

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.03.2022 Bulletin 2022/13

(51) International Patent Classification (IPC):
B67D 1/00 ^(2006.01) **B67D 1/07** ^(2006.01)

(21) Application number: **20198736.9**

(52) Cooperative Patent Classification (CPC):
B67D 1/0021; B67D 1/0046; B67D 1/0031;
 B67D 2001/0093; B67D 2001/0094;
 B67D 2001/075; B67D 2210/0001;
 B67D 2210/0006; B67D 2210/0012

(22) Date of filing: **28.09.2020**

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

(72) Inventors:

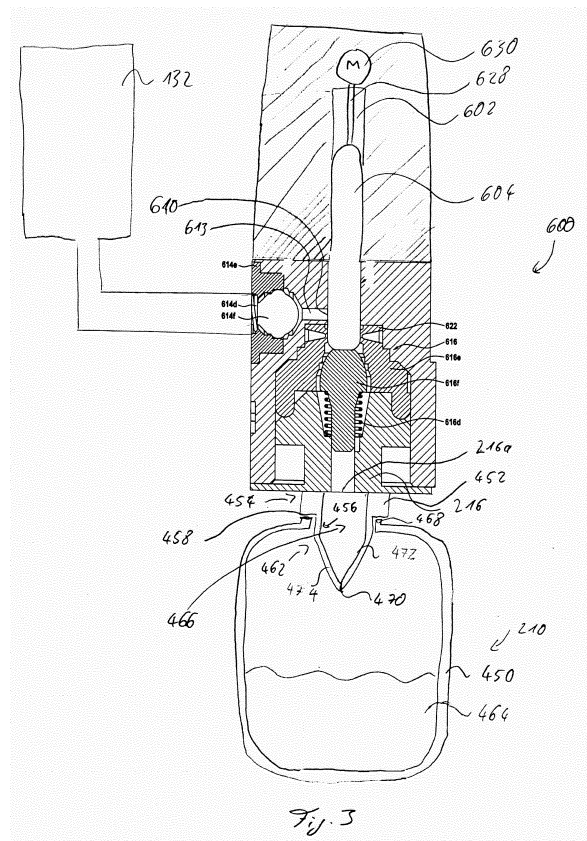
- **Bissen, Monique**
75175 Pforzheim (DE)
- **Schucker, Josef**
6622 Ronco Sopra Ascona (CH)

(74) Representative: **Wittmann, Günther**
Patentanwaltskanzlei Wittmann
Frans-Hals-Straße 31
81479 München (DE)

(71) Applicant: **RIPRUP Company S.A.**
St. Peter Port GY1 WQ (GG)

(54) **MANIFOLD FOR ADDING MINERAL SALTS TO A BEVERAGE AVOIDING SCALING AND PRECIPITATION; BEVERAGE DISPENSER HAVING SUCH MANIFOLD**

(57) Beverage mineralization device (200) that avoids scaling and precipitation of minerals by a supplementation inlet valve (462), such as a duckbill valve connected to an outlet (216a) of a mineralization conduit (216) feeding solved minerals in concentration close to saturation into beverage to be mineralized (464).



Description

[0001] The present invention relates to a beverage dispenser for preparing individualized beverage at the point of use without the necessity to transport bottles, and for avoiding waste caused by plastic bottles. 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 cup, 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 a small group of persons into a portable vessel such as into a carafe or bottle. Small groups are considered to be formed by 2 to approximately 10 persons. The beverage is output by a nozzle into the user vessel. The raw water may be drawn from a tank filled with tap water, for example. The beverage dispenser may be connected to tap water.

[0002] More particularly, the present invention relates to a beverage supplementation device and a beverage dispenser having such beverage supplementation device allowing individual mineralization of beverage at the point of use. The beverage supplementation device may be a mineralization device that adds a plurality of highly concentrated mineral solutions to filtered and demineralized water in a beverage dispenser for dispensing customized mineral water at the point of use. The plurality of mineralization solutions are stored in a plurality of mineralization bottles. The plurality of mineralization solutions are fed by micro dosing pumps.

Related 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 dispenser is connected to a water source such as tap water. The water can be filtered by a sediment filter, an activated carbon filter, an ion exchanger filter, a reverse osmosis filter or the like.

[0004] DE 20 2010 006 679 U1 discloses an apparatus for generating mineral water having a filter and at least one mineral container between the filter and the outlet. The apparatus further comprises a controller for controlling the feed of minerals from the at least one mineral container. If the water consumption by the user exceeds a daily limit of the daily water consumption, feeding of minerals is stopped or another specific formulated water is dispensed.

[0005] WO 94/06547 A1 discloses a water purification and dispensing apparatus comprising a water inlet for obtaining water from a supply source, a water purification

system for removing impurities from the source water and a mineral addition system for adding desired minerals into the purified water

[0006] US 5,443,739 discloses a water purification and dispensing apparatus comprising a water inlet for obtaining water from a supply source, a water purification system for removing impurities of the source water and a mineral addition system for adding desired minerals to the purified water.

[0007] EP 3 663 578 A1 discloses a dosing device and water dispenser having such dosing device for allowing individualized mineralization of water at the point of use.

[0008] EP 3 489 200 A1 discloses a method and device for avoiding scaling and precipitation of salts.

[0009] The mineral solutions must be stored in the mineralization bottles at concentrations close to saturation in order to achieve a satisfying yield. A plurality of different mineral solutions must be supplied to filtered and demineralized water in order to provide an individual and customized mineralization of water, for example. If a plurality of different mineral solutions are supplied to water or any other beverage scaling or participation may occur in the beverage dispenser.

Summary of the invention

[0010] It is an object of the invention to provide a beverage supplementation device that avoids scaling and participation caused by beverage supplementation fluids.

[0011] The object of the invention is achieved by a beverage supplementation device according to claim 1, a beverage dispenser according to claim 11 and a method of claim 15.

[0012] The present invention discloses a beverage supplementation device comprising at least one beverage conduit having a beverage inlet adapted to be coupled with a beverage source supplying beverage to be supplemented to a plurality of supplementation openings adapted to be coupled with a supplementation source. The beverage source may be a tank, a tap or the like. The beverage supplementation device comprises a plurality of supplementation conduits. Each supplementation conduit has one supplementation inlet adapted to be coupled with a supplementation source providing at least one supplementation fluid. Each supplementation conduit comprises a supplementation outlet adapted to be coupled with a supplementation opening of the beverage conduit. The beverage supplementation device further comprises at least one supplementation inlet valve arranged at at least one supplementation opening of the beverage conduit. The beverage conduit is connected to the inlet of the supplementation inlet valve. The outlet of the supplementation inlet valve is directed to the interior of the beverage conduit. The supplementation inlet valve comprises an input section adapted to be coupled with at least one of the supplementation conduits. The supplementation inlet valve further comprises an output sec-

tion including two output elements that are biased against each other to close a gap formed between the two output elements. The two output elements contact each other, if no liquid is supplied into the input section. The two output elements are moved apart to open the gap between the two output elements, if liquid is supplied into the input section of the supplementation input valve. The beverage drawn from the beverage source may be an aqueous liquid, such as water, filtered water, demineralized water. In one embodiment the beverage conduit may comprise a plurality of supplementation openings. In each supplementation opening one supplementation inlet valve may be arranged. To each supplementation inlet valve a supplementation conduit may be coupled.

[0013] The supplementation inlet valve allows that food supplementation liquid (such as mineralization solution) is supplied into the beverage conduit by a suitable dosing device, such as a micro-dosing pump. Thereby supplementation liquid is supplied into the beverage conduit in which an aqueous liquid flows. Thus, proper mineralization of water may be achieved. The mineralization may be an individual mineralization, since determined quantities of the supplementation liquids (minerals solutions) may be supplied.

