



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
24.08.2016 Bulletin 2016/34

(51) Int Cl.:
F24C 15/00 ^(2006.01) **F24C 15/20** ^(2006.01)

(21) Application number: **16154982.9**

(22) Date of filing: **10.02.2016**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(30) Priority: **19.02.2015 EP 15155739**

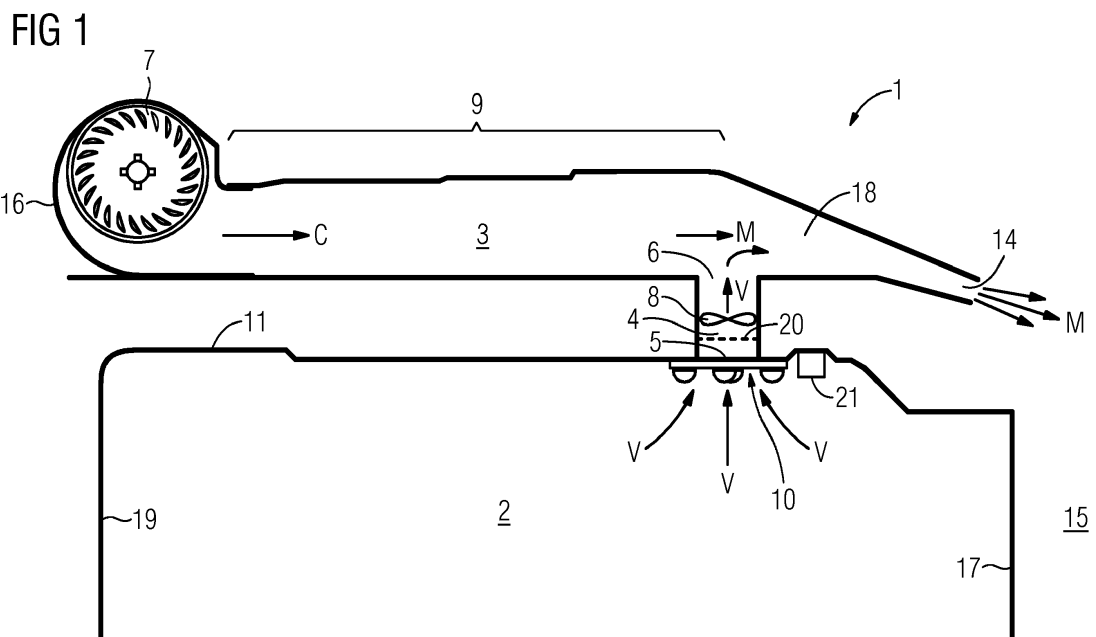
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(54) **KITCHEN OVEN**

(57) A kitchen oven, comprising a cavity and a cooling chamber arranged outside of the cavity and provided as a common duct for the joint discharge of cooling air and vapors, and at least one vapor duct for realizing a fluid communication between the cavity and the cooling chamber, in that said vapor duct is arranged such that its first end is in fluid communication with the cavity, and

its second end is in fluid communication with said cooling chamber, said cooling chamber further comprising a first fan wheel for blowing the air and vapors out of the oven, wherein the vapor duct comprises a negative pressure device arranged within said vapor duct such that it is capable of sucking air and vapors out of the cavity.



Description

[0001] The present invention relates to a kitchen oven, comprising a cavity and a cooling chamber arranged outside of the cavity and provided as a common duct for the joint discharge of cooling air and vapors.

[0002] Kitchen ovens and particularly, build-in kitchen ovens are heated according to their major purpose of heating or baking food products. Therefore, such kitchen ovens need a cooling and/or insulation system. A cooling system usually uses a pressure free air ventilation or a pressure forced ventilation.

[0003] In addition, with regard to vapor and moisture accumulating during a heating or baking process within an oven cavity, it is in general preferred to remove said vapor or moisture from the cavity and to release said vapor or moisture out of the kitchen oven.

[0004] For such purpose it is known to provide a vapor-duct which allows a fluid connection between the cavity and the cooling air system and through which vapor and moisture can be removed from the cavity and can be led to the outside of the kitchen oven, particularly combined with air from the cooling system.

In connection with such solutions the use of fan wheels is known, on the one hand providing the cool air to cool the oven or, more particularly the oven housing, and on the other hand to promote the remove of moisture and vapor from the cavity.

[0005] The document EP 0 926 448 B1 describes an air channel above an oven cavity, containing a motor. This motor runs two different fans on one axle. The first propeller leads cooling air from the ambience above into the air channel and the lower propeller promotes the removal of vapor from the cavity through a hole provided in the cavity's top wall. In the air channel, cooling air and vapor are mixed and led to an exit in the front of the appliance. However, in such configuration there exist several constraints, particularly as such solution is of a relatively large dimension and thus needs relatively much space. Moreover, a further disadvantage exists in that both propellers are dependent on the one particular motor, which does not allow adapting the propeller to different needs with regard to varying receipts or programs to be performed, a varying degree of moisture or temperature.

