of the following:

- at least one vent passage comprising the vent opening extending from the upper portion of the

valve seat to the lower portion of the valve seat and located in radial direction between the locking passage and the outer perimeter of the umbrella shaped membrane;
- the locking passage is also configured as a vent passage for allowing passage of gas along the valve stem and the perimeter of the locking passage.

8. The food supplementation vessel according to any one of claims 1 to 7, wherein the top of the valve stem does not extend to the top of the valve seat.

9. The food supplementation vessel according to claim 8, wherein the upper portion of the valve seat comprises a recess, in which the upper portion of the valve stem is located.

10. The food supplementation vessel according to claim 9, wherein the top portion of the valve stem comprises a bulge arranged in the recess of the valve seat and biasing the umbrella shaped membrane against the lower portion of the valve seat.

11. The food supplementation vessel according to any one of claims 6 to 10, wherein the radially outward portion of the umbrella shaped membrane contacts the lower portion of the valve seat, if no fluid passes the umbrella shaped membrane, and the radially inward portion of the umbrella shaped membrane does not contact the lower valve seat.

12. The food supplementation vessel according to any one of claims 6 to 11, therein the locking passage and the valve stem are tapered in the vertical direction.

13. The food supplementation vessel according to any one of claims 6 to 12, wherein the cover element covers the ventilation opening of the ventilation passage and the recess of the valve seat.

14. A vessel extraction apparatus adapted to extract a fluid from a food supplementation vessel according to claim 1 to 13, wherein the vessel extraction device comprises:

- a plurality of guides, wherein each guide is adapted to guide a food supplementation vessel from an insertion position, at which the food supplementation vessel is inserted into the guide, to an extraction position in which the fluid in the food supplementation vessel is extracted; and
- a single hollow needle extending from a base in direction of one of the guides, wherein the single hollow needle extends through the first septum into the food supplementation vessel, when the food supplementation vessel is in the extraction position;
- a conduit connected to the single extraction needle, wherein fluid extracted by the single hollow needle from the food supplementation vessel flows to the conduit;
- a fluid level sensor arranged in the conduit;
- a fill level controller electrically connected to the fluid level sensor and adapted to monitor the fluid level in the conduit, wherein, if the fluid level sensor determines that the level of fluid in the conduit has fallen below a predetermined level, the fill level controller outputs a signal indicating that the fill level of the food supplementation vessel is lower than a predetermined threshold.

15. The vessel extraction device according to claim 14, wherein

- at least a first and second guide comprise two complimentary mechanical coding means adapted to engage with two mechanical coding means of the food supplementation vessel;
- wherein the two complimentary mechanical coding means of the first guide comprise a first angular distance;
- wherein the two complimentary mechanical coding means of the second guide comprise a second angular distance; and
- wherein the first angular difference is lager the second angular distance.