[0014] On the other hand, the supplementation inlet valve prevents supplementation liquid, such as highly concentrated mineral solutions, to enter the beverage conduit unintended. Thereby, scaling, precipitation of minerals or the like is avoided, particularly during stagnation, when no significant amount of beverage to be supplemented flows through the beverage conduit. Such stagnation in the beverage conduit may occur during times, when no beverage is requested. Further, the aqueous liquid in the beverage conduit cannot enter the beverage supplementation conduit.

[0015] In one embodiment the output section of the supplementation inlet valve is generally tapered. The cross section of the output section is larger in a portion juxtaposed to the input section as compared to the cross section of a portion of the output section located opposite to the input section. This avoids that the aqueous liquid flowing in the beverage conduit can enter the output section of the supplementation inlet valve.

[0016] The supplementation inlet valve may be a check valve, a beak valve, a duckbill valve and/or a duck beak valve. Manufacturing and function of these types of valves are known to the person skilled in the art and do not have to be explained in further detail.

[0017] In one embodiment, the supplementation inlet valve is made of an elastomer, preferably silicon.

[0018] The supplementation inlet valve may extend less than 40 %, preferably less than 35 %, more preferred less than 20 % of the inner cross section of the beverage conduit into the beverage conduit. The supplementation inlet valve may extend between 40 % and 20 %, between 35 % and 20 % of the inner cross section of the beverage conduit into the beverage conduit. The supplementation inlet valve extends in the downward direction into the

beverage conduit. This also avoids aqueous liquid from entering the output section of the supplementation inlet valve.

[0019] The input section of the supplementation inlet valve comprises a first cross section in a first portion located opposite to the output portion and a second cross section in a second portion located between the first portion and the output section. The second portion of the input section of the supplementation inlet valve is located in the supplementation opening and the first portion of the input section of the supplementation inlet valve is located between the outer perimeter of the beverage conduit and the outlet of the supplementation conduit. The first portion may contact the outer perimeter of the beverage conduit and the outlet of the supplementation conduit. In this embodiment the input portion of the supplementation inlet valve acts as a seal between the supplementation opening and the corresponding supplementation conduit coupled therewith. The first cross section may be larger than the second cross section.

[0020] A sealing section with a sealing surface may be formed at the outer perimeter of the beverage conduit around the supplementation opening. An edge may extend from the second portion to the first portion of the input section of the supplementation inlet valve. This edge may contact the sealing surface of the sealing section. Thereby, the second portion of the input section of the supplementation inlet valve is fixed in the supplementation opening. The first portion of the input section of the supplementation inlet valve acts as a seal with the outlet of the supplementation conduit.

[0021] The cross section of the beverage conduit comprises a first dimension orthogonal to the longitudinal direction of the beverage conduit and a second dimension orthogonal to the first dimension and orthogonal direction of the beverage conduit. The first dimension is larger than the second dimension and the output section of the supplementation inlet valve extends into the direction of the first dimension. In other words, the beverage conduit is not point symmetric and the height of the beverage conduit is larger than the width of the beverage conduit, if the output section of the supplementation inlet valve extends from the top of the beverage conduit in the downward direction. Thereby, aqueous fluid is prevented from entering the output section of the supplementation inlet valve.

[0022] In one embodiment the beverage conduit may have a circular cross section.

[0023] The beverage conduit may be formed meander shaped in the longitudinal direction of the beverage conduit. The beverage conduit may comprise a plurality of supplementation openings. If the beverage conduit is formed meander shaped, the distance between two supplementation openings is increased. This allows a first supplementation fluid entering the beverage conduit at a first supplementation opening to dilute in the aqueous fluid, before it is transported by the aqueous fluid to the following supplementation opening, where a different

mineral solution is fed into the aqueous fluid. Thereby, scaling and precipitation of minerals (salts) may be avoided.

[0024] The beverage conduit may comprise titanium and/or the beverage conduit may be manufactured from titanium. The beverage conduit may be manufactured by 3D-printing.

[0025] The beverage supplementation device may comprise a plurality of micro-dosing pumps each connected to a supplementation conduit or comprising a supplementation conduit. In one embodiment, the supplementation conduit extends from the supplementation inlet valve to an outlet valve of the micro-dosing pump. Alternatively or additionally, the supplementation conduit extends from the supplementation inlet valve to a seal of the outlet valve of the micro-dosing pump. Alternatively or additionally, the supplementation conduit extends from the supplementation inlet valve to a moveable sealing element of the outlet valve of the micro-dosing pump. Alternatively or additionally, the supplementation conduit extends from the supplementation inlet valve to an elastic element biasing the moveable sealing element of the outlet valve of the micro-dosing pump.

[0026] The micro-dosing pump may be a piston pump comprising a piston moving in a piston chamber. The front surface of piston may be located close to the outlet valve or contact the outlet valve in his extended position (distal position). In the retracted position (proximal position) of the piston the front surface of the piston is located more distant from the outlet valve as compared with the extended position of the piston. The elastic element may bias the moveable sealing element of the outlet valve towards the piston until the sealing element contacts the seal of the outlet valve. In this position the outlet valve is closed.

[0027] If the piston is retracted from in the piston chamber from the outlet valve of the micro-dosing pump, supplementation fluid is drawn from a supplementation source through an inlet valve of the micro-dosing pump into the piston chamber. If the piston is extended in the direction of the outlet valve, the supplementation liquid in the piston chamber is pressed towards the outlet valve and presses the sealing element from the seal for opening the outlet valve. Then, the supplementation liquid passes the outlet valve of the micro-dosing pump into the supplementation conduit.

[0028] The invention discloses a beverage dispenser comprising an inlet connectable to the beverage source of aqueous liquid, an outlet adapted to output beverage and the beverage supplementation device described above, wherein the beverage supplementation device is connected between the inlet and outlet of the beverage dispenser. The beverage dispenser may comprise a filter connected between the inlet of the beverage dispenser and the inlet of the beverage supplementation device. The filter is adapted to filter the aqueous liquid. In one embodiment, the filter may be a reverse osmosis filter, wherein the permeate is passed to the inlet of the bev-

erage supplementation device. Additionally, the beverage dispenser may comprise a tempering device connected downstream of the filter and adapted to temper the filtered aqueous liquid. Additionally and alternatively the beverage dispenser may comprise a carbonization device connected downstream of the filtering device and adapted to carbonize the aqueous liquid.

[0029] The inlet of each supplementation conduit may be coupled to a different supplementation source. The supplementation source comprises at least one of a mineralization liquid vessel, a flavoring agent vessel and/or a nutrition supplement vessel. The mineralization liquid vessel may be filled with a mineral solution close to saturation. Each mineralization liquid vessel may be filled with different minerals (ions).

[0030] The beverage dispenser may further comprise a plurality of dosing devices, wherein the outlet of each dosing device is connected to the inlet of a supplementation conduit and the inlet of each dosing device is connected to a different supplementation source. The dosing device, such as a micro-dosing pump, may be connected to a controller. The controller instructs each dosing device about the quantity of supplementation liquid to be fed in the supplementation conduit and thus into the beverage conduit, in which the beverage to be supplemented flows. Thereby, an individual mineralization of water may be achieved at the point of use without the necessity of transporting bottled water and the waste generated by plastic bottles. Thereby, the mineralization requirements of each user and the taste preferences of each user are satisfied, without the necessity to store a large amount of bottles (plastic bottles) at the point of use.

[0031] The invention also discloses a method of manufacturing a beverage supplementation device comprising the step of 3D-printing a beverage conduit by stacking titanium layers and forming at least one supplementation opening in the beverage conduit by 3D-printing by stacking titanium layers. A supplementation inlet valve is positioned in the at least one supplementation opening and a supplementation conduit is coupled with the at least one supplementation opening. The supplementation inlet valve comprises a hollow input section adapted to be coupled with at least one of the supplementation conduits and an output section including two output elements that are biased against each other to close a gap formed between the two output elements, wherein the two output elements contact each other, if no liquid is supplied into the input section, and wherein the two output elements are moved apart to open the gap between the two output elements, if liquid is supplied into the input section of the input valve.

