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(54) **ARRANGEMENT FOR FLOWING AN EXHAUST AIR THROUGH A HOOD**

(57) An arrangement (1) for flowing an exhaust air through a paddle box (2), the paddle box (2) is adapted to be placed above a fuel burner (3) adapted to burn a fuel, or a food cooktop (3) adapted to cook food, such that the burning of fuel, or cooking of food generates an exhaust air, the paddle box (2) comprises a hollow structure (4) adapted to channelize the exhaust air through itself, characterized in that the arrangement comprising a pressure change mechanism (5) adapted to change an inside pressure of an inside environment (6) inside the hollow structure to be lower with respect to an environmental pressure of a paddle box environment (7) surrounding the paddle box (2), such that the exhaust air is pushed through the hollow structure (4) of the paddle box, due to a pressure difference between the environmental pressure and the inside pressure.

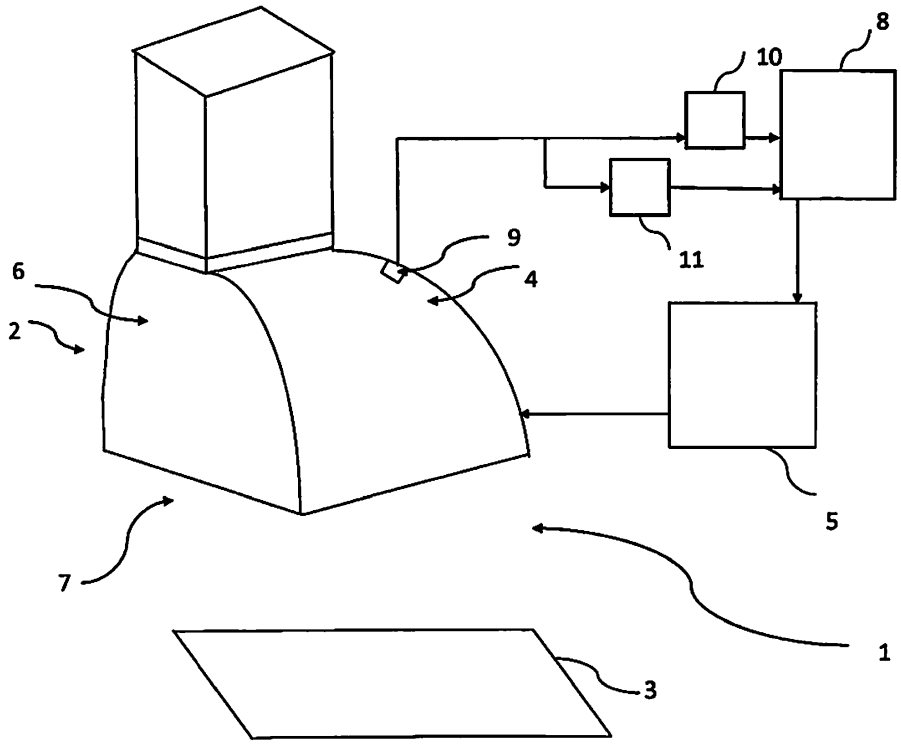

Fig. 1

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Description

[0001] This invention refers to an arrangement for flowing an exhaust air through a paddle box according to claim 1, a paddle box according to claim 11, and a method for flowing an exhaust air through a paddle box according to claims 12.

Background of the Invention

[0002] A paddle box is required for fresh air breathing in the kitchen. The paddle box basically eliminates the burning fumes, the bad smells coming from the cooking stove. It improves the quality of the air by destroying the steam and the niches which are harmful for both living and household items. While in function, the paddle box uses high energy during the air suction of the hood and also causes noise. In addition, while sucking through the hood, the paddle box also reduces the air quality of the environment by throwing out the necessary air of the environment besides steam and other irritating or harmful aspects of the air.

[0003] Korean Patent Publication No. KR20140063307 discloses a range hood which comprises a main intake part installed to be separated from the upper side of a heating apparatus such as a gas or an electric range installed and used in a kitchen, and capable of sucking cooking gas containing smoke, smells, and steam generated from food cooked to be heated by the heating apparatus, a hood main body coupled to the top of the main intake part, and allowing the sucked cooking gas to pass through the upper side thereof, a main exhaust pipe coupled to the top of the hood main body, and discharging the cooking gas to the outside, an additional intake part positioned at the side of the main intake part, and capable of sucking steam generated from food cooked in a cooking utensil such as a rice cooker used to be put on the upper surface of a cooking table coupled to the side of the heating apparatus, and an additional exhaust pipe having one end coupled to the top of the additional intake part, having the other end coupled to the main exhaust pipe or the hood main body, and discharging the steam sucked into the additional intake part to the main exhaust pipe or the hood main body.

