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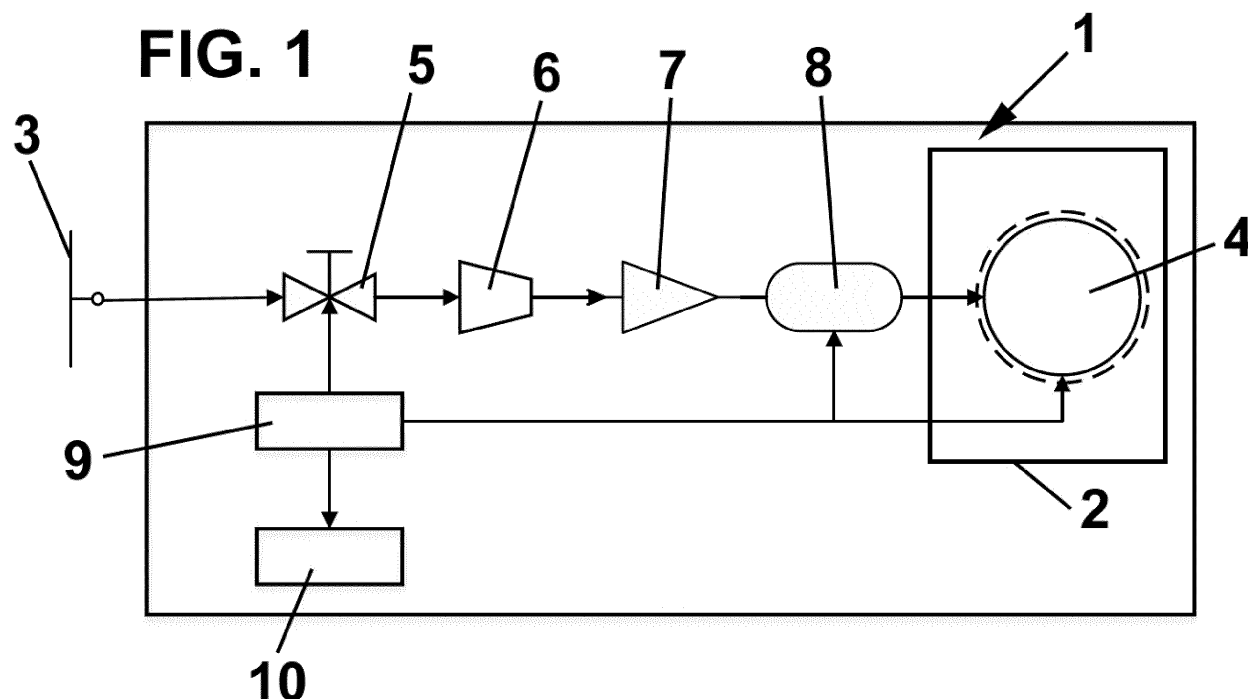
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(54) **COOKING OVEN**

(57) The cooking oven (1) comprising a cooking chamber (2) and a water intake (3) that feeds water to a steam generator (4), which provides water steam to the inside of said cooking chamber (2), also comprising a sterilizer (8) located between the water intake (3) and the

steam generator (4), which sterilizes the water that reaches said steam generator (4).

It allows for the elimination of pathogens regardless of the temperature and the altitude, and prevents the appearance of pathogens in parts of the oven.



## Description

**[0001]** The present invention relates to a cooking oven, in particular, although not exclusively, to a professional oven for communities.

## Background of the invention

**[0002]** Cooking ovens are specialized machinery for cooking and processing food with very broad and very precise control over the conditions inside the cooking chamber. Cooking ovens make it possible to control the temperature and stability thereof, at both very low and high temperatures, moisture, steam convection, homogeneity inside the oven, etc.

**[0003]** Control over moisture in the cooking chamber and steam generation are very important factors for the correct production and preparation of some foods and plates in modern cuisine. Control over the steam in the cooking chamber makes it possible to work with very important elements in the final result of the cooked plate, such as juiciness, texture, color, etc.

**[0004]** By being in direct contact with food for consumption, professional cooking ovens should guarantee healthy and sanitary conditions that guarantee the elimination of pathogens and elements dangerous to one's health from the cooked elements themselves as well as from the elements that make up the cooking process, cooking chamber, interior conditions of the chamber, water used to generate steam and control the inside moisture, etc.

