RANGE HOOD

TECHNICAL FIELD

[0001]

The present invention relates to a range hood that gathers oil contents from oily smoke generated by cooking, and particularly to, a range hood which exhibits a significant oil gathering efficiency.

BACKGROUND ART

[0002]

A range hood that is installed in a kitchen or the like is intended to inhale steam, oily smoke and the like generated by cooking performed under the range hood along with a flow of air generated by a fan, and discharge the oily smoke or the like along with the inhaled air to the outdoors or the like. However, in view of environmental undesirability, the discharge of the oil contents contained in the oily smoke to the outdoors or the like without change causes the oil contents to adhere to facilities such as the fan and a duct normally present on the downstream of the range hood in the flow path of air, which requires great labor/expense for maintenance such as washing, and accelerates the degradation of the facilities.

Therefore, conventionally, in the range hood, in order to catch and collect the oil content contained in the oily smoke in the filter and the like, a lot of schemes for improving the gathering efficiency of the oil contents have been made.

[0003]

As a scheme for increasing the gathering efficiency of the filter, there is a technology, for example, disclosed in Patent Literature 1. This Patent Literature 1 discloses a range hood filter in which a plurality of rows is formed by vertically providing slits in a vertical direction at a pitch of 2 to 5 mm in a thin metal plate having a predetermined shape, a filter single element is formed by providing ventilation openings having a vertical width of 1 to 3 mm without leaving a flat section between the slits by bending and tilting the whole tongue divided by each of the slits in each row in one direction, and the filter single element or a plurality of the filter single elements are combined with each other.

[0004]

Such a filter has a gathering rate of the oil content of about 50% and has a gathering effect of the oil content, but is not sufficient yet. When finely forming the slits of the filter so as to improve the gathering efficiency, since the oil contents are gathered in the section of a plurality of the slits at a small pitch, clogging of the filter is likely to occur.

Furthermore, when such a filter is clogged, it is easily washed compared to a filter using a lath net or a wire mesh, but since a number of slits are opened at a small pitch, cleaning and washing the entire slit sections require significant time and effort, which is inferior in cleaning properties. In particular, it is difficult to remove oil and dust permeating inside, and it is not possible to fully exhibit the original function of the filter in the state in which the oil or the like permeates therein. Furthermore, when combining a plurality of the filters so as to improve the gathering efficiency, the ventilation resistance becomes higher, the pressure loss of the range hood flow path becomes higher, and the amount of ventilation air is insufficient, which causes poor ventilation, and thus, there is a need for a fan capable of generating a higher wind pressure.

[0005]

Furthermore, as a scheme for improving the cleaning properties of the range hood, there is a technology disclosed, for example, in Patent Literature 2. This Patent Literature 2 discloses a range hood having a filter washing function that can remove any dirt adhering to a filter without using a large amount of washing water, by including the filter that gathers oily smoke during cooking, and a brush (dirt wiping unit) that moves while abutting against the surface of the filter.

[0006]

In such a range hood, time and effort for personally cleaning the filter by a user is relieved, but there is a need for a brush, an electric motor for driving the brush, a tank of the washing water, a spray nozzle and the like, and thus a structure of the range hood itself becomes larger and more complicated, and the cost also increases. First of all, this range hood does not suggest a technology for improving an oil gathering efficiency of the filter.

[0007]

As a scheme that can prevent the clogging of the filter to relieve time and effort for cleaning and increase a collect rate of oil by the filter, there is a technology disclosed in Patent Literature 3. This Patent Literature 3 discloses a range hood in which a rotatable filter having a blade for removing oil in exhaust gas and formed in a substantially disk shape is provided on the front side of an exhausting rotary blade, the exhaust gas flowing via the filter is guided to the exhausting rotary blade, and a passage section for causing the oil in the exhaust gas to adhere to an inner surface is provided over the exhausting rotary blade from the filter.