[0006] With the increasing demands on reducing energy losses in the field of kitchen appliances, and particularly with regard to kitchen ovens, especially a more effective insulation is needed, which, however, is further limiting the space for integration of ducts or fans of a cooling and exhaust air system.

[0007] It is an object of the present invention to provide a kitchen oven comprising a cost-, or purpose-effective and simple design that allows both an effective cooling and an effective vapor exhaustion.

[0008] It is a further object of the present invention to provide a kitchen oven that allows for a more compact design of a combined cooling and vapor exhaust system.

[0009] These and other problems are solved by the subject-matter of the attached independent claims.

[0010] The above objects of the invention are achieved by a kitchen oven according to claim 1.

[0011] Preferred embodiments may be taken from the dependent claims.

[0012] A kitchen oven according to claim 1 comprises at least a cavity and a cooling chamber arranged outside of the cavity and provided as a common duct for the joint discharge of cooling air and vapors, and at least one vapor duct for realizing a fluid communication between the cavity and the cooling chamber, in that said vapor duct is arranged such that its first end is in fluid communication with the cavity, and its second end is in fluid communication with said cooling chamber, said cooling chamber further comprising a first fan wheel for blowing the air and vapors out of the oven. Such kitchen oven according to the present invention is characterized in that the vapor duct comprises a negative pressure device arranged within said vapor duct such that it is capable of sucking air and vapors out of the cavity.

[0013] Such oven allows for an effective cooling by the air blown through the cooling chamber by the first fan wheel. Moreover, said cooling chamber serves as or comprises a mixing area in which vapors and cooling air are mixed together. This is possible as the cavity and the cooling chamber are in fluid connection, through the vapor duct. Within said vapor duct a negative pressure device is arranged which is capable of generating a negative pressure within the cavity and thus sucks the vapor within the cavity out of said cavity and into the vapor duct, from where it enters the blowing chamber and is mixed with the cooling air. The vapor is then taken away by the cooling airflow. The mixture thereof is finally released to the surrounding of the kitchen appliance. In that the vapor is mixed with the cooling air, preferably immediately after being sucked out of the cavity, the vapor is cooled down and neither hot vapor is exhausted by the oven, nor unwanted condensation will occur or at least be reduced. This is of particular importance as the vapor contained within the cavity may probably comprise moisture to a certain extend.

[0014] In an advantageous embodiment of the inventive oven said second end of the vapor duct is arranged in an outlet area of the first fan wheel, preferably such, that a rotating movement of said first fan wheel supports the sucking of the vapors out of the cavity.

[0015] The term "outlet area" as used herein, preferably refers to the positioning relative to a fan wheel; accordingly, an outlet area is an area located in a region where air is blown to, whereas an inlet area refers to a region where air is pulled from.

[0016] It is immediately understood, that in general the second end of the vapor duct may be arranged both, in an inlet and/or in an outlet area of the first fan wheel. Both is considered herein. Where however, the second end is arranged in an outlet area of the fan, it may be advantageously avoided that the vapor, probably hot and

moist, which is sucked out of the cavity has to pass the fan wheel.

[0017] In both settings, however, it is preferred that a rotating movement of said first fan wheel supports the sucking of the vapors out of the cavity. This, for example, is the case if the second end and the opening and the respective opening of the vapor duct is designed and arranged such that the air blown or pulled by the fan wheel strives said second end and respective opening and due to an injector effect an under pressure in the vapor duct is achieved and/or strengthened which supports the sucking of the vapors out of the cavity. In this way a venturi effect may be advantageously achieved, supporting said under pressure in the vapor duct and, particularly the performance of the negative pressure device. Accordingly the sucking is either more effective, or for having the same effect, the negative pressure device can have a reduced performance.

[0018] In connection with the various embodiments of the present invention it is to be understood that the operation of the second fan wheel be such that an under-pressure resulting from the sucking action of the second fan wheel in the cavity, will not be high, however, sufficient to suck vapor and moisture out of the cavity. It will also be immediately understood that such under-pressure is usually immediately compensated by an air influx through various small openings of the cavity, for example, screw holes, holes for heating elements, central fan wheel or lamps, or the like.

[0019] In a further advantageous embodiment of the inventive oven, said first fan wheel is a radial flow fan wheel.

[0020] A radial flow fan wheel as used herein is a fan wheel designed and arranged such that, preferably an air influx is an axial air influx and air efflux is a radial air efflux. Alternatively, other arrangements or configurations of such radial flow fan wheel are considered herein. Particularly, a radial flow fan wheel may be arranged such that an air influx is a radial air influx.

[0021] In addition, a person skilled in the art with regard to various needs and advantages can design such radial flow fan wheel in various forms. For example, a radial flow fan wheel can be designed to suck on one, or on two sides of the wheel.

[0022] In connection with the various embodiments of the present invention according to which said first fan wheel is a radial flow fan wheel, it is to be understood that such radial flow fan wheel may be advantageously save energy in that a relatively high transported air volume is possible with, however, a relatively low rotational speed of said radial flow fan wheel.