**[0005]** Many current culinary processes require control over the level and homogeneity of the moisture inside the cooking chamber. To do so, they require steam generation through a water inlet that makes it possible to control said moisture level. Said water intake is usually located in the rear part of the ovens and is controlled through an electrovalve. This element controls the periods in which water is introduced into the oven for generating steam as well as for other purposes, such as self-cleaning.

**[0006]** In professional cooking ovens there are basically two methods of generating steam in the cooking chamber.

**[0007]** The first system is via a drum, which is essentially based on using a drum, also commonly called a water heater. This element is essentially a water tank with an electrical resistor, temperature sensors and safety elements.

**[0008]** The resistor heats the water until it is brought above its boiling point, generating steam. The steam is led from the drum to the oven chamber until it reaches the desired moisture level thereof.

**[0009]** This system has a set of disadvantages compared to the possible alternatives: The first one is that it has a slower response time and requires a more complex control system. This is because the drum must heat the water, which then must begin to boil, therefore taking

some time for the steam to be produced. Thus, cooking using steam or a mixture requires time to start being functional, a fact that increases the times for steam cooking.

**[0010]** Another similar problem appears when one wants to stop producing steam. Even though the resistor is switched off, the water will keep boiling for a few minutes due to the temperature reached. This will make it continue to generate steam, complicating the control system.

**[0011]** Another disadvantage of the drum is that the evaporation process fosters the accumulation of lime in this element, damaging it and cutting short its useful life. In the same way, steam generation takes place at temperatures close to 100°C, depending on the atmospheric pressure. Thus, it is not possible to precisely generate steam at a low temperature.

**[0012]** Finally, the steam generation system via drum is incapable of killing all the pathogens that the water can carry to the inlet thereof. There are pathogens that are temperature resistant which can survive at temperatures greater than 120°C. In this case, at a higher altitude, the lower the boiling temperature and the more pathogens that survive.

**[0013]** A second steam generation method in professional ovens is direct injection.

**[0014]** This method consists of placing a water injection tube at a point above the blades of the convection fan, that which is considered the most advantageous or strategic, wherein a stream of water falls. This is sent out abruptly into the fan blades and, due to the rotating movement, collides with the convection resistor that surrounds the fan. The collision of these drops against the resistor at a high temperature generates steam. Each manufacturer and model uses different points and inclinations of the tube in order to try and achieve the greatest amount of steam with the least amount of inconvenience possible. In this case, with steam generation being due to the precipitation and the speed at which the water flow is dispersed, the steam is generated at a lower temperature than that when using drum.

**[0015]** This system solves the problems that the steam generation via drum caused, since its operations are simpler and require less complicated control and fewer elements. Upon using the chamber convection resistor as a heater in order to evaporate water and eliminate the need for a specific tank for generating steam, the system greatly reduces its size and number of components, reducing at the same time the cost of the oven.

**[0016]** Even though this method solves the disadvantages of the drum, it also has a set of inconveniences. For example, in this case lime accumulates in the convection resistors, damaging them and harming their useful life. Moreover, the majority of the drops that are sent out by the fan hit the resistor, evaporating them, however, some of them are sent in other directions and stay in a liquid state in the chamber. This can create problems in some cooking processes. Finally, if not balanced, when the stream collides with the blades, they can become

destabilized, negatively affecting their operation and reducing their useful life.

**[0017]** Even with these disadvantages, this system is much cheaper and more functional than the use of a drum, and provides faster and more controlled operations, providing at the same time a better command for the user over the conditions in the oven chamber.

**[0018]** The steam generation system through direct injection is worse regarding the elimination of pathogens than the systems based on drums, since direct injection can generate steam at lower temperatures than drums can. At lower temperatures, more pathogens can survive the thermal effects.

**[0019]** Thus, it is deduced that all steam generation systems used in professional cooking ovens have health risks, since they are incapable of eliminating all the pathogens that the water introduced into the oven may contain.

**[0020]** In both systems, drum and direct injection, the steam is generated from the water flow that enters the oven directly from the electrovalve connected to the water intake. This process does not guarantee that the steam generated in the cooking chamber, which is in direct contact with the food being cooked, is free of pathogens that can be harmful to the health of the consumer.

**[0021]** As was commented previously, there are pathogens that are able to survive at temperatures at which steam is generated in professional cooking ovens, and that can truly represent a risk to the health of consumers.