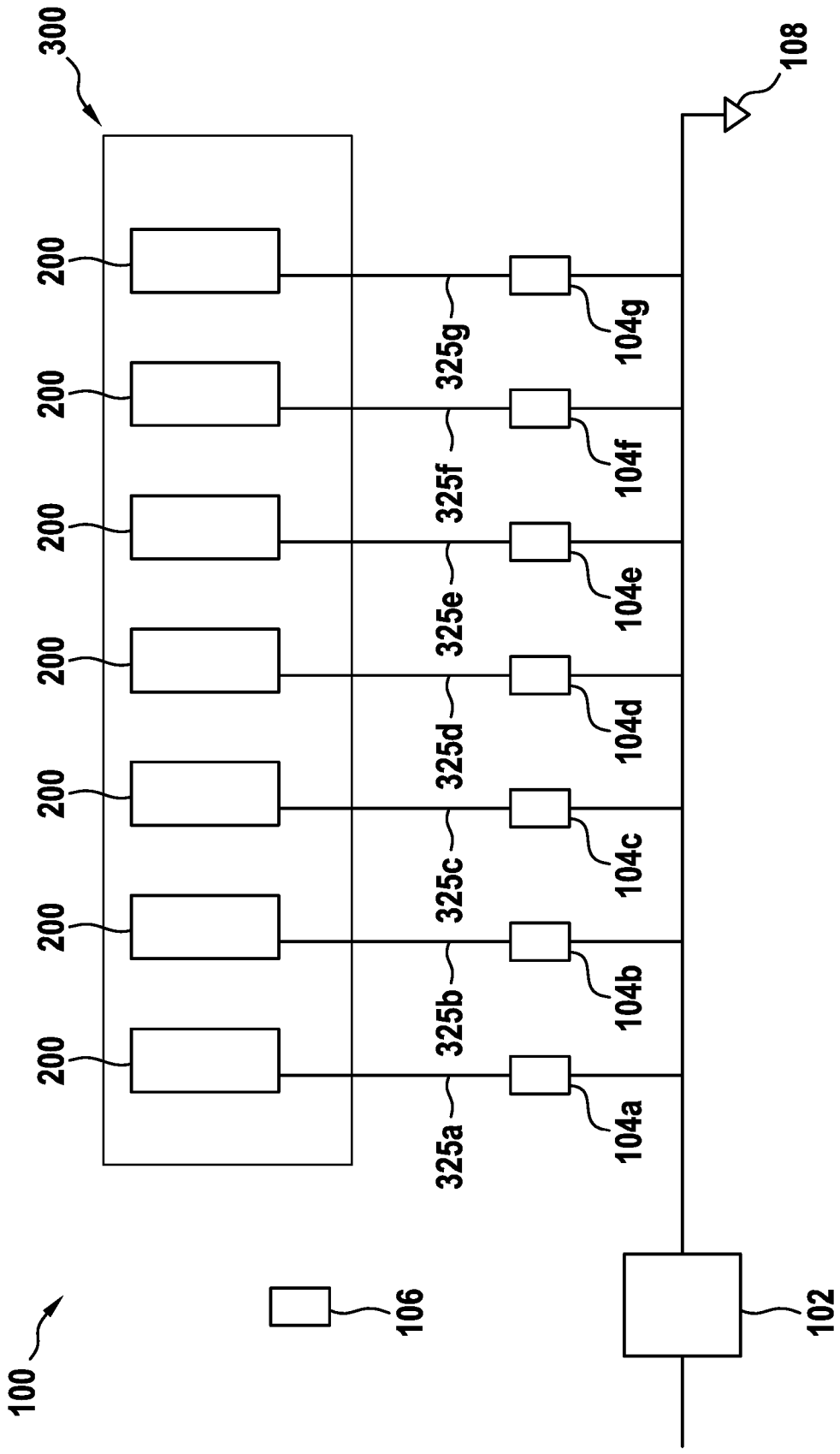
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Fig. 1

Fig. 2

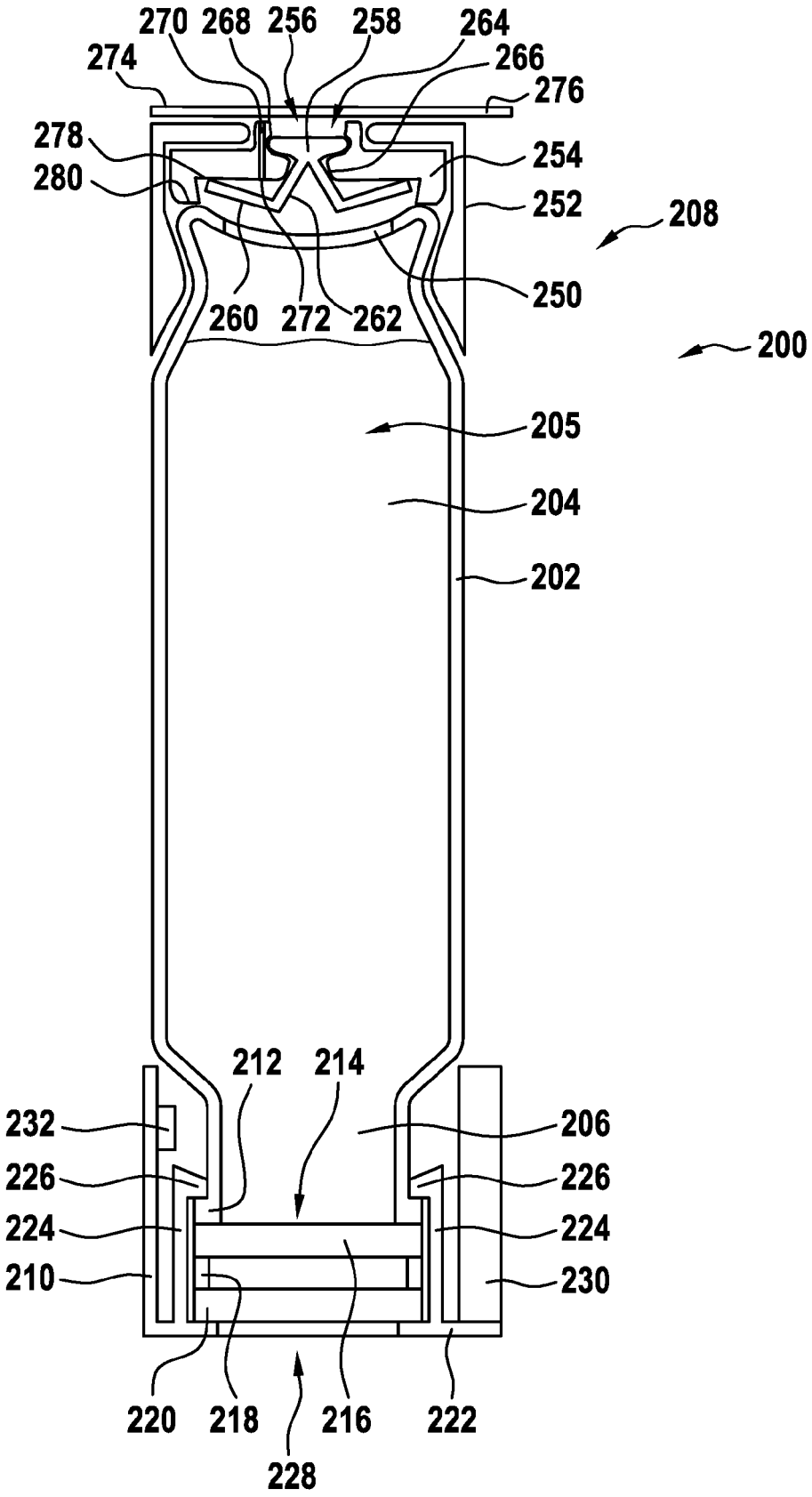
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Fig. 3