[0032] The method may be further configured as discussed above with respect to the beverage supplementation device and beverage dispenser.

Brief description of the drawings

[0033] The invention is now described in further detail

by exemplary and not limiting embodiments with reference to the figures, wherein

Figure 1 shows a schematic diagram of a water dispenser having the inventive beverage supplementation device according to a first embodiment; and

Figure 2 shows a schematic diagram of a water dispenser having the inventive beverage supplementation device according to the second embodiment; and

Figure 3 shows a sectional view of the beverage supplementation device according to the present invention.

Detailed description of the drawings

[0034] The invention is described with reference to a water dispenser 100 embodying the claimed beverage dispenser having a mineralization device 200 embodying the claimed beverage supplementation device.

[0035] The water dispenser 100 comprises a water source 102 such as a tank or tap. The water source 102 is connected to a reverse osmosis filter 104. Filtered water (permeate) exits the reverse osmosis filter 104 into a tempering device 150. The concentrate exits the reverse osmosis filter 104 by the conduit 108 and is disposed.

[0036] The concentrate may be supplied to the tank 102 by conduits 108, 140 for increasing the yield of permeate for a given volume of raw water. Thereby, the concentration of ions in the tank 102 increases. It is possible to generate permeate by reverse osmosis filtering, until the ions concentration in the tank 102 reaches a predetermined limit.

[0037] The permeate is passed to a tempering device 150 adapted to individually temper the beverage based on the preferences of a user. From the tempering device 150 the beverage is passed to a carbonizer 152 adapted to individually carbonize the beverage according to preferences of a user. The beverage flows from the carbonization device 152 into conduit 106.

[0038] In the conduit 106 demineralized water flows to an inlet 202 of a mineralization device 200. From the inlet 202 the demineralized water flows to an inlet manifold 206. A first beverage conduit 210, a second beverage conduit 212 and a third beverage conduit 214 are connected to the inlet manifold 206. Water flows from the inlet manifold 206 through the first beverage conduit 210, the second beverage conduit 212 and the third beverage conduit 214. After the water has passed the first beverage conduit 210, the second beverage conduit 212 and the third beverage conduit 214 the water flows to the outlet manifold 208, from which the water flows through the outlet 204 of the water mineralization device 200. The inlet 210a of the first beverage conduit 210, the inlet 212a of the second beverage conduit 212 and the inlet 214a of the third beverage conduit 214 are connected to the

inlet manifold 206. The outlet 210b of the first beverage conduit 210, the outlet of the second beverage conduit 212b and the outlet 214b off the third beverage conduit 214 are connected to the outlet manifold 208.

[0039] The mineralization device 200 and its components may be made of stainless steel, such as V4A-steel or other materials suitable for use in food such as titanium.

[0040] The water flows from the outlet 204 of the mineralization device 200 to a disinfecting device 112 and to a nozzle 114, where the water is output into a vessel 116 of a user.

[0041] The water dispenser 100 comprises a plurality of mineralization vessels 132, 134, 136, 138, 140, 142 storing different mineralization fluids. The water dispenser 100 further comprises a plurality of dosing devices 120, 122, 124, 126, 128, 130, such as pumps. Particularly, the first mineralization vessel 132 is connected by the first dosing device 120 to the inlet 116b of a first supplementation conduit 216. A second mineralization vessel 134 is connected by a second dosing device 122 to the inlet 218b of a second supplementation conduit 218. A third mineralization vessel 132 is connected by a second dosing device 124 to an inlet 220b of a third supplementation conduit 220. A fourth mineralization vessel 132 is connected by a fourth dosing device 126 to the inlet 222b of a fourth supplementation conduit 222. A fifth mineralization vessel 114 is connected by a fifth dosing device 128 to the inlet 224b of a fifth supplementation conduit. A sixth mineralization vessel 142 is connected by a sixth dosing device 130 to the inlet 226b of the sixth supplementation conduit 226.

[0042] An outlet 216a of the first supplementation conduit 216, an outlet 224a of the fourth supplementation conduit 224 and an outlet 226a of the sixth supplementation conduit 226 are connected spaced apart from each other to the first beverage conduit 210. An outlet 218a of the second supplementation conduit 218 and an outlet 224a of the fifth supplementation conduit 224 are connected spaced apart from each other to the second beverage conduit 212. An outlet 220a of the third supplementation conduit 220 is connected to the third beverage conduit 214.

[0043] In the exemplary embodiment shown in figure 1 the mineralization fluid stored in the third mineralization bottle 136 may react chemically with the second mineralization fluid stored in the second mineralization bottle 134 and/or react with the first mineralization fluid stored in the first mineralization bottle 132 and/or with the fourth mineralization fluid stored in the fourth mineralization bottle 138 and/or with the fifth mineralization fluid stored in the fifth mineralization vessel 140 and/or with the sixth mineralization fluid stored in the sixth mineralization vessel 142. Further, the first mineralization fluid may react with the second mineralization fluid and/or the fifth mineralization fluid. The fourth mineralization fluid may react with the second mineralization fluid and/or the fifth mineralization fluid. The sixth mineralization fluid may react

with the fifth mineralization fluid.

[0044] Therefore, the first mineralization fluid is fed by the first supplementation conduit 216, the fourth mineralization fluid is fed by the fourth supplementation conduit 222 and the sixth mineralization fluid is fed by the sixth supplementation conduit 226 into the first beverage conduit 210, and the second mineralization fluid is fed by the second supplementation conduit 218 and the fifth mineralization fluid is fed by the fifth supplementation conduit 224 into the second beverage conduit 212. Thereby, the first mineralization fluid, the second mineralization fluid, the fourth mineralization fluid, the fifth mineralization fluid and/or the sixth mineralization fluid are diluted in the first beverage conduit 210 and the second beverage conduit 212 such that they do not react in the output manifold 208. Finally, the third mineralization fluid is fed by the third supplementation conduit 220 to the third beverage conduit 214 to avoid that the third mineralization fluid reacts with the first, second, fourth, fifth and/or the sixth mineralization fluid.

[0045] Mineralization fluids (supplementation fluids) are fed in parallel into a plurality of water streams for diluting the mineralization fluids before they are rejoined to a single water stream that is supplied as beverage to a user.

[0046] The present invention also allows to feed mineralization fluid serially into a water stream. Particularly, a controller 118 can control operation of the dosing devices 120-130. Particularly, the controller 118 can control the first dosing device 120, the fourth dosing device 126 and the sixth dosing device 113 such that when minerals are to be fed by the first dosing device 120, the fourth dosing device 126 and the sixth dosing device 130 to the first beverage conduit 210 the first dosing device 120, the fourth dosing device 126 and the sixth dosing device 130 are activated, as soon as a user wishes to be supplied with mineralized water. If the first mineralization fluid, the fourth mineralization fluid and/or the sixth mineralization fluid react, the controller can stop the sixth dosing device 130 before the fourth mineralization fluid supplied by a fourth dosing device 126 reaches the supplementation outlet 266a of the sixth supplementation conduit 226. Further, the controller 118 can stop the fourth dosing device 126 before the first mineralization fluid supplied by the first mineralization device 120 reaches the supplementation outlet 226a of the fourth mineralization conduit 226. Further, the second dosing device 122 can supply the second mineralization fluid and the fifth dosing device 128 can supply the fifth mineralization fluid to the second beverage conduit 212, as soon as a user requests water mineralized by the second and fifth mineralization fluid. The controller stops the fifth dosing device 128 before the second mineralization fluid fed of by the second dosing device 122 reaches the outlet 224a of the fifth supplementation conduit 224 by the flow of the water in the second beverage conduit 212. Thereby, minerals are fed serially into the beverage conduits in order to avoid a chemical reaction between the different mineralization

fluids. This aspect is protected by the European patent EP 3 489 200, by the US patent application having the serial number US 2016/198,997 and the Chinese patent application CN 2018 11406508.6.

