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(11)

EP 1 637 810 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.03.2006 Bulletin 2006/12

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

(21) Application number: **04106777.8**

(22) Date of filing: **21.12.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL BA HR LV MK YU

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(30) Priority: **20.09.2004 KR 2004075211**

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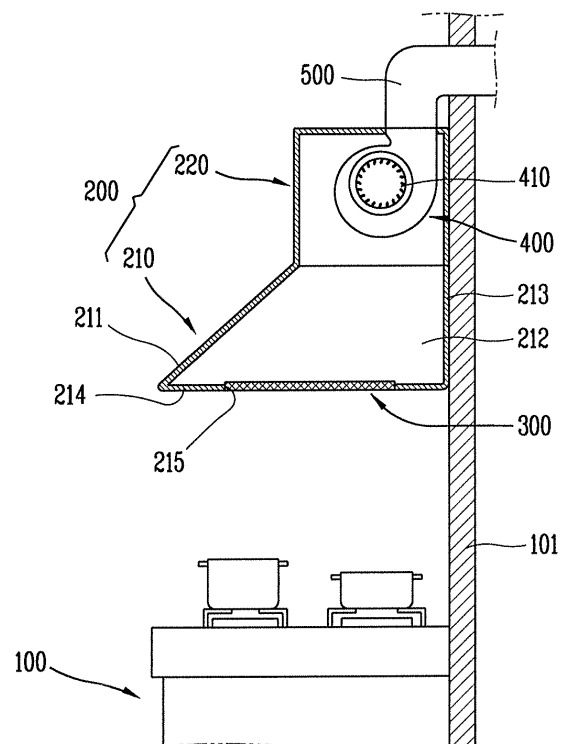
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(54) Kitchen exhaust system

(57) A kitchen exhaust system comprises: a hood installed above a heating source, for sucking/exhausting the contaminated air; a blower means mounted inside the hood, for generating a suction force to suck the contaminated air into the hood; an air-curtain spray means provided in the hood, for spraying the air and forming an air-curtain so as to introduce the contaminated air flowing out of a suction side of the hood toward the suction side; and a filtering means mounted at an air suction side of the hood, for filtering the contaminated air. Accordingly, the contaminated air such as combustion gas, fumes, micro oil, aerosol and the like generated during cooking can be effectively exhausted to the outside.

FIG. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a kitchen exhaust system, and more particularly, to a kitchen exhaust system capable of effectively exhausting the contaminated air such as combustion gas, odor, micro oil or the like generated during cooking.

2. Description of the Background Art

[0002] When food items are cooked in a kitchen or a restaurant, odor and contaminated air are generated. To remove the contaminated air such as odor, fumes, oil particles or the like generated during cooking, a kitchen exhaust system is installed above a gas range, an electric oven or the like, which is a heating source.

[0003] Figures 1 and 2 are a side sectional view and a bottom view showing one example of a kitchen exhaust system in accordance with the conventional art. As shown, the kitchen exhaust system includes: a hood 200 installed at a mounting wall (101) or the like and positioning above a heating source 100 such as a gas range, a cooktop or the like at a certain distance; a grease filter 300 mounted at an inlet side facing an upper surface of the heating source 100, of the hood 200, namely, at a suction side, for removing oil particles and particles in a state of aerosol generated in cooking; a blower means 400 mounted to an upper side inside the hood 200, for generating a flow of the suction air; and an exhaust pipe 500 connected to an upper portion of the hood 200, for allowing the air passing through the hood 200 to be exhausted to the outside.

[0004] The hood 200 is provided with a collection case part 210 and a mounting case part 220. Here, the collection case part 210 has a large area at its lower portion, and a small area at its upper portion, and its inside is penetratingly formed. And the mounting case part 220 is extendingly formed at the upper portion of the collection case part 210 and has a blower means 400 therein.

[0005] The collection case part 210 is provided with a front surface 211 formed as a trapezoid shape; both side surfaces 212 extendingly formed at both sides of the front surface 211 as a trapezoid shape; a rear surface 213 connecting both side surfaces 212; and a lower surface 214 having a penetrating hole 215 therein. The lower surface 214 of the collection case part 210 becomes a suction side through which the air is introduced, and its upper portion becomes an exhaust side through which the introduced air is exhausted.

[0006] The grease filter 300 is formed to have a certain area. The grease filter 300 is mounted at the penetrating hole 215 on the lower surface of the collection case part.

[0007] The blower means 400 includes: a motor (not shown); and a blower fan 410 connected to a rotary shaft

of the motor and generating a flow by being rotated by a rotary force of the motor. A centrifugal fan is used as the blower fan 410.

[0008] The operation of the kitchen exhaust system as described above will now be described.

[0009] First, the kitchen exhaust system is operated when food items are cooked on a heating source 100.

[0010] When power is supplied to the motor constituting the blower means 400, the motor is operated, and the blower fan 410 is rotated by the operation of the motor, thereby generating a flow of the air, namely, a suction force.

[0011] Simultaneously, the contaminated air generated from the food being cooked by the heating source 100 flows upward by convection, and is sucked into the collection case part 210 via the grease filter 300 mounted at the lower surface 214 of the collection case part 210 of the hood by the suction force that is generated by the blower fan 410. The contaminated air sucked in the collection case part 210 is exhausted to the outside through the blower fan 410 and an exhaust pipe 500. While the contaminated air passes through the grease filter 300, oil particles, particles in a state of aerosol and the like generated during cooking are filtered by the grease filter 300 to be removed.

