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(54) **COOKING OVEN WITH STEAM GENERATOR**

(57) The present invention is related to a cooking oven (1) comprising:

- a cooking chamber (2) wherein foodstuffs can be placed for being cooked,
- a steam generator (3) configured for producing steam and fluidly connected to the cooking chamber (2) for releasing steam into the latter;
- a cleaning system (70) for cleaning the cooking chamber

(2) and the steam generator (3), comprising an additive drawer (5) loadable with a washing/rinsing additive; wherein the additive drawer (5) comprises a liquid inlet (9) configured for taking a liquid therein, and is fluidly connected or connectable both to the inside of the cooking chamber (2) and to the inside of the steam generator (3).

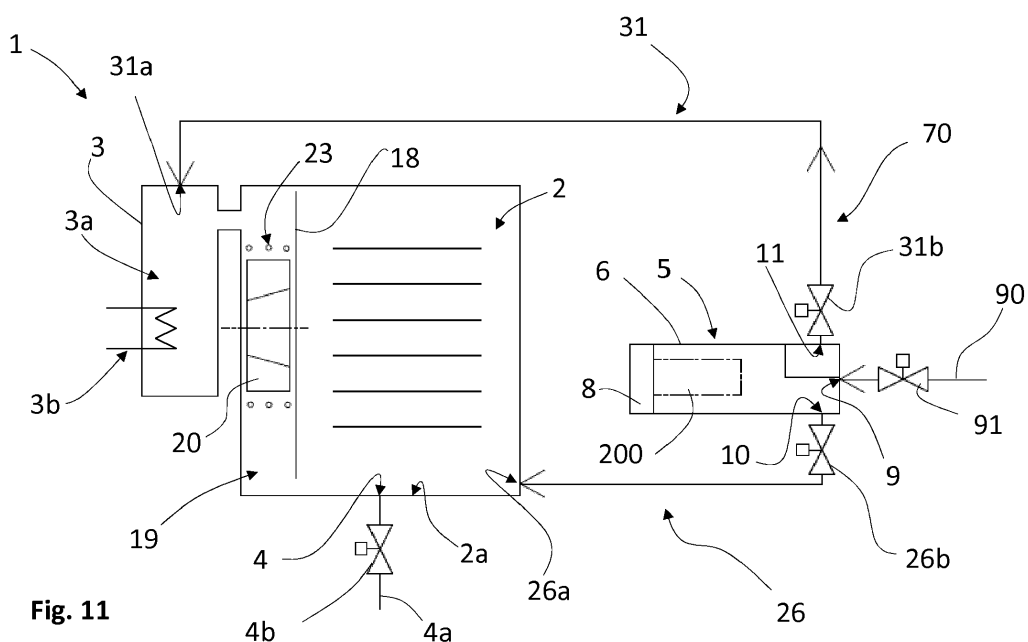


Fig. 11

Description

[0001] The present invention relates to a cooking oven comprising a steam generator, and in particular to a "professional" oven, i.e. and oven used mainly in professional activities, like restaurants, canteens, hotels, etc.

[0002] Typically, professional ovens comprise a housing, usually made of steel, containing a cooking chamber wherein foodstuffs can be placed for being cooked.

[0003] The cooking chamber is frequently provided with removable trays or racks, where food and/or pots or baking trays containing foodstuff can be placed.

[0004] The cooking chamber is typically parallelepipedal, and it is provided with a bottom wall wherein the grease dripping from foodstuff during the cooking is collected, and periodically drained via a cooking chamber outlet fluidly connected, typically via a valve, to a grease container external to the oven.

[0005] The oven is also provided with a heating device, e.g. an electric heater, or a gas heater, configured for heating the internal of the cooking chamber.

[0006] Typically, professional ovens are also provided with a ventilation system for circulating air within the cooking chamber during the cooking process, so as to make uniform the temperature within the internal of the cooking chamber.

[0007] Professional ovens are also typically provided with a vapour outlet duct, configured for discharging vapour (i.e. steam or steam mixed with air and/or gasses) from the cooking chamber during the cooking process.

[0008] The vapour outlet duct is also typically provided with a quenching system for dehumidifying and cooling down the vapour before discharging it into the external environment; typically, the quenching system comprises a nozzle provided within the vapour outlet duct and positioned in such a way to spray a jet of fresh water against the vapour passing through the vapour outlet duct, so as to cool down the vapour and to condensate the humidity contained therein.

[0009] Condensate is drained from the vapour outlet duct via a condensate draining conduit fluidly connected to an oven outlet configured for draining liquid outside the cooking oven.

[0010] Many known professional ovens are also equipped with a steam generator which generates steam by heating water up to its boiling point, by means of a heat source immersed in water. The flow of steam generated by the heat source is then conveyed, through a pipe, into the cooking cavity of the oven, in order to obtain a prefixed humidity degree in the interior thereof.

[0011] Typically, the steam generator comprises a liquid container adapted to contain water, and a heat source at least partially arranged in the liquid container for heating water contained therein.

[0012] Currently, most of the known steam generators for professional ovens are gas steam generators, called also gas boilers. Such known gas steam generators comprise a combustion chamber wherein a hot exhaust gas

is generated by a gas burner, and then conveyed into a heat exchanger at least partially immersed in water.

[0013] In known solutions, both the cooking chamber and the steam generator need to be periodically cleaned and in particular they need to be "descaled", i.e. the limestone settled on their internal surfaces have to be removed.

[0014] Typically, the descaling of the cooking chamber is performed after a washing procedure comprising a degreasing phase in which a degreasing agent is introduced in the cooking chamber for removing grease from its internal surfaces; the descaling of the cooking chamber can be done during a rinsing phase following the degreasing phase, or in a dedicated descaling phase, in both cases by adding a chemical agent, called "descaler" or "descaling agent", adapted to chemically react with the limestone and to melt it, in such a way that it can be removed by water.

[0015] Typically, the descaling of the steam generator is done manually by inserting a descaling agent into the liquid container of the steam generator.

[0016] A problem that affects these professional ovens is that the user has to put manually, at different times, two chemical products, not necessarily having the same chemical composition and/or concentration, one in the steam generator and one in the oven cavity; these two separate operations are burdensome and require relatively much time.

[0017] In addition, there is the risk that the user uses a wrong additive and/or a wrong concentration of additive in one of the two operations, and or that he/she could forget to perform one of the two operations, with the risk that too much limestone can settle on the internal of the cooking chamber and/or of the steam generator, which could damage such components and/or negatively affecting their performances.

[0018] The aim of the invention is therefore to provide a cooking oven with a steam generator in which the cleaning, and in particular the descaling of the cooking chamber and of the steam generator can be performed with a minimum user intervention, and in a reliable way. Within this aim, another object of the invention is providing a cooking oven with a steam generator which is configured for reducing the risk of forgetting to clean, and in particular to descale, one between the cooking chamber and the steam generator or to use a wrong cleaning (descaling) additive for cleaning (and in particular for descaling) one of these two components.

[0019] Applicant has found that by providing the oven with a cleaning system having an additive drawer loadable with a washing/rinsing additive, and comprising a liquid inlet configured for taking a liquid within the drawer, and fluidly connected both to the inside of the cooking chamber and to the inside of the steam generator, the user has to load only once the additive in the drawer for cleaning both the cooking chamber and the steam generator. This reduces the number and the complexity of the operations the user has to perform in order to clean

the oven, and therefore the time needed for performing such operations is reduced.

[0020] In addition, the risk that the user can load a wrong additive, or a wrong concentration of additive, in one between the cooking chamber and the steam generator, or that he/she can forget to clean one of these two components, is highly reduced.

[0021] In particular, above aim and objects are solved by a cooking oven comprising:

- a cooking chamber wherein foodstuffs can be placed for being cooked,
- a steam generator configured for producing steam and fluidly connected to the cooking chamber for releasing steam into the latter;
- a cleaning system for cleaning the cooking chamber and the steam generator, comprising an additive drawer loadable with a washing/rinsing additive;

wherein the additive drawer comprises a liquid inlet configured for taking a liquid therein, and is fluidly connected or connectable both to the inside of the cooking chamber and to the inside of the steam generator.

[0022] Preferably, the liquid inlet is connected or connectable to a source of water external to the cooking oven.

[0023] More preferably, the cooking oven comprises a first valve interposed between the liquid inlet and the source of water external to the cooking oven.

[0024] In an advantageous embodiment, the additive drawer comprises:

- a first liquid outlet fluidly connecting the inside of the additive drawer to the inside of the cooking chamber;
- a second liquid outlet fluidly connecting the inside of the additive drawer to the inside of the steam generator.

[0025] In this advantageous embodiment, therefore, a washing/rinsing liquid (i.e. water entered into the drawer via the liquid inlet and mixed with a washing/rinsing additive contained in the drawer) exits the drawer via two separate ways (i.e. the first and second liquid outlets), each connected, preferably autonomously, respectively to the cooking chamber and to the steam generator.

[0026] It is underlined that a washing additive can be for example a detergent and/or a degreaser, while a rinsing additive can be for example a brightener and/or a descaling additive.

[0027] In a further advantageous embodiment, the additive drawer can be provided with a single liquid outlet connected, for example, to a pipe or tube external to the drawer which branches off in at least two branches, one fluidly connected to the cooking chamber, and the other fluidly connected to the steam generator; in this advantageous embodiment, therefore, a washing/rinsing liquid (i.e. water entered into the drawer via the liquid inlet and mixed with a washing/rinsing additive contained in the

drawer) exits the drawer via a single outlet, and then is taken respectively to the cooking chamber and to the steam generator by two pipes or conduits that branches off outside the drawer.

[0028] In an advantageous embodiment, the additive drawer comprises:

- a hollow housing, wherein a cleaning additive can be loaded, having a first end opened;
- a cap configured for being removably fixed to the hollow housing and removably closing the first end of the latter.

[0029] Preferably, the cap is configured for entering and being positioned within the first end of the hollow housing and being fixed therein.

[0030] Preferably, the cap is fixed or fixable to the hollow body by a bayonet-type or a screw-type closure.

[0031] Preferably, the cap is provided with handling device, for facilitating the grapping of the cap. Advantageously, the handling device comprises a couple of wings, advantageously protruding radially from a cylindrical inner surface of the cap which is accessible from the external to the hollow housing when the cap is fixed to the latter.

[0032] In an advantageous embodiment, the additive drawer comprises a support for an additive, configured for supporting an additive (preferably in the form of a tab) within the hollow housing when the cap is fixed to the hollow housing. This advantageous embodiment is particularly easy to use, since the user, in order to load, additive within the drawer, has simply to remove the cap, placing the additive in the support of the latter, and close the cap on the drawer.

[0033] In a further advantageous embodiment, the additive drawer comprises a sealing system configured for favouring the hermetic closure of the first end of the hollow body by the cap. Preferably, the sealing system is comprised in the cap.