[0047] With reference to Fig. 2 a second embodiment of the beverage dispenser 100' according to the present invention is described. In the conduit 106 demineralized water flows to an inlet 302 of the mineralization device 300. From the inlet 302 the demineralized water flows through the first portion 314 of the beverage conduit, the second portion 312 of the beverage conduit, and the third portion 310 of the beverage conduit. After the water has passed the third portion 310 of the beverage conduit the water flows through the outlet 304 of the water mineralization device 300.

[0048] The mineralization device 300 and its components may be made of stainless steel, such as V4A-steel, and titanium or other materials suitable for use in food technology.

[0049] The water flows from the outlet 304 of the mineralization device 300 through a conduit 110 to a disinfecting device 112 and to a nozzle 114, where the water is output into a vessel 116 of a user.

[0050] The water dispenser 100' comprises a plurality of mineralization vessels 132, 134, 136, 138, 140, 142 storing different mineralization fluids. The water dispenser 100' further comprises a plurality of dosing devices 120, 122, 124, 126, 128, 130, such as pumps. Particularly, the first mineralization vessel 132 is connected by the first dosing device 120 to the inlet 116b of a first supplementation conduit 216. A second mineralization vessel 134 is connected by a second dosing device 122 to the inlet 218b of a second supplementation conduit 218. A third mineralization vessel 136 is connected by a second dosing device 124 to an inlet 220b of a third supplementation conduit 220. A fourth mineralization vessel 138 is connected by a fourth dosing device 126 to the inlet 222b of a fourth supplementation conduit 222. A fifth mineralization vessel 140 is connected by a fifth dosing device 128 to the inlet 224b of a fifth supplementation conduit. A sixth mineralization vessel 142 is connected by a sixth dosing device 130 to the inlet 226b of the sixth supplementation conduit 226.

[0051] An outlet 216a of the first supplementation conduit 216, an outlet 224a of the fourth supplementation conduit 224 and an outlet 226a of the sixth supplementation conduit 226 are connected spaced apart from each other to the third beverage conduit 310. An outlet 218a of the second supplementation conduit 218 and an outlet 224a of the fifth supplementation conduit 224 are connected spaced apart from each other to the second beverage conduit 312. An outlet 220a of the third supplementation conduit 220 is connected to the third beverage conduit 314.

[0052] In the exemplary embodiment shown in figure 2 the mineralization fluid stored in the third mineralization bottle 136 may react chemically with the second mineralization fluid stored in the second mineralization bottle

134 and/or react with the first mineralization fluid stored in the first mineralization bottle 132 and/or with the fourth mineralization fluid stored in the fourth mineralization bottle 138 and/or with the fifth mineralization fluid stored in the fifth mineralization vessel 140 and/or with the sixth mineralization fluid stored in the sixth mineralization vessel 142. Further, the first mineralization fluid may react with the second mineralization fluid and/or the fifth mineralization fluid. The fourth mineralization fluid may react with the second mineralization fluid and/or the fifth mineralization fluid. The sixth mineralization fluid may react with the fifth mineralization fluid.

[0053] Therefore, the first mineralization fluid is fed by the first supplementation conduit 216, the fourth mineralization fluid is fed by the fourth supplementation conduit 222 and the sixth mineralization fluid is fed by the sixth supplementation conduit 226 into the third portion 314 of the beverage conduit, and the second mineralization fluid is fed by the second portion 218 of the supplementation conduit and the fifth mineralization fluid is fed by the fifth supplementation conduit 224 into the second portion 312 of the beverage conduit. Thereby, the first mineralization fluid, the second mineralization fluid, the fourth mineralization fluid, the fifth mineralization fluid and/or the sixth mineralization fluid are diluted in the third beverage conduit 314 and the second beverage conduit 312 such that they do not react. Finally, the third mineralization fluid is fed by the third supplementation conduit 220 to the first portion 314 of the beverage conduit to avoid that the third mineralization fluid reacts with the first, second, fourth, fifth and/or the sixth mineralization fluid.

[0054] In operation the controller 118 controls a plurality of dosing devices 120 to 130 such that the mineralization fluids stored in the mineralization bottles 132 to 142 are not mixed within the mineralization device, i.e. first portion 314 of the beverage conduit, second portion 312 of beverage conduit and the third portion 310 of beverage conduit. If a user requests a beverage to be output, the controller 118 controls a plurality of dosing devices 120 to 130 such that mineralization fluids are fed by the plurality of dosing devices 120 to 130 into the beverage conduit 310, 312, 314 simultaneously. It is to be understood that the controller 118 does not have to control all of dosing devices 120 to 130 such to output a mineralization fluid, but actually only the dosing devices 120 to 130 that must deliver a mineralization fluid stored in one of the mineralization vessels 132 to 142 that is required according to a select water recipe, i.e. the desired mineralization. Before a mineralization fluid fed by an upstream outlet of an upstream mineralization conduit is transported by the flow of water in the respective beverage conduits 310, 312, 314 to a downstream outlet of a downstream mineralization conduit, the controller instructs the dosing device connected to the downstream mineralization conduit to stop feeding mineralization fluid through the downstream mineralization conduit and downstream outlet into the respective beverage conduit. Thereby, a mixing of mineralization fluids in the mineral-

ization device 300 can be prevented and thus fall out and other undesired chemical reactions.

[0055] Now an exemplary and non-limiting scenario is described, in which the first dosing device 120, the third dosing device 124, the fourth dosing device 126 and the fifth dosing device 128 shall feed the respective mineralization fluid into the beverage conduit 310, 312 and 314. As soon as the beverage shall be output by the beverage dispenser 100', the controller 118 instructs the first dosing device 120, the third dosing device 124, the fourth dosing device 126 and the fifth dosing device 128 to feed mineralization fluid from the respective mineralization vessel 132, 136, 138, 140 into the respective beverage conduit 310, 312, 314 essentially simultaneously. The mineralization fluid fed by the first dosing device 120, the third dosing device 124, the fourth dosing device 126 and the fifth dosing device 128 is transported downstream in the direction of the outlet 304 of the mineralization device 300.

[0056] Before or as soon as mineralization fluid fed by the first mineralization device 120 is transported by the flow of water in the third beverage conduit portion 310 to the opening 222a of the fourth mineralization conduit 222, the controller 118 instructs the fourth dosing device 126 to stop feeding mineralization fluid from the fourth mineralization bottle 138 into the third beverage conduit portion 310. Thereby, mixing of the first mineralization fluid and fourth mineralization fluid can be prevented.

[0057] Before or as soon as mineralization fluid fed by the third mineralization device 124 is transported by the flow of water in the first and second beverage conduit portions 312, 314 to the opening 224a of the fifth mineralization conduit 224, the controller 118 instructs the fifth dosing device 128 to stop feeding mineralization fluid from the fifth mineralization bottle 140 into the second beverage conduit 312. Thereby, mixing of the third mineralization fluid and fifth mineralization fluid can be prevented.

[0058] Before or as soon as mineralization fluid fed by the fifth mineralization device 120 is transported by the flow of water in the second and third beverage conduit portions 310, 312 to the opening 216a of the first mineralization conduit 216, the controller 118 instructs the first dosing device 120 to stop feeding mineralization fluid from the first mineralization bottle 132 into the third beverage conduit 310. Thereby, mixing of the first mineralization fluid and fifth mineralization fluid can be prevented.

[0059] The present invention allows that mineralization fluids are fed in a rapid manner into a flow of water without reacting with each other, when the mineralization fluids are still solved in a high concentration in the water. As mentioned before, this aspect is protected by the European patent EP 3 489 200, by the US patent application having the serial number US 2016/198,997 and the Chinese patent application CN 2018 11406508.6.

[0060] In the second embodiment the beverage conduits 310, 312, 314 are arranged in a meander shape. Other embodiments are possible, such as a beverage

conduit in a spiral shape or coil shape.