[0012] However, the conventional kitchen exhaust system as described above has following problems.

[0013] As shown in Figure 3, the contaminated air generated during cooking flows upward by convection. At this time, only the contaminated air which is near a suction surface, is easily sucked through the suction surface to thereby be exhausted to the outside through an exhaust pipe 500. However, the contaminated air which is far from the suction surface is not sucked through the suction surface of the hood but flows inside a room, contaminating the indoor air. Also, a suction force generated by rotation of the blower fan 410 is weakened in inverse proportion to the square of a distance between the suction surface and the heating source 100. Therefore, even if great suction force works on the suction surface, when the distance between the suction surface and the heating source 100 is long, the contaminated air generated at the heating source 100 cannot effectively be sucked to the suction surface. However, the hood 200 should not be positioned adjacent to the heating source 100 because of possible breakout of fire or the like, and the suction force should not be too strong because of noise generation or the like.

SUMMARY OF THE INVENTION

[0014] Therefore, an object of the present invention is to provide a kitchen exhaust system capable of maintaining a room in a pleasant state by effectively exhausting the contaminated air such as combustion gas, fumes, micro oil, aerosol or the like generated during cooking.

[0015] 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 kitchen exhaust system comprising: a hood installed above a heating source, for sucking/exhausting the contaminated air; a blower means mounted inside the hood, for generating a suction force to suck the contaminated air into the hood; an air-curtain spray means provided in the hood, for spraying the air and forming an air-curtain so as to introduce the contaminated air flowing out of a suction side of the hood toward the suction side; and a filtering means mounted at an air suction side of the hood, for filtering the contaminated air.

[0016] 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

[0017] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a unit of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention.

[0018] In the drawings:

Figures 1 and 2 are a side sectional view and a bottom view showing a conventional kitchen exhaust system;

Figure 3 is a side view showing an operational state of the conventional kitchen exhaust system;

Figure 4 is a side view showing one embodiment of a kitchen exhaust system in accordance with the present invention;

Figure 5 is an enlarged sectional view showing one part of the kitchen exhaust system;

Figure 6 is a perspective view showing an auxiliary driving means constituting a kitchen exhaust system in accordance with the present invention;

Figure 7 is a side sectional view showing a modified example of a filtering means constituting a kitchen exhaust system in accordance with the present invention;

Figure 8 is a side sectional view showing a modified example of an air-curtain spray means constituting a kitchen exhaust system in accordance with the present invention; and

Figures 9 and 10 are side sectional views showing an operational state of a kitchen exhaust system in accordance with the present invention, respectively.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0019] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0020] Figure 4 is a side sectional view showing one embodiment of a kitchen exhaust system in accordance with the present invention. The same reference numbers are given to the same parts as those of the conventional art.

[0021] As shown, a kitchen exhaust system in accordance with the present invention includes: a hood 200 installed above a heating source 100, for introduction of the contaminated air; a blower means 400 mounted inside the hood 200, for generating a suction force to suck the contaminated air into the hood 200; an air-curtain spray means provided at the hood 200, for forming an air-curtain by spraying the air so as to introduce the contaminated air, which flows out of the suction side of the hood 200, toward the suction side; and a filtering means 600 mounted at the air suction side of the hood 200, for filtering the contaminated air. An exhaust pipe 500 for allowing the air having passed through the hood 200 to be exhausted to the outside is connected to an upper portion of the hood 200.

[0022] The hood 200 is provided with a collection case part 210 and a mounting case part 220. Here, the collection case part 210 has a large area at its lower portion, and a small area at its upper portion, and its inside is penetratingly formed. And the mounting case part 220 is extendingly formed at the upper portion of the collection case part 210 and has a blower means 400 therein. The collecting case part 210 and the mounting case part 220 may be manufactured by separate components and then coupled to each other.

[0023] The collection case part 210 is provided with a front surface 211 formed as a trapezoid shape; both side surfaces 212 extendingly formed at both sides of the front surface 211 as a trapezoid shape; a rear surface 213 connecting both side surfaces 212; and a lower surface 214 having a penetrating hole 215 therein. The lower part of the collection case part 210 becomes a suction side through which the air is introduced, and its upper portion becomes an exhaust side through which the introduced air is exhausted.

[0024] The hood 200 may be formed as various shapes such as a conical shape and the like.

[0025] The blower means 400 includes a motor (not shown) and a blower fan 410 connected to a rotary shaft of the motor, for generating a flow by being rotated by a rotary force of the motor. A centrifugal fan is used as the blower fan 410.

[0026] The filtering means 600 is a grease filter having a certain area. The grease filter is mounted to a penetrating hole 215 on the lower surface of the collection case part.

[0027] The air-curtain spray means includes: an air-curtain passage 230 provided at the hood 200, for guiding a flow of the air so that the external air can be sprayed to an edge of a suction side of the hood 200; an air spray means 700 mounted to be connected to the air-curtain passage 230, for spraying the external air to the edge of the suction side of the hood 200 through the

air-curtain passage 230; and an air direction guiding member 800 rotatably mounted in the air-curtain passage 230 and positioned at the edge of the suction side of the hood 200, for guiding a direction that the air is sprayed.