[0034] In a further advantageous embodiment, the additive drawer comprises a safety system configured for automatically opening the first end of the hollow body if the internal pressure exceeds a prefixed threshold. This safety system can be particularly useful in some configuration of the oven according to the invention in which the additive drawer works with an internal pressure above atmospheric pressure.

[0035] Preferably, the safety system is comprised in the cap.

[0036] In a preferred embodiment, the safety system at least partially, more preferably totally, coincides with the sealing system.

[0037] In an advantageous embodiment, the cap comprises:

- a fixed portion removably fixable to the hollow housing,
- a closure portion movable with respect to the fixed

portion, and configured for being selectively moved, when the fixed portion is fixed to the hollow housing, to a closing position in which it hermetically seals the first end of the hollow housing,

- an active closure system configured for forcing the closure portion into the closing position when the fixed portion is fixed to the hollow housing.

[0038] Advantageously, the sealing system comprises such fixed portion, closure portion, and active closure system.

[0039] Preferably, the fixed portion is fixed or fixable to the hollow body by a bayonet-type or a screw-type closure.

[0040] Preferably the closure portion abuts, in the closing position, against an abutment provided at the first end of the hollow housing, internally to the latter for hermetically closing such a first end.

[0041] Preferably, the closure portion comprises a gasket configured for abutting against such an abutment provided at the first end of the hollow housing, internally to the latter.

[0042] In a preferred embodiment, the active closure system is configured for allowing the closure portion to be moved away from the closing position when the pressure within the hollow housing exceeds a prefixed threshold. In this preferred embodiment, the active closure system operates also as a safety system.

[0043] In a preferred embodiment, the active closure system comprises a resilient element acting between the fixed portion and the closure portion for exerting an elastic force pushing the closure portion into the closing position when the fixed portion is fixed to the hollow housing.

[0044] In a preferred embodiment, the resilient element comprises a coil spring positioned between the fixed portion and the closure portion and configured for being compressed when the fixed portion is fixed to the hollow housing, so as to push the closure portion away from the fixed portion, towards the closing position.

[0045] In a further advantageous embodiment, the resilient element can comprise a pneumatic spring.

[0046] In an advantageous embodiment, the fixed portion comprises a cylindrical wall, preferably, from which internal surface protrudes an internal septum, advantageously dividing the cylindrical wall in two cylinders.

[0047] Preferably, the internal septum comprises a bulge in its central region.

[0048] In an advantageous embodiment, the closure portion comprises a disk-shaped portion, configured for abutting, preferably with the interposition of the gasket, with the abutment of the hollow housing.

[0049] In an advantageous embodiment, the closure portion comprises a cylindrical portion, protruding from the disk-shaped portion towards the internal septum of the fixed portion, and advantageously positioned within the cylindrical wall of the latter.

[0050] Preferably, the coil spring is positioned between the disk-shaped portion of the closure portion and the

internal septum of the fixed portion, so as to be compressed between these two elements when the fixed portion is fixed to the hollow housing, and exerting a force on the disk-shaped portion towards the abutment, that ensure the seal between these components.

[0051] Preferably, the closure portion is movably associated to the fixed portion by a pin, fixed to the closure portion and slidably supported by the fixed portion; more preferably, the pin is fixed to a central region of the disk-shaped portion, and it is slidably supported by a central region of the internal septum, preferably by the bulge of the latter.

[0052] In a further advantageous embodiment, the sealing system advantageously comprises one or more O-rings protruding from the external surface of the cap facing the internal surface of the hollow housing when the cap is fixed to the latter, and adapted to abut against this internal surface for ensuring the watertight of the closure.

[0053] In an advantageous embodiment, the hollow housing has a tubular shape, preferably cylindrical, and comprises a lateral wall, the first end of the hollow housing, and a second end, opposite the first end, and closed.

[0054] In an advantageous embodiment, the liquid inlet, the first liquid outlet and the second liquid outlet are positioned at the second end of the hollow housing.

[0055] In an advantageous embodiment, the hollow housing comprises connection elements, protruding from its second end towards the external of the hollow housing for fluidly connecting, respectively, the liquid inlet, the first liquid outlet and the second liquid outlet, to pipes or tubes external to the additive drawer.

[0056] In an advantageous embodiment, the hollow housing comprises a diverting element for diverting a liquid entering the hollow housing from the liquid inlet to the first liquid outlet and/or to the second liquid outlet.

[0057] In a preferred embodiment, the diverting element comprises a septum protruding from the internal wall of the second end of the hollow housing towards the internal of the latter, the liquid inlet and at least one between the first liquid outlet and the second liquid outlet being positioned on opposite sides with respect to the septum.

[0058] The septum defines an optimised path for the liquid moving from the liquid inlet to the liquid outlets which optimises the dissolution of the additive contained in the hollow housing, in particular if the latter is in form of tabs.

[0059] In an advantageous embodiment, the first liquid outlet is connected to the cooking chamber via a first piping system having an outlet into the cooking chamber.

[0060] In a preferred embodiment, the additive drawer is positioned, when the cooking oven is in its operative position, higher than a bottom wall of the cooking chamber, and the outlet of the first piping system is positioned, when the cooking oven is in its operative position, lower than the additive drawer, so that a liquid can pass from the inside of the hollow housing to the inside of the cook-

ing chamber by gravity.

[0061] Preferably, as shown for example in figure the first liquid outlet is positioned in such to be, when the cooking oven is in its operative position, substantially tangent to the lower region (or internal bottom) of the internal surface of the hollow housing, so that all the liquid present within the latter can exit the first liquid outlet by gravity.

[0062] It is underlined, that in the present application "*by gravity*" means due only to the gravity force, so without the need of a dedicated fluid moving device, like for example a pump.

[0063] It is also underlined that the fact that a certain configuration allows a movement by gravity does not prevent to use also, in addition to the gravity, a mechanical or electromechanical element, like for example a pump, for contributing to that movement.

[0064] It is also underlined that in the present application "*operative position*", is defined as a position in which the oven is installed to be operated, and it lies in a horizontal, or substantial horizontal, plane such as the floor of a room, or the internal bottom wall of a piece of furniture in which the oven is built-in.

[0065] Preferably, the first piping system comprises a second valve interposed between the first liquid outlet of the additive drawer and the outlet of the first piping system.

[0066] In a further advantageous embodiment, the oven comprises a first pump configured for taking a liquid from the first liquid outlet of the additive drawer into the cooking chamber via the first piping system.

[0067] In this case, the additive drawer can be also positioned below the cooking chamber, since the first pump allows the liquid contained in the additive drawer to be completely drained from the additive drawer and to reach the cooking chamber, even without the effect of the gravity force.

[0068] Preferably, the second valve is positioned between the first pump and the first liquid outlet of the additive drawer.

[0069] Preferably, the first pump is configured for being able to completely empty the additive drawer via the first liquid outlet.

[0070] In a further advantageous embodiment, the first piping system comprises a circulation system configured for pumping liquid out of the cooking chamber and for pumping such liquid, or a part thereof, again in the cooking chamber, wherein the first liquid outlet is fluidly connected to the circulation system in such a way to take a liquid from the inside of the hollow housing into the circulation system, and from the circulation system into the cooking chamber.

[0071] In an advantageous embodiment, the circulation system comprises a second pump configured for pumping liquid out of the cooking chamber and for pumping such liquid, or a part thereof, again in the cooking chamber.

[0072] Preferably, the second valve is positioned between the second pump and the first liquid outlet of the

additive drawer.

[0073] Preferably, the second pump is configured for being able to completely empty the additive drawer via the first liquid outlet.

5 **[0074]** In an advantageous embodiment, the cooking oven comprises a control unit configured for controlling the electric and electronic components of the cooking oven.

10 **[0075]** Advantageously the control unit is configured for determining if the additive drawer is empty.

[0076] Preferably, the control unit is configured for determining the emptying status of the additive drawer by measuring the elapsed time from the activation of the first pump.

15 **[0077]** Preferably, the control unit is configured for determining the emptying status of the additive drawer by measuring the elapsed time from the activation of the second pump.

[0078] Preferably, the control unit is configured for determining the emptying status of the additive drawer by measuring the current absorption of the first pump, and more preferably the variations of the current absorption.

20 **[0079]** Preferably, the control unit is configured for determining the emptying status of the additive drawer by measuring the current absorption of the second pump, and more preferably the variations of the current absorption.

25 **[0080]** Preferably, the control unit is configured for determining the emptying status of the additive drawer by measuring the rotation speed of the first pump, and more preferably the variations of the rotation speed.

30 **[0081]** Preferably, the control unit is configured for determining the emptying status of the additive drawer by measuring the rotation speed of the second pump, and more preferably the variations of the rotation speed.

35 **[0082]** Preferably, the control unit is configured for determining the emptying status of the additive drawer by measuring the measuring the vibration levels of the first pump, for example by means of an accelerometer, and more preferably by threatening statistically the vibration levels data.

40 **[0083]** Preferably, the control unit is configured for determining the emptying status of the additive drawer by measuring the measuring the vibration levels of the second pump, for example by means of an accelerometer, and more preferably by threatening statistically the vibration levels data.

45 **[0084]** In an advantageous embodiment, the second liquid outlet is connected to the steam generator via a second piping system having an outlet into the steam generator.

50 **[0085]** Preferably, the second piping system comprises a third valve interposed between the second liquid outlet of the additive drawer and the outlet of the second piping system.

55 **[0086]** These and other features and advantages of the invention will be better apparent from the following description of some exemplary and non-limitative em-

bodiments, to be read with reference to the attached drawings, wherein:

- Fig. 1 is a schematic frontal view of an oven according to the invention;
- Fig. 2 is a perspective view of a first embodiment of an additive drawer of an oven according to the invention, in an open condition;
- Fig. 3 is a plan view of the additive drawer of figure 2, in an open condition;
- Fig. 4 is a lateral view of the additive drawer of figure 2, in a closed condition;
- Fig. 5 is a cross section operated according to plane V-V of figure 4;
- Fig. 6 is a longitudinal cross section of the hollow body of an additive drawer according to the invention;
- Fig. 7 is a cross section operated according to line VII-VII of figure 6;
- Fig. 8 is a longitudinal cross section of the cap of an additive drawer according to the invention;
- Fig. 9 is a longitudinal cross section of a further embodiment of an additive drawer according to the invention;
- Fig. 10 is a cross section operated according to line X-X of figure 9;
- Fig. 11 is a schematic lateral view, with some parts removed for clarity, of a first embodiment of a cooking oven according to the invention;
- Fig. 12 is a schematic lateral view, with some parts removed for clarity, of a second embodiment of a cooking oven according to the invention;
- Fig. 13 is a schematic lateral view, with some parts removed for clarity, of a third embodiment of a cooking oven according to the invention.

[0087] With reference initially to Fig. 1, a cooking oven 1 according to the invention is schematically described.

[0088] The cooking oven 1 advantageously comprises an external casing 200, containing a cooking chamber 2, wherein foodstuffs can be placed for being cooked; preferably, the cooking chamber is accessible via a door 200a.