[0004] German Patent Publication No. DE202007017325 discloses apparatus for deduction of cooking fumes in vertically below a hob plane pointing direction. The apparatus comprises a reversibly openable and closable cooking-oven inlet device and one or several cooking appliances, which is arranged at right angles to the vertical and vertical line from the side at right angles and horizontally or from the side from obliquely downwards, directly or indirectly, on the underside and / or on a lateral flank of the cooking vapor entry device, wherein a downstream section of the exhaust air duct is provided directly downstream of the cooking vapor inlet device, with the intermediate section of an initial section of the exhaust air duct, and the downstream outlet opening of the exhaust duct of the exhaust air duct is in the form of a horizontal section extending in the longitudinal direction of this outlet opening of the further section of the exhaust air duct is greater than the height thereof, and the width of this outlet opening corresponds approximately to the width of the inlet opening of the cooking vapor entry device, and wherein one or more flat-channel elements are arranged downstream of the outlet opening of the further section of the exhaust air channel and/or to the initial section of the exhaust air duct and/or to the starting section of the exhaust air duct or to the further section of the exhaust air channel, directly or indirectly.

[0005] Chinese Patent Publication No. CN206398810 discloses a steady flow noise reduction device and a silent hood having the noise reduction device, which comprises a body, and a smoke box is arranged under the body, and the filter box is provided with a filter. A second smoke pipe is provided with an annular plate, the annular plate is provided with an arc-shaped fume slot, and the second smoke pipe is provided with a second smoke pipe. The second hood jacket is provided with a sleeve, the bottom of which is in contact with the annular plate.

Object of the Invention

[0006] It is therefore the object of the present invention is to provide for a technique to for functioning of paddle box, with minimal noise, and also maintaining quality of air in the aenvironment where the paddle box is running.

Description of the Invention

[0007] The before mentioned object is solved by refers to an arrangement for flowing an exhaust air through a paddle box according to claim 1, a paddle box according to claim 11, and a method for flowing an exhaust air through a paddle box according to claims 12.

An arrangement for flowing an exhaust air through a paddle box, the paddle box is adapted to be placed above a fuel burner adapted to burn a fuel, or a food cooktop adapted to cook food, such that the burning of fuel, or cooking of food generates an exhaust air, the paddle box comprises a hollow structure adapted to channelize the exhaust air through itself, characterized in that the arrangement comprising a pressure change mechanism adapted to change an inside pressure of an inside environment inside the hollow structure to be lower with respect to an environmental pressure of a paddle box environment surrounding the paddle box, such that the exhaust air is pushed through the hollow structure of the paddle box, due to a pressure difference between the environmental pressure and the inside pressure.

This provides a mechanism for providing a flow of the exhaust air through the hollow structure of the paddle box, as the inside pressure of the inside environment inside the hollow box reduces lower than the environmental pressure of the paddle box environment surrounding the paddle box, hence enabling the exhaust air

to expand towards lower pressure region and enabling an air flow channel of the exhaust air through the paddle box. It is to be noted that the paddle box environment surrounding the paddle box is generally hot due to the hottness of the exhaust air, which is being produced during cooking or burning of any fuel. This exhaust air is much hotter with respect to air in the room where the paddle box is placed, hence only the exhaust air shall move through the paddle box, and not the air of the room. This substantially helps to maintain the air quality of the room in which the paddle box is placed.

With this invention, less energy is used and the bad humidity, steam that is only to be thrown away, will be thrown away without disturbing sound.

[0008] Further preferred embodiments are subject-matter of dependent claims and/or of the following specification parts.

According to a preferred embodiment of the arrangement, the arrangement comprises a controller adapted to activate, deactivate, or regulate the pressure change mechanism.

[0009] This embodiment is beneficial as it helps to regulate the pressure change mechanism, which makes the arrangement energy efficient, as well as adaptable to the requirements.

According to a further embodiment of the arrangement, the arrangement comprises a sensor adapted to sense presence of the exhaust air, to generate a presence data related to presence of the exhaust air, and to send the presence data to the controller, wherein the controller is adapted to receive and process the presence data, and activate or deactivate the pressure change mechanism.

This embodiment is helpful, as it provides an automatic and self-functioning arrangement, as the controller do not require human intervention to activate or deactivate the pressure change mechnaism.

According to another embodiment of the arrangement, the sensor is adapted to sense density of the exhaust air, to generate the density data, and to send the density data to the controller, wherein the controller is adapted to receive and process the density data and regulates the pressure change mechanism to change the inside pressure, so as to increase or decrease the pressure difference between the environmental pressure and the inside.

This embodiment is helpful, as it provides an automatic and self-regulating arrangement, as the controller do not require human intervention to regulate the pressure change mechnaism.

According to a further preferred embodiment of the arrangement, the pressure change mechanism is based on cooling technique, such that the pressure change mechanism is adapted to change an inside temperature of the inside environment within the hollow structure to change the inside pressure.

This embodiment is helpful, as it provides for an efficient implimentation of the pressure change mechanism.

According to a further embodiment of the arrangement, the pressure change mechanism comprises a flow pipe adapted to flow a cooling fluid, the flow pipe is placed within the hollow structure, such that when the cooling fluid flows through the pipe, it absorbs heat from the inside environment and reduces the inside temperature.

This embodiment is beneficial, as it provides for easy implementation of the cooling technique for implementing the pressure change mechanism.

According to another embodiment of the arrangement, the flow pipe is at least partially arranged along the walls of the hollow structure.

