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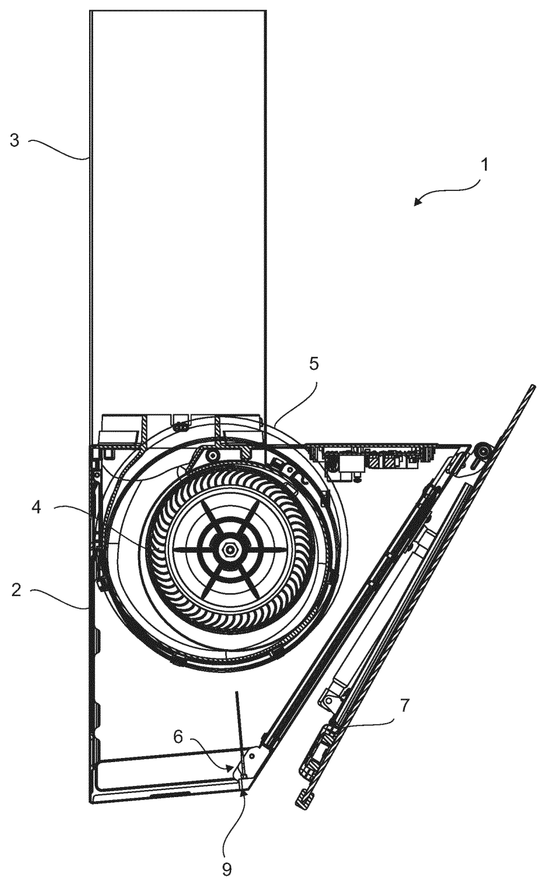
(54) **EXHAUST HOOD WITH AUTOMATIC OPERATION PERFORMANCE**

(57) The present invention relates to an exhaust hood (1) comprising a body (2); a suction channel (3) which is provided in the body (2); a fan (4); at least one first temperature sensor (5) which detects the ambient temperature; at least one second temperature sensor (6) which detect the temperature of the air rising from a cooking device (8) such as countertop cooker, oven, etc. or a cooking vessel thereon; a control unit (7) which enables the exhaust hood (1) to automatically operate according to the information received from the first and second temperature sensors (5 and 6) and which also enables the operation level to be automatically adjusted; and a surface (9) which is positioned on the side facing the cooking device (8) and which has thermal conductivity by radiation or convection; wherein the second temperature sensor (6) detects the temperature of said surface (9). Thus, almost the entire surface of the exhaust hood (1) is used as a sensor which measures the temperature of the air rising from a cooking device (8) such as cooktop, oven, etc. or from a cooking vessel thereon, in other words measures the activity of the cooker.

Figure 2



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Description

[0001] The present invention relates to an exhaust hood wherein the sensors are efficiently positioned to increase the automatic operation performance.

[0002] The exhaust hood provides the discharge of the water vapor and odor generated during the cooking process to the outside environment. With the development of sensor technologies, there are also important additional functions such as automatic operation and air purification.

[0003] The exhaust hood generally comprises a suction fan and a suction channel. The exhaust hood can be operated at different levels depending on the motor power in order to provide the discharge of the water vapor and odor generated during the cooking process to the outside environment. Said different levels can be selected by the user at appropriate stages according to the load of the cooking process.

[0004] In the state of the art, the user operates the exhaust hood when required during the cooking process and selects the appropriate level. In addition, there are applications where the exhaust hood is operated automatically to increase user comfort and to determine the most accurate level. In applications where the exhaust hood is operated and controlled automatically, sensors which monitor changes such as odor and temperature are used.

[0005] One of at least two temperature sensors on the exhaust hood measures the ambient temperature while the other temperature sensor detects whether the cooking device is operational or not from the temperature changes caused by the cooking process. By using at least two temperature sensors, it can be determined whether the cooker under the exhaust hood is operational or not, from the relative change (differences) between the temperature information measured by said sensors. Accordingly, it is provided that the exhaust hood is activated, the level is increased, and when the thermal load disappears, the level is reduced and the exhaust hood is closed. However, the position of the sensor which measures the temperature of the air rising from the cooking device or the cooking vessel thereon is very important since the load of the cooker must be detected without error when the cooking process is started on the cooker.