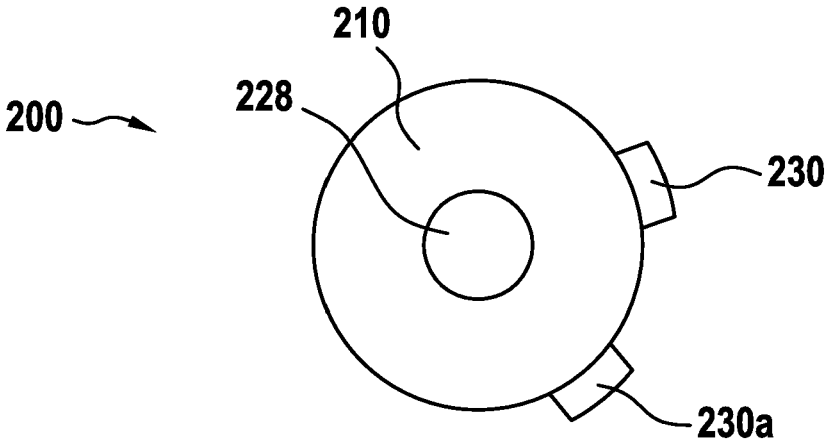


Fig. 4

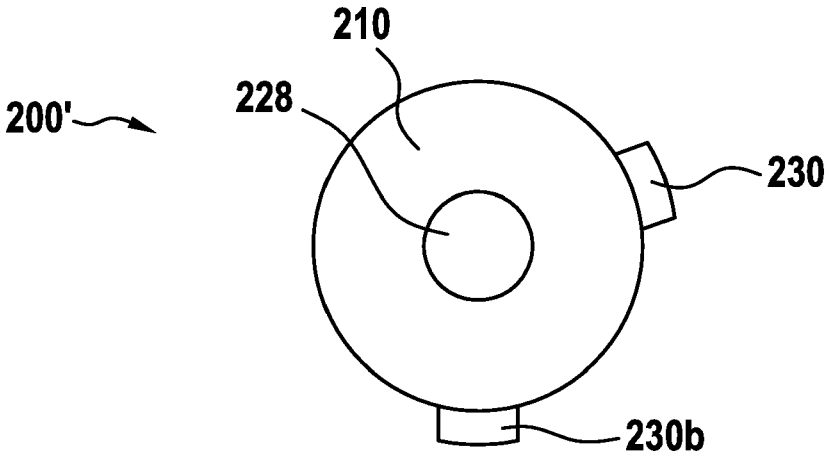
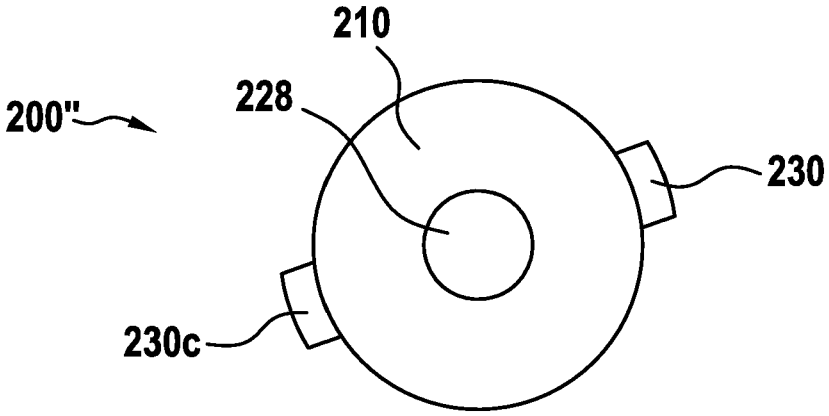


