



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.10.2023 Bulletin 2023/42

(51) International Patent Classification (IPC):
G07F 13/06 (2006.01) **G07F 13/02** (2006.01)
B67D 1/00 (2006.01)

(21) Application number: **23167263.5**

(52) Cooperative Patent Classification (CPC):
G07F 13/06; B67D 7/02; B67D 7/743; G07F 13/025

(22) Date of filing: **11.04.2023**

(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 ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **COCCONI, Luca**
41036 Medolla (MO) (IT)
• **ARDIZZONI, Christian**
41036 Medolla (MO) (IT)

(74) Representative: **Karaghiosoff, Giorgio**
Alessandro
c/o Praxi Intellectual Property S.p.A. - Savona
Via F. Baracca 1R, 4° piano
"Il Gabbiano"
17100 Savona (IT)

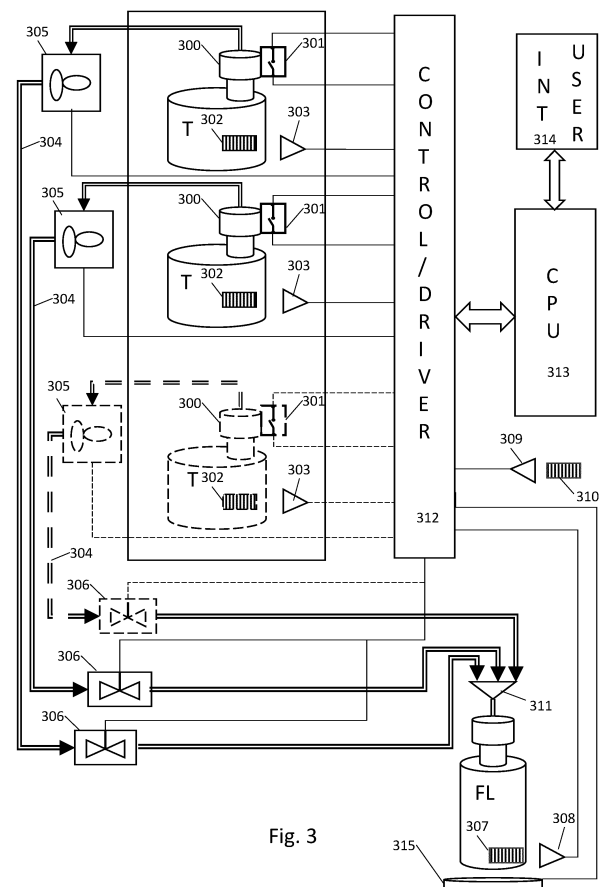
(30) Priority: **11.04.2022 IT 202200007127**

(71) Applicant: **AR-CO Chimica S.r.l.**
41036 Medolla (MO) (IT)

(54) **ON-DEMAND SYSTEM FOR SAFE PREPARATION OF LIQUID PRODUCT PACKAGES**

(57) The invention refers to a system for the safe preparation of packages of liquid products on demand, said system being intended to dose and dispense a pre-determined quantity of a liquid product from one or more tanks into a container. In order to make the system safer and more reliable both against counterfeiting and against improper use, each tank of product to be dispensed is provided with a unique identification code which is disabled upon assembly in the system. It is also possible to provide a unique identification code of the containers in which the product must be dispensed and/or unique identification codes of the users who require a specific product.

Dispensing takes place through separate ducts for each type of different component of the product to be dispensed. The process includes checks on the compatibility of the tanks and containers and/or users as well as on the composition and authorization for use by users.



Description**BACKGROUND OF THE INVENTION**

[0001] The invention relates to a system for the safe preparation of on demand packages of liquid products, said system being intended to dose and dispense a pre-determined quantity of a liquid product from one or more tanks into a container, said system comprising:

at least one housing for loading at least one tank of at least one component constituting the liquid product to be dispensed;

said housing or in said housing being provided a connection fitting to said tank which can be fixed in a removable way to a withdrawal opening of said tank and said connection constituting the terminal for the connection of at least one withdrawal duct of said component from said tank;

a mixer of said at least one component taken from said at least one tank with at least one further component of the product to be dispensed, in particular with at least one solvent or diluent, said at least one withdrawal duct being coupled to said at least one tank connected at the inlet to said mixer and at least one feeding duct being provided to said mixer of said at least one solvent and/or diluent;

means for generating a flow of said component from said tank to said mixer through said duct associated with said at least one tank;

means for generating a flow of said at least one further component through the corresponding feeding duct to said mixer;

at least one outlet duct from said mixer which ends with at least one delivery mouth, said delivery mouth being provided in a housing for the container of the product to be dispensed and said delivery mouth being removably coupled to an opening of said product container;

said at least one tank being provided with at least one unique identification code, while said housing for said tank is provided with a reader of said code;

said at least one product container being provided with a unique identification code and said housing for said container being provided with a reader of said code;

a control unit to which the readers of the identification code of said at least one tank and of the identification code of said at least one container of the product and the flow generating means of said component

of said at least one tank and of said at least one further component such as a diluent or a solvent and optionally said mixer are connected;

a control program loaded into said control unit and comprising instructions for reading said identification codes of said at least one tank and of said at least one product container and activating the withdrawal of said at least one component from said tank and mixing of the same with said at least one further component and dispensing of the mixture to said product container when said identification codes meet authorization criteria for mixing said components and dispensing said at least one product container;

at least one unit of measurement of the delivered quantity, said unit of measurement being connected to the control unit which is configured to compare the value detected by said unit of measurement of the delivered quantity with a reference value preset or presettable in the control unit.

[0002] A system of this type is known in the state of the art, but has several drawbacks.

[0003] A first drawback consists in the fact that the current management of the unique identification codes of the tanks and product containers does not allow an adequate level of security against actions of unauthorized reuse and compliant with the rules of tanks and product containers and does not guarantee that at least certain types of products can be dispensed only when requested by an operator authorized to use these products.

[0004] Another drawback of the current systems consists in the fact that they do not guarantee chemical safety, i.e. in the fact that they are used to load a pre-established product, a product container which had previously been intended to house products which are not chemically compatible and which can give rise to contaminations. These contaminations can lead to simple risks of loss of effectiveness of the product subsequently dispensed into the container due to residues of the product(s) previously contained in the same, or in the worst case the contaminations can give rise to even dangerous chemical reactions.

[0005] Furthermore, the systems currently in use do not guarantee against overdose and/or underdose of one or more of the components of the product to be dispensed into the product container.

BRIEF DESCRIPTION OF THE INVENTION

[0006] The invention aims to solve the aforementioned problems with a system for the safe preparation of packages of on demand liquid products, which has the characteristics described at the beginning and wherein the following characteristics are also provided:

the system has a plurality of housings for a corre-

sponding number of tanks or a common housing for said plurality of tanks which can accommodate said plurality of tanks simultaneously;

a dedicated withdrawal duct is provided for the component contained in each tank of said plurality of tanks, each of said withdrawal ducts being provided with a removable coupling fitting to the corresponding tank,

each connector for coupling to a tank is provided with a sensor for the presence of said tank;

each withdrawal duct has dedicated means for generating the flow of fluid from the corresponding tank to a mixer;

each withdrawal duct has a valve for opening/closing the outlet end of the corresponding withdrawal duct in said mixer;

said valves and said tank presence sensors in correspondence with the respective withdrawal ducts are connected to the control unit for receiving the corresponding presence/absence signals of the corresponding tank and for the opening/closing command the valve of the corresponding tank withdrawal duct;

the control program executed by the control unit comprises the instructions for reading and associating the identification code of each tank with the corresponding withdrawal duct with the corresponding unit for generating the fluid flow from said tank to the mixer and with the corresponding opening /closing valve;

the control unit being provided with a memory accessible to said control program and wherein are stored a database of the identification codes of the tanks, a database of the identification codes of the product containers, a database of the products intended to be loaded into said product containers, a database of preparation recipes for said products, a list of withdrawal ducts and associated fluid flow generation devices and solenoid valves, a list of permitted combinations of identification codes of the tanks with identification codes of the product containers, the identification codes of the tanks being uniquely associated with a specific substance which constitutes at least one component of the product and the identification codes of the product containers being uniquely associated with at least one product;

said control program containing the instructions for at least temporarily verifying the compatibility between the substance contained in a tank and the product to be dispensed in a product container on

the basis of a correlation between the identification codes of said tank and said product container and for at least temporarily associating the identification code of a tank with a predetermined withdrawal duct and with the corresponding flow generation means and the corresponding solenoid valve;

and in case of positive check of the aforementioned conditions, said program containing the instructions for the control unit for the activation of the fluid flow generation means or devices in the corresponding withdrawal duct from the related tank and for the opening of the solenoid valves in said corresponding withdrawal duct.