[0006] The sensor placed anywhere under the exhaust hood can measure the cooker load temperature when the exhaust hood is not operational. The sensor can also enable the exhaust hood to automatically switch to the first level at the specified stage. However, since after the exhaust hood starts to operate, the air flow path changes direction towards the ventilation channel due to the suction, from this moment on, if the sensor is not placed in a correct position, in an area suitable for the air flow path, the exhaust hoot does not switch to the next level although the cooker continues to operate. Since the hot air is drawn by the exhaust hood at this time, the sensor remains out of the air flow path and starts to cool down even if the cooker is operational, transmitting incorrect information to the exhaust hood and causing the same to stop.

[0007] Moreover, there is a great variety of designs for cooking devices, especially cookers. In the cookers, the cooking zones can be located at different positions. The thermal load which occurs during the cooking process in the cooking zones at these different positions follows a different flow path. The sensor, which is placed in any position under the exhaust hood, may remain within the air flow path of some cooking zones, while remaining outside the air flow path of some cooking zones. In this case, in the cooking processes performed in the cooking zones where the sensor is outside the air flow path, the latter cannot carry out an error-free detection. Moreover, it becomes difficult to make homogeneous and accurate detection during the cooking process made in different cooking zones. There may be differences in the detection capabilities during the cooking process performed in a cooking zone away from the sensor and the cooking process performed in a cooking zone close to the sensor.

[0008] Due to all these reasons, the sensor must be placed at a position that does not cause such problems in the proper conditions in order to detect the cooker load, that is, the heat released due to the cooking process.

[0009] In order for the exhaust hood to perform the automatic operation function correctly, the sensor must be within the air flow path when the exhaust hood is operational or not, at every level and in every mode, in every type of cooker and in every cooking zone. To meet this condition, it is not sufficient to use only one sensor other than the sensor which monitors the ambient temperature. The need for correctly detecting the temperature released by following more than one air flow path from different cooking zones in cooking devices which may have various designs necessitates the use of a plurality of temperature sensors. While increasing the number of sensors results in increased sensing sensitivity, it also requires additional sensor cost, a more costly processor, more circuit elements, and the need for designing a larger circuit board.

[0010] In the state of the art German Patent Application No. DE102006041581, an exhaust hood which is prevented from overheating and a control method are disclosed.

[0011] In the state of the art Chinese Utility Model Document Application No. CN2491733, a smart exhaust hood comprising a control device is disclosed. In this document, two negative temperature coefficient thermistors are used as sensors. The thermistors are mounted directly onto the lower corners of the exhaust hood.

[0012] In the state of the art German Patent Application No. DE3922090, an exhaust hood is disclosed, comprising a temperature sensor placed on the outer surface thereof and measuring the ambient temperature and at least two temperature sensors placed on the suction surface, wherein the fan is controlled according to temperature difference based on the information received from the sensors.

[0013] In the state of the art International Patent Application No. WO2020078670, an exhaust hood is disclosed, which is positioned above cooking devices such as cooker, oven, etc., comprising a body; a suction channel; a fan which enables the air to be sucked and discharged to the outer environment; a guiding plate which is disposed on the lower surface of the body; an air suction duct; and one or more than one temperature sensor which measures the temperature of the air rising from the cooking device by heating up. This document also discloses the temperature sensor which is mounted at the center of the air suction duct between the guiding plate and the front panel, which is positioned in the flow path of the air, and which is enabled to be affected from the air flow at maximum. Thus, incorrect measurement is prevented while the temperature sensor performs its automatic operating functions.

[0014] The aim of the present invention is the realization of an exhaust hood wherein the sensors are efficiently positioned to increase the automatic operation performance.

[0015] The exhaust hood realized in order to attain the aim of the present invention, explicated in the first claim and the respective claims, comprises at least one first temperature sensor which detects the ambient temperature; at least one second temperature sensor which detect the temperature of the air rising from a cooking device such as countertop cooker, oven, etc. or a cooking vessel thereon; a control unit which enables the exhaust hood to automatically operate according to the information received from the first and second temperature sensors and which also enables the operation level to be automatically adjusted; and a surface which is positioned on the side facing the cooking device and which has thermal conductivity by radiation or convection; and the second temperature sensor detects the temperature of said surface. Thus, almost the entire surface of the exhaust hood is used as a sensor which measures the temperature of the air rising from a cooking device such as cooktop, oven, etc. or from a cooking vessel thereon, in other words measures the activity of the cooker.

[0016] In an embodiment of the invention, the surface is a metal surface and is located on the side of the exhaust hood facing the cooking zones. Thus, instead of measuring the temperature of the air flow, the temperature of the outer metal surface of the exhaust hood is measured by the second temperature sensor. In this embodiment of the present invention, the second temperature sensor is disposed on the surface from the inside of the exhaust hood. Thus, any accumulation of dust, dirt, etc. on the second temperature sensor is prevented. Moreover, the second temperature sensors are prevented from being visible from the outside, and are enabled to be kept in a safe position and as far away from external factors as possible.

[0017] By means of the present invention, a lesser number of second temperature sensors are used instead of using multiple second temperature sensors. Moreover, instead of measuring the hot air, the temperature of the exhaust hood is measured. By using the metal surface of the exhaust hood like a sensor, data can be obtained from all surfaces of the exhaust hood, from many regions, while erroneous measurements caused by the sudden change in the air flow during the measurement of the temperature are prevented.

[0018] The problems arising from varying designs, shapes, types, dimensions of the cooker used under the exhaust hood as well as the number and position of cooking zones make it impossible to collect the hot air rising from the cooking zones in a single path. By means of the present invention, the heating caused by the hot air coming from the cooking zones on the surface of the exhaust hood is measured by using the exhaust hood as a sensor, by means of a second temperature sensor disposed so as to measure the metal surface from the inside. Instead of directing the air flow to a region and measuring the temperature of the air flow in said area, the outer metal surface of the entire exhaust hood is used as a sensor.

[0019] By means of the present invention, by measuring the temperature of the surface manufactured from preferably metal or similar heat-conducting material, which forms the outer part of the exhaust hood, where one and/or more than one second temperature sensor measuring the temperature of the surface is used, in different types, powers and levels of cookers, in different exhaust hood levels, in different types and positions of cooking vessels, it is efficiently provided that the cooking process in any cooking zone of the cooking device is detected, that the load of cooking process as well as the powers/levels of the cooker are detected, that the automatic exhaust hood operating level (motor suction power) is automatically graded and that the termination of the cooking process is detected.

[0020] In the present invention, the second temperature sensor is disposed on the exhaust hood, on a surface of the exhaust hood facing the cooker, on the outer sheet metal thereof. The homogeneous temperature change occurring in this heat-conducting region is detected as a result of the heat reaching by radiation or spreading through the hot air flow path. When the cooking process ends, the exhaust hood starts to cool down since there is no longer a heat source in the environment. Said cooling process does not show a high inertia thanks to the air flow provided by the fan in operation and the high heat conduction characteristic of the surface selected for the measurement of the cooker load temperature, and is completed in the desired time. Thus, it can be detected in a suitable time that a heat source is no longer available in the cooking device and the operation of the exhaust hood is terminated in line with the automatic operation function.

[0021] In an embodiment of the present invention, the second temperature sensor which measures the load of the cooker is disposed at a position on the outer surface of the exhaust hood, which is the hottest during the cooking process, so as to measure the temperature of said surface with or without contact. In the preferred embodiment of the present invention, the second temperature sensor is disposed on the metal surface of the exhaust hood facing the cooker. Thus, without the need for the use of a plurality of sensors, since the heat conductive surface distributes the temperature information at different points homogeneously in accordance with the principles of heat conduction, detection is made from only one point, and a high-performance automatic operation function is provided independent of variables such as the type and/or power of the cooker, the position of the cooking zone, the type of the cooking vessel, the suction level, etc.

[0022] An exhaust hood realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 - is the sideways view of an exhaust hood and a cooking device.

Figure 2 - is the sideways cross-sectional view of the exhaust hood.

[0023] The elements illustrated in the figures are numbered as follows:

1. Exhaust hood
2. Body
3. Suction channel
4. Fan
5. First temperature sensor
6. Second temperature sensor
7. Control unit
8. Cooking device
9. Surface

[0024] The exhaust hood (1) comprises a body (2); a suction channel (3) which is provided in the body (2); a fan (4); at least one first temperature sensor (5) which detects the ambient temperature; at least one second temperature sensor (6) which detect the temperature of the air rising from a cooking device (8) such as countertop cooker, oven, etc. or a cooking vessel thereon; a control unit (7) which enables the exhaust hood (1) to automatically operate according to the information received from the first and second temperature sensors (5 and 6) and which also enables the operation level to be automatically adjusted; and a surface (9) which is positioned on the side facing the cooking device (8) and which has thermal conductivity by radiation or convection; and the second temperature sensor (6) detects the temperature of said surface (9). Thus, almost the entire surface of the exhaust hood (1) is used as a sensor which measures the temperature of the air rising from a cooking device (8) such as cooktop, oven, etc. or from a cooking vessel thereon, in other words measures the activity of the cooker (Figure 1).

[0025] In an embodiment of the present invention, the surface (9) is metal. In the preferred embodiment of the present invention, the surface (9) is located on the side of the exhaust hood (1) facing the cooking zones on the cooking device (8). Thus, instead of measuring the temperature of the air flow, the temperature of the outer metal surface (9) of the exhaust hood (1) is measured by the second temperature sensor (6). In this embodiment of the present invention, the second temperature sensor (6) is disposed on the surface (9) from the inside of the exhaust hood (1). Thus, any accumulation of dust, dirt, etc. on the second temperature sensor (6) is prevented. Moreover, the second temperature sensors (6) are prevented from being visible from the outside, and are enabled to be kept in a safe position and as far away from external factors as possible.

[0026] In the present invention, the second temperature sensor (6) is disposed on the exhaust hood (1), on the surface of the exhaust hood (1) facing the cooking device (8), preferably on the outer sheet metal thereof. The homogeneous temperature change occurring in this heat-conducting region is detected as a result of the heat reaching by radiation or spreading through the hot air flow path. When the cooking process ends, the exhaust hood (1) starts to cool down since there is no longer a heat source in the environment. Said cooling process does not show a high inertia thanks to the air flow provided by the fan (4) in the suction channel (3) in operation and the high heat conduction characteristic of the surface (9) selected for the measurement of the cooker load temperature, and is completed in the desired time. Thus, it can be detected in a suitable time that a heat source is no longer available in the cooking device (8) and the operation of the exhaust hood (1) is terminated in line with the automatic operation function (Figure 2).

[0027] In an embodiment of the present invention, the second temperature sensor (6) which measures the load of the cooking device (8) is disposed at a position on the outer surface of the exhaust hood (1), which is the hottest during the cooking process, so as to measure the temperature of said surface (9) with or without contact. In the preferred embodiment of the present invention, the second temperature sensor (6) is disposed on the metal surface (9) of the exhaust hood (1) facing the cooking device. Thus, without the need for the use of a plurality of sensors, since the heat conductive surface (9) distributes the temperature information at different points homogeneously in accordance with the principles of heat conduction, detection is made from only one point, and a high-performance automatic operation function is provided independent of variables such as the type and/or power of the cooker, the position of the cooking zone, the type of the cooking vessel, the suction level, etc.

[0028] By means of the present invention, a lesser number of second temperature sensors (6) are used instead of using multiple second temperature sensors (6). Moreover, instead of measuring the hot air, the temperature of the exhaust hood (1) is measured. By using the metal surface (9) of the exhaust hood (1) like a sensor, data can be obtained from all surfaces of the exhaust hood (1), from many regions, while erroneous measurements caused by the sudden change in the air flow during the measurement of the temperature are prevented.

[0029] The problems arising from varying designs, shapes, types, dimensions of the cooker used under the exhaust hood (1) as well as the number and position of cooking zones make it impossible to collect the hot air rising from the cooking zones in a single path. By means of the present invention, the heating caused by the hot air coming from the cooking zones on the surface (9) of the exhaust hood (1) is measured by using the exhaust hood (1) as a sensor, by means of a second temperature sensor (6) disposed so as to measure the metal surface (9) from the inside. Instead of directing the air flow to a region and measuring the temperature of the air flow in said area, the outer metal surface (9) of the entire exhaust hood (1) is used as a sensor.

[0030] By means of the present invention, by measuring the temperature of the surface (9) manufactured from preferably metal or similar heat-conducting material, which forms the outer part of the exhaust hood (1), where one and/or more than one second temperature sensor (6) measuring the temperature of the surface (9) is used, in different types, powers and levels of cookers, in different exhaust hood (1) levels, in different types and positions of cooking vessels, it is efficiently provided that the cooking process in any cooking zone of the cooking device (8) is detected, that the load of cooking process as well as the powers/levels of the cooker are detected, that the automatic exhaust hood (1) operating level (motor suction power) is automatically graded and that the termination of the cooking process is detected.

Claims

1. An exhaust hood (1) **comprising** a body (2); a suction channel (3) which is provided in the body (2); a fan (4); at least one first temperature sensor (5) which detects the ambient temperature; at least one second temperature sensor (6) which detect the temperature of the air rising from a cooking device (8) such as countertop cooker, oven, etc. or a cooking vessel thereon; a control unit (7) which enables the exhaust hood (1) to automatically operate according to the information received from the first and second temperature sensors (5 and 6) and which also enables the operation level to be automatically adjusted; **characterized by** a surface (9) which is positioned on the side facing the cooking device (8) and which has thermal conductivity by radiation or convection and the second temperature sensor (6) which detects the temperature of said surface (9).

2. An exhaust hood (1) as in Claim 1, **characterized by** the surface (9) which is manufactured from heat conductive material.

3. An exhaust hood (1) as in Claim 1 or 2, **characterized by** the surface (9) which is metal.

4. An exhaust hood (1) as in any one of the above claims, **characterized by** the surface (9) which is located on the side thereof facing the cooking zones on the cooking device (8).

5. An exhaust hood (1) as in any one of the above claims, **characterized by** the second temperature sensor (6) which is disposed on the surface (9) from the inside of the exhaust hood (1).

6. An exhaust hood (1) as in any one of Claims 1 to 5, **characterized by** the second temperature sensor (6) which is disposed on the exhaust hood (1), on the outer sheet metal of the exhaust hood (1) facing the cooking device (8).

7. An exhaust hood (1) as in Claim 1, **characterized by** the second temperature sensor (6) which is disposed so as to measure the temperature of the surface (9) with or without contact.

Figure 1

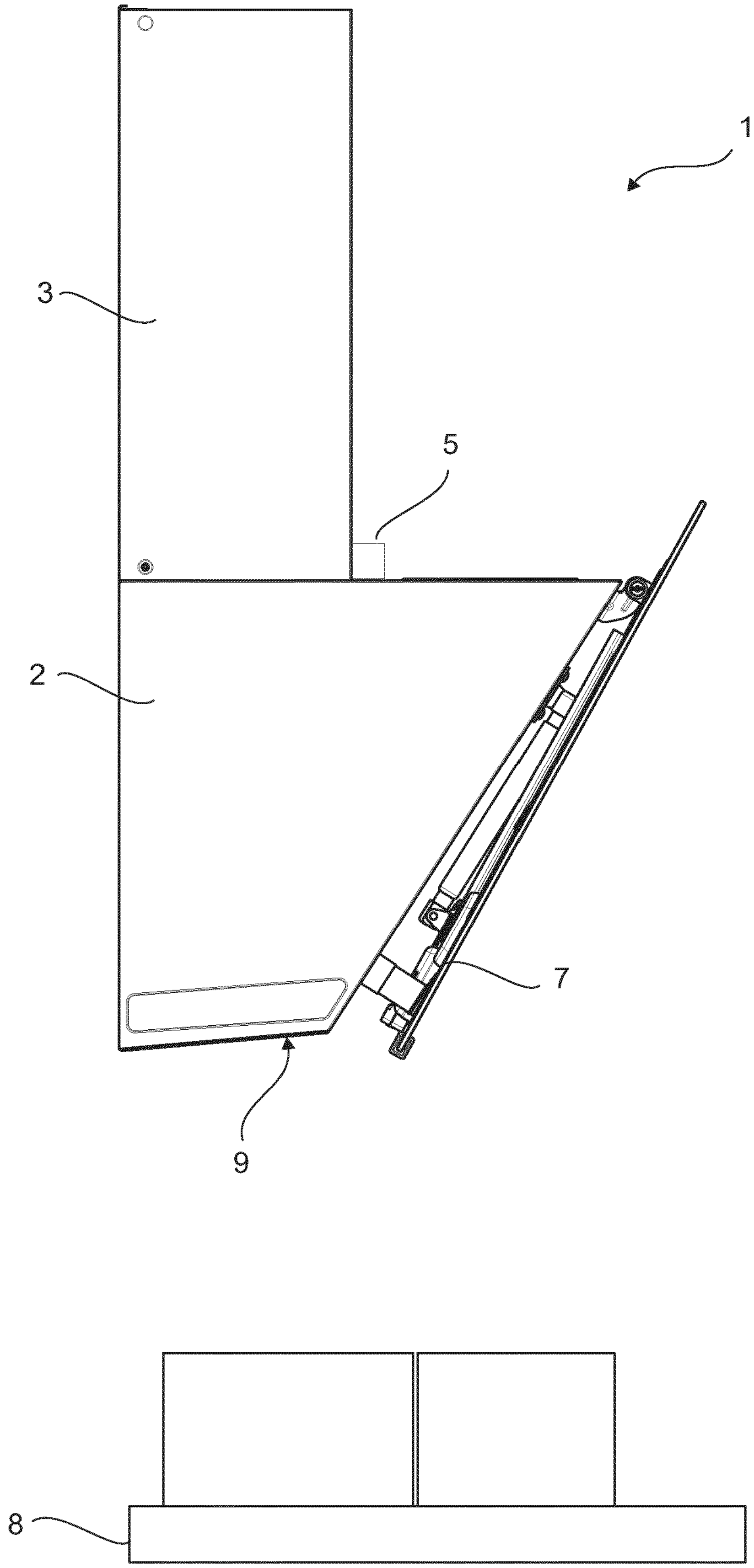
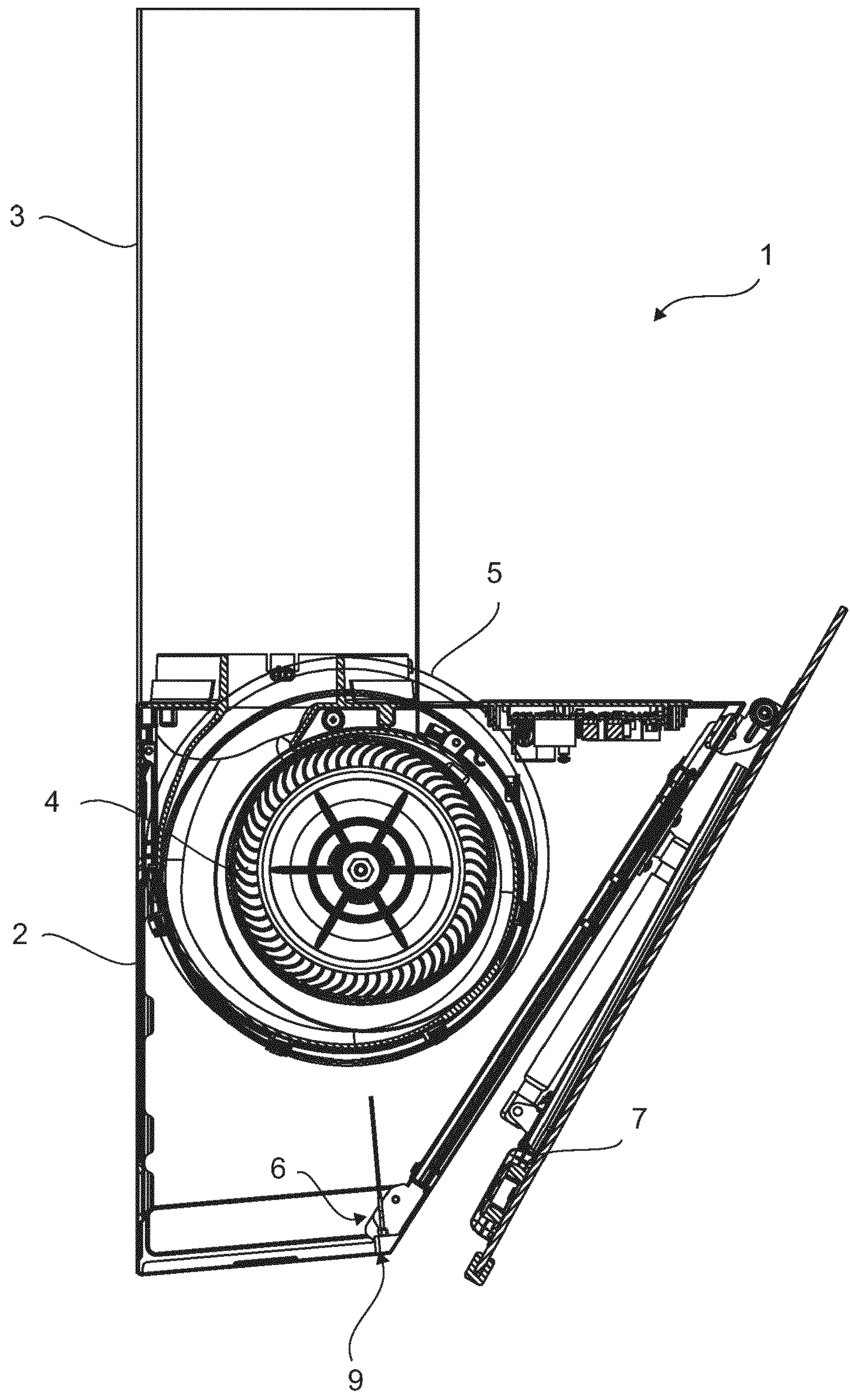


Figure 2



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EUROPEAN SEARCH REPORT

Application Number
EP 23 17 0669

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	EP 1 258 687 A1 (BRANDT COOKING [FR]) 20 November 2002 (2002-11-20) * paragraphs [0001], [0011], [0033] - [0047]; figures * -----	1-7	INV. F24C15/20
Y	JP 2022 086131 A (FUJI INDUSTRIES CO LTD) 9 June 2022 (2022-06-09) * paragraphs [0045] - [0047], [0052]; figures * -----	1-7	

TECHNICAL FIELDS SEARCHED (IPC)

F24C
F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	1 November 2023	Verdoodt, Luk

1

CATEGORY OF CITED DOCUMENTS

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EP 23 17 0669

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01-11-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1258687 A1	20-11-2002	DE 60202550 T2	16-02-2006
		EP 1258687 A1	20-11-2002
		ES 2236456 T3	16-07-2005
		FR 2824894 A1	22-11-2002
JP 2022086131 A	09-06-2022	NONE	

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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

- DE 102006041581 **[0010]**
- CN 2491733 **[0011]**
- DE 3922090 **[0012]**
- WO 2020078670 A **[0013]**