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(54) **A DISPENSING SYSTEM FOR DISPENSING A SOLID SUBSTANCE BEING CONDUCTIVE IN SOLUTION AND AN ACCORDING METHOD**

(57) 1. A method for dispensing a soluble but solid substance (20), comprising the steps of:
- providing a dispensing system (10),
- placing the solid substance (20) or a capsule (16, 18) containing the solid substance (20) into a first container (12) and a second container (14) of the dispensing system (10),
- spraying the first container (12) and/ or the second container (14) with water from a water supply (28) such that an amount of the solid substance (20) dissolves and a thus resulting solution (34) flows into a solution reservoir (36),
- measuring the conductivity of the solution (34) inside the solution reservoir (36),
- continuously or discontinuously spraying the first container (12) and/or the second container (14) and measuring the conductivity of the solution (34) inside the solution reservoir (36),
- discharging at least a portion of the solution (34) via at least a first discharge line (42),
- replacing the solid substance (20) or the capsule (16, 18) containing the solid substance (20) in the first container (12) and/or the second container (14) after the solid substance (20) in the first container (12) and/or the second container (14) is completely dissolved.

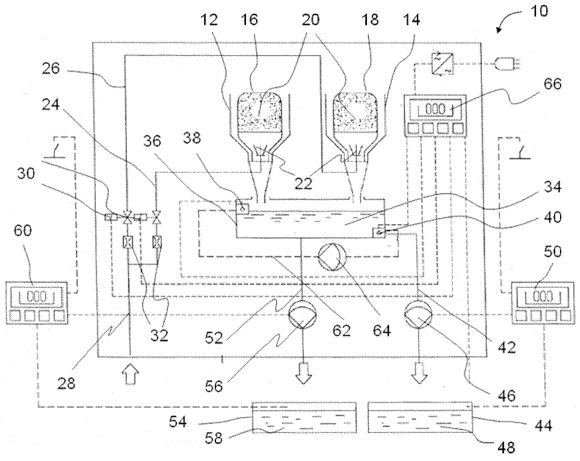

Fig. 1

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Description

Technical field of the invention

[0001] The present invention relates to a method for dispensing a soluble but solid substance using a dispensing system.

Background of the invention

[0002] A solid substance concentrate which can be brought into solution, for example for cleaning purposes in multiple professional ware-washing machines or the like, has compared to corresponding liquid substance concentrates the advantage that normally the concentration of the active components is much higher than the concentration of said active components in a corresponding liquid substance, since the amount of solvent is reduced or the solvent can even be avoided at all. This has the advantage that the solid substance, i.e. a solid detergent substance, saves volume and weight with respect to storage and transportation capacities. Further, remote dosing of the solvent from a central dispensing system has the advantage of keeping the solid substance concentrate and the dispensing system separated from the point of use where the solution is needed, e.g. a kitchen. Thus, health risks due to the potentially hazardous solid substance concentrate may be avoided. However, such solid substances need to be brought into solution in order to use them, for example in a cleaning process. Devices and methods for the generation of liquid detergent concentrates from solid detergent substances are well known in the state of the art.

[0003] The WO 2008/077437 A1, for example, describes a dosing apparatus for dosing a soluble but solid composition and a corresponding method for dosing, the dosing apparatus comprises at least one box, preferably a capsule, for keeping the solid composition, a solution reservoir for keeping the composition solution, at least one spray means for bringing the composition solution into contact with the solid composition being in the box such that an amount of the solid composition dissolves and the thus resulting solution flows into the solution reservoir, a supply line comprising a liquid connection for supplying a liquid, preferably water, to the solution reservoir, a discharge line, comprising a discharge for discharging the composition solution, a spray line for feeding the spray means with composition solution coming from the solution reservoir, a circulation line coming from the solution reservoir and ending in the solution reservoir for circulating composition solution, means, preferably two level gauges, for measuring the filling height in the solution reservoir, measuring means for measuring the conductivity of the composition solution, and at least one motorised feed pump for moving the composition solution. According to the WO 2008/077437 A1 the solid composition inside the capsules is dissolved by spraying it with the solution inside the solution reservoir, the composition solution. Thus, by spraying the solid composition with the composition solution, a certain mainly constant concentration of the composition solution inside the solution reservoir is maintained.

[0004] However, even if the dosing apparatus according to the WO 2008/077437 A1 provides an aqueous solution of a mainly constant concentration, there remain a few drawbacks if the used capsules are to be disposed.

[0005] For the disposal of containers that are filled with dangerous or harmful substance, for example concentrated cleaning substances, it is desirable to reduce the amount of substance left over in an emptied container to a minimum, in order to enable a normal disposal of the spent container. Moreover, an unintended contact of a person handling the emptied container with the substance is to be avoided in order to reduce health risks.

[0006] Therefore, there is a need for a dispensing system, which is capable of automatically dissolving a soluble but solid substance in such a manner, that the amount of substance left in the emptied capsule is reduced to a minimum or even reduced to zero.

[0007] It is therefore an object of the present invention to provide an improved dispensing system for dispensing a soluble but solid substance with respect to the automatic maintenance of at least a pre-determined concentration of a concentration of a solution, which enables a complete, substance free, emptying of the container. A further object of the present invention is to provide a method for dispensing a soluble but solid substance which comprises the use of the dispensing system according to the present invention.

SUMMARY OF THE INVENTION

[0008] This object is solved by means of a method for dispensing a soluble but solid substance having the features of claim 1. Preferred embodiments, additional details, features, characteristics and advantages of the object of the invention of said dispensing system and said method are disclosed in the dependent claims.

[0009] Solid substance in the sense of the present invention means any substance, pure or composed of several components, not being liquid or fluent but having a firm or solid constitution, a constant homogenous or varying concentration, including, for example, powders or formed blocks of the substance in any kind of shapes, preferably with little or no hollow spaces within the block. Also included are pastes or gels having a viscosity of above 20000 mPas.

[0010] In a general aspect of the invention the dispensing system for dispensing a soluble but solid substance, the substance being conductive in solution, comprises at least a first container and a second container for keeping a solid substance, a solution reservoir for holding a solution, at least one spray line allocated to each container connected to a water supply, at least one spray means allocated to each container, wherein the spray means is connected to the corresponding spray line, for

bringing water from the water supply into contact with the solid substance being inside the first container and the second container such that an amount of the solid substance dissolves and the thus resulting solution flows into the solution reservoir, means, preferably at least one level sensor, for measuring the filling height in the solution reservoir, measuring means for measuring the conductivity of the solution inside the solution reservoir, at least one first discharge line, through which the solution reservoir is connectable to a first tank, at least one first delivery pump for moving the solution from the solution reservoir through the first discharge line, and an electronic main control unit for controlling the operation of the dispensing system.