[0028] The air-curtain passage 230 may be formed at inner walls of the front surface 211 and both side surfaces 212 in the collection case part 210 of the hood 200, or may be formed only at the inner wall of the front surface 211 in the collecting case part 210. An inlet side of the air-curtain passage 230 communicates with the outside, and its spray side is formed at an edge of the lower surface 214, the suction side of the collection case part 210 of the hood. The spray side of the air-curtain passage 230 may be formed over an entire edge of the lower surface, the suction side of the collection case part 210, or may be formed only at a front edge of the lower surface of the collection case part 210.

[0029] As shown in Figure 5, an insertion space where the air direction guiding member 800 is positioned is formed in the air-curtain passage 230 positioned at edge of the hood 200. And the air direction guiding member 800 is rotatably inserted in the insertion space 231.

[0030] The air direction guiding member 800 includes a cylindrical body 810 having a certain length and outer diameter; and a spray slit 811 penetratingly formed at the cylindrical body 810 in a radial direction, for spraying the air. The air sprayed through the spray slit 811 of the air direction guiding member 800 forms an air-curtain.

[0031] An inner wall of the insertion space 231 is provided with two curved walls 232 facing each other, and a curvature of the curved wall 232 corresponds to a curvature of an outer circumferential surface of the cylindrical body 810 of the air direction guiding member. A range of an angle at which the air is sprayed through the spray slit 811 of the air direction guiding member is controlled by an area of the curved wall 232 encompassing the cylindrical body 810 of the air direction guiding member.

[0032] The air direction guiding member 800 is oscillated by the air flowing through the air-curtain passage 230, and the air-curtain formed by the air sprayed through the spray slit 811 of the air direction guiding member makes an angular motion within a certain range by such oscillation of the air direction guiding member 800.

[0033] Preferably, an angle at which the air-curtain is sprayed through the air direction guiding member 800 is within a range of 30 degrees to 70 degrees toward the suction side of the hood 200 or a range of 0 degrees to 30 degrees toward the opposite side on the basis of a direction perpendicular to the lower surface of the hood 200.

[0034] Meanwhile, as shown in Figure 6, the air direction guiding member 800 can be oscillated within a certain angular range by a separately provided auxiliary driving means. The auxiliary driving means includes an auxiliary motor 900; and a gear train 910 for transmitting a rotary force of the auxiliary motor 900 to the air direction guiding member 800.

[0035] And, the air spray means 700 includes a blower

fan 710 and a motor 720 for rotating the blower fan 710.

[0036] The air direction guiding member 800 is fixed at a certain angle in the insertion space 231, so that an air-curtain formed by the air sprayed through the spray slit 811 of the air direction guiding member can be fixed at a certain angle.

[0037] As shown in Figure 7, as a modified example of the filtering means 600, the filtering means 600 is mounted to be inclined at a certain angle to a suction surface, the lower surface 214 of the hood 200. The filtering means 600 is a grease filter having a certain area. The lower surface forming the suction surface of the hood together with the grease filter is coupled to the grease filter in an inclined manner. As the filtering means 600 is mounted to the suction surface to be inclined at a certain angle thereto, the contaminated air is effectively sucked to the suction side of the hood 200.

[0038] As shown in Figure 8, as a modified example of the air-curtain spray means, the air-curtain spray means includes an air-curtain passage 240 and an air direction guiding member 800. Here, the air-curtain passage 240 connects a part of an exhaust side of the blower means 400 with an edge of the lower surface 214, the suction side of the hood 200, and allows part of the air, which is exhausted to the exhaust side of the blower means 400, to be sprayed to the edge of the lower surface 214 of the hood 200. And the air direction guiding member 800 is movably mounted in the air-curtain passage 240 and is positioned at the edge of the lower surface, the suction side of the hood 200, and controls a direction that the air is sprayed through the air-curtain passage 240.

[0039] The air-curtain passage 240 is formed at inner walls of the front surface and both side surfaces forming the hood 200. Also, the air-curtain passage 240 may be provided in the hood 200 as a separate plenum.

[0040] An insertion space 241 where the air direction guiding member 800 is formed in the air-curtain passage 240 positioned toward an edge of a lower surface of the hood 200. And the air direction guiding member 800 is rotatably inserted in the insertion space 241.

[0041] The air direction guiding member 800 is provided with a cylindrical body 810 having a certain length and outer diameter; and a spray slit 811 penetratingly formed at the cylindrical body 810 in a radial direction, for spraying the air. The air sprayed through the spray slit 811 of the air direction guiding member forms an air-curtain.

[0042] An inner wall of the insertion space 241 is provided with two curved walls 241 facing each other, and a curvature of the curved wall 242 corresponds to a curvature of an outer circumferential surface of the cylindrical body 810 of the air direction guiding member. A range of an angle that the air is sprayed through the spray slit 811 of the air direction guiding member is controlled according to an area of the curved wall 242 encompassing the cylindrical body 810 of the air direction guiding member.

[0043] The air direction guiding member 800 is oscillated by the air flowing through the air-curtain passage

240. The air-curtain formed by the air sprayed through the spray slit 811 of the air direction guiding member makes an angular motion within a certain range by such oscillation of the air direction guiding member 800.

[0044] An angle that the air-curtain is sprayed through the air direction guiding member 800 is within an range of 30 degrees to 70 degrees toward a suction side of the hood 200 or a range of 0 degrees to 30 degrees toward its opposite side on the basis of a direction perpendicular to the lower surface of the hood 200.