[0023] A radial flow fan wheel according to the present invention preferably is arranged within a spiral housing. A person skilled in the art knows various forms of such spiral housing and may design such housing with regard to various needs and advantages, e.g. deceleration of air speed, air streaming, guiding or redirection.

[0024] Alternatively, the first fan wheel may be an axial

flow fan wheel.

[0025] The negative pressure device is arranged within the vapor duct and is for generating a negative pressure within the cavity. This allows for sucking the vapor within the cavity out of said cavity and into the vapor duct, from where it enters the blowing chamber and is mixed with the cooling air.

[0026] In a further advantageous embodiment of the inventive oven, said negative pressure device is selected from the group comprising a second fan wheel or a suction filter. It is thereby preferred that the negative pressure device is arranged such that is suitable to support the sucking of the vapors out of the cavity. Accordingly, it is to be understood that such negative pressure device, which in general may be arranged such that it can be operated in both directions, is particularly configured such that the negative pressure device generates a negative pressure within the cavity and sucks the vapor within the cavity out of said cavity and into the vapor duct.

[0027] In a further advantageous embodiment of the inventive oven, said second fan wheel is an axial flow fan wheel.

[0028] An axial flow fan wheel as used herein is a fan wheel designed and arranged such that, preferably an air influx is an axial air influx and air efflux is an axial air efflux. Providing a second fan wheel in the form of an axial flow fan wheel is advantageous in that it allows for a relatively compact and more robust design.

[0029] Such second fan wheel provided as an axial flow fan wheel is of particular advantage as only low or moderate pressure differences are achieved according to the present invention, however a rather high volume is to be transported. In connection therewith, it is to be understood that such second fan wheel, which is provided as an axial flow fan wheel, may be operated in its normal operation mode with a relatively low rotational speed, and may thus suck a relatively small amount of vapor out of the cavity. It will be immediately acknowledge, that a person skilled in the art is capable of adapting the particular design and arrangement of such second fan wheel according to the particular desired characteristics, for example, a desired air volume exchange.

[0030] In a particular preferred embodiment of the inventive oven said first fan wheel is a radial flow fan wheel and said second fan wheel is an axial flow fan wheel.

[0031] In connection therewith, it will be immediately understood that according to the present invention the particular design of the vapor duct, the first fan wheel and the second fan wheel can be advantageously adjusted to the particular needs according to a particular oven. For example, the size of the first and of the second fan wheel, respectively, as well as the diameter of the vapor duct, or the like can advantageously be adapted to particular designs of various ovens.

[0032] It will be immediately understood that said second fan wheel being an axial flow fan wheel advantageously supports the sucking of vapor out of the cavity. Particularly, where the first fan wheel performs such

sucking effect, e.g. by a herein described arrangement of the vapor duct, i.e. by an injector effect of the first fan wheel, the second fan wheel being an axial flow fan wheel will support said effect and add to the performance of the first fan wheel. In such configuration, both fan wheels act together and support the function of sucking the vapor out of the cavity.

[0033] Furthermore, the second fan wheel being an axial flow fan wheel will prevent that air from the first fan wheel will be blown or pressed into the cavity.

[0034] In a further advantageous embodiment of the inventive oven said vapor duct at its first end is connected to an opening in an upper wall of the cavity and/or the cooling chamber is arranged above said upper wall of the cavity.

[0035] As used herein terms such as "upper", or "above" or the like refer, preferably, to an arrangement and/or a location relative to the height of the kitchen oven according to the present invention. Accordingly, and in way of an example, where said vapor duct at its first end is connected to an opening in an upper wall of the cavity and/or the cooling chamber is arranged above said upper wall of the cavity, it will be immediately understood that such upper wall is the wall of the cavity which is averted from a kitchen floor, when the oven is installed and mounted for its intended use. Where the cooling chamber is arranged above said upper wall it is clear that the cooling chamber is, preferably arranged on or adjacent to the top of the cavity.

[0036] In a further advantageous embodiment of the inventive oven said first fan wheel is driven by a first driving means, and the negative pressure device is driven by a second driving means.

[0037] In connection therewith, it is important to understand that to drive the first fan wheel by a first driving means and to drive the second fan wheel independent from the first fan wheel by a second driving means is of particular advantage. This is as the rotational speed of the first fan wheel and the second fan wheel may be controlled independently and individually, which advantageously allows achieving better baking or cooking results. Particularly, problems related to unwanted condensation can be advantageously avoided. Furthermore, if both the first and the second fan wheel are controllable independently and individually, i.e. driving the first fan wheel by a first driving means and individually and independently driving the second fan wheel by a second driving means, this advantageously allows to adapt the operation of both, the first and the second fan wheel to different needs with regard to varying receipts or programs to be performed, a varying degree of moisture or temperature.

[0038] In connection therewith it is considered herein, that the rotational speed of the first fan wheel and of the second fan wheel, respectively, may independently and individually be controlled by software, e.g. by means of a control unit of the oven. Additionally, it is possible that the first fan wheel, the second fan wheel or both, respec-

tively, may be switched off completely, independently and individually.