Fig. 5



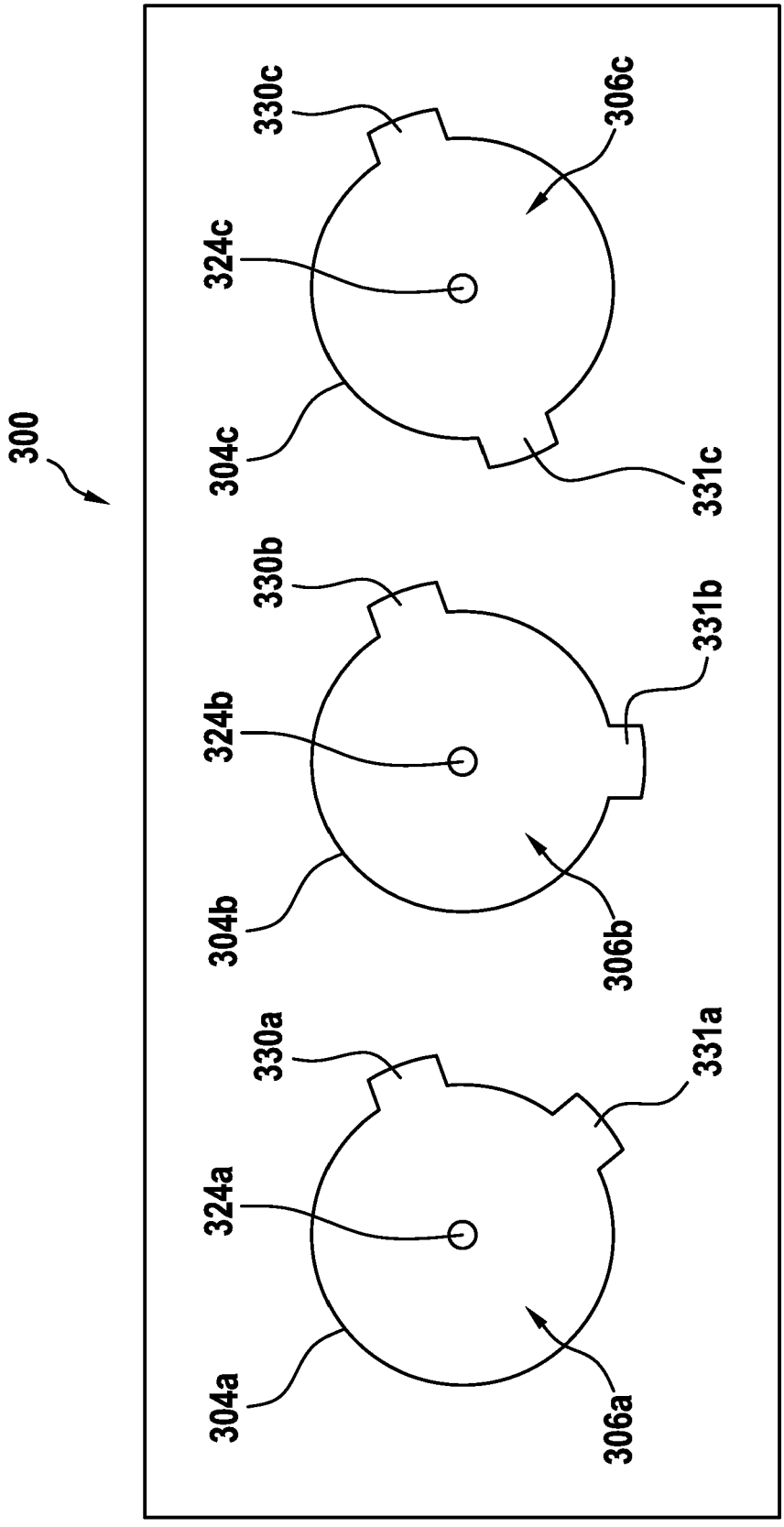

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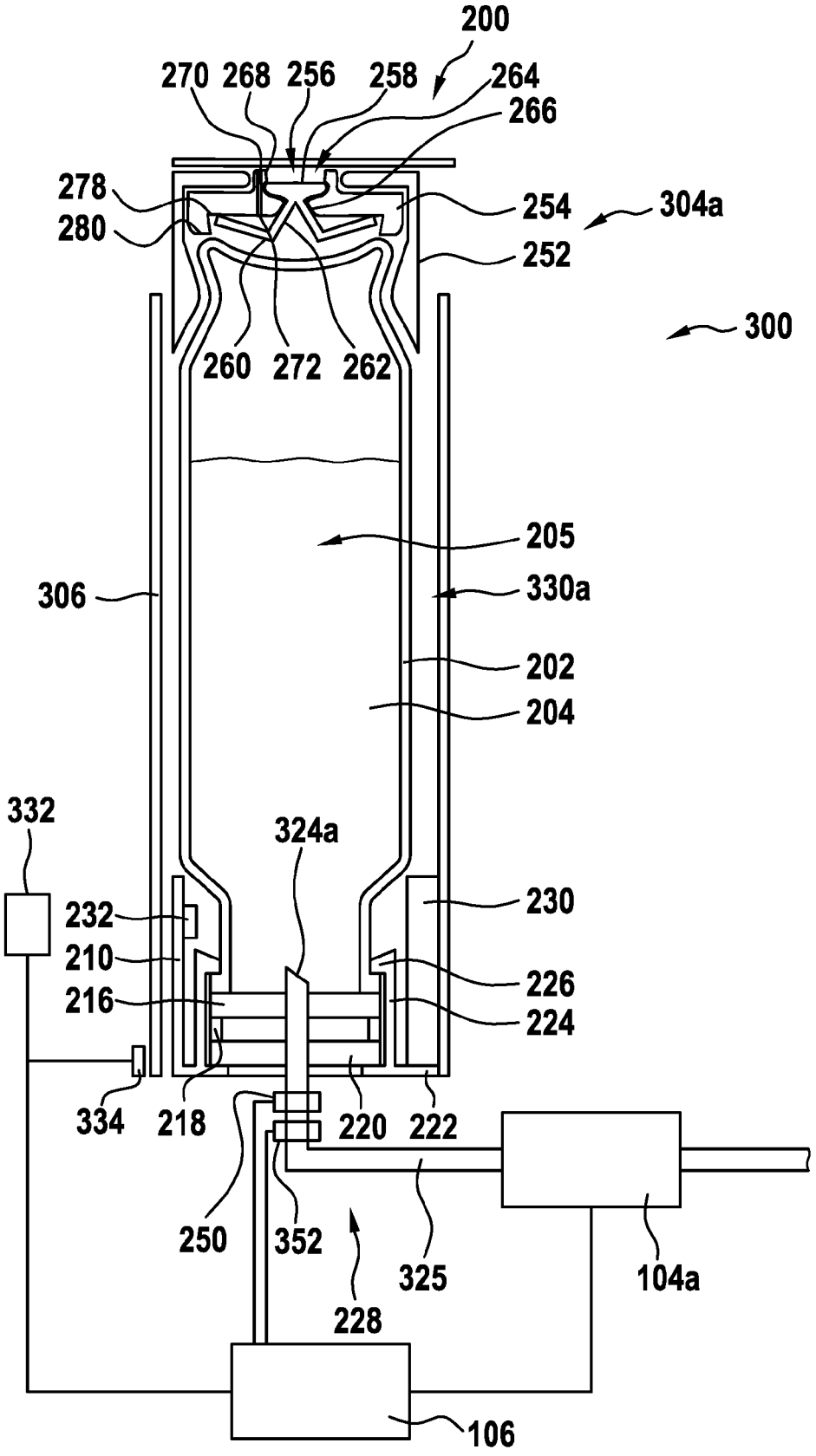
Fig. 6

Fig. 7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EUROPEAN SEARCH REPORT

Application Number
EP 19 19 1294

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	30 January 2020	Desittere, Michiel

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Application Number
EP 19 19 1294

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 19 19 1294

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-13

   Food supplementation vessel with umbrella vent valve

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2. claims: 14, 15

   Vessel extraction apparatus

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 19 1294

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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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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