**[0022]** It should be taken into account that in a health authority-controlled hydric network, there can be pathogens in very low concentrations that can still pose a threat to immunodeficient persons. In uncontrolled hydric networks, such as those in developing countries, wells etc., or incorrectly controlled hydric networks, the concentration of pathogens can pose an elevated risk to public health. Through the steam generation system of the oven, these pathogens can eventually come in direct contact with the prepared food and, therefore, put the health of the client at risk.

**[0023]** Another problem that these pathogenic microorganisms generate in the oven is the creation of accumulations or colonies in sensitive areas where water accumulates during normal oven use, such as the siphon or the water collector. In these areas, the bacteria and spores proliferate and create small colonies that can end up being visible, like a small viscous film. This can cause odor and aesthetic problems, in addition to increasing the risk that these pathogens can move and come in contact with food, creating a risk to the healthiness and quality of the cooked product.

**[0024]** Thus, an objective of the present invention is to provide a cooking oven, with both direct injection and drum that prevents the inlet of pathogens coming from the hydric network.

## Description of the invention

**[0025]** The cooking oven of the invention resolves the aforementioned drawbacks and has other advantages which are described below.

**[0026]** The cooking oven according to the present invention comprising a cooking chamber and a water intake that feeds water to a steam generator, which provides water steam to the inside of said cooking chamber, and is characterized in that it also comprises a sterilizer located between the water intake and the steam generator, which reduces the pathogens in the water that reaches said steam generator.

**[0027]** Advantageously, the cooking oven according to the present invention can also comprise an electrovalve located between the water intake and the sterilizer.

**[0028]** Furthermore, the cooking oven according to the present invention can also comprise a control unit connected to the electrovalve, the sterilizer and the steam generator, and a user interface connected to the control unit.

**[0029]** According to alternative embodiments, said sterilizer can be an ultraviolet radiation emitter, a gamma radiation emitter, or a chemical disinfectant product injector.

**[0030]** The cooking oven according to the present invention can also comprise a pressure reducer and/or a flow reducer, the sterilizer being arranged between the pressure reducer and/or the flow reducer and the steam generator.

**[0031]** The inclusion of a water treatment system via a sterilizer improves the healthiness of the water used to generate steam, regardless of the kind of steam generation, providing the following advantages among others:

- Elimination of pathogens regardless of the temperature:

In direct injection ovens, the pathogens that the water contains can be inactivated at the inlet thereof, regardless of the temperature of steam generation.

- Elimination of pathogens regardless of the altitude:

In ovens with drums, the pathogens that the water contains can be inactivated at the inlet thereof, regardless of the atmospheric pressure, which determines the boiling point of the water in the drum.

- To prevent the appearance of pathogen accumulations in parts of the oven:

Using the sterilizer, the appearance of pathogen colonies is notably reduced in areas of water accumulation such as in the water collector or the siphon.

## Brief description of the drawings

**[0032]** For the purpose of helping to make the foregoing description more readily understandable, it is accompanied by a set of drawings which, schematically and by way of illustration and not limitation, represent an embodiment.

**[0033]** Figure 1 is a flowchart of the components of the cooking oven according to the present invention.

## Description of a preferred embodiment

**[0034]** The present invention is a cooking oven, for example, a professional cooking oven, which can use direct injection or drum.

**[0035]** The cooking oven according to the present invention is generally identified by the reference number 1 in figure 1, and comprising a cooking chamber 2 where the food to be cooked is placed.

**[0036]** Said oven 1 also comprises a water intake 3 that feeds a steam generator 4, which generates water steam that is supplied to the inside of the cooking chamber 2 in order to control its moisture level.

**[0037]** According to the embodiment shown, between the water intake 3 and the steam generator 4 an electrovalve 5, a pressure reducer 6 and a flow reducer 7 are placed.

**[0038]** In order to prevent the entrance of pathogens coming from the hydric network into the cooking chamber 2, the cooking oven comprises a sterilizer 8 that treats the water that the oven uses for steam generation. This sterilizer 8 is located between the water intake 3 and the steam generator 4.

**[0039]** There are several kinds of cells that allow for pathogen inactivation: through physical processes (for example, high pressure, high temperature, ultraviolet radiation, gamma radiation, etc.), chemical processes (pH, oxidation, etc.).