[0008]

Even in such a range hood, the gathering efficiency of the filter is not significantly

improved compared to the technology in Patent Literature 1, and there is no need for a large and complicated structure as much as Patent Literature 2, but such a range hood is the same as Patent Literatures 1 and 2 in that the oil contents adhering to the filter while operating the range hood are removed while the range hood is not operated (during stop of the range hood). In addition, time and effort for personally washing the filter by a user is somewhat relieved, but since a large amount of oil contents scatter to the passage section provided over the exhausting rotary blade from the filter, that is, the downstream section of the filter, it cannot be said that time and effort for personally washing the downstream section of the filter is relieved compared to the case of the filter which requires considerable time and effort when a user personally washes the range hood.

CITATION LIST

PATENT LITERATURE

[0009]

Patent Literature 1: JP 02-043456 Y

Patent Literature 2: JP 2006-292248 A

Patent Literature 3: JP 2006-38240 A

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0010]

Thus, the present invention has been made in view of the above-described problems, and an object thereof is provided a range hood that is provided with a filter which has an oil gathering efficiency greatly exceeding the oil gathering efficiency of the prior art, has a small pressure loss, and is hard to clog, and in which cleaning/washing are easy, in particular, it is possible to relieve time and effort for cleaning/washing the downstream section of the filter in the flow path of air, and these operations can be achieved by a simple structure.

SOLUTION TO PROBLEM

[0011]

As a result of intensive studies to solve the above-described problems, the present inventors have found that the high oil gathering efficiency is obtained in a state of the small pressure loss by moving the filter while operating the fans of the range hood, which led to completion of the present invention.

[0012] In order to solve the above-described problems, there is provided a range hood which includes an inner surface panel of a hood which gathers oily smoke generated by cooking and has an opening section located substantially at the center of the inner surface panel, a fan which locates above the opening section of the inner surface panel and generates a flow of air, a filter which locates at the opening section, being a flow path of the flow of air, or on an upstream side of the opening section and the filter has holes which allow the flow of air to pass through the filter, an electric motor configured to rotate the filter, an oil content gathering member which is provided so as to be freely attachable and detachable and surrounds a periphery of the filter, and an airflow guide plate which faces to the filter on an upstream side of the flow of air and locates on an upstream side of the filter, wherein the filter is mounted to a rotary shaft of the electric motor in a freely attachable and detachable manner, and when the fan generates the flow of air, the electric motor rotates the filter so as to gather oil contents contained in the air to the oil content gathering member.

With this configuration, it is possible to provide a range hood that greatly relieves time and effort for cleaning/washing the downstream section of the filter in the flow path of air, since the oil contents adhere to the inner surface panel, the filter and the oil content gathering member, and the oil contents hardly adhere to the downstream section of the filter in the flow path of air. Since a speed of the flow of air in a gap between the airflow guide plate and the inner surface panel increases, steam, oily smoke or the like generated by cooking performed under the range hood is surely inhaled together with the flow of air generated by the fan and it is possible to prevent omission of gathering the oil contents from the hood. Since the filter and the oil content gather member are mounted freely attachable and detachable manner, they become easily washable.

[0013]

Furthermore, both surfaces of the filter may be a smooth surface.

According to this configuration, since a ventilation resistance in the filter is further reduced and a rotational resistance of the filter is also further reduced, the electric motor, configured to rotate the filter, having a small torque is sufficient. In addition, since there is no protrusion, such as a cut-and-raised portion on the filter, it is possible to provide a range hood in which the noise cutting the air is small. Furthermore, these facilitate the rotation of the filter at high speed. In addition, since clogging of the holes of the filter due to oil is further reduced and there is no protrusion, such as a cut-and-raised portion, cleaning/washing of the filter itself becomes easier.