[0089] In an advantageous embodiment, like in the examples of attached figures, the cooking chamber 2 contains a plurality of trays or racks 200b, wherein foodstuff, or pots or trays containing foodstuff, can be placed for being cooked.

[0090] The cooking chamber 2 has a bottom wall, schematically illustrated in figures 11, 12 and 13, and indicated with reference number 2a, preferably, but not necessarily, at least partially, basin-shaped, so as to better collect grease dripping from the foodstuffs being cooked. Advantageously, the bottom wall 2a is provided with a cooking chamber outlet 4 fluidly connected to a drain conduit 4a, for draining outside the cooking chamber 2 grease or other substances accumulated therein.

[0091] Preferably, but not necessarily, the drain con-

duit 4a is provided with a drain valve 4b. Advantageously, the cooking oven 1 is provided with a control unit, schematically illustrated in figure 1 by a dashed square 600, preferably configured for controlling the electric and electronic components of the cooking oven 1.

[0092] Advantageously, the cooking oven 1 further comprises a heating device 23 configured for heating the internal of the cooking chamber 2; the heating device 23 can be, for example, an electrical heater, or (as in the examples illustrated in attached figures) hot tubes wherein the hot fumes exiting a gas burner flows, a heat exchanger, etc.

[0093] Advantageously, the cooking oven 1 comprises a perforated suction wall 18 separating the cooking chamber 2 from a heating chamber 19 containing, at least partially, the heating device 23, and, preferably, a fan 20 configured for circulating heated air through the cooking chamber 2 and the heating chamber 19.

[0094] The cooking oven 1 can also advantageously comprise a vapour outlet duct, not illustrated, configured for discharging vapour from the cooking chamber 2.

[0095] Advantageously, the cooking oven 1 comprises a steam generator 3 configured for producing steam and fluidly connected to the cooking chamber 2 for releasing steam into the latter. Advantageously, the steam generator comprises a liquid container 3a adapted to contain water, and fluidly connected to the cooking chamber, and a heat source 3b at least partially arranged in the liquid container 3a for heating water contained therein.

[0096] Advantageously, the heat source 3b can be an electric heater, or heat exchanger, for example one or more pipes in which gasses exiting a gas burner can flow.

[0097] Advantageously, the steam generator 3 comprises a drain conduit, not illustrated, for emptying the liquid container 3a.

[0098] Advantageously, the cooking oven 1 comprises a cleaning system 70 for cleaning the cooking chamber 2 and the steam generator 3.

[0099] Preferably the cleaning system 70 comprises an additive drawer 5 loadable with a washing/rinsing additive, for example a detergent and/or a degreaser, a brightener and/or a descaling additive.

[0100] Advantageously, the additive drawer 5 comprises a liquid inlet 9 configured for taking a liquid therein, and is fluidly connected or connectable both to the inside of the cooking chamber 2 and to the inside of the steam generator 3.

[0101] Preferably, the liquid inlet 9 is connected or connectable to a source 90 of water external to the cooking oven 1, for example to the water mains of the building where the cooking oven is installed.

[0102] More preferably, the cooking oven comprises a first valve 91 interposed between the liquid inlet 9 and the source 90 of water external to the cooking oven 1.

[0103] In an advantageous embodiment, the additive drawer 5 comprises:

- a first liquid outlet 10 fluidly connecting the inside of

the additive drawer 5 to the inside of the cooking chamber 2;

- a second liquid outlet 11 fluidly connecting the inside of the additive drawer 5 to the inside of the steam generator 3.

[0104] In this advantageous embodiment, therefore, a washing/rinsing liquid (i.e. water entered into the drawer via the liquid inlet 9 and mixed with a washing/rinsing additive contained in the drawer 5) exits the additive drawer 5 via two separate ways (i.e. the first and second liquid outlets), each connected, preferably autonomously, respectively to the cooking chamber 2 and to the steam generator 3.

[0105] In an advantageous embodiment, like in the examples of the attached figures, the additive drawer 5 comprises:

- a hollow housing 6, wherein a cleaning additive can be loaded, having a first end 7 opened;
- a cap 8 configured being removably fixed to the hollow housing 6 and removably closing the first end 7 of the latter.

[0106] Preferably, like in the examples of attached figures, the cap 8 is configured for entering and being positioned within the first end 7 of the hollow housing 6 and being fixed therein. Preferably, like in the examples of attached figures, the additive 300 is in the form of tabs or tablets; anyway, the additive can be also a powder, a liquid, a gel, etc.

[0107] Preferably, the cap 8 is fixed or fixable to the hollow body 6 by a bayonet-type or a screw-type closure.

[0108] In the examples of attached figures, the closure is a bayonet-type closure, and advantageously comprises one or more pins 50, protruding preferably from external surface 8a of the cap 8 facing the internal surface 6a of the hollow housing 6 when the cap 8 is fixed to the latter; the pins 50 are adapted to be engaged in a suitable seat 51 obtained in the internal surface 6a of the hollow housing 6.

[0109] In a further advantageous embodiment, not illustrated, the pin(s) can be provided in the internal surface 6a of the hollow housing 6, and the seat(s) in the external surface 8a of the cap 8.

[0110] Advantageously, the pin(s) 50 and the seat(s) are configured in such a way that a rotation of the cap 8 with respect to the hollow housing 6 fixes the cap 8 to the latter when the pin(s) 50 reaches/reach the end of the seat(s).

[0111] Anyway, other kind of closure (e.g. a screw-type closure, a form-fit closure, etc.) for removably fixing the cap 8 to the hollow housing 6 are possible.

[0112] Preferably, the cap 8 is provided with handling device 8b, for facilitating the grasping of the cap 8; in the example of figures 2 to 8, the handling device advantageously comprises a couple of wings, advantageously protruding radially from a cylindrical inner surface 8c of

the cap 8 which is accessible from the external to the hollow housing 6 when the cap 8 is fixed to the latter.

[0113] In further advantageous embodiment, like in the example of figure 9, the additive drawer 5 comprises a support 55 for an additive, configured for supporting an additive (preferably in the form of a tab 300) within the hollow housing 6 when the cap 8 is fixed to the hollow housing 6. In the advantageous embodiment of figure 9 the support 55 is a cylindrical crown or protrusion protruding from the inner wall 8d of the cap 8 facing the internal of the hollow housing 6 when the cap 8 is fixed to the latter.

[0114] In a further advantageous embodiment, the additive drawer 5 comprises a sealing system configured for favouring the hermetic closure of the first end of the hollow body by the cap. Preferably, the sealing system is comprised in the cap 8.

[0115] In an advantageous embodiment, the cap 8 comprises:

- a fixed portion 81 removably fixable to the hollow housing 6;
- a closure portion 82 movable with respect to the fixed portion 81, and configured for being selectively moved, when the fixed portion 81 is fixed to the hollow housing 6, to a "closing position" (illustrated for example in figure 5) in which it hermetically seals the first end 7 of the hollow housing 6;
- an active closure system configured for forcing the closure portion 82 into the closing position when the fixed portion 81 is fixed to the hollow housing 6.

[0116] Advantageously, the sealing system comprises such fixed portion 81, closure portion 82, and active closure system.

[0117] Preferably, the fixed portion 81 is fixed or fixable to the hollow body 6 by a bayonet-type or a screw-type closure, or by any kind of removable closure. In the advantageous embodiment illustrated in figures 2 to 8, the pins 50 are provided on the fixed portion 81.

[0118] Preferably the closure portion 82 abuts, in the closing position, against an abutment 6b provided at the first end 7 of the hollow housing 6, internally to the latter for hermetically closing such a first end 7.

[0119] Preferably, the closure portion 82 comprises a gasket 83 configured for abutting against the abutment 6b.

[0120] In a preferred embodiment, the active closure system is configured for allowing the closure portion 82 to be moved away from the closing position when the pressure within the hollow housing exceeds a prefixed threshold. In this preferred embodiment, therefore, the active closure system has also the function of a safety system, which prevents overpressures within the additive drawer 5. This safety system can be particularly useful in some configurations of the oven according to the invention in which the additive drawer works with an internal pressure above atmospheric pressure.

[0121] In a preferred embodiment, the active closure system comprises a resilient element acting between the fixed portion 81 and the closure portion 82 for exerting an elastic force pushing the closure portion 82 into the closing position when the fixed portion 81 is fixed to the hollow housing 6.

[0122] In a preferred embodiment, the resilient element comprises a coil spring 84 positioned between the fixed portion 81 and the closure portion 82 and configured for being compressed when the fixed portion is fixed to the hollow housing 6, so as to push the closure portion 82 away from the fixed portion 81, towards the closing position.

[0123] In a further advantageous embodiment, not illustrated, the resilient element can comprise a pneumatic spring.

[0124] In the advantageous embodiment of figures 2 to 8, the fixed portion 81 comprises a cylindrical wall 81a, from which internal surface protrudes an internal septum 81b, advantageously dividing the cylindrical wall 81a in two cylinders.

[0125] Preferably, the internal septum 81b comprises a bulge 81c in its central region.

[0126] In the advantageous embodiment of figures 2 to 8, the closure portion 82 comprises a disk-shaped portion 82a, configured for abutting, preferably with the interposition of the gasket 83, with the abutment 6a of the hollow housing 6.

[0127] In the advantageous embodiment of figures 2 to 8, the closure portion 82 comprises a cylindrical portion 82b, protruding from the disk-shaped portion 82a towards the internal septum 81b of the fixed portion 81, and advantageously positioned within the cylindrical wall 81a of the latter.

[0128] In the advantageous embodiment of figures 2 to 8, the coil spring 84x is positioned between the disk-shaped portion 82a of the closure portion 82 and the internal septum 81b of the fixed portion 81, so as to be compressed between these two elements when the fixed portion 81 is fixed to the hollow housing 6, and exerting a force on the disk-shaped portion 82a towards the abutment 6a, that ensure the seal between these components.

[0129] Preferably, the closure portion 82 is movably associated to the fixed portion 81 by a pin 85, fixed to the closure portion 82 and slidably supported by the fixed portion 81; in the advantageous embodiment of figures 2 to 8, the pin 85 is fixed to a central region of the disk-shaped portion 82a, and it is slidably supported by a central region of the internal septum 81b, preferably by the bulge 81c of the latter.

[0130] In the advantageous embodiment of figure 9, the sealing system advantageously comprises one or more O-rings 100 protruding from the external surface 8a of the cap 8 facing the internal surface 6a of the hollow housing 6 when the cap 8 is fixed to the latter and adapted to abut against this internal surface 6a for ensuring the watertight of the closure.

[0131] Clearly, a support 55 like the one of figure 9 can be provided also in the embodiment of figures 2 to 8; for example the support 55 can protrude from the closure portion 82 towards the internal of the hollow housing.

[0132] In the advantageous embodiments of attached figures, the hollow housing 6 has a tubular shape, preferably cylindrical, and comprises a lateral wall 60, the first end 7 of the hollow housing 6, and a second end 70, opposite the first end 7, and closed.