[0010] This embodiment is beneficial, as it provides for placement of the cooling pipes, so that they should not hinger in flow of the exhaust air.

According to a further embodiment of the arrangement, the flow pipe is at least partially arranged along the walls of the hollow structure in a helical fashion.

The embodiment is beneficial, as it provides an efficient mechanism for placing the flow pipes, so that the flow piper can cover a maximum area of the hollow structure, and provide efficient regulation of temperature through the hollow structure.

According to another embodiment of the arrangement, the pressure change mechanism comprises a compressor adapted to cool the cooling fluid before being flown into the part of the flow pipe entering the hollow structure.

The embodiment is beneficial, as it provides an easy mechanism for cooling the cooling fluid before entering the hollow structure.

According to a further preferred embodiment of the arrangement, the controller is adapted to regulate the compressor to activate, or deactivate the compressor, or vary the cooling of the cooling fluid to be flown in the flow pipe, so that the inside temperature is regulated.

This embodiment is helpful, as it provides a way for regulating the cooling of cooling fluid, which shall help to adapt the pressure change mechanism as per the requirements as a particular instance.

The before mentioned object is also solved by a paddle box comprising the arrangement for flowing an exhaust air through the paddle box according to any of the claims 1 to 10.

The before mentioned object is also solved by a method for flowing an exhaust air through a paddle box according to claim 12.

The method for flowing an exhaust air through a paddle box, the paddle box is adapted to be placed above a fuel burner adapted to burn a fuel, or a food cooktop adapted to cook food, such that the burning of fuel, or cooking of food generates an exhaust air, the paddle box comprises a hollow structure adapted to channelize the exhaust air through itself, the method comprising:

- changing an inside pressure of an inside environment inside the hollow structure by a pressure change mechanism, such that the inside pressure is lower with respect to an environmental pressure of a paddle box environment where the paddle box is

placed, which enables pushing of the exhaust air through the hollow structure of the paddle box, due to a pressure difference between the environmental pressure and the inside pressure.

[0011] According to a further preferred embodiment of the method, the method comprises steps of:

- sensing presence of the exhaust air by a sensor, and generating a presence data related to presence of the exhaust air; and

- receiving and processing the presence data by a controller, and activating or deactivating the pressure change mechanism.

[0012] According to another embodiment of the method, the method comprises steps of:

- sensing density of the exhaust air by the sensor and, generating the density data; and

- receiving and processing the density data by the controller, and regulating the pressure change mechanism to change the inside pressure, so as to increase or decrease the pressure difference between the environmental pressure and the inside pressure.

[0013] According to a further embodiment of the method, the method comprises steps of:

- activating, deactivating, or regulating a compressor by the controller, for starting, stopping, or varying cooling of a cooling fluid based on at least one of the presence data or the density data; and

- flowing the cooling fluid through a fluid pipe within the hollow structure, such that when the cooling fluid flows through the pipe, it absorbs heat from the inside environment and reduces the inside temperature, which reduces the inside pressure.

[0014] Further benefits, goals and features of the present invention will be described by the following specification of the attached figures, in which components of the invention are exemplarily illustrated. Components of the devices and method according to the inventions, which match at least essentially with respect to their function, can be marked with the same reference sign, wherein such components do not have to be marked or described in all figures.
The invention is just exemplarily described with respect to the attached figure in the following.

Brief Description of the Drawings

[0015]

Fig. 1 illustrates a schematic diagram of an arrangement for flowing an exhaust air through a paddle box, according to an embodiment of the invention.

Fig. 2 illustrates a schematic diagram of the arrangement for flowing an exhaust air through a paddle box using cooling technique, according to an embodiment of the invention.

Fig. 3 illustrates a method flow chart for regulating pressure change between the inside environment and the paddle box environment using the arrangement of the Fig. 1.

Detailed Description of the Drawings

[0016] The present invention focuses on an energy efficient mechanism for removing an exhaust air produced during burning of fuel, or cooking, however maintaining the air quality within the room where the burning of fuel and cooking is taking place. The invention uses the pressure change mechanism to reduce pressure within a paddle box through which the exhaust air is channelized because of pressure difference between inside of the paddle box, and out the paddle box where burning of fuel or cooking is taking place.

[0017] Fig 1 illustrates a schematic diagram of an arrangement 1 which enabled flowing of the exhaust air through the paddle box 2. The paddle box 2 is placed above a food cooktop 3 having burners 15. When the burners are on, and the food is being cooked onto the cooktop 3, steam is produced, which is one of the exhaust air required to be removed from a paddle box environment 7 in which the paddle box 2 is placed. It is to be noted that steam is produced generally when water is boiling, mostly in cases of making water based cooking, however, in cases where the oil based cooking is done, the exhaust air also includes air produced due to heating of oil. If the exhaust air is not pushed to outside of the room where the cooking is taking place, the exhaust air shall start expanding to remaining part of the room, and makes it uncomfortable for person in the room to breathe or stay. This exhaust air is required to channelize through a hollow structure 4 of the paddle box.