[0045] As shown in Figure 6, the air direction guiding member 800 can be oscillated by the air direction guiding member 800 within a certain angular range by a separately provided auxiliary driving means.

[0046] In addition, the air direction guiding member 800 is fixed in the insertion space 241 at a certain angle, so that the air-curtain formed by the air sprayed through the spray slit 811 of the air direction guiding member can be formed at a certain angle in a stopped state.

[0047] The operational effect of the kitchen exhaust system according to the present invention will now be described.

[0048] First, the kitchen exhaust system is operated when food items are cooked on a heating source 100.

[0049] When power is supplied to the kitchen exhaust system, a motor constituting a blower means 400 is operated, and a blower fan 410 is rotated by the operation of the motor, thereby generating a flow of the air, namely, a suction force. Simultaneously, a motor 720 and a blower fan 710 constituting an air spray means 700 are operated.

[0050] As shown in Figure 9, the contaminated air generated from the food items being cooked by the heating source 100 flows upward by convection. By the suction force generated by the blower fan 410, the flowing contaminated air passes through a grease filter, the filtering means 600 mounted to a lower surface 214 of the collection case part of the hood 200, and is sucked into the collection case part 210.

[0051] And the external air is sprayed through the air-curtain passage 230 and the spray slit 811 of the air direction guiding member by the operation of the motor 720 and the blower fan 710 constituting the air spray means 700, thereby forming an air-curtain. The air-curtain is oscillated from the outside of the suction surface of the hood 200 toward the suction surface, thereby introducing the contaminated air flowing out of the lower surface 214 of the hood toward the suction surface.

[0052] Namely, the air-curtain is formed at an edge of the lower surface 214, having a certain area, and makes an angular rotation about the edge of the lower surface within a certain rotary angle range, thereby introducing the contaminated air flowing out of the lower surface 214 of the hood, namely, out of the suction surface, toward the suction surface. The contaminated air introduced toward the suction surface of the hood 200 is sucked into the collection case part 210 via the grease filter, the filtering means 600.

[0053] Meanwhile, when the air direction guiding member 800 is fixed so that the air-curtain is formed inclined to the edge of the lower surface 214 of the hood, having a certain area, the contaminated air flowing out of the lower surface 214 of the hood, that is, out of the suction surface is introduced toward the suction surface by the air-curtain. Then, the contaminated air introduced to the suction surface of the hood 200 is introduced into the collection case part 210 via the grease filter.

[0054] The contaminated air sucked in the collection case part 210 is exhausted to the outside through the blower fan 410 and an exhaust pipe 500. And, while the contaminated passes through the grease filter, oil particles, particles in an aerosol state and the like generated during cooking are filtered by the grease filter to be removed.

[0055] As shown in Figure 10, in case that the air-curtain spray means uses part of the air exhausted through the blower means 400, part of the air exhausted by the blower means 400 is sprayed through the air-curtain passage 240 and the spray slit 811 of the air direction guiding member, thereby forming an air-curtain. The air-curtain is oscillated from the outside of the suction surface of the hood 200 toward the suction surface by rotation of the air direction guiding member 800, thereby introducing the contaminated air flowing out of the lower surface 214 of the hood toward the suction surface. The contaminated air introduced toward the suction surface of the hood 200 is sucked into the collection case part 210 via the grease filter, the filtering means 600.

[0056] Meanwhile, in case that the air direction guiding member 800 is fixed so that the air-curtain is formed inclined to the edge of the lower surface 214 of the hood, having a certain area, the contaminated air flowing out of the lower surface 214 of the hood, namely, out of the suction surface, is introduced toward the suction surface by the air-curtain. The contaminated air introduced toward the suction surface of the hood 200 is introduced inside the collection case part 210 via the grease filter.

[0057] As so far described, in the kitchen exhaust system in accordance with the present invention, the contaminated air is exhausted to the outside through a hood 200 by a suction force of a blower means 400. And, the contaminated air flowing out of a suction side of the hood 200 is introduced toward the suction side of the hood 200 by an air-curtain to thereby be exhausted to the outside. Accordingly, a spread of the contaminated air in a room is minimized, and the contaminated air is effectively exhausted outside. Thus, a pleasant kitchen environment and clean room air can be maintained during cooking.

[0058] In addition, the contaminated air generated during cooking ascends at a low speed by buoyancy and convection. At this time, a movement of the air-curtain provides a momentum to the contaminated air, so that the contaminated air easily ascends toward the hood 200. Therefore, collection efficiency of the contaminated air is increased with only a relatively small suction force of a blower means 400. Also, because of the relatively

small suction force of the blower means 400, a flow speed of the air is lowered, thereby reducing noise generated due to flow resistance.

[0059] In addition, because flowing of the contaminated air out of the suction surface of the hood 200 is prevented by the air-curtain, the contaminated air does not flow to the face of a person who cooks, and thus the person can cook in a pleasant environment.

[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 kitchen exhaust system comprising:

a hood installed above a heating source, for sucking/exhausting the contaminated air;
a blower means mounted inside the hood, for generating a suction force to suck the contaminated air into the hood;
an air-curtain spray means provided in the hood, for spraying the air and forming an air-curtain so as to introduce the contaminated air flowing out of a suction side of the hood toward the suction side; and
a filtering means mounted at an air suction side of the hood, for filtering the contaminated air.