[0039] Particularly, it is to be understood that the performance of the first and the second fan wheel may be adjusted and regulated via the motor speed of the respective driving means. In connection therewith, it is also considered that such driving means may be completely switched off. Accordingly, it is possible that the first fan wheel, the second fan wheel or both, respectively, may be switched off completely, independently and individually. Additionally, it is considered herein, independently and individually to switch on the second driving means for driving the second fan wheel to suck condensed air or vapor out of the cavity.

[0040] It is within the scope of the invention that the second driving means for operation of the second fan wheel can be mounted external or internal of the vapor duct, depending on the particular configuration of the oven. Particularly, a motor driving the second fan wheel and being mounted in the vapor duct provides an advantageously cheap configuration.

[0041] In a further advantageous embodiment of the inventive oven said first and/or the second driving means is selected from the group comprising a motor, preferably DC motor, and compressed air.

In connection therewith, it is to be understood that for driving means for a first and/or second flow fan wheel being a radial flow fan wheel a DC motor is preferred. Alternatively, however, it is within the present invention that such driving means for a first and/or second flow fan wheel being a radial flow fan wheel an AC motor can be applied.

[0042] In a further advantageous embodiment of the inventive oven said first driving means and/or the second driving means is an infinitely adjustable driving means.

[0043] Particularly, an infinitely adjustable AC motor may be applied as an infinitely adjustable driving means.

[0044] According to the present invention, an AC motor is preferably applied as a driving means for a first or second fan wheel being an axial flow fan wheel, as an AC motor may allow a better control of such axial flow fan wheel.

[0045] The oven according to the present invention may comprise a control unit capable of controlling the first fan wheel and the second fan wheel. Particularly, the electronics of such oven according to the present invention may be advantageously used for controlling the first fan wheel and/or the second fan wheel by controlling the driving means, preferably, by controlling a first driving means to drive the first fan wheel and a second driving means to drive the second fan wheel independent and individually from the first fan wheel.

[0046] Alternatively, the second fan wheel is arranged and configured such that said second fan wheel is operated by the venturi effect in said vapor duct. Such venturi effect may thereby result from the cooling airflow of the first fan wheel striving over the second end of the vapor duct. In such alternative embodiment, a second fan wheel

may be operated with or without a second driving means.

[0047] The oven according to the present invention may further comprise at least one sensor. Such sensor may be advantageously provided to determine the rotational speed to be applied in a certain desired operation mode. Such sensor may be operatively connected with the electronics and/or the control unit of the oven. Accordingly, such sensor advantageously may deliver its input value to the control unit of the oven, according to which the desired rotational speed of the first and/or the second fan wheel is controllable and adjustable.

[0048] This advantageously allows for an infinite adjustability of the rotational movement speed of the first fan wheel and/or the negative pressure device, respectively, and thus an infinite adjustability of the air streams and pressures generated therewith.

[0049] In a further advantageous embodiment of the inventive oven, said second driving means is arranged within said vapor duct.

[0050] This advantageously allows for a compact design of a combined cooling and vapor exhaust system and both, an effective cooling and an effective vapor exhaustion. Particularly, such arrangement of the second driving means within said vapor duct allows for a sucking action without loss.

In a further advantageous embodiment of the inventive oven said oven comprises at least one outlet opening for blowing the air and vapors out of the oven, wherein, preferably said at least one outlet opening is arranged at a front side of the oven.

[0051] A front side, as used herein preferably refers to the side of the oven, in a stage where the oven is mounted in place for its intended use, facing a user of the oven.

[0052] Such outlet opening advantageously is in fluid connection with the blowing chamber and thus the mixture of vapor and cooling air can exhaust out of said at least one outlet opening.

[0053] A person skilled in the art will know various designs and arrangements of such outlet opening. For example, the outlet opening may be arranged adjacent to or in a handle of an oven door, advantageously cooling said handle.

[0054] Preferably, such outlet opening is arranged essentially above the cavity, preferably in a horizontal arrangement.

[0055] In a further advantageous embodiment of the inventive oven said vapor duct has a tube-shape.

[0056] Such tube-shape allows for a chimney-effect, which further supports the sucking of vapor out of the cavity. This is particularly the case, if the vapor duct has is configured and arranged as an essentially upright and straight tube-shaped duct.

[0057] As used herein, a kitchen oven, preferably, is selected from the group comprising steam oven, microwave oven, baking oven.

[0058] In a preferred embodiment, the oven according to the present invention does not comprise a lateral ventilator.

[0059] In a preferred embodiment, the oven according to the present invention further comprises a valve.

[0060] Such valve may be arranged in the vapor duct or, additionally or alternatively at a first or second end of the vapor duct. Such valve may be connected to the control unit and/or electronics of the oven, and thus advantageously may allow closing the vapor duct if desired, for example, dependent on a sensor measurement.

