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(54) HOUSEHOLD APPLIANCE WITH EXTRACTION DEVICE FOR SALT CONTAINER AND METHOD FOR OPERATING SUCH A HOUSEHOLE APPLIANCE

(57) A household appliance (**100**) is provided. The household appliance comprises a water softening system (**WSS**) configured to receive fresh water having a first level of hardness and to provide softened water having a second level of hardness lower than the first level of hardness. The water softening system comprises: - a water softening agent container (**145**) configured to store a water softening agent capable of reducing a hardness of the fresh water; - a removable salt container (**150**) configured to contain salt for regenerating the water softening agent stored in the water softening agent container; - a housing (**H**) for accommodating the removable salt container (**150**), the housing comprising a cavity (**CV**) for slidingly inserting the salt container into the housing in an inward direction (**XI**), and for slidingly extracting the salt container from the housing in an outward direction (**XO**); and - a system for coupling/decoupling the salt container (**150**) to/from the housing (**H**), configured to be selectively switched between: - a coupled condition in which the salt container (**150**) is fastened to the housing (**H**), thereby preventing sliding of the salt container inside the cavity (**CV**), and - a decoupled condition in which the salt container (**150**) is unfastened from the housing (**H**), thereby allowing sliding of the salt container inside the cavity (**CV**). The system for coupling/decoupling the salt container comprises an extraction device (**ED**) configured to move the salt container (**150**) in the outward direction (**XO**) when the system is switched from the coupled condition to the decoupled condition.

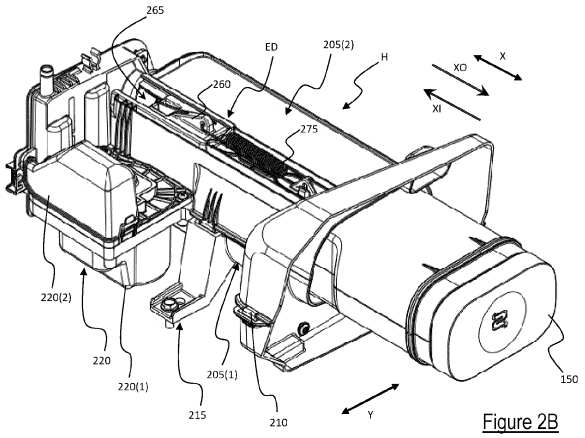

Figure 2B

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Description

Technical field

[0001] The present disclosure generally relates to the field of laundry treatment appliances (hereinafter, concisely, "household appliances"), and particularly to household appliances for treating (*e.g.*, washing) laundry, such as laundry washing appliances and laundry washing appliances also implementing laundry drying functions (also referred to as washers/dryers), comprising a water softening system.

Background art

[0002] A conventional household appliance is configured to treat laundry located in a (*e.g.*, rotatable) drum by providing process liquids in a washing tub housing the rotatable drum.

[0003] Process liquids may comprise (*e.g.*, depending on a selected treatment cycle and/or on a current phase of the selected treatment cycle) plain water or a treatment mixture comprising water mixed with proper treatment agents, including, but not limited to, washing detergents, rinsing detergents, bleaches and softeners detergents.

[0004] Since the hardness of the water (*i.e.*, the amount of minerals, largely calcium and magnesium, dissolved in the water) may negatively affect the performance of the household appliance (*e.g.*, in that components or parts of the household appliance that are in direct contact with hard or excessively hard water may become encrusted with limestone, thereby prematurely impairing the correct operation thereof) and/or of the treatment cycles (*e.g.*, in that laundry treated by using hard or excessively hard water may become stiff, subjected to premature tear and wear, and cause skin irritation), a modern type of household appliance comprises a water softening system configured to receive fresh water and to provide a softened water having a reduced hardness than the fresh water.

[0005] Typically, the water softening system comprises a water softening agent container configured to store a water softening agent (such as an ion-exchange resin) capable of reducing the hardness of the fresh water by reaction of the fresh water with the water softening agent.

[0006] Typically, the water softening system comprises a salt container configured to store salt, which is used for regenerating the water softening agent contained in the water softening agent container during a water softening agent regeneration procedure. Particularly, the salt container is configured to receive the fresh water, generate a mixture of salt and fresh water to produce a brine, and channel the brine into the water softening agent container to allow regeneration of the water softening agent.

[0007] The salt container is generally accommodated within the household appliance in a corresponding housing and must be accessible to a user, to allow the user to refill it with new amounts of salt.

Summary

[0008] The Applicant has realized that the current household appliances provided with a water softening system are not satisfactory, in particular those comprising a salt container located in a bottom portion of the appliance and which can be accessed only from the front part.

[0009] Indeed, it is very difficult to access the cavity of a salt container horizontally arranged in a bottom portion of the appliance when it has to be refilled with salt or cleaned from residual brine or salt. Therefore, to simplify these operations, the salt container has to be extracted by the user from the household appliance.

[0010] Since the salt container is accommodated in a housing located in an internal portion of the household appliance, the salt container is usually difficult to be reached by hand from the user. Moreover, since the housing for the salt container typically surrounds and encloses the salt container, it is very difficult for a user to manage to grasp the salt container when fitted in the housing.

[0011] This problem is exacerbated by the not negligible size and weight of typical salt containers.

[0012] In view of the above, the Applicant has devised a household appliance that is not affected by the above-mentioned drawbacks, and particularly a household appliance capable of allowing a simple and easy extraction of the salt container, which is at the same time simple and cost-effective.

[0013] An aspect of the present invention relates to a household appliance.

[0014] The household appliance comprises a water softening system configured to receive fresh water having a first level of hardness and to provide softened water having a second level of hardness lower than the first level of hardness.

[0015] The water softening system comprises a water softening agent container configured to store a water softening agent capable of reducing a hardness of the fresh water.

[0016] The water softening system comprises a removable salt container configured to contain salt for regenerating the water softening agent stored in the water softening agent container.

[0017] The water softening system comprises a housing for accommodating the removable salt container.

[0018] The housing comprises a cavity for slidingly inserting the salt container into the housing in an inward direction, and for slidingly extracting the salt container from the housing in an outward direction.

[0019] The water softening system comprises a system for coupling/decoupling the salt container to/from the housing.

[0020] The system for coupling/decoupling the salt container is configured to be selectively switched be-

tween:

- a coupled condition in which the salt container is fastened to the housing, thereby preventing sliding of the salt container inside the cavity, and
- a decoupled condition in which the salt container is unfastened from the housing, thereby allowing sliding of the salt container inside the cavity. The system for coupling/decoupling the salt container comprises an extraction device configured to move the salt container in the outward direction when the system is switched from the coupled condition to the decoupled condition.

[0021] Thanks to the extraction device, the operations to be performed by a user to extract the salt container from the household appliance are strongly simplified.

[0022] According to an embodiment of the present invention, the extraction device comprises a sliding element configured to slide with respect to the housing in the inward and the outward directions when the system is in the decoupled condition and to mechanical interact with the salt container when the salt container is inside the cavity.

[0023] According to an embodiment of the present invention, the sliding element is configured to push the salt container in the outward direction when it slides in the outward direction.

[0024] According to an embodiment of the present invention, the salt container is configured to push the sliding element in the inward direction when the salt container slides into the cavity in the inward direction.

[0025] According to an embodiment of the present invention, the sliding element comprises an interaction portion protruding inside the cavity.

[0026] According to an embodiment of the present invention, the interaction portion is configured to mechanically interact with the salt container when the salt container is inside the cavity so that it pushes the salt container in the outward direction when the sliding element slides in the outward direction.

[0027] According to an embodiment of the present invention, the salt container is configured to push the interaction portion when the salt container slides in the inward direction.

[0028] More than one interaction portion may be provided, each one part of or coupled to the sliding element and protruding inside the cavity.

[0029] According to an embodiment of the present invention, the extraction device further comprises an elastic element coupled to the sliding element.

[0030] According to an embodiment of the present invention, the elastic element is configured to pull the sliding element in the outward direction so that the sliding element slides in the outward direction thereby pushing the salt container in the outward direction.

[0031] According to an embodiment of the present invention, the elastic element is configured to be pushed by the sliding member when the salt container slides in the inward direction thereby pushing the sliding element in the inward direction.

[0032] According to an embodiment of the present invention, the elastic element comprises a spring element coupled between the housing and the sliding element.

[0033] Other types of elastic elements can be provided, such as for example comprising an elastic band or belt.

[0034] According to an embodiment of the present invention, the system for coupling/decoupling the salt container further comprises a first fastening element located at the salt container housing and a second fastening element located at the salt container.

[0035] According to an embodiment of the present invention, the first fastening element and the second fastening element are configured to be engaged with each other in the coupled condition and to be disengaged from each other in the decoupled condition.

[0036] More than one first fastening element and/or one second fastening element may be also provided.

[0037] According to an embodiment of the present invention, the first and second fastening elements are configured to disengage from each other when the salt container is pushed in the inward direction while the system is in the coupled condition, and the sliding element is configured to slide in the outward direction when the first and second fastening elements disengage from each other, thereby causing the elastic element to pull the sliding element in the outward direction so that the sliding element slides in the outward direction thereby causing the interaction portion to push the salt container in the outward direction.

[0038] In this way, through a small and simple pushing movement of the user, the extraction device causes the salt container to be (at least partially) pushed outside the housing, so that it can be easily grasped by the user to be extracted from the housing.

[0039] In this way, the operations for extracting the salt container from the household appliance are strongly simplified because the salt container is automatically pushed outwards without having to exploit costly (and prone to faults) motorized systems.

[0040] According to an embodiment of the present invention, the sliding element is configured to slide in the inward direction until the first and second fastening elements engage with each other.

[0041] According to an embodiment of the present invention, the first fastening element and the second fastening element comprise snap-fit elements.

[0042] According to an embodiment, the water softening system further comprises a presence detection unit for detecting a presence or absence of the salt container within the household appliance.

[0043] According to an embodiment, the housing comprises a processing unit configured to receive presence detection signals from the presence detection unit, and to provide to a control unit of the household appliance an indication of the presence of the salt container within the

household appliance.

[0044] In basic embodiments in which the processing unit is omitted, the presence detection unit (when provided) may be electrically connected (*e.g.*, directly) to the control unit. In these embodiments, the presence detection unit may transmit the presence detection signals to the control unit, and the control unit may determine an indication of the presence or absence of the salt container within the household appliance based on the received presence detection signals.

[0045] According to an embodiment of the present invention, the household appliance further comprises a door for accessing salt container housing, thereby allowing access to a protruding portion of the salt container when the coupling system is in the decoupled condition.

[0046] According to an embodiment of the present invention, the salt container is configured to receive the fresh water and generate a mixture of salt and fresh water to produce a brine.

[0047] According an embodiment of the present invention, when the salt container is accommodated within the cavity of the housing and fastened to the latter by the coupling system in the coupled condition the salt container is hydraulically connected to the water softening agent container.

[0048] According an embodiment of the present invention, when the salt container is accommodated within the cavity of the housing and fastened to the latter by the coupling system in the coupled condition the salt container is hydraulically connected to the water supply unit.

[0049] According to an embodiment of the present invention, when the salt container is accommodated within the cavity of the housing and fastened to the latter by the coupling system in the coupled condition, the salt container is fluidly connected to one or more regions of the water softening system.

[0050] According to an embodiment of the present invention, the hydraulic connection between the salt container and the water softening agent container, the hydraulic connection between the salt container and the water supply unit and the fluid connection between the salt container and region(s) of the water softening system are obtained by means of one or more check valves.

[0051] According to an embodiment of the present invention, the salt container housing comprises a first housing shell and a second housing shell connected to each other in a removable manner to define said cavity.

[0052] More than two housing shells may be also contemplated and configured to be connected to each other in a removable manner to define said cavity.

[0053] According to an embodiment, the housing is adapted to be fixed to the household appliance.

[0054] Another aspect of the present invention provides for a method for operating a household appliance comprising a water softening system.

[0055] The water softening system comprises a removable salt container configured to contain salt for regenerating the water softening agent stored in the water softening agent container.

[0056] The water softening system comprises a housing for accommodating the removable salt container.

[0057] The housing comprises a cavity for slidingly inserting the salt container into the housing in an inward direction, and for slidingly extracting the salt container from the housing in an outward direction.

[0058] The water softening system comprises a system for coupling/decoupling the salt container to the housing, configured to be selectively switched between:

- a coupled condition in which the salt container is fastened to the housing, thereby preventing sliding of the salt container inside the cavity, and
- a decoupled condition in which the salt container is unfastened from the housing, thereby allowing sliding of the salt container inside the cavity.

[0059] The system for coupling/decoupling the salt container comprises an extraction device configured to move the salt container in the outward direction when the system is switched from the coupled condition to the decoupled condition.