[0061] In one embodiment mineralization fluids that do not react with each other, when in high concentration may mix within a beverage conduit 310. In this embodiment, outlets 216a, 222a and 226a feeding mineralization fluids not reacting with each other are spaced apart a first distance. The outlets 220a, 224a feeding mineralization fluids reacting with each other at high concentration are spaced apart a second distance. The second distance is larger than the first distance. The present invention allows that mineralization fluids (supplementation fluids) not reacting with each other can be fed into a beverage conduit in parallel, whereas mineralization fluids reacting with each other are fed in serial relationship into a beverage conduit.

[0062] Under a further aspect of the invention, a first outlet coupled to a first supplementation conduit (mineralization conduit) and second outlet coupled to a second supplementation conduit (mineralization conduit) are spaced apart such that no diffusion of supplementation fluids (mineralization fluids) from a first outlet to the second outlet may occur during stagnation. Thereby, fall out or other undesired chemical reaction between supplementation fluids (mineralization fluids) may be avoided.

[0063] Reference is made to figure 3 showing a beverage mineralization device 200 that avoids scaling and precipitation of minerals by a supplementation inlet valve 462, such as a duck beak valve connected to an outlet 216a of a mineralization conduit 216 feeding solved minerals into beverage to be mineralized 464.

[0064] Particularly, figure 3 shows a cross section of a beverage supplementation device having a beverage conduit 210. Beverage to be supplemented 464 flows in the beverage conduit 210. The beverage conduit 210 may comprise a wall 450. The wall 450 of the beverage conduit 210 may be manufactured by 3D-printing of titanium. At the upper portion of the beverage conduit 210 a supplementation opening 466 is formed. Around the supplementation opening 466 a sealing section 468 is formed.

[0065] A supplementation inlet valve 462 is positioned in the supplementation opening 466 of the beverage conduit 210. The supplementation inlet valve 462 may be a beak valve, a duckbill valve, a duck beak valve. For the sake of brevity, the supplementation inlet valve 462 is termed beak valve in the following, although other embodiments of a supplementation inlet valve 462 may be chosen.

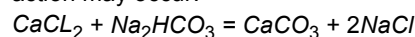
[0066] The beak valve 462 comprises a hollow input section 454 that is coupled with the supplementation conduit 216, and an output section having two output elements 472, 474. The output elements 472, 474 are biased against each other to close a gap 470 formed between the two output elements 472, 474 at its tip. The output elements 472, 474 contact each other, if no liquid is supplied into the input section 454, for example if a micro-dosing device 600 does not feed a mineralization fluid from the first mineralization vessel 132 into the supple-

mentation conduit 216.

[0067] The two output elements 472, 474 are moved apart to open the gap between the output elements 472, 474, if liquid is supplied into the input section 454 of the duck beak valve 462, if the micro-dosing device 600 feeds mineralization fluid from the mineralization vessel 132 to the supplementation conduit 216.

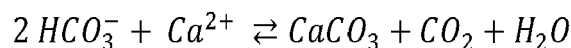
[0068] The duck beak valve 462 prevents that beverage 464 to be supplemented can enter the duck beak valve 462 and the supplementation conduit 216. Further, the duck beak valve 462 prevents that the supplementation fluid and mineralization fluid, respectively can flow out of the duck beak 462, if the dosing device 120 does not feed any supplementation fluid into the supplementation conduit. Thereby, proper mineralization of the beverage to be supplemented 464 may be achieved.

[0069] During stagnation, if no beverage is requested to be produced by the beverage dispenser 100, 100' only residual beverage or no beverage may be in the beverage conduit 210. The duck beak valve 462 avoids that highly concentrated mineralization fluid drops into the beverage conduit 210 during stagnation or non-use of the beverage dispenser 100, 100'. Drops of highly concentrated mineralization solution in the beverage conduit without beverage to be supplemented may cause severe effects, such as corrosion, scaling, precipitation of minerals and reducing the efficiency of the beverage dispenser 100. Corrosion may occur due to the reactivity of the highly concentrated mineral solutions. Therefore, the supplementation conduit 210 is made of titanium. If one mineral solution comprises calcium chloride and another mineral solution comprises sodium carbonate, the following reaction may occur:



[0070] Ca_2CO_3 is chalk, scale or the like and causes scaling of the beverage conduit, deteriorating the function of the beverage dispenser 100.

[0071] If one mineralization solution comprises hydrogen carbonate ions and another mineralization solution comprising calcium cations the following reaction may occur:



[0072] Further, sodium hydrogen carbonate cannot be solidified and leads to scaling, if liquid is removed, such as by evaporation.

[0073] The beverage supplementation device 200, 300, the tempering device 150 and the carbonization device 152 as well as the disinfection device 112 are flushed for hygienic reasons before beverage is output by the nozzle 114. The flushed aqueous fluid is directed by the conduit 142, 140 into the tank 102. The lower the concentration of minerals, ions, salts or the like in the aqueous fluid supplied by the conduits 140, 142 into the tank 102, the higher the yield of beverage by a given volume of raw water filled into the tank 102, since less concen-

trate comprising, inter alia, minerals has to be removed by the reverse osmosis filter 104 and a higher volume of permeate may be generated from a given volume of aqueous fluid in the tank.

[0074] The output section 472, 474 of the duck beak valve 462 extends less than 40%, preferably less than 35%, more preferred less than 20% of the inner cross section of the beverage conduit 210 into the beverage conduit. The width of the beverage conduit may be smaller than the height of the beverage conduit. The output section 472, 474 may extend in the vertical direction of the beverage conduit 210. The beverage conduit may have a width of approximately 4 to 10 mm and a height of approximately 4 to 15 mm. In one embodiment, the output section 472, 474 may range less than 2.5 mm in the vertical direction into the beverage conduit.

[0075] The input section 454 of the duck beak valve 462 comprises a first cross section in a first portion 452 located opposite to the output portion 472, 474 and a second cross section in a second portion 456 located between the first portion 452 and the output section 472, 474. The first cross section is larger than the second cross section. The second portion 456 is located in the supplementation opening 466. The first portion is located between the outer perimeter of the beverage conduit 210 and the supplementation outlet 216a of the supplementation conduit 216.

[0076] In one embodiment a sealing section 468 may be formed around the supplementation opening 466 of the beverage conduit 210. The supplementation opening 466 protrudes around the supplementation opening 466 from the wall 450 of the beverage conduit 210. The sealing section 468 comprises at the end of the protrusion a sealing surface. The sealing section is a portion of the beverage conduit. An edge 458 extends from the second portion of the input section 454 to the first portion of the input section. The edge may extend in the horizontal direction, whereas the outer perimeter of the first portion 454 and the outer perimeter of the second portion 456 extend in the vertical direction. The edge 458 extending from the second portion 456 to the first portion 454 abuts the sealing surface. Since the perimeter of the second portion 456 abuts the inner diameter of the sealing section 468 and the inner diameter of the supplementation opening 466, the second portion 456 seals the supplementation opening 466. The top portion of the first portion of the seals the outlet 216a of the supplementation conduit 216.

[0077] As shown in figure 3, the output section 472, 474 of the duck beak valve 462 is shaped generally tapered. The cross section of the output section 472, 474 in a portion close to the input section 454 is larger than the cross section of a portion more distant to the input section 454. The angle of taper may range between 10° and 50°, preferably 15° to 30°. The tapered shape of the output portion 472, 474 prevents beverage to be supplemented from entering the duck beak valve 462 and the supplementation conduit 216.

[0078] The supplementation conduit 216 extends into the micro-dosing pump 600 described in further detail below. An inlet valve 614 of the micro-dosing pump comprises a movable valve member 614f that is biased by a spring 614d against the valve seat 614e of the inlet valve 214. The valve member 614f comprises a lower elasticity as compared to the valve seat 614e.

[0079] If a piston 604 is moved within the chamber 602 by a motor 630 and a rod 628 in a proximal direction, the valve member 614f is released from the valve seat 614e and a fluid may flow through the conduit 613 and the opening 610 into the chamber. If the piston 604 is moved into the distal direction, the fluid presses the valve element 614f against the valve seat 614e.