[0061] The second fan wheel and the vapor duct according to the present invention may be made from various materials. It is preferred to manufacture the vapor duct and the second fan wheel from materials which prevent corrosion and wear out. For example, the second fan wheel can advantageously be made from stainless steel, which advantageously prevents corrosion and wear out, and/or the vapor duct is made from aluminum cast material, which advantageously prevents corrosion and wear out.

[0062] In an embodiment, the oven according to the present invention further comprises at least one filter, for filtering the vapor and moisture, which is sucked out of the cavity. Such filter may be arranged in the vapor duct or at one end of the vapor duct. Particularly, a smell filter may be provided to remove smell from the vapor and moisture sucked out of the cavity.

[0063] According to embodiments, the vapor duct comprises a closing mechanism adapted to close, specifically selectively close (in case that certain conditions are fulfilled) the vapor duct. Thereby it is possible to close the vapor duct which enhances the energy efficiency of the oven.

[0064] According to embodiments, the closing mechanism comprises a sliding valve element or a rotating valve element. For example, the sliding valve element may comprise a flat slider and the rotating valve element may be a rotating vane. Said sliding valve element/rotating valve element may be actuated by any actuating means e.g. an electric actuator.

[0065] According to embodiments, a moisture sensor is coupled with the closing mechanism in order to control the negative pressure device. Alternatively or in addition, the moisture sensor is coupled with the negative pressure device in order to control said negative pressure device based on the moisture value of the cavity. Thereby, the operation of the negative pressure device and/or the status of the closing mechanism (i.e. opened, closed, partly closed etc.) can be controlled based on a moisture value derived within the cavity.

[0066] All described embodiments of the invention have the advantage, that a kitchen oven is provided comprising a cost-, effective and simple, design that allows both an effective cooling and an effective vapor exhaustion. Moreover, a kitchen oven according to the present invention allows for a more compact design of a combined cooling and vapor exhaust system. Thereby, the condensation and vapors within the cavity of the oven are advantageously reduced.

[0067] The present invention will be described in fur-

ther detail with reference to the drawings from which further features, embodiments and advantages may be taken, and in which

FIG 1 illustrates a schematically side sectional view of a cavity and a cooling chamber showing a first inventive embodiment.

[0068] FIG 1 shows schematically side sectional view of the upper part of the cavity 2 of a kitchen oven 1 according to the present invention. Such oven 1 usually comprises a housing and further elements, for example, heating elements, electronics, user interfaces, or the like, which for better understanding are not shown in Fig. 1. The cavity 2 is defined and comprised by several walls, more precisely, a frontal wall 17, usually having a central opening for insertion of cooking products which is usually provided with a front door for opening and closing said central opening, a rear wall 19 and an upper cavity wall 11, as well as two not shown side walls and a bottom wall. An oven 1 according to the embodiment shown in Fig. 1 allows for an effective cooling by the cooling air C blown through the cooling chamber 3 (see arrows marked with C in Fig. 1) by the first fan wheel 7. Moreover, said cooling chamber 3 here serves as or comprises a mixing area 18 in which vapors V and cooling air C are mixed together (the flow of the mixture "M" of vapor "V" and cooling air "C" is depicted with arrows marked with "M" in Fig. 1).

[0069] In that the vapor V is mixed with the cooling air C to the mixture M, immediately after being sucked out of the cavity 2, the vapor V is cooled down and neither hot vapor is exhausted by the oven 1, nor unwanted condensation will occur or at least be reduced. This is of particular importance as the vapor V contained within the cavity 2 may probably comprise moisture to a certain extend and may be hot.

[0070] For this purpose, above the upper cavity wall 11 a first fan wheel 7 is arranged, preferably adjacent to a rear part of the upper cavity wall 11.

[0071] Said first fan wheel 7 is provided in a cooling chamber 3, both arranged outside, here above, of the cavity 2. Said cooling chamber 3 is provided as a common duct for the joint discharge of cooling air, the general flow direction of which is marked with arrows "C" and vapors, the general flow direction of which is marked with arrows "V". Here, one vapor duct 4 is provided for realizing a fluid communication between the cavity 2 and the cooling chamber 3, in that said vapor duct 4 is arranged such that its first end 5 is in fluid communication with the cavity 2, and its second end 6 is in fluid communication with said cooling chamber 3. The vapor duct 4 has a tube-shape allowing for a chimney-effect, which supports the sucking of vapor out of the cavity 2. This is particularly the case, as can be seen from Fig. 1 the vapor duct 4 is configured and arranged as an essentially upright and straight tube-shaped duct. The second end 6 of the vapor duct 4 is arranged in an outlet area 9 of the first fan wheel 7 such, that a rotating movement of said first fan wheel