[0060] The extraction device comprises a sliding element configured to slide with respect to the housing in the inward and the outward directions when the system is in the decoupled condition and to mechanical interact with the salt container when the salt container is inside the cavity.

[0061] The sliding element is configured to push the salt container in the outward direction when it slides in the outward direction, and wherein the salt container is configured to push the sliding element in the inward direction when the salt container slides into the cavity in the inward direction.

[0062] The method comprises inserting the salt container into the cavity.

[0063] The method comprises pushing the salt container in the inward direction thereby pushing the sliding element so that it slides in the inward direction until the system is in the coupled condition in which the salt container is fastened to the housing.

[0064] The method comprises pushing the salt container fastened to the housing in the inward direction until the system is switched from the coupled to the decoupled condition, so that the sliding element slides in the outward direction thereby pushing the salt container in the outward direction.

Brief description of the annexed drawings

[0065] These and other features and advantages of the present disclosure will be made apparent by the following description of an exemplary and non-limitative embodiment thereof; for its better intelligibility, the following description should be read referring to the attached drawings, wherein:

Figure 1A shows a perspective view of a household appliance according to an exemplary embodiment of the present disclosure;

Figure 1B shows, in terms of simplified functional blocks, a hydraulic/electric circuit of the household appliance of **Figure 1A** according to the exemplary embodiment of the present disclosure;

Figure 2A shows a perspective front view of a housing accommodating a salt container of the household appliance of **Figures 1A** and **1B** in a retracted position according to the exemplary embodiment;

Figure 2B shows a perspective front view of the housing accommodating the salt container in an extracted position according to the exemplary embodiment.

Figure 3A and **Figure 3B** show top views of the housing accommodating the salt container of **Figure 2A** and **Figure 3B,** respectively, according to the exemplary embodiment;

Figure 4A shows a sectional view of the housing accommodating the salt container of **Figure 3A** taken along section plane **IVA-IVA** according to the exemplary embodiment;

Figure 4B shows a sectional view of the housing accommodating the salt container of **Figure 3B** taken along section plane **IVB-IVB** according to the exemplary embodiment;

Figure 5A shows a sectional view of the housing accommodating the salt container of **Figure 3A** taken along section plane **VA-VA** according to the exemplary embodiment.

Figure 5B shows a sectional view of the housing accommodating the salt container of **Figure 3B** taken along section plane **VB-VB** according to the exemplary embodiment;

Figure 6 shows a perspective back view of the housing accommodating the salt container of **Figure 2A** according to the exemplary embodiment;

Figure 7 shows a perspective and partially exploded rear view of a lower housing shell of the housing according to the exemplary embodiment;

Figure 8A shows a flow chart illustrating in terms of functional blocks main operations of a method for inserting the salt container into the housing of the household appliance according to the exemplary embodiment of the present invention;

Figure 8B shows a flow chart illustrating in terms of functional blocks main operations of a method for extracting the salt container from the housing of the household appliance according to the exemplary embodiment of the present invention.

Detailed description of an exemplary embodiment

[0066] With reference to the drawings, **Figures 1A** and **1B** show a perspective view of a household appliance **100** and a hydraulic/electric circuit thereof, respectively, according to an exemplary embodiment of the present disclosure.

[0067] In the following, only relevant components of the household appliance **100** (hereinafter, appliance components) deemed relevant for the understanding of the exemplary embodiment of the present disclosure will be discussed for the sake of conciseness.

[0068] In the following, directional terminology (such as above, below, front, rear, central, side, upper and lower) is only used for describing the household appliance (as well as the appliance components) according to an intended orientation use thereof; therefore, directional terminology should be under no circumstances construed in absolute terms. In particular, the directional terminology is referred to mutually orthogonal reference axis **X, Y,** and **Z.**

[0069] In **Figure 1B,** hydraulic connections among the appliance components are graphically represented by double lines. Without losing generality, the hydraulic connections may comprise rigid and/or semi-rigid (flexible) pipes. In **Figure 1B,** electric connections among the appliance components are graphically represented by single lines (so as to distinguish them from the hydraulic connections).

[0070] According to the exemplary embodiment, the household appliance **100** is a washing machine. In any case, although in the following description explicit reference will be made to a washing machine, this should not to be construed as a limitation; indeed, the present disclosure equivalently applies to other types of household appliances, for example combined washers/dryers *(i.e.,* washing machines also having laundry drying functions).

[0071] According to the exemplary embodiment, the household appliance **100** comprises a control unit **CU** for controlling the household appliance **100.**

[0072] According to the exemplary embodiment, the control unit **CU** is configured to control (*e.g.*, drive, power, interact with and/or exchange data with) the appliance components (or a subset thereof, as will be progressively detailed in the following discussion), in order to manage the execution of selected treatment cycles.

[0073] The implementation of the control unit **CU** is not limiting for the present disclosure.

[0074] Just as an example, the control unit **CU** may comprise a plurality of dedicated electronic sub-units (not shown) each one aimed at controlling one or more respective appliance components, and a central electronic unit (not shown) for coordinating the plurality of dedicated control sub-units.

[0075] Just as another example, the control unit **CU** may comprise a single, common electronic unit.

[0076] In the following, when one or more of the appliance components are said to be operated under the control of the control unit **CU,** it is meant that these appliance components may be equally operated by the respective dedicated electronic units or by the common electronic unit.

[0077] According to the exemplary embodiment, the household appliance **100** comprises a (e.*g.*, parallepi-

ped-shaped) cabinet **105.**

[0078] According to the exemplary embodiment, the household appliance **100** comprises a basement portion (not shown) provided at a bottom of the household appliance **100** and adapted to receive or accommodate one or more of the appliance components.

[0079] According to the exemplary embodiment, the household appliance **100** comprises a laundry treatment chamber, such as a washing tub **110** (schematically shown in **Figure 1B**). According to the exemplary embodiment, the washing tub **110** is accommodated within the cabinet **105,** the washing tub **110** for example resting on the basement portion.

[0080] According to the exemplary embodiment, the household appliance **100** comprises a (e.g., rotatable) drum, not shown in the figures, adapted to receive laundry to be treated (*e.g.*, to be washed), or laundry load. According to the exemplary embodiment, the drum is housed within the washing tub **110.**

[0081] According to the exemplary embodiment, the household appliance **100** comprises (*e.g.*, at a cabinet front), a loading opening (not visible in the figures) providing an access to the drum (*e.g.*, for loading/unloading the laundry load).

[0082] According to the exemplary embodiment, the household appliance **100** comprises a porthole **115** (shown in a closed position in **Figure 1A**) for sealably closing the loading opening during the operation of the household appliance **100.**

[0083] According to the exemplary embodiment, the household appliance **100** comprises a user interface.

[0084] According to the exemplary embodiment, the user interface comprises a physical user interface.

[0085] According to the exemplary embodiment, the user interface comprises, *e.g.*, depending on type and/or model of household appliance, one or more interaction units associated with (*e.g.*, for selecting and/or interacting with) corresponding functionalities of the household appliance **100.** According to the exemplary embodiment, the interaction unit(s) comprise(s) one or more among a button or key (or more thereof) **120(1),** a rotary knob (or more thereof) **120(2),** and a display (or more thereof) **120(3).**

[0086] According to the exemplary embodiment, the control unit **CU** is configured to control the household appliance **100** according to instructions received by a user through the user interface of the household appliance **100.**

[0087] According to the exemplary embodiment, the user interface comprises warning means to provide one or more warning indications to the user.

[0088] According to the exemplary embodiment, the warning means comprises one or more warning units of, or associated with, the physical user interface.

[0089] According to the exemplary embodiment, the warning means is configured to communicate with the control unit **CU.** According to the exemplary embodiment, the control unit **CU** is electrically connected to the warning unit(s).

[0090] According to the exemplary embodiment, the warning means may be configured to provide one or more types of warning indications, for example optical and/or acoustical indications. Just as an example, the optical indication(s) may comprise a light and/or a text message and/or a symbol/icon (for example, a static or animated symbol/icon for salt container extraction and/or for salt refill). Just as an example, the acoustical indication(s) may comprise a beep sound and/or a vocal message.

[0091] Without losing generality, the warning unit(s) may comprise the display **120(3)** and/or one or more sound emitters of the household appliance **100** (not shown).

[0092] According to the exemplary embodiment, the household appliance **100** comprises a process liquid supply apparatus for supplying process liquids into the washing tub **110.**

[0093] According to the exemplary embodiment, the process liquids may comprise water (such as fresh water or softened water, as discussed in the following) or a treatment mixture including a treatment agent mixed with water *(i.e.,* a treatment agent mixed with the fresh water or with the softened water).

[0094] According to the exemplary embodiment, the treatment agent may comprise one or more among a washing detergent, a rinsing detergent, a bleach and a softener.

[0095] According to the exemplary embodiment, the process liquid supply apparatus comprises a drawer **125.** According to the exemplary embodiment, the drawer **125** is configured to store an amount of treatment agent sufficient for performing one or more treatment cycles, and to selectively deliver the process liquids (*i.e.*, the water or the treatment mixture) to the washing tub **110.**

[0096] According to the exemplary embodiment, the drawer **125** is adapted to slide within a drawer seat (not shown), along a sliding direction, between an extracted position (not shown) and a retracted position (shown in **Figure 1A**). According to the exemplary embodiment, the sliding direction (parallel to the **X** axis) is parallel to a rest surface (identified by the **X-Y** plane), such as the floor, on which the household appliance **100** rests in operation (*i.e.*, when it is installed in the user premises).

[0097] According to the exemplary embodiment, the drawer **125** comprises a water distribution system (not shown) for distributing the water (*e.g.*, the fresh water or the softened water) within the drawer **125** in order to obtain the process liquids. Without losing generality, the water distribution system may comprise a flushing device (not shown) flushing the fresh water or the softened towards specific regions of the drawer **125** (such as compartments and/or channels thereof). According to the exemplary embodiment, as mentioned above, the fresh water or the softened water from the flushing device (or, more generally, from the water distribution system) may be mixed with treatment agent (so that the process liquids provided to the washing tub **110** comprise a correspond-

ing treatment mixture) or not mixed with any treatment agent (so that the process liquids provided to the washing tub **110** comprise plain (fresh or softened water) water).

[0098] According to the exemplary embodiment, the process liquids provided to the washing tub **110** may comprise the treatment mixture or the plain water depending on a current phase of a selected (and ongoing) treatment cycle performed by the household appliance **100.** Just as an example, the process liquids may comprise the treatment mixture during pre-washing and washing phases of the treatment cycle, or the plain water during wetting and rinsing phases of the treatment cycle.

[0099] According to the exemplary embodiment, the process liquids provided to the washing tub **110** may comprise the fresh water or the softened water depending on a current phase of a selected (and ongoing) treatment cycle performed by the household appliance **100.** Just as an example, the process liquids may comprise the softened water during pre-washing and washing phases of the treatment cycle, or the fresh water during wetting and rinsing phases of the treatment cycle.

[0100] According to the exemplary embodiment, the household appliance **100** comprises a drain **135** (schematically shown in **Figure 1B**) for allowing the process liquids contained in the washing tub **110** to be discharged from the household appliance **100.** According to the exemplary embodiment, the drain **135** is located at the cabinet back, preferably at a top portion thereof.

[0101] According to the exemplary embodiment, the household appliance **100** comprises a water supply unit **140** (schematically shown in **Figure 1B**) configured to supply fresh water to the household appliance **100.** According to the exemplary embodiment, the water supply unit **140** is located at a cabinet back, preferably at a top portion thereof.

[0102] For the purposes of the present disclosure, the fresh water supplied by the water supply unit **140** has a high or relatively high level of hardness (*i.e.* a high or relatively high amount of dissolved minerals (largely, calcium and magnesium). For the purposes of the present disclosure, the level of hardness of the fresh water is higher than the level of hardness of the softened water provided by a water softening system (discussed in the following) from the fresh water.

[0103] According to the exemplary embodiment, the water supply unit **140** comprises a valve system.

[0104] According to the exemplary embodiment, the water supply unit **140** is connected to a fresh water hose (not shown). According to the exemplary embodiment, the fresh water hose is located behind the household appliance **100.** According to the exemplary embodiment, the fresh water hose is connected to an external water supply (such as the water mains, not shown). According to the exemplary embodiment, the water supply unit **140** may be operated to allow selective supply of fresh water to the process liquid supply apparatus and/or to a water softening system (discussed in the following), or to prevent the supply of fresh water to both the process liquid supply apparatus and the water softening system.

[0105] According to the exemplary embodiment, the water supply unit **140** is operated under the control of the control unit **CU** (as conceptually represented in the figure by electrical connection between the control unit **CU** and the water supply unit **140**). For the purposes of the present disclosure, the control unit **CU** may be configured to selectively allow or prevent the supply of fresh water from the water supply unit **140** to the process liquid supply apparatus, to a water softening agent container (discussed in the following) and/or to a salt container (discussed in the following).