[0018] For channelizing the exhaust air, the arrangement 1 is provided with a pressure change mechanism 5. The pressure change mechanism 5 changes the inside pressure of an inside environment 6 inside the hollow structure 4 to be lower with respect to an environmental pressure of the paddle box environment 7. Such pressure change in the inside environment 6 pushed the exhaust air to expand toward the inside environment 6, and further makes a channel of air flow of exhaust air from the paddle box environment 7 to the inside environment 6. Once the exhaust air enters the inside environment 6, it further routed to outside of the room in which the paddle box 2 is placed.

[0019] The arrangement 1 is also provided with a sen-

sor 9 which senses presence of the exhaust air and generates a presence data 10 related to presence of the exhaust air. The sensor 9 sends the presence data 10 to a controller, which processes the presence data 10, and based on the processing of the presence data 10, activates or deactivates the pressure change mechanism 5. Activation of the pressure change mechanism 5 enables it to create the pressure change by changing inside pressure. The pressure change is maintained by the pressure change mechanism 5 until the pressure change mechanism 5 is not deactivated. Once the pressure change mechanism 5 is deactivated, the inside pressure and the environment pressure starts getting into an equilibrium, and the channelizing of exhaust air is stopped. The controller 8 and the sensor 9, together provides a completely automated mechanism for functioning of the pressure change mechanism, where no human intervention is required. In an alternate embodiment, only the controller 8 is provided and the sensor 9 is not provided. In such scenario, human intervention is required to trigger the controller 8 for activation or deactivation of the pressure change mechanism 5. In yet another embodiment, even the controller 8 is not provided, and the user of the arrangement has to manually through any mechanical means activate or deactivate the pressure change mechanism 5.

[0020] Once the pressure change mechanism is activated, the sensor 9 further senses density of the exhaust air and generates a density data 11. The sensor 9 sends the density data 11 to the controller 8, and the controller 8 processes the density data 11, and based on processing, regulates the pressure change mechanism 5. In case that the density of the exhaust air within the inside environment 6 reduces, the controller 8 triggers the pressure change mechanism 5 to reduce the pressure difference between the inside environment 6 and the paddle box environment 7. This can be achieved by increasing the inside pressure. While, if the density of the exhaust air increases within the inside environment 6, the pressure change mechanism 5 increases the pressure difference between the inside environment 6 and the paddle box environment 7. This can be achieved by decreasing the inside pressure. In an alternate embodiment, the sensor 9 only generates the presence data 10, and need not generate the density data 11. In such case, the controller shall only activate or deactivate the pressure change mechanism 5.

[0021] The sensor 9 can be placed anywhere in the hollow structure 4, along any of the walls of the hollow structure or in proximity to the walls. This helps in generation of the presence data 10 or the density data 11 from within the inside environment. In another embodiment, the sensor 9 can be placed outside to the paddle box, either on paddle box, or in proximity to paddle box, or in proximity to the cook top 3, or any other location in the paddle box environment 7, so as to detect the presence or density of the exhaust air from the paddle box environment 7, despite of the inside environment 6, and accordingly the controller 8 activates, deactivates, or regulates the pressure change mechanism.

[0022] In one embodiment, the pressure change mechanism 5 can be based on cooling technique. The pressure change mechanism 5 works by changing an inside temperature of the inside environment 6 within the hollow structure to change the inside pressure

[0023] Implementation of the pressure change mechanism with cooling technique is illustrated in Fig. 2. This embodiment is shown with certain amendments from the embodiment of the Fig. 1, where the pressure change mechanism is shown to be comprising of a flow pipe 12, and a compressor 14. A part of the flow pipe 12 is arranged within the hollow structure 4. A cooling fluid flows through the flow pipe 12, and absorbs heat from the inside environment 6, which helps in reducing the inside temperature. Reduction of inside temperature reduces the inside pressure, and further creates required pressure difference between the inside pressure and the environmental pressure. The flow pipe 12 is arranged along one or more walls 13 of the hollow structure 4. Part of the flow pipe 12 can be within the hollow structure, and part of the flow pipe 12 can be outside. The flow pipe 12 is arranged along the walls 13 of the hollow structure 4 in a helical fashion. The flow pipe 12 can be arranged in any other geometrical fashion, like moving in vertically up-down fashion along the walls 13, or in a spiral shape inside the hollow structure 4, with part of the spiral touching the walls 13, and remaining part hanging within the hollow structure 4.

[0024] The flow pipe 12 is coupled to the compressor 14 which cools the cooling fluid before being flown into the part of the flow pipe 12 entering the hollow structure 4. The compressor 14 is placed outside the paddle box 2, hence part of the flow pipe 12 which is physically coupled to the compressor 14 is outside the hollow structure 4. In one embodiment, the compressor is not required, however, any cooling mechanism for cooling the cooling fluid can be used.

[0025] The controller 8 regulates the compressor 14 for activating, or deactivating the compressor 14, or varying the cooling of the cooling fluid flowing in the flow pipe 12, so as to regulate the inside temperature, or stop changing the inside temperature, as the case may be. The controller 8 activates or deactivates the compressor 14 based on the presence data 10 received from the sensor 9, and regulates the compressor 14 based on the density data 11. In one embodiment, the sensor 9 is not provided, and based on user intervention the controller 8 activates, deactivates, or regulates the compressor 14. In another embodiment, the controller 8 is not provided, and the user has to manually operate any mechanical means and activates, deactivates, or regulates the compressor 14.

