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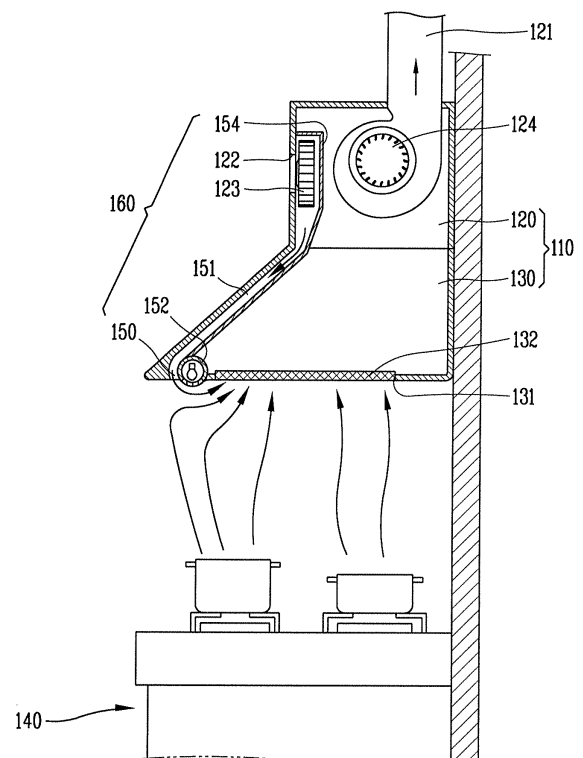
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(54) Hood ventilation system

(57) A hood ventilation system of the present invention comprises a hood installed over a cooking source and having an intake opening at a surface of the hood opposed to the cooking source in order that air including cooking by-products generated from the cooking source can be sucked into the intake opening; a first air suction means installed in the hood and generating suction force for sucking air through the intake opening and exhausting air through an exhaust duct communicated with the first air suction means to the outside; and a second air suction means installed at the hood and generating suction force in order that air escaping from the intake opening can be introduced into the intake opening, whereby indoor environments can be comfortably maintained and air containing cooking by-products generated during cooking can be effectively exhausted to the outside.

FIG. 3



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a hood ventilation system, and more particularly, to a hood ventilation system capable of effectively exhausting air containing cooking by-products generated during cooking to the outside in order to maintain comfortable indoor environments.

2. Description of the Background Art

[0002] In general, a hood ventilation system is installed over cooking appliances, heat sources, such as a microwave range, an electric oven and the like such that air containing pollutants generated during cooking of the foods in household kitchens or in restaurants can be exhausted to an external environment.

[0003] Figure 1 is a perspective view showing the conventional hood ventilation system, and Figure 2 is a longitudinal sectional view showing an installation structure of the conventional hood ventilation system and its state of use.

[0004] As shown therein, the conventional hood ventilation system includes: a hood 10 installed at a support 15 such as a mounting wall so as to be placed over a cooking source 40, separating from the cooking source 40 such as a gas stove or a cooktop by a certain space; a grease filter 32 mounted at an intake opening 31 formed at an opening of the hood 10 which is opposed to an upper surface of the cooking source 40 and removing grease particles and aerosol particles generated during cooking; a blower means 22 mounted at an upper side in the hood 10 for generating intake airstreams; and an exhaust duct 21 connected at an upper portion in the hood 10 and guiding air having passed the hood 10 so that the air can be exhausted to the outside.

[0005] The hood 10 includes: an air collecting chamber 30 having a canopy shape that its lower area is large, its upper area is small and its inside is penetratingly formed so as to collect air; and a machinery chamber 20 extending from and communicating with an upper portion of the air collecting chamber 30, and having the blower means 22 therein communicated with the exhaust duct 21.

[0006] The intake opening 31 is formed at a lower surface of the air collecting chamber 30 opposed to the cooking appliance, and the grease filter 32 is mounted to stop up the entire intake opening 31.

[0007] Since the grease filter 32 is constructed to allow air to be ventilated, air generated from the cooking appliance, the heat source, is sucked into the air collecting chamber 30, and grease, aerosol cooking by-products which are included in the air are filtered by the grease filter 32.

[0008] The blower means 22 includes a motor (not

shown) and a fan 23 connected to a rotary axis of the motor, and rotating by rotation force of the motor and generating airstreams. A concentric fan is used as the fan 23.

[0009] An operation of the conventional hood ventilation system will be described as follows.

[0010] Firstly, the hood ventilation system is operated simultaneously with when cooking foods in the cooking source 40.

[0011] When the power is supplied to the motor constituting the blower means 22, the motor operates to thereby rotate the fan 23 to generate airstreams by suction force.

[0012] At the same time, air including cooking by-products produced during cooking by the cooking source 40 is carried upward by natural convection, passes the grease filter 32 by the suction force produced by the fan 23 and then is sucked into the air collecting chamber 30. Air sucked into the air collecting chamber 30 is exhausted to the outside through the fan 23 and the exhaust duct 21. In addition, when air passes the grease filter 32, the grease particles, the aerosol particles and the like are filtered through the grease filter 32.

[0013] However, in the conventional hood ventilation system, as shown in Figure 2, when air containing the cooking by-products during cooking flows upward by the convection and then is sucked into the air collecting chamber of the hood, the air is smoothly sucked into a suction region of the lower surface of the air collecting chamber having the grease filter and is discharged to the outside through the exhaust duct, but the efficiency for capturing hot and pollutant air from the cooking source rapidly drops off.

[0014] In particular, when the suction force of the fan is low, such a phenomenon becomes worse. Even though the suction force of the fan is increased to enhance the air collecting efficiency, suction speed of air which rises towards the region distant from the suction region of the grease filter is lowered due to the flow resistance factor by the grease filter and finally polluted air spreads toward a user along an outer circumference of the lower surface of the air collecting chamber of the hood.

[0015] In addition, since the suction force by the fan is lowered in inverse proportion to the square of a distance from a suction surface of the air collecting chamber of the hood, even though the suction force acts greatly on the suction surface, air generated from the heat source cannot be effectively collected in the hood if the distance toward the heat source gets far away.

[0016] The air containing the cooking by-products which are not collected within the hood flows in the room, contaminating indoor air.

[0017] Accordingly, the user feels unpleasant considerably, and it becomes hard to maintain comfortable indoor environments.

SUMMARY OF THE INVENTION

[0018] Therefore, an object of the present invention is to provide a hood ventilation system capable of efficiently exhausting air containing cooking by-products generated during cooking in order to maintain comfortable indoor environments.

[0019] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described herein, there is provided a hood ventilation system comprising: a hood installed over a cooking source and having an intake opening at a surface of the hood opposed to the cooking source in order that air including cooking by-products generated from the cooking source can be sucked into the intake opening; a first air suction means installed in the hood and generating suction force for sucking air through the intake opening and exhausting air through an exhaust duct communicated with the first air suction means to the outside; and a second air suction means installed at the hood and generating suction force in order that air escaping from the intake opening can be introduced into the intake opening.

[0020] The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0022] In the drawings:

Figure 1 is a perspective view showing the conventional hood ventilation system;

Figure 2 is a longitudinal sectional view showing an installation structure of the conventional hood ventilation system and its state of use;

Figure 3 is a longitudinal sectional view showing a structure of a hood ventilation system in accordance with a first embodiment of the present invention;

Figure 4 is an enlarged view showing an important part of the hood ventilation system in accordance with the first embodiment of the present invention;

Figure 5 shows a hood ventilation system of the present invention in accordance with the second embodiment;

Figure 6 is a CFD result showing a velocity field of airflow through the second air suction means of the present invention;

Figure 7 is a CFD result showing a pressure field of airflow through the second air suction means of the

present invention; and

Figure 8 is a CFD result showing an airflow locus by the second air suction means of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0023] Reference will now be made in detail to a hood ventilation system of the present invention, examples of which are illustrated in the accompanying drawings.

[0024] There can be a plurality of embodiments in accordance with the present invention, and, hereinafter, the most preferable embodiment will be described.

[0025] In addition, it should be understood that the above-described embodiments are not limited by any of the details of the foregoing specific embodiment, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims.

[0026] Figure 3 is a longitudinal sectional view showing a structure of a hood ventilation system in accordance with a first embodiment of the present invention, and Figure 4 is an enlarged view showing an important part of the hood ventilation system in accordance with the first embodiment of the present invention.

[0027] As shown therein, a hood ventilation system in accordance with the first embodiment of the present invention includes: a hood 110 installed over and apart from a cooking source 140 and having an intake opening 131 at a lower surface of the hood opposed to the cooking source 140 in order that air including cooking by-products generated from the cooking source 140 can be sucked into the intake opening 131; a first air suction means 124 installed in the hood 110 and generating suction force for sucking air through the intake opening 131 and exhausting air through an exhaust duct 121 communicated with the first air suction means 124 to the outside; and a second air suction means 160 installed at the hood 110 and generating suction force in order that air escaping from the intake opening 131 can be introduced into the intake opening 131.

[0028] The hood 110 includes: an air collecting chamber 130 having a canopy shape that its lower part is large, its upper part is small and the inside is penetratingly formed to collect air; and a machinery chamber 120 extending from and communicating with an upper portion of the air collecting chamber 130, and having the first air suction means 124 therein communicated with the exhaust duct 121.

[0029] The intake opening 131 is formed at a lower surface of the air collecting chamber 130 opposed to the cooking source 140, and a filter device 132 is mounted at the intake opening 131 of the hood 110 for filtering air so as to stop up the entire intake opening 131. In general, a grease filter is mounted as the filter device 132.

[0030] Since the grease filter is constructed to allow air to be ventilated, air generated from the cooking source

passes through the grease filter and then is sucked into the air collecting chamber 130, and grease, aerosol cooking by-products included in the air are filtered by the grease filter.

[0031] The first air suction means 124 includes a motor (not shown) and a fan connected to a rotary axis of the motor, and rotating by rotation force of the motor and generating airstreams. In general, a sirocco fan of a double suction type is used as the fan.

[0032] As for the second air suction means 160, when air, including heat, cooking by-products and the like generated during cooking, which has risen toward the intake opening 131 of the hood 110 by the action of natural convection is not sucked to the intake opening 131, and so passes a lower circumferential edge of the air collecting chamber 130 and spreads out into the room, in order to introduce the spreading air into the intake opening 131, the second air suction means 160 forms negative pressure field around an outer circumference of the intake opening 131 and thus supplies suction force in a direction of the intake opening 131. This will be described as follows.

[0033] As shown in Figure 4, the second air suction means 160 includes: a walljet channel 151 having an air suction opening 122 at its one side and a blower fan 123 installed therein for allowing air outside the hood 110 to flow in through the air suction opening 122, and formed at a wall surface of the hood in order that the air having flowed in can be sprayed through a slit 150 formed in the vicinity of the intake opening 131; and an airflow guide portion 152 extending from the slit 150 and protrudingly formed around the intake opening 131 for generating negative pressure around a surface of the airflow guide portion itself while the air sprayed from the slit 150 moves along the surface.

[0034] The walljet channel 151 is formed within the hood 110 along an inner wall surface of the hood by a channel forming member 154 separated from the inner wall of the hood 110 by a certain interval. The airflow guide portion 152 is formed of a circular hollow member so as to be integrally connected to the airflow forming member 154. In addition, in the airflow guide portion 152, a part of its outer circumferential surface predeterminedly protrudes downward with respect to the lower surface of the air collecting chamber 130 of the hood 110. That is, the protruding surface of the airflow guide portion is formed as a curved surface facing the intake opening. In addition, the walljet channel 151 adjacent to the slit 150 is bent towards the airflow guide portion 152 such that the air sprayed through the slit 150 can be easily introduced to the airflow guide portion 152.

[0035] Moreover, though not shown in the drawings, according to designs, the walljet channel 150 is preferably formed outside the hood 110 by installing the channel forming member separated from the outer wall of the hood 100 by a predetermined interval. In addition, it also can be formed through a separate walljet channel pipe.

[0036] In addition, the slit 150 and the airflow guide

portion 152 formed at an outlet side of the walljet channel 151 are preferably formed to encompass a circumference of the intake opening 131.

[0037] Meanwhile, a light transmission window 161 is formed at the protruding surface of the airflow guide portion 152, which is provided with a lighting source 162, thereby making the surroundings of the hood bright and improving appearance.

[0038] Velocity of air which flows through the walljet channel 150 and is sprayed through the slit 150 is appropriately 3 to 5 m/s. This is due to following reasons. If the velocity is less than 3 m/s, negative pressure is not stably generated around a surface of the airflow guide portion 152 because of the weak coanda effect but there is a problem that the speed is low. If the velocity is more than 5 m/s, the negative pressure cannot be formed because separation of airstreams occurs at the surface of the airflow guide portion 152.

[0039] An operation of the hood ventilation system in accordance with the first embodiment of the present invention will be described as follows.

[0040] Firstly, the hood ventilation system in accordance with the present invention is operated simultaneously with when cooking foods in the cooking source 140.

[0041] When the power is supplied to the motor constituting the first air suction means 124, the motor operates to thereby rotate the fan to generate airstreams by suction force.

[0042] At this time, air including cooking by-products generated during cooking in the cooking source 140 is carried upward by convection, passes the grease filter mounted at the lower surface of the air collecting chamber 130 of the hood by the suction force produced by the first air suction means 124 to thereby filter the cooking by-products and then is sucked into the air collecting chamber 130. Air sucked into the air collecting chamber 130 is exhausted to the outside through the exhaust duct 121.

[0043] At the same time, the second air suction means 160 operates to improve air collection efficiency through the intake opening. That is, air outside the hood flows in by the blower fan 123 installed within the walljet channel 151, flows along the walljet channel 151 and is sprayed at the proper speed through the slit 150. The sprayed air flows along the protruding surface of the airflow guide portion 152, and at this time, the negative pressure is formed around the surface by the coanda effect. Accordingly, the air containing the cooking by-products which has not been sucked into the intake opening by the suction force of the first air suction means 124 but spread out becomes flowing in a direction of the intake opening 131 by the pressure difference generated because of the negative pressure produced around the airflow guide portion 152. The air having flowed towards the intake opening flows into the hood 110 through the intake opening 131 and then is exhausted to the outside through the exhaust duct 121.

[0044] Hereinafter, the second embodiment of the

hood ventilation system of the present invention, especially the second air suction means, will be described in detail.

[0045] Figure 5 shows a hood ventilation system of the present invention in accordance with the second embodiment. Here, since other constituents except for the second air suction means of the hood ventilation system in accordance with the second embodiment of the present invention are the same as those of the first embodiment, a detailed description for them will be omitted.

[0046] As shown therein, a second air suction means 180 of the hood ventilation system in accordance with the second embodiment of the present invention includes: a walljet channel 171 having one side communicating with the exhaust duct 121 such that air can flow therein from the exhaust duct 121, and formed at a wall surface of the hood 110 in order that the air having flowed therein can be sprayed through a slit 170 formed in the vicinity of the intake opening 131; and an airflow guide portion 172 extending from the slit 170 and protrudingly formed around the intake opening 131 for generating negative pressure a surface of the airflow guide portion itself while the air sprayed from the slit 170 moves along the surface.

[0047] That is, by making one end of the walljet channel 171 communicate with the exhaust duct 121 without using a separate blower fan as a blower source which allows air to flow through the walljet channel 171, part of air sucked through the intake opening 131 by the first air suction means 124 and exhausted through the exhaust duct 121 flows within the walljet channel 171.

[0048] Air flowing through the walljet channel 171 is sprayed through the slit 170 and flows towards the intake opening 131 along the protruding surface of the airflow guide portion 172. At this time, the negative pressure is formed on the surface of the airflow guide portion 172 and the ambient air is introduced to the intake opening 131 by the pressure difference.

[0049] As shown in Figure 5, a more detailed description on the airflow guide portion and the walljet channel of the second embodiment of the present invention is the same as that of the first embodiment, and thus the description will be omitted.

[0050] Firstly, the hood ventilation system of the present invention is operated simultaneously with when cooking foods in the cooking source 140.

[0051] When the power is supplied to the motor constituting the first air suction means 124, the motor operates to thereby rotate the fan to generate airstreams by suction force.

[0052] At this time, air including cooking by-products generated during cooking in the cooking source 140 is carried upward by convection, passes the grease filter 123 mounted at the lower surface of the air collecting chamber 130 of the hood by the suction force produced by the first air suction means 124 to thereby filter the cooking by-products and then is sucked into the air collecting chamber 130. Air sucked into the air collecting

chamber 130 is exhausted to the outside through the exhaust duct 121.

[0053] At the same time, the second air suction means 180 operates to improve air collection efficiency through the intake opening. That is, part of air passing the exhaust duct 121 and exhausted to the outside is introduced within the walljet channel 171 communicating with the exhaust duct 21, and the introduced air passes the walljet channel 171 and then is sprayed at the proper speed through the slit 170. The air sprayed through the slit 170 flows in a direction of the intake opening 131 along the protruding surface of the airflow guide portion 172. At this time, negative pressure is formed around the airflow guide portion 172, which allows air which has not been sucked into the intake opening 131 by the first air suction means 124 but spread out to be introduced towards the intake opening 131 by the pressure difference of air. The introduced air flows into the hood 110 through the intake opening 131 and then is exhausted to the outside through the exhaust duct 121.

[0054] Figures 6 and 8 are graphs showing that performance of the hood ventilation system in accordance with the present invention is analyzed using computational fluid dynamics (CFD). Figure 6 is a graph showing a velocity vector field of airflow through the second air suction means of the present invention, Figure 7 is a graph showing a pressure field of airflow through the second air suction means of the present invention and Figure 8 is a graph showing an airflow locus by the second air suction means of the present invention.

[0055] As shown in Figures 6 and 7, it can be checked that as air sprayed through the walljet channel 151 and 171 is guided and flows by the airflow guide portion 152 and 172, negative pressure is generated around the airflow guide portions 152 and 157 toward the intake opening 131 by the coanda effect.

[0056] In addition, as shown in Figure 8, it also can be checked that air containing the cooking by-products which spreads toward a lower circumferential edge of the air collecting chamber 130 of the hood 110 is sucked into the intake opening 131 by suction force according to the fact that the negative pressure is formed around the airflow guide portions 152 and 157 toward the intake opening 131.

[0057] As so far described, the hood ventilation system in accordance with the present invention can improve efficiency in collecting contaminated air produced during cooking and maintain comfortable indoor environments by introducing part of air including cooking by-products, which has not been sucked into the intake opening around the and spread in the vicinity of the intake opening by the pressure difference caused by artificial generation of negative pressure, to the hood.

[0058] In addition, by additionally operating the second air suction means at a low suction velocity by the first air suction means, air containing cooking by-products can be exhausted through the hood at low power consumption and more efficiently.

[0059] In addition, by installing a lighting system in the airflow guide portion, appearance and diversity in a design method are improved.

[0060] As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalence of such metes and bounds are therefore intended to be embraced by the appended claims.

Claims

1. A hood ventilation system, comprising:

a hood installed over a cooking source and having an intake opening at a surface of the hood opposed to the cooking source in order that air including cooking by-products generated from the cooking source can be sucked into the intake opening;

a first air suction means installed in the hood and generating suction force for sucking air through the intake opening and exhausting air through an exhaust duct communicated with the first air suction means to the outside; and
a second air suction means installed at the hood and generating suction force in order that air escaping from the intake opening can be introduced into the intake opening.

2. The system of claim 1, wherein the second air suction means generates negative pressure in the vicinity of an outer circumference of the intake opening.

3. The system of claim 2, wherein the second air suction means comprises:

a walljet channel having an air suction opening at its one side and a blower fan installed therein for allowing air outside the hood to flow in through the air suction opening, and formed at a wall surface of the hood in order that the air having flowed in can be sprayed through a slit formed around the intake opening; and
an airflow guide portion extending from the slit and protrudingly formed around the intake opening for generating negative pressure around a surface of the airflow guide portion itself while the air sprayed from the slit moves along the surface.

4. The system of claim 3, wherein the walljet channel

is formed at an outer wall of the hood

5. The system of claim 3, wherein the walljet channel is formed at an inner wall of the hood.

6. The system of claim 3, wherein a protruding surface of the airflow guide portion is formed as a curved shape.

7. The system of claim 3, wherein the walljet channel around the slit is formed to be curved towards the airflow guide portion so that air sprayed through the slit can be easily introduced to the airflow guide portion.

8. The system of claim 3, wherein the slit and the airflow guide portion are formed to encompass a circumference of the intake opening.

9. The system of claim 3, wherein the airflow guide portion is formed of a circular hollow member, is provided with a light transmission window, and has a lighting source installed therein.

10. The system of claim 3, wherein velocity of air flowing through the walljet channel is 3 to 5 m/s.

11. The system of claim 2, wherein the second air suction means comprises:

a walljet channel having one side communicating with the exhaust duct such that air can flow therein from the exhaust duct and formed at a wall surface of the hood in order that the air having flowed therein can be sprayed through a slit formed around the intake opening; and
an airflow guide portion extending from the slit and protrudingly formed around the intake opening for generating negative pressure around a surface of the airflow guide portion itself while the air sprayed from the slit moves along the surface.

12. The system of claim 11, wherein the walljet channel is formed at an outer wall of the hood.

13. The system of claim 11, wherein the walljet channel is formed at an inner wall of the hood.

14. The system of claim 11, wherein a surface of the airflow guide portion is formed as a curved surface.

15. The system of claim 11, wherein the walljet channel in the vicinity of the slit is formed to be curved towards the airflow guide portion so that air sprayed through the slit can be easily introduced to the airflow guide portion.

16. The system of claim 11, wherein the slit and the air-flow guide portion are formed to encompass a circumference of the intake opening.
17. The system of claim 11, wherein a light transmittance window is formed at a protruding surface of the air-flow guide portion, in which a lighting source is installed. 5
18. The system of claim 11, wherein velocity of air which flows through the walljet channel and is sprayed through the slit is 3 to 5 m/s. 10

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FIG. 1

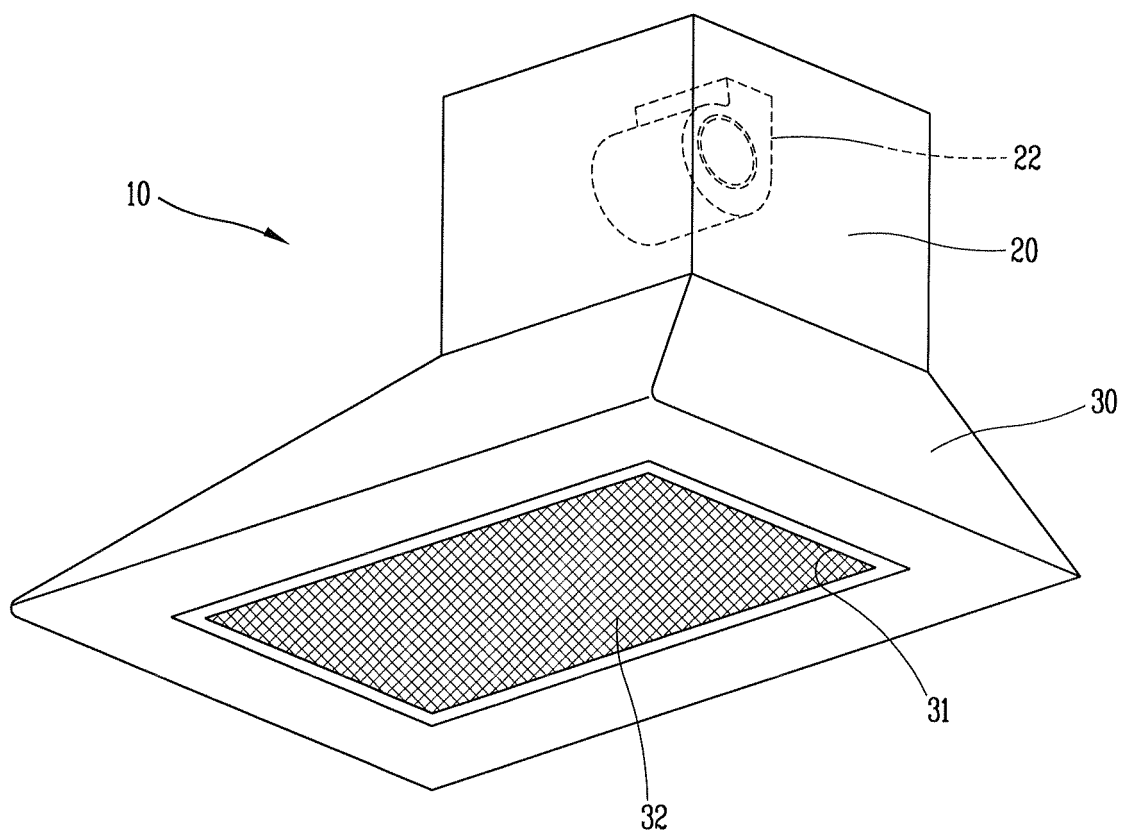


FIG. 2

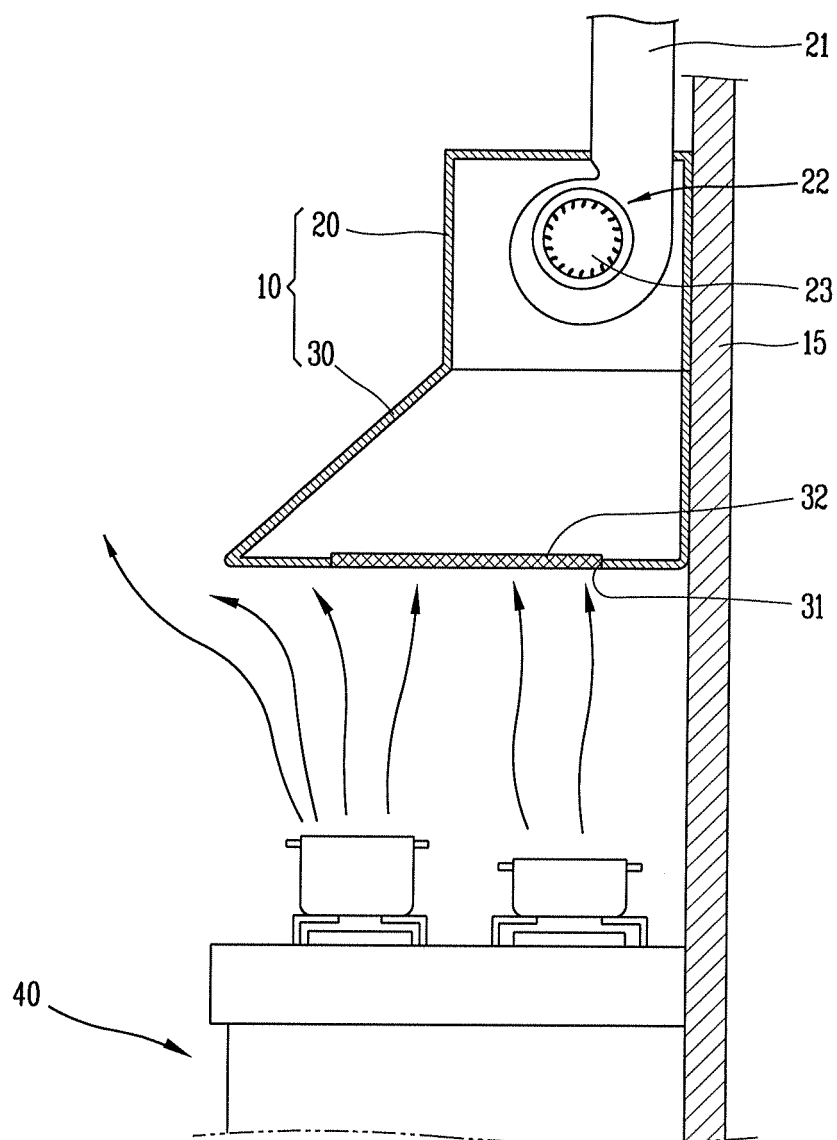


FIG. 3

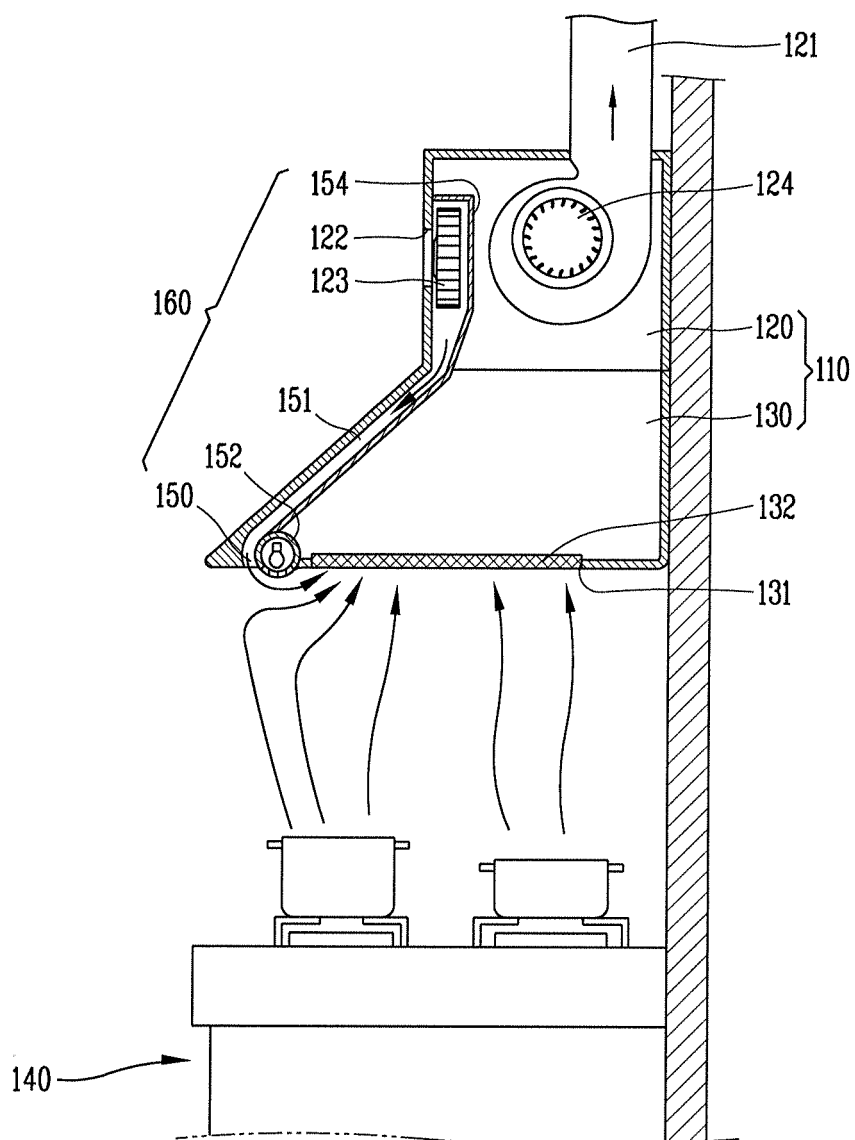


FIG. 4

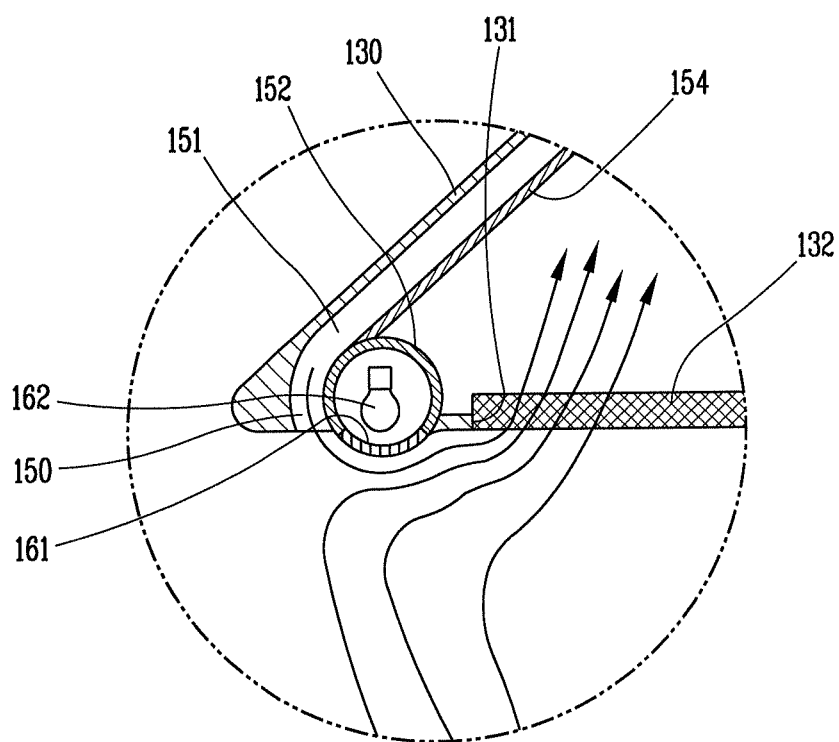


FIG. 5

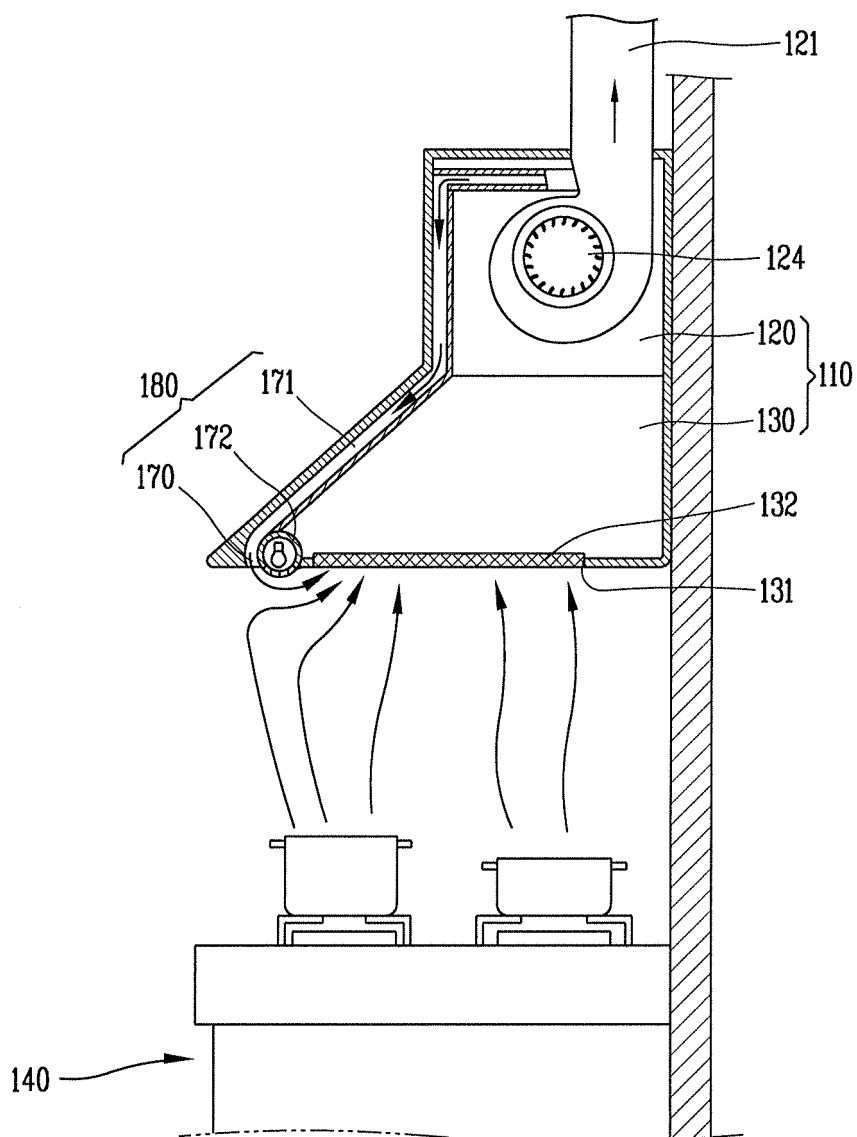


FIG. 6

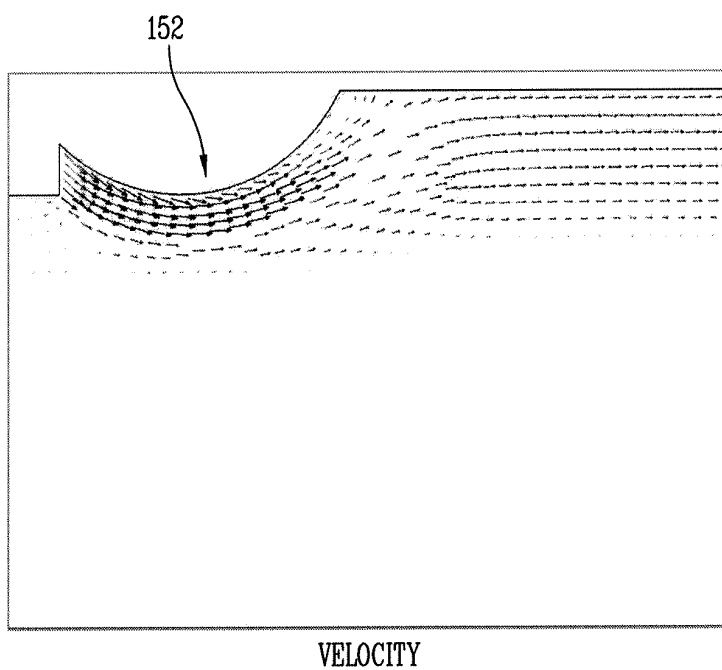


FIG. 7

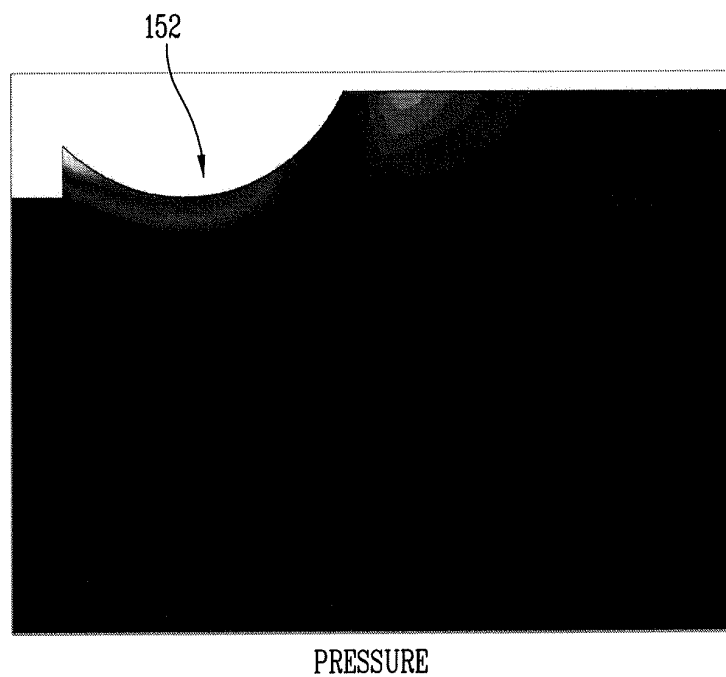
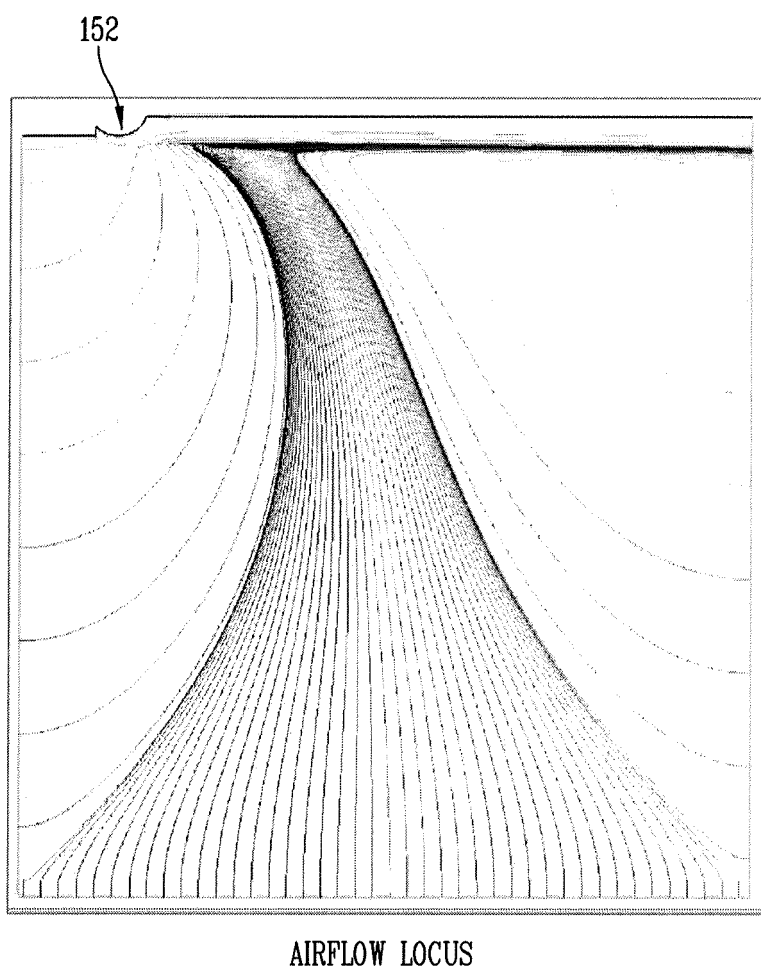


FIG. 8





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 10 6845

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 13 December 2005	Examiner Vanheusden, J
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EPO FORM 1503 03/02 (P04/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 10 6845

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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