2. The system of claim 1, wherein the air-curtain sprayed by the air-curtain spray means makes an angular motion within a certain range.

3. The system of claim 1, wherein the air-curtain spray means comprises:

an air-curtain passage provided in the hood, for guiding a flow of the air so that the external air is sprayed to an edge of the suction side of the hood;
an air spray means mounted to be connected to the air-curtain passage, for spraying the external air to the edge of the suction side of the hood through the air-curtain passage; and
an air direction guiding member rotatably mounted in the air-curtain passage and positioned at the edge of the suction side of the hood, for controlling a direction that the air is sprayed.

4. The system of claim 3, wherein an angle at which the air curtain is sprayed through the air direction guiding member is within a range of 30 degrees to 70 degrees toward a suction side of the hood or within a range of 0 degrees to 30 degrees its opposite side on the basis of a direction perpendicular to a lower surface of the hood.

5. The system of claim 3, wherein an auxiliary driving means for oscillating the air direction guiding member within a certain angular range is provided at one side of the air direction guiding member.

6. The system of claim 3, wherein an insertion space where the air direction guiding member is positioned is formed in the air-curtain passage positioned at an edge side of the hood, and the air direction guiding member is rotatably inserted in the insertion space.

7. The system of claim 3, wherein the air-curtain passage is formed to be connected to an entire edge of the suction side of the hood, and the air direction guiding member is provided over the entire edge of the suction side of the hood.

8. The system of claim 3, wherein the air direction guiding member comprises: a cylindrical member having a certain length and outer diameter; and a spray slit penetratingly formed at the cylindrical body in a radial direction, for spraying the air, and an inner wall of the insertion space is provided with two curved walls facing each other and supporting the air direction guiding member in contact therewith.

9. The system of claim 1, wherein the filtering means is mounted to be inclined at a certain angle to a suction surface of a lower surface of the hood.

10. The system of claim 1, wherein the air-curtain spray means comprises:

an air-curtain passage connecting part of an exhaust side of the blower means with an edge of the suction side of the hood, for allowing part of the air, which is exhausted to the exhaust side of the blower means, to be sprayed to the edge of the suction side of the hood; and
an air direction guiding member movably mounted in the air-curtain passage and positioned at the edge of the suction side of the hood, for controlling a direction that the air is sprayed through the air-curtain passage.

11. The system of claim 10, wherein an auxiliary driving means for oscillating the air direction guiding member within a certain angular range is provided at one side of the air direction guiding member.

12. The system of claim 10, wherein an insertion space where the air direction guiding member is positioned is formed in the air-curtain passage positioned at the edge side of the hood, and the air direction guiding member is rotatably inserted in the insertion space. 5
13. The system of claim 10, wherein the air-curtain passage is formed to be connected to an entire edge of the suction side of the hood, and the air direction guiding member is provided over the entire edge of the suction side of the hood. 10
14. The system of claim 10, wherein the air direction guiding member comprises: a cylindrical member having a certain length and outer diameter; and a spray slit penetratingly formed at the cylindrical body in a radial direction, for spraying the air, and an inner wall of the insertion space is provided with two curved walls facing each other and supporting the air direction guiding member in contact therewith. 15
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FIG. 1

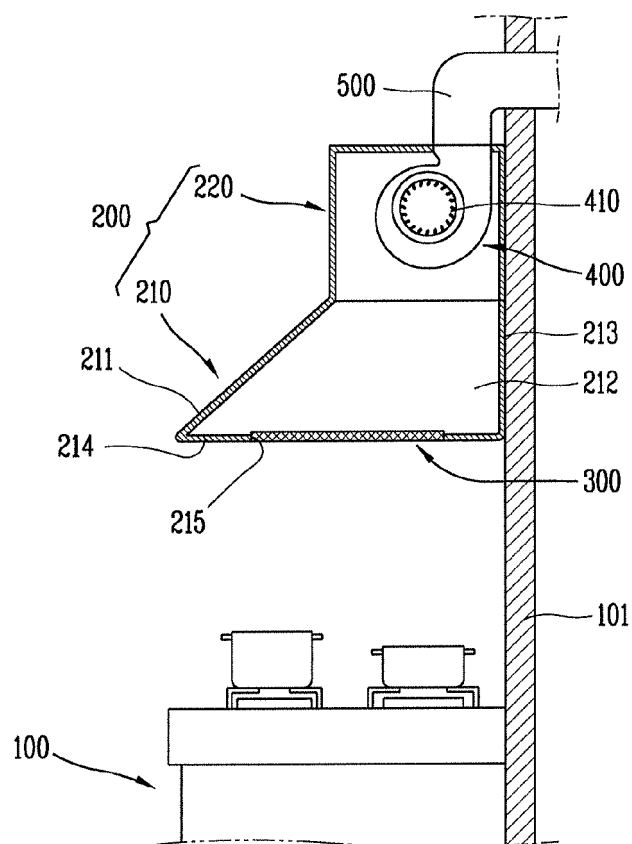


FIG. 2

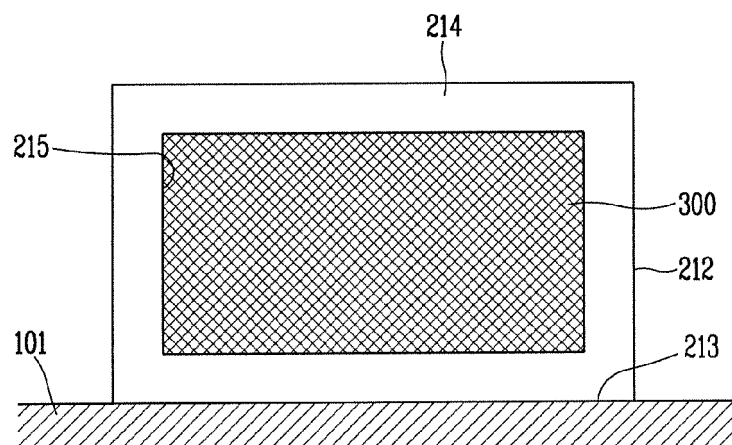


FIG. 3

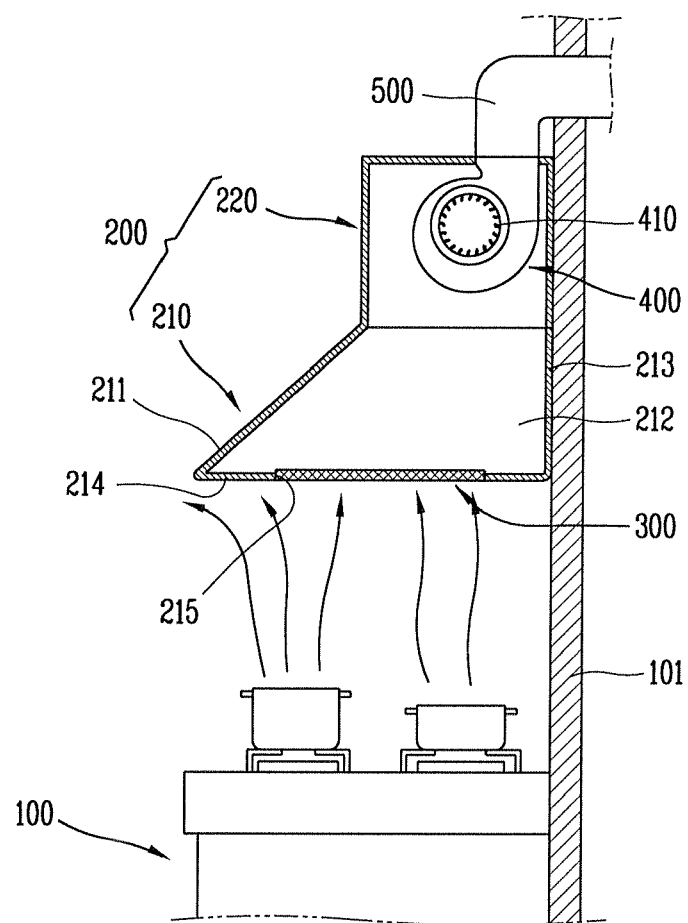


FIG. 4

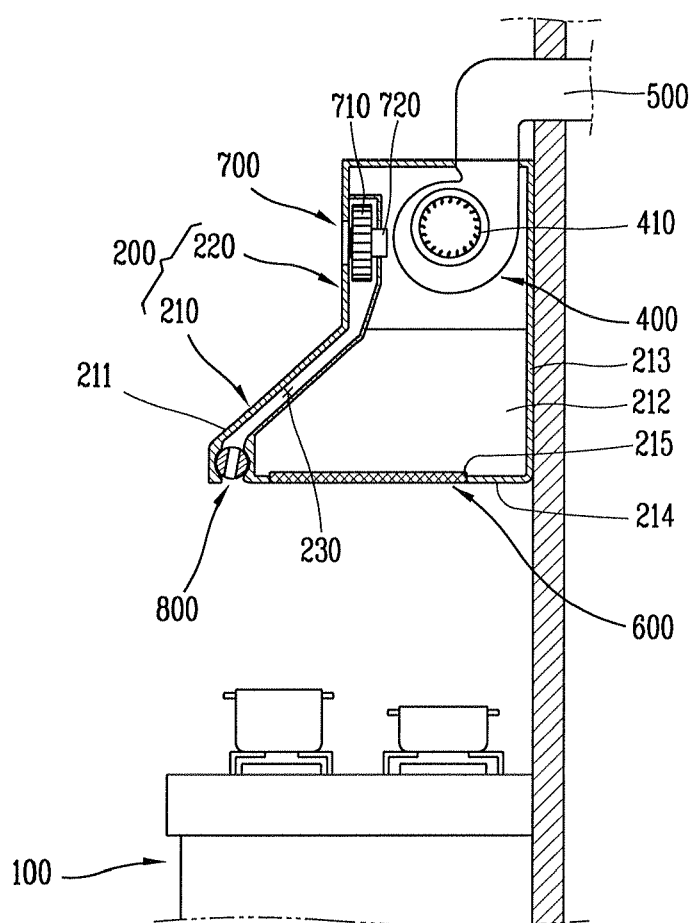


FIG. 5

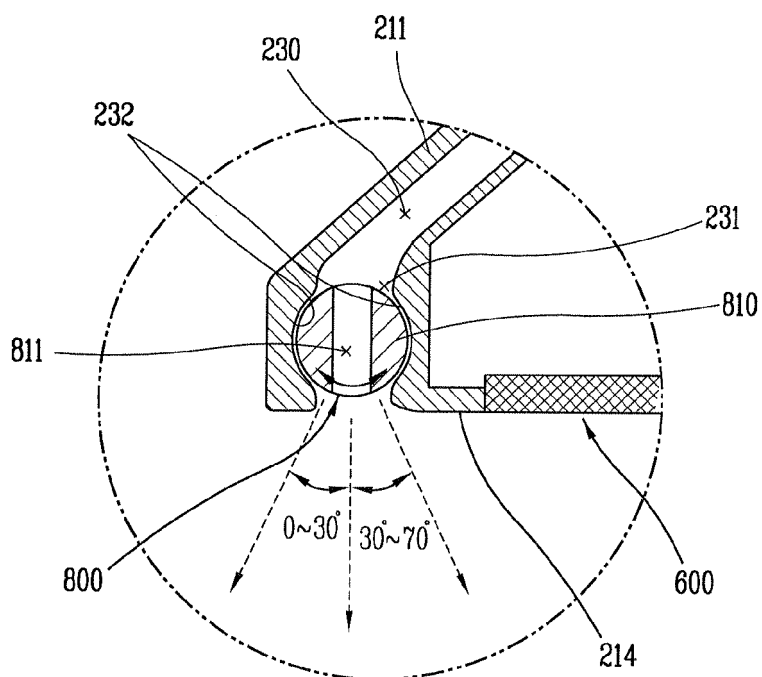


FIG. 6

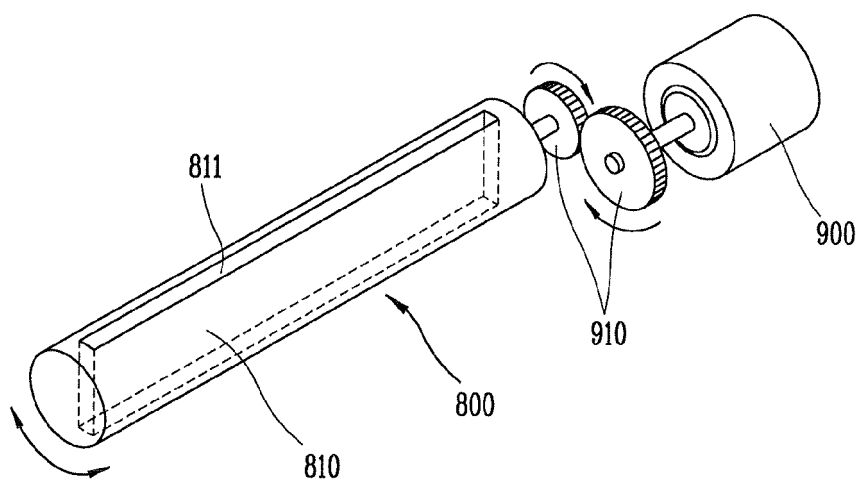


FIG. 7

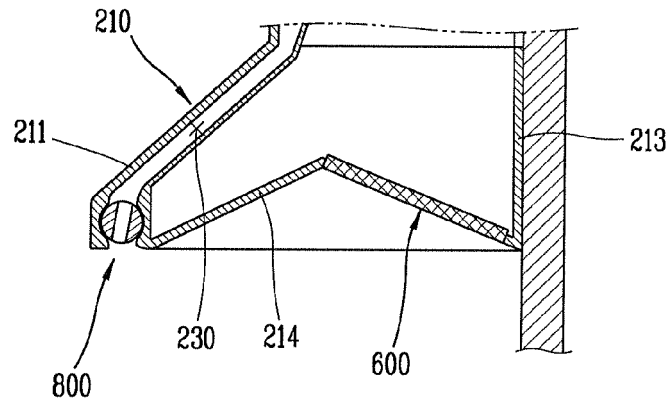


FIG. 8

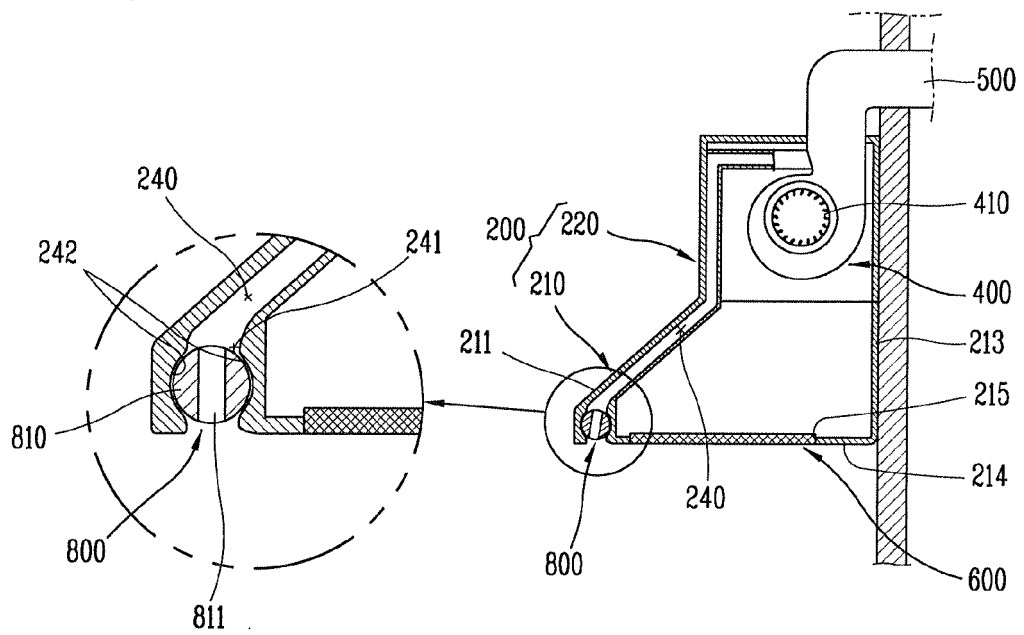