[0026] Fig. 3 illustrates a method flow chart for regulating pressure change 5 between the inside environment and the paddle box environment using the arrangement of the Fig. 1. In step 101, the sensor is activated to detect

the presence of the exhaust air and generate the presence data. In step 102, the controller processes the presence data and identifies if the exhaust air is present or not, and if the exhaust air is present the flow moves to step 103, otherwise the sensor keeps on checking the presence of exhaust air as per step 101. In step 103, the pressure change mechanism is activated by the controller, to change the inside pressure, so that the exhaust air can be channelized into the hollow structure of the paddle box. In step 104, the sensor starts checking the density of the exhaust air and generates the density data. In step 105, the controller receives and processes the density data, and checks if the density of the exhaust air has changed. If the density of the exhaust air has changes, the flow moves to step 106, otherwise the flow moves to step 104 to keep on generating the density data. In step 106, the controller receives and processes the density data, and based on processing regulates the pressure change mechanism to dependently increase the inside pressure. Once the pressure change has happened, the flow again moves to step 104 for generating the density data. In case the density of the exhaust air is identified to be nil or very less, which shall be the absence of the exhaust data, the controller shall deactivate the pressure change mechanism.

[0027] Thus, the present invention provides an arrangement 1 for flowing an exhaust air through a paddle box 2. When the paddle box 2 is placed above a fuel burner 3 and burns a fuel, or above a food cooktop 3 to cook food, such burning of fuel or cooking of food generates an exhaust air. The paddle box 2 includes a hollow structure 4 which channelize the exhaust air through itself. The arrangement includes a pressure change mechanism 5 which changes an inside pressure of an inside environment 6 inside the hollow structure to be lower with respect to an environmental pressure of a paddle box environment 7 surrounding the paddle box 2, such that the exhaust air is pushed through the hollow structure 4 of the paddle box due to a pressure difference between the environmental pressure and the inside pressure.

List of reference numbers

[0028]

1 arrangement for flowing an exhaust air through a paddle box
2 paddle box
3 burner / food cooktop
4 hollow structure
5 pressure change mechanism
6 inside environment
7 paddle box environment
8 controller
9 sensor
10 presence data
11 density data
12 flow pipe
13 walls of the hollow structure
14 compressor
15 Burner
101 Step of activating sensor to detect presence of the exhaust air
102 Step of determining presence of the exhaust air by the controller
103 Step of activating pressure change mechanism
104 Step of detecting density change of the exhaust air by the sensor
105 Step of determining density change of the exhaust air by the controller
106 Step of regulating pressure change mechanism by the controller

Claims

1. An arrangement (1) for flowing an exhaust air through a paddle box (2), the paddle box (2) is adapted to be placed above a fuel burner (3) adapted to burn a fuel, or above a food cooktop (3) adapted to cook food, such that the burning of fuel or cooking of food generates an exhaust air, the paddle box (2) comprises a hollow structure (4) adapted to channelize the exhaust air through itself, **characterized in that** the arrangement comprising:

- a pressure change mechanism (5) adapted to change an inside pressure of an inside environment (6) inside the hollow structure (4) to be lower with respect to an environmental pressure of a paddle box environment (7) surrounding the paddle box (2), such that the exhaust air is pushed through the hollow structure (4) of the paddle box due to a pressure difference between the environmental pressure and the inside pressure.

2. The arrangement (1) according to the claim 1 comprising:

- a controller (8) adapted to activate, deactivate, or regulate the pressure change mechanism (5).

3. The arrangement (1) according to the claim 2 comprising:

- a sensor (9) adapted to sense the presence of the exhaust air, to generate a presence data (10) related to the presence of the exhaust air, and to send the presence data (10) to the controller (8), wherein the controller (8) is adapted to receive and process the presence data (10), and to activate or deactivate the pressure change mechanism (5).

4. The arrangement (1) according to the claim 3, where-

in the sensor (9) is adapted to sense density of the exhaust air, to generate a density data (11) and to send the density data (11) to the controller (8), wherein the controller (8) is adapted to receive and process the density data (11) and regulates the pressure change mechanism (5) to change the inside pressure, so as to increase or decrease the pressure difference between the environmental pressure and the inside pressure.

5. The arrangement (1) according to the claims according to any of the claims 1 to 4, wherein the pressure change mechanism (5) is based on cooling, such that the pressure change mechanism (5) is adapted to change an inside temperature of the inside environment (6) within the hollow structure to change the inside pressure.

6. The arrangement (1) according to the claim 5, wherein the pressure change mechanism (5) comprising:

- a flow pipe (12) adapted to flow a cooling fluid, wherein the flow pipe (12) is placed within the hollow structure (4), such that when the cooling fluid flows through the flow pipe (12) it absorbs heat from the inside environment (6) and reduces the inside temperature.