[0011] The first container and the second container may also be considered as a first pair of containers, containing the same solid substance. The first container and the second container may also hold different solid substances, which are both soluble, and form, after dissolving, a solution inside the solution reservoir of a desired concentration. This allows for the separate storage of solid substances, that for example may be too difficult or too dangerous to be stored together a pre-mixed single solid substance. The above described dispensing system according to the invention may also be used, for example, with a further third container and a fourth container, forming a second pair of containers, wherein, for example, the third container and the fourth container may hold the same or different solid substances. The water supply, the spray lines are connected to, may be pressurised, for example by a water pump. This allows for using e.g. a high pressure in order to dissolve the solid substance inside the containers. The flow of water from the water supply trough the spray line and the spray means allocated to each container, e.g. at the inside of the container, may be controlled by a valve, preferably a solenoid valve, located inside each spray line. This enables the controlled use, e.g. he dissolving of the solid substance inside the container, of each container separately and independently of one another. The means for measuring the filling height in the solution reservoir may be designed as a level sensor, preferably measuring a maximum level of the solution in the solution reservoir. The measuring means for measuring the conductivity of the solution inside the solution reservoir may be designed to measure a predefined conductivity, preferably a minimum conductivity, of the solution, wherein the conductivity of the solution corresponds to a certain concentration, e.g. of the solid substance in solution, of the solution. The measuring means for measuring the conductivity and/or the concentration of the solution may be based on an inductive conductivity technology. The first tank, to which the at least first discharge line is connectable, may for example be part of a remotely located washing machine and may be provided with sensor means for measuring the conductivity of a solution inside that first tank. The main control unit for controlling the operation of the dispensing system may, for example, control the spraying of the containers, preferably by controlling valves located inside the spray lines, monitor the conductivity of the solution in the solution reservoir by reading the data of the measuring means measuring the conductivity of the solution inside the solution reservoir, control the delivery pump for delivering the solution from the solution reservoir to for example the first tank. The main control unit may also receive data from the sensor means for measuring the conductivity of a solution inside the first tank. The dispensing system may be not only be used for the remote, central dispensing or dosing of solid substances, dissolved preferably with water, for multiple professional ware-washing machines, but also for the remote, central dispensing of solid substances for e.g. floor care, bottle washer, instrument cleaning, car washer, tunnel washer and/or wash extractors.

[0012] The dispensing system according to the present invention has a few advantages over devices according to the state of the art. For example, one advantage is that the dispensing system uses water, for example fresh or potable water or drinking quality water, for spraying the containers and thus dissolving the solid substances. This enables the dispensing system to flush or spray the containers with water until all the solid substance has been dissolved, leaving the container reliable residue-free of the solid substance and solution-free. Before discharge the inside of the containers has only been in contact with fresh or potable water, thus the emptied container may be disposed efficiently and cost effective as common plastic, thus avoiding high cost for disposal and also avoiding a person removing the container to get into contact with the potentially hazardous solid substance or its solution.

[0013] Another advantage of the dispensing system according to the invention is that by measuring the conductivity of the solution inside the solution reservoir, the dispensing system can detect an empty container by a change in the conductivity of the solution. Hence, a signal may be provided, indicating the empty container and thus enabling an exchange of the container in due time.

[0014] A further important advantage of the present dispensing system is that by measuring the conductivity of the solution in the solution reservoir and using at least two containers with a solid substance, it is possible to use one container first, with at least a second container as stand-by, wherein the second container is sprayed after the first container has been emptied or the second container may be used at least partially at the same time as the first container in order to keep the conductivity of the solution inside the solution reservoir at a predetermined conductivity, preferably above a predetermined minimum conductivity, while at the same time allowing the first container to be emptied residue free. The measured conductivity of the solution in the solution reservoir may be used as an indicator for an emptied container and/or as an indicator for activating the spraying of a further, i.e. the second, container. Hence, the solution reservoir is always filled with a useable solution of, pref-

erable a minimum, conductivity. Further, this allows for replacing or refilling for example the first container after it has been emptied, while at the same time the second container is sprayed in order to dissolve the solid substance inside the second container. Thus, a continuous, interrupt-free operation of the dispensing system with a continuous solid substance supply is provided.

[0015] In another embodiment of the invention the dispensing system further comprises a second discharge line connectable to a second tank and a second delivery pump. The second tank may for example be part of a second remotely located washing machine. This enables the use of a second tank which may be supplied with solution from the solution reservoir independently from the first tank.

[0016] In another preferred embodiment of the invention the dispensing system further comprises a circulation line connected to the solution reservoir and a circulation pump for circulating the solution through the circulation line. Thus, the solution in the solution reservoir may be circulated for example every time after a container and/or capsule has been sprayed, thereby providing a balanced concentration or mixture of the solution in the solution reservoir. Also by circulating the solution the quality of the solution in the solution reservoir may be kept stable. The solution may be circulated at intervals or continuously or at predetermined times. The circulation time may be adjusted, for example, depending on the solid substance used with the dispensing system.

[0017] In a particularly preferred embodiment of the invention the level sensor may be submerged in the solution and/or overflown by the solution. The level sensor may be designed in such a way, that after a predetermined upper level or maximum level of the solution inside the solution reservoir has been detected and has lead to a stop, preferably delayed by a predetermined time, in spraying, the amount of solution entering the solution reservoir after the measurement of the maximum level is large enough to cover the level sensor so that it is fully submerged in the solution. The level sensor may also be designed in such a way, that the solution entering the solution reservoir, i.e. from spraying and/ or circulating, overflows the level sensor. Thus, the level sensor is cleaned periodically or continuously by the solution inside the solution reservoir, avoiding for example a misreading due to dirt on the level sensor.

[0018] Furthermore, in a preferred embodiment of the invention the at least one first delivery pump is controllable by an external control unit. The use of an external control unit, which may be located for example directly at the first washing machine comprising the first tank and not next to the central dispensing system, the ease of using the dispensing system is increased, as an operator may choose for example the desired concentration of a use solution directly at the corresponding washing machine. The external control unit allocated to the first washing machine comprising the first tank, may for example control the first delivery pump and measure the conductivity of the first use solution inside the first tank. This allows to provide a use solution for direct usage inside a washing machine for example, independently from another tank. It is possible to mix an individual use solution inside each tank, for example a first use solution inside the first tank, with an individual concentration of the use solution. The concentration of the use solution for each tank may be predetermined for each tank independently and separately. Depending on the desired concentration of the use solution and the conductivity of the solution inside the solution reservoir, the amount of solution that needs to be pumped from the solution reservoir to the corresponding tank may be determined.

[0019] In a further preferred embodiment of the invention the first container and the second container are capable of each holding a capsule containing a solid substance in a way that the spray means are capable of bringing water into contact with the solid substance and that the resulting solution can flow into the solution reservoir. Using a capsule containing the solid substance increases the ease of handling the solid substance and also increases the safety of persons handling the capsules and/or containers as there is no need to handle loose solid substance. Only sealed capsules are to be handled which are residue free of solid substance and/or solution after use.

[0020] A further aspect of the present invention is a method for dispensing a soluble but solid substance, comprising the steps of placing the solid substance or a capsule containing the solid substance into a first container and a second container of the above described dispensing system, spraying the first container and/ or the second container with water from a water supply such that an amount of the solid substance dissolves and a thus resulting solution flows into a solution reservoir, measuring the conductivity of the solution inside the solution reservoir, continuously or discontinuously spraying the first container and/or the second container and measuring the conductivity of the solution inside the solution reservoir, discharging at least a portion of the solution via at least a first discharge line, replacing the solid substance or the capsule containing the solid substance in the first container and/or the second container after the solid substance in the first container and/or the second container is completely dissolved.