[0106] According to the exemplary embodiment, the household appliance **100** comprises a water softening system **WSS** configured to receive the fresh water (*e.g.,* from the water supply unit **140**) and to provide the softened water (*e.g.*, to the process liquid supply apparatus).

[0107] According to the exemplary embodiment, the water softening system **WSS** comprises a water softening agent container **145.**

[0108] According to the exemplary embodiment, the water softening agent container **145** is configured to store a water softening agent capable of reducing a hardness of the fresh water. Without losing generality, the water softening agent may comprise an ion-exchange resin.

[0109] According to the exemplary embodiment, the water softening agent container **145** is configured to provide the softened water obtained from the fresh water (*e.g.*, from the water supply unit **140**) reacting with the water softening agent. In other words, the water softening agent contained in the water softening agent container **145** causes a reduction of the hardness of the received fresh water, thus obtaining the corresponding softened water.

[0110] According to the exemplary embodiment, the water softening agent container **145** is operated under the control of the control unit **CU.** For the purposes of the present disclosure, the control unit **CU** may be configured to selectively allow or prevent the supply of the softened water from the water softening agent container **145** to the process liquid supply apparatus.

[0111] According to the exemplary embodiment, the water softening system **WSS** comprises a salt container **150** configured to store salt. According to the exemplary embodiment, the salt stored in the salt container **150** is used for regenerating the water softening agent contained in the water softening agent container **145** during a water softening agent regeneration procedure. Particularly, according to the exemplary embodiment, the salt container **150** is configured to receive the fresh water (*e.g.*, from the water supply unit **140**), generate a mixture of salt and fresh water to produce a brine, and channel the brine into the water softening agent container **145** to allow a regeneration of the water softening agent.

[0112] According to the exemplary embodiment, the brine contained in the salt container **150** is caused to be channelled into the water softening agent container **145** by water pressure of the fresh water entering the salt

container **150.**

[0113] According to the exemplary embodiment, the salt container **150** is removably accommodated within the household appliance **100,** for example (as illustrated) at a cabinet bottom. According to the exemplary embodiment, the household appliance **100** comprises (*e.g.*, at a cabinet front) an opening **160** for accessing the salt container **150** and allow a user to refill it with new amounts of salt.

[0114] According to the exemplary embodiment, the household appliance **100** comprises (*e.g.*, at a cabinet front) a door **D** for selectively opening/closing the opening **160.**

[0115] According to the exemplary embodiment, the salt container **150** is adapted to slide within a cavity **CV** of a respective housing **H** (discussed in the following), along the sliding direction (parallel to the **X** axis) for being extracted/inserted from/to the household appliance **100** through the opening **160** for allowing an easy refilling of salt.

[0116] According to the exemplary embodiment, the household appliance **100** comprises a coupling system (discussed in the following) for coupling/decoupling the salt container **150** to the housing.

[0117] According to the exemplary embodiment, the coupling system is configured to be selectively switched between:

- a coupled condition in which the salt container is fastened into the housing **H,** thereby preventing sliding of the salt container **150** inside the cavity **CV,** and
- a decoupled condition in which the salt container is unfastened from the housing **H,** thereby allowing sliding of the salt container **150** inside the cavity **CV.**

[0118] According to the exemplary embodiment, the salt container **150** comprises an inlet channel **A.** According to the exemplary embodiment, a check valve **165A** is arranged in the inlet channel **A.** According to the exemplary embodiment, when the salt container **150** is accommodated within the cavity **CV** of the housing **H** and fastened to the latter by the coupling system in the coupled condition, the salt container **150** is hydraulically connected to the water softening agent container **145** through the check valve **165A** arranged in the inlet channel **A** of the salt container **150** and through a respective check valve **170A** arranged in the housing **H.** In this way, when the salt container **150** is accommodated within the cavity **CV** of the housing **H** and fastened to the latter by the coupling system in the coupled condition, the salt container **150** may receive fresh water from the water supply unit **140** to produce the brine.

[0119] According to the exemplary embodiment, the salt container **150** comprises a first outlet channel **B.** According to the exemplary embodiment, a check valve **165B** is arranged in the first outlet channel **B.** According to the exemplary embodiment, when the salt container **150** is accommodated within the cavity **CV** of the housing **H** and fastened to the latter by the coupling system in the coupled condition, the salt container **150** is hydraulically connected to the water supply unit **140** through the check valve **165B** arranged in the first outlet channel **B** of the salt container **150** and through a respective check valve **170B** arranged in the housing **H.** In this way, when salt container **150** is accommodated within the cavity **CV** of the housing **H** and fastened to the latter by the coupling system in the coupled condition, brine contained in the salt container **150** may be channelled into the water softening agent container **145** (to allow regeneration of the water softening agent) or into the drain **135** (to allow safe and easy salt container extraction to perform salt refill, as better discussed in the following).

[0120] According to the exemplary embodiment, the salt container **150** comprises a second outlet channel **C.** According to the exemplary embodiment, a check valve **165C** is arranged in the second outlet channel **C.** According to the exemplary embodiment, when the salt container **150** is accommodated within the cavity **CV** of the housing **H** and fastened to the latter by the coupling system in the coupled condition, the salt container **150** is fluidly connected to one or more regions of the water softening system **WSS** through the check valve **165C** arranged in the second outlet channel **C** of the salt container **150** and through a respective check valve **170C** arranged in the housing **H.** In this way, when the salt container **150** is accommodated within the cavity **CV** of the housing **H** and fastened to the latter by the coupling system in the coupled condition, air contained inside the salt container **150** may exit the salt container (i.e., to allow air vent).

[0121] According to the exemplary embodiment, each check valve **165A, 165B, 165C** arranged in a channel **A, B, C** of the salt container **150** is configured to interact or cooperate (*e.g.*, couple) with the respective check valve **170A, 170B, 170C** in the housing **H** when the salt container **150** is accommodated within the cavity **CV** of the housing **H** and fastened to the latter by the coupling system in the coupled condition.

[0122] According to the exemplary embodiment:

- When the salt container **150** is inserted within the cavity **CV** of the housing **H** and fastened to the housing **H** by the coupling system in the coupled condition, the check valves **165A, 165B, 165C** and **170A, 170B, 170C** are open, thereby allowing the hydraulic connection of the salt container **150** to the water softening agent container **145,** the hydraulic connection of the salt container **150** to the water supply unit **140** and the fluid connection of the salt container **150** to the external region;
- when the salt container **150** is unfastened from the housing **H** by the coupling system in the decoupled condition, the check valves **165A, 165B, 165C** and **170A, 170B, 170C** are closed, thereby preventing said hydraulic and fluid connections of the salt container **150.**

[0123] According to the exemplary embodiment, each check valve **165A, 165B, 165C** and **170A, 170B, 170C** comprises a valve body actuatable to allow passage of fluid (*e.g.*, water or air) therethrough. According to the exemplary embodiment, each check valve **170A, 170B, 170C** of the housing **H** comprises an actuation member (for example, in the form of a pin or stem) for valve body actuation.

[0124] According to the exemplary embodiment, when the salt container **150** is inserted within the cavity **CV** of the housing **H** and fastened to the housing **H** by the coupling system in the coupled condition, each actuation member actuates the valve bodies of the respective check valves $\mathbf{165_A}$,$\mathbf{170_A}$, $\mathbf{165_B}$,$\mathbf{170_B}$, $\mathbf{165_C}$,$\mathbf{170_C}$ thereby opening the check valves $\mathbf{165_A}$,$\mathbf{170_A}$, $\mathbf{165_B}$,$\mathbf{170_B}$, $\mathbf{165_C}$, $\mathbf{170_C}$ to establish the respective hydraulic and fluid connections, whereas when the salt container **150** is unfastened from the housing **H** by the coupling system in the decoupled condition, the actuation members do not interact with the valve bodies of the respective check valves $\mathbf{165_A}$,$\mathbf{170_A}$, $\mathbf{165_B}$,$\mathbf{170_B}$, **165c,170c** so that each of the check valves $\mathbf{165_A}$,$\mathbf{170_A}$, $\mathbf{165_B}$,$\mathbf{170_B}$, **165c,170c** is closed, thereby preventing the respective hydraulic and fluid connections.

[0125] In this way, spillage of the content of the water softening agent container **145** into the housing **H** is prevented.

[0126] According to the exemplary embodiment, the water softening system **WSS** comprises a draining arrangement **175,** hydraulically connected to the salt container **150,** configured to drain the brine from the salt container **150.** Without losing generality, the draining arrangement **175** may comprise a draining pump. According to the exemplary embodiment, the draining arrangement **175** is operated under the control of the control unit **CU.**

[0127] According to the exemplary embodiment, as conceptually represented in **Figure 1B,** the draining arrangement **175** is arranged in the housing **H.**

[0128] According to the exemplary embodiment, the draining arrangement **175** is configured to drain the brine from the salt container **150** into the drain **135** through the washing tub **110** *(i.e.,* by bypassing the process liquid supply apparatus). This avoids that the process liquid supply apparatus gets soiled with the brine and/or impurities thereof.

[0129] **Figure 2A** shows a perspective front view of the housing **H** accommodating the salt container **150** in a retracted position, with the salt container **150** that is fastened to the housing **H** by the coupling system in the coupled condition, according to the exemplary embodiment.

[0130] **Figure 2B** shows a perspective front view of the housing **H** accommodating the salt container **150** in an extracted position, with the salt container **150** that is unfastened from the housing **H,** *i.e.,* when the coupling system is in the decoupled condition, according to the exemplary embodiment.

[0131] **Figure 3A** and **Figure 3B** show top views of the housing **H** accommodating the salt container **150** of **Figure 2A** and **Figure 3B,** respectively, according to the exemplary embodiment.

[0132] **Figure 4A** shows a sectional view of the housing **H** accommodating the salt container **150** of **Figure 3A** taken along section plane **IVA-IVA** according to the exemplary embodiment.

[0133] **Figure 4B** shows a sectional view of the housing **H** accommodating the salt container **150** of **Figure 3B** taken along section plane **IVB-IVB** according to the exemplary embodiment.

[0134] **Figure 5A** shows a sectional view of the housing **H** accommodating the salt container **150** of **Figure 3A** taken along section plane **VA-VA** according to the exemplary embodiment.

[0135] **Figure 5B** shows a sectional view of the housing **H** accommodating the salt container **150** of **Figure 3B** taken along section plane **VB-VB** according to the exemplary embodiment.

[0136] **Figure 6** shows a perspective back view of the housing **H** accommodating the salt container **150** of **Figure 2A** according to the exemplary embodiment.

[0137] According to the exemplary embodiment, the housing **H** comprises a first (*e.g.*, lower) housing shell **205(1)** and a second (*e.g.*, upper) housing shell **205(2)** (wherein the terms lower and upper refer to lower and upper positions along the **Z** axis). According to the exemplary embodiment, the lower housing shell **205(1)** and the upper housing shell **205(2)** are connected to each other, so as to define the cavity **CV** adapted to slidingly receive the salt container **150.** The cavity **CV** is visible in **Figures 4A, 4B, 5A,** and **5B.** According to the exemplary embodiment, the lower housing shell **205(1)** and the upper housing shell **205(2)** are connected to each other in a removable manner. A perspective and exploded rear view of the lower housing shell **205(1)** according to the exemplary embodiment is depicted in **Figure 7.**

[0138] According to the exemplary embodiment, the lower housing shell **205(1)** and the upper housing shell **205(2)** are connected to each other by means of one or more snap-fit mechanisms **210,** for example a plurality of snap-fit mechanisms **210** provided at (*e.g.*, edge or perimeter portions of) the lower and upper housing shells.

[0139] According to the exemplary embodiment, the lower housing shell **205(1)** is made of a plastic (*e.g.*, rigid or semi rigid) material and/or of a metal material.

[0140] According to the exemplary embodiment, the upper housing shell **205(2)** is made of a plastic (*e.g.*, rigid or semi rigid) material and/or of a metal material. Without losing generality, the lower housing shell **205(1)** and the upper housing shell **205(2)** may be made of same, different, or partially different materials.

[0141] According to the exemplary embodiment, the housing **H** is adapted to be accommodated in a respective housing seat (not shown), the housing seat being for example formed in the basement portion of the household appliance **100.** According to the exemplary embod-

iment, the housing seat has a profile matching or substantially matching a profile of the lower housing shell **205(1).**

[0142] According to the exemplary embodiment, the housing **H** is adapted to be fixed to the household appliance **100,** so as to stably keep it firm while moving the salt container **150** between the extracted and retracted positions.

[0143] According to the exemplary embodiment, the housing **H** is adapted to be fixed to the basement portion of the household appliance **100** by means of a fixing arrangement **215.**

[0144] According to the exemplary embodiment, the housing **H** comprises a seat (hereinafter, pump seat) **220** for positioning the draining pump (or, more generally, the draining arrangement **175**) therein.