7. The arrangement (1) according to the claim 6, wherein the flow pipe (12) is at least partially arranged along one or more walls (13) of the hollow structure (4).

8. The arrangement (1) according to the claim 7, wherein the flow pipe (12) is at least partially arranged along the walls (13) of the hollow structure (4) in a helical fashion.

9. The arrangement (1) according to any of the claims 6 to 8, wherein the pressure change mechanism (5) comprises:

- a compressor (14) adapted to cool the cooling fluid before being flown into the part of the flow pipe (12) entering the hollow structure (4).

10. The arrangement (1) according to the claim 9, wherein the controller (8) is adapted to regulate the compressor (14) to activate, or deactivate the compressor (14), or vary the cooling of the cooling fluid to be flown in the flow pipe (12), so that the inside temperature is regulated.

11. A paddle box (2) comprising the arrangement (1) for flowing an exhaust air through the paddle box (2) according to any of the claims 1 to 10.

12. A method for flowing an exhaust air through a paddle box (2), the paddle box (2) is adapted to be placed above a fuel burner (3) adapted to burn a fuel, or above a food cooktop (3) adapted to cook food, such that the burning of fuel, or cooking of food generates an exhaust air, the paddle box (2) comprises a hollow structure (4) adapted to channelize the exhaust air through itself, the method comprising:

- changing an inside pressure of an inside environment (6) inside the hollow structure (4) by a pressure change mechanism (5), such that the inside pressure is lower with respect to an environmental pressure of a paddle box environment (7) where the paddle box (2) is placed, which enables pushing of the exhaust air through the hollow structure (4) of the paddle box (2), due to a pressure difference between the environmental pressure and the inside pressure.

13. The method according to the claim 12 comprising:

- sensing presence of the exhaust air by a sensor (9), and generating a presence data (10) related to presence of the exhaust air; and
- receiving and processing the presence data (10) by a controller (8), and activating or deactivating the pressure change mechanism (5).

14. The method according to the claim 13 comprising:

- sensing density of the exhaust air by the sensor (9) and, generating a density data (11); and
- receiving and processing the density data (11) by the controller (8), and regulating the pressure change mechanism (5) to change the inside pressure, so as to increase or decrease the pressure difference between the environmental pressure and the inside pressure

15. The method according to any of the claims 12 to 14 comprising:

- activating, deactivating, or regulating a compressor (14) by the controller (8), for starting, stopping, or varying cooling of a cooling fluid based on at least one of the presence data (10) or the density data (11); and
- flowing the cooling fluid through a flow pipe (12) within the hollow structure (4), such that when the cooling fluid flows through the flow pipe (12), it absorbs heat from the inside environment (6) and reduces the inside temperature, which reduces the inside pressure.