[0021] Following the placing the solid substances or the capsules containing the solid substances into the first container and the second container of the dispensing system, the main control unit may choose a container which is to be sprayed first. This may be based on the assumption that a replaced and/or refilled container and/or capsule is completely filled with the solid substance. For spraying the first container and/or second container a water valve may be opened, allowing water to flow from the water supply through the first spray line and/ or the second spray line towards the spray means allocated to the containers. The water is sprayed by spray means onto the solid substance dissolving the solid sub-

stance. The thus resulting solution flows into the solution reservoir, from where it may be pumped for example by the first delivery pump via the first discharge line into the first tank, where a use solution of a predetermined concentration may be set up. The discharged solution from the solution reservoir is refilled by spraying and dissolving more solid substance. As the containers and/ or capsules are sprayed with fresh or potable water only, their replacement and/ or disposal does not require any special safety measures.

[0022] In a preferred embodiment of the method one container, the first container or the second container, is sprayed first, until the solid substance in the first container or the second container is completely dissolved, and then the other container, the second container or the first container is sprayed. This allows for a residue free spraying of first a single container for example the first container and/ or first capsule, thus enabling the disposing of for example the emptied first capsule without the need for special safety precautions due to hazardous solution remaining in the capsule for example. Further, the use of at least two containers and/ or capsules allows for switching from spraying the first container and/ or first capsule to spraying the second container and/ or second capsule when the first container and/ or first capsule is empty, thus allowing a continuous operation of the dispensing system. Also the second container may be sprayed first, before the first container, for example directly after the second container has been replaced and therefore is completely filled with the solid substance.

[0023] In a particularly preferred embodiment of the method one container, the first container or the second container, is sprayed first, until the conductivity of the solution in the solution reservoir reaches a predefined value, then both containers, the first container and the second container, are sprayed simultaneously, until the solid substance inside the container sprayed first is completely dissolved. The second capsule and/ or second capsule may be sprayed as soon as the conductivity, and hence the concentration, of the solution in the solution reservoir reaches a predetermined, preferably minimum, value. For example, after detecting an empty or almost empty first container and/ or first capsule both containers and/ or capsules may be sprayed, for example ten times, simultaneously in order to ensure a thorough cleansing of the first container and/ or capsule while at the same time maintaining the conductivity of the solution above a desired level. This allows for a continuous operation of the dispensing system while maintaining the conductivity and thus the concentration of the solution in the solution reservoir above a predetermined level and at the same time providing residue free containers and/ or capsules that may be refilled and/or exchanged and disposed without any health risks due to remaining solution. Also the second container may be sprayed first, before the first container, for example directly after the second container has been replaced and therefore is completely filled with the solid substance.

[0024] In a further preferred embodiment of the method the solution inside the solution reservoir is continuously or discontinuously circulated by a circulation pump via a circulation line. The solution may be circulated when no solution is disposed in order to keep the quality, for example the homogeneity, of the solution constant. The solution may also be circulated after each spraying of the solid substance in order to provide a homogeneous solution with a uniformly concentration.

[0025] In a preferred embodiment of the method the spraying, preferably the timing of the spraying, of the first container and/ or the second container, the work of the level sensor and/or the measuring means, the timing of the circulation of the solution through the circulation line, the amount of solution discharged through the at least one first discharge line are controlled by the main control unit. This allows for an automated operation of dispensing the soluble but solid substance, wherein a person performing the method, for example, merely needs to decide which conductivity, and thus concentration, the solution in the solution reservoir should have. Further, the replacing of the solid substance in the containers and/ or the replacing of the emptied capsules may be done during performing the method.

[0026] In a most preferred embodiment of the method the amount of solution discharged through the at least one first discharge line is controlled by an external control unit. The external control unit may be allocated for example to the first tank inside a first washing machine at a remote site. Thus, the amount of solution needed in order to provide a use solution of a certain conductivity in the first tank may be controlled from the remote site.

[0027] In another aspect of the present invention the solid substance which is used together with the above described dispensing system and the corresponding method for dispensing a solid substance, being conductive in solution, comprises at least one or more of the components selected from the group comprising alkali source, surfactant component, nonionic surfactant, anionic surfactant, cationic surfactants, amphoteric surfactants, chelant, polyethylene glycol, corrosion inhibitor, threshold inhibitor/crystal modifier, sequestering agent, solvents, bleaching agent, hydrotrope component, organic carboxylic acid, salts, additives.

[0028] An exemplary source of alkalinity include alkali metal hydroxides, alkali metal salts, phosphates, amines, and mixtures thereof. The surfactant component can be used to reduce surface tension and wet the soil particulate to allow penetration of the use solution and separation of the soil.

[0029] The surfactant component can include anionic surfactants, nonionic surfactants, but other than (a) nonionic lower alkoxylated alcohol tenside and (b) nonionic higher alkoxylated alcohol tenside mentioned above, amphoteric surfactants and mixtures thereof.

[0030] Exemplary nonionic surfactants that can be used in the composition of the first component of the invention are alkoxylated, preferably ethoxylated or ethox-

ylated and propoxylated, fatty acid alkyl esters preferably containing 1 to 4 carbon atoms in the alkyl chain, more particularly the fatty acid methyl esters.

[0031] Exemplary anionic surfactants that can be used include organic carboxylates, organic sulfonates, organic sulfates, organic phosphates and the like, particularly linear alkylaryl sulfonates, such as alkylarylcarboxylates, alkylarylsulfonates, alkylarylphosphates, and the like. These classes of anionic surfactants are known within the surfactant art as linear alkyl benzyl sulfonates (LABS), alpha olefin sulfonates (AOS), alkyl sulfates, and secondary alkane sulfonates.

[0032] Suitable cationic surfactants include quaternary ammonium compounds having the formula of RR'R"R"'N+X-, where R, R', R" and R'" are each a C1-C24 alkyl, aryl or arylalkyl group that can optionally contain one or more P, O, S or N heteroatoms, and X is F, Cl, Br, I or an alkyl sulfate. Additional preferred cationic surfactants include ethoxylated and/or propoxylated alkyl amines, diamines, or triamines. Examples of suitable amphoteric surfactants include capryloamphopropionate, disodium lauryl B-iminodipropionate, and cocoamphocarboxypropionate, and disodium octylimino dipropionate. Exemplary chelants that can be used according to the invention include phosphonates, sodium gluconate, pentasodium salt of diethylenetriamine pentaacetic acid (available under the name Versenex 80), sodium glucoheptonate, ethylene diamine tetraacetic acid (EDTA), salts of ethylene diamine tetraacetic acid, hydroxyethyl ethylene diamine triacetic acid (HEDTA), salts of hydroxyethyl ethylene diamine triacetic acid, nitrilotriacetic acid (NTA), salts of nitrilotriacetic acid, diethanolglycine sodium salt (DEG), ethanoldiglycine disodium salt (EDG), tetrasodium N,N-bis(carboxylatomethyl)-L-glutamate (GLDA), and mixtures thereof. Exemplary salts of ethylene diamine tetraacetic acid include disodium salts, tetrasodium salts, diammonium salts, and trisodium salts. An exemplary salt of hydroxyethyl ethylene diamine triacetic acid is the trisodium salt.