[0014]

Furthermore, a diameter in the circumferential direction of the hole may be 0.75 mm or less and a number of rotations of the filter may be 230 rpm or more, the diameter in the circumferential direction of the hole may be 1.00 mm or less and the number of rotations of the filter may be 310 rpm or more, the diameter in the circumferential direction of the hole may be 1.50 mm or less and the number of rotations of the filter

may be 460 rpm or more, the diameter in the circumferential direction of the hole may be 2.00 mm or less and the number of rotations of the filter may be 620 rpm or more, or the diameter in the circumferential direction of the hole may be 5.00 mm or less and the number of rotations of the filter may be 1500 rpm or more.

With this configuration, it is possible to provide a range hood in which the oil gathering efficiency is further improved.

[0015]

Furthermore, an average value in the filter of the time required for one end and the other end of the diameter in the circumferential direction of the hole to pass through a point of the circumference may be $3.2 * 10^{-4}$ sec or less.

With this configuration, it is possible to provide a range hood in which the oil gathering efficiency is further improved.

[0016]

Furthermore, an average hole diameter pass time tx represented in Formula (1) below may be $3.2 * 10^{-4}$ sec or less.

With this configuration, it is possible to provide a range hood in which the oil gathering efficiency is further improved.

[0017]

Furthermore, the shortest distance between an end portion of a downstream side of the oil content gathering member surrounding the periphery of the filter and a downstream side disk surface of the filter may be equal to or greater than the shortest distance between an end portion of an upstream side of the oil content gathering member and an upstream side disk surface of the filter.

According to this configuration, by catching the oil contents scattered toward the outer peripheral direction on the downstream side of the filter, a rate capable of gathering the oil content that has passed through the holes increases, and it is possible to provide a range hood in which the oil gathering efficiency is further high.

[0018]

Furthermore, an extension section extending inward from an inner wall of the oil content gathering member may be further provided at the end portion of the downstream side of the oil content gathering member.

According to this configuration, even when a length of the downstream side of the filter of the oil content gathering member is small, by catching the oil contents scattered toward the outer peripheral direction on the downstream side of the filter, the rate capable of gathering the oil contents that have passed through the holes also increases, and it is possible to provide a range hood in which the oil gathering efficiency is high.

ADVANTAGEOUS EFFECTS OF INVENTION

[0019]

As described above, according to the present invention, it is possible to provide a range hood which includes a filter that has an oil gathering efficiency greatly exceeding the oil gathering efficiency of the prior art, has a small pressure loss, and hardly clogs, and in which cleaning/washing are easy, in particular, it is possible to relieve time and effort for cleaning/washing the downstream section of the filter in the flow path of air, and these operations can be achieved by a simple structure.

BRIEF DESCRIPTION OF DRAWINGS

[0020]

Fig. 1 is a cross-sectional view of a first embodiment of a range hood according to the present invention.

Fig. 2 is a perspective view as viewed from below of the first embodiment of the range hood according to the present invention (illustrating a state in which an airflow guide plate is detached).

Fig. 3(A) is a front view illustrating a filter and a peripheral portion thereof in the first embodiment of the range hood according to the present invention, Fig. 3(B) is a side view thereof, Fig. 3(C) is a plan view thereof, Fig. 3(D) is a bottom view thereof, and Fig. 3(E) is a cross-sectional view thereof.

Figs. 4(A) and 4(B) are perspective views illustrating a filter and a peripheral portion thereof in a first embodiment of a range hood according to the present invention, Fig. 4(A) is a perspective view as seen from above, and Fig. 4(B) is a perspective view as seen from below.

Figs. 5(A) to 5(C) are perspective views of the filter and the peripheral portion thereof in the first embodiment of the range hood according to the present invention.

Fig. 6 is an enlarged cross-sectional view illustrating the filter and the peripheral portion thereof in the first embodiment of the range hood according to the present invention (a position of the cross-section is the same position as Fig. 3(E)).

Fig. 7 is a diagram illustrating the operation of the first embodiment of the range hood according to the present invention.

Fig. 8 is an enlarged view illustrating the operation of the first embodiment of the range hood according to the present invention.

Fig. 9(A) is a front view illustrating the filter and an electric motor that rotates the filter in the first embodiment of the range hood according to the present invention, Fig.