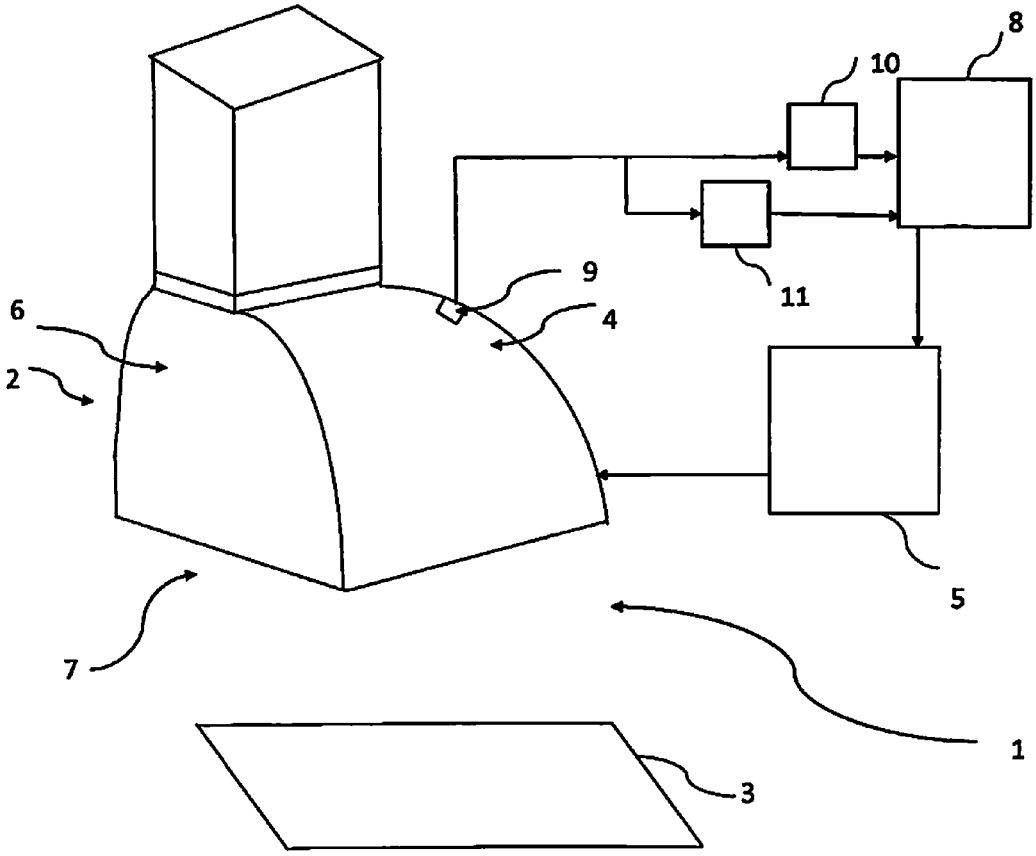

Fig. 1

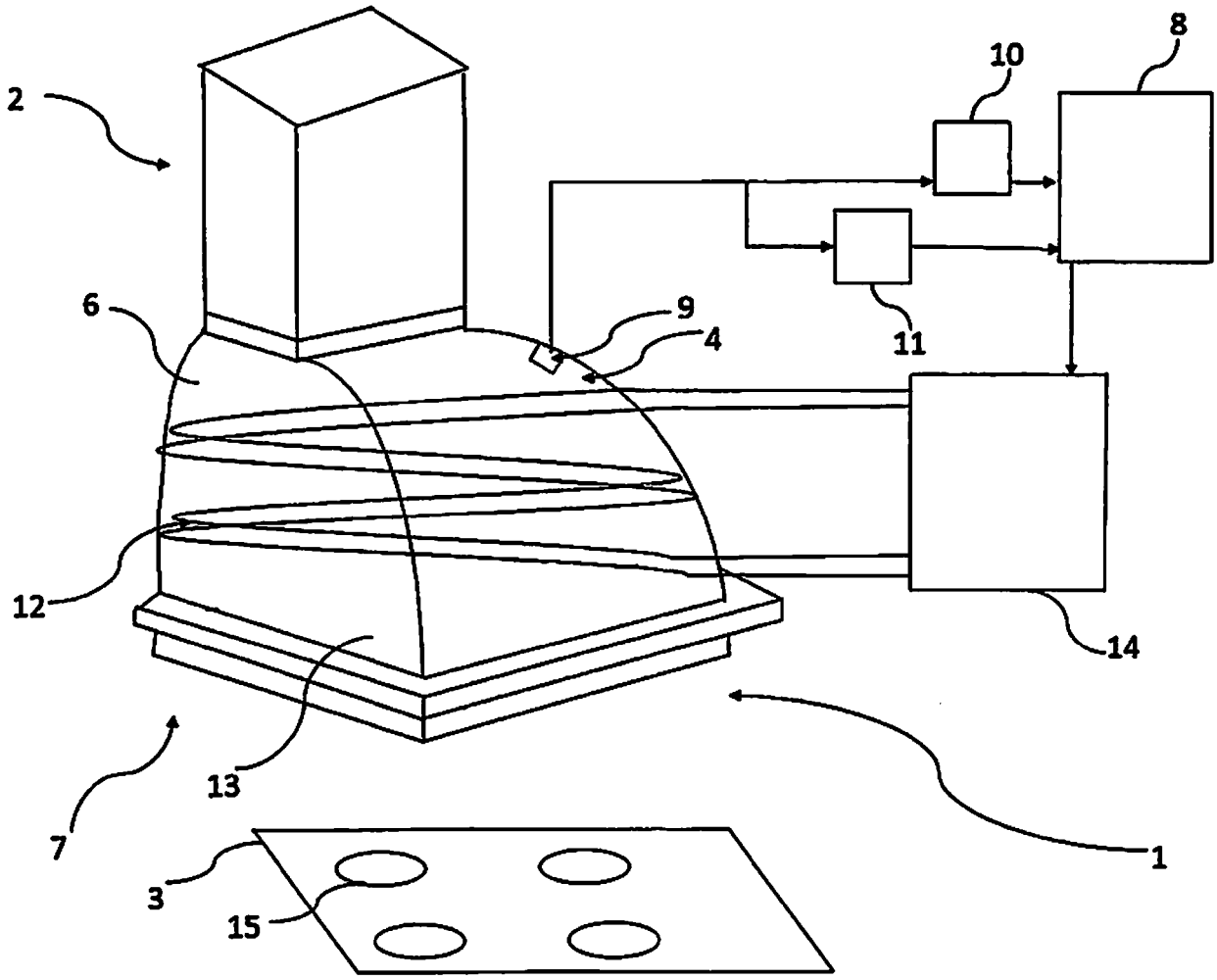

Fig. 2

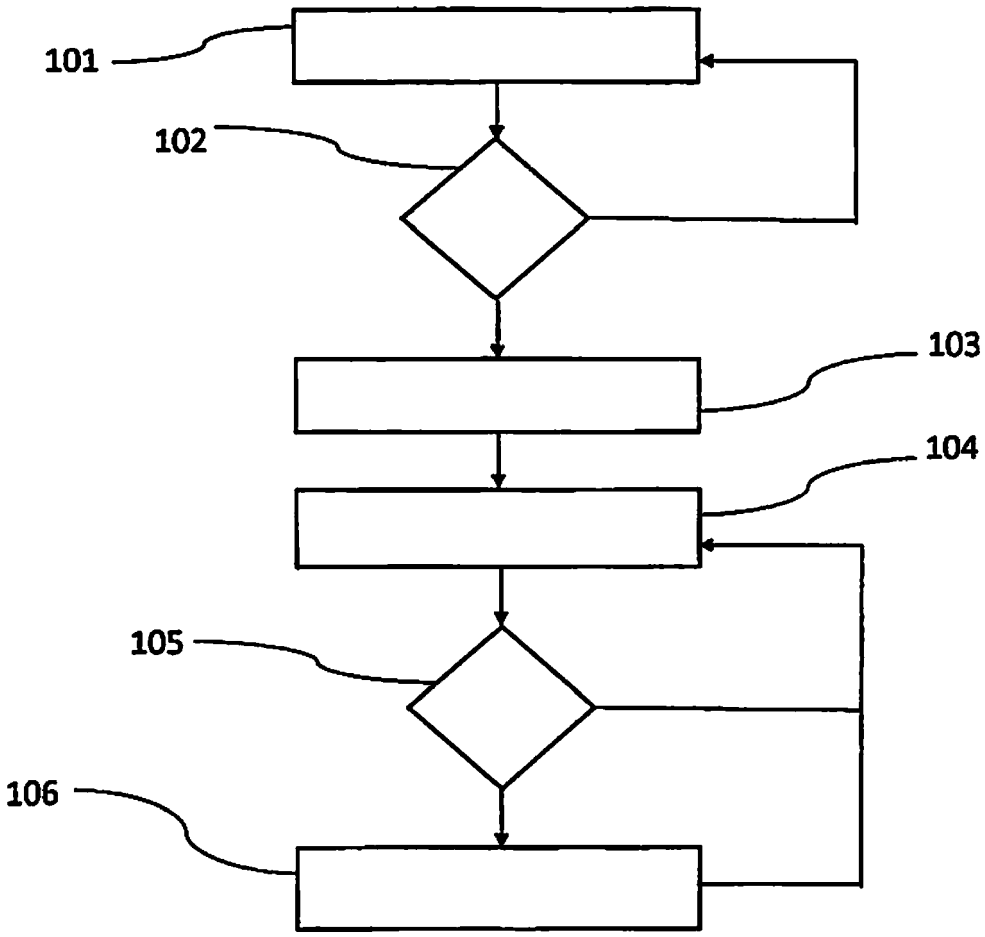

Fig. 3

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 17 19 8576

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 070 920 A1 (L N 2 S R L [IT]) 24 January 2001 (2001-01-24) * paragraph [0017]; figure 1 *	1-4, 12-14	INV. F24C15/20
X	US 2002/129809 A1 (LIESE FRANK [DE]) 19 September 2002 (2002-09-19) * paragraphs [0037], [0038], [0043]; figure 1 *	1-4, 11-14	
X	US 4 741 257 A (WIGGIN MERLON E [US] ET AL) 3 May 1988 (1988-05-03) * column 2, line 52 - column 3, line 20; figure 1 *	1,2,11, 12	
X	CN 103 868 120 A (XU GUOAN) 18 June 2014 (2014-06-18) * paragraphs [0013] - [0017]; figures 1,2 *	1,2, 5-12,15	
X	CN 105 371 335 A (JIANG YONG) 2 March 2016 (2016-03-02) * paragraphs [0003] - [0006]; figure 1 *	1,5-8, 11,12	TECHNICAL FIELDS SEARCHED (IPC) F24C B08B
X	EP 1 452 804 A1 (EGO ELEKTRO GERAETEBAU GMBH [DE]) 1 September 2004 (2004-09-01) * paragraph [0020]; figure 1 *	1-3, 11-13	