[0033] A suitable polyethylene glycol for use in the present invention can have a molecular weight (MW) in the range of about $\geq$ 4000 to about $\leq$ 12000, preferably about $\geq$ 6000 to about $\leq$ 10000 and more preferred of about $\geq$ 7000 to about $\leq$ 8000.

[0034] The corrosion inhibitor can be selected from the group comprising silicate, calcium acetate, calcium chloride, calcium gluconate, calcium phosphate, calcium borate, calcium carbonate, calcium citrate, calcium lactate, calcium sulfate, calcium tartrate, benzotriazole, 1,2,3-benzotriazole and mixtures thereof. More preferred, the corrosion inhibitor is a heterocyclic compound, a triazole derivate, such as a benzotriazole or 1,2,3-benzotriazole and mixtures thereof.

[0035] The threshold inhibitor/crystal modifier can be selected from the group comprising salts of phosphonocarboxylic acids, phosphonates, salts of 1-hydroxyethylidene -1,1,-diphosphonic acid (HEDP), salts of acid substituted polymers, and mixtures thereof. Preferably salts of acid substituted polymers of monomers of acrylate, methacrylate, salts of polyitaconic acid, salts of polymaleic acid, and mixtures thereof. In particular preferred are salts of polyacrylic acid. The solid alkaline composition according to the present invention can comprise at least one sequestering agent. The sequestering agent can be selected from the group of sodium gluconate, pentasodium salt of diethylenetriamine pentaacetic acid, sodium glucoheptonate, salts of ethylene diamine tetraacetic acid, salts of ethylene diamine tetraacetic acid, salts of hydroxyethyl ethylene diamine triacetic acid, salts of hydroxyethyl ethylene diamine triacetic acid, salts of nitrilotriacetic acid, salts of nitrilotriacetic acid, diethanolglycine sodium salt, ethanoldiglycine disodium salt, salts of hydroxymonocarboxylic acid compounds, salts of hydroxydicarboxylic acid compounds, salts of amine containing carboxylic acids, terasodium N,N-bis(carboxylatomethyl)-L-glutamate (GDLA) and mixtures thereof.

[0036] Suitable solvents include, but are not limited to, water, alcohols, glycols, glycol ethers, esters, and the like, or combinations thereof. Suitable alcohols include, but are not limited to, ethanol, isopropanol (propan-2-ol), 2-butoxy ethanol (butyl glycol), 1-decanol, benzyl alcohol, glycerin, monoethanolamine (MEA), and the like, or combinations thereof.

[0037] The bleaching composition can include at least one agent or agents that provide bleaching properties, an agent or agents that provide antimicrobial properties, and agents that provide both bleaching and antimicrobial properties. The bleaching composition can comprise H2O2 and/or a peroxy acid of acetic acid, hydroxyethylene diphosphonic acid, sulfonated oleic acid, octanoic acid.

[0038] It should be understood that the hydrotrope component is optional and can be omitted if it is not needed for stabilizing the surfactant component. In many cases, it is expected that the hydrotrope component will be present to help stabilize the surfactant component. Examples of the hydrotropes include the sodium, potassium, ammonium and alkanol ammonium salts of xylene, toluene, ethylbenzoate, isopropylbenzene, naphthalene, alkyl naphthalene sulfonates, phosphate esters of alkoxylated alkyl phenols, phosphate esters of alkoxylated alcohols, short chain (C8 or less) alkyl polyglycoside, sodium, potassium and ammonium salts of the allcyl sarcosinates, salts of cumene sulfonates, amino propionates, diphenyl oxides, and disulfonates. The organic carboxylic acids can be present in its salt form, preferably as sodium salt.

[0039] Suitable organic carboxylic acids, but are not limited to, are C3 to C9 organic carboxylic acids selected from the group comprising gluconic acid, lactic acid, citric acid, glycolic acid, acetic acid, propionic acid, succinic acid, glutaric acid, adipinic acid, butanedioic acid, isoascorbic acid, ascorbatic acid and tatric acid. Suitable organic carboxylates, but are not limited to, are C3 to C9 organic carboxylates selected from the group comprising gluconate, lactate, citrate, glycolate, acetate, propionate,

succinate, glutarate, adipate, butanedioate, isoascorbate, sodium ascorbate and tatrate and preferably sodium salts thereof. Most preferred is gluconic acid and/or gluconate. Preferably, the gluconate is present as sodium gluconate.

[0040] However, salts can be suitable added to the composition for cleaning of the invention. The components that can be added to the composition for cleaning, the concentrated solution and/or ready to use solution include salts provided in water-soluble form. The salt can be function as analytical tracer. Preferred are salts selected from the group of lithium chloride, lithium iodide, sodium chloride, sodium iodide, potassium chloride, potassium iodide, sodium sulphate, sodium acetate, potassium acetate, sodium nitrate, sodium phosphate and mixtures thereof.

[0041] Additives may include, but are not limited to dyes, color transfer inhibitors, solvents, Exemplary additional agents include anti-redeposition agents, optical brighteners, sequestrates, builders, water conditioning agents, oil and water repellant agents, color fastness agents, starch/sizing agents, fabric softening agents, souring agents, iron controlling agents, antimicrobials, fungicides, UV absorbers and/or fragrances, and the like.

[0042] Solid compositions that can be used in the apparatus of the present invention can be obtained from ECOLAB.

[0043] In a preferred embodiment of the invention the conductivity of the solution in the solution reservoir is about 5 mS/cm to about 250 mS/cm, preferably about 10 mS/cm to about 200 mS/cm, more preferably about 15 mS/cm to about 150 mS/cm, even more preferably about 20 mS/cm to about 120 mS/cm, and most preferably about 30 mS/cm to about 100 mS/cm, if the solution has a concentration of about 1 wt.-% to about 10 wt.-%, preferably of about 7 wt.-% in water.

[0044] In a most preferred embodiment of the present invention the rate of dissolving of the solid substance by spraying with water is about 5 g/l to about 200 g/l, preferably about 6 g/l to about 175 g/l, more preferably about 8 g/l to about 150 g/l, even more preferably about 9 g/l to about 125 g/l, and most preferably about 10 g/l to about 100 g/l, at a Temperature of about 10°C to about 60°C, preferably of about 20°C to about 50°C, and most preferably of about 30°C to about 40°C.

[0045] In a particularly preferred embodiment of the invention the rate of dissolving of the solid substance by spraying with water is about 5 g/l to about 200 g/l, preferably about 6 g/l to about 175 g/l, more preferably about 8 g/l to about 150 g/l, even more preferably about 9 g/l to about 125 g/l, and most preferably about 10 g/l to about 100 g/l, and the conductivity is about 5 mS/cm to about 250 mS/cm, preferably about 10 mS/cm to about 200 mS/cm, more preferably about 15 mS/cm to about 150 mS/cm, even more preferably about 20 mS/cm to about 120 mS/cm, and most preferably about 30 mS/cm to about 100 mS/cm, at a Temperature of about 10°C to about 60°C, preferably of about 20°C to about 50°C, and most preferably of about 30°C to about 40°C.