[0080] An outlet valve 616 of the micro-dosing pump 600 comprises a movable valve member 616f that is biased by a spring 616d against a seat 616e of the outlet valve 616. If the piston 604 is moved within the chamber 602 into the distal direction (towards the outlet valve 616), the fluid in the chamber 602 presses against the valve member 616f and releases the valve member 616f from the valve seat 616e against the bias of the spring 616d and fluid may flow out of the chamber 602 into the supplementation conduit 216. In the distal position (distal dead center position) the distal end portion of the piston 604 contacts the surface of the valve member 616f that is directed to the piston 604. Thereby, flow of fluid from the chamber 602 through the outlet valve 616 into the conduit 620 may be prevented. A first seal 622 accommodated around the distal end of the piston 604 is formed integrally (in one piece) with the seat 616e of the outlet valve 616. If the supplementation conduit 216 extends to the outlet valve of the micro-dosing pump 600, less space is required and fewer parts have to be manufactured and assembled. The micro-dosing pump 600 is arranged on the duck beak valve 462, particularly on the first portion 452 (upper portion) of the duck beak valve 462.

[0081] The present invention discloses a beverage mineralization device 200 that avoids scaling and precipitation of minerals by using a supplementation inlet valve 462, such as a duck beak valve, connected to an outlet 216a of a mineralization conduit 216 that feeds solved minerals into beverage to be mineralized 464, if a dosing device does not feed a mineral solution to the duck beak valve 462. Thereby, corrosion of the beverage conduit 210 may be avoided. Further, the yield of the mineralization fluid is increased. If aqueous liquid in the beverage conduit 210 are flushed before preparing a beverage into the raw water tank 102, the present invention increases the volume of beverage that can be prepared from a given volume of raw water in the tank 102, since the duck beak valve 462 avoids leakage of a mineral solution into the beverage conduit 210 during stagnation, i.e. such as during a period, when no beverage is to be prepared.

Claims

1. A beverage supplementation device (200; 300), comprising:

- at least one beverage conduit (210; 310) having a beverage inlet (202; 302) adapted to be coupled with a beverage source (102) supplying beverage to be supplemented (464) and a plurality of supplementation openings (466) adapted to be coupled with a supplementation source (132, 134, 136, 138, 149, 142);

- a plurality of supplementation conduits (216, 218, 220, 222, 224, 226), wherein each supplementation conduit (216, 218, 220, 222, 224, 226) has a supplementation inlet (216b, 218b, 220b, 222b, 224b, 226b) adapted to be coupled to one of the supplementation sources providing at least one supplementation liquid and wherein each supplementation conduit (216, 218, 220, 222, 224, 226) comprises a supplementation outlet (216a, 218a, 220a, 222a, 224a, 226a) adapted to be coupled with the at least one supplementation opening of the beverage conduit (210; 310);

- at least one supplementation inlet valve (462) arranged at least one supplementation opening of the beverage conduit (210; 310), wherein the supplementation conduit (216, 218, 220, 222, 224, 226) is connected to the inlet of the supplementation inlet valve and the outlet of the supplementation inlet valve is directed into the interior of the beverage conduit (210; 310);

- wherein the supplementation inlet valve (462) comprises an input section (454) adapted to be coupled with at least one of the supplementation conduits (216, 218, 220, 222, 224, 226) and an output section including two output elements (472, 474) that are biased against each other to close a gap formed between the two output elements (472, 474), wherein the two output elements (472, 474) contact each other, if no liquid is supplied into the input section, and wherein the two output elements (472, 474) are moved apart to open the gap between the two output elements (472, 474), if liquid is supplied into the input section of the supplementation input valve (462).

2. The beverage supplementation device (200; 300) according to claim 1, wherein output section (472, 474) of the supplementation inlet valve (462) is generally tapered, wherein the cross section of the output section (472, 474) is larger in a portion juxtaposed to the input section (454) as compared the cross section of a portion of the output section (472, 474) located opposite to the input section (454).

3. The beverage supplementation device (200; 300) according to claim 1 or 2, wherein the supplementation inlet valve (462) is at least one of:

- a check valve;
 - a beak valve;
 - a duck bill valve;
 - a duck beak valve.

4. The beverage supplementation device (200; 300) according to any one of claims 1 to 3, wherein supplementation inlet valve (462) extends less than 40 %, preferably less than 35 %, more preferred less than 20 % of the inner cross section of the beverage conduit (210; 310) into the beverage conduit.

5. The beverage supplementation device (200; 300) according to any one of claims 1 to 4, wherein the input section (454) of the supplementation inlet valve (462) comprises a first cross section in a first portion (452) located opposite to the output portion (472, 474) and a second cross section in a second portion (456) located between the first portion (452) and the output section (472, 474), wherein the second section (456) is located in the supplementation opening (466) and the first portion (452) is located between the outer perimeter of the beverage conduit (210) and the supplementation outlet (216a, 218a, 220a, 222a, 224a, 226a) of the supplementation conduit (216, 218, 220, 222, 224, 226).

6. The beverage supplementation device (200; 300) according to claim 5, wherein a sealing section (468) with a sealing surface is formed at the outer perimeter of the beverage conduit (210; 310) around the supplementation opening (466), wherein an edge (458) extends from the second portion (456) to the first portion (452) of the input section (454) of the supplementation inlet valve (462) and wherein the edge (458) abuts the sealing surface.

7. The beverage supplementation device (200; 300) according to any one of claims 1 to 6, wherein the cross section of the beverage conduit (210; 310) comprises a first dimension orthogonal to the longitudinal direction of the beverage conduit (210; 310) and a second dimension orthogonal to the first dimension and longitudinal direction of the beverage conduit, wherein the first dimension is larger than the second dimension and wherein the output section (472, 474) of the supplementation inlet valve (462) extends into the direction of the first dimension.

8. The beverage supplementation device (300) according to any one of claims 1 to 7, wherein beverage conduit (310) is formed meander shaped in the longitudinal direction of the beverage conduit.

9. The beverage supplementation device (200; 300) according to any one of claims 1 to 8, wherein the beverage conduit (210; 310) comprises titanium.
10. The beverage supplementation device (200; 300) according to any one of claims 1 to 9, further comprising a plurality of micro-dosing pumps (600), **characterized by** at least one of the following:
- the supplementation conduit extends (216) from the supplementation inlet valve (462) to an outlet valve (616) of the micro-dosing pump (600);
 - the supplementation conduit (216) extends from the supplementation inlet valve (462) to a seal (616e) of the outlet valve (616) of the micro-dosing pump (600);
 - the supplementation conduit (216) extends from the supplementation inlet valve (462) to a moveable sealing element (616f) of the outlet valve (616) of the micro-dosing pump (600);
 - the supplementation conduit (216) extends from the supplementation inlet valve (462) to an elastic element (616d) biasing the moveable sealing element (616f) of the outlet valve (616) of the micro-dosing pump (600).
11. A beverage dispenser (100; 100'), comprising:
- an inlet connectable to a beverage source (102) of aqueous liquid;
 - an outlet (114) adapted to output beverage; and
 - the beverage supplementation device (200; 300) according to any one of claims 1 to 10, wherein the beverage supplementation device (200; 300) is connected between the inlet and the outlet (114) of the beverage dispenser (100; 100').
12. The beverage dispenser (100; 100') according to claim 11, **characterized by** at least one of the following:
- a filter (104) adapted to filter the aqueous liquid and connected between the inlet of the beverage dispenser (100; 100') and the inlet of the beverage supplementation device (206; 306);
 - a tempering device (150) connected downstream of the of the filter (104) and adapted to temper the filtered aqueous liquid;
 - a carbonization device (152) connected downstream of the filtering device (104) and adapted to carbonize the filtered aqueous liquid.
13. The beverage dispenser (100; 100') according to claim 11 or 12, wherein the inlet (216b, 218b, 220b, 222b, 224b,