A	WO 2011/140490 A1 (HALTON GROUP LTD OY [FI]; PARVIN FUOAD A [US]; SCHROCK DEREK W [US]; L) 10 November 2011 (2011-11-10) * paragraph [0030]; figures 1-5 *	1,5-12	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 March 2018	Fest, Gilles

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

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28-03-2018

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1070920 A1	24-01-2001	NONE	
US 2002129809 A1	19-09-2002	AT 313762 T	15-01-2006
		DE 19940123 A1	01-03-2001
		EP 1212570 A1	12-06-2002
		US 2002129809 A1	19-09-2002
		WO 0114798 A1	01-03-2001
US 4741257 A	03-05-1988	CA 1227949 A	13-10-1987
		US 4741257 A	03-05-1988
CN 103868120 A	18-06-2014	NONE	
CN 105371335 A	02-03-2016	NONE	
EP 1452804 A1	01-09-2004	DE 10307247 A1	26-08-2004
		EP 1452804 A1	01-09-2004
WO 2011140490 A1	10-11-2011	CA 2798455 A1	10-11-2011
		CN 203413692 U	29-01-2014
		JP 3184025 U	13-06-2013
		US 2013092148 A1	18-04-2013
		US 2016047554 A1	18-02-2016
		WO 2011140490 A1	10-11-2011

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 20140063307 **[0003]**
- DE 202007017325 **[0004]**
- CN 206398810 **[0005]**