9(B) is a plan view thereof, Fig. 9(C) is a bottom view thereof, and Fig. 9(D) is a perspective view thereof.

Fig. 10(A) is a front view illustrating an oil content gathering member in the first embodiment of the range hood according to the present invention, Fig. 10(B) is a plan view thereof, Fig. 10(C) is a bottom view thereof, and Fig. 10(D) is a perspective view thereof.

Figs. 11(A1) to 11(E2) are explanatory views illustrating a modified example of a shape of holes of the filter in the first embodiment of the range hood according to the present invention.

Fig. 12 is a graph illustrating a relation between an average hole diameter pass time and a gathering rate in the first embodiment of the range hood according to the present invention.

Fig. 13 is a test block diagram used in a test for obtaining a relation between the gathering rate of the filter and adherence of the oil contents to downstream components in the first embodiment of the range hood according to the present invention and the prior art.

Fig. 14 is a cross-sectional view of a modified example of the first embodiment of the range hood according to the present invention.

Fig. 15 is a cross-sectional view of a second embodiment of the range hood according to the present invention.

Fig. 16 is a cross-sectional view of a third embodiment of the range hood according to the present invention.

Fig. 17 is a cross-sectional view of a fourth embodiment of the range hood according to the present invention.

DESCRIPTION OF EMBODIMENTS

[0021]

Hereinafter, each of the embodiments according to the present invention is described with reference to the drawings.

<First Embodiment>

Fig. 1 illustrates a range hood 1 of a first embodiment according to the present invention. The range hood 1 has a thin hood section 80 having an upward concave inner surface panel 81 on an inner surface thereof so as to gather steam, oily smoke or the like generated by cooking performed under the range hood. The hood section 80 is connected to a blower box 82 connected to an exhaust duct D near an opening section 2 located substantially at the center. The blower box 82 has a fan casing 61 inside, and

the fan casing 61 has a fan 60 that generates a flow of air, as a sirocco fan, therein. A inhalation opening 62 of the fan 60 is disposed so as to be located in the opening section 2 of the hood section 80. Accordingly, when the fan 60 is operated, the opening section 2 becomes a negative pressure, and the air below the inner surface panel 81 is inhaled through the opening section 2 and discharged to the outside through the exhaust duct D. That is, the opening section 2 is located on an upstream side of the fan 60 on a flow path of the flow of air generated by the fan 60.

[0022]

In the opening section 2, there are a mounting plate 50 mounted to have no gap that may be a flow path of air between the mounting plate 50 and the inner surface panel 81, a disk-shaped filter 10 having a hole which allows the flow of air to pass through, an electric motor 20 connected to the center of the disk of the filter 10 at a rotary shaft to rotate the filter 10, an electric motor fixture 40 for mounting the electric motor 20 to the mounting plate 50, and an oil content gathering member 30 mounted to the mounting plate 50 to surround an outer peripheral edge of the filter 10. Accordingly, the range hood 1 is rotatably provided with the filter 10 that is present on the upstream side of the flow from the fan 60 on the flow path of the flow of air generated by the fan 60, and has a hole which allows the flow of air to pass through from the bottom to the top in the drawings.

[0023]

The air below the inner surface panel 81 contains the steam, the oily smoke or the like generated by cooking, and when the fan 60 is operated, the air is sucked to a hole of the filter 10 present in the opening section 2, that is, located on the upstream side from the fan 60 on the flow path of the flow of air generated by the fan 60, and passes through the hole. The filter 10 is provided so as to be rotatable by the electric motor 20, when the range hood 1 is operated, the fan 60 generates the flow of air, and the electric motor 20 rotates the filter 10. The range hood 1 gathers the oil content contained in the air to the oil content gathering member 30 by rotating the filter 10. The way of gathering is described later.