[0133] In the advantageous embodiments of attached figures, the liquid inlet 9, the first liquid outlet 10 and the second liquid outlet 11 are positioned at the second end 70 of the hollow housing 6.

[0134] In the advantageous embodiments of attached figures, the hollow housing 6 comprises connection elements 9a, 10a, 11a, protruding from its second end 70 towards the external of the hollow housing 6 for fluidly connecting respectively the liquid inlet 9, the first liquid outlet 10 and the second liquid outlet 11 to pipes or tubes external to the drawer 5.

[0135] In advantageous embodiments, like in attached figures, the hollow housing 6 comprises a diverting element for diverting a liquid entering the hollow housing 6 from the liquid inlet 9 to the first liquid outlet 10 and/or to the second liquid outlet 11.

[0136] In a preferred embodiment, the diverting element comprises a septum 22 protruding from the internal wall of the second end 70 of the hollow housing 6 towards the internal of the latter.

[0137] Advantageously, the liquid inlet 9 and at least one between the first liquid outlet 10 and the second liquid outlet 11 are positioned on opposite sides with respect to the septum 22.

[0138] The septum 22 defines an optimised path for the liquid moving from the liquid inlet 9 to the liquid outlets 10, 11 which optimises the dissolution of the additive contained in the hollow housing 6, in particular if the latter is in form of tabs.

[0139] In an advantageous embodiment, the first liquid outlet is connected to the cooking chamber via a first piping system 26 having an outlet 26a into the cooking chamber 2.

[0140] In an advantageous embodiment, like in the one illustrated in figure 11, the additive drawer 5 is positioned, when the cooking oven 1 is in its operative position (i.e. installed to be operated, and it lies in a horizontal, or substantial horizontal, plane such as the floor of a room, or the internal bottom wall of a piece of furniture in which the oven is built-in), higher than a bottom wall 2a of the cooking chamber 2, and the outlet 26a of the first piping system 26 is positioned, when the cooking oven 1 is in its operative position, lower than the additive drawer 5, so that a liquid can pass from the inside of the hollow housing to the inside of the cooking chamber by gravity.

[0141] Preferably, as shown for example in figure 7 and 10, the first liquid outlet 10 is positioned in such to be, when the cooking oven 1 is in its operative position, substantially tangent to the lower region (or internal bot-

tom) of the internal surface 6a of the hollow housing 6, so that all the liquid present within the latter can exit the first liquid outlet 10 by gravity. Preferably, the first piping system comprises a second valve 26b interposed between the first liquid outlet 10 of the additive drawer 5 and the outlet 26a of the first piping system 26.

[0142] In a further advantageous embodiment, the oven 1 comprises a first pump 28 configured for taking a liquid from the first liquid outlet 10 of the additive drawer 5 into the cooking chamber 2 via the first piping system 26.

[0143] In this case, the additive drawer 5 can be also positioned below the cooking chamber 2, since the first pump 28 allows the liquid contained into the additive drawer 5 to reach the cooking chamber 2, even without the effect of the gravity force.

[0144] Preferably, the second valve 26b is positioned between the first pump 28 and the first liquid outlet 26 of the additive drawer 5.

[0145] Preferably, the first pump 28 is configured for being able to completely empty the additive drawer 5 via the first liquid outlet 10.

[0146] In a further advantageous embodiment, like the one illustrated in figure 13, the first piping system 26 comprises a circulation system 29 configured for pumping liquid out of the cooking chamber 2 and for pumping such liquid, or a part thereof, again in the cooking chamber 2.

[0147] Advantageously, the first liquid outlet 10 is fluidly connected to the circulation system 29 in such a way to take a liquid from the inside of the hollow housing 6 into the circulation system 29, and from the circulation system 29 into the cooking chamber.

[0148] Advantageously, the outlet of the circulation system coincides with the outlet 26a of the first piping system 26.

[0149] In an advantageous embodiment, the circulation system 29 comprises a second pump 30 configured for pumping liquid out of the cooking chamber 2 and for pumping such liquid, or a part thereof, again in the cooking chamber 2.

[0150] Preferably, the second valve 26b is positioned between the second pump 30 and the first liquid outlet of the additive drawer 5.

[0151] Preferably, the second pump 30 is configured for being able to completely empty the additive drawer via the first liquid outlet 10.

[0152] Advantageously the control unit 600 is configured for determining if the additive drawer 5 is empty.

[0153] Preferably, the control unit 600 can be configured for determining the emptying status of the additive drawer 5 by measuring the elapsed time from the activation of the first pump 28. In a further advantageous embodiment, the control unit 600 can be configured for determining the emptying status of the additive drawer 5 by measuring the elapsed time from the activation of the second pump 30.

[0154] In a further advantageous embodiment, the control unit 5 is configured for determining the emptying

status of the additive drawer 5 by measuring the current absorption of the first pump 28, and more preferably the variations of the current absorption.

[0155] In a further advantageous embodiment, the control unit 600 is configured for determining the emptying status of the additive drawer 5 by measuring the current absorption of the second pump 30, and more preferably the variations of the current absorption.

[0156] In a further advantageous embodiment, the control unit 600 is configured for determining the emptying status of the additive drawer 5 by measuring the rotation speed of the first pump 29, and more preferably the variations of the rotation speed.

[0157] In a further advantageous embodiment, the control unit 600 is configured for determining the emptying status of the additive drawer 5 by measuring the rotation speed of the second pump 30, and more preferably the variations of the rotation speed.

[0158] In a further advantageous embodiment, the control unit 600 is configured for determining the emptying status of the additive drawer 5 by measuring the measuring the vibration levels of the first pump 29, for example by means of an accelerometer, not illustrated and more preferably by threatening statistically the vibration levels data.

[0159] In a further advantageous embodiment, the control unit is configured 600 for determining the emptying status of the additive drawer 5 by measuring the measuring the vibration levels of the second pump 30, for example by means of an accelerometer, not illustrated, and more preferably by threatening statistically the vibration levels data.

[0160] In an advantageous embodiment, the second liquid outlet 11 is connected to the steam generator 3 via a second piping system 31 having an outlet 31a into the steam generator 3. Preferably, the second piping system 31 comprises a third valve 31b interposed between the second liquid outlet 11 of the additive drawer 5 and the outlet 31a of the second piping system 31.

[0161] The functioning of the cooking oven 1 according to the invention is illustrated in the following.

[0162] For example after having performed one or more cooking processes, the oven can be cleaned by activating the cleaning system 70.

[0163] The cleaning procedure can comprise one or more washing phases and one or more rinsing phases; in one or more of the rinsing phases, a descaling agent can be added. Alternatively, or in addition, one or more dedicated descaling phases can be performed.

[0164] Preferably, the last rinsing phase is performed using only clean water, so as to remove all possible additive residuals present in the cooking oven 1.

[0165] In one or more of the washing or rinsing, or descaling phases an additive 300 (e.g. a degreaser in the washing phase, a descaling additive or a brightener in the rinsing phase) can be loaded into the additive drawer 5.

[0166] With reference to the embodiment of figures 2

to 8, the cap 8 can be removed from the hollow housing 6, an additive 300 can be positioned within the latter, and the cap 8 can be fixed to the first end 7 of the hollow housing 6, to close the latter.

[0167] In this advantageous embodiment, once the fixed portion 81 is fixed (for example by the bayonet-type closure) to the hollow housing 6, the active closure system pushes the closure portion 82 against the abutment 6b of the hollow housing 6, so as to watertight seal the latter. Once the additive 300 is loaded into the additive drawer, the washing or rinsing procedure can be activated, for example by the control unit 600.

[0168] In the advantageous embodiment of figure 9, the user can load an additive 300 (e.g. a descaling additive) directly in the support 55 of the cap 8 before fixing the latter to the hollow housing 6.

[0169] In the embodiment of figure 11, by opening the first valve 91, clean water (schematically illustrated with arrows 500 in figure 5), enters the additive drawer 5 from the liquid inlet 9, and strikes the additive 300, melting the latter.

[0170] Then, a mixture 550 of water and additive can exit the additive drawer 5 via the first or second liquid outlet.

[0171] In the embodiment of figure 11, by closing the second valve 26b and opening the third valve 31b (if provided), thanks to the pressure of the water present in the source of water 90, and to the fact that the drawer 5 is watertight closed by the cap 8, the mixture 550 exits the drawer 5 via the second liquid outlet 11, and goes to the steam generator 3 via the second piping system 31.

[0172] By opening the second valve 26b, the mixture 550 exits the drawer 5 via the first liquid outlet 10, and goes to the cooking chamber 2 via the first piping system 26.

[0173] The control unit 600 can be programmed in such a way to take the mixture 550 firstly to the steam generator 3, or firstly to the cooking chamber 2, or contemporaneously, simply by deciding the order of opening of the second valve 26b, and if provided also of the third valve 31b.

[0174] By regulating the opening time of the second valve 26b, and if provided also of the third valve 31b, the control unit 600 can also dose the quantity of additive provided to the cooking cavity 2 and the steam generator 3.

[0175] In the embodiment of figure 11, if the first liquid outlet 10 is positioned in such a way to be, when the cooking oven 1 is in its operative position, substantially tangent to the lower region (or internal bottom) of the internal surface 6a of the hollow housing 6, once the washing or rinsing phase is ended, the additive drawer 5 can be completely emptied, with the first valve 91 closed, simply by opening the second valve 26b (and if present also the third valve 31b), so that all the liquid present in the drawer 5 is taken to the bottom 2a of the cooking chamber 2 via the first liquid outlet 10 by gravity; then the liquid present in the bottom 2a of the cooking

chamber can be drained outside the oven 1 via the drain conduit 4a.

[0176] The functioning of the embodiment of figure 12 differs from the one of figure 11 substantially because in order to completely empty the additive drawer 5, with the first valve 91 closed, it is necessary opening the second valve 26b (and if present also the third valve 31b), and activating the first pump 28.

[0177] In addition, in the embodiment of figure 12, the first pump 28 can be operated also during the supply of the mixture 550 to the cooking chamber 2.

[0178] The functioning of the embodiment of figure 13 differs from the embodiment of figure 12 substantially because in the embodiment of figure 13 the mixture 505 is supplied to the circulation system 29, and not directly within the cooking chamber 2; once the mixture 550 is within the circulation system 29, the second pump 30 circulates it within the cooking chamber.

[0179] In addition, in the embodiment of figure 13, in order to completely empty the additive drawer 5, with the first valve 91 closed, it is necessary opening the second valve 26b (and if present also the third valve 31b), and activating the second pump 30, which sucks the mixture from the drawer 5 via the first liquid outlet 10.

[0180] In addition, in the embodiment of figure 13, the second pump 30 can be operated also during the supply of the mixture 550 to the circulation system 29.

[0181] It is seen therefore how the invention achieves the proposed aim and objects, there being provided a cooking oven in which, in particular thanks to the inventive additive drawer of its cleaning system, the number and the complexity of the operations the user has to perform in order to clean the oven, and therefore the time needed for performing such operations is reduced.