[0046] The afore mentioned components, as well as the claimed components and the components to be used in accordance with the invention in the described embodiments, are not subject to any special exceptions with respect to their size, shape, material selection and technical concept such that the selection criteria known in the pursuant field can be applied without a limitation.

DESCRIPTION OF THE FIGURES

[0047] Additional details, features, characteristics and advantages of the object of the invention are disclosed in the figures and the following description of the respective figures, which - in exemplary fashion - show one embodiment and an example of a dispensing system according to the invention. In the drawings:

Fig. 1 shows a schematically illustration of a dispensing system according to the present invention;

Fig. 2 shows a perspective view of one actual embodiment of the dispensing system according to the present invention.

[0048] The illustration in Fig. 1 shows an embodiment of the present invention. In Fig. 1 a central solid dispensing system 10 is shown, comprising a first container 12 and a second container 14 for holding a first capsule 16 and a second capsule 18. The first capsule 16 and the second capsule 18 are filled with a solid substance 20. Inside the first container 12 and the second container 14 spray means 22 are located in such a way, that they can spray the inside of the first capsule 16 and the second capsule 18 and thus the solid substance 20. The spray means 22 are connected to a first spray line 24, corresponding to the first container 12, and a second spray line 26, corresponding to the second container 14. The spray lines 24,26 are connected to a water supply 28, delivering fresh or potable water, which may be pressurised e.g. by a water pump (not shown). Each spray line 24,26 comprises a water valve 30, preferable a solenoid valve, a flow restrictor 32, and, in order to protect the water supply 28, a safety device (not shown), which may be located between in the spray line 24,26 between the water valve 30 and the spray means 22. As a further safety device, a capsule switch (not shown) inside the solid substance 20 may be provided. Opening the water valve of the first spray line 24 and/ or the second spray line 26 allows the water to flow from the water supply 28 through the respective spray line 24,26 to the spray means 22 located inside the first container 12 and the second container 14.

[0049] The spray means 22 are arranged in such a way as to reach into the first capsule 16 and the second capsule 18, allowing the water to be directly sprayed onto the solid substance 20. The solid substance 20 is subsequently at least partially dissolved, and the resulting

solution 34 flows into a solution reservoir 36. Inside the solution reservoir 36 a means for measuring the filling height of the solution 34 is located in form of a level sensor 38. The level sensor 38 may be designed in such a way, that it is fully submerged in the solution 34 and/ or may be overflown by the solution 34.

[0050] Inside the solution reservoir 36 also a measuring means 40 for measuring the conductivity of the solution 34 is provided. By measuring the conductivity of the solution 34 it is possible to determine the concentration of the solution 34, for example a high conductivity corresponds to a high concentration of the solid substance 20 dissolved in the solution 34. The solution 34 may be discharged partially from the solution reservoir 36 through a first discharge line 42 into a first tank 44 by a first delivery pump 46. The first tank 44 may be part of a first washing machine (not shown), which may be located at a remote site. Inside the first tank 44 a first use solution 48 may be provided. The concentration of the first use solution 48 may be lower than the concentration of the solution 34 in the solution reservoir 36.

[0051] A first external control unit 50 is connected to the first delivery pump 46 and to the first tank 44 and may therefore control the amount of solution 34 to be pumped into the first tank 44. The first external control unit 50 may for example measure the level of the first use solution 48 inside the first tank 44 of the first washing machine (not shown) and may also measure the conductivity of the first use solution 48. This enables the first external control unit 50 to provide a first use solution 48 of a predetermined concentration by adding an appropriate amount of the solution 34 via the first delivery pump 46 to the first tank 44. Thus a first use solution 48 of a predetermined concentration may be provided, independently from a possibly varying concentration of the solution 34 in the solution reservoir 36.

[0052] Further a second discharge line 52, connected to a second tank 54, for example as part of a second washing machine (not shown) located at a remote site, is provided with a second delivery pump 56 for pumping the solution 34 at least partially into the second tank 54. A use solution 58 may be provided in the second tank 56 controlled by a second external control unit 60, which is designed analogue to the first external control unit 50. The second external control unit 60 is connected to the second delivery pump 56 and the second tank 54 and may therefore control the amount of solution 34 to be pumped into the second tank 54. The second external control unit 60 enables the mixing of a second use solution 58 with a concentration that is different and independently of the concentration of for example the first use solution 48.

[0053] Further a circulation line 62 connected to the solution reservoir 36 is provided for circulating the solution 34. The solution 34 is circulated through the circulation line 62 by a circulation pump 64. The central solid dispensing system 10 is controlled by a main control unit 66. The main control unit 66 is at least connected to the level sensor 38, the measuring means 40 and the water valves 30 inside the spray lines 24,26. This enables the main control unit 66 to operate the water valves 30 and thus the spraying means 22 independently and/or according to the conductivity and the filling level of the solution 34 inside the solution reservoir 36. The main control unit 66 may also communicate, for example for exchanging data, with at least the first external control unit 50 and the second external control unit 60, for example of the first washing machine and the second washing machine (both not shown).

[0054] The in Fig. 1 shown and above described central solid dispensing system may be operated according to the following example. The first capsule 16 may be sprayed with water, preferably fresh water, from the water supply 28 by the spray means 22. When the level sensor 38 indicates the reaching of the maximum level inside the solution reservoir 36, the water valve 30 inside the first spray line 24 may be closed after a predefined time. This ensures that the level sensor 38 will be overflown and submerged. This may be done periodically or continuously, so that the level sensor 38 will be cleaned periodically. The second capsule 18 is not sprayed and used as a stand-by capsule. The conductivity of the solution 34 in the solution reservoir 36 is measured by the measuring means 40 while the circulation pump 64 is operating. When the for example the first delivery pump 46 is operating, the level sensor 38 will indicate a falling level of the solution 34. The main control unit 66 will open the water valve 30 of the first spray line 24 in order to spray the solid substance 20 inside the first capsule 16 again. This will be repeated until the first capsule 16 is empty. That the first capsule 16 is empty may be detected by the measuring means 40 and may be displayed in the main control unit 66, when the measured conductivity of the solution 34 drops below a predefined value. Depending on the specific solid substance 20 the desired conductivity may be adjusted to a corresponding specific value. When the first capsule 16 is empty, the main control unit 66 will switch to spraying the stand-by second capsule 18, repeating the above described process until the second capsule 18 is empty. During the spraying of the second capsule 18 the first capsule 16 may be replace, wherein the empty first capsule 16 is residue-free of the solid substance 20. When the first capsule 16 is not replaced and both capsules are empty and the desired concentration is not reached within a certain time, an alarm may occur and an information to change the capsule may appear. When the solution 34 inside the solution reservoir 36 has at least the desired minimum concentration, the solution 34 may be pumped for example into the first tank 44. To ensure that the quality of the product stays stable the circulation pump 64 may start operation every time after spraying of the solid substance 20, wherein the circulation time may be adjusted depending on the solid substance 20 used.

[0055] In Fig. 2 a central solid dispensing system 10 is illustrated. The dispensing system 10 comprises a first

container 12 and a second container 14 for receiving a first capsule 16 and a second capsule 18 (both not shown) containing the solid substance 20. From the water supply 28 the water for spraying the first container 12 and the second container 16 is supplied. The dissolved solid substance 20 (not shown) flows into the solution reservoir 36. Connected to the solution reservoir 36 is the circulation line 62 through which the solution 34 (not shown) may be circulated by the circulation pump 64. A first discharge line 42 is connected to the solution reservoir 36.

[0056] The particular combinations of elements and features in the above detailed embodiments are exemplary only; the interchanging and substitution of these teachings with other teachings in this and the patents/applications incorporate by reference are also expressly contemplated. As those skilled in the art will recognize, variations, modifications, and other implementations of what is described herein can occur to those of ordinary skill in the art without departing from the spirit and the scope of the invention as claimed. Accordingly, the foregoing description is by the way of example only and is not intending as limiting. In the claims, the wording "comprising" does not exclude other elements or steps, and the identified article "a" or "an" does not exclude a plurality. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage. The inventions scope is defined in the following claims and the equivalents thereto. Furthermore, reference signs used in the description and claims do not limit the scope of the invention as aspected.

The invention refers to further aspects

[0057]

1. A dispensing system for dispensing a soluble but solid substance, the substance being conductive in solution, comprising:

at least a first container (12) and a second container (14) for keeping a solid substance (20),

a solution reservoir (36) for holding a solution (34),

at least one spray line (24,26) allocated to each container (12,14) connected to a water supply,

at least one spray means (22) allocated to each container (12,14), wherein the spray means (22) is connected to the corresponding spray line (24,26), for bringing water from the water supply (28) into contact with the solid substance (20) being inside the first container (12) and the second container (14) such that an amount of the solid substance (20) dissolves and the thus resulting solution (34) flows into the solution reservoir (36),

means, preferably at least one level sensor (38), for measuring the filling height in the solution reservoir (36),

measuring means (40) for measuring the conductivity of the solution (34) inside the solution reservoir (36),

at least one first discharge line (42), through which the solution reservoir (36) is connectable to a first tank (44),

at least one first delivery pump (46) for moving the solution (34) from the solution reservoir (36) through the first discharge line (42), and

an electronic main control unit (66) for controlling the operation of the dispensing system (10).

2. The dispensing system according to aspect 1, wherein the dispensing system (10) further comprises a second discharge line (52) connectable to a second tank (54) and a second delivery pump (56).

3. The dispensing system according to any of the preceding aspects, wherein the dispensing system (10) further comprises a circulation line (62) connected to the solution reservoir (36) and a circulation pump (64) for circulating the solution (34) through the circulation line (62).

4. The dispensing system according to any of the preceding aspects, wherein the level sensor (38) may be submerged in the solution (34) and/or overflown by the solution (34).

5. The dispensing system according to any of the preceding aspects, wherein the at least one first delivery pump (46) is controllable by an external control unit (50).

6. The dispensing system according to any of the preceding aspects, wherein the first container (12) and the second container (14) are capable of each holding a capsule (16,18) containing a solid substance (20) in a way that the spray means (22) are capable of bringing water into contact with the solid substance (20) and that the resulting solution (34) can flow into the solution reservoir (36).

7. A method for dispensing a soluble but solid substance (20), comprising the steps of:

- placing the solid substance (20) or a capsule (16,18) containing the solid substance (20) into

a first container (12) and a second container (14) of the dispensing system (10) according to any of the aspects 1 to 6,

- spraying the first container (12) and/ or the second container (14) with water from a water supply (28) such that an amount of the solid substance (20) dissolves and a thus resulting solution (34) flows into a solution reservoir (36),
- measuring the conductivity of the solution (34) inside the solution reservoir (36),
- continuously or discontinuously spraying the first container (12) and/or the second container (14) and measuring the conductivity of the solution (34) inside the solution reservoir (36),
- discharging at least a portion of the solution (34) via at least a first discharge line (42),
- replacing the solid substance (20) or the capsule (16,18) containing the solid substance (20) in the first container (12) and/or the second container (14) after the solid substance (20) in the first container (12) and/or the second container (14) is completely dissolved.

8. The method according to aspect 7, wherein one container, the first container (12) or the second container (14), is sprayed first, until the solid substance (20) in the first container (12) or the second container (14) is completely dissolved, and then the other container, the second container (14) or the first container (12) is sprayed.

9. The method according to aspects 7 or 8, wherein one container, the first container (12) or the second container (14), is sprayed first, until the conductivity of the solution (34) in the solution reservoir (36) reaches a predefined value, then both containers, the first container (12) and the second container (14), are sprayed simultaneously, until the solid substance (20) inside the container (12, 14) sprayed first is completely dissolved.

10. The method according to any of the aspects 7 to 9, wherein the solution (34) inside the solution reservoir (36) is continuously or discontinuously circulated by a circulation pump (64) via a circulation line (62).

11. The method according to any of the aspects 7 to 10, wherein the spraying, preferably the timing of the spraying, of the first container (12) and/ or the second container (14), the work of the level sensor (38) and/or the measuring means (40), the timing of the circulation of the solution (34) through the circulation line (62), the amount of solution (34) discharged through the at least one first discharge line (42) are controlled by the main control unit (66.

12. The method according to any of the aspects 7 to 11, wherein the amount of solution (34) discharged through the at least one first discharge line (42) is controlled by an external control unit (50).

13. The substance used together with the dispensing system according to aspects 1 to 7 or the method according to aspects 8 to 12, wherein the solid substance (20), being conductive in solution (34), comprises at least one or more of the components selected from the group comprising alkali source, surfactant component, nonionic surfactant, anionic surfactant, cationic surfactants, amphoteric surfactants, chelant, polyethylene glycol, corrosion inhibitor, threshold inhibitor/crystal modifier, sequestering agent, solvents, bleaching agent, hydrotrope component, organic carboxylic acid, salts, additives.

14. The substance according to aspect 13, wherein the conductivity of the solution (34) in the solution reservoir (36) is about 5 mS/cm to about 250 mS/cm, preferably about 10 mS/cm to about 200 mS/cm, more preferably about 15 mS/cm to about 150 mS/cm, even more preferably about 20 mS/cm to about 120 mS/cm, and most preferably about 30 mS/cm to about 100 mS/cm, if the solution (34) has a concentration of about 1 wt.-% to about 10 wt.-%, preferably of about 7 wt.-% in water.

15. The substance according to any of the aspects 13 to 14, wherein the rate of dissolving of the solid substance (20) by spraying with water is about 5 g/l to about 200 g/l, preferably about 6 g/l to about 175 g/l, more preferably about 8 g/l to about 150 g/l, even more preferably about 9 g/l to about 125 g/l, and most preferably about 10 g/l to about 100 g/l, at a Temperature of about 10°C to about 60°C, preferably of about 20°C to about 50°C, and most preferably of about 30°C to about 40°C.

16. The substance according to any of the aspects 13 to 15, wherein the rate of dissolving of the solid substance (20) by spraying with water is about 5 g/l to about 200 g/l, preferably about 6 g/l to about 175 g/l, more preferably about 8 g/l to about 150 g/l, even more preferably about 9 g/l to about 125 g/l, and most preferably about 10 g/l to about 100 g/l, and the conductivity is about 5 mS/cm to about 250 mS/cm, preferably about 10 mS/cm to about 200 mS/cm, more preferably about 15 mS/cm to about 150 mS/cm, even more preferably about 20 mS/cm to about 120 mS/cm, and most preferably about 30 mS/cm to about 100 mS/cm, at a Temperature of about 10°C to about 60°C, preferably of about 20°C to about 50°C, and most preferably of about 30°C to about 40°C.

List of reference signs

[0058]

10	dispensing system
12	first container
14	second container
16	first capsule
18	second capsule
20	solid substance
22	spray means
24	first spray line
26	second spray line
28	water supply
30	water valve
32	flow restrictor
34	solution
36	solution reservoir
38	level sensor
40	measuring means
42	first discharge line
44	first tank
46	first delivery pump
48	first use solution
50	first external control unit
52	second discharge line
54	second tank
56	second delivery pump
58	second use solution
60	second external control unit
62	circulation line
64	circulation pump
66	main control unit

Claims

1. A method for dispensing a soluble but solid substance (20), comprising the steps of:

- providing a dispensing system (10),
- placing the solid substance (20) or a capsule (16, 18) containing the solid substance (20) into a first container (12) and a second container (14) of the dispensing system (10),
- spraying the first container (12) and/or the second container (14) with water from a water supply (28) such that an amount of the solid substance (20) dissolves and a thus resulting solution (34) flows into a solution reservoir (36),
- measuring the conductivity of the solution (34) inside the solution reservoir (36),
- continuously or discontinuously spraying the first container (12) and/or the second container (14) and measuring the conductivity of the solution (34) inside the solution reservoir (36),
- discharging at least a portion of the solution (34) via at least a first discharge line (42),
- replacing the solid substance (20) or the capsule (16, 18) containing the solid substance (20) in the first container (12) and/or the second container (14) after the solid substance (20) in the first container (12) and/or the second container (14) is completely dissolved.

2. The method according to claim 1, wherein one container, the first container (12) or the second container (14), is sprayed first, until the solid substance (20) in the first container (12) or the second container (14) is completely dissolved, and then the other container, the second container (14) or the first container (12) is sprayed.

3. The method according to claim 1 or 2, wherein one container, the first container (12) or the second container (14), is sprayed first, until the conductivity of the solution (34) in the solution reservoir (36) reaches a predefined value, then both containers, the first container (12) and the second container (14), are sprayed simultaneously, until the solid substance (20) inside the container (12, 14) sprayed first is completely dissolved.

4. The method according to any of the claims 1 to 3, wherein the solution (34) inside the solution reservoir (36) is continuously or discontinuously circulated by a circulation pump (64) via a circulation line (62).

5. The method according to any of the claims 1 to 4, wherein the spraying, preferably the timing of the spraying, of the first container (12) and/ or the second container (14), the work of the level sensor (38) and/or the measuring means (40), the timing of the circulation of the solution (34) through the circulation line (62), the amount of solution (34) discharged through the at least one first discharge line (42) are controlled by the main control unit (66).

6. The method according to any of the claims 1 to 5, wherein the amount of solution (34) discharged through the at least one first discharge line (42) is controlled by an external control unit (50).

7. The method according to any of the claims 1 to 6, wherein the solid substance (20), being conductive in solution (34), comprises at least one or more of the components selected from the group comprising alkali source, surfactant component, nonionic surfactant, anionic surfactant, cationic surfactants, amphoteric surfactants, chelant, polyethylene glycol, corrosion inhibitor, threshold inhibitor/crystal modifier, sequestering agent, solvents, bleaching agent, hydrotrope component, organic carboxylic acid, salts, additives.

8. The method according to claim 7, wherein the con-

ductivity of the solution (34) in the solution reservoir (36) is about 5 mS/cm to about 250 mS/cm, preferably about 10 mS/cm to about 200 mS/cm, more preferably about 15 mS/cm to about 150 mS/cm, even more preferably about 20 mS/cm to about 120 mS/cm, and most preferably about 30 mS/cm to about 100 mS/cm, if the solution (34) has a concentration of about 1 wt.-% to about 10 wt.-%, preferably of about 7 wt.-% in water.

9. The method according to claims 7 or 8, wherein the rate of dissolving of the solid substance (20) by spraying with water is about 5 g/l to about 200 g/l, preferably about 6 g/l to about 175 g/l, more preferably about 8 g/l to about 150 g/l, even more preferably about 9 g/l to about 125 g/l, and most preferably about 10 g/l to about 100 g/l, at a temperature of about 10°C to about 60°C, preferably of about 20°C to about 50°C, and most preferably of about 30°C to about 40°C.

10. The method according to any of the claims 1 to 9, wherein the dispensing system (10) comprises: at least a first container (12) and a second container (14) for keeping a solid substance (20), a solution reservoir (36) for holding a solution (34), at least one spray line (24, 26) allocated to each container (12, 14) connected to a water supply, at least one spray means (22) allocated to each container (12, 14), wherein the spray means (22) is connected to the corresponding spray line (24, 26), for bringing water from the water supply (28) into contact with the solid substance (20) being inside the first container (12) and the second container (14) such that an amount of the solid substance (20) dissolves and the thus resulting solution (34) flows into the solution reservoir (36), means, preferably at least one level sensor (38), for measuring the filling height in the solution reservoir (36), measuring means (40) for measuring the conductivity the solution (34) inside the solution reservoir (36), at least one first discharge line (42), through which the solution reservoir (36) is connectable to a first tank (44), at least one first delivery pump (46) for moving the solution (34) from the solution reservoir (36) through the first discharge line (42), and an electronic main control unit (66) for controlling the operation of the dispensing system (10).

11. The method according to any of the claims 1 to 10, wherein the dispensing system (10) further comprises a second discharge line (52) connectable to a second tank (54) and a second delivery pump (56).

12. The method according to any of the claims 1 to 11, wherein the dispensing system (10) further comprises a circulation line (62) connected to the solution reservoir (36) and a circulation pump (64) for circulating the solution (34) through the circulation line (62)

13. The method according to any of the claims 1 to 12, wherein the level sensor (38) may be submerged in the solution (34) and/or overflown by the solution (34).

14. The method according to any of the claims 1 to 13, wherein the at least one first delivery pump (46) is controllable by an external control unit (50).

15. A dispensing system (10) constructed and configured to carry out the method according to any one of claims 1 to 14.

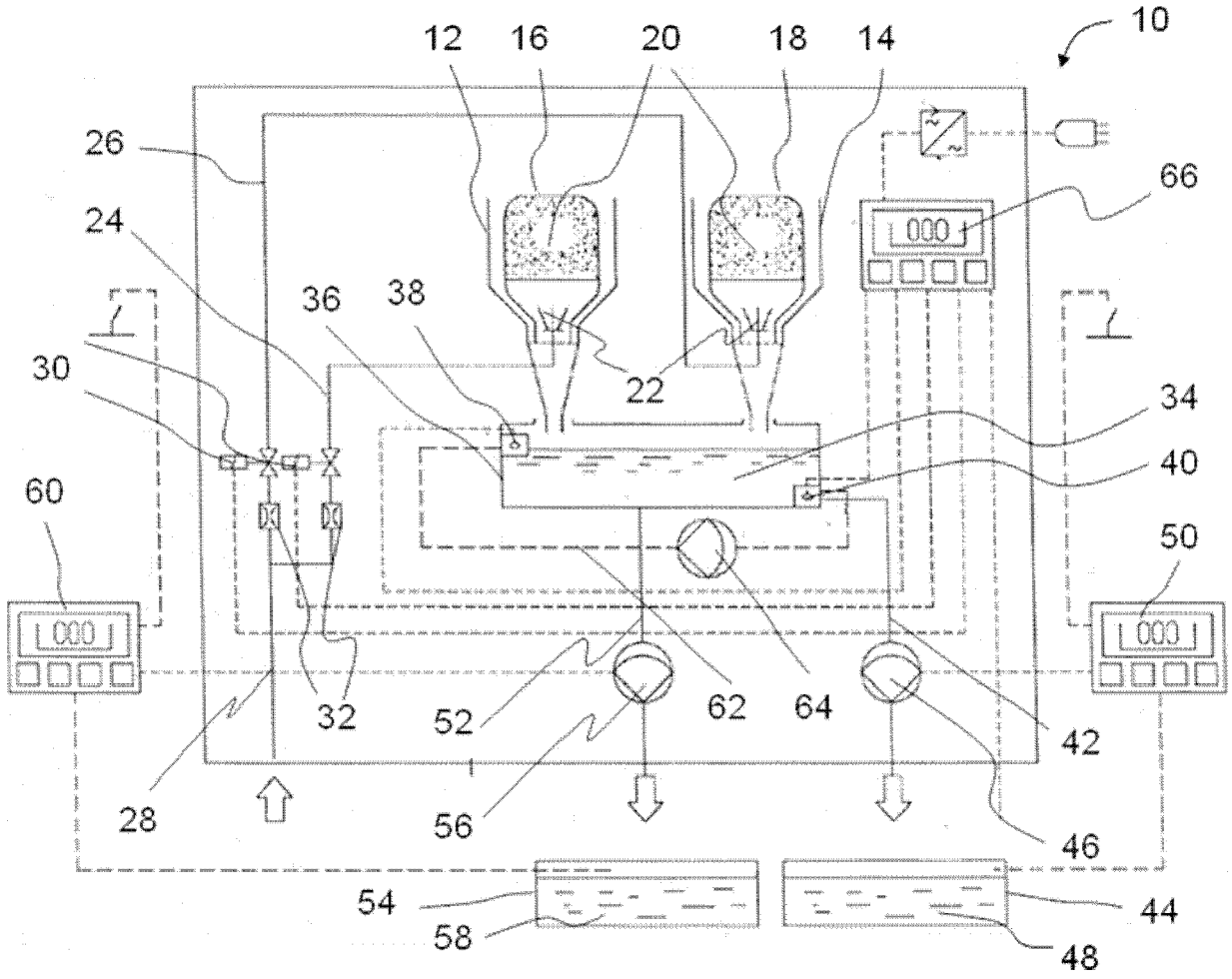
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Fig. 1

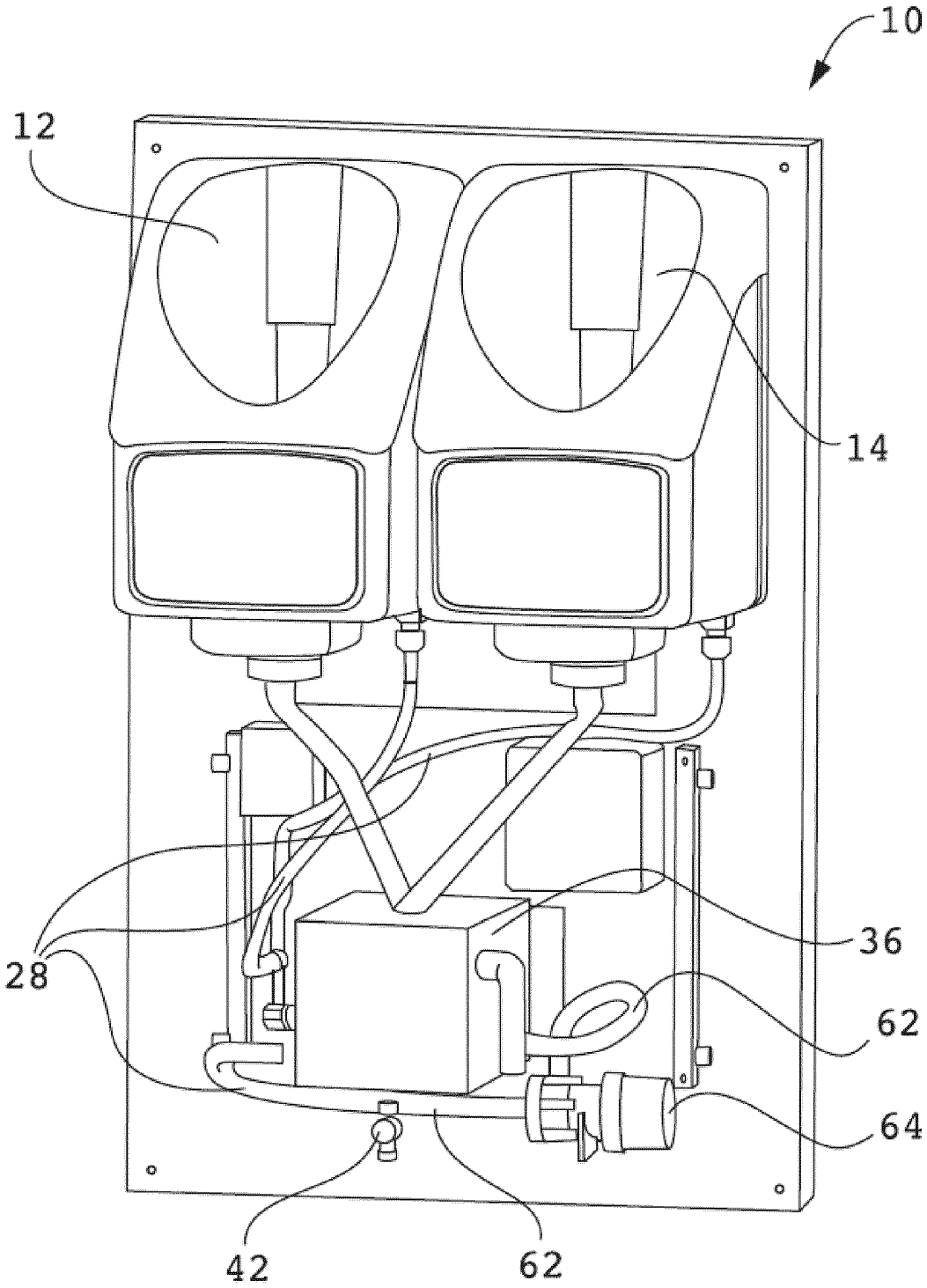

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 1892

DOCUMENTS CONSIDERED TO BE RELEVANT

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A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	19 February 2018	Blumenberg, Claus

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REFERENCES CITED IN THE DESCRIPTION

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