7 supports the sucking of the vapors out of the cavity 2. The first fan wheel 7 is blowing cooling air C along the cooling chamber 3 into the outlet area, i.e. the area where air is blown to, thereby a rotating movement of said first fan wheel 7 supports the sucking of the vapors out of the cavity 2. This, preferably is the case as the second end 6 and the opening and the respective opening of the vapor duct 4 is designed and arranged such that the air blown or pulled by the fan wheel strives said second end 6 and respective opening and due to an injector effect an under pressure in the vapor duct 4 is achieved and/or strengthened which supports the sucking of the vapors out of the cavity 2. Here the vapor duct 4 is screwed to the inner side of the upper cavity wall 11, and therefore protrudes into the cavity 2. Such injector effect is of particular advantage in that the performance of the negative pressure device 8, here an axial flow fan wheel 8, is supported. Accordingly, the sucking is either more effective, or having the same effect at a reduced performance. The axial flow fan wheel 8 is arranged within said vapor duct 4 such that it is capable of generating a negative pressure within the cavity 2 and thus sucking air and vapors V out of the cavity 2 and into the vapor duct 4, from where it enters the blowing chamber 3. The vapor V is then taken away by the cooling air flow C and is mixed with the cooling air C in the mixing area 18. This is particularly shown by the arrows marked with V, C and M. Vapor V is sucked out of the cavity 2, when the flow fan wheel 8 is in a first operation mode, i.e. performing its rotational movement.

[0072] The mixture M is finally released to the surrounding of the kitchen appliance 1, through the outlet opening 14.

[0073] In its first operation mode the axial flow fan wheel 8 generates the negative pressure, as described above, within the cavity 2 and sucks the vapor V within the cavity 2 out of said cavity 2 and into the vapor duct 4 as may be seen from Fig. 1. The axial flow fan wheel 8 is of particular advantage as only low or moderate pressure differences may be achieved according to the present inventions purpose, however, a rather high volume may be transported in order to remove vapors V from the cavity 2.

[0074] Here the first fan wheel 7 is a radial flow fan wheel designed and arranged such that, an air influx is an axial air influx and air efflux is a radial air efflux. The radial flow fan wheel 7 is arranged within a spiral housing 16 and comprises several impeller blades with forward-curved blade geometry.

[0075] It will be immediately understood that the axial flow fan wheel 8 advantageously supports the sucking of vapor V out of the cavity 2. This is, as the cooling air flow C generated by the first fan wheel 7 performs such sucking effect by the arrangement of the vapor duct 4 as shown in Fig. 1, in that an injector effect of the first fan wheel 7 sucks vapor V out of the cavity 2 and through the vapor duct 4; Thereby, the axial flow fan wheel 8 supports said effect and adds to the performance of the first fan wheel 7 in that its rotational movement in its first

operation mode generates and strengthens an under pressure within the cavity 2 and sucks out the vapor V. It is important to note that in such configuration, both fan wheels act together and support the function of sucking the vapor V out of the cavity 2.

[0076] As may be taken from Fig. 1 the vapor duct 4 at its first end 5 is connected to an opening 10 in an upper wall 11 of the cavity 2 and the cooling chamber 3 is arranged above said upper wall 11 of the cavity 2. Accordingly, the vapor duct 4 realizes a fluid communication between the cavity 2 and the cooling chamber 3, in that said vapor duct 4 is arranged such that its first end 5 is in fluid communication with the cavity 2, and its second end 6 is in fluid communication with said cooling chamber 3.

[0077] In the embodiment shown in Fig. 1 the first fan wheel 7 is driven by a here not shown first driving means 12, and the axial flow fan wheel 8 is driven by a here also not shown second driving means 13, which both are infinitely adjustable DC motors.

[0078] Here the second driving means 13 may be advantageously arranged within said vapor duct 4, which advantageously allows for a relatively cheap and effective arrangement, and moreover, for a compact design of a combined cooling and vapor exhaust system and both an effective cooling and an effective vapor exhaust-ion.

[0079] The oven 1 shown in Fig. 1 comprises at least one outlet opening 14 for blowing the mixture M of air and vapors out of the oven 1. It can be immediately seen that said outlet opening 14 is arranged at a front side 15 of the oven 1 essentially above the cavity 2 and is in fluid connection with the blowing chamber 3 and thus the mixture M of vapor V and cooling air C can exhaust out of said at least one outlet opening 14.

[0080] The vapor duct 4, being serving as a tube-shaped extension out of the cavity 2 has inside an integrated fan as a negative pressure device. This fan is propelled by electricity or compressed air and its rotating movement supports the sucking of the vapours V out of the cavity 2. The vapor V is then taken away by the cooling air flow C provided by the first fan wheel 7.

[0081] As schematically shown in Fig. 1, the oven 1 may comprise a closing mechanism 20 for at least partially closing the cross-sectional aperture of the vapor duct 4. As shown in Fig. 1, said closing mechanism 20 may be arranged in the vapor duct 4 between the first end 5 of the vapor duct 4 and the negative pressure device 8. However, according to other embodiments, the closing mechanism 20 may be arranged in the vapor duct 4 between the second end 6 of the vapor duct 4 and the negative pressure device 8.

[0082] Said closing mechanism 20 may comprise a valve, flap, lid etc. which is moveably mounted in said vapor duct 4 in order to open the vapor duct 4 in a first position and close, specifically completely close the vapor duct 4 in a second position. Thereby, according to certain operating conditions of the oven 1, the vapor duct

4 can be opened or partly opened in order to remove moisture of the interior of the cavity 2 or closed in order to reduce loss of energy, i.e. enhance the efficiency of the oven 1.