**[0040]** The preferred embodiment for the sterilizer 8 is an ultraviolet radiation emitter. Despite the fact that in the preferred embodiment inactivation via ultraviolet radiation was chosen, it should be understood that the use of other kinds of pathogen-inactivating technology is equally applicable.

**[0041]** Inactivation with ultraviolet rays has multiple advantages compared to other kinds of treatments such as chemical disinfectant or high temperatures. One advantage, for example, is that there is no need to use products that can be potentially harmful to the health of the workers or the consumer. Neither is it necessary to use post-treatment processes in order to clean the water, such as dechlorination, in the case of chemical disinfection.

**[0042]** Another benefit compared to other treatments is that the ultraviolet rays deactivate without problem the microorganisms resistant to high temperatures or chemical products, since they attack them in their nucleus.

**[0043]** Water treatment with ultraviolet rays is a process of microorganism inactivation. Ultraviolet light repre-

sents a range of wavelengths between visible light and X-rays.

**[0044]** Within this range, UVC light, used in this treatment, represents the range between wavelengths of 200 nm and 280 nm. The operations of this treatment are based on the fact that UVC photons can travel through water and penetrate the pathogen cells, damaging their nucleic acid, microbiologically converting them into organisms incapable of reproducing.

**[0045]** Every kind of pathogen, such as bacteria, viruses and spores, can be biologically deactivated through this treatment, preventing them from reproducing and becoming a health problem.

**[0046]** The cooking oven 1 according to the present invention can also comprise a control unit 9 which will control the inlet electrovalve 5, the sterilizer 8 and the steam generator 4, and interacts with the user through the user interface 10. Through this user interface 10 and the control unit the following actions can be completed:

- Passage control by closing the inlet electrovalve 5 so that the water from the hydric network can reach the steam generator 4.
- Activation of the sterilizer 8 according to the water flow: The sterilizer 8 should only be activated as much as necessary in order to eliminate the pathogens.
- Activation of the steam generator 4: depending on the desired, and existing, quantity of steam, it enables steam generation inside of the cooking chamber 2.
- Notification to the user when the sterilizer 8 has reached the end of its useful life and should be replaced.

**[0047]** The inclusion of this sterilizer 8 in the cooking oven 1 allows the water that reaches the steam generator 4 to have several orders of magnitude less of active microorganisms than at the inlet, guaranteeing that it has healthiness conditions of a much higher quality.

**[0048]** With the reduction of the pathogenic elements that circulate inside the oven, the appearance of viscous films is reduced in water storage areas like the water collector or the siphon. This solves the problems created by these accumulations and allows for improving the operating conditions of the oven and making it easier to clean.

**[0049]** Another relevant point is the location of this sterilizer 8. Placing it in the water inlet of the oven just past the flow 7 and/or pressure 6 regulator creates an important advantage. The first is that this is a low-pressure point made to make it possible to use a smaller and less complicated sterilizer 8, which considerably reduces its cost and the costs of implementation in the oven 1.

**[0050]** Moreover, the fact that it is directly controlled by the control unit 9 makes it possible to measure the real operating hours of the sterilizer 8 and its real useful life can be monitored, facilitating good operation of the

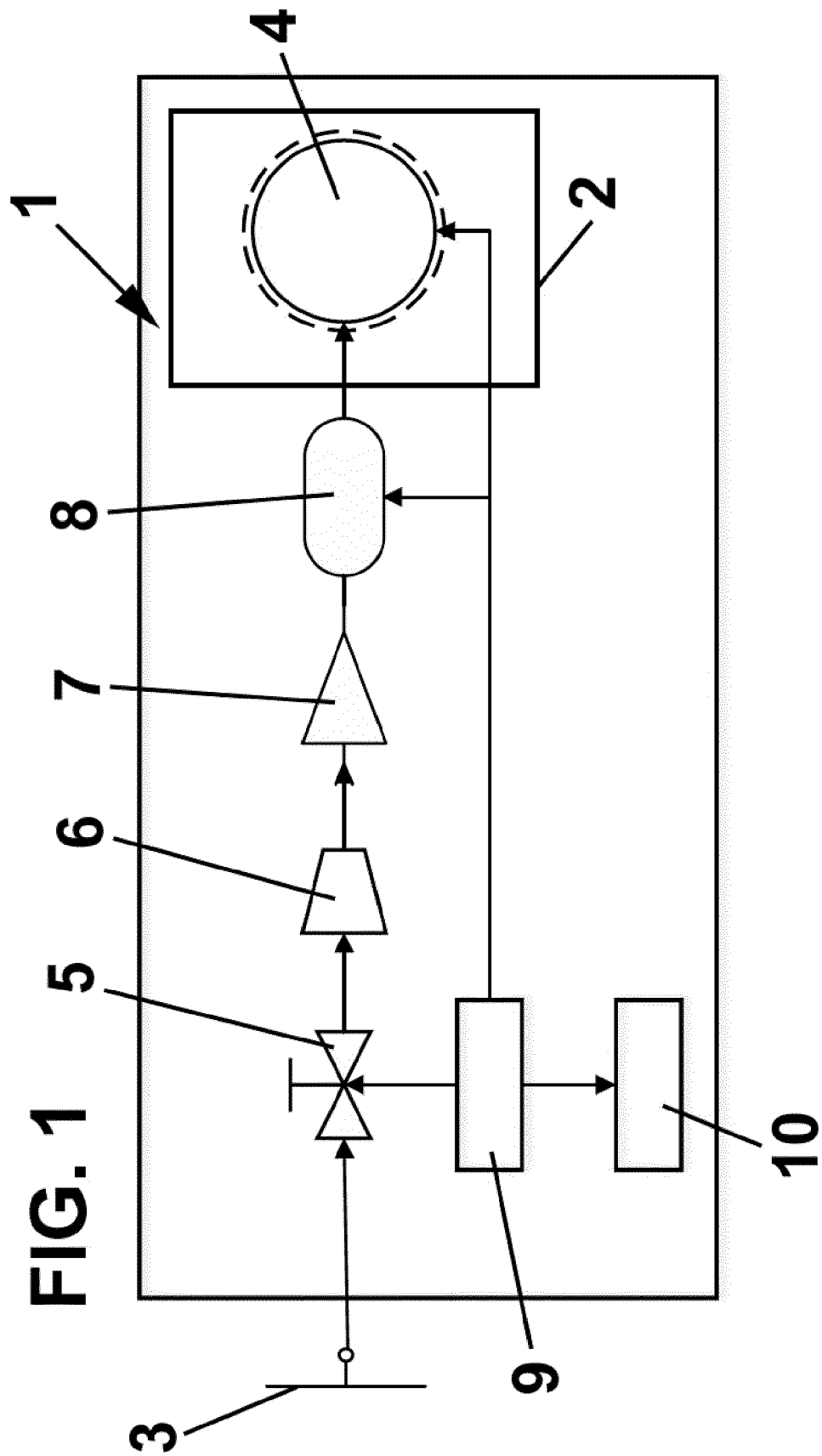
system. The control unit 9 notifies the user when the sterilizer 8 needs to be replaced.

**[0051]** Despite the fact that reference has been made to a specific embodiment of the invention, it is evident for the person skilled in the art that numerous variations and changes may be made to the cooking oven described, and that all the aforementioned details may be substituted by other technically equivalent ones, without detracting from the scope of protection defined by the attached claims.

## Claims

1. A cooking oven (1) comprising a cooking chamber (2) and a water intake (3) that feeds water to a steam generator (4), that provides water steam to the inside of said cooking chamber (2), **characterized in that** it also comprises a sterilizer (8) located between the water intake (3) and the steam generator (4), which sterilizes the water that reaches said steam generator (4). 15 20
2. The cooking oven (1) according to claim 1, also comprising an electrovalve (5) located between the water intake (3) and the sterilizer (8). 25
3. The cooking oven (1) according to claims 1 and 2, also comprising a control unit (9) connected to the electrovalve (5), the sterilizer (8) and the steam generator (4). 30
4. The cooking oven (1) according to claim 3, also comprising a user interface (10) connected to the control unit (9). 35
5. The cooking oven (1) according to claim 1, wherein said sterilizer (8) is an ultraviolet radiation emitter.
6. The cooking oven (1) according to claim 1, wherein said sterilizer (8) is a gamma radiation emitter. 40
7. The cooking oven (1) according to claim 1, wherein said sterilizer (8) is a chemical disinfectant product injector. 45
8. The cooking oven (1) according to claim 1, also comprising a pressure reducer (6) and/or a flow reducer (7), the sterilizer (8) being arranged between the pressure reducer (6) and/or the flow reducer (7) and the steam generator (4). 50

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 Application Number  
 EP 17 38 2157

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| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                |                                  |                                         |
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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