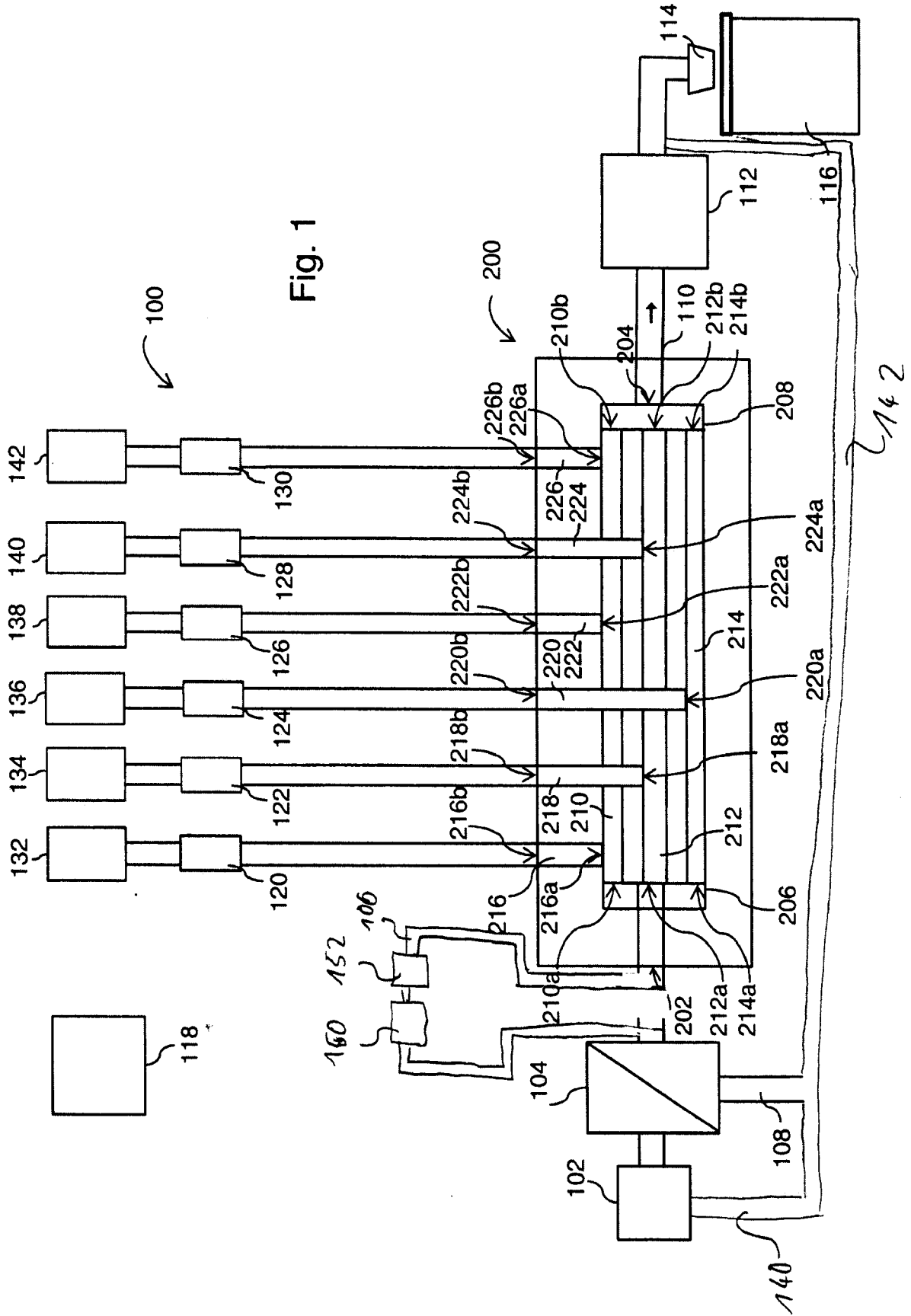
226b) of each supplementation conduit (216, 218, 220, 222, 224, 226) is coupled to a different supplementation source, wherein the supplementation source comprises at least one of

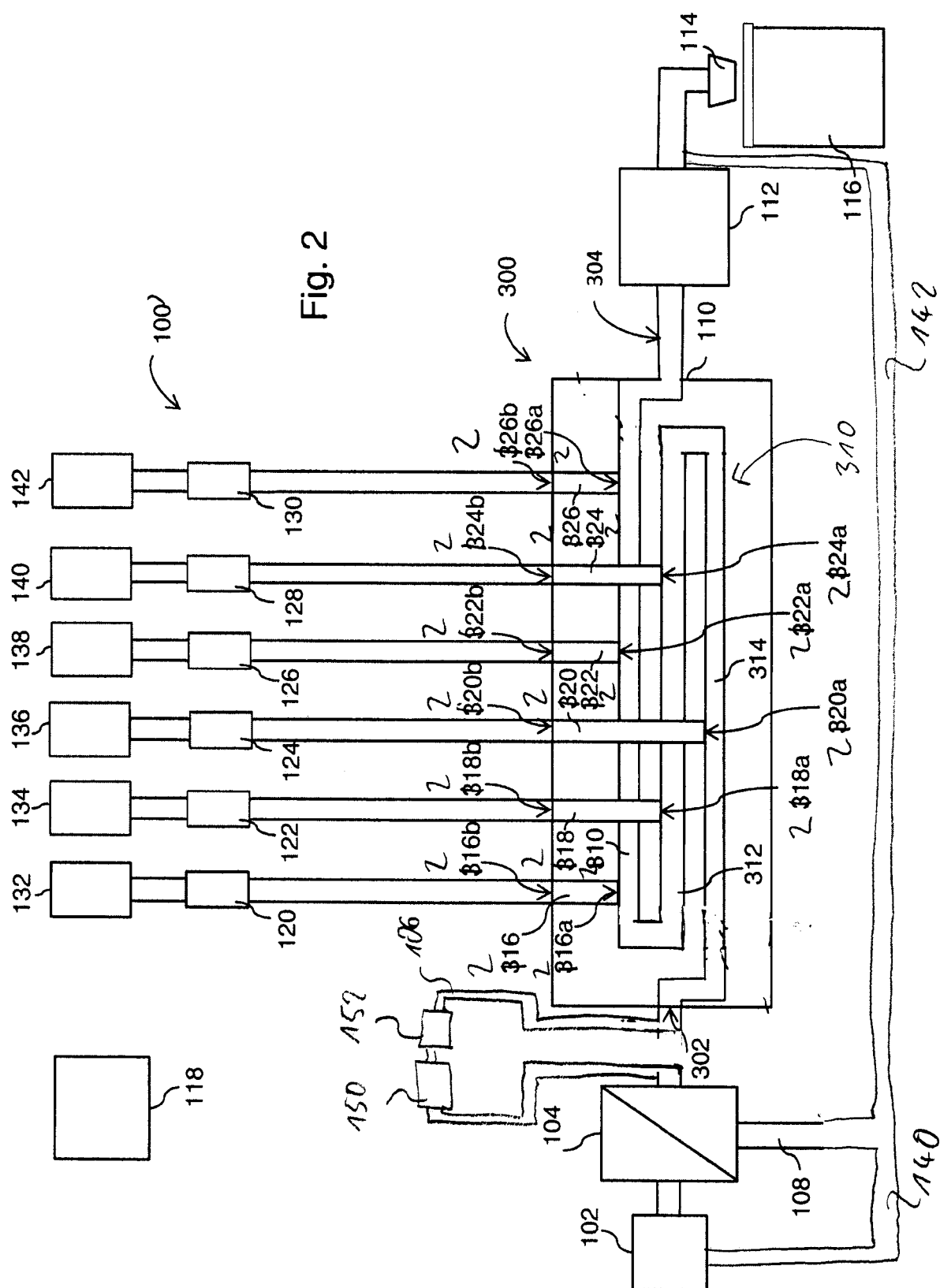
- a mineralization liquid vessel (132, 134, 136, 138, 140, 142);
- a flavoring agent vessel;
- a nutrition supplement vessel.