[0182] In addition, by regulating the opening time and durations of the first, second, and third valves, there is the possibility to set the order of the cleaning procedure, for example deciding to clean firstly the steam generator and then the cooking cavity, or vice versa, and also to better dose the additives.

[0183] The risk that the user can use the wrong additive or dosing for one of the steam generator and the cooking cavity, or that he/she forgets to clean the steam generator or the cooking cavity is highly reduced.

Claims

1. Cooking oven (1) comprising:

- a cooking chamber (2) wherein foodstuffs can be placed for being cooked,
- a steam generator (3) configured for producing steam and fluidly connected to said cooking chamber (2) for releasing steam into the latter;
- a cleaning system (70) for cleaning said cooking chamber (2) and said steam generator (3), comprising an additive drawer (5) loadable with

a washing/rinsing additive;

characterized in that

said additive drawer (5) comprises a liquid inlet (9) configured for taking a liquid therein, and is fluidly connected or connectable both to the inside of said cooking chamber (2) and to the inside of said steam generator (3).

2. Cooking oven, according to claim 1, wherein said additive drawer (5) comprises:

- a first liquid outlet (10) fluidly connecting the inside of said additive drawer (5) to the inside of said cooking chamber (2);
- a second liquid outlet (11) fluidly connecting the inside of said additive drawer (5) to the inside of said steam generator (3).

3. Cooking oven (1), according to claim 1 or 2, wherein said additive drawer (5) comprises:

- a hollow housing (6), wherein a cleaning additive can be loaded, having a first end (7) opened;
- a cap (8) configured for being removably fixed to said hollow housing (6) and removably closing said first end (7) of the latter.

4. Cooking oven (1), according to claim 3, wherein said cap (8) comprises a support (55) for an additive, configured for supporting an additive within said hollow housing (6) when said cap (8) is fixed to said hollow housing (6).

5. Cooking oven (1), according to claim 3 or 4, wherein said additive drawer (5) comprises a sealing system configured for favouring the hermetic closure of said first end (7) of said hollow body (6) by said cap (8).

6. Cooking oven (1), according to one or more of claims 3 to 5, wherein said additive drawer (5) comprises a safety system (50) configured for automatically opening said first end (7) of said hollow body (6) if the internal pressure exceeds a prefixed threshold.

7. Cooking oven (1) according to one or more of claims 3 to 6, wherein said cap (8) comprises:

- a fixed portion (81) removably fixable to said hollow housing (6),
- a closure portion (82) movable with respect to said fixed portion (81), and configured for being selectively moved, when said fixed portion (81) is fixed to said hollow housing (6), to a closing position in which it hermetically seals said first end (7) of said hollow housing (6),
- an active closure system (84) configured for forcing said closure portion (82) into said closing

position when said fixed portion (81) is fixed to said hollow housing (6).

8. Cooking oven (1) according to claim 7, wherein said active closure system (84) comprises a resilient element (84) acting between said fixed portion (81) and said closure portion (82) for exerting an elastic force pushing said closure portion (82) into said closing position when said fixed portion (81) is fixed to said hollow housing (6).

9. Cooking oven (1), according to one or more of claims 3 to 8, wherein said hollow housing (6) has a tubular shape, and comprises a lateral wall (60), said first end (7), and a second end (70), opposite said first end (7), and closed.

10. Cooking oven (1), according to claim 9, wherein said liquid inlet (9), said first liquid outlet (10) and said second liquid outlet (11) are positioned at said second end (70) of said hollow housing (6).

11. Cooking oven (1), according to one or more of claims 2 to 10, wherein said hollow housing (6) comprises a diverting element (22) for diverting a liquid entering said hollow housing (6) from said liquid inlet (9) to said first liquid outlet (10) and/or to said second liquid outlet (11).

12. Cooking oven (1), according to one or more of claims 2 to 11, wherein said first liquid outlet (10) is connected to said cooking chamber (3) via a first piping system (26) having an outlet (26a) into said cooking chamber (2).

13. Cooking oven (1), according to claim 12, wherein said additive drawer (5) is positioned, when said cooking oven (1) is in its operative position, higher than a bottom wall (2a) of said cooking chamber (2), and wherein said outlet (26a) of said first piping system (26) is positioned, when said cooking oven (1) is in its operative position, lower than said additive drawer (5), so that a liquid can pass from the inside of said hollow housing (6) to the inside of said cooking chamber (2) by gravity.

14. Cooking oven (1), according to claim 12 or 13, comprising a first pump (28) configured for taking a liquid from said first liquid outlet (10) of said additive drawer (5) into said cooking chamber (2) via said first piping system (26).

15. Cooking oven (1), according to one or more of claims 12 to 14, wherein said first piping system (26) comprises a circulation system (29) configured for pumping liquid out of said cooking chamber (2) and for pumping such liquid, or a part thereof, again in said cooking chamber (2), wherein said first liquid outlet

(10) is fluidly connected to said circulation system (29) in such a way to take a liquid from the inside of said hollow housing (6) into said circulation system (29), and from said circulation system (29) into said cooking chamber (2).

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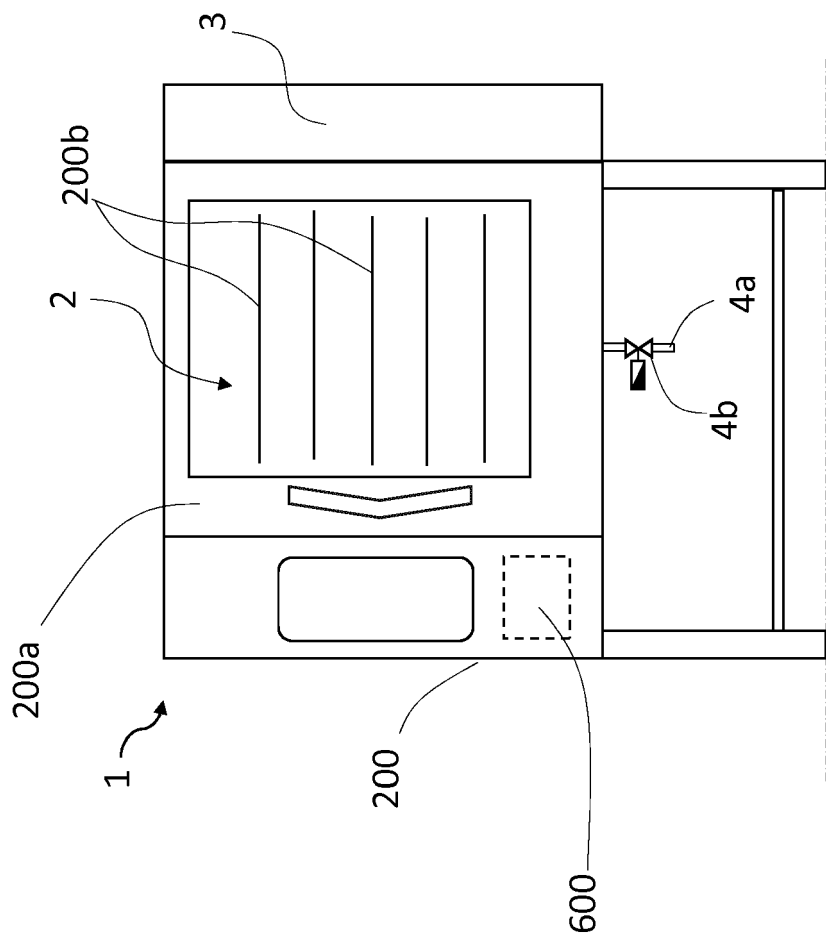