[0024]

Such a range hood 1 can have a high oil gathering efficiency in a state of a small pressure loss, as compared to the case of improving the oil gathering efficiency by finely forming slits or meshes of filter or overlapping filters into a multi-layer using a slot filter, a HEPA filter of the prior art or the like. That is, when improving the oil gathering efficiency by finely forming the meshes of the slits or overlapping filters into a multi-layer using the slot filter, the HEPA filter of the prior art or the like, since the

ventilation section of the filter forms a complicated flow path, the ventilation resistance tends to increase. However, in the case of the range hood 1, since the oil gathering efficiency increases by the rotation of the filter, it is not necessary to form such a complicated flow path. Thus, it is possible to obtain a high oil gathering efficiency while maintaining a low ventilation resistance as compared to the conventional filters. Furthermore, since there is a low risk of occurrence of clogging by adherence of the oil content to the filter, an effort of washing of the filter itself decreases, it is possible to prevent the pressure loss from increasing in accordance with the use, and since the oil content hardly adheres to the downstream section of the filter in the flow of air path, it is possible to provide a range hood that greatly relieves time and effort for cleaning/washing the downstream section of the filter.

[0025]

The type of the fan of the fan 60 is not particularly limited, and may be other fans such as an axial-flow fan that generates the flow of air. The fan is preferably a sirocco fan with a high static pressure used in this embodiment. Furthermore, an airflow guide plate 70 is included below the hood section 80. The airflow guide plate 70 is capable of being attached to and detached from the hood section 80 and increases the suction force while having a gap between the airflow guide plate 70 and the hood section 80. The range hood 1 of the present embodiment is provided with the airflow guide plate 70, but the presence of the airflow guide plate 70 is not particularly limited, and may or may not be present. When there is no airflow guide plate or when the airflow guide plate is detached, as illustrated in Fig. 2, the upward concave inner surface panel 81 as the inner surface of the hood section 80, the mounting plate 50 mounted so that a gap is not generated in the inner surface panel 81, the disk-shaped filter 10, and the oil content gathering member 30 provided so as to surround the outer peripheral edge of the filter 10 mounted to the mounting plate 50 are directly visible from a user.

[0026]

Furthermore, in this embodiment, the filter 10 is formed from a thin plate which forms a disk shape, but is not limited thereto, for example, the filter may be cylindrical. In this case, in the cylindrical filter, the cylinder rotates by connection of the rotary shaft of the electric motor to the center shaft of the cylinder, and the cylindrical filter has a hole which allows the flow of air to pass through to the side surface of the cylinder. The flow of air is configured to pass from the outside to the inside of the side surface of the cylinder. Furthermore, the oil content gathering member is provided to surround the side surfaces of the cylinder. The cylinder may be horizontal and may be vertical. When the cylinder is horizontal, the oil content gathering member is provided with an

opening section that is opened downward for inhaling the air, and an opening section that is opened to cause the air to flow to the fan side. When the cylinder is vertical, since the filter inhales the flow of air from the side surface of the cylinder, the bottom surface of the cylinder is not opened, and the oil content gathering member is provided so as to surround the entire side surface of the filter. Since it is possible to provide a thin range hood having a simple structure, a filter formed from a thin plate forming a disk shape as in the present embodiment is preferred.

[0027]

Furthermore, in this embodiment, the filter 10 is formed from a piece of thin plate, but may be formed of a plurality of thin plates, and a plurality of filters may be arranged on a flow path of the flow of air. With this configuration, even if the rotational speed of the filter is not sufficient, the gathering rate of the oil contents becomes higher.

[0028]

Furthermore, in this embodiment, sections other than the holes on the surfaces of both sides of the filter 10 have no projections or irregularities, have a smooth surface which is flat and smooth, but are not limited thereto, and may have projections such as a cut-and-raised portion together with slits (holes) as in a general slot filter. If the filter includes the smooth surface as in the present embodiment, since the ventilation resistance of the flow of air through the filter is further reduced and the rotational resistance of the filter is also further reduced, the electric motor, configured to rotate the filter, having a small torque is sufficient. In addition, since there is no protrusion such as a cut-and-raised portion on the filter, it is possible to provide a range hood in which noise cutting the air is small. Furthermore, these make it easy to rotate the filter at high speed. Furthermore, since most of the oil contents are gathered on the surface of the filter and the oil content is hardly gathered on the side surface of the hole of the filter, clogging of the holes of the filter due to oil is further reduced, and since there is no protrusion such as a cut-and-raised portion, cleaning/washing of the filter itself becomes easy.

