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(54) FUEL OVEN AND OPERATING METHOD FOR SAID OVEN

(57) Fuel oven (1), which has a hollow containment body (2) which internally delimits a heat treatment chamber (3) susceptible to contain a product to be treated, adapted to contain a radiant-convective heat exchanger (4) and process air treatment and movement means (32-33-36), a housing chamber (7) thermally separated from the treatment chamber (3), which delimits a heat generation and management system, characterized by a multi-gas burner with forced suction (11), an aspirator (18) placed downstream of the exchanger, a recirculation (26) of the combustion products integrated with external air suction and insufflation (23) in order to lower the temperature thereof and ensure the renewal of air (8) of the housing chamber (7).

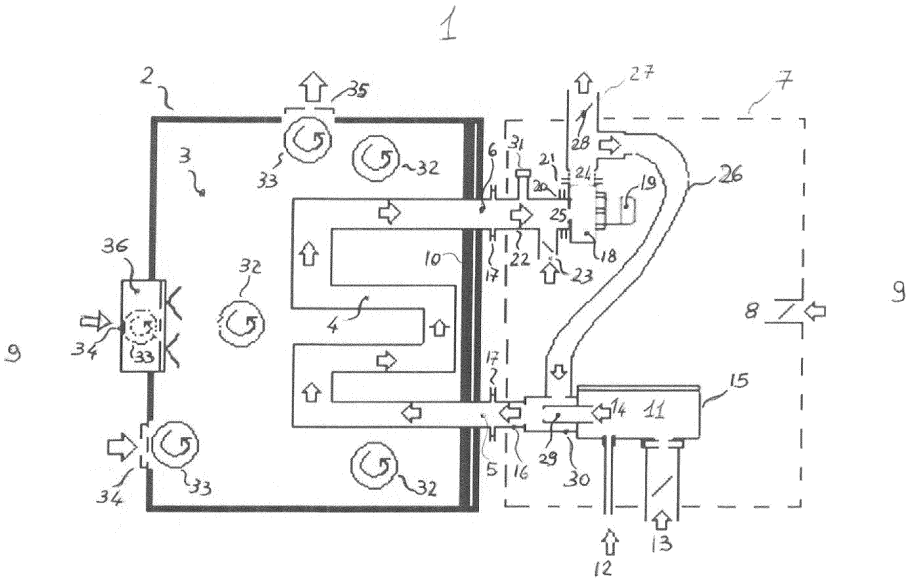

Fig. 1

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Description

Field of application

[0001] The present invention regards a fuel oven and an operating method for said oven, according to the preamble of the relative independent claims.

[0002] The present oven and method are intended to be advantageously employed in multiple fields, such as in the food sector for cooking, drying, desiccating and heat cycles, or in the field of electronics for drying, desiccating and thermal treatments of components, or for thermal treatments on metals with heat cycles.

[0003] Advantageously, the present oven and method are intended to be used in the food field for cooking foods, in particular foods for human consumption. Preferably, the present oven is intended to be employed in a professional environment, e.g. in the restaurant/catering, gastronomy, confectionary and bakery sectors.

State of the art

[0004] Fuel ovens are known on the market that are employed generally for cooking, drying, desiccating and heat cycles. Such ovens use fuel burners coupled to combustion chambers having the purpose of generating mainly hot or overheated air.

[0005] Such ovens of known type conventionally comprise a thermally-insulated chamber in which the material to be treated is inserted; such chamber is equipped with the following accessories: systems for transport and movement, for ventilation and treatment of the air including heating, dehumidification or humidification.

[0006] The heating is normally executed with hot air generators fed with fuel (methane, LPG, diesel) with indirect exchange, placed outside the treatment chamber and usually provided with blown-air burners.

[0007] In practice, these ovens have the drawback of ensuring the thermal load necessary for the treatment of the material only by means of high flow rates of hot air produced by the external generators, introduced in a forced manner into the chamber by means of external fans which however require high electric power in order to ensure high air flow rates.

[0008] A further drawback of the above-described fuel ovens of known type lies in the fact that the high speed of the process air, tied to the considerable flow rate that passes through the narrow sections of the chamber, generates air currents on the material to be thermally treated that are not always desirable for the heat cycle thereof.

[0009] A further drawback of the above-described fuel ovens of known type lies in the fact that the heating via irradiation of the material cannot be employed inside the treatment chamber, since the high-temperature combustion chamber of the hot air generators - which should irradiate directly on the material - is instead situated outside the treatment chamber itself, actually making it impossible to attain all those heat cycles where the thermal irradiation of the material is requested.