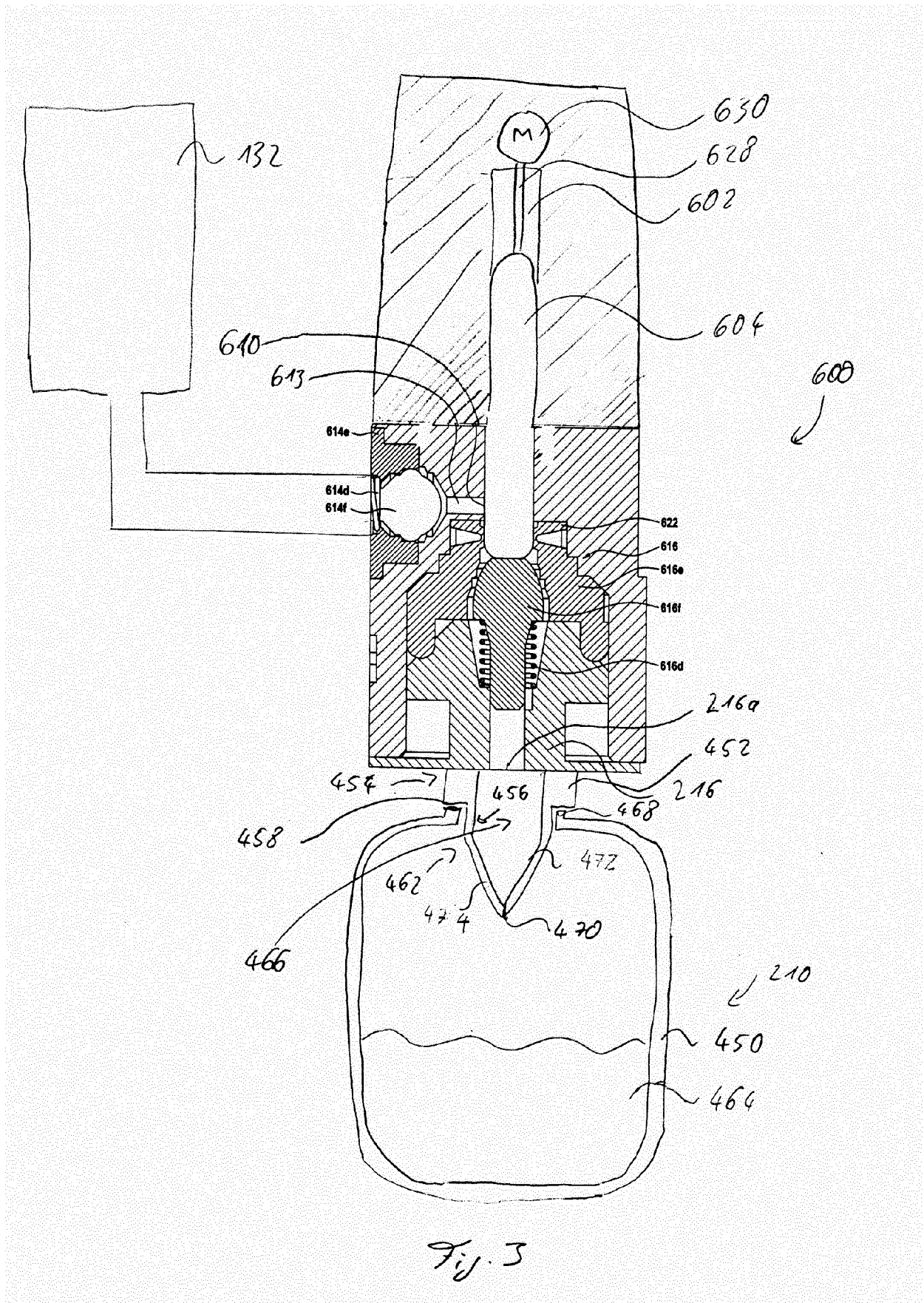
14. The beverage dispenser (100) according to any one of claims 11 to 13, further comprising a plurality of dosing devices (120, 122, 124, 126, 128, 130), wherein the outlet of each dosing device (120, 122, 124, 126, 128, 130) is connected to the inlet (216b, 218b, 220b, 222b, 224b, 226b) of a supplementation conduit (216, 218, 220, 222, 224, 226) and the inlet of each dosing device (120, 122, 124, 126, 128, 130) is connected to a different supplementation source.

15. A method of manufacturing a beverage supplementation device (200; 300), comprising the following steps:

- 3D-printing a beverage conduit (210; 310) by stacking titanium layers;
- forming at least one supplementation opening (466) in the beverage conduit (210) by 3D-printing by stacking titanium layers;
- positioning a supplementation inlet valve (462) in at least one supplementation opening (466); and
- coupling a supplementation conduit (216, 218, 220, 222, 224, 226) with the at least one supplementation opening (466);
- wherein the supplementation inlet valve (462) comprises an input section (454) adapted to be coupled with at least one of the supplementation conduits (216, 218, 220, 222, 224, 226) and an output section including two output elements (472, 474) that are biased against each other to close a gap formed between the two output elements (472, 474), wherein the two output elements (472, 474) contact each other, if no liquid is supplied into the input section, and wherein the two output elements are moved apart to open the gap between the two output elements (472, 474), if liquid is supplied into the input section of the supplementation input valve (462).









EUROPEAN SEARCH REPORT

 Application Number
EP 20 19 8736

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2017/225936 A1 (JERSEY STEVEN T [US] ET AL) 10 August 2017 (2017-08-10)	1-3,5,6,10-14	INV. B67D1/00
Y	* paragraphs [0003], [0052] - [0062], [0070], [0076], [0102] - [0104], [0113], [0117] *	7,9	ADD. B67D1/07
X	US 2007/257059 A1 (STEVENSON WILLIAM C [US]) 8 November 2007 (2007-11-08)	1-3,5,10,11,13,14	
X	* paragraph [0014] - paragraph [0019] *		
X	WO 2010/015828 A1 (WATER WERKZ LTD [GB]; GREEN ADAM LLYWELLYN [GB]) 11 February 2010 (2010-02-11)	1,3,4,10,11,13,14	
Y	* page 6, line 12 - page 7, line 7 *		
Y	EP 2 759 234 A1 (FRIESLAND BRANDS BV [NL]) 30 July 2014 (2014-07-30)	7	
Y	* paragraph [0040] - paragraph [0044] *		
Y	US 6 098 418 A (KYEES MELVIN D [US]) 8 August 2000 (2000-08-08)	9	TECHNICAL FIELDS SEARCHED (IPC) B67D
	* column 3, line 46 - line 56 *		
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 December 2020	Examiner Desittere, Michiel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

 1
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 20 19 8736

5

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

18-12-2020

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2017225936 A1	10-08-2017	AU 2017213823 A1	09-08-2018
		BR 112018015941 A2	18-12-2018
		CA 3012468 A1	10-08-2017
		CN 108602661 A	28-09-2018
		EP 3411326 A1	12-12-2018
		JP 6585854 B2	02-10-2019
		JP 2019505449 A	28-02-2019
		US 2017225936 A1	10-08-2017
		WO 2017136555 A1	10-08-2017

US 2007257059 A1	08-11-2007	NONE	

WO 2010015828 A1	11-02-2010	NONE	

EP 2759234 A1	30-07-2014	EP 2759234 A1	30-07-2014
		WO 2014116109 A1	31-07-2014

US 6098418 A	08-08-2000	AU 9321098 A	05-04-1999
		US 6098418 A	08-08-2000
		WO 9914155 A2	25-03-1999

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- DE 202010006679 U1 **[0004]**
- WO 9406547 A1 **[0005]**
- US 5443739 A **[0006]**
- EP 3663578 A1 **[0007]**
- EP 3489200 A1 **[0008]**
- EP 3489200 A **[0046] [0059]**
- US 2016198997 A **[0046] [0059]**
- CN 201811406508 **[0046] [0059]**