FIG. 9

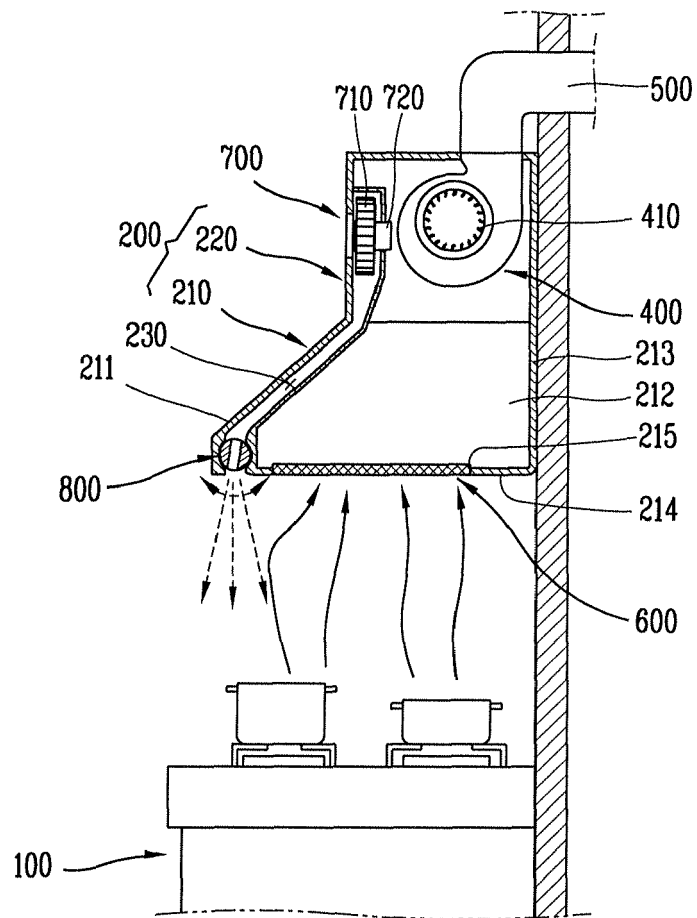
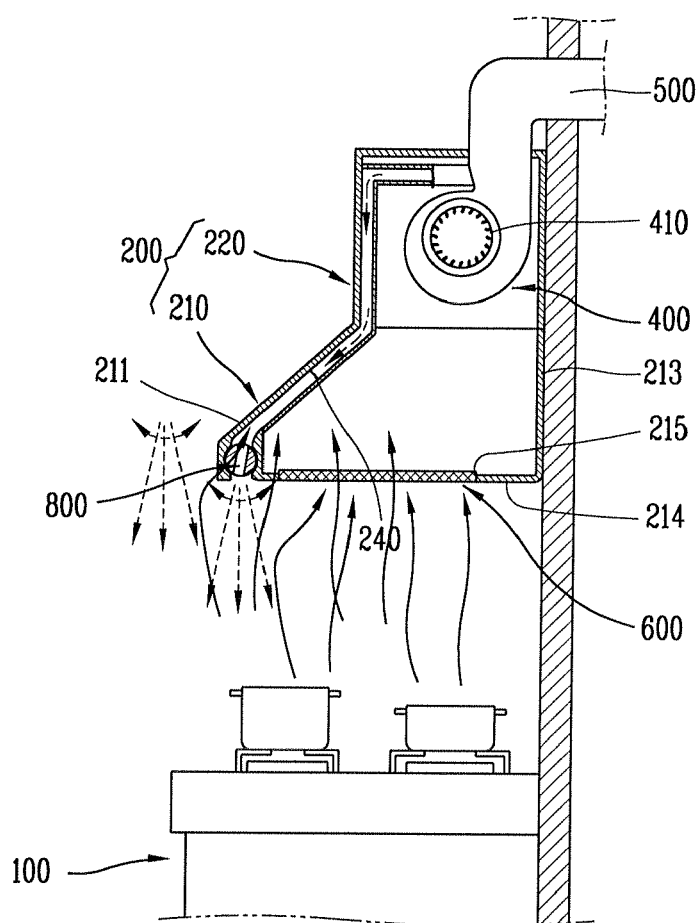


FIG. 10





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 10 6777

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	DE 34 04 004 A1 (BUERCHER, FRIEDRICH) 25 October 1984 (1984-10-25)	1-4, 6-8	F24C15/20
A	* pages 2-3; figure 2 *	5, 9-14	
X	CH 682 512 A5 (ZURECON AG) 30 September 1993 (1993-09-30)	1-4, 6-8	
A	* columns 4-5; figures 3-5 *	5, 9-14	
A	GB 2 132 335 A (* CHUNG-TSUNG CHENG) 4 July 1984 (1984-07-04)	1-14	
	* the whole document *		
X	US 4 475 534 A (MORIARTY ET AL) 9 October 1984 (1984-10-09)	1, 9	
	* columns 5-6; figure 1 *		
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	* paragraphs [0034] - [0044]; figures 2, 3 *		
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