[0007] In a preferred embodiment, each tank can be coupled with a corresponding connecting terminal to a dispensing/metering duct of the component contained in the corresponding tank and the dispensing/metering duct or ducts associated respectively with a tank having a different content from the others, open freely in a hopper or in a mixing funnel which ends with a single delivery duct in a connection terminal to a container, the mixing taking place by simple feeding in succession or at the same time of all or part of the components of the tanks through the relative dedicated dispensing/metering ducts, while at least one tank contains at least one solvent or diluent and while the control program of the elements generating the flow of the fluid component from each of said tanks to the funnel comprises the instructions for activating the dispensing of the dose of the solvent or diluent before dispensing or immediately after dispensing of said one or more components from said one or more corresponding tanks or for part of the total dose foreseen for the solvent or diluent is dispensed before and the remaining part of said solvent and diluent is dispensed after dispensing of said one or more components from said one or more corresponding tanks, so as to obtain washing of the funnel immediately before and/or immediately after dispensing of said one or more further components.

[0008] As will be described in greater detail below, this construction and this operating mode allow residues of said one or more components to be eliminated between one dispensing cycle and the next.

[0009] The aforementioned embodiment therefore also allows dispensing of fluid compounds having different and potentially mutually reactive compositions without generating danger or contamination conditions.

[0010] According to an embodiment, the dose of each component to be dispensed can be established on the basis of the activation time of the corresponding means for generating the fluid flow from the tank associated with the withdrawal duct and/or from the switching time in the open condition of the solenoid valve at the outlet of the corresponding duct in the mixer.

[0011] In this case, when the product comprises two or more components, the feeding of the single compo-

nents to the mixer through the corresponding fluid flow generating means can take place simultaneously or substantially simultaneously, since the respective quantities are detected by the activation times of the associated flow generation means and/or by the associated solenoid valves.

[0012] According to an embodiment which can be provided, which can be activated in parallel through a choice of setting envisaged in the control program, the dispensing of the single components from the single tanks to the mixer can take place in sequence, whereby the quantity of each single component is detected by the dispensed quantity measurement unit, such as a load cell that weighs the product container.

[0013] In both embodiments, it is possible to use the load cell respectively to check the effective mass dispensed of all the components, so if for one or more components the dispensed quantity is incorrect, it is possible to have an effective comparison value, or activation times of the flow generation means and/or of the corresponding solenoid valve to obtain from them a comparison measurement with the weight detected by the load cell for the corresponding component of the product.

[0014] The quantity of each component for each product is stored in the product database which comprises the recipe of the corresponding product and from which the control unit defines the delivery times of the component to the mixer and/or their weight, the end of measuring the dose dispensed to the mixer and/or from this to the container.

[0015] According to an advantageous embodiment, an initial weighing of the product container can be carried out. This initial weighing measures the weight of the container to be used as a tare for subsequent measurements of the quantity of components or of the mixed product, said value being temporarily stored in a work memory of the control unit and used for measuring the effective quantity of the various components loaded into the container according to one or more of the variants described above.

[0016] In an executive embodiment, the load cell measures the weight of a product container which may also be partially full. From this value it is possible to determine a dispensing quantity of the product for only topping up the container, an amount which is obviously lower than the maximum quantity which can be housed in the product container.

[0017] According to an embodiment of the present invention which can be provided separately or in combination with one or more of the preceding claims, the system comprises the following characteristics:

at least one housing for loading at least one tank of at least one component constituting the liquid product to be dispensed;

the housing or in said housing being provided a connection fitting to said tank which can be fixed in a

removable way to a withdrawal opening of said tank and said connection fitting constituting the terminal for the connection of at least one withdrawal duct of said component from said tank;

a mixer of said at least one component taken from said at least one tank with at least one further component of the product to be dispensed, in particular with at least one solvent or diluent, said at least one withdrawal duct being coupled to said at least one tank connected at the inlet to said mixer and at least one feeding duct being provided to said mixer of said at least one solvent and/or diluent;

means for generating a flow of said component from said tank to said mixer through said duct associated with said at least one tank;

means for generating a flow of said at least one further component through the corresponding feeding duct to said mixer;

at least one outlet duct from said mixer which ends with at least one delivery mouth, said delivery mouth being provided in a housing for the container of the product to be dispensed and said delivery mouth being removably coupled to an opening of said product container;

said at least one tank being provided with at least one unique identification code, said housing for said tank being provided with a reader of said code;

said at least one product container being provided with a unique identification code and said housing for said container being provided with a reader of said code;

a control unit to which are connected said readers of the identification code of said at least one tank and of the identification code of said at least one product container and the flow generating means of said component of said at least one tank and of said at least one further component such as a diluent or a solvent and optionally said mixer;

a control program loaded into said control unit and comprising instructions for reading said identification codes of said at least one tank and of said at least one product container and activating the withdrawal of said at least one component from said tank and mixing of the same with said at least one further component and dispensing of the mixture to said product container when said identification codes satisfy criteria for authorizing mixing of said components and dispensing into said at least one product container;

at least one dispensed quantity metering unit said

metering unit being connected to the control unit which is configured to compare the value detected by said dispensed quantity metering unit with a pre-set or presettable reference value in the control unit and in combination further with

at least a reader or an interface for entering a unique user identification code;

said identification code being read by the control unit and being provided in parallel with the check of the satisfaction of said authorization criteria by said codes of said at least one container and/or of said at least one tank the check of further relative authorization criteria the user identification code and the identification code of one or more product containers.

[0018] An embodiment which can be provided in combination with any one or more of the preceding embodiments and variants provides that a unique identification code of a product container corresponds to at least one specific product among a plurality of different products that can be dispensed by the system.

[0019] In the case of the aforesaid embodiment, the memory of the control unit can comprise a database of the identification codes of the single users to which the authorization for use is associated and therefore to receive one or more different products among the products that can be supplied by the system and said products are uniquely related to a specific product container identification code.

[0020] Thanks to this feature, the system is not only able to verify compatibility between product and container and also between product composition, but it is also able to verify whether the request made by the user on the basis of its identification code is compatible with the authorization to use the product explicitly requested and/or implicitly requested through the unambiguous correlation of container identification code and type of product.

[0021] This check also makes it possible to memorize the dispensing events and relate them to the various users, allowing to keep track of the various operations and therefore also to verify analytically and user by user, the type of products withdrawn and the quantity per time unit of said products, for which the system allows to verify for the presence of illegal activities such as theft or other.

[0022] In a preferred embodiment which can be provided in combination with any one or more of the preceding embodiments and embodiment variants, at least one or at least part or all of the means for generating the flow of a fluid in a corresponding withdrawal duct connected to a corresponding tank consist of a peristaltic pump or a vibration pump.

[0023] In a further embodiment, the unique identification codes can consist of optical codes, such as for instance barcodes and/or QR codes or other, while the

readers are of the optical type, while the information corresponding to said codes is contained within the databases defined above and the enabling or disabling of a code must take place within the control program, setting a status of the various codes as enabled or disabled.

[0024] In one embodiment which may be provided in combination with one or more of the preceding embodiments and/or embodiment variants, the identification codes consist of electronic tags, such as for instance RFID tags and/or beacons and/or similar devices. In this case the readers will be readers of said RFID tags as transceiver reading units for instance of the transponder type or the like or operating with one or more of the currently existing communication protocols.

[0025] It is possible to provide for the parallel presence of optical codes and/or electronic tags or these can be provided as an alternative to each other.

[0026] Using electronic tags provided with a sufficient memory capacity, it is possible that the data relating to the lists of components and therefore of various tanks with the relative identification codes and/or the lists of products that can be dispensed in a container having a specific identification code are loaded into them and/or the recipes of said products and/or the lists of users authorized to use one or more of said products.

[0027] This information can be searched for, selected and copied from the databases present in the control unit memories and can be stored in the internal memory of the electronic tag of the corresponding product container and/or in a temporary file associated with the user's identification code and/or loaded into the memory of a portable unit used by the user and uniquely associated with the same, said unit communicating with the system control unit.

[0028] According to yet another embodiment, the mixer consists of a hopper and/or a funnel whose outlet ends with a duct and/or with a delivery mouth that can be coupled to a corresponding product container, while the individual withdrawal ducts freely flow each into said funnel or into said hopper.

[0029] In an executive embodiment it is provided that the control program contains the instructions for identifying and selecting the withdrawal duct for the solvent or diluent fluid as the withdrawal duct whose flow generating means and/or whose solenoid valve are activated last in a pre-established time sequence for dispensing at least two components of the product to be dispensed, one of which consists of said diluent or solvent.

[0030] An improvement may provide for dispensing the intended amount of solvent or diluent in several separate dispensing steps of a partial amount, one of said dispensing steps of the partial amount being set as the last dispensing step in the sequence of dispensing said at least two components the product one of which is the solvent or diluent.

[0031] An embodiment whose characteristics can be provided in combination with one or more of the previous embodiments and/or embodiment variants provides a

housing for a plurality of product containers or several housings each for one of a plurality of product containers.