Fig. 1

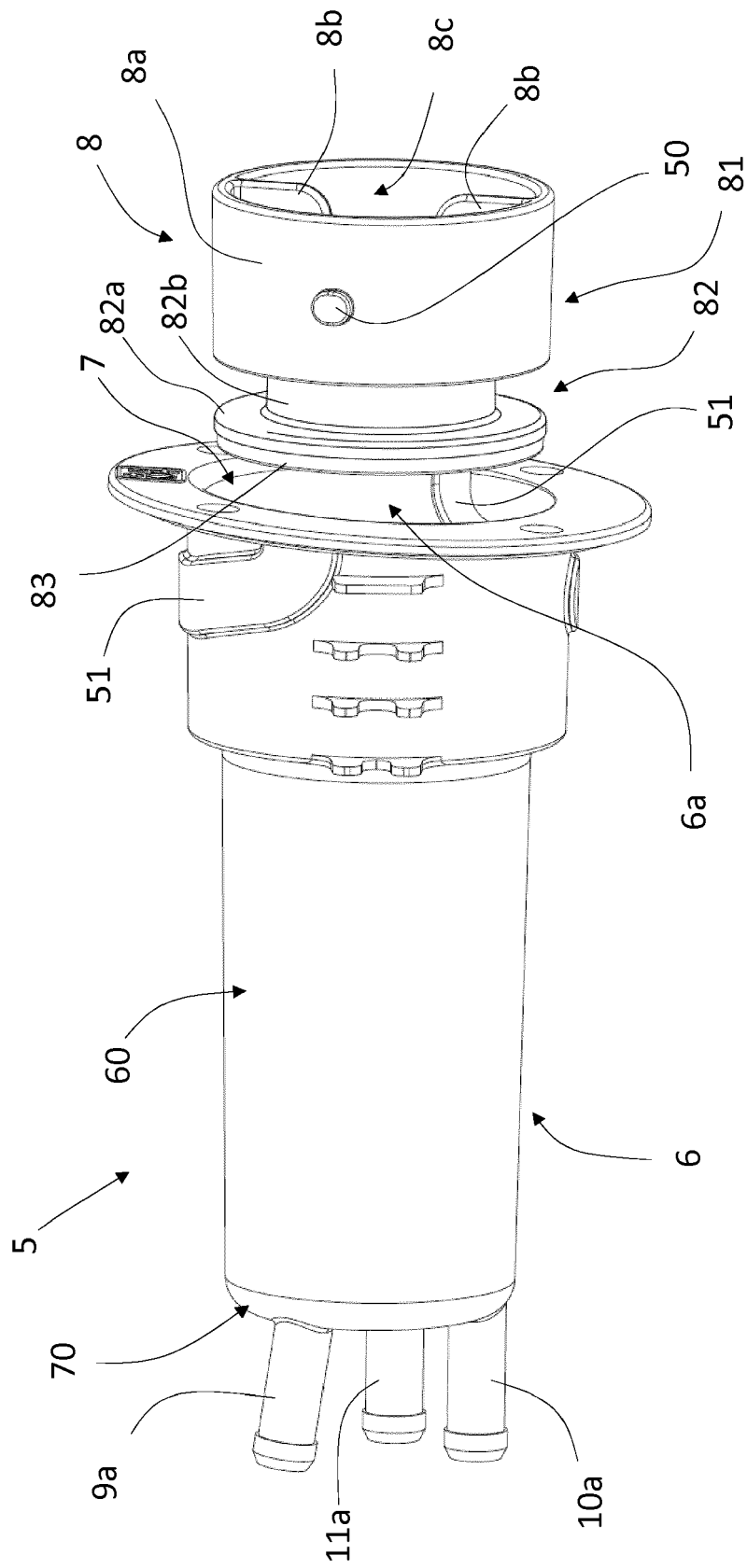


Fig. 2

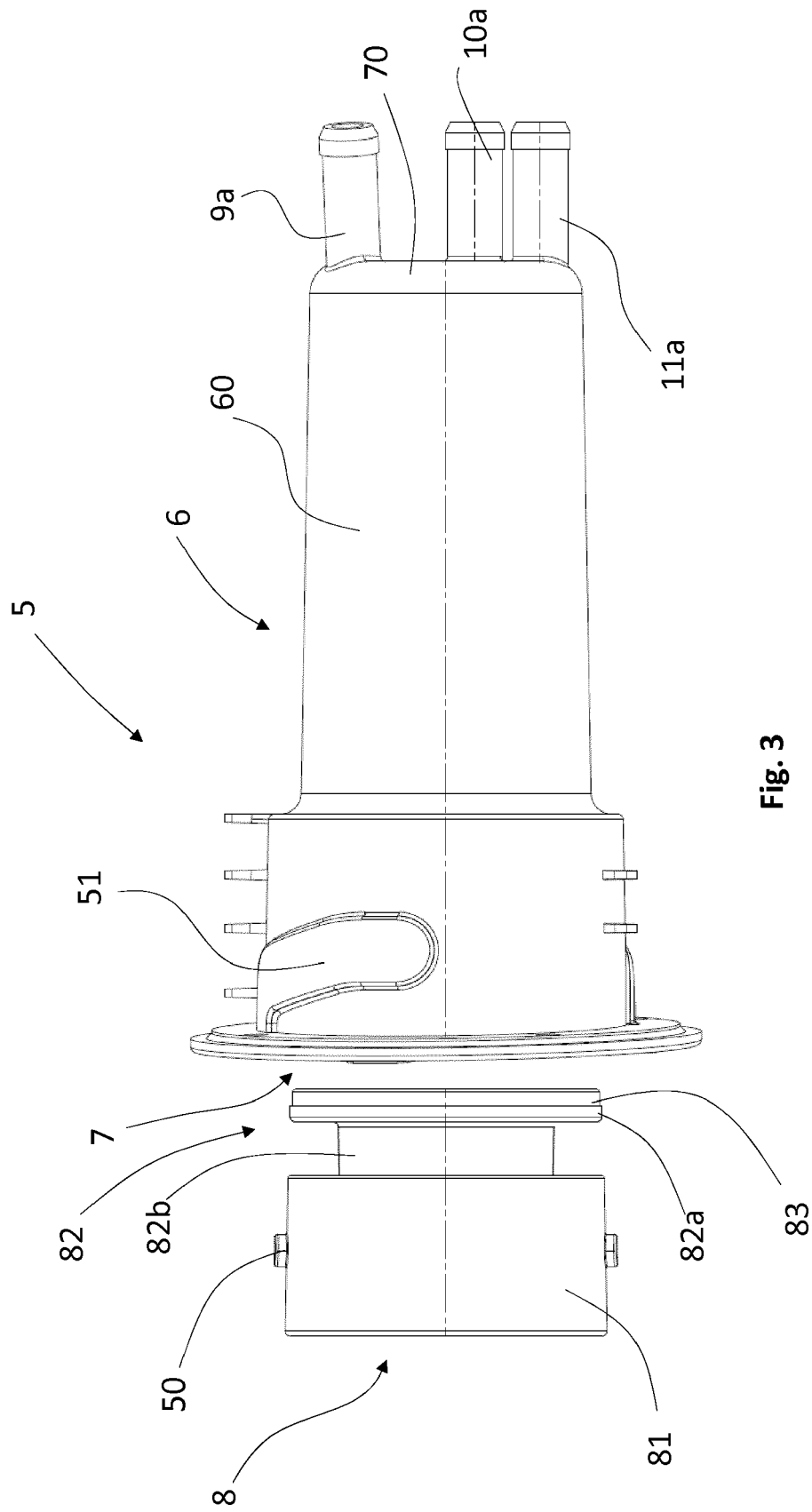


Fig. 3

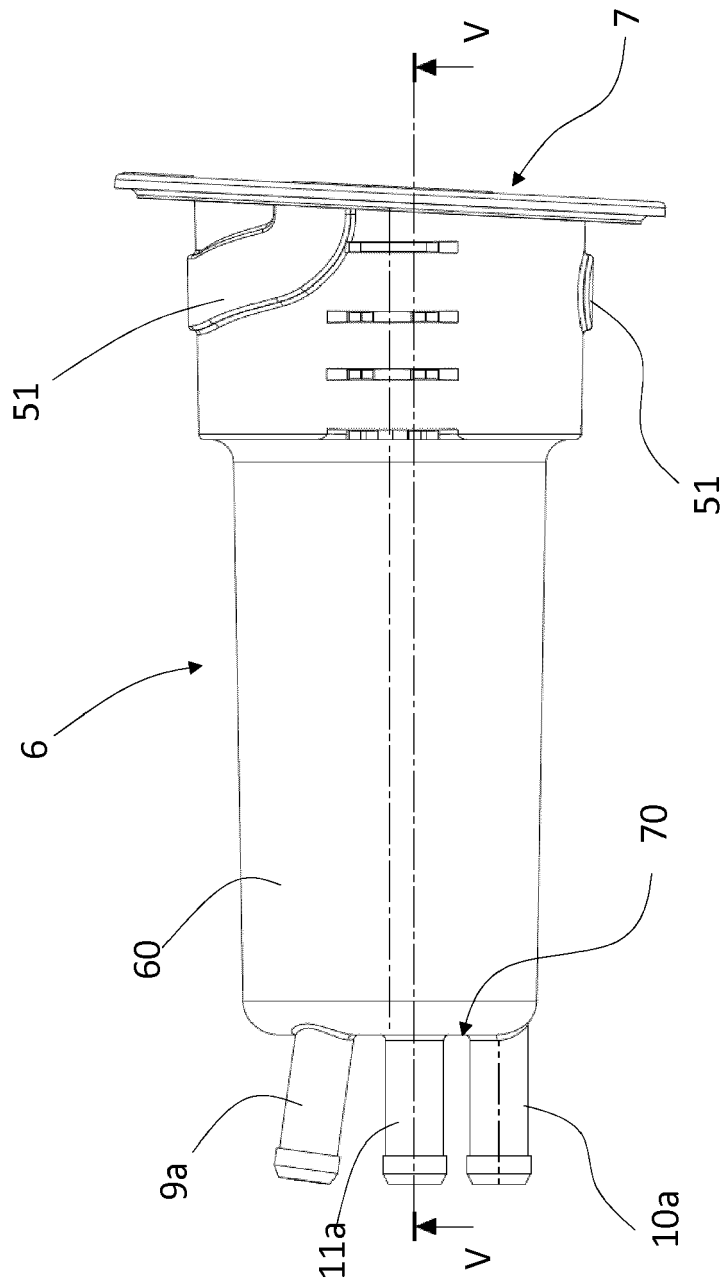
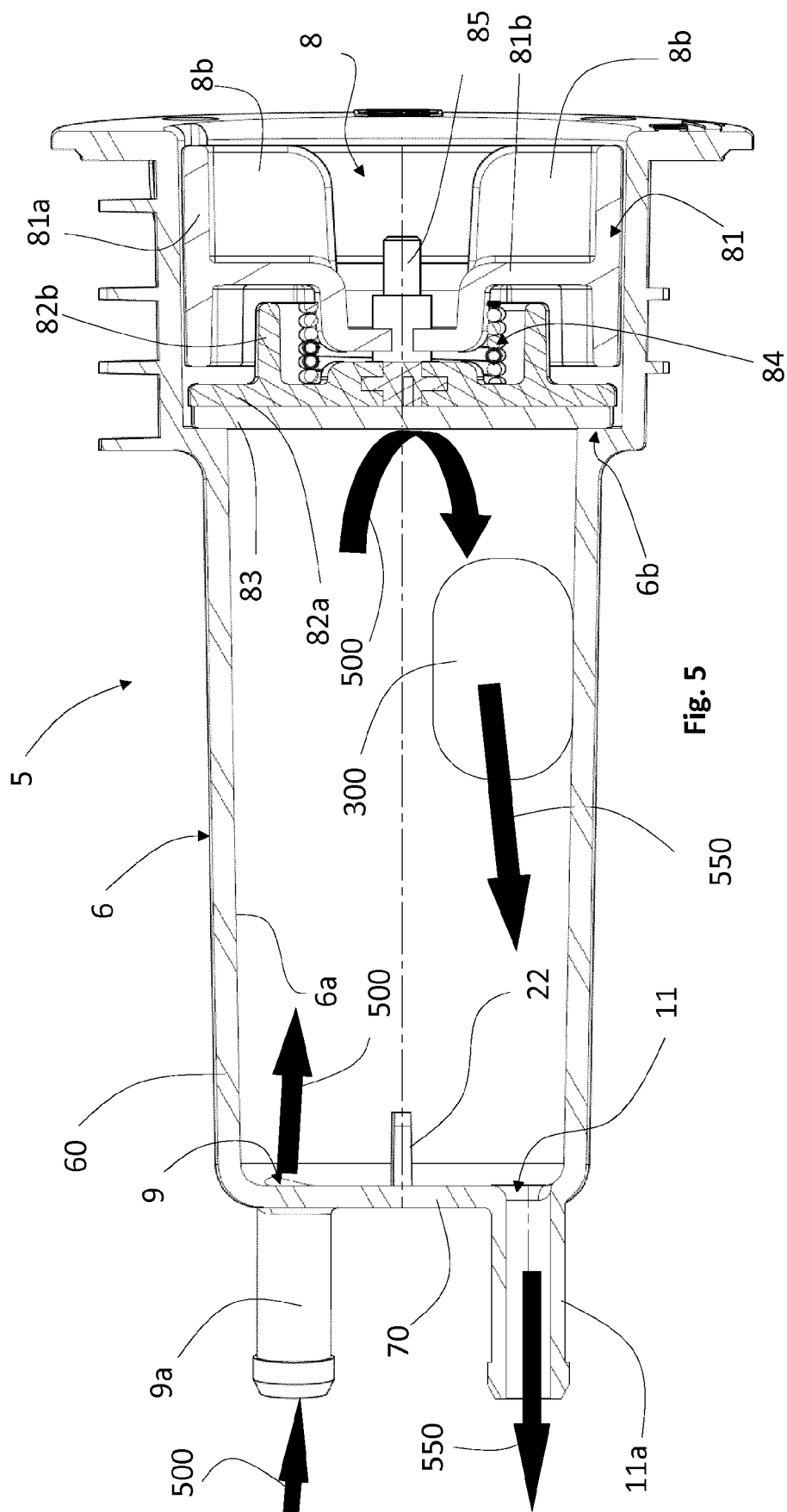


Fig. 4



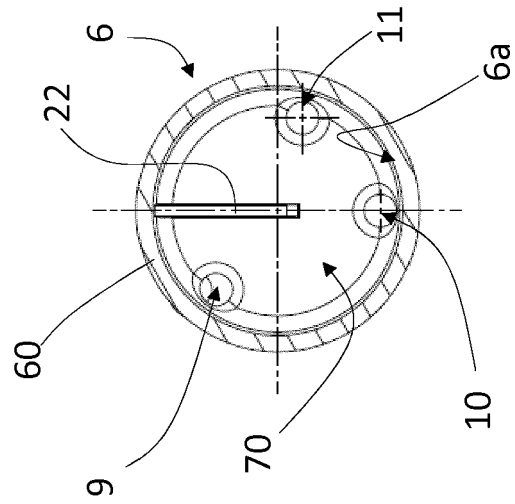


Fig. 7

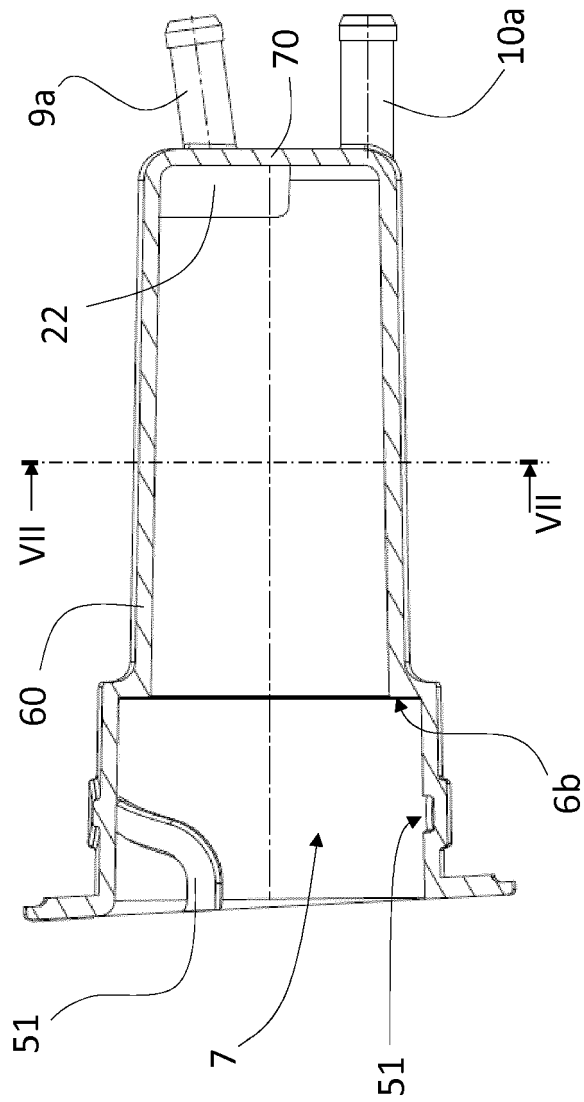


Fig. 6

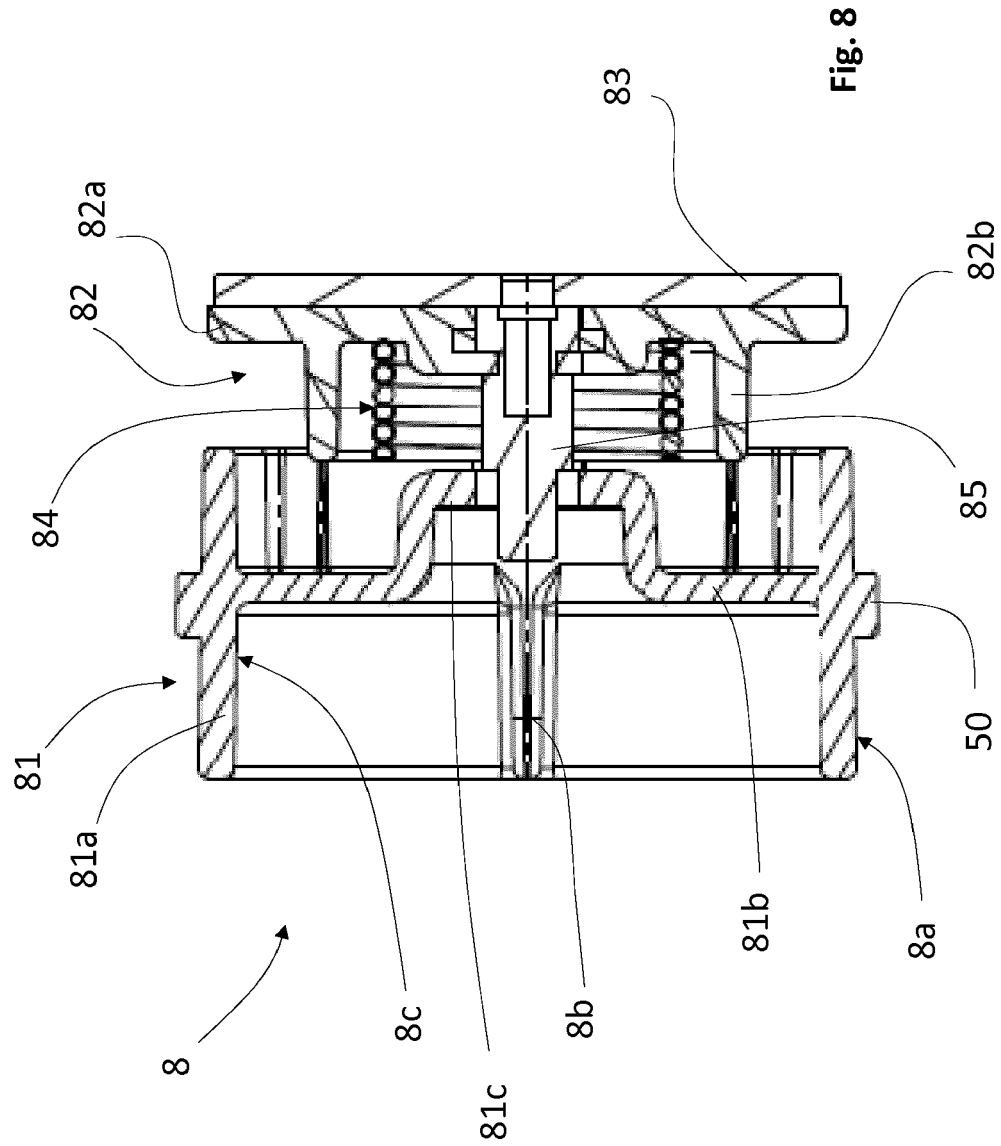


Fig. 8

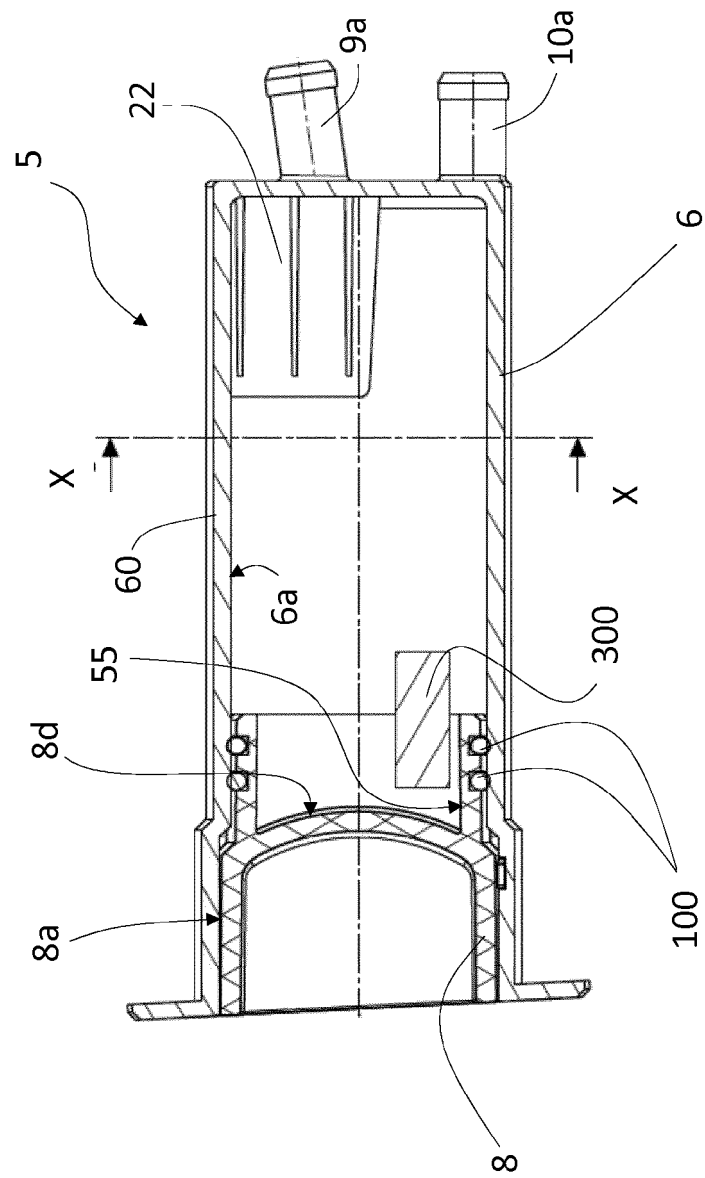


Fig. 9

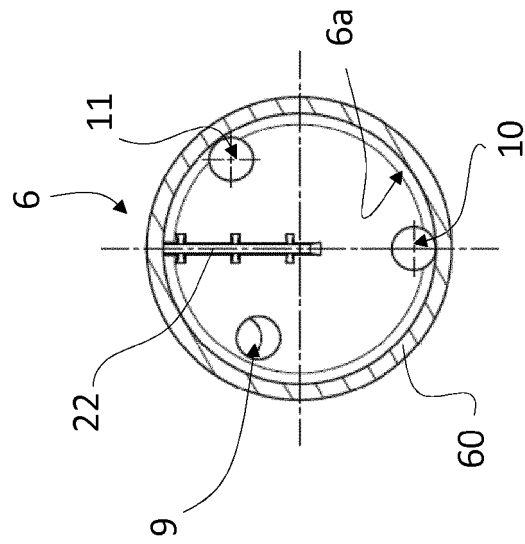


Fig. 10

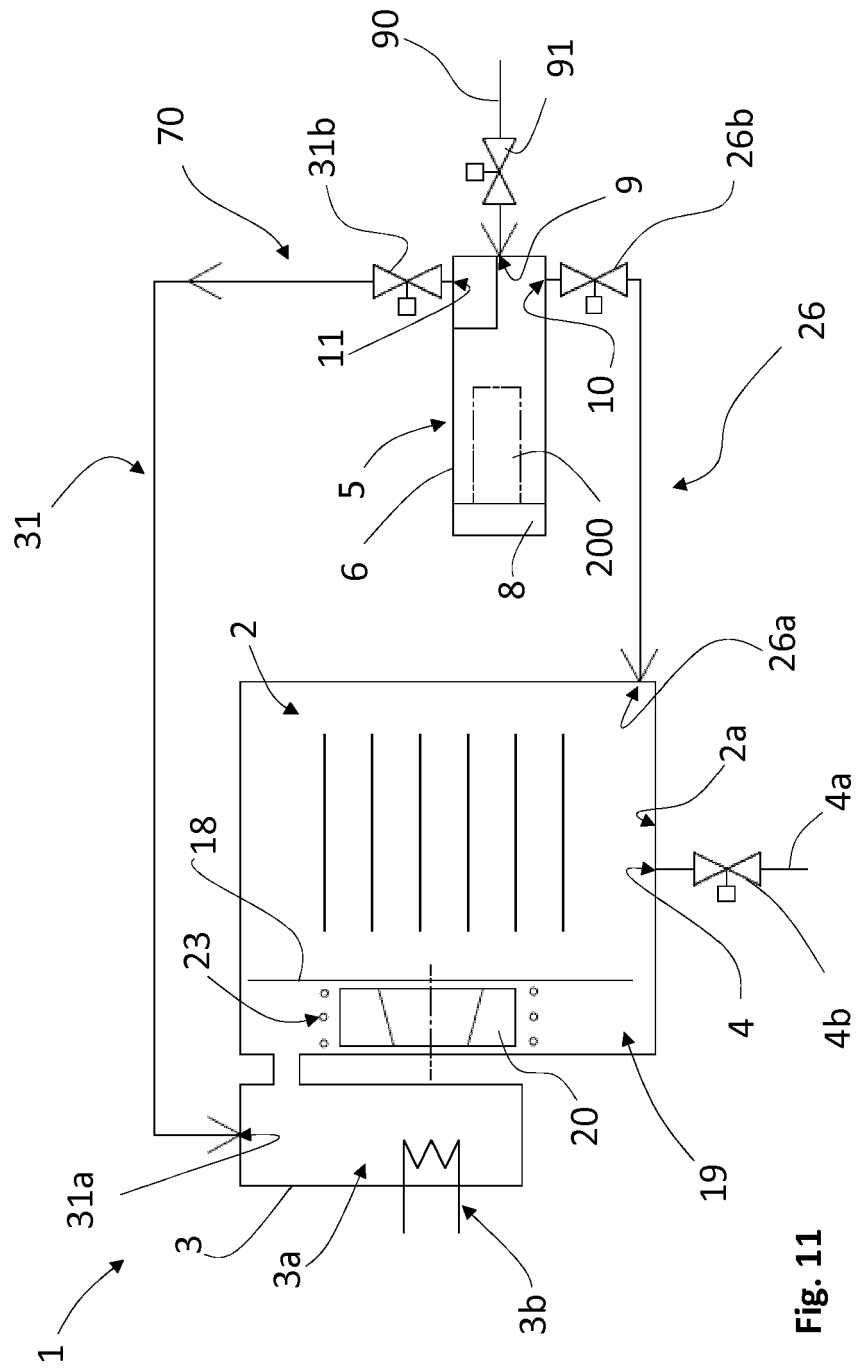


Fig. 11

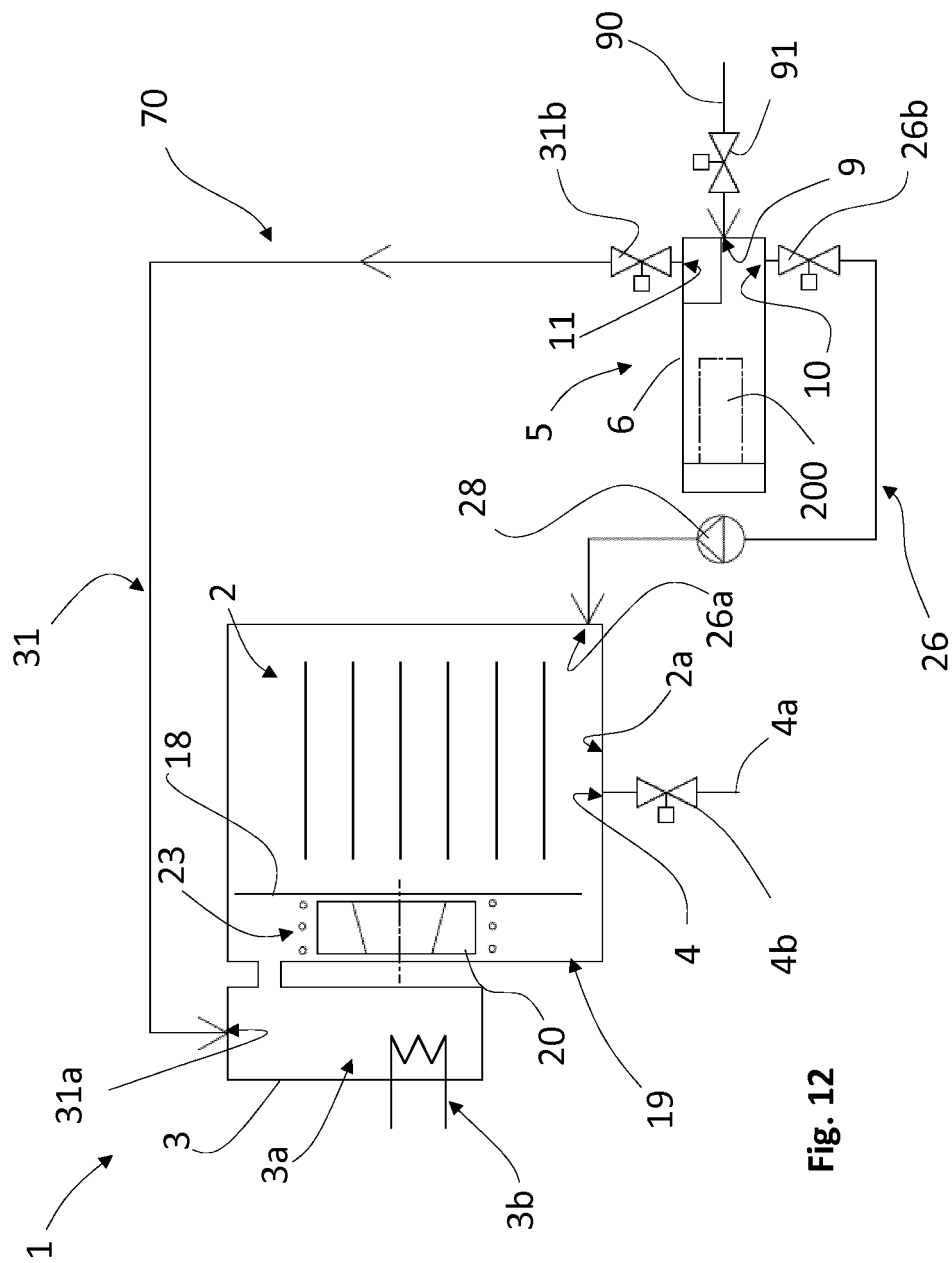


Fig. 12