[0145] According to the exemplary embodiment, the pump seat **220** comprises a lower pump seat portion **220(1)** associated with (*e.g.*, formed in a single piece with) the lower housing shell **205(1)** and adapted to house (from below) the draining pump (or, more generally, the draining arrangement **175**), and an upper pump seat portion **220(2)** associated with (*e.g.*, formed in a single piece with) the upper housing shell **205(2)** and adapted to cover (from above) the draining pump (or, more generally, the draining arrangement **175**). According to the exemplary embodiment, the pump seat **220** is configured to completely enclose the draining pump (or, more generally, the draining arrangement **175**) when the lower housing shell **205(1)** and the upper housing shell **205(1)** are connected to each other.

[0146] According to the exemplary embodiment, the housing **H** comprises a closure lid **245** for closing the rear portion of the lower housing shell **205(1).** According to the exemplary embodiment, the closure lid **245** is configured to be fixed to the rear portion of the lower housing shell **205(1),** for example by means of a snap closure.

[0147] According to the exemplary embodiment, the housing **H** comprises a presence detection unit **250** for detecting a presence or absence of the salt container **150** within the cavity **CV** of the housing **H.** Without losing generality, the presence detection unit **250** may be based on any suitable detection principle, such as mechanical detection, electrical detection, optical detection or a combination thereof.

[0148] According to an embodiment, the housing **H** comprises a processing unit (not illustrated) configured to receive presence detection signals from the presence detection unit **250,** and to provide to the control unit **CU** of the household appliance **100** an indication of the presence of the salt container within the household appliance based on the presence detection signals received from the presence detection unit **250.**

[0149] According to the exemplary embodiment of the invention, the salt container **150** is configured to:

- be inserted into the housing **H** by sliding in the cavity **CV** in an inward direction **XI** (*i.e.,* directed toward the inside of the household appliance **100**) parallel to the axis **X,** and
- be extracted from the housing **H** by sliding in the cavity **CV** in an outward direction **XO** *(i.e.,* directed toward the outside of the household appliance **100**) opposite to the inward direction **XI.**

[0150] According to the exemplary embodiment of the invention, the coupling system for coupling/decoupling the salt container **150** to the housing **H** comprises a releasable push-push coupling mechanism including a first fastening element **E1** located at the housing **H** and a second fastening element **E2** located at the salt container **150.**

[0151] According to the exemplary embodiment of the invention, the first fastening element **E1** and the second fastening element **E2** are configured to be engaged with each other when the coupling system is in the coupling condition (see **Figure 4A**).

[0152] According to the exemplary embodiment of the invention, the first fastening element **E1** and the second fastening element **E2** are configured to be disengaged from each other when the coupling system is in the decoupling condition (see **Figure 4B**).

[0153] According to the exemplary embodiment of the invention, the first fastening element **E1** and the second fastening element **E2** comprise snap-fit elements.

[0154] According to the exemplary embodiment of the invention, starting from the coupling system in the decoupled condition - in which the first fastening element **E1** is disengaged from the second fastening element **E2** -, the coupling system is configured to be switched to the coupled condition by pushing the salt container **150** in the cavity **CV** in the inward direction **XI** until the first fastening element **E1** engages the second fastening element **E2** by snap-fit.

[0155] According to the exemplary embodiment of the invention, starting from the coupling system in the coupled condition - in which the first fastening element **E1** is engaged with the second fastening element **E2** -, the releasable push-push coupling mechanism is configured to cause the first fastening element **E1** be disengaged from the second fastening element **E2** (switching thus the coupling system from the coupled condition to the decoupled condition) in response to a push of the salt container **150** in the inward direction **XI.**

[0156] According to the exemplary embodiment of the invention, the presence or absence of the salt container within the cavity **CV** of the housing **H,** related, each, to the coupled or decoupled condition, are detected by the presence detection unit **250** .

[0157] According to the exemplary embodiment of the invention, the coupling system comprises an extraction device **ED** configured to push the salt container **150** in the outward direction **XO** when the coupling system is switched from the coupled condition to the decoupled condition.

[0158] According to the exemplary embodiment of the

invention, the extraction device **ED** comprises a sliding element **260** configured to slide with respect to the housing **H** in the inward direction **XI** and in the outward direction **XO** when the coupling system is in the decoupled condition.

[0159] According to the exemplary embodiment of the invention, the upper housing shell **205(2)** is provided with a guide element **265** running parallel to the axis **X** and configured to guide the movement of the sliding element **260** along the inward direction **XI** and the outward direction **XO.**

[0160] According to the exemplary embodiment of the invention, the sliding element **260** is configured to mechanical interact with the salt container **150** when the salt container **150** is inside the cavity **CV** of the housing **H.**

[0161] For this purpose, according to the exemplary embodiment of the invention, the sliding element **260** comprises an interaction portion **270** protruding inside the cavity **CV** of the housing **H,** for example through the guide element **265.**

[0162] According to the exemplary embodiment of the present invention, the mechanical interaction between (the interaction portion **270** of) the sliding element **260** and the salt container **150** allows the salt container **150** to push the sliding element **260** in the inward direction **XI** when the salt container **150** slides into the cavity **CV** of the housing **H** in the inward direction **XI.**

[0163] According to the exemplary embodiment of the present invention, the mechanical interaction between (the interaction portion **270** of) the sliding element **260** and the salt container **150** allows the sliding element **260** to push the salt container **150** in the outward direction **XO** when the sliding element **260** slides along the guide element **265** in the outward direction **XO.**

[0164] According to the exemplary embodiment of the invention, the extraction device **ED** comprises an elastic element (*e.g.*, a spring) **275** coupled to the sliding element **260.**

[0165] According to the exemplary embodiment of the invention, the elastic element **275** is configured to pull the sliding element **260** in the outward direction **XO.**

[0166] In this way, when the coupling system switches from the coupled condition to the decoupled condition, so that the first fastening element **E1** disengages from the second fastening element **E2,** the sliding element **260** is slid by the elastic element **275** in the outward direction thereby pushing the salt container **150** inside the cavity **CV** in the outward direction **XO.** Moreover, when the salt container **150** is slid inside the cavity **CV** in the inward direction **XO,** the elastic element **275** is pushed by the sliding element **260.**

[0167] According to the exemplary embodiment of the invention, the elastic element **275** comprises a spring element for coupling the housing **H** to the sliding element **260.**

[0168] According to the exemplary embodiment of the invention, the elastic element **275** comprises a spring having a first end connected (*e.g.*, fitted in) to a coupling portion (*e.g.*, an eyelet) of the sliding element **260.**

[0169] According to the exemplary embodiment of the invention, the elastic element **275** comprises a spring having a second end connected (*e.g.*, fitted in) to a coupling portion (*e.g.*, an eyelet) located at the upper housing shell **205(2)** of the housing **H.**

[0170] According to the exemplary embodiment of the invention, the sliding element **260** is configured to slide in the inward direction **IW** (under the pushing force exerted by the sliding of the salt container **150** inside the cavity **CV** along the inward direction **IW**) until the first and second fastening elements **E1**, **E2** engage with each other (*i.e.,* until the coupled condition of the coupling system is reached).

[0171] According to an embodiment of the present invention, when the first and second fastening elements **E1**, **E2** disengage from each other, the elastic element **275** is left free to retract, so as it drags (pull) the sliding element **260** in the outward direction **XO.** Therefore, because of the pulling force exerted by the retracting elastic element **275,** the interaction portion **270** of the sliding element **260** pushes the salt container **150** in the outward direction **XO.**

[0172] In this way, according to the exemplary embodiment of the present invention, when the door **D** of the opening **160** (see **Figure** 1A) is opened, and the coupling system is switched to the decoupled condition (*e.g.*, by pushing the salt container **150** along in the inward direction **XI** to disengage the first fastening element **E1** from the second fastening element **E2**), the salt container **150** is pushed in the outward direction **XO** by the sliding element **260** (pulled in turn by the elastic element **275**), until protruding outside the opening **160,** easing the extraction of the salt container **150** from the housing **H** by allowing a user to grab the protruding portion of the salt container **150.**

[0173] With reference now to **Figure 8A,** it shows a flow chart illustrating in terms of functional blocks the main operations of a method **300** performed by a user, for inserting the salt container **150** into the housing **H** of the household appliance **100** according to the exemplary embodiment of the present invention.

[0174] Starting from a condition in which the salt container **150** is outside the housing **H** of the household appliance **100,** according to the exemplary embodiment the method **300** comprises opening the door **D** to expose the opening **160** for accessing the cavity **CV** of the housing **H** (block **302**).

[0175] According to the exemplary embodiment of the invention, the method **300** comprises inserting the salt container **150** into the cavity **CV** of the housing **H** through the opening **160** (block **304**).

[0176] According to the exemplary embodiment of the invention, once the salt container **150** is inserted in the cavity **CV,** the method **300** comprises pushing the salt container **150** inside the cavity **CV** of the housing **H** in the inward direction **XI,** thereby pushing the sliding element **260** so that it slides in the inward direction **XI** until

the first and second fastening elements **E1**, **E2** engage with each other (*i.e.,* until the coupled condition of the coupling system is reached) (block **306**). In this way, the salt container **150** is fastened to the housing **H,** and the respective check valves $\mathbf{165_A}$,$\mathbf{170_A}$, $\mathbf{165_B}$,$\mathbf{170_B}$, $\mathbf{165_C}$, $\mathbf{170_C}$ are open, thereby allowing the hydraulic connection of the salt container **150** to the water softening agent container **145,** the hydraulic connection of the salt container **150** to the water supply unit **140** and the fluid connection of the salt container **150** to the surrounding region external to the salt container **150** (see **Figure 1B**).

[0177] According to the exemplary embodiment of the invention, the method **300** ends with closing the door **D** for preventing access to the cavity **CV** of the housing **H** (block **308**).

[0178] With reference now to **Figure 8B,** it shows a flow chart illustrating in terms of functional blocks main operations of a method **300'** performed by a user, for extracting the salt container **150** from the housing **H** of the household appliance **100** according to the exemplary embodiment of the present invention.

[0179] Starting from a condition in which the salt container **150** is fastened inside the housing **H** of the household appliance **100,** according to the exemplary embodiment the method **300** comprises opening the door **D** to expose the opening **160** for accessing the cavity **CV** of the housing **H** (block **310**).

[0180] According to the exemplary embodiment of the invention, the method **300'** comprises pushing the salt container **150** inside the cavity **CV** of the housing **H** in the inward direction **XI,** so as that the fastening elements **E1**, **E2** disengage from each other (*i.e.*, switching the coupling system to the decoupled condition) (block **312**). By having the coupling system that in the decoupled condition, the salt container **150** is unfastened from the housing **H,** and the respective check valves $\mathbf{165_A}$,$\mathbf{170_A}$, $\mathbf{165_B}$, $\mathbf{170_B}$, **165c,170c** are closed, thereby preventing the hydraulic connection of the salt container **150** to the water softening agent container **145,** the hydraulic connection of the salt container **150** to the water supply unit **140** and the fluid connection of the salt container **150** to the surrounding region external to the salt container **150.**

[0181] According to the exemplary embodiment of the invention, the salt container **150** is pushed in the outward direction **XO** by the sliding element **260** under the pushing exerted by the elastic element **275,** until a portion of the salt container **150** protrudes outside the opening **160** (block **314**).

[0182] According to the exemplary embodiment of the invention, the method **300'** comprises extracting the salt container **150** from the cavity **CV** of the housing **H** by grabbing the portion of the salt container **150** protruding outside the opening **160** (block **316**).

[0183] According to the exemplary embodiment of the invention, the method **300'** ends with closing the door **D** for preventing access to the (empty) cavity **CV** of the housing **H** (block **316**).

[0184] Naturally, in order to satisfy local and specific requirements, a person skilled in the art may apply to the disclosure described above many logical and/or physical modifications and alterations. More specifically, although the disclosure has been described with a certain degree of particularity with reference to preferred embodiments thereof, it should be understood that various omissions, substitutions and changes in the form and details as well as other embodiments are possible. In particular, different embodiments of the disclosure may even be practiced without the specific details (such as the numeric examples) set forth in the preceding description for providing a more thorough understanding thereof; on the contrary, well-known features may have been omitted or simplified in order not to obscure the description with unnecessary particulars.