[0083] The closing mechanism 20 may be coupled with a moisture sensor 21. Said moisture sensor 21 may be adapted to gain information regarding the moisture within the cavity 2. More in detail, the moisture sensor 21 may be arranged in, at or close to the cavity 2 in order to derive moisture values. Based on the gained information, the closing mechanism 20 is controlled. Specifically, the closing mechanism 20 is opened (i.e. the vapor duct 4 is at least partially opened) in order to remove moisture out of the cavity 2 in case that the obtained moisture value is above a first threshold value. On the other hand, the closing mechanism 20 may be closed (i.e. the vapor duct 4 is closed) if the obtained moisture value is below a further threshold value. Said further threshold value may be equal or different to the first threshold value.

[0084] In addition, the moisture information gained by the moisture sensor 21 may also be used to control the negative pressure device 8. For example, the negative pressure device 8 may be turned on if the moisture value is above a first threshold value and turned off if the moisture value is below a second threshold value. Said second threshold value may be equal or different to the first threshold value. In addition, the threshold values for controlling the negative pressure device 8 and the closing mechanism 20 may be equal or different. In case that the negative pressure device 8 and the closing mechanism 20 is controlled based on the information gained by the moisture sensor 21, the control of the negative pressure device 8 and the control of the closing mechanism 20 may be performed independently from each other.

[0085] The closing mechanism 20 may comprise a sliding valve element or a rotating valve element in order to open/close the vapor duct 4. More in detail, the closing mechanism 20 may comprise a rotary vane or a flat slider. The rotary vane may be rotatably arranged within the vapor duct 4. More in detail, the rotary vane may be configured to be rotated around a rotation axis arranged across the longitudinal axis (flow direction) of the vapor duct 4. In case of a sliding valve element, said sliding valve element may be adapted to be moved in a direction transverse to the longitudinal axis (flow direction) of the vapor duct 4.

[0086] The features of the present invention disclosed in the specification, the claims, and/or the figures may both separately and in any combination thereof be material for realizing the invention in various forms thereof.

List of reference numerals

[0087]

- | | |
|---|-----------------|
| 1 | kitchen oven |
| 2 | cavity |
| 3 | cooling chamber |

4 vapor duct
 5 first end of vapor duct
 6 second end of vapor duct
 7 first fan wheel
 8 negative pressure device
 9 outlet area
 10 opening
 11 upper cavity wall
 12 first driving means
 13 second driving means
 14 outlet opening
 15 front side of the oven
 16 spiral housing
 17 frontal wall of cavity
 18 mixing area
 19 back wall of cavity
 20 closing mechanism
 21 moisture sensor

C cooling air
 V Vapor and moisture
 M mixture of vapor and moisture

Claims

1. A kitchen oven (1), comprising a cavity (2) and a cooling chamber (3) arranged outside of the cavity (2) and provided as a common duct for the joint discharge of cooling air and vapors, and at least one vapor duct (4) for realizing a fluid communication between the cavity (2) and the cooling chamber (3), in that said vapor duct (4) is arranged such that its first end (5) is in fluid communication with the cavity (2), and its second end (6) is in fluid communication with said cooling chamber (3), said cooling chamber (3) further comprising a first fan wheel (7) for blowing the air and vapors out of the oven (1),
characterized in that
 the vapor duct (4) comprises a negative pressure device (8) arranged within said vapor duct (4) such that it is capable of sucking air and vapors out of the cavity (2).
2. The oven (1) according to claim 1, wherein the second end (6) of the vapor duct (4) is arranged in an outlet area (9) of the first fan wheel (7), preferably such, that a rotating movement of said first fan wheel (7) supports the sucking of the vapors out of the cavity (2).
3. The oven (1) according to any one of claims 1 or 2, wherein the first fan wheel (7) is a radial flow fan wheel.

4. The oven (1) according to any one of claims 1 to 3, wherein the negative pressure device (8) is selected from the group comprising a second fan wheel or a suction filter, and, preferably the negative pressure device (8) is arranged such that is suitable to support the sucking of the vapors out of the cavity (2).
5. The oven (1) according to any one of claims 1 to 4, wherein the second fan wheel (8) is an axial flow fan wheel.
6. The oven (1) according to any one of claims 1 to 5, wherein the vapor duct (4) at its first end (5) is connected to an opening (10) in an upper wall (11) of the cavity (2) and/or wherein the cooling chamber (3) is arranged above said upper wall (11) of the cavity (2).
7. The oven (1) according to any one of claims 1 to 6, wherein the first fan wheel (7) is driven by a first driving means (12), and the negative pressure device (8) is driven by a second driving means (13).
8. The oven (1) according to any one of claims 1 to 7, wherein the first (12) and/or the second (13) driving means is selected from the group comprising a motor, preferably DC motor, and compressed air.
9. The oven (1) according to any one of claims 7 or 8, wherein the first driving means (12) and/or the second driving means (13) is an infinitely adjustable driving means.
10. The oven (1) according to any one of claims 1 to 9, wherein the second driving means (13) is arranged within said vapor duct (4).
11. The oven (1) according to any one of claims 1 to 10 comprising at least one outlet opening (14) for blowing the air and vapors out of the oven (1), wherein, preferably said at least one outlet opening (14) is arranged at a front side (15) of the oven (1).
12. The oven (1) according to any one of claims 1 to 11, wherein the duct vapor duct (4) has a tube-shape.
13. The oven (1) according to any one of the preceding claims, the vapor duct (4) comprising a closing mechanism (20) adapted to close the vapor duct (4).
14. The oven (1) according to claim 13, wherein the closing mechanism (20) comprises a sliding valve element or a rotating valve element.
15. The oven (1) according to anyone of the preceding claims, including a moisture sensor (21) coupled with the closing mechanism (20) in order to control the negative pressure device (8) based on a moisture