[0010] A further drawback of the above-described fuel ovens of known type lies in the fact that the hot air generators, in particular the burners, cause a strong increase of the temperature in the technical space where the generators are housed, with consequent problems in accessing the technical space and in generator efficiency.

[0011] A further drawback of the above-described fuel ovens of known type lies in the fact that such ovens generate a high amount of NO_x in particular due to the high temperature of the combustion gases produced by the burners of the air generators.

Presentation of the invention

[0012] Therefore, in such context, the main object of the present invention is to overcome the abovementioned drawbacks of the prior art, by providing a fuel oven capable of attaining a suitable thermal control of the housing chamber of the burners, especially ensuring the cooling thereof.

[0013] Further object of the present invention is to have a fuel oven capable of having, in the thermal processes within the treatment chamber, heat exchange both due to irradiation and via convection, or only one of the two.

[0014] Further object of the present invention is to have a fuel oven capable of using, within the treatment chamber, heat exchangers having mainly longitudinal extension with shape and size such to render the thermal treatment on the material as effective as possible. Further object of the present invention is to have an operating method for a fuel oven, based on the use of multi-gas burners with forced suction provided with a combustion product recirculation system, effectively couplable to any geometric shape of the radiant-convective heat exchangers and such to ensure and maintain a high combustion efficiency and low NO_x emissions over a wide thermal work power range.

[0015] Further object of the present invention is to have an operating method for a fuel oven based on the use of burners, preferably multi-gas with forced suction, associated with a system for suctioning ambient air in order to draw air from the housing chamber of the aforesaid burners, especially ensuring the cooling of such chamber since the air comes from outside. Further object of the present invention is to have an operating method for a fuel oven based on the use of burners, preferably multi-gas with forced suction, provided with a system for recirculating the combustion products that is integrated with the suction system of ambient air that is even introduced into the burner fume recirculation, thus creating a mixture of recirculation of the combustion products at lower temperature, improving the distribution of the temperature on the first section of the exchanger and further reducing the emissions of NO_x.

Brief description of the drawings

[0016] The technical characteristics of the invention, according to the proposed task and objects, can be clearly seen from the contents of the below-reported claims and the advantages thereof will be more evident from the detailed description of one embodiment, according to the invention, illustrated as a non-limiting example, in the set of drawing tables in which:

- fig. 1 represents a section of the fuel oven assembly;
- fig. 2 represents a section of the burner and fumes recirculation intake;
- fig. 3 represents a section of the fumes and insufflated air recirculation system.

Detailed description of a preferred embodiment

[0017] With reference to the set of drawings, reference number 1 overall indicates a fuel oven in accordance with a preferred embodiment of the present invention.

[0018] The oven is intended to be mainly employed for cooking, drying, desiccating, various thermal treatments and cycles of a general product.

[0019] Advantageously, the present fuel oven 1 is intended to be used for cooking foods, in particular foods for human consumption. Preferably, the oven 1 is intended to be used in a professional environment, e.g. in the restaurant-catering, gastronomy, confectionary and bakery sectors.

[0020] In accordance with the embodiment illustrated in the enclosed figures, the oven 1 comprises a hollow containment body 2, which delimits at its interior a heat treatment chamber 3 in which a product to be treated is susceptible of being arranged.

[0021] Preferably, the containment body 2 of the oven 1 has substantially box-like form and comprises a lower wall and an upper wall parallel to and facing each other, and two lateral walls placed to connect the upper and lower walls. Such walls together delimit the aforesaid heat treatment chamber 3.

[0022] The containment body 2 also comprises a bottom wall fixed to the upper, lower and lateral walls, as a rear closure of the heat treatment chamber 3.

[0023] In addition, the containment body 2 is provided with an access opening to the heat treatment chamber 3, such opening preferably positioned opposite the bottom wall of the containment body 2 itself.

[0024] Advantageously, the oven 1 comprises a door which is hinged to the containment body 2 and is movable between a closure position, in which it obstructs the access opening, and an open position, in which the access opening is free of the door in order to allow the introduction and extraction of the products to be treated (such as foods) in and by the heat treatment chamber 3.

[0025] Advantageously, the containment body 2 comprises panels of sandwich type able to ensure a good thermal insulation between the internal temperatures of the treatment chamber 3 and the external environment 9, as well as support the material to be treated and all the accessories for heating, dehumidification or humidification, in addition to the transport, movement, ventilation and treatment of the process air.

[0026] In addition, the oven 1 comprises a radiant tube 4 extending inside the heat treatment chamber 3 between an inlet opening 5 thereof, arranged at a first passage of the containment body 2, and an outlet opening 6 thereof, arranged at a second passage of the containment body 2.

[0027] Advantageously, the radiant tube 4 is made with a continuous tube that can have circular, square or rectangular profile, assuming configurations that are coil-like, "comb"-like, or of any other shape necessary for the thermal treatment of the material and compatible with the space available.

[0028] The present oven 1 also comprises a housing chamber 7, thermally insulated from the heat treatment chamber 3 and provided with at least one ventilation opening 8 through which the housing chamber 7 is susceptible of being connected with an external environment 9. Advantageously, the housing chamber 7 is delimited by a structure that is not necessarily thermally insulated, with masonry or sandwich panels, more or less open towards the external environment 9, at most even fully open towards the external environment 9. Preferably, the containment body 2 (which delimits the heat treatment chamber 3) is provided with at least one insulated wall 10 (which for example constitutes the aforesaid bottom wall of the containment body 2 itself) positioned so as to separate the heat treatment chamber 3 and the housing chamber 7. More in detail, such wall 10 must ensure, at the passage openings 5 and 6 of the radiant tube 4 in the treatment chamber 3, protection from the high temperatures of the radiant tube 4 itself.

[0029] The oven 1 according to the present invention comprises a burner 11 arranged in the housing chamber 7, intended to burn a combustive mixture formed by the fuel 12 and air 13, in order to generate combustion gases 14 at high temperature, and provided with a dispensing head 16 fluidically connected with the inlet opening 5 of the radiant tube 4 in order to introduce the aforesaid combustion gases inside the latter.

[0030] More in detail, preferably, the burner 11 is contained in a suitable metallic body 15, which also contains all the accessories, such as gas valves, air manostat, regulation and control unit (*per se* known to the man skilled in the art and therefore not described in detail).

[0031] In operation, the combustion gases, which are introduced by the dispensing head 16 of the burner 11 into the inlet opening 5 of the radiant tube 4, traverse the latter, transferring heat to the walls of the radiant tube 4 itself. Such heat is then irradiated into the heat treatment chamber 3, especially heating the air inside the latter in order to heat and thermally treat the product arranged inside the heat treatment chamber 3 itself.

[0032] In particular, the connection from the dispensing head 16 of the burner 11 to the inlet opening 5 of the

radiant tube 4 is made with mechanical fixing systems 17, preferably of flange type, arranged for the disconnection, possible maintenance or substitution of the radiant tube 4 or of the components physically connected to the radiant tube 4 itself which are situated inside the housing chamber 7.

[0033] In addition, the oven 1 comprises suction means 18 arranged in the housing chamber 7, provided with a suction mouth 25 fluidically connected with the outlet opening 6 of the radiant tube 4 and operable to suction the combustion gases out of the radiant tube itself. Preferably, the aforesaid suction means 18 comprise a suction fan suitable for suctioning and treating combustion products at high temperature (300°C) comprising in particular the electric motor 19 with self-cooling fan, a flange connection system upstream 20 and downstream 21 of the fan itself for the connection to the respective pipes.

[0034] In accordance with the idea underlying present invention, the fuel oven 1 comprises a connection body of tubular shape 22, positioned in the housing chamber 7 and provided with an inner channel arranged to connect between the outlet opening 6 of the radiant tube 4 and the suction mouth 25 of the suction means 18. The latter are adapted to generate an internal reduced pressure in the inner channel of the connection body 22 in order to suction the combusted gases out of the radiant tube 4.

[0035] In addition, the connection body 22 is provided with at least one or more insufflation openings 23 through which the inner channel of the connection body 22 itself is in communication with the housing chamber 3.

[0036] As a result of the internal reduced pressure generated by the suction means in the inner channel of the connection body 22, a flow of air coming from the housing chamber 7 is suctioned into the inner channel of the connection body 22 through the aforesaid insufflation openings 23.

[0037] Such air flow generates, in the housing chamber 7, an external reduced pressure which suctions, into the housing chamber 7, air coming from the external environment 9 through the ventilation opening 8 of the housing chamber 7 itself.

[0038] This facilitates the exchange of the air in the housing chamber 7, preventing overheating in the same, ensuring the suitable temperature for the correct functioning of the burner 11 and of the suction means 18, since the fresh renewal air coming from the outside 9 is at lower temperature.

[0039] Advantageously, the suction means 18 comprise, in addition to the aforesaid suction mouth 25, a delivery mouth 24 through which they emit a mixture composed of the combustion gases (which exit from the radiant tube 4 through the outlet 6) and the air blown into the inner channel of the connection body 22 through the insufflation openings 23 of the connection body itself. Such mixture of combustion gases and air has a temperature clearly lower than that of the combustion gases exiting from the section 6 of the radiant tube 4. The oven 1 comprises a discharge pipe connected to the delivery mouth 24 of the suction means 18 and provided with at least one recirculation branch 26 fluidically connected with the dispensing head 16 of the burner 11, in order to convey a first part of the aforesaid mixture of combustion gases and air into the dispensing head 16, mixing such mixture with the combustion gases 14 generated in the burner 11 in order to lower the temperature of the latter.

[0040] This prevents the overheating of the first part of the radiant tube exchanger 4 in proximity to the inlet section 6 of the treatment chamber 3, facilitating the uniformity of the temperature along the entire radiant tube 4 exchanger and further reducing the NO_x emissions, which we know are tied to the combustion temperature (lower values of the combustion temperature correspond with lower values of the NO_x emissions). Advantageously, the discharge pipe of the oven 1 comprises an expulsion branch 27 through which a second part of the mixture of combustion gases and air is conveyed out of the housing chamber 7.

[0041] Preferably, the expulsion branch 27 of the discharge pipe is provided with regulation members 28 adapted to balance the flow of the combustion gases and air between the expulsion branch 27 and the recirculation branch 26.

[0042] Advantageously, the burner comprises a combustion chamber 29 in which the combustive mixture is burned, producing the combustion gases to be introduced into the radiant tube 4 through its dispensing head 16.

[0043] In addition, the burner comprises an outer chamber 30 which is connected to the combustion chamber 29 in order to receive the combustion gases generated in the latter, and is connected to the recirculation branch 26 of the discharge pipe in order to receive the mixture of air and combustion gases. Such mixture is susceptible of being mixed with the combustion gases coming from the combustion chamber 29 of the burner 11 obtaining, in the outer chamber 30, a mixture of gas at a reduced temperature with respect to the temperature of the combustion gases generated in the combustion chamber itself.

[0044] In addition, the outer chamber 30 of the burner is connected to the dispensing head 16 in order to introduce the aforesaid mixture at a reduced temperature in said radiant tube 4.

[0045] Advantageously, the connection body 22 of the oven 1 is provided with a control intake 31 arranged upstream of the insufflation openings 23 and positioned in particular between the latter and the containment body 2 which delimits the heat treatment chamber 3. A portion of the combustion gases which pass through the inner channel of the connection body 22 is drawn through such control intake 31.

[0046] In addition, the oven 1 comprises at least one detection device connected to the control intake 31 of the connection body 22 in order to intercept the aforesaid portion of combustion gases in order to detect parameters indicative of the operation and efficiency of the oven

1, such as the temperature, concentrations of CO_2, CO and NO_x. Advantageously, the oven 1 comprises first ventilation means 32 arranged inside the heat treatment chamber 3 and operable to generate a forced convective motion of the air present in the heat treatment chamber 3, in order to facilitate the diffusion of the heat via convection inside the same. Preferably, such first ventilation means 32 comprise one or more first fans (of type *per se* known to the man skilled in the art).

[0047] Advantageously, the oven 1 comprises air treatment means 33, 36 operatively associated with the heat treatment chamber 3 and operable in order to change the degree of moisture inside the latter and/or to generate a forced air recirculation of the air present in the heat treatment chamber 3 itself.

[0048] Preferably, the aforesaid thermal treatment means comprise second ventilation means 33 arranged inside the heat treatment chamber 3 and operable to generate a forced motion of the air present in the heat treatment chamber 3, in order to ensure an external air renewal of the treatment chamber 3 by means of introduction 34 and expulsion 35 openings made in the containment body 2. In particular, such second ventilation means 33 comprise one or more second fans (of type *per se* known to the man skilled in the art).

[0049] Advantageously, the air treatment means comprise humidification and dehumidification apparatuses 36 (for example provided with nebulizer means of type known to the man skilled in the art) arranged adjacent to the containment body 2 directly in communication with the heat treatment chamber 3, and operable to generate a humidification or a dehumidification and renewal of the air present in the heat treatment chamber 3 in order to ensure the suitable degree of moisture in the treatment chamber 3 by means of suitable adjustments of the introduction 34 and expulsion 35 openings.

[0050] Also forming the object of the present invention is an operating method for a fuel oven, in particular of the above-described type; for the sake of simplicity, the same reference numbers will be employed hereinbelow.

[0051] The present operating method comprises a step for producing combustion gases at high temperature by means of the burner 11 and a step for introducing such combustion gases into the radiant tube 4, in which the combustion gases are introduced by the dispensing head 16 of the burner 11 into the radiant tube 4 itself through the inlet opening 5 of the latter.

[0052] In addition, the present method comprises a step for suctioning the combustion gases by means of the suction means 18, in which the combustion gases are forced to exit from the radiant tube 4 through the outlet opening 6 of the latter.

[0053] According to the idea underlying the present invention, in the aforesaid suction step, the suction means 18 generate an internal reduced pressure in the inner channel of the connection body 2. Such internal reduced pressure generates a flow of air which is suctioned, from the housing chamber 7, into the inner channel of the connection body 22 through the insufflation openings 23 of the latter, generating an external reduced pressure in the housing chamber 7 which suctions air coming from the external environment 9 through the ventilation opening 8 of the housing chamber 7 itself.

[0054] Advantageously, in the suction step, the flow of air, suctioned in the inner channel of the connection body 2 through the insufflation openings 23 of the latter, is mixed with the combustion gases (coming from the outlet opening 6 of the radiant tube 4) generating a mixture of air and combustion gases having temperature lower than that of such combustion gases.

[0055] The present method also comprises a step for recirculating the aforesaid mixture of air and combustion gases, in which the suction means 18 convey, by means of the recirculation branch 26 of the discharge pipe, a first part of the mixture of air and combustion gases to the interior of the burner 11, in which such mixture is mixed with the combustion gases produced in the burner 11 itself, generating a mixture at a reduced temperature with respect to the temperature of the combustion gases generated in the burner 11. Such mixture at a reduced temperature is introduced into the inlet opening 5 of the radiant tube 4 through the dispensing head 16 of the burner 4.

[0056] The invention thus conceived therefore attains the pre-established objects.

Claims

1. Fuel oven (1), which comprises:

- a hollow containment body (2), which delimits within it a heat treatment chamber (3) in which a product to be treated is susceptible of being arranged;
- at least one radiant tube (4) extending inside said heat treatment chamber (3) between an inlet opening (5) thereof, arranged at a first passage of said containment body (2), and an outlet opening (6) thereof, arranged at a second passage of said containment body (2);
- a housing chamber (7), thermally insulated from said heat treatment chamber (3) and provided with at least one ventilation opening (8) through which said housing chamber (7) is susceptible of being connected with an external environment (9);
- at least one burner (11) arranged in said housing chamber (7), intended to burn a combustive mixture for generating combustion gases at high temperatures, and provided with at least one dispensing head (16) fluidically connected with the inlet opening (5) of said radiant tube (4) in order to introduce said combustion gases inside the latter;
- suction means (18) arranged in said housing

chamber (7), provided with a suction mouth (25) fluidically connected with the outlet opening (6) of said radiant tube (4) and operable to suction said combustion gases out of said radiant tube (4);

said fuel oven (1) being **characterized in that** it comprises at least one connection body (22) of tubular shape, positioned in said housing chamber (7) and provided with an inner channel arranged to connect between the outlet opening (6) of said radiant tube (4) and the suction mouth (25) of said suction means (18), which are adapted to generate an internal reduced pressure in the inner channel of said connection body (22) in order to suction said combusted gases out of said radiant tube (4);
said connection body (22) being provided with at least one insufflation opening (23) through which said inner channel is in communication with said housing chamber (7); through said insufflation opening (23), as a result of said internal reduced pressure generated by said suction means (18) in the inner channel of said connection body (22), a flow of air coming from said housing chamber (7) is susceptible of being suctioned into the inner channel of said connection body (22), generating an external reduced pressure in said housing chamber (7) which suctions, into said housing chamber (7), air coming from said external environment (9) through said at least one ventilation opening (8).

2. Fuel oven (1) according to claim 1, **characterized in that** said suction means (18) comprise a delivery mouth (24), through which said suction means (18) are adapted to emit a mixture of said combustion gases and said air blown into the inner channel of said connection body (22) through said at least one insufflation opening (23), such mixture having a temperature lower than that of said combustion gases;
said oven (1) further comprising a discharge pipe connected to the delivery mouth (24) of said suction means (18) and provided with at least one recirculation branch (26) fluidically connected with the dispensing head (16) of said burner (11), in order to convey at least one first part of said mixture of combustion gases and air in said dispensing head (16), mixing said mixture with the combustion gases generated in said burner (11) in order to lower the temperature of the latter.

3. Fuel oven (1) according to claim 2, **characterized in that** said discharge pipe comprises an expulsion branch (27) through which a second part of said mixture of combustion gases and air is conveyed out of said housing chamber (7).

4. Fuel oven (1) according to claim 2 or 3, **characterized in that** said burner (11) comprises a combustion chamber (29) in which said combustive mixture is burned, producing said combustion gases, and an outer chamber (30) which:

- is connected to said combustion chamber (29) in order to receive said combustion gases generated in the latter,
- is connected to the recirculation branch (26) of said discharge pipe in order to receive said mixture of air and combustion gases, such mixture susceptible of being mixed with said combustion gases coming from said combustion chamber (29), obtaining in said outer chamber (30) a mixture of gas at reduced temperature with respect to the temperature of said combustion gases generated in said combustion chamber (30);
- is connected to the dispensing head (16) of said burner (11) in order to introduce said mixture at a reduced temperature in said radiant tube (4).

5. Fuel oven (1) according to any one of the preceding claims, **characterized in that** said connection body (2) is provided with a control intake (31) arranged upstream of said insufflation opening (23), and through such control intake (23), a portion of said combustion gases which pass through the inner channel of said connection body (23) being susceptible to be drawn;
said oven (1) comprising at least one detection device connected to said control intake (31) in order to intercept said portion of combustion gases.

6. Fuel oven (1) according to any one of the preceding claims, **characterized in that** said containment body (2) is provided with at least one insulated wall (10) positioned so as to separate said heat treatment chamber (3) and said housing chamber (7).

7. Fuel oven (1) according to any one of the preceding claims, **characterized in that** it comprises ventilation means (32) arranged inside said heat treatment chamber (3) and operable to generate at least one forced convective motion of the air present in said heat treatment chamber (3).

8. Fuel oven (1) according to any one of the preceding claims, **characterized in that** it comprises air treatment means (33, 36) operatively associated with said heat treatment chamber (3) and operable in order to change the degree of moisture in said heat treatment chamber (3) and/or to generate at least one forced air exchange of the air present in said heat treatment chamber (3).

9. Operating method for a fuel oven according to any one of the preceding claims, such method comprising:

- a step for producing combustion gases at high temperature by means of said burner (11);
- a step for introducing said combustion gases in said radiant tube (4), wherein said combustion gases are introduced by the dispensing head (16) of said burner (11) in said radiant tube (4) through the inlet opening (5) of the latter;
- a step for suctioning said combustion gases by means of said suction means (18), wherein said combustion gases are forced to exit from said radiant tube (4) through the outlet opening (6) of the latter;

said method being **characterized in that** in said suction step, said suction means (18) generate an internal reduced pressure in the inner channel of said connection body (23), such internal reduced pressure generating a flow of air suctioned from said housing chamber (7) in said inner channel through said at least one insufflation opening (23) of said connection body (23), generating in said housing chamber (7) an external reduced pressure which suctions, in said housing chamber (7), air coming from said external environment (9) through said at least one ventilation opening (8) of said housing chamber (7).

10. Operating method, according to claim 9, for a fuel oven according to claim 2, such method **characterized in that** in said suction step, the flow of air, suctioned in the inner channel of said connection body (22) through said at least one insufflation opening (23), is mixed with said combustion gases, generating a mixture of air and combustion gases having temperature lower than that of said combustion gases;
said method further comprising a step for recirculating said mixture of air and combustion gases, wherein said suction means (18) convey, by means of the recirculation branch (26) of said discharge pipe, at least one first part of said mixture of air and combustion gases in said burner (11) wherein said mixture is mixed with the combustion gases produced in said burner (11), generating a mixture at a reduced temperature with respect to the temperature of said combustion gases generated in said burner (11), such mixture at a reduced temperature being introduced into said radiant tube (4).

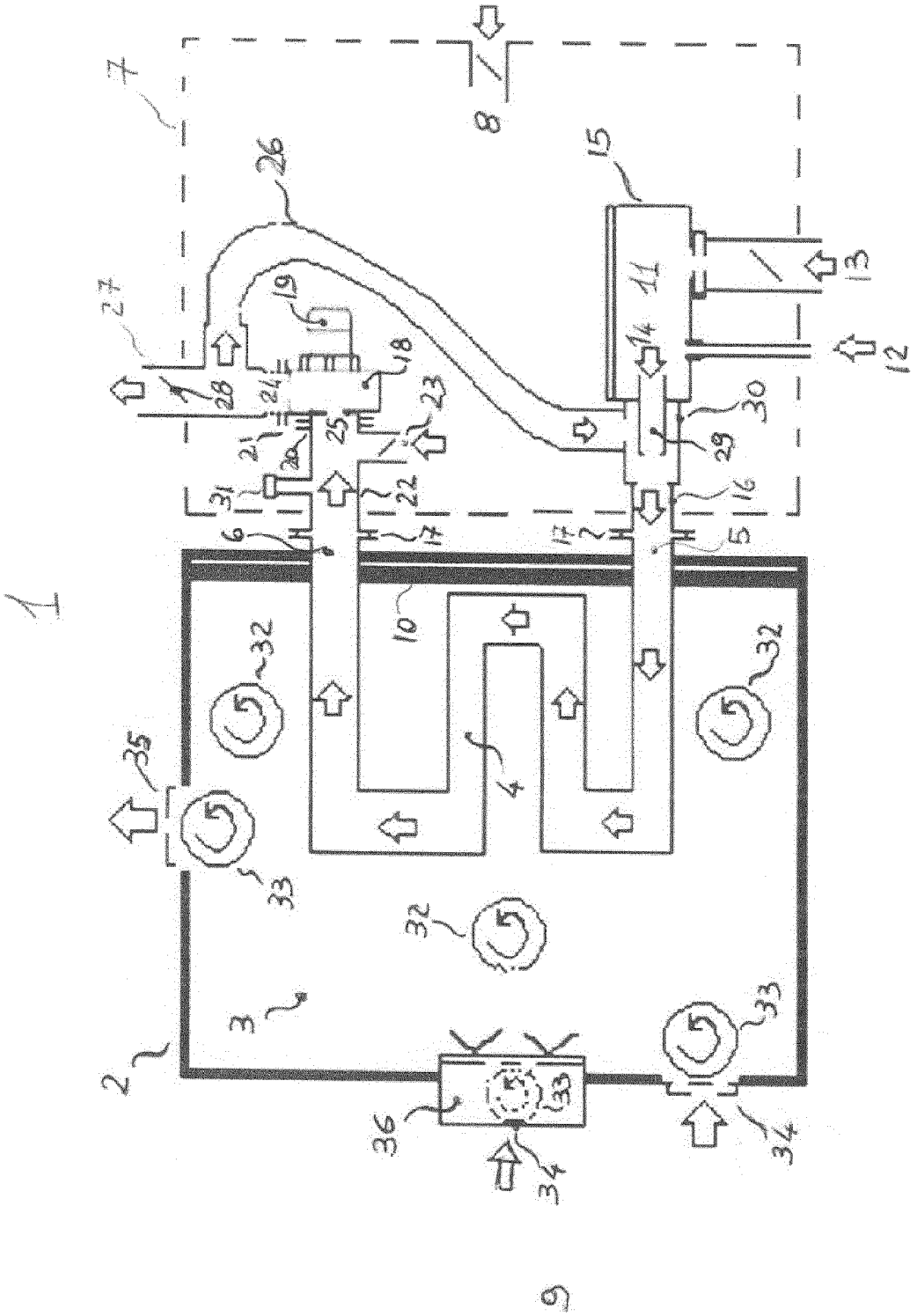
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Fig. 1

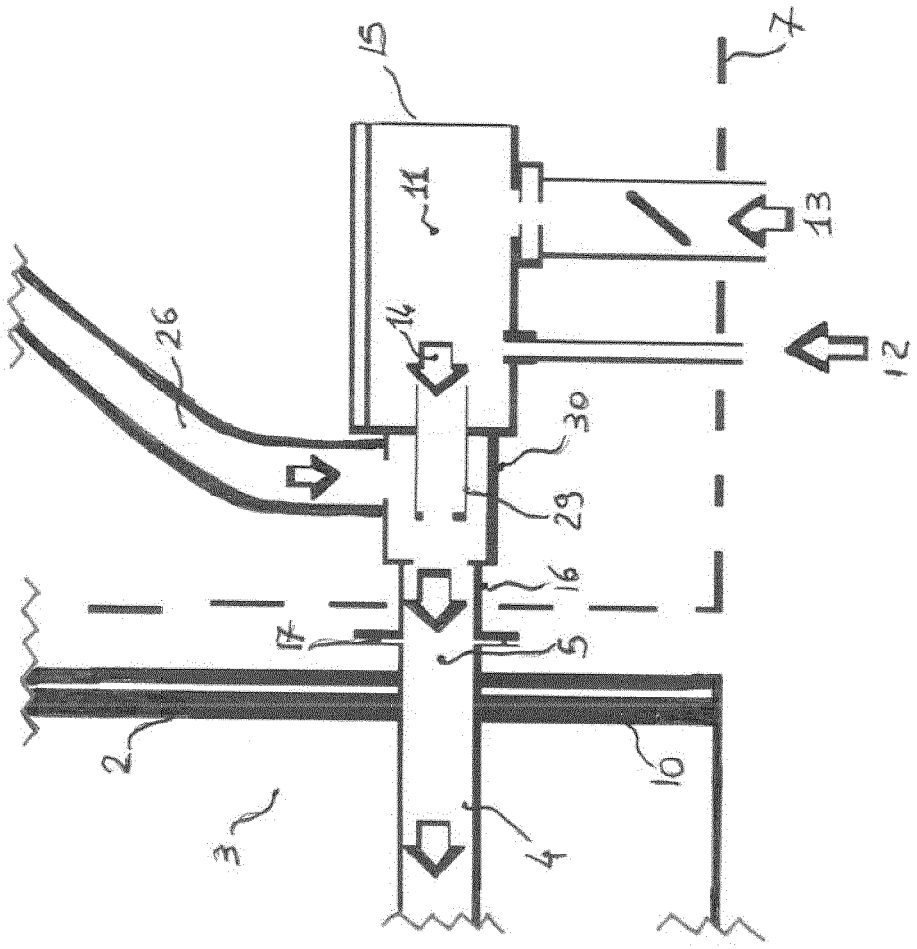

Fig. 2

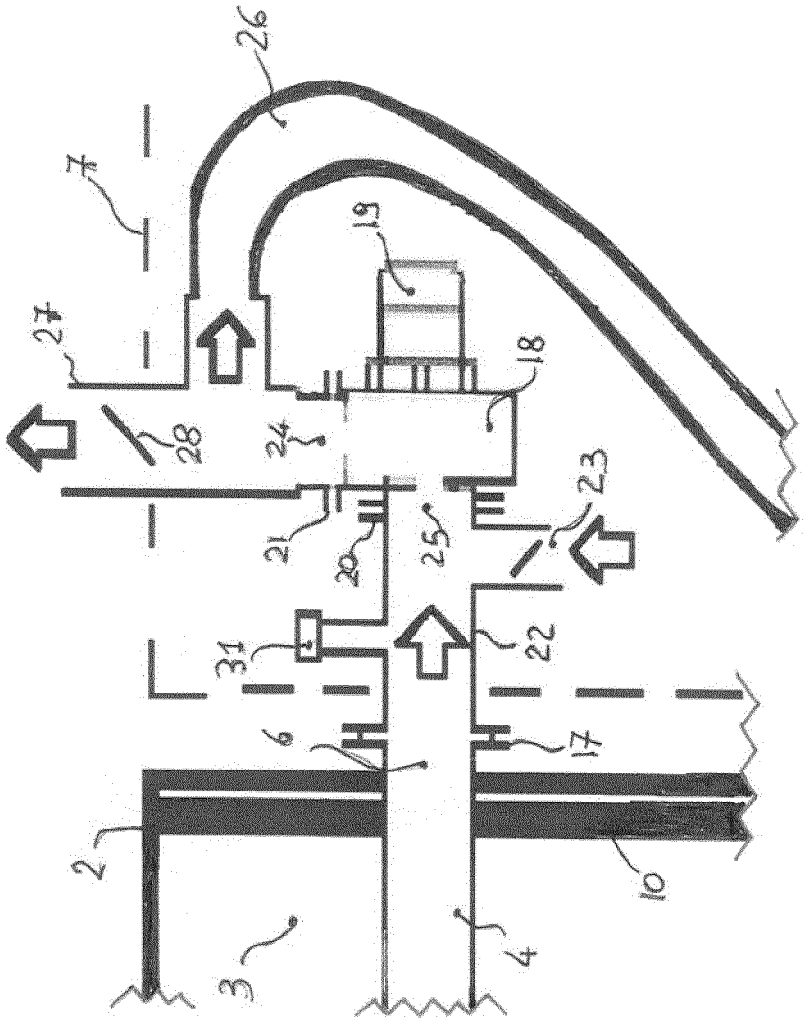

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 8980

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2006/120717 A1 (SYSTEMA S P A [IT]; PALLARO OSCAR [IT]) 16 November 2006 (2006-11-16) * figures 1,2 *	1-10	INV. F27B17/00 F27D9/00 F27D99/00
A	EP 2 299 175 A1 (JP STEEL PLANTECH CO [JP]) 23 March 2011 (2011-03-23) * figure 1 *	1-10	

TECHNICAL FIELDS SEARCHED (IPC)

F27D
F23C
F23L
C21D
F26B
F27B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 February 2016	Peis, Stefano

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 18 8980

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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