The present invention relates to an improved professional oven for cooking food, being of the forced air recirculation type, comprising, at a rear part of a food cooking chamber and connected thereto, a chamber for air ventilation and heating, means being provided for introducing humidification water in the heating chamber, in order to humidify the hot air injected into said cooking chamber, and means for discharging the hot exhaust gases from the cooking chamber towards the outside. The humidification water and the hot exhaust gases flow within heat exchange means for the cooling of the hot exhaust gases that exit from the cooking chamber and the preheating of the humidification water prior to entry in said heating chamber.
PROFESSIONAL HOT AIR RECIRCULATION OVEN FOR COOKING FOOD

[0001] The present invention relates to an improved professional oven for cooking food with forced air recirculation.

BACKGROUND OF THE INVENTION

[0002] Ovens with forced air circulation known today, generally comprise, in the rear part of the muffle and connected thereto, a chamber for air ventilation and heating.

[0003] Said ovens are provided with means for introducing water in the heating chamber, to be nebulized by the associated ventilation and heating means, thus blowing water vapor on the food in the cooking chamber.

[0004] The humidity in the muffle is determined by a first step of the mechanical breaking of water drops, nebulizing the same, by the action of the rotating fans of one or more ventilators, and by a second water vaporization step mechanically nebulized by the action of heating elements surrounding the fans.

[0005] The hot and humid air is then evacuated from the muffle generally in a natural way, i.e. not forced, by means of vent stacks formed by simple tubes putting the cooking chamber in direct communication with the outside.

[0006] In this way the hot exhaust gases, having temperatures ranging from 100°C to 180°C, are dispersed in the environment.

[0007] Said known type ovens, although widespread and appreciated, have certain aspects that can be improved.

[0008] A first aspect that can be improved concerns the very high exhaust temperatures of hot gases which have a severe environmental impact.

[0009] A second aspect concerns the fact that the cold water entering the oven is in no way pre-heated, and thus the room temperature which is emitted onto the fans and onto the heating elements causes a noteworthy lowering of the temperature of the same heating elements, with the obvious consequence that, for maintaining the cooking chamber at a predetermined temperature, an adequate consumption of electric energy is needed for restoring and maintaining the heating elements at a temperature that keeps the cooking chamber at the predetermined cooking temperature.

SUMMARY OF THE INVENTION

[0010] The object of the present invention is to provide an improved professional oven suited to obviate the mentioned limits of the known art.

[0011] Within this object, a purpose of the invention is to provide an improved professional oven having a lower environmental impact compared to known ovens.

[0012] Another purpose of the invention is to provide an improved professional oven capable of a lower electric consumption for heating and humidification of the cooking chamber.

[0013] This object, as well as these and other purposes which will become apparent hereinafter, are achieved by an improved professional oven for cooking food, being of the forced air recirculation type, comprising, at a rear part of a food cooking chamber, and connected thereto, a chamber for air ventilation and heating, means being provided for introducing humidification water in said heating chamber, in order to humidify the hot air injected into said cooking chamber and means for discharging the hot exhaust gases from said cooking chamber outward, said improved professional oven being characterized in that said humidification water and said hot exhaust gases flow within heat exchange means for cooling the hot exhaust gases exiting from the cooking chamber and for the preheating of the humidification water prior to entering said heating chamber.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] Further characteristics and advantages of the invention will become apparent from the description of two preferred, but not exclusive, embodiments of the improved professional oven according to the invention, illustrated, by way of non-limitative example in the accompanying drawings, wherein:

[0015] FIG. 1 shows a side view in section of the oven according to the invention;

[0016] FIG. 2 is a perspective view from behind the oven according to the invention;

[0017] FIG. 3 is a side view of a detail of the oven according to the invention in its first embodiment;

[0018] FIG. 4 is the view according to the section line IV-IV of FIG. 3;

[0019] FIG. 5 is a side view of a detail of the oven according to the invention in its second embodiment;

[0020] FIG. 6 is the view according to the section line VI-VI of FIG. 5.

DETAILED DESCRIPTION OF THE INVENTION

[0021] With reference to the above figures, an improved professional oven for cooking food is indicated as a whole by number 10.

[0022] Said improved professional oven 10 is of the forced air recirculation type, comprising, at a rear part of a food cooking chamber 11 and connected thereto, a chamber 12 for air ventilation and heating.

[0023] Means for introducing humidification water in the heating chamber 12 are provided, in order to humidify the hot air injected into the cooking chamber 11, and means for discharging the hot exhaust gases from said cooking chamber 11 outward.

[0024] The peculiarity of the invention resides in the fact that the humidification water and the hot exhaust gases flow within heat exchange means 13 for cooling the hot exhaust gases 14 exiting the cooking chamber 11 and for preheating the humidification water 15 prior to entering the heating chamber 12.

[0025] In the first embodiment of the invention, described herein by way of example and not limitative of the invention itself, the heat exchange means 13 comprise two concentric tube exchangers 16 and 17, as shown in FIG. 2.

[0026] Regarding said concentric tube exchangers 16 and 17, a first exchanger 16 is described and well illustrated in FIGS. 3 and 4, the second exchanger 17 is to be considered equal.

[0027] The concentric tube exchanger 16 comprises an inner tubular duct 18 for the passage of one of the two involved fluids, for example for the hot exhaust gases 14 from the inside of the cooking chamber 11 outward, and an outer tubular duct 19, which is arranged so as to surround at least part of said inner tubular duct 18, defining an annular interspace 20 in which the other one of said two involved fluids, for example the humidification water 15, is adapted to flow.
The inner tubular duct 18 having a vertical rectilinear axis, is closed in a lower region and is connected to the cooking chamber 11 by means of two sleeves 21 and 22 with an axis that is transverse to said vertical rectilinear axis 23, a first lower sleeve 21, and a second upper sleeve 22.

The outer tubular duct 19 is shaped so as to surround said inner tube in the region between the two first 21 and second 22 sleeves.

This outer tubular duct 19 has two nozzles, an upper one 24 and a lower one 25, for the inflow and the outflow of the humidification water 15.

In the outer tubular duct 19, the humidification water 15 is introduced by the upper nozzle 24, so that the concentric tube exchanger 16 as well as 17 operate in countercurrent.

In a second embodiment of the invention, represented in FIGS. 5 and 6, each concentric tube exchanger 116 to the outer tubular duct 119 is constituted by a first tube with a vertical rectilinear axis 123, which is closed in a lower region and is connected to the cooking chamber by means of two sleeves 121 and 122 with an axis that is transverse to said vertical rectilinear axis 123, a first lower sleeve 121 and a second upper sleeve 122, while the inner tubular duct 118 is constituted by a second tube, which has a smaller transverse cross-section with respect to the section of the outer tubular duct 119, entering said outer tubular duct 119 at the junction 126 with the upper sleeve 122, and exiting from the outer tubular duct 119 at the junction 127 thereof with the lower sleeve 121.

Also in said embodiment it is preferable that the humidification water 115 flows countercurrent along the inner tubular duct 118, i.e. from the top downwards, with respect to the upward motion of the hot exhaust gases 114 in the outer tubular duct 119.

In FIG. 1 a condensation drain nozzle 30 is also represented, which protrudes from the lower end 31 of the inner tubular duct 18.

The heating and ventilation means for hot air forced recirculation contained in the heating chamber 12 are to be considered as known type and, for example, formed by a series of fans 31 surrounded by air heating electric coils 32.

It has now been observed that the invention achieves the object and the intended purposes.

In particular, with the invention an improved professional oven has been developed having a lower environmental impact with respect to known ovens, due to concentric tube exchangers that allow cooling the hot exhaust gases exiting the cooking chamber.

Moreover, with the invention an improved professional oven has been developed capable of a lower electric consumption for heating and humidifying the air, due to the preheating of the humidification water ejected on the fans of the hot air ventilators in the heating chamber, as said preheated humidification water allows to use a lower temperature of the electric heating coils, at equal working conditions, with respect to what is necessary with a known type oven.

The invention, thus conceived, is susceptible to numerous modifications or variations, all falling within the inventive concept; moreover, all the details may be replaced with other technically equivalent elements.

Practically, the material used, as long as it is compatible with the specific use, as well as the size or the actual shape, may be any according to the requirements and the background art.

Where the features and techniques mentioned in any claim are followed by reference marks, said marks have been assigned with the sole purpose of increasing the intelligibility of the claims and accordingly said reference marks do not have any limiting effect on the interpretation of each element identified by way of example by said reference marks.

1. An improved professional oven, for cooking food (10), of the type with forced air recirculation, comprising, at a rear part of a food cooking chamber (11) and connected thereto, a chamber (12) for air ventilation and heating, means being present for introducing humidification water in said heating chamber (12), in order to humidify the hot air injected into said cooking chamber (11), and means for discharging the hot exhaust gases from said cooking chamber (11) outward, said improved oven being characterized in that said humidification water and said hot exhaust gases flow within heat exchange means (13) for the receiving of the hot exhaust gases that exit from the cooking chamber (11) and for the preheating of the humidification water prior to entry in said heating chamber (12).

2. The improved oven according to claim 1, characterized in that said heat exchange means have at least one concentric tube exchanger (16), which comprises an inner tubular duct (18) for the passage of one of the two involved fluids, or of the hot exhaust gases (14) from the inside of the cooking chamber (11) outward, or of said humidification water (15), and an outer tubular duct (19), which is arranged so as to surround at least part of said inner tubular duct (18), forms an annular interspace (20) in which the other one of said two involved fluids is adapted to flow.

3. The improved oven according to claim 2, characterized in that it comprises two concentric tube exchangers (16, 17), each of which comprises an inner tubular duct (18) that has a vertical rectilinear axis (23), is closed in a lower region and is connected to the cooking chamber (11) by means of two sleeves (21, 22) with an axis that is transverse to said vertical rectilinear axis (23), a first lower sleeve (21) and a second upper sleeve (22), and an outer tubular duct (19), which is contoured so as to surround said inner tubular duct (18) in the region between the two first (21) and second (22) sleeves, said outer tubular duct (19) having two nozzles, an upper one (24) and a lower one (25) for the inflow and the outflow of the humidification water (15).

4. The improved oven according to claim 3, characterized in that said humidification water (115) flows in said inner tubular duct (118), said hot exhaust gases (114) flowing in said outer tubular duct (119).

5. The oven according to claim 2, characterized in that said humidification water (115) flows in said inner tubular duct (118), said hot exhaust gases (114) flowing in said outer tubular duct (119).

6. The improved oven according to claim 5, characterized in that said outer tubular duct (119) is constituted by a first tube with a vertical rectilinear axis (123), which is closed in a downward region and is connected to the cooking chamber by virtue of two sleeves with an axis that is transverse to said vertical rectilinear axis, a first lower sleeve (121) and a second upper sleeve (122), while said inner tubular duct (118) is constituted by a second tube, which has a smaller...
transverse cross-section than the outer tubular duct (119),
enters said outer tubular duct (119) at the junction (126) with
the upper sleeve (122) and exits from the outer tubular duct
(119) at the junction (127) thereof with said lower sleeve
(121).

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