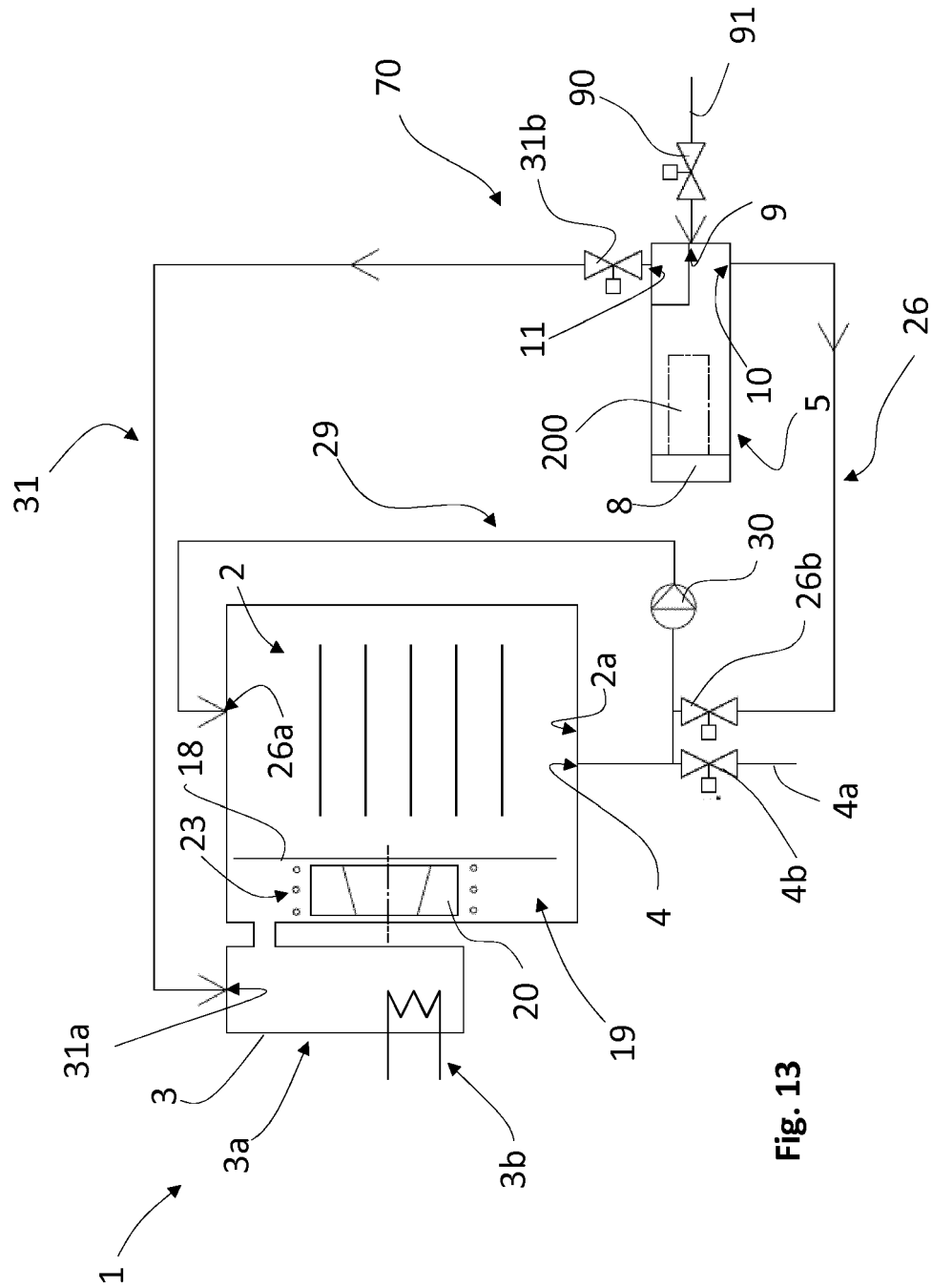


Fig. 13



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Application Number
EP 19 15 9485

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Place of search The Hague		Date of completion of the search 12 July 2019	Examiner Fest, Gilles
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			

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