value of the cavity (2) and/or including a moisture sensor (21) coupled with the negative pressure device (8) in order to control the negative pressure device (8) based on a moisture value of the cavity (2).

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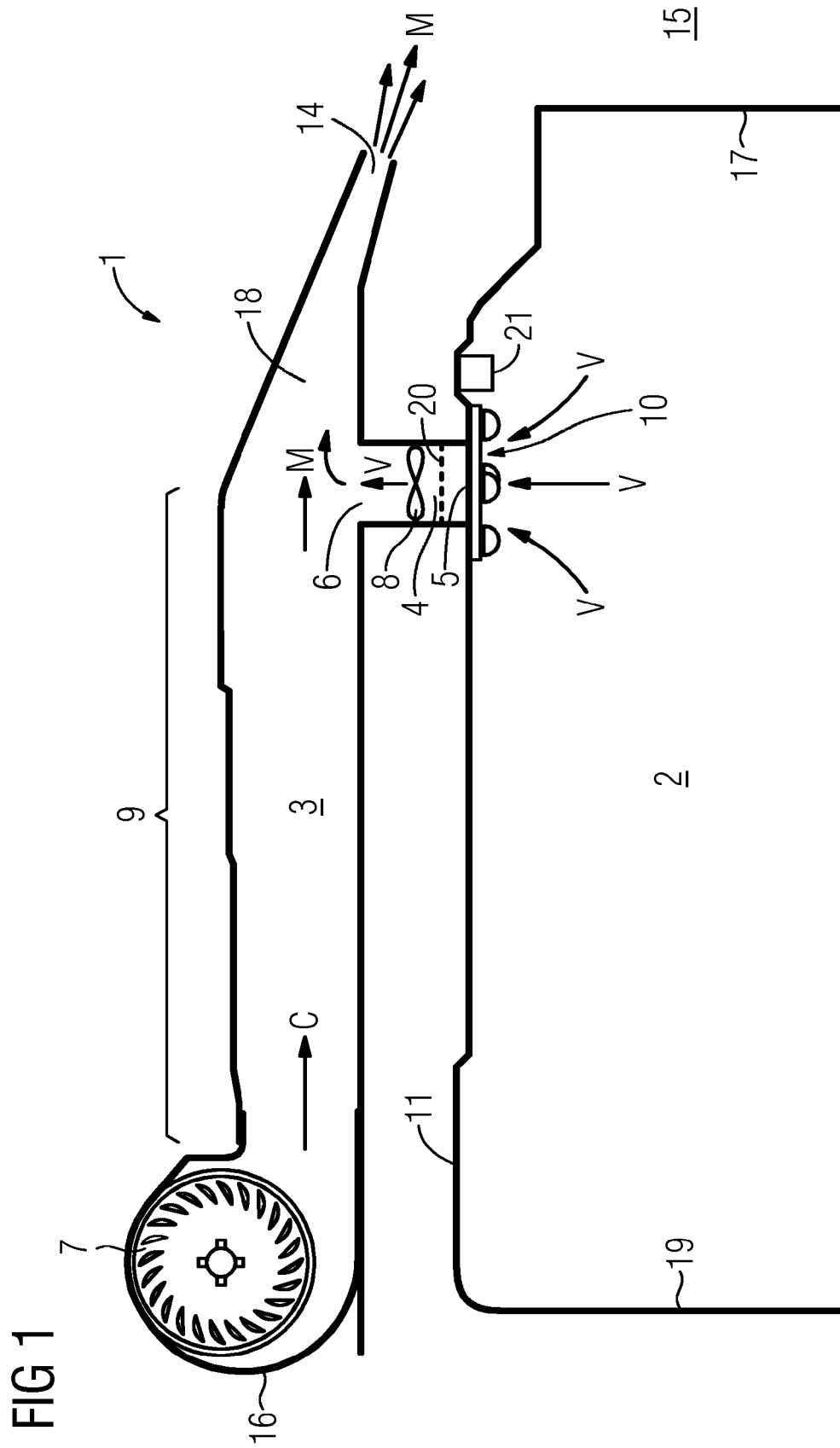
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