[0029]

Furthermore, in this embodiment, the movement of the filter is a rotational movement around a center of the disk-shaped filter as a rotational center, but is not limited to this, may be an eccentric rotational movement, and may be a linear reciprocating movement. In view of fact that the structure is simple and the oil contents can be efficiently gathered, the rotational motion around the center of the disk-shaped filter as the rotational center is preferred as in this embodiment.

[0030]

Figs. 3A to 6 illustrate the filter 10 of the range hood 1 and the peripheral portion thereof (hereinafter, referred to as a filter unit). The filter unit 3 is provided with the mounting plate 50 mounted to the opening section 2, the disk-shaped filter 10 having the holes which allow the flow of air to pass through, the electric motor 20 connected to the center of the disk of the filter 10 at the rotary shaft thereof to rotate the filter 10, the electric motor fixture 40 for mounting the electric motor 20 to the mounting plate 50, and the oil content gathering member 30 mounted on the mounting plate 50 and provided so as to surround the periphery of the filter 10.

[0031]

The mounting plate 50 is a substantially square flat plate including a circular mounting plate opening section 51 at the central portion. In the present embodiment, a periphery of the flat plate is curved upward with a curvature, but is not limited thereto, and may have a configuration mounted to the opening section 2 of the inner surface panel 81. Mounting of the mounting plate 50 and the opening section 2 is performed to have no gap or the like, and the flow of air does not pass through the mounting portion. Therefore, the mounting plate opening section 51 becomes the only part which allows the flow of air generated by the fan 60 to pass through, and the mounting plate opening section 51 becomes a flow path of the flow of air generated by the fan 60.

[0032]

The electric motor fixture 40 is provided on the downstream side of the flow of air of the mounting plate 50 so as to straddle the mounting plate opening section 51. The electric motor fixture 40 has a hole 41 which allows the rotary shaft 21 of the electric motor 20 to pass through at the substantially central portion, and has a margin portion to facilitate mounting to the mounting plate 50. The electric motor fixture 40 is mounted to the mounting plate 50 so that the hole 41 becomes the center of the mounting plate opening section 51 in the plan view.

[0033]

The electric motor 20 is fixed to the electric motor fixture 40 by allowing the rotary shaft thereof to penetrate into the hole 41 of the electric motor fixture 40 from the upper side to the lower side in the drawings (toward the upstream side from the downstream side of the flow of air). The rotary shaft 21 of the electric motor 20 becomes the center of the circular mounting plate opening section 51 in the plan view.

[0034]

The filter 10 is mounted to the leading end portion of the rotary shaft 21 of the

electric motor 20 in a freely attachable and detachable manner so that the surface of the filter 10 is perpendicular to the rotary shaft 21. An external shape of the filter 10 is circular, and since the center of the filter 10 is mounted on the rotary shaft 21 of the electric motor 20 located at the center of the circular mounting plate opening section 51, the external shape of the filter 10 and the external shape of the mounting plate opening section 51 are a concentric circle. In this embodiment, since there is an extension section 52 in the mounting plate opening section 51, the diameter of the filter 10 is greater than the diameter of the mounting plate opening section 51. The extension section 52 extends to the inner side from the inner wall of the oil content gathering member 30, that is, to the rotary shaft side of the electric motor 20, at the end portion of the downstream side of the oil content gathering member 30. The extension section 52 preferably increases the rate capable of gathering the oil contents that have passed through the hole, thereby being able to provide a range hood having a high oil gathering rate.

[0035]

The position of the filter 10 in the front view is lower than the lower surface of the mounting plate 50, that is, on the upstream side of the flow of air. Thus, the oil content gathering member 30 is mounted to the mounting plate 50 so as to surround the outer peripheral edge of the filter 10. A distance between the outer peripheral edge of the filter 10 and the inner wall of the oil content gathering member 30 needs to be greater than 0 so that the both do not come into contact with each other, but it is preferred that the distance be as short as possible so that the oil content does not leak. In the present embodiment, the distance is about 2.5 mm. The oil content gathering member 30 is provided with an oil sump 31 at a lower end. The oil sump 31 is a location where the oil content blown off by hitting against the upstream surface of the filter 10 abuts against the inner wall of the oil content gathering member 30, and the oil content is stored.

[0036]

In addition, the height of the range hood 1 includes the height of the hood section 80 and the height of the blower box 82, but the height of the blower box 82 is nearly defined by the height of the fan 60, and the height of the hood section 80 is defined from the sum of the height from the upper end of the electric motor 20 to the lower end of the oil content gathering member 30, that is, the height of the filter unit 3, and the depth (height) of the recess of the inner surface panel 81 for catching the air containing the oil content or the like. In order to catch the air containing the oil content or the like, the depth (height) of the recess is required to some extent, and thus it is important to

reduce the height of the filter unit 3 in order to provide a thin range hood by reducing the height of the entire range hood 1. In this embodiment, since the filter unit 3 is formed from a thin plate having the filter 10 formed in a disk-shape, the filter unit 3 is preferably thin.

[0037]

Figs. 7 and 8 illustrate the operation of gathering the oil contents accompanied by the flow of air in the range hood 1. Fig. 7 illustrates the operation of the flow of air in the entire range hood 1. Along with the steam, the oily smoke and the like generated by cooking performed under the range hood 1, warmed air A rises toward the range hood 1. When the range hood 1 starts operating and the fan 60 starts rotating, the fan 60 generates the flow of air in the direction from the bottom to the top in Figs. 7 and 8. Then, the air rising to the vicinity of the airflow guide plate 70 is sucked from between the airflow guide plate 70 and the inner surface panel 81, then, passes through the hole 11 of the filter 10, and is inhaled into the inhalation opening 62 of the fan 60 in the fan casing 61. Moreover, thereafter, the air is discharged to the exhaust duct D from the blower box 82.

[0038]

The number of rotations per unit time of the filter 10 also depends on the opening state of the holes in the filter, but may be at least 230 rpm (Rotation Per Minute) or more. The relation between the holes and the opening state or the like is described below. When the filter 10 rotates at a relatively high speed, the surface (a section having no hole 11) of the filter 10 drags the air abutting against the surface by frictional force, the movement is also transmitted to the air in the vicinity thereof due to the viscosity of air, the movement of air occurs near the surface of the filter 10, the filter 10 performs the rotational movement, and thus, the movement of air becomes spiral that centers the rotary shaft.

[0039]

The spiral movement of air occurs on both surfaces of the filter 10, that is, both the lower surface and the upper surface of the filter 10, in other words, on both the surface of the upstream side and the surface of the downstream side of the flow of air A of the filter 10. In this embodiment, since the flow of air A generated by the fan 60 flows from the bottom to the top in Figs. 5 and 6 through the holes 11 of the filter 10, the helical flow toward the outer peripheral edge of the filter 10 occurs on the downstream side of the filter 10, while the spiral movement of air is pulled away from the surface of the filter 10, and the air is sucked from the inhalation opening 62 by the fan 60. Meanwhile, on the upstream side of the filter 10, the spiral movement of air is pressed

against the surface of the filter 10, and an air layer having a high density accompanied by a spiral flow toward the outer peripheral edge of the filter 10 is formed.

[0040]

Fig. 8 illustrates the operation of the flow of air in the filter unit 3. Oil contents OP1 generated by cooking or the like flow together with a flow of air A and reach the surface near the upstream side of the filter 10. A part (oil content having a small particle size) of oil contents OP2 reaching the vicinity of the surface of the upstream side is blown off in the direction of the outer peripheral edge of the filter 10 by the spiral flow toward the outer peripheral edge of the air layer having a high density, and the other part thereof (oil content having a large particle size) is blown off by colliding with the surface (a portion having no hole 11) of the upstream side of the filter 10. As a result, the oil contents are gathered in the oil content gathering member 30 provided so as to surround the outer peripheral edge of the disk-shaped filter 10 as oil contents OP3, and are collected as oil OL in the oil sump 31.

[0041]

The oil contents becoming very fine particulates pass through the holes of the filter 10 along with the flow of air A, a part thereof collides with the extension section 52 or the inner wall of the downstream side of the filter 10 of the oil content gathering member 30 and is collected. A part of the oil content, finally not able to be collected, adheres to the fan 60, the exhaust duct D or the like located at the downstream side thereof, but most of the oil contents becoming the particulates enough to pass through the holes of the filter 10 ride on the flow of air A as they are and are discharged to the outdoors through the exhaust duct D. Accordingly, in the range hood 1 of the present embodiment according to the present invention, the oil contents hardly adhere to the downstream section of the filter 10 in the flow path of air, and it is possible to significantly relieve time and effort for cleaning/washing

[0042]

Figs. 9(A) to 9(D) illustrate the filter 10, and the electric motor 20 that rotates the filter 10 in this embodiment. The filter 10 and the rotary shaft 21 of the electric motor 20 are connected to each other in a freely attachable and detachable manner such that the surface of the filter is perpendicular to the rotary shaft 21. The length of the rotary shaft 21 is determined in relation to the height of the electric motor fixture 40, but is determined such that the filter 10 is positioned on the upstream side of the lower surface of the mounting plate 50 in a front view. The type of the electric motor 20 is not particularly limited. The electric motor 20 has the capacity in which the number of rotations per unit time is at least about 200 rpm, but is not limited thereto.

[0043]

The filter 10 has a disk shape, is made by punching a thin plate having a circular external shape, the material thereof is a stainless steel, a thickness thereof is 0.5 mm, and a diameter thereof is 285 mm, but is, of course, not limited thereto. The shape or the like of the holes 11 provided in the filter 10 is described later. In addition, since there is no change in the gathering rate in the filter even if the thickness of the filter is changed between 1.0 mm and 0.5mm, when the flow of air generated by the fan passes through the holes of the filter, it is understood that most of the oil is gathered on the surface of the filter, rather than collecting the oil contents on the side surface of the holes. Therefore, in the range hood according to the present invention, the holes of the filter are hardly clogged with oil, an effort of washing the filter itself is reduced, and it is possible to prevent an increase in the pressure loss in accordance with use.

[0044]

Figs. 10(A) to 10(D) illustrate an oil content gathering member 30 in this embodiment. The oil content gathering member 30 has a cylindrical section that surrounds the outer peripheral edge of the disk-shaped filter 10. An outer diameter of the cylindrical section is 294 mm, an inner diameter thereof is 290 mm, and these diameters are slightly greater than the diameter of the filter 10. A gap between the both is preferably as small as possible so that oil does not leak. A height of the oil content gathering member 30 is not particularly limited thereto, but the shortest distance between the end portion (upper end) of the downstream side of the oil content gathering member 30 and the disk surface on the downstream side of the filter 10 is preferably equal to or greater than the shortest distance between the end portion (lower end) of the upstream side of the oil content gathering member 30 and the disk surface on the upstream side of the filter 10. Thus, by gathering the oil contents scattered toward the outer peripheral edge direction on the downstream side of the filter 10, the rate capable of gathering the oil contents that have passed through the hole 11 increases, and it is possible to further increase the oil gathering efficiency.

[0045]

The oil content gathering member 30 has a flange at the end portion (upper end) on the downstream side, and thus is easily mounted to the mounting plate 50. Furthermore, it is preferred that the oil content gