

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 415 035 A1

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **90113046.8**(51) Int. Cl.⁵: **F24C 15/32**(22) Date of filing: **09.07.90**(30) Priority: **01.09.89 IT 4577189**(43) Date of publication of application:
06.03.91 Bulletin 91/10(84) Designated Contracting States:
DE ES FR GB IT(71) Applicant: **ZANUSSI GRANDI IMPIANTI S.p.A.**
Viale Treviso 15
I-33170 Pordenone(IT)(72) Inventor: **Del Fabbro, Claudio**
Via Veneto 1
I-33080 Porcia, Pordenone(IT)(74) Representative: **Giugni, Valter et al**
PROPRIA Protezione Proprietà Industriale
S.p.A. Via Mazzini 13
I-33170 Pordenone(IT)(54) **Cooking oven.**

(57) Cooking oven, preferably forced convection cooking oven, composed of at least a fan (12) for circulating hot air and of a plurality of tubular conduits (15, 29) crossed by the fuel gases of a gas burner (18), or composed of at least an electric heating element (35). Oven comprising a conduit (21) intercepted by an adjustment element (23) and adapted to put in communication with the outside the oven cooking room (7), where the foods to be cooked are disposed, to determine an air exchange within the same room, as well as comprising a further conduit (24) intercepted by an associated adjustment element (25) and interconnected between the cooking room (7) and the discharge side (16, 32) of the burnt gases being circulating through the tubular conduits (15, 29).

Thanks to the possibility to selectively introduce the burnt gases inside the cooking room (7), through the further conduit (24), at the opened position of the adjustment element (25), also particular cooking programs of foods can be carried out, such for instance the "broiling" intended as cooking on oven which is like as much as possible to the conventional broiling.

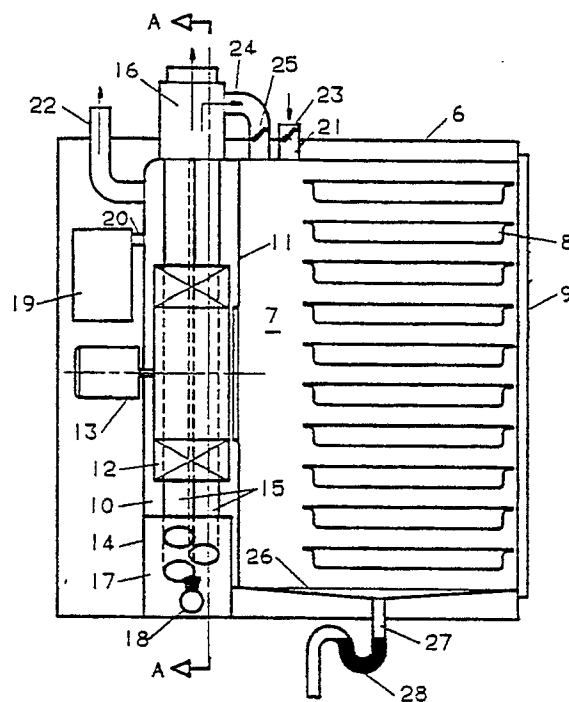


FIG. 1

EP 0 415 035 A1

COOKING OVEN

The invention concerns a cooking oven preferably a forced convection cooking oven, with direct or indirect gas heating or electric heating of the foods disposed within the cooking room of the same oven. Forced convection cooking ovens for foods with direct gas heating of foods, utilized for instance for communities (schools, hospitals, refectories, etc.) are known, which substantially comprise a metallic box-like casing defining an inner room for cooking foods, in which a fan operated in rotation by an electric motor is housed and adapted for generating a flow of hot air through such cooking room, which air is mixed with the fuel gases generated by a burner housed within a corresponding firebox communicating with said cooking room and the outer ambient.

Thanks to the direct heating of the foods within the cooking room, such gas cooking ovens permit the same to be heated in a rapid manner and with high thermal efficiency.

Moreover, the circulation of the fuel gases through the foods also causes, for instance in presence of meats, a satisfactory broiling thereof, intended as a cooking with characteristics similar to those of a broiling obtained in the conventional appliances. Furthermore, forced convection cooking ovens with indirect gas heating of the foods are known, which substantially comprise at least a heat exchanger housed, together with the fan for generating the flow of hot air, within an additional oven room separated to and communicating with the cooking room, said heat exchanger being constituted by a bundle of tubular conduits connected to the firebox and the exhaust conduit and acting for conveying the fuel gases.

In this way, heating of the foods is effected by the flow of air produced by the fan and heated by the heat exchanger, which flow therefore is properly distributed in the cooking room containing the same foods. Due to the fact that the circulation of the fuel gases within the cooking room is not provided, this kind of indirect heated cooking ovens allows to perform cooking programs with precise adjustment of the foods heating temperature as well as, in the case in which heating is effected in presence of steam generated by at least a heated boiler or the like communicating with the cooking room, of the humidity level within the same room, with the possibility to perform in a satisfactory manner particular cooking programs as for instance the gratin or to make bread, wherein the foods to be cooked too moist develop considerable quantities of steam and therefore require an effective disposal of the steam in excess to obtain cooked foods with preestablished quality and flavour.

Further, electric cooking ovens are known in which air is heated by electric heating elements housed within the cooking room. These electric cooking ovens too have the same operative characteristics of the above mentioned ovens with indirect gas heating.

The scope of the present invention is to obtain a cooking oven formed so as to permit the cooking programs to be selectively carried out by utilizing both a direct or indirect gas heating of foods and an electric heating, thus obtaining all the above cited advantages involved by such kinds of heating. This cooking oven is obtained with the constructive features substantially described with particular reference to the accompanied claims of the considered patent. The invention will be better understood by the following description given solely by way of a not limitative example and with reference to the accompanying drawings, in which:

- fig. 1 shows, in a schematic side view, a cooking oven according to the invention in a first embodiment thereof;
- fig. 2 shows the oven of fig. 1 in a front view cut along the line A-A;
- fig. 3 shows, a modified constructive item of the oven of fig. 1;
- fig. 4 shows the cooking oven according to the invention in a second embodiment thereof;
- fig. 5 shows the cooking oven according to the invention in a third embodiment thereof.

With reference to the fig. 1 and 2 in which a forced convection gas cooking oven utilized for cooking foods for communities (schools, refectories, hospitals etc.) is shown, it is noted that such oven is substantially constituted by a metallic box-like casing 6 defining a cooking room 7 therein, in which proper containers 8 placed one upon another for laying the foods to be cooked thereon is housed, which containers are advantageously introduced into and extracted from corresponding side guide members (not shown) of the cooking room, after opening of the front closing door 9 of the same oven, said room being subdivided in a further separated inner room 10 by a separating wall 11 extended for the entire height and part of the width of the same room, so as to determine side openings (not shown) therein for circulation of hot air, in which inner room a fan 12 is centrally housed, which fan can be operated in rotation by a correspondent coaxial electric motor 13, disposed outside against the oven rear wall 14. In turn, the fan 12 is laterally delimited by a bundle of tubular conduits 15 disposed at a closer distance from the circumferential edge of the same fan and adequately bent so as to enclose said fan and whose

upper and lower ends are respectively connected to an exhaust stack 16 situated at the oven upper side and to a firebox 17, situated at the oven lower side and housing at least a conventional gas burner 18.

In this way, the tubular conduits 15 act as a heat exchanger when they are crossed by the combustion gases produced by the burner 18 in the firebox 17 and discharged outside through the upper stack 16 and the so generated heat is utilized for the indirect heating of the foods within the oven cooking room 7, as a flow of hot air produced by the action of the fan 12 and regularly distributed in the same cooking room. Besides, the present cooking oven may be also connected to an eventual separated steam generator as a boiler 19 or the like, intercommunicating through a conduit 20 with the separated room 10 or also directly with the cooking room 7, in order to provide cooking of foods by means of admission of metered quantities of steam within such cooking room, or by means of the combined action of both the steam and the forced circulation of hot air.

In order to allow an effective exchange of air within the cooking oven, the cooking room 7 and the separate room 10 are communicating to the outside through an associated conduit 21 and 22, preferably provided at the upper side of the same rooms and respectively foreseen for causing a suction of outer air by the fan 12 toward the cooking room 7 for exchanging air into the same room and a discharge toward outside of the damp air contained within both the separated room 10 and the cooking room 7, said conduit 21 being intercepted by an adjustment element 23 as a valve member or the like, manually or automatically shiftable from an opened to a closed position and vice versa, with possibility to adjust thereof in different positions so as to vary within pre-established limits the inflow cross-section of the conduit 21 and therefore the air quantity being sucked in the cooking room 7 by the fan 12 during the course of the selected cooking program. In turn, the conduit 22 on the contrary communicates directly to the outside to perform the above specified function. Finally, the oven cooking room 7 according to the present invention comprises a further conduit 24 intercommunicating with the upper part of the cooking room 7, at a position adjacent the conduit 21, and with the exhaust stack 16, said further conduit being intercepted by at least an adjustment element 25 of the same kind of the adjustment element 23 previously described and manually or automatically operable to put or not put in communication the exhaust stack 16 with the cooking room 7 for the reasons set forth below.

To permit draining of the condensate formed in the cooking room 7 and collected on the inclined bottom 26 thereof during the course of each cook-

ing program of foods, the present cooking oven also comprises a discharge conduit 27 connected at its lower side to such bottom 26 and communicating with an underlying collecting and draining vessel (non shown) through at least another conduit 28 which is bent as an elbow to form a siphon. In this way, the condensate water and/or the eventual liquids of various kind formed during the course of each cooking program or utilized for cleaning the oven cooking room, are collected on the inclined bottom 26 and discharged outwardly through the vessel and the siphon 27, which in turn acts for preventing undesired flowbacks of such liquids and re-suctions of vapours toward the cooking room 7, caused by the action of the fan 12, whose admission within such cooking room makes it practically impossible to obtain the required humidity level and to adequate hygienic conditions within the same room.

Thanks to the presence of the further conduit 24, thus it is possible to determine either a direct or an indirect heating of foods contained in the cooking room 7, simply by acting on the adjustment element 25 associated with such further conduit, so as to permit or prevent respectively the communication of such cooking room with the exhaust stack 16.

In particular, in case in which the indirect heating of foods is required, the adjustment element 25 remains operated in its closed position, thus preventing the communication between the cooking room 7 and the exhaust stack 16, in which circumstance the foods situated in such room are heated either by the flow of hot air produced by the fan 12 in the manner cited as above, or by the steam in case generated in the boiler 19 or by the combined action of both hot air and steam. In addition, by regulating adequately the position of the adjustment element 23 associated with the conduit 21, it is possible to obtain an effective air exchange within the cooking room 7 and therefore satisfactory cookings of foods.

Consequently, in this case are obtained cooking programs of foods with the advantages attainable by utilizing exclusively cooking ovens with indirect heating of this kind, that is with accurate adjustments of both the heating temperature and the moisture level of the cooking room 7, due to the absence of the flue gases within the same room, and with the possibility to carry out particular cooking programs of foods in an excellent manner, such for instance the gratin and making bread. Conversely, in case in which the direct heating of foods is required, particularly for obtaining broiling thereof, the adjustment element 25 is operated in its opened or partially opened position, thus putting in communication both the cooking room 7 and the exhaust stack 16, in which circumstance the flue

gases directed outwardly are partially sucked by the fan 12 and, while passing through the further conduit 24, enter the cooking room 7 where come into contact with the foods so causing cooking thereof, and thereafter are discharged outwardly by passing through the separated room 10 and the conduit 22. Therefore, in this case are obtained cooking programs with the advantages attainable by utilizing cooking ovens employed exclusively for the direct heating, of foods, that is reduced cooking durations of the same programs and high thermal efficiencies as well as satisfactory carrying out of particular cooking programs, as broiling, in case of foods constituted for instance by meats.

Fig. 3 shows a different possible embodiment of the present cooking oven, where the above specified further conduit 24 is communicating directly with the conduit 21 connected to the cooking room 7 and intercepted by the adjustment element 23, which in this case is then disposed in correspondence of the inlet end of said conduit 21, thus permitting the fuel gases to be directly introduced within said cooking room at the opened position of the adjustment element 25.

Now, by examining the fig. 4, another possible embodiment of the present cooking oven is shown, which oven is constituted by a heat exchanger 28 formed by a plurality of "U" bent tubular conduits 29, simmetrically and evenly distributed concentrically around the entire circumference of the fan 12, as well as by a circular collector 30 surrounding such heat exchanger 28 and connected through an aspirator 31 to a discharge conduit 32 communicating with the outside.

This cooking oven is substantially identical to that described in the Italian patent application No. 45731 A/88 filed on 1st June 1988 by the same Applicant and is also constituted by a gas burner 18 of circular shape, provided with a plurality of outlet ports (not shown) for the fuel gases which are, communicating with an end of the "U" shaped tubular conduits 29 of the heat exchanger 28, conduits whose other end is communicating with the inner chamber 33 of the collector 30, thus permitting the fuel gases to be conveyed into said inner chamber and to be subsequently discharged outwardly therefrom through the discharge conduit 32, thanks to the suction thereof by the aspirator 31. Moreover, in the present cooking oven the discharge conduit 32 is connected, through a conduit 34 intercepted by an adjustment element 25, carrying out the same function of the previously cited further conduit 24 and the adjustment element 25, to the cooking room 7 of the same oven so as to be able to obtain the same double functionality and the same purposes of the above described oven. Finally, with reference to the fig. 5, is shown a different possible embodiment of the cooking oven

according to the invention, which in this case is heated by means of an electric element 35 concentrically disposed around the fan 12 and housed with this latter in the separated oven inner room 10 of the oven, which in turn is communicating with the outside through an associated discharge conduit 36.

This cooking oven is substantially constituted by a conduit 21 connected to the cooking room 7 and communicating with the outside, which conduit is intercepted by an adjustment element 23 manually or automatically shiftable in different positions and at the upper end of which a cap 37 of circular shape provided for the purposes hereinafter described is disposed at a closer distance therefrom.

Besides, this cooking oven is constituted by at least a gas burner 38, fed with gas through a pipe 39 connected to the gas feeding line (not shown) and disposed near the cap 37 and the free end of the conduit 21, so that the fuel gases produced by said burner are directed against the opposite inner surface of the cap 37 and diverged by the same toward the conduit 21 and the inside of the cooking room 7, thanks to the sucking action of the fan 12, at a variable quantity depending on the different opening position of the adjustment element 23. Therefore, the presence of the gas burner 38 makes it possible, thanks to the admittance of the fuel gas in the cooking room, also to carry out particular cooking programs of foods as the broiling, in the same manner and for the same purposes described as above.

Claims

1. Cooking oven, preferably forced convection cooking oven, comprising a metallic box-like casing defining a room for cooking foods by means of a forced circulation of the hot air produced by at least a fan operated by a correspondent electric motor, said cooking room being communicating with the outside through at least a conduit intercepted by at least an adjustment element, manually or automatically operable from an opened to a closed position thereof and vice versa, and being subdivided in a further separated room communicating with the outside and adapted to house said fan and heat exchanger means, adapted to heat the air being circulated in the cooking room and constituted by a plurality of tubular conduits crossed by the burnt gases generated by at least a gas burner and connected to a correspondent discharge side, or constituted by at least an electric heating element, said further room being also communicating with at least an eventual steam generator of per se known kind, characterized in that it comprises diverging means (25, 23) adapted to

determine the selective admission of the burnt gases within said cooking room (7).

2. Cooking oven according to claim 1, characterized in that said diverging means comprise at least a further adjustment element (25) fitted in a conduit (24, 34) intercommunicating with the discharge side (16, 32) of said tubular conduits (15, 29), said further adjustment element (25) being manually or automatically operable from an opened to a closed position and vice versa.

3. Cooking oven according to claim 1, characterized in that said diverging means comprise said adjustment element (23) disposed within said conduit (21), which in turn is associated with at least a gas burner (38) which can be selectively fed and with a cap (37), shaped for diverging the burnt gases produced by said gas burner (38) toward said cooking room (7) by passing through said conduit (21) at the opened position of said adjustment element (23).

5

10

15

20

25

30

35

40

45

50

55

5

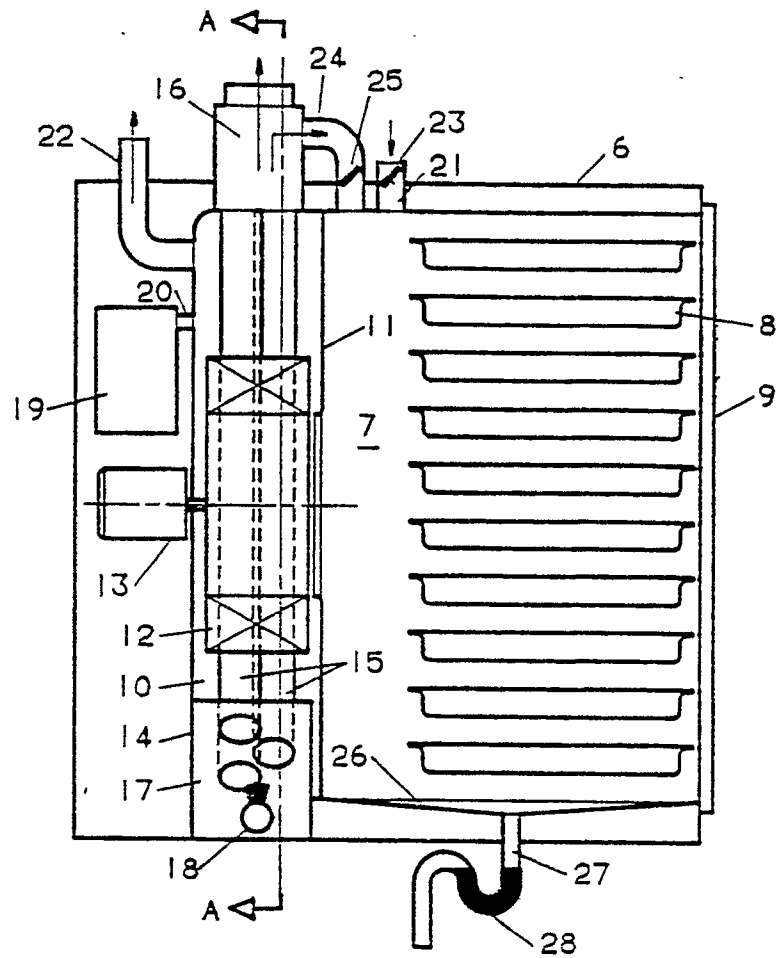


FIG. 1

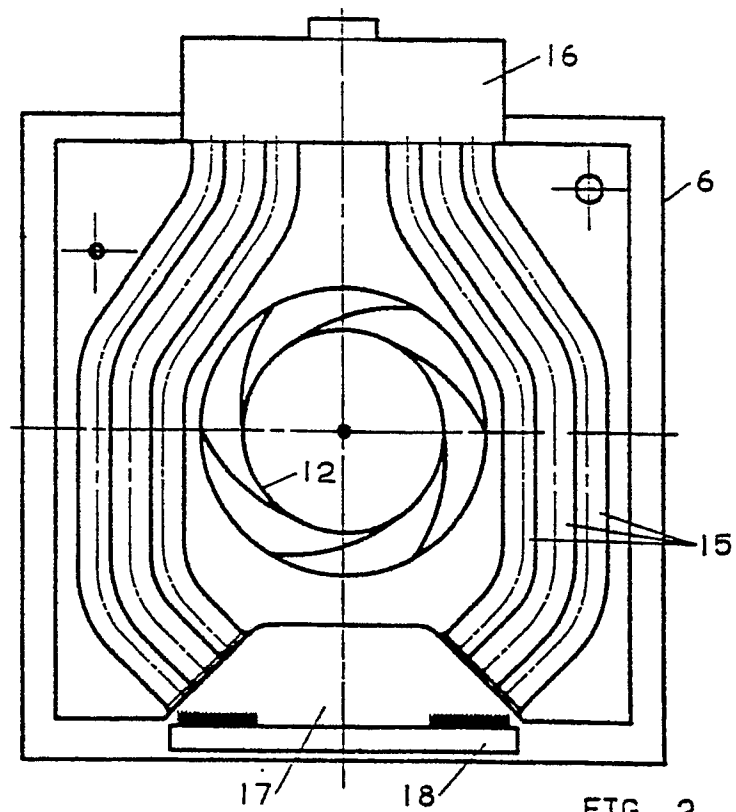


FIG. 2

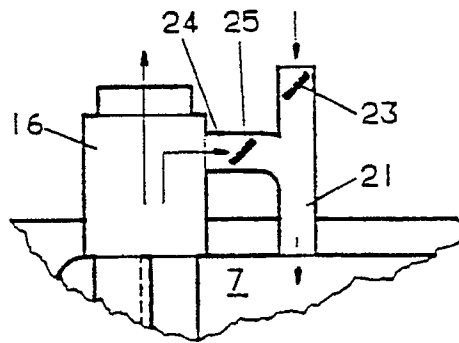


FIG. 3

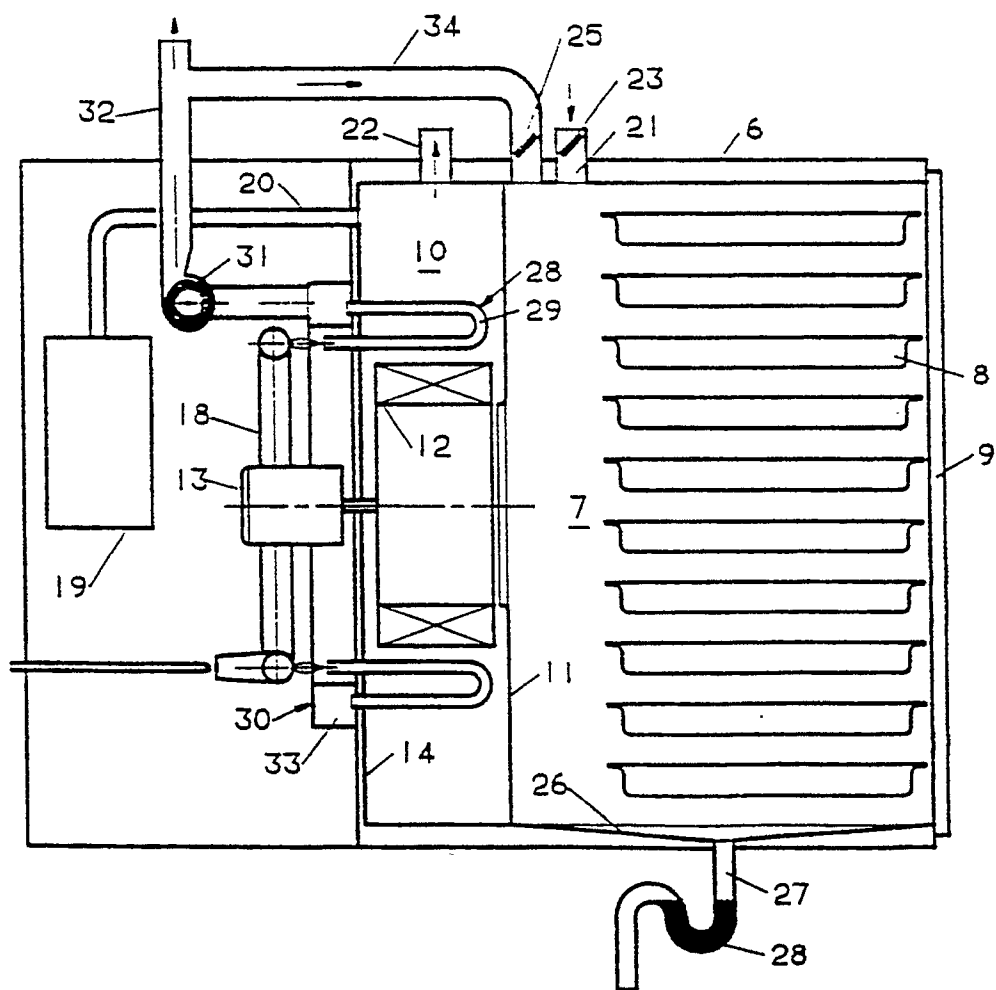


FIG. 4

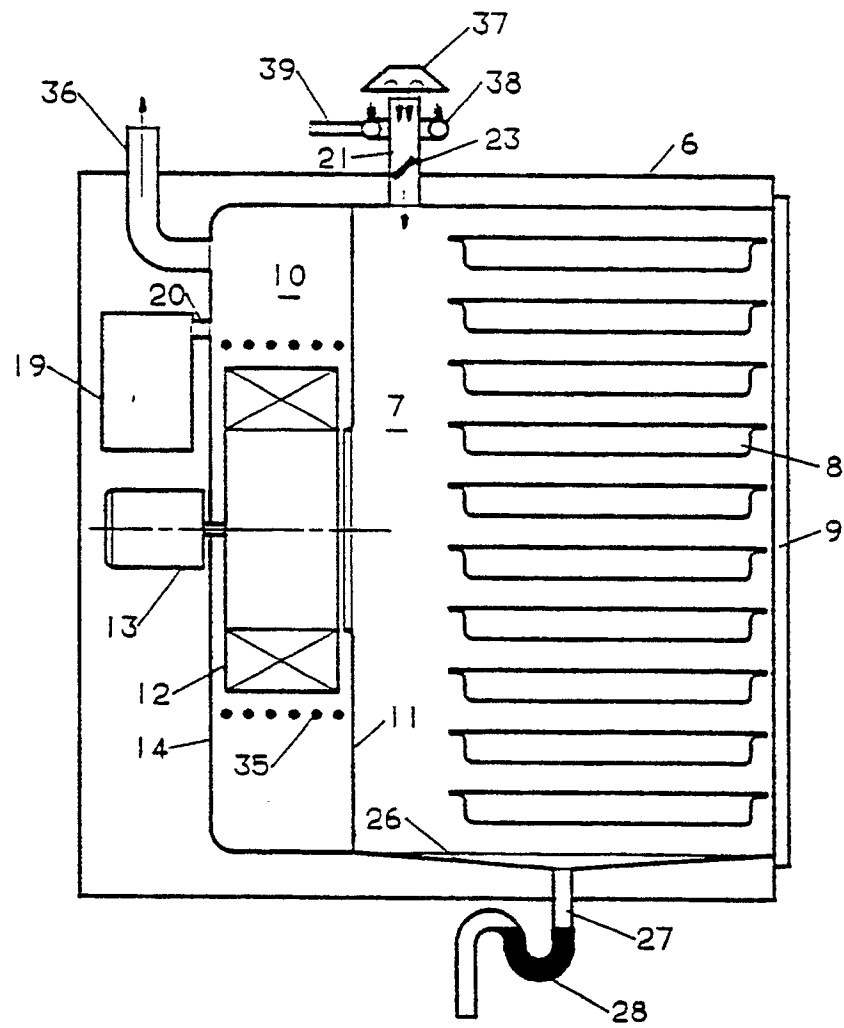


FIG. 5



European
Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 11 3046

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	DE-A-3 428 330 (KÖNIG) * claims 1, 15; figures * - - -	1,2	F 24 C 15/32
Y	DE-A-2 600 081 (MAURER) * page 39, paragraph 2; figure 1 * - - -	1,2	
A	DE-A-2 050 159 (CROWN-X) * page 13, paragraph 1; figure 2 * - - -	1,2	
A	DE-A-3 508 747 (KÖNIG) - - -		
A	US-A-4 590 916 (KÖNIG) - - - - -		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			F 24 C A 47 J A 21 B
The present search report has been drawn up for all claims			
Place of search		Date of completion of search	Examiner
The Hague		03 December 90	VANHEUSDEN J.
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			