Claims

1. Household appliance (**100**) comprising a water softening system (**WSS**) configured to receive fresh water having a first level of hardness and to provide softened water having a second level of hardness lower than the first level of hardness, wherein the water softening system comprises:

- a water softening agent container (**145**) configured to store a water softening agent capable of reducing a hardness of the fresh water;
- a removable salt container (**150**) configured to contain salt for regenerating the water softening agent stored in the water softening agent container;
- a housing (**H**) for accommodating the removable salt container (**150**), the housing comprising a cavity (**CV**) for slidingly inserting the salt container into the housing in an inward direction (**XI**), and for slidingly extracting the salt container from the housing in an outward direction (**XO**); and
- a system for coupling/decoupling the salt container (**150**) to/from the housing (**H**), configured to be selectively switched between:

  - a coupled condition in which the salt container (**150**) is fastened to the housing (**H**), thereby preventing sliding of the salt container inside the cavity (**CV**), and
  - a decoupled condition in which the salt container (**150**) is unfastened from the housing (**H**), thereby allowing sliding of the salt container inside the cavity (**CV**), wherein:

the system for coupling/decoupling the salt container comprises an extraction device (**ED**) configured to move the salt container (**150**) in the outward direction (**XO**) when the system is switched from the coupled

condition to the decoupled condition.

2. The household appliance (**100**) of claim 1, wherein the extraction device (**ED**) comprises a sliding element (**260**) configured to slide with respect to the housing (**H**) in the inward (**XI**) and the outward (**XO**) directions when the system is in the decoupled condition and to mechanical interact with the salt container (**150**) when the salt container is inside the cavity (**CV**), wherein the sliding element (**260**) is configured to push the salt container (**150**) in the outward direction (**XO**) when it slides in the outward direction (**XO**), and wherein the salt container (**150**) is configured to push the sliding element (**260**) in the inward direction (**XI**) when the salt container (**150**) slides into the cavity (**CV**) in the inward direction (**XI**).

3. The household appliance (**100**) of claim 2, wherein the sliding element (**260**) comprises an interaction portion (**270**) protruding inside the cavity (**CV**) and configured to mechanically interact with the salt container (**150**) when the salt container is inside the cavity so that it pushes the salt container (**150**) in the outward direction (**XO**) when the sliding element slides in the outward direction (**XO**), wherein the salt container (**150**) is configured to push the interaction portion (**270**) when the salt container (**150**) slides in the inward direction (**XI**).

4. The household appliance (**100**) of claim 2, wherein the salt container (**150**) comprises an interaction portion (**270**) protruding outside the cavity (**CV**) when the salt container (**150**) is inside the cavity (**CV**) and configured to mechanically interact with the sliding element (**260**) so that the salt container (**150**) is pushed in the outward direction (**XO**) by the mechanical interaction between the interaction portion (**270**) and the sliding element (**260**) when the sliding element (**260**) slides in the outward direction (**XO**), wherein the salt container (**150**) is configured to push the sliding element (**260**) in the inward direction (**XI**) by the mechanical interaction between the interaction portion (**270**) and the sliding element (**260**) when the salt container (**150**) slides in the inward direction (**XI**).

5. The household appliance (**100**) of any of claims 2 to 4 wherein the extraction device (**ED**) further comprises an elastic element (**275**) coupled to the sliding element (**260**), the elastic element (**275**) being configured:

- to pull the sliding element (**260**) in the outward direction (**XO**) so that the sliding element (**260**) slides in the outward direction (**XO**) thereby pushing the salt container (**150**) in the outward direction (**XO**), and
- to be pushed by the sliding element (**260**) when the salt container (**150**) slides in the inward direction (**XI**) thereby pushing the sliding element (**260**) in the inward direction.

6. The household appliance (**100**) of claim 5, wherein the elastic element (**275**) comprises a spring element coupled between the housing (**H**) and the sliding element (**260**).

7. The household appliance (**100**) of any of the preceding claims, wherein the system for coupling/decoupling the salt container (**150**) further comprises a first fastening element (**E1**) located at the salt container housing (**H**) and a second fastening element (**E2**) located at the salt container (**150**), the first fastening element (**E1**) and the second fastening element (**E2**) being configured to be engaged with each other in the coupled condition and to be disengaged from each other in the decoupled condition.

8. The household appliance (**100**) of claim 7, wherein the first (**E1**) and second (**E2**) fastening elements are configured to disengage from each other when the salt container (**150**) is pushed in the inward direction (**XI**) while the system is in the coupled condition.

9. The household appliance (**100**) of claim 7 or 8, wherein the sliding element (**260**) is configured to slide in the inward direction (**XI**) until the first (**E1**) and second (**E2**) fastening elements engage with each other, and to slide in the outward direction (**XO**) when the first and second fastening elements disengage from each other.

10. The household appliance (**100**) of any of claims 6-9, wherein the first fastening element (**E1**) and the second fastening element (**E2**) comprise snap-fit elements.

11. The household appliance (**100**) of any preceding claim, further comprising a door (**D**) for accessing salt container housing (**H**), thereby allowing access to a protruding portion of the salt container (**150**) when the coupling system is in the decoupled condition.

12. The household appliance (**100**) of any of the preceding claims, wherein:

- the salt container (**150**) is configured to receive the fresh water and to generate a mixture of salt and fresh water to produce a brine;
- the housing (**H**) is configured to enable a hydraulic connection between the salt container (**150**) and the water softening agent container (**145**) when the coupling system is in the coupled condition, and to disable said hydraulic connec-

tion between the salt container and the water softening agent container when the coupling system is in the decoupled condition.

13. The household appliance (**100**) of any of the preceding claims, wherein the salt container housing (**H**) comprises a first housing shell (**205**(**1**)) and a second housing shell (**205**(**2**)) connected to each other in a removable manner to define said cavity (**CV**).

14. Method (**300, 300'**) for operating a household appliance (**100**) comprising a water softening system (**WSS**) comprising

- a removable salt container (**150**) configured to contain salt for regenerating water softening agent stored in a water softening agent container (**145**);
- a housing (**H**) for accommodating the removable salt container (**150**), the housing comprising a cavity (**CV**) for slidingly inserting the salt container into the housing in an inward direction (**XI**), and for slidingly extracting the salt container from the housing in an outward direction (**XO**); and
- a system for coupling/decoupling the salt container (**150**) to the housing, configured to be selectively switched between:
- a coupled condition in which the salt container is fastened to the housing, thereby preventing sliding of the salt container inside the cavity, and
- a decoupled condition in which the salt container is unfastened from the housing, thereby allowing sliding of the salt container inside the cavity, wherein:
the system for coupling/decoupling the salt container (**150**) comprises an extraction device (**ED**) configured to move the salt container (**150**) in the outward direction when the system is switched from the coupled condition to the decoupled condition, the extraction device comprising a sliding element (**260**) configured to slide with respect to the housing (**H**) in the inward (**XI**) and the outward (**XO**) directions when the system is in the decoupled condition and to mechanical interact with the salt container (**150**) when the salt container (**150**) is inside the cavity (**CV**), wherein the sliding element (**260**) is configured to push the salt container (**150**) in the outward direction (**XO**) when it slides in the outward direction, and wherein the salt container (**150**) is configured to push the sliding element (**260**) in the inward direction (**XI**) when the salt container (**150**) slides into the cavity (**CV**) in the inward direction(**XI**); the method comprising:

- inserting (**304**) the salt container (**150**) into the cavity (**CV**),
- pushing (**306**) the salt container (**150**) in the inward direction thereby pushing the sliding element so that it slides in the inward direction (**XI**) until the system is in the coupled condition in which the salt container (**150**) is fastened to the housing (**H**), and further comprising:
- pushing (**312**) the salt container (**150**) fastened to the housing (**H**) in the inward direction (**XI**) until the system is switched from the coupled to the decoupled condition, so that the sliding element (**260**) slides in the outward direction (**XO**) thereby pushing (**314**) the salt container (**150**) in the outward direction (**XO**).

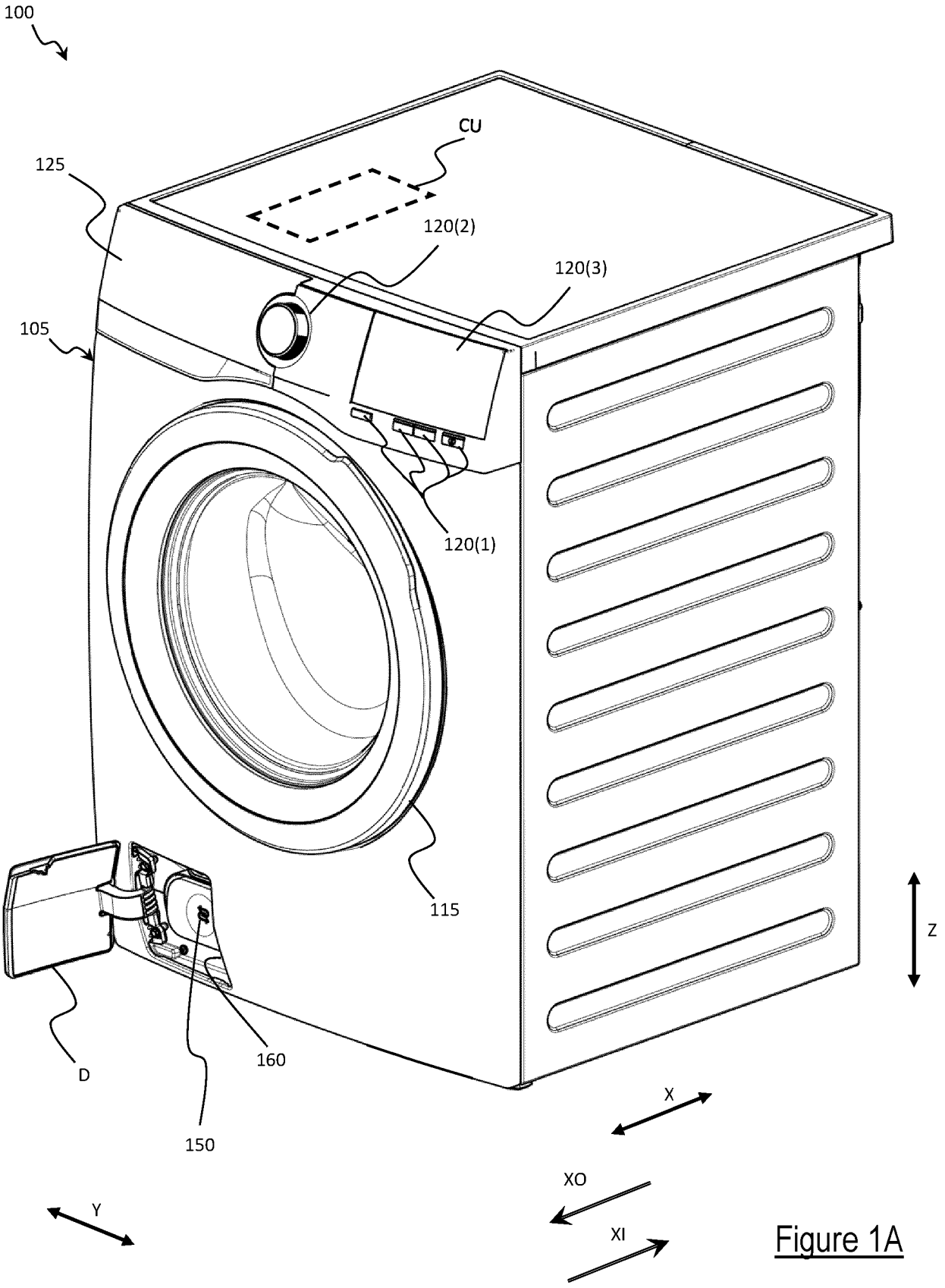

Figure 1A

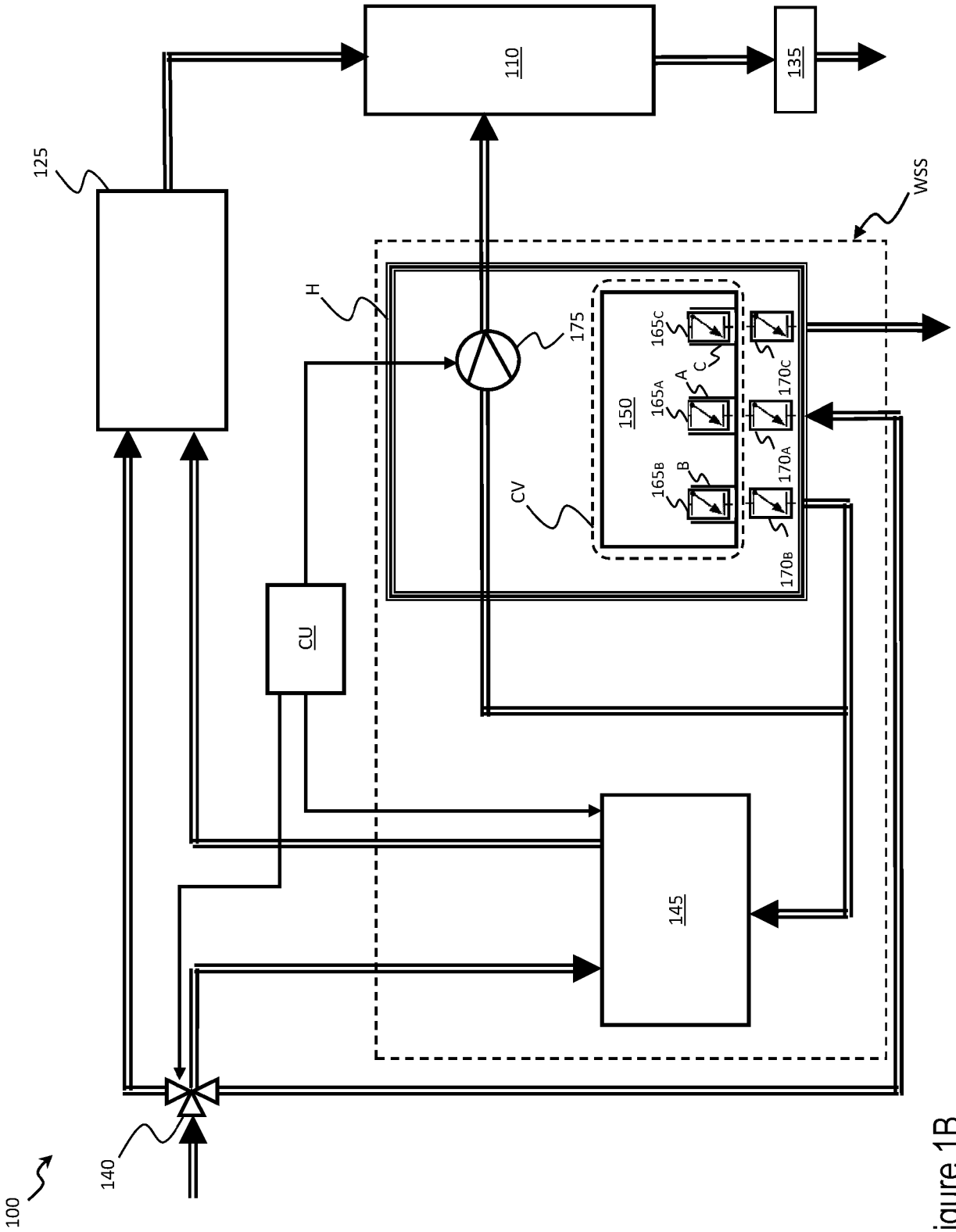
110
135
125
WSS
H
175
165C
C
A
165A
150
170C
170A
165B
B
CV
170B
CU
145
140
100

Figure 1B

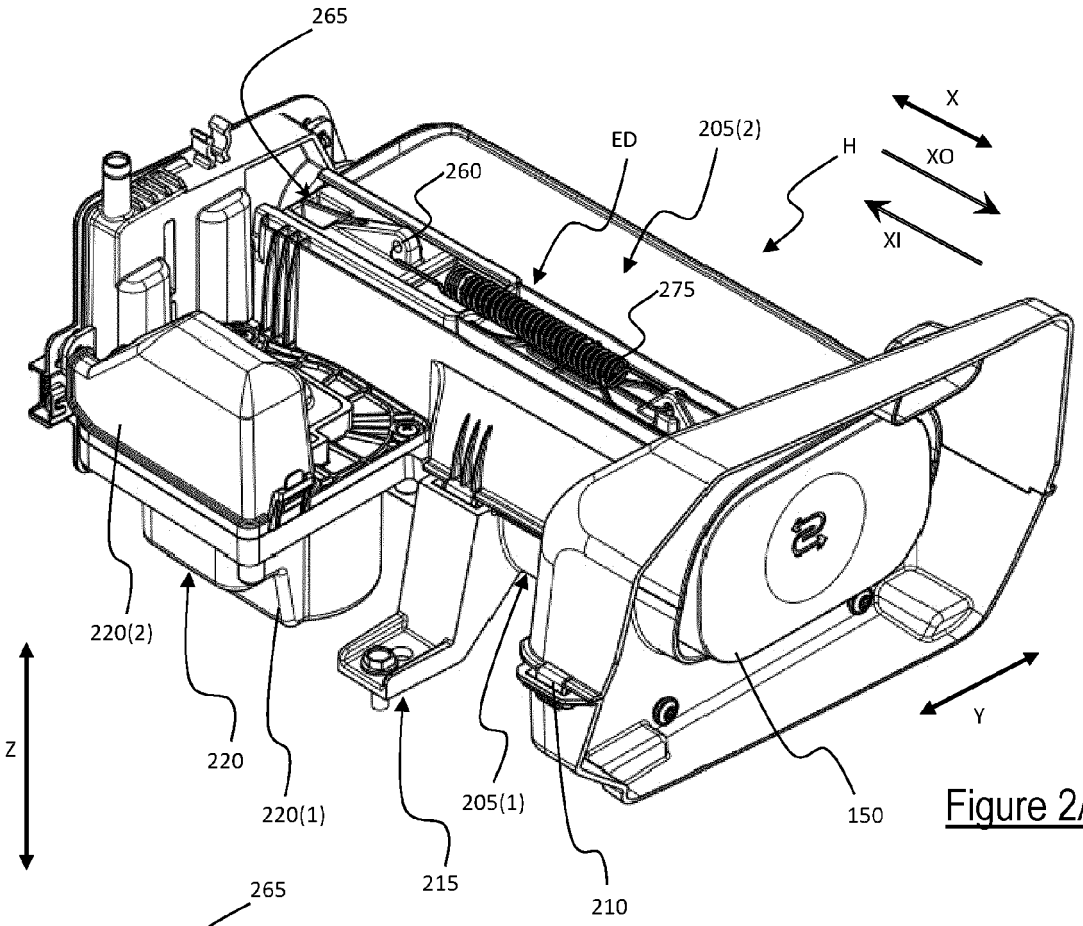

Figure 2A

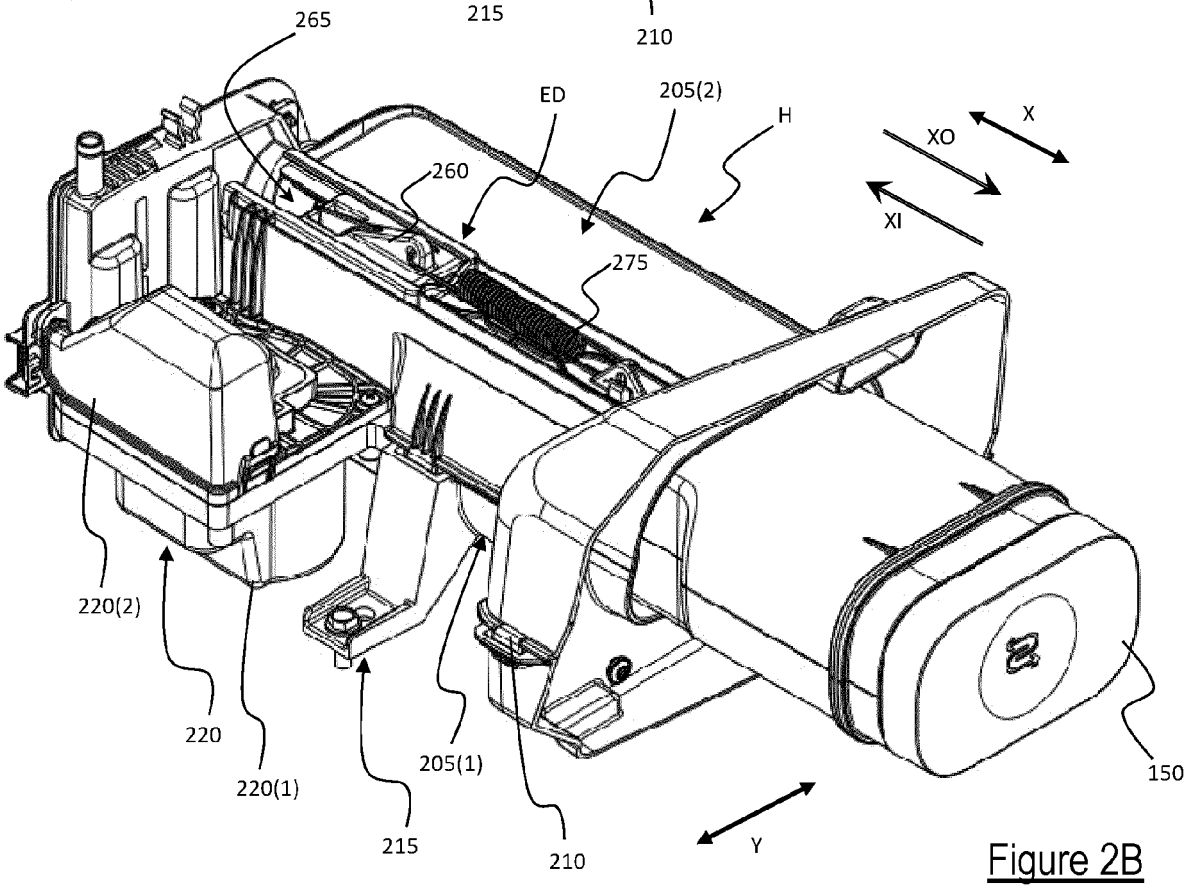

Figure 2B

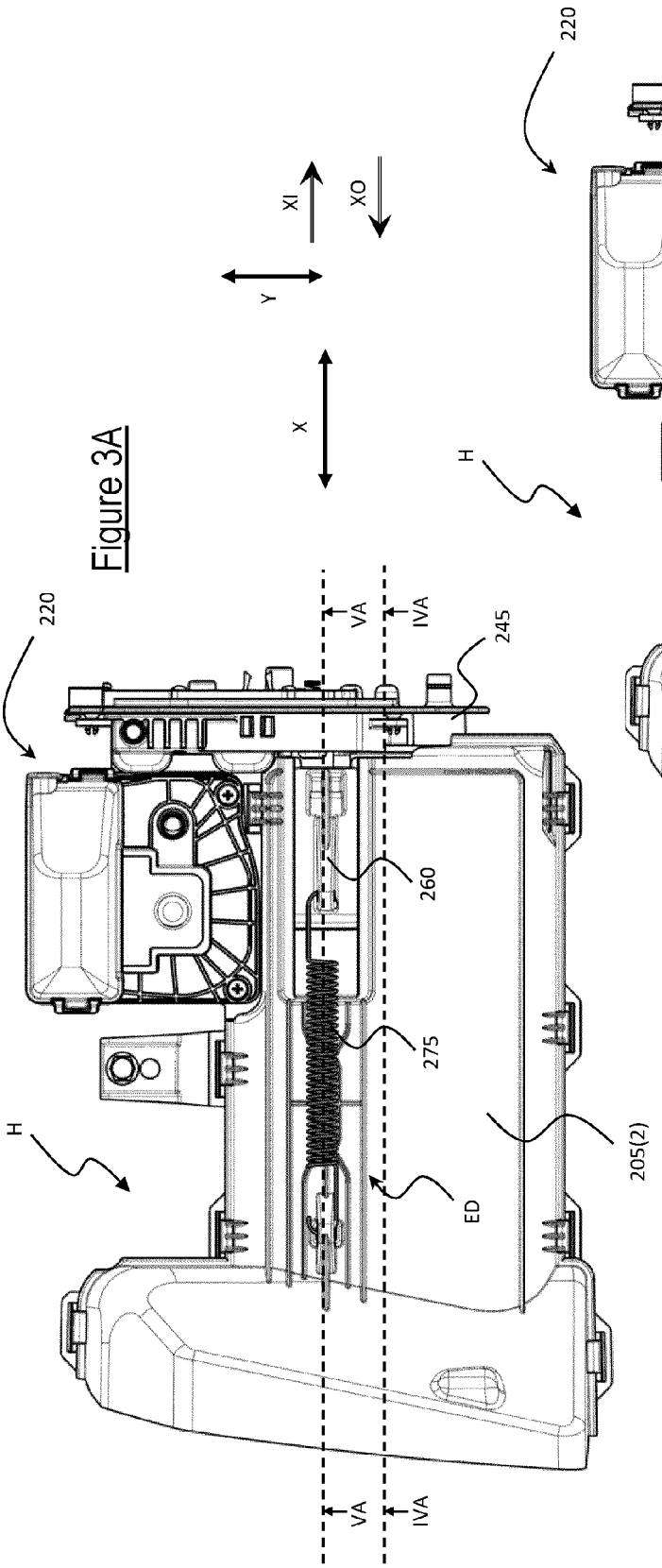

Figure 3A

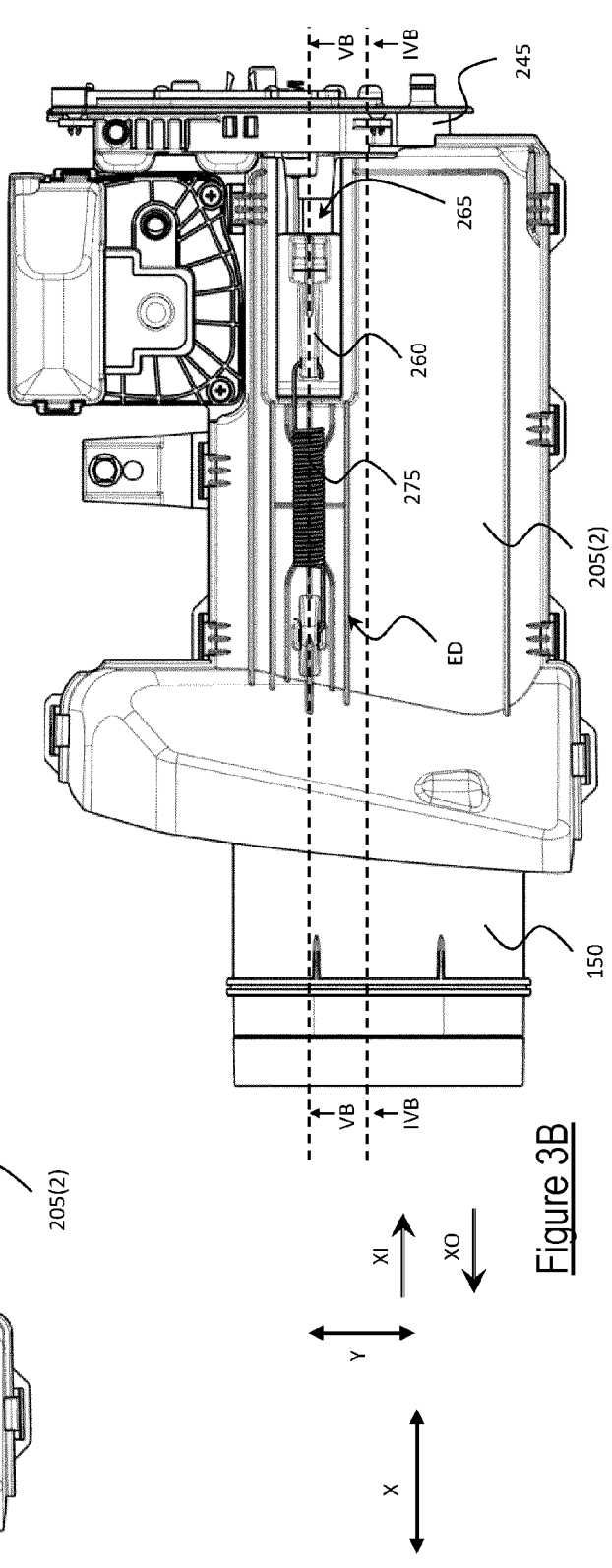

Figure 3B

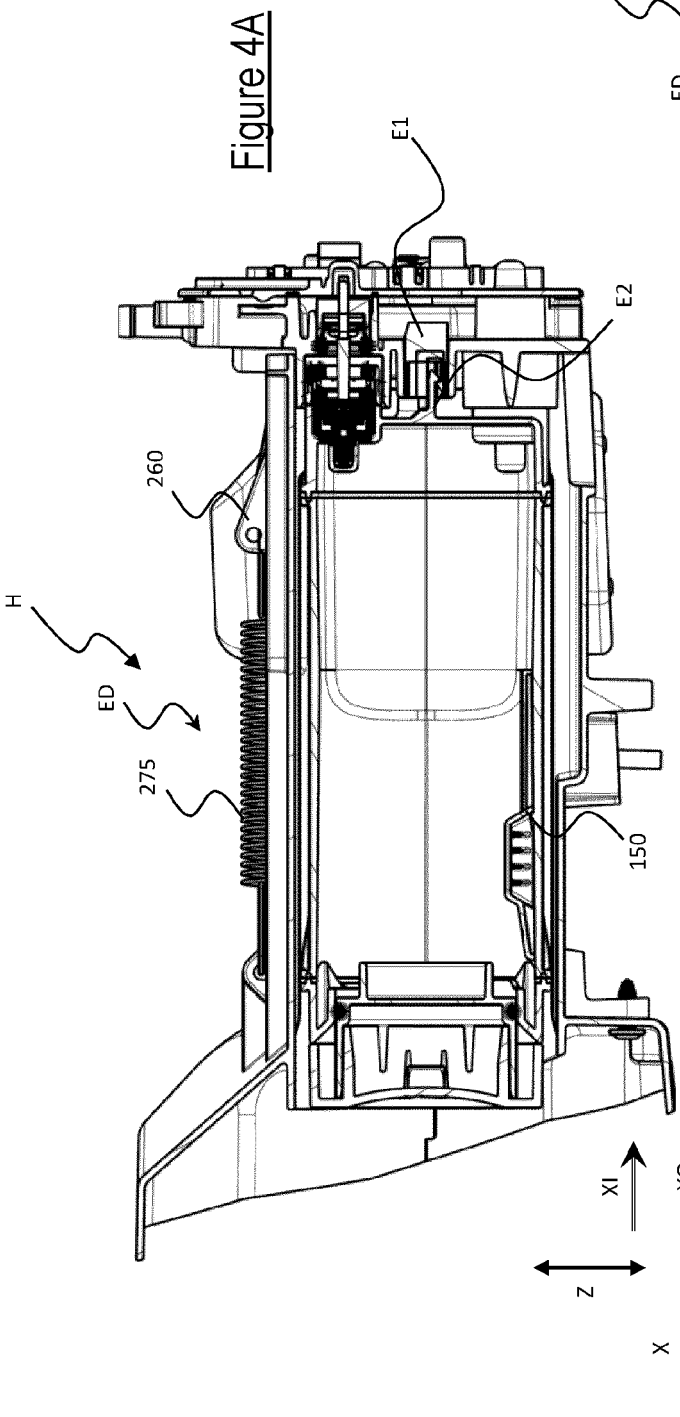

Figure 4A

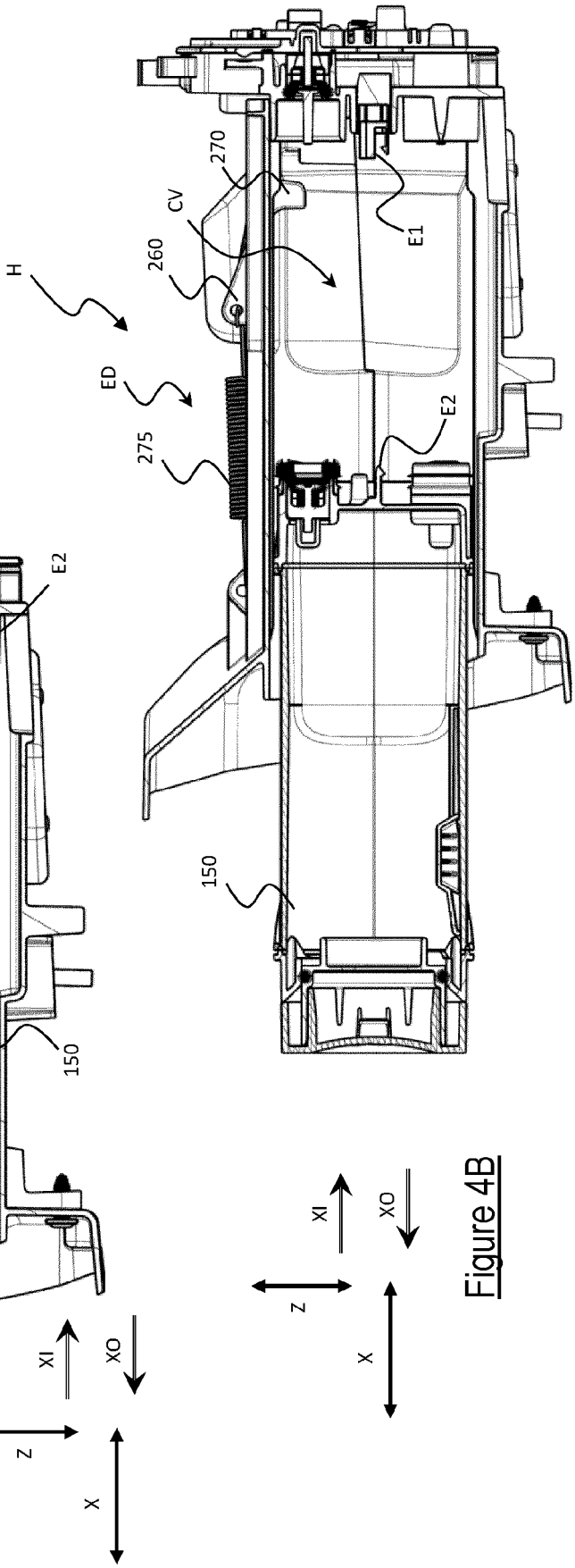

Figure 4B

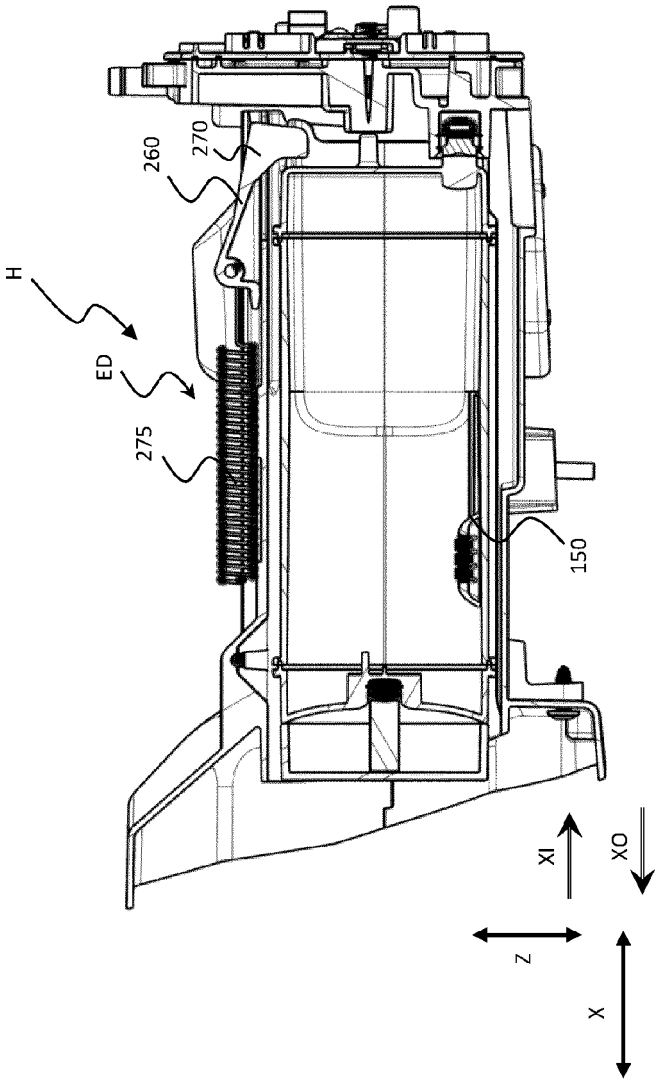

Figure 5A

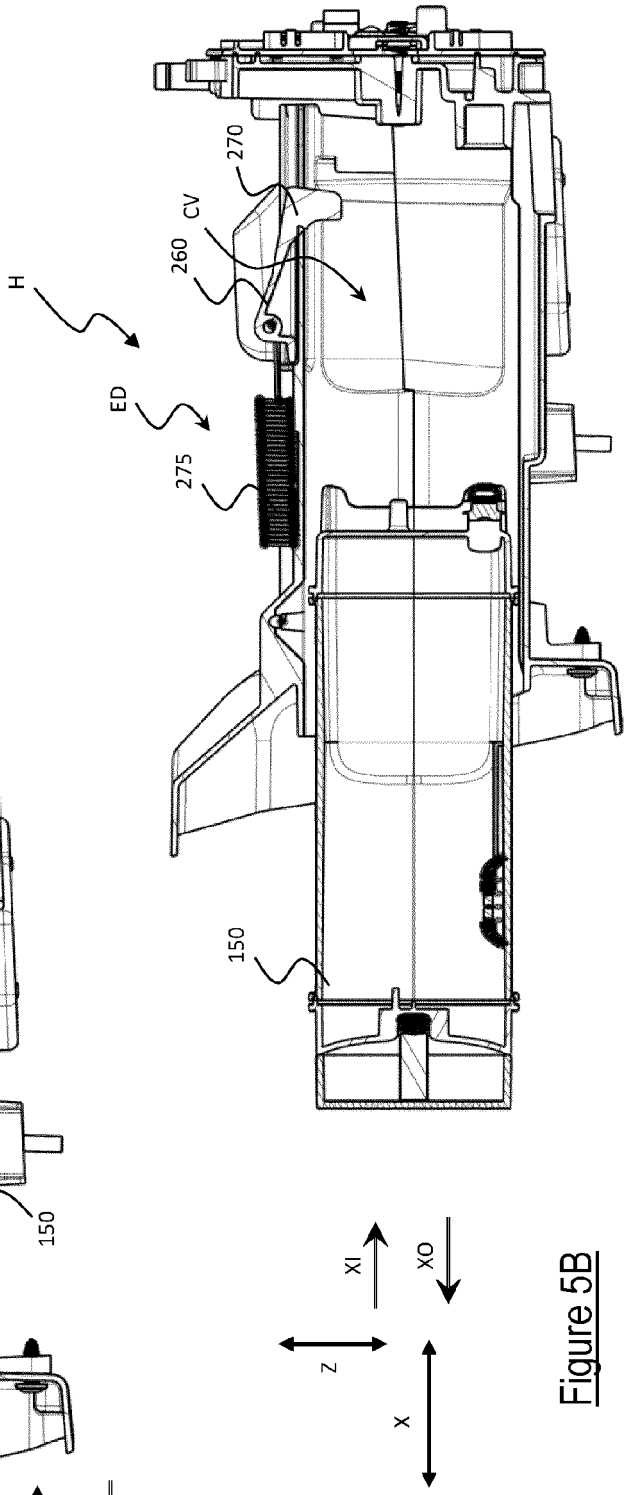

Figure 5B

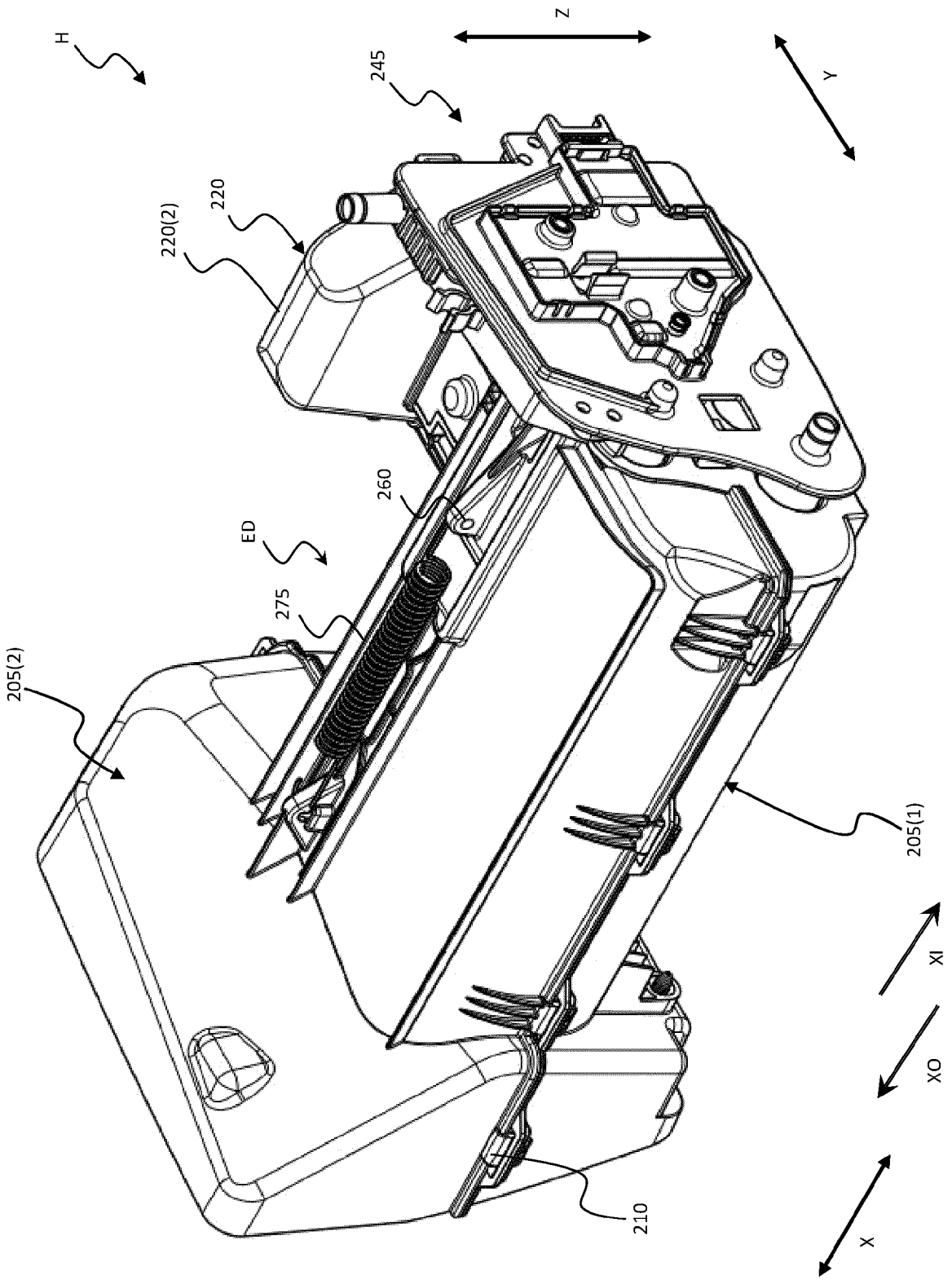

Figure 6

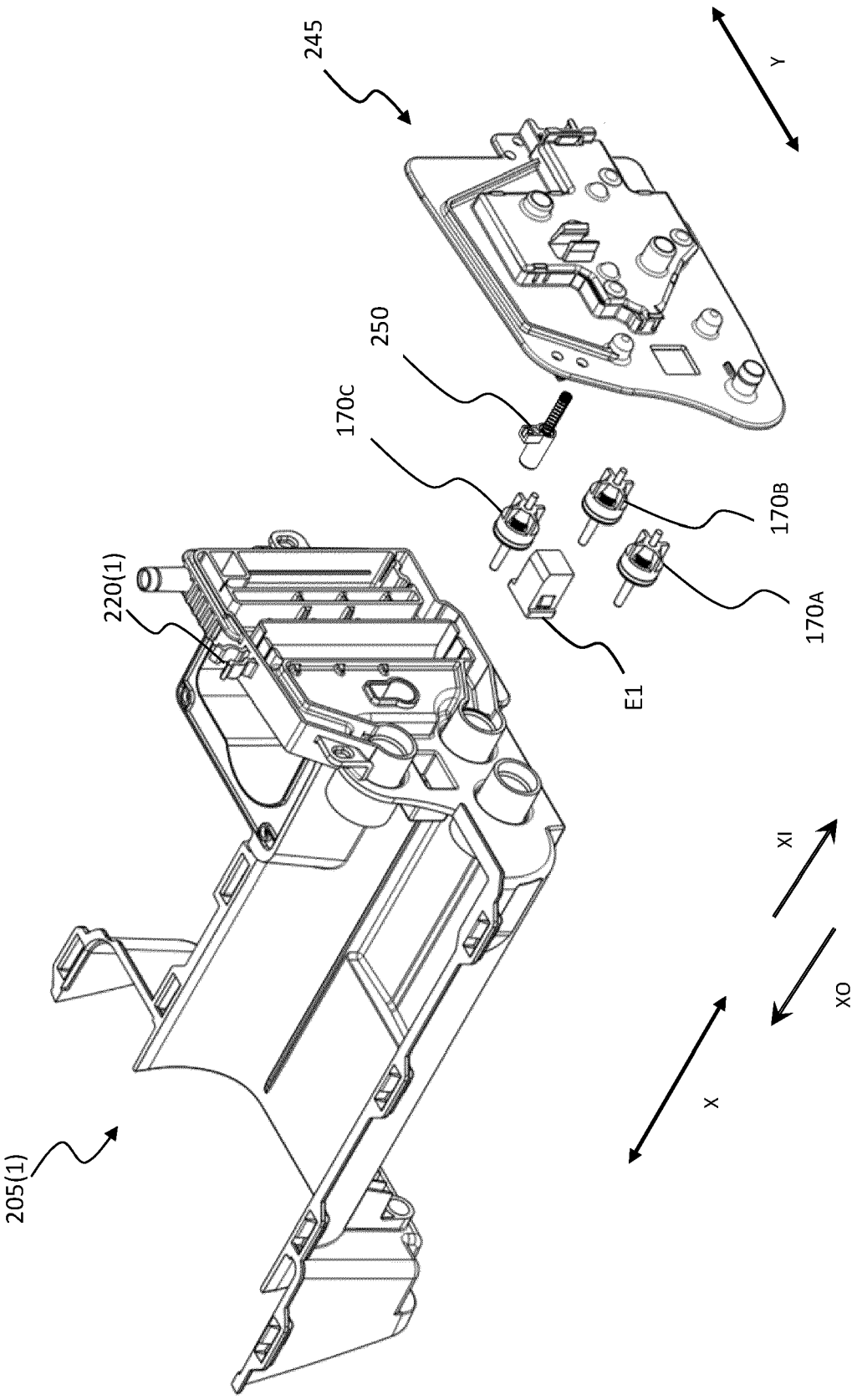

Figure 7

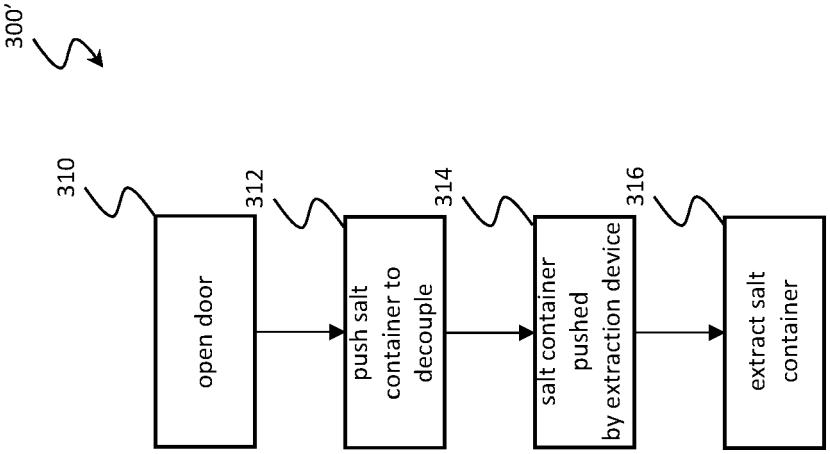

Figure 8B

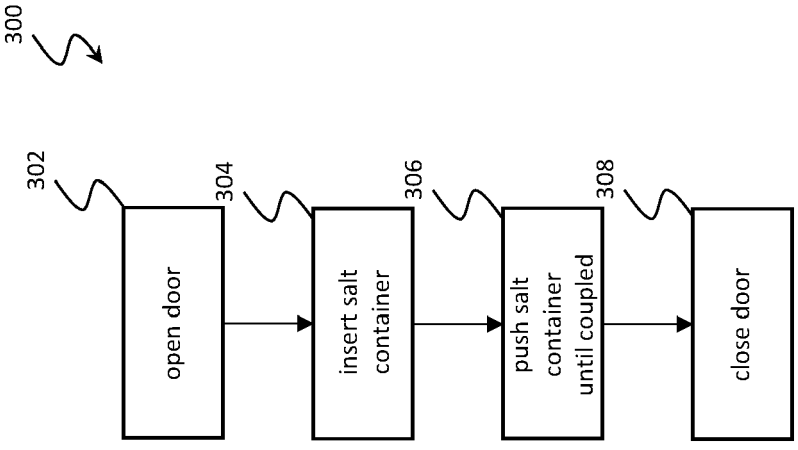

Figure 8A

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EUROPEAN SEARCH REPORT

Application Number
EP 22 21 3627

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	EP 3 632 286 A1 (VESTEL BEYAZ ESYA SANAYI VE TICARET AS [TR]) 8 April 2020 (2020-04-08)	1,7-13	INV. D06F39/00
A	* paragraph [0006] * * paragraph [0011] - paragraph [0018] * * figures 1-9 *	2-6,14	
X	US 2014/157835 A1 (DEL POS MAURIZIO [IT] ET AL) 12 June 2014 (2014-06-12)	1	
A	* paragraph [0060] * * paragraph [0071] - paragraph [0072] * * paragraph [0079] * * paragraph [0095] - paragraph [0098] * * paragraph [0118] - paragraph [0131] * * figures 1-9 *	2-14	
X	WO 2013/098068 A1 (ARCELIK AS [TR]; KURTKAYA KAGAN [TR] ET AL.) 4 July 2013 (2013-07-04)	1	
A	* paragraph [0036] - paragraph [0049] * * figures 1-12 *	2-14	

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D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 May 2023	Sabatucci, Arianna

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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11-05-2023

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