[0032] When the system is set to dispense only one type of product, it is possible to provide a single mixer from which a plurality of dispensing pipes branch off, each of which can be coupled to a product container and each equipped with a dispensing solenoid valve which opens and closes the outlet of said dispensing duct, while each dispensing duct is provided with a sensor for the presence of the associated product container, each solenoid valve being associated with a predetermined container and controlled by the control unit to serve the different one or more in parallel containers inserted in the corresponding housing and connected to a dispensing duct, a load cell also being provided for each container.

[0033] Alternatively, when the system is made to be able to distribute two or more different products at the same time, each withdrawal duct that leads to a connection to a tank is replicated, as are the flow generation means and/or solenoid valves and these are provided in combination with a replica of the mixer and of the dispensing duct, each of said replicas being provided for a corresponding housing of a product container, a load cell also being provided for each container.

[0034] In this alternative, an obvious configuration of the control program allows the machine to dispense different types of products in parallel to a container enabled to receive the corresponding product and for a user enabled to use or withdraw said product.

[0035] In one embodiment, following the reading of the unique identification code of a tank, this code is made unusable, while a new operating Rfid tag will be associated with a new tank which will be delivered to the user by the manufacturer and which has been subjected to packaging by the manufacturer itself and/or by a subsidiary authorized to carry out this activity.

[0036] Alternative embodiments can optionally also provide for a deactivation of the Rfid tag or a similar electronic tag, while said tag will be reactivated only when the tank returns to the system manufacturer for a refill of the same and a new delivery to the user.

[0037] The system can therefore provide means suitable for making the electronic tags unusable or, in the case of a less radical alternative, means for enabling and disabling, i.e. turning off the electronic tags, when the codes are contained in the electronic tags, or operating via control software as described above by setting a status variable of the individual codes in the relative databases stored in the control unit as enabled status or disabled status.

[0038] As is evident from the foregoing, there are many possible variants both from the point of view of a hardware configuration and from the point of view of the dispensing process. Many of these variants fall within the obvious choices of the person skilled in the art among the various opportunities and alternatives present in the state of the art.

[0039] The invention also relates to a method for the

safe on request preparation of packages of liquid products, said method involving the following steps:

- temporarily associating at least one tank of at least one component of a product to be dispensed with a unique identification code of said tank;
- permanently associating a unique identification code of said container with at least one product container;
- permanently associating a specific type of product and/or the possible composition of said product, to the unique identification code of a container;
- checking the compatibility between the component of the tank or tanks each having a said unique identification code, with the product to be dispensed in the product container identified by said unique code thereof, on the basis of a relationship between said unique codes;
- feeding each of said at least one component of the product to be dispensed to the corresponding tank separately and with its own withdrawal duct from the corresponding tank;
- measuring the quantity of product to be dispensed and stopping dispensing when the quantity corresponds to a pre-established reference value.

[0040] One embodiment provides for associating to each identification code of the product container, in addition to the specific type of product intended to be contained in the same, also the recipe or composition of said product, further performing the following steps:

- checking by reading the identification codes of the tanks present whether all the tanks relating to the components foreseen for the production of the product are present;
- setting the quantities foreseen by the recipe for each component and dispensing in parallel and/or in sequence the quantity foreseen for each of said components,
- since said quantity is measured on the basis of the dispensing time of each component and/or the weight of the component dispensed in the container.

[0041] An embodiment of the method provides that at least one component consists of a solvent or a diluent, a sequence of dispensing of the individual components of the product being carried out in the corresponding container, said sequence providing that at least a part of the amount of solvent or diluent is dispensed last in said dispensing sequence.

[0042] One embodiment of the method provides that

the product container is provided with two identification codes, one relating to the container itself and the other relating to the product to be dispensed into it.

[0043] A further embodiment provides for a step for attributing a unique identification code to each user enabled to use the system, while the identification code of each user is correlated to a list of container identification codes and/or to a list of product identification codes for which the user is authorized to request dispensing, dispensing being prohibited when the user's identification code is not associated with the authorization to use a product container having a certain identification code and/or the use of the related product.

[0044] According to yet another feature which can be provided in any combination with one or more of the previous features of the method, said method providing the steps of:

detecting if the loaded container is empty or includes a product residue;

measuring the product residue;

modifying the quantity of said product to be dispensed in order to top up the container;

dispensing said quantity to be dispensed to top up the container.

[0045] A variant embodiment provides for measuring the weight of the container to be filled with product, comparing the measured weight with a reference tare of the container and determining the residual product still present in the container by difference, while determining the quantity of topping up product is performed by subtracting the weight of product remaining in the container from the expected product weight for an empty-to-full container filling.

[0046] A method according to a further feature which can be provided in any combination or sub-combination with the previous ones, and in which after the reading step of the identification code of the tank, said identification code is disabled and is only re-enabled upon refilling at the tank manufacturer said tank with the corresponding component.

[0047] According to yet another feature which can also be provided in any combination or sub-combination with the previous ones, the identification code of the tanks is temporary and subject to authorization and rehabilitation or variation, while the identification code of the product container and/or the corresponding product are fixed and stable, being preferably said identification codes imposed in a way that cannot be modified by others than the producer himself.

[0048] In one embodiment, the identification code is of an optical type such as a barcode and/or a QR code or the identification code is stored in an electronic tag such as an RFID tag or the like, or the identification code is

applied using in combination optical code and an electronic tag.

[0049] One embodiment of the method provides that the temporary identification code of each tank is constituted by an RFID tag, while the identification code of the product container and/or of the product associated therewith is of the optical type.

[0050] In relation to the user's identification code, when this variant is provided for, this can be entered using a keyboard, an electronic card or a card with an optical code, a portable device that interfaces with a communication unit of the system or other similar systems.

[0051] When the user is provided with a portable device such as a smartphone or the like, it is possible to load and run an app that is configured to communicate with the system control unit or with a remote unit associated with the system control unit through which the user can receive information relating to the products and/or administrative information or other communications.

[0052] The invention provides for further variations and improvements of the system and method described above which are the subject of the dependent claims.

BRIEF DESCRIPTION OF THE FIGURES

[0053] The features of the invention will become clearer from the following detailed description of the system and method with reference to the attached figures wherein:

Figure 1 shows a flowchart of an embodiment of the method according to the present invention.

Figure 2 shows a high-level block diagram of an embodiment of the system according to the present invention.

Figure 3 shows a more detailed schematic plan of an embodiment of the system according to the present invention.

DETAILED DESCRIPTION OF THE FIGURES

[0054] With reference to figure 1, the same schematically shows the steps of an embodiment of the method according to the present invention. The figure shows an embodiment which provides additional steps compared to an essential embodiment. These steps will be reported in the description.

[0055] The dispensing process is illustrated with reference to a product consisting of a single component concentrated in a single tank and which is dispensed with a pre-established dilution in a single product container referred to as a container in the figure, being mixed with a pre-established diluent.

[0056] The illustrated process starts from the condition wherein there is no product component tank in the system and therefore provides the steps relating to loading the

tank and associating it with the system itself. Obviously these steps are performed for at least part of them only once in a while so when the tank is installed, the steps that are performed are those relating to the request for filling a container, while the installation steps of a tank will be performed only when the need arises to replace the empty tank with a full one.

[0057] The right branch of the figure shows the steps of the process inherent to the installation of a new tank containing one of the two components of the product to be dispensed. The further component consists of the diluent which can come from a tank dedicated to the same or can also be water coming from the water mains directly or after filtration and/or accumulation in a buffer tank.

[0058] At step 105 a new tank is loaded containing a specific component of the product to be dispensed into the container. The tank is provided with an identification code which uniquely identifies it and said code being read using appropriate readers. Following the reading, it is possible to optionally but preferably provide a step for disabling the identification code of the tank. This makes it possible to avoid abusive use of the tank, for instance to fill it by service personnel with a component that does not come from, and therefore is not guaranteed by, the company supplying the system.

[0059] As already described above, the identification code of the tank can be in the form of a physical identification code such as an optical type identification code, for instance a barcode or a QR code or in the form of a code stored in an electronic tag, for instance in an RFID tag or similar.

[0060] In the first case, the identification codes of the tanks are managed by a computer system and are stored in a database as they are associated with a status variable which can take on two conditions, namely an enabled code and a disabled code.

[0061] In the second case, the reader of the electronic tag can also transmit to said electronic tag commands which make the electronic tag at least temporarily non-functional or which make it stably and irreversibly unusable.

[0062] In the event of a temporary functional impediment, the electronic tag reader, or possibly a separate unit, transmits to the electronic tag commands for activating/deactivating and/or disabling code transmission or canceling the code.

[0063] For further identification security against abuse and/or forcing, the two types of codes can also be provided together on a tank, each being managed independently of the other.

[0064] In the event that the electronic tag is made stably and irreversibly non-functional, or unusable, the reader and/or a unit configured to perform the following function, send commands or subject the electronic tag to signals capable of making the tag stably and irreversibly unusable.

[0065] The temporary or stable and irreversible dysfunctionality of the electronic tag and therefore the im-

possibility of obtaining a code as shown by step 108 makes it possible to make the corresponding tank unusable once it has been removed from the system. A new installation will result in the non-recognition of the tank due to the disabling of the code and the generation of an error message as well as the interdiction of the execution of the withdrawal and dispensing steps.

[0066] Depending on the way of functional interdiction of the electronic tag, respectively temporary or stable and irreversible, the method foresees further steps: In case of temporary malfunctioning of the electronic tag, the method foresees that the electronic tag and/or the availability of the code of a tank are reactivated, rehabilitated or in any case regenerated once the tank has returned to the manufacturer or supplier and that this has filled the tank with the correct component guaranteed by the same. In the event of temporary malfunctioning of the electronic tag, the method foresees that a new functioning electronic tag be applied to the tank wherein a unique identification code of the tank and/or of the product contained in it has been memorized after the tank has been subjected to the filling process at the manufacturer and/or supplier.

[0067] When the tanks have large volumes and therefore their transport is not recommended, filling can take place directly at the system installation site. In this case the rehabilitation or reactivation or the regeneration and association of the code to the tank or the application of a new functioning electronic tag and in which the new identification code of the tank and/or of the product contained in it is memorized is performed by computer means communicating with a remote management system and directly on site, i.e. at the installation site of the tank itself.

[0068] The next step indicated with 107 foresees that on the basis of the identification code of the tank the information of the type of component contained in the same is retrieved.

[0069] This can take place according to various embodiments of which a first embodiment provides that the information is contained in a local control system associated with the dispensing system. An embodiment which can also be provided in combination since it can be activated alternatively or in partial combination with the previous one, provides that all the information and/or at least a part of it is retrieved and downloaded from one or more databases provided and managed in a remote server, for instance at the supplier or manufacturer.

[0070] Step 109 is a step that can be optional, for instance in the case that the system and the method are aimed at a product which consists only of mixing a single component contained in a single tank which is mixed when dispensing to the container with a pre-established component in a pre-established dilution ratio.

[0071] In fact, the method provides that for each component of the product, for the component of at least one tank and for instance for the diluent or solvent, separate and independent ducts are provided for withdrawing the component from the tank and the diluent or solvent, which are configured to dispense each independently one of

the other the corresponding component and diluent.

[0072] The independent dispensing step can advantageously be combined with a step of measuring the amount of each component, including the diluent or solvent, which is dispensed to the container.

[0073] In the case of a single diluent and a single further component, the diluent can have a duct permanently dedicated to it, so that a further separate duct is always free for dispensing and dosing said single component from the tank. Therefore, loading it into the tank in the system and connecting it to the dedicated dispensing/metering duct does not require recognition of the duct and an operation of logical and unambiguous association of the same to the tank.

[0074] In a more complex embodiment, the product to be dispensed into the container can be composed of a diluent or a solvent and at least two different components, each contained in a different tank, each of said tanks having its own identification code which associates it uniquely to the component it contains.

[0075] In this case, the method which provides for the separate dispensing of each component provides for a separate dispensing/metering duct for each tank, so it is advantageous to provide a step for identifying the dispensing/metering duct which is connected to the tank and a logical association of said duct to said tank in order to uniquely correlate the tank, the dispensing/metering duct, the component contained in the tank and the quantity of said component to be dispensed to the container according to a predefined recipe of the product intended to be contained in the container.

[0076] At step 110 the identification codes of said one or more installed tanks and/or of the relative components contained therein and/or of the delivery ducts associated with each tank are checked for compatibility with the identification codes of one or more containers intended to contain the product and/or the corresponding product, or the recipe that defines the combination of components and their quantity for said pre-established product and/or also possibly with the user identification codes as will be seen in greater detail in the following description.

[0077] The left branch of the flowchart relates to the method steps related to the recognition of the container and therefore of the product intended for it and/or also to the recognition of the user and the enabling of the same to be able to receive said product.

[0078] At step 100, a container filling request is performed. Following this request, a user recognition step is performed as indicated with 101.

[0079] This step can be performed in several ways, including:

the manual entry of a user identification code;

the transmission of a user identification code from a portable unit of the user to a control unit which manages the process;

an automatic recognition of the user through biophysical and/or vocal parameters.

[0080] Once the system recognition step has been performed, the method provides for verifying which products the user is authorized to use for as indicated in step 102. In step 103 the unique identifier of the container is read, which in the present method is uniquely linked to a specific product.

[0081] In an executive embodiment, the unique and stable correlation between the identification code of the container and the product is generated through a database or a correlation table stored in a control unit of the system which can be a local unit or a remote server unit.

[0082] In an executive embodiment, the container, in addition to its identification code, carries a further identification code of the type of product which is intended to be contained therein.

[0083] At step 104, the method provides for identifying the recipe relating to the combination of components and their quantity for making the product uniquely associated with the product code and/or with the identification code of the container according to one of the two variants described above.

[0084] The aforementioned information is then sent to section 110 where compatibility is verified between the user requesting a specific product intended to be contained in a specific container, the recipe of the combination of components which make up the product, the presence of the tanks which contain said components. These compatibility checks take place on the basis of the unique identification codes of the container, of the user, of the product and of the tanks and therefore of the components contained therein.

[0085] In the event of no positive check of compatibility between the above information, the process is stopped and an error signal is emitted as indicated in step 111.

[0086] In the event of a positive check, the system proceeds to the dispensing step of the individual components, taking them from the individual tanks and dispensing them in the corresponding quantity foreseen by the recipe into the container.

[0087] The dispensing and dosing process can provide for the separate measurement of the dose of each component and also the check of the final total weight of the quantity of product dispensed into the container.

[0088] According to one embodiment of the method, the delivered quantity of each component is measured by means of activation parameters of generation means of the flow of feed of each component to the container or to a mixer. Alternatively and/or in combination, it is also possible to measure the increase in container weight by dispensing the individual components in sequence from the individual corresponding tanks.

[0089] According to yet another embodiment of the method, this provides for a mixing hopper into which the single dispensing and metering ducts of the single components from the single tanks, from which a common

container filling duct departs, for the diluent or solvent or at least one part of this dispensed separately as the last component of the product to obtain a final washing of the mixer and of said filling duct.

[0090] Figure 2 shows a high level block diagram of a non-limiting executive example of a system suitable for implementing the method according to the present invention.

[0091] According to the illustrated example, the system comprises a processing unit or CPU 214 which is provided with memories or storage areas respectively for a control logic of the hardware units of the system 215, a control logic of the dispensing process 216, a database comprising the identification codes of the single tanks and the correlation to the corresponding components contained therein indicated by 217, a database comprising the identification codes of the containers and the products uniquely associated with them as well as any recipes for said products indicated by 218 and a database 219 comprising the identification codes of the users and the relative authorizations to request and/or use certain products.

[0092] Obviously the subdivision in the various memory areas and in the various databases is only an example, being possible to bring together all the information in a single database or to foresee different subdivisions of the data.

[0093] The process control logic engine 216 consists of a software comprising the instructions relating to the execution sequences of the process steps, for instance as described with reference to the example of the method of figure 1 or according to one or more of any of the forms and executive embodiments described above.

[0094] The hardware control logic 215 comprises a software which transforms the outputs of the process control logic into activation/deactivation commands of the various hardware units present in the system and in particular of those illustrated in the present example.

[0095] These hardware units consist of a user interface 211 which can alternatively or in combination comprise an input/output interface integrated in the system as indicated with 212, or a separate input/output interface communicating with the system through a communication interface as indicated with 213. Said two types of interfaces can also both be present and usable at the user's choice.

[0096] In the first case of integrated interface 212 it can be an alphanumeric keyboard for entering data or other input means such as a touch interface or the like in combination with a display screen and/or with a voice interface or alternatively or in combination said interface may include various selecting and pointing means, such as a mouse, or the like.

[0097] In the second case of separate input/output interface 213, this can comprise portable devices used by users and which run communication apps with the processing unit 214 of the system.

[0098] Reference 200 indicates specific connections

of dispensing and/or metering ducts of the single components from the single tanks to the container or to a mixer. 201 indicates a reader or a combination of several readers of the identification code(s) associated with the single tanks and in particular 201 indicates a possible optical reader when the tank also has identification codes of an optical type, while 202 indicates a reader for reading an identification code stored in an electronic tag associated with the tank.

[0099] When said electronic tag associated with the tank is provided, the system can have a unit for disabling the identification code in the tank stored in the electronic tag. This can happen according to different embodiments. A variant that simply provides for the electronic tag to be switched off when possible. An alternative that provides for the cancellation of the identification code stored in the electronic tag. A further alternative which provides for the interdiction of the communication of said code from the electronic tag to the reader. Other alternatives are possible and depend on the configuration of the electronic tag and its functions.

[0100] When a plurality of separate dispensing and metering ducts is provided for withdrawing the components of each single tank of a plurality of tanks, each containing one of the components which form the product to be dispensed, each of said dispensing and metering ducts is equipped with a connection sensor to the tank, said sensor unambiguously also identifying said code of said duct, allowing to associate a certain dispensing and/or metering duct to a specific tank and therefore to a specific component unequivocally related to the tank itself, i.e. contained in it. These sensors indicated with 204 are also connected to the system.

[0101] Furthermore, in the illustrated embodiment, the system comprises a separate metering pump 205 for each dispensing and/or metering duct and possibly also a solenoid valve 206 for opening/closing each metering duct. Said pumps and said solenoid valves are also controlled with the hardware units described above by the processing unit 214 based on the hardware control logic 215 driven by the process control logic 216.

[0102] In relation to the container, the system provides connections to a corresponding delivery duct with a possible presence sensor of the container similarly to the tanks and indicated with 207. This can be advantageous if the system can be configured, by replicating the mixers and other constructive parts, to the parallel filling of several containers with the same product and/or with different products.

[0103] Furthermore, as indicated with references 208, 209 and 210, the system further comprises a reader of a container identification code and/or a reader of a product identification code stably associated with a container and a container weighing unit.

[0104] Obviously, when the parallel installation of several containers is foreseen, these units will be replicated corresponding to the number of containers that can be installed and/or served simultaneously by the system.

[0105] Figure 3 shows an example of a system according to Figure 2 wherein the dispensing system, the hardware operating units and the installation housings of the tanks are schematically shown. This figure constitutes a non-limiting schematic executive example of the inventive concept of the invention.

[0106] T denotes the tanks each intended to contain a certain component for the production of a product to be dispensed to a FL container. A connecting terminal 300 can be coupled to each tank T to a dispensing/metering duct 304 of the component contained in the corresponding tank to a mixing hopper 311 which terminates with a common dispensing duct in a connection terminal to a FL container.

[0107] Each tank T comprises an identification code 302 which is read by a corresponding reader 303. The identification code 302 and the reader 303 can be made according to one or more of the embodiments described for them previously. The readers 302 are connected to a control interface and driver 312 which is under the control of the control CPU 313 which executes, for instance, the hardware and process control logics described with reference to the previous embodiment of figure 2.

[0108] Each connecting terminal 300 of the corresponding dispensing and metering duct 304 is associated with a sensor 301 for the presence of the corresponding tank T preferably also having an identification code of the duct itself and said sensor also communicating with the control unit and drivers 312.

[0109] Each dispensing and/or metering duct further comprises a dedicated dispensing and/or metering pump indicated with 305 and which is controlled by corresponding outputs of the control unit and driver 312.

[0110] Furthermore, each dispensing and/or metering duct 304 can also comprise, as illustrated, a solenoid valve 306 which opens and closes the outlet of the corresponding duct 304 towards the mixer 311 and each of which solenoid valves is controlled by said control unit and driver 312.

[0111] A load cell 315 is provided in the housing for the FL container which is connected to a corresponding input of the control and driver unit 312 and which supplies a measurement of the weight of the FL container.

[0112] Furthermore, at least one reader 308 of the identification code 307 of the FL container is provided. When the container also bears a further identification code of the product to be dispensed therein, said container housing can have a further reader of said identification code.

[0113] As indicated by 309 and 310, the system also comprises a reader or other alternative means for reading and/or entering the user's identification code.

[0114] As is evident, the dispensing of each component takes place separately from the other components and independently.

[0115] The mixing can take place in the mixer 311 or the mixing can take place in the container with the components being fed sequentially thereto.

[0116] It is important to underline that what has been described and illustrated represents only an executive example which allows the person skilled in the art to implement wide variations inspired by these examples, without requiring any creative activity.

Claims

1. A system for the safe preparation of packages of liquid products on demand, said system being intended to dose and dispense a predetermined quantity of a liquid product from one or more tanks into a container and said system including:

at least one housing for loading at least one tank of at least one component constituting the liquid product to be dispensed;

said housing or in said housing being provided a connection fitting to said tank which can be fixed in a removable way to a withdrawal opening of said tank and said connection fitting constituting the terminal for the connection of at least one withdrawal duct of said component from said tank;

a mixer of said at least one component taken from said at least one tank with at least one further component of the product to be dispensed, in particular with at least one solvent or diluent, said at least one withdrawal duct being coupled to said at least one tank connected at the inlet to said mixer and at least one feeding duct being provided to said mixer of said at least one solvent and/or diluent;

means for generating a flow of said component from said tank to said mixer through said duct associated with said at least one tank;

means for generating a flow of said at least one further component through the corresponding feeding duct to said mixer;

at least one outlet duct from said mixer which ends with at least one delivery mouth, said delivery mouth being provided in a housing for the container of the product to be dispensed and said delivery mouth being removably coupled to an opening of said product container;

said at least one tank being provided with at least one unique identification code, said housing for said tank being provided with a reader of said code;

said at least one product container being provided with a unique identification code and said housing for said container being provided with a reader of said code;

a control unit to which the identification code reader of said at least one tank and the identification code reader of said at least one container of the product and the flow generating means of

said component of said at least one tank and said at least one further component such as a diluent or a solvent and optionally said mixer are connected;

a control program loaded into said control unit and comprising instructions for reading said identification codes of said at least one tank and of said at least one product container and activating the withdrawal of said at least one component from said tank and mixing the same with said at least one further component and activating the dispensing of the mixture to said product container when said identification codes meet authorization criteria for mixing said components and dispensing said at least one product container;

at least one dispensed quantity metering unit said metering unit being connected to the control unit which is configured to compare the value detected by said dispensed quantity metering unit with a reference value preset or presettable in the control unit.

2. The system according to claim 1, characterized in that it further comprises:

a plurality of housings for a corresponding number of tanks or a common housing for said plurality of tanks which can accommodate said plurality of tanks simultaneously;

a dedicated withdrawal duct for the component contained in each tank of said plurality of tanks, each of said withdrawal ducts being provided with a removable coupling fitting to the corresponding tank;

each fitting for coupling to a tank is provided with a sensor for the presence of said tank;

each withdrawal duct has a dedicated means for generating the flow of fluid from the corresponding tank to a mixer;

each withdrawal duct has a valve for opening/closing the outlet end of the corresponding withdrawal duct in said mixer;

said valves and said tank presence sensors in correspondence with the respective withdrawal ducts are connected to the control unit for receiving the corresponding presence/absence signals of the corresponding tank and for opening/closing command of the valve of the corresponding tank withdrawal duct;

the control program executed by the control unit includes the instructions for reading and associating the identification code of each tank with the corresponding withdrawal duct with the corresponding unit for generating the fluid flow from said tank to the mixer and with the corresponding opening /closing valve;

the control unit being provided with a memory

accessible to said control program and wherein a database of the identification codes of the tanks, a database of the identification codes of the product containers, a database of the products intended to be loaded into said product containers, a database of preparation recipes for said products, a list of withdrawal ducts and associated fluid flow generation devices and solenoid valves, a list of permitted combinations of identification codes of the tanks with identification codes of the product containers are stored, the identification codes of the tanks being uniquely associated with a specific substance which constitutes at least one component of the product and the identification codes of the product containers being uniquely associated with at least one product;

said control program containing the instructions for at least temporarily verifying the compatibility between the substance contained in a tank and the product to be dispensed in a product container on the basis of a correlation between the identification codes of said tank and said product container and for at least temporarily associating the identification code of a tank with a predetermined withdrawal duct and with the corresponding flow generation means and the corresponding solenoid valve;

and in case of positive check of the aforementioned conditions, said program containing the instructions for the control unit for the activation of the fluid flow generation means(s) or devices in the corresponding withdrawal duct from the related tank and for the opening of the solenoid valves in said corresponding withdrawal duct.

3. The system according to claims 1 or 2, characterized in that it further comprises:

at least one reader or an interface for entering a unique identification code of a user;

said identification code being read by the control unit and being provided in parallel with the check of the satisfaction of said authorization criteria by said codes of said at least one container and/or of said at least one tank, the check of further relative authorization criteria relating to the user identification code and the identification code of one or more product containers;

at least one housing for loading at least one tank of at least one component constituting the liquid product to be dispensed;

said housing or in said housing being provided a connection fitting to said tank which can be fastened in a removable way to a withdrawal opening of said tank and said connection constituting the terminal for the connection of at least one withdrawal duct of said component

from said tank;

a mixer of said at least one component taken from said at least one tank with at least one further component of the product to be dispensed, in particular with at least one solvent or diluent, said at least one withdrawal duct being coupled to said at least one tank connected at the inlet to said mixer and at least one feeding duct being provided to said mixer of said at least one solvent and/or diluent;

means for generating a flow of said component from said tank to said mixer through said duct associated with said at least one tank;

means for generating a flow of said at least one further component through the corresponding feeding duct to said mixer;

at least one outlet duct from said mixer which ends with at least one delivery mouth, said delivery mouth being provided in a housing for the container of the product to be dispensed and said delivery mouth being removably coupled to an opening of said product container;

said at least one tank being provided with at least one unique identification code, while said housing for said tank is provided with a reader of said code;

said at least one product container being provided with a unique identification code and said housing for said container being provided with a reader of said code;

a control unit to which the reader of the identification code of said at least one tank and the reader of the identification code of said at least one container of the product and the flow generating means of said component of said at least one tank and of said at least one further component such as a diluent or a solvent and optionally said mixer are connected;

a control program loaded into said control unit and comprising instructions for reading said identification codes of said at least one tank and of said at least one product container and for activating the withdrawal of said at least one component from said tank and mixing of the same with said at least one further component and activating the dispensing of the mixture to said product container when said identification codes meet authorization criteria for mixing said components and dispensing said at least one product container;

at least one metering unit of the dispensed quantity, said metering unit being connected to the control unit which is configured to compare the value detected by said metering unit of the dispensed quantity with a reference value preset or presettable in the control unit and in combination further

at least one reader or an interface for entering

a unique identification code of a user;

said identification code being read by the control unit and being provided in parallel with the check of the satisfaction of said authorization criteria by said codes of said at least one container and/or of said at least one tank, the check of further relative authorization criteria the user identification code and the identification code of one or more product containers.

4. The system according to one or more of the preceding claims, wherein the dose to be dispensed of each component can be established on the basis of the activation time of the corresponding fluid flow generation means from the tank associated with the withdrawal duct and/or the time switching of the solenoid valve to the open condition at the outlet of the corresponding duct in the mixer and/or by the weight increase of the container measured by means of a weight measuring device and possibly in combination with a sequential delivery of the individual components that form the product to the container, while the quantity of each component for each product is stored in the product database which includes the recipe of the corresponding product and from which the control unit defines the delivery times of the component to the mixer and/or their weight, the end of measure the dose dispensed to the mixer and/or from this to the container.

5. The system according to one or more of the preceding claims wherein an initial weighing of the product container is performed, for measuring the weight of the container to be used as a tare for subsequent measurements of the quantity of components or product and for determining the effective quantity of product to be dispensed to the container.

6. The system according to one or more of the preceding claims, wherein a unique identification code of a product container corresponds to at least one specific product among a plurality of different products that can be dispensed by the system.

7. The system according to one or more of the preceding claims wherein at least one or at least part or all of the means for generating the flow of a fluid in a corresponding withdrawal duct connected to a corresponding tank consist of a peristaltic pump or a vibration pump.

8. The system according to one or more of the preceding claims wherein the unique identification codes can consist of optical codes, such as for instance barcodes and/or QR codes or other, while the readers are of the optical type, while the information corresponding to said codes is contained within the databases defined above and the enabling or disabling

of a code must take place within the control program, setting a status of the various codes as enabled or disabled or alternatively or in combination said identification codes consist of electronic tags, such as for instance RFID tags and/or beacons and/or similar devices, said readers being readers of said RFID tags as transceiver reading units.

9. The system according to one or more of the preceding claims, wherein the control program contains the instructions for identifying and selecting the withdrawal duct of the solvent or diluent fluid as the withdrawal duct whose flow generating means and/or whose solenoid valve are activated last in a pre-established dispensing time sequence of at least two components of the product to be dispensed, one of which consists of said diluent or solvent or alternatively the instructions for dispensing the foreseen quantity of solvent or diluent in several separate dispensing steps of a partial amount, one of said dispensing steps of the partial amount being set as the last dispensing step in the dispensing sequence of said at least two components of the product, one of which consists of the solvent or the diluent.

10. The system according to one or more of the preceding claims wherein a housing is provided for a plurality of product containers or more housings each for one of a plurality of product containers and a plurality of dispensing ducts each connectable to a product container and each provided with a dispensing solenoid valve which opens and closes the outlet of said dispensing duct, while each dispensing duct is provided with a sensor for the presence of the associated product container, each solenoid valve being associated with a predetermined container and controlled by the control unit to serve in parallel the various one or more containers inserted in the corresponding housing and connected to a dispensing duct, a load cell also being provided for each container.

11. The system according to one or more of the preceding claims wherein means for enabling and disabling i.e. temporary switching off of the electronic tags via control software are provided by setting a status variable of the single codes in the relative databases stored in the control unit as enabled or disabled status and/or means are provided which make said electronic tags stably and irreversibly inoperative, when the codes are contained in the electronic tags.

12. A method for the safe preparation of packages of liquid products on demand, said method involving the following steps:

- temporarily associating at least one tank of at least one component of a product to be dis-

pensed with a unique identification code of said tank;

- permanently associating a unique identification code of said container with at least one product container;

- permanently associating a specific type of product and/or the possible composition of said product to the unique identification code of a container;

- checking the compatibility between the component of the tank or tanks each having a said unique identification code, with the product to be dispensed in the product container identified by said unique code thereof, on the basis of a relationship between said unique codes;

- feeding each of said at least one component of the product to be dispensed to the corresponding container separately and with its own withdrawal duct from the corresponding tank;

- measuring the quantity of product to be dispensed and stopping dispensing when the quantity corresponds to a pre-established reference value.

13. The method according to claim 12, **characterized in that** it provides for associating to each identification code of the product container, in addition to the specific type of product intended to be contained therein, also the recipe or composition of said product, being further performed the following steps:

- checking by reading the identification codes of the tanks present whether all the tanks relating to the components envisaged for the production of the product are present;

- setting the quantities required by the recipe for each component and dispensing in parallel and/or in sequence the quantity required for each of said components,

- said quantity being measured on the basis of the dispensing time of each component and/or the weight of the component dispensed in the container.

14. The method according to claims 12 or 13, **characterized in that** it provides that at least one component consists of a solvent or a diluent, a dispensing sequence of the individual components of the product being performed in the corresponding container, said sequence providing that at least a part of the amount of solvent or diluent is dispensed last in said dispensing sequence.

15. The method according to one or more of the preceding claims 12 to 14, wherein the product container is provided with two identification codes, one relating to the container itself and the other relating to the product to be dispensed therein.

16. The method according to one or more of claims 12 to 15, wherein a step is provided for assigning a unique identification code to each user enabled to use the system, while the identification code of each user is correlated to a list of codes container identifiers and/or a list of product identification codes by which the user is authorized to request dispensing, dispensing being prohibited when a user's identification code is not associated with authorization to use a product container having a certain identification code and/or the use of the relative product. 5 10
17. The method according to one or more of the preceding claims 12 to 16, said method further providing the steps of: 15
- detecting if the loaded container is empty or includes a product residue;
 - measuring the product residue;
 - modifying the quantity of said product to be dispensed in order to top up the container; 20
 - dispensing said quantity to be dispensed to top up the container.
18. The method according to one or more of the preceding claims 12 to 17, wherein following the reading step of the identification code of the tank, said identification code is disabled and is only re-enabled upon refilling at the manufacturer of said tank with the corresponding component while the identification code of the product container and/or of the corresponding product are fixed and stable, said identification codes being preferably imposed in a way that cannot be modified by others but the producer himself. 25 30 35
19. The method according to one or more of claims 12 to 18, wherein the user's identification code can be entered by means of a keyboard, an electronic card or a card with an optical code, a portable device which interfaces with a system communication or other similar systems. 40
20. The method according to one or more of the preceding claims 12 to 19, wherein the identification code of the tanks is of the electronic type and is deactivated, made unreadable temporarily or stably and irreversibly upon loading the tank into the system and after the reading of the same by the system. 45 50

55

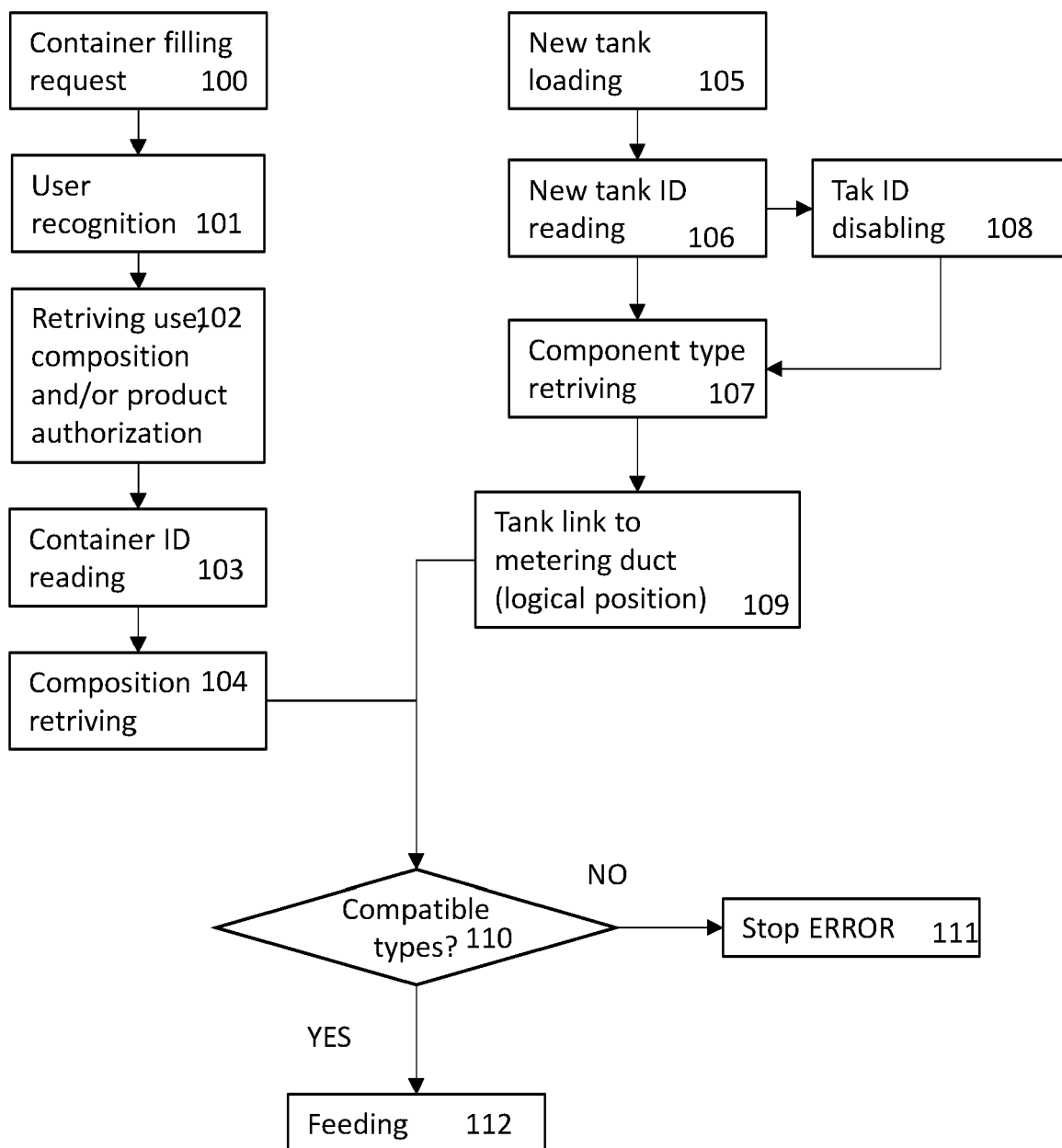


Fig. 1

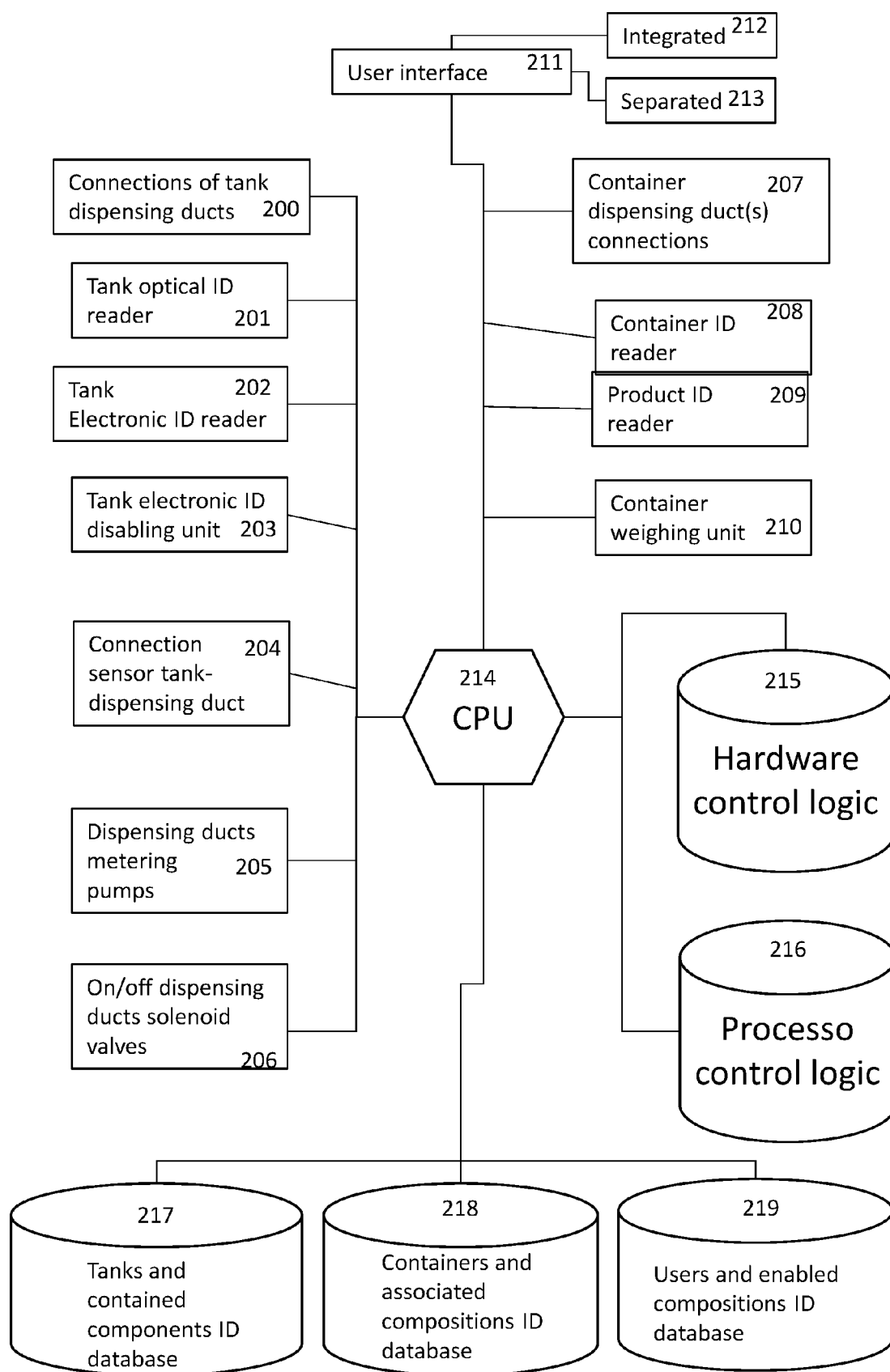
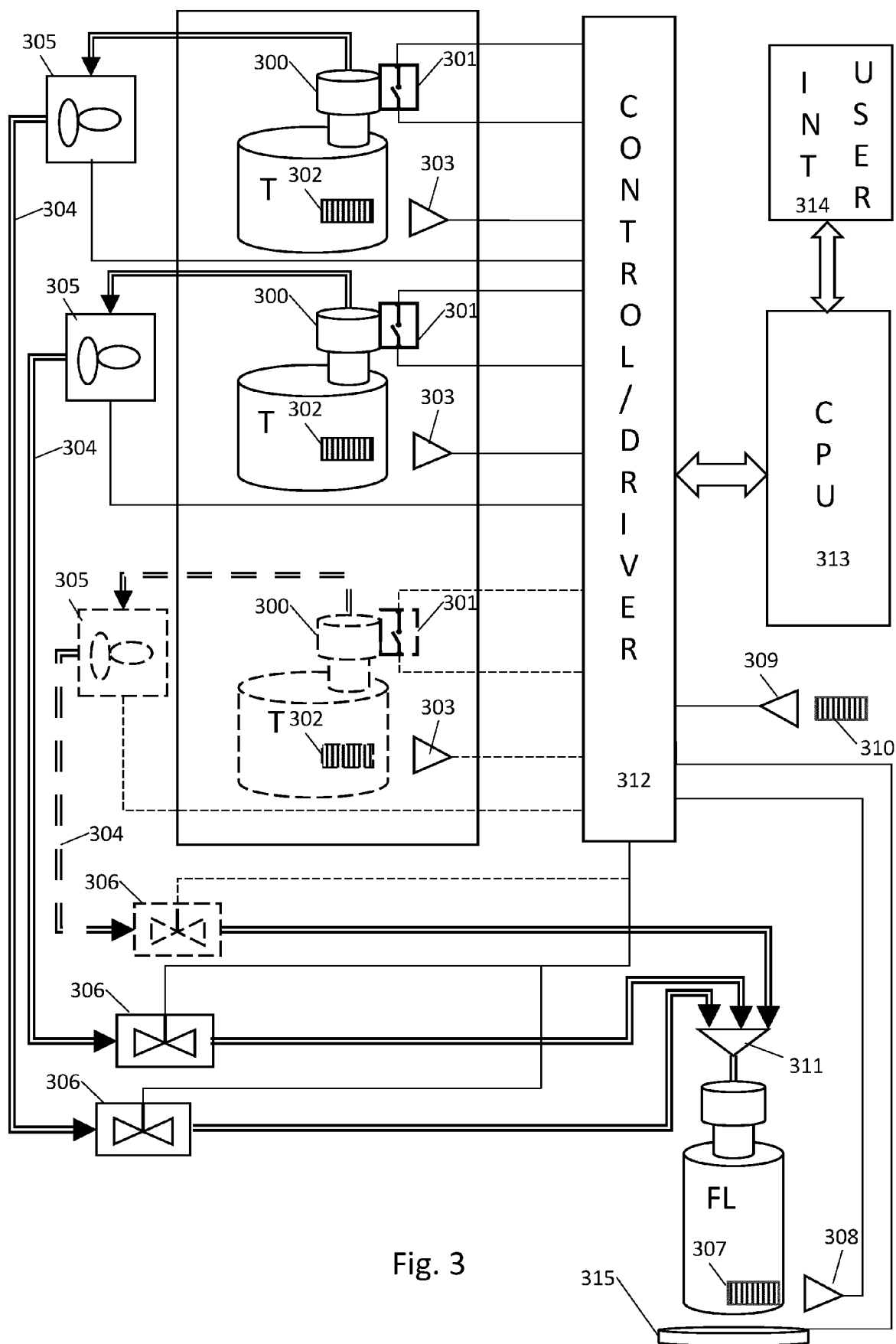


Fig. 2





EUROPEAN SEARCH REPORT

Application Number

EP 23 16 7263

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	WO 2020/176261 A1 (CAPITAL FORMATION INC [US]) 3 September 2020 (2020-09-03) * abstract; figures * * paragraphs [0038] - [0055], [0077], [0103] - [0112] *	1-20	INV. G07F13/06 G07F13/02 B67D1/00
A	US 2009/069949 A1 (CARPENTER GREGG [US] ET AL) 12 March 2009 (2009-03-12) * abstract; figures * * paragraphs [0057], [0140] *	1-20	
A	IT UA20 162 893 A1 (ALLEGRIINI S P A) 26 October 2017 (2017-10-26) * abstract; figures * * page 8, line 3 - page 10, line 23 *	1-20	
A	US 2010/024915 A1 (THOMAS GORDON [US] ET AL) 4 February 2010 (2010-02-04) * abstract; figures *	1-20	
A	WO 2006/131940 A1 (IMETEC SPA [IT]; MORGANDI ARTURO [IT]) 14 December 2006 (2006-12-14) * abstract; figures *	1-20	TECHNICAL FIELDS SEARCHED (IPC) G07F B67D
A	WO 03/005295 A1 (NESTEC SA [CH]; THOMAS KEVIN R [US] ET AL.) 16 January 2003 (2003-01-16) * abstract; figures *	1-20	
A	US 2018/177325 A1 (LYONS MARK [US] ET AL) 28 June 2018 (2018-06-28) * abstract; figures *	1-20	
A	US 2002/064880 A1 (MERTEN C WILLIAM [US] ET AL) 30 May 2002 (2002-05-30) * abstract; figures *	1-20	
-/--			
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 July 2023	Examiner Breugelmans, Jan
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	



EUROPEAN SEARCH REPORT

Application Number

EP 23 16 7263

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2016/139585 A1 (SODASTREAM IND LTD [IL]) 9 September 2016 (2016-09-09) * abstract; figures *	1-20	
A	US 2010/005903 A1 (BEAVIS RUSSELL H [US]) 14 January 2010 (2010-01-14) * abstract; figures *	1-20	
A	US 2021/338004 A1 (ALSAYAR MAX [CA] ET AL) 4 November 2021 (2021-11-04) * abstract; figures *	1-20	
A	WO 2014/036127 A1 (PEPSICO INC [US]) 6 March 2014 (2014-03-06) * abstract; figures *	1-20	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
Place of search The Hague			Date of completion of the search 24 July 2023
Examiner Breugelmans, Jan			
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			

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

EP 23 16 7263

24-07-2023

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.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2020176261 A1	03-09-2020	NONE	
US 2009069949 A1	12-03-2009	AU 2008296270 A1	12-03-2009
		BR PI0816377 A2	18-10-2016
		CN 101827778 A	08-09-2010
		CN 104961088 A	07-10-2015
		EP 2212238 A2	04-08-2010
		JP 5544291 B2	09-07-2014
		JP 6352373 B2	04-07-2018
		JP 6537225 B2	03-07-2019
		JP 2010537915 A	09-12-2010
		JP 2014196144 A	16-10-2014
		JP 2017081651 A	18-05-2017
		MX 338136 B	05-04-2016
		RU 2010110464 A	20-10-2011
		US 2009069949 A1	12-03-2009
		US 2017236358 A1	17-08-2017
		US 2020286326 A1	10-09-2020
		WO 2009032942 A2	12-03-2009
		ZA 201001756 B	24-11-2010
IT UA20162893 A1	26-10-2017		
US 2010024915 A1	04-02-2010	NONE	
WO 2006131940 A1	14-12-2006	AU 2005332781 A1	14-12-2006
		CN 101198991 A	11-06-2008
		EP 1897071 A1	12-03-2008
		JP 2008543360 A	04-12-2008
		US 2009127330 A1	21-05-2009
		WO 2006131940 A1	14-12-2006
WO 03005295 A1	16-01-2003	AR 034719 A1	17-03-2004
		AT 406630 T	15-09-2008
		AU 2002354823 B2	29-05-2008
		EP 1405261 A1	07-04-2004
		EP 1986150 A2	29-10-2008
		ES 2312599 T3	01-03-2009
		PT 1405261 E	09-10-2008
		US 2003006281 A1	09-01-2003
		US 2006108415 A1	25-05-2006
		WO 03005295 A1	16-01-2003
US 2018177325 A1	28-06-2018	US 2018177325 A1	28-06-2018
		US 2021007533 A1	14-01-2021
US 2002064880 A1	30-05-2002	AU 1988802 A	11-06-2002

EPO FORM P0459

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

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

EP 23 16 7263

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.

24-07-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		US 2002064880 A1	30-05-2002
		WO 0244690 A2	06-06-2002

WO 2016139585 A1	09-09-2016	AU 2016227418 A1	12-10-2017
		CA 2978175 A1	09-09-2016
		CN 107428524 A	01-12-2017
		DK 3265421 T3	30-03-2020
		EP 3265421 A1	10-01-2018
		ES 2783298 T3	17-09-2020
		HR P20200489 T1	02-10-2020
		HU E048644 T2	28-08-2020
		JP 6654642 B2	26-02-2020
		JP 2018513060 A	24-05-2018
		KR 20170129797 A	27-11-2017
		LT 3265421 T	10-06-2020
		PL 3265421 T3	10-08-2020
		PT 3265421 T	07-04-2020
		RU 2017132507 A	05-04-2019
		SI 3265421 T1	30-09-2020
		US 2016257551 A1	08-09-2016
		WO 2016139585 A1	09-09-2016

US 2010005903 A1	14-01-2010	AU 2009285598 A1	04-03-2010
		BR PI0917384 A2	17-11-2015
		CN 102387982 A	21-03-2012
		CN 104310298 A	28-01-2015
		EP 2331452 A2	15-06-2011
		JP 5663480 B2	04-02-2015
		JP 2012505370 A	01-03-2012
		JP 2014237487 A	18-12-2014
		RU 2011111550 A	10-10-2012
		RU 2013148950 A	10-05-2015
		US 2010005903 A1	14-01-2010
		US 2012192969 A1	02-08-2012
		US 2013340499 A1	26-12-2013
		US 2016069716 A1	10-03-2016
		US 2017050834 A1	23-02-2017
		US 2019375623 A1	12-12-2019
		WO 2010025382 A2	04-03-2010

US 2021338004 A1	04-11-2021	AU 2019323998 A1	18-03-2021
		BR 112021003140 A2	11-05-2021
		CA 3110122 A1	27-02-2020
		CN 113645882 A	12-11-2021
		EP 3840617 A1	30-06-2021
		IL 280981 A	29-04-2021

EPO FORM P0459

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

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

EP 23 16 7263

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.

24-07-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		JP 2021534049 A	09-12-2021
		KR 20210055049 A	14-05-2021
		US 2021338004 A1	04-11-2021
		WO 2020037406 A1	27-02-2020

WO 2014036127 A1	06-03-2014	NONE	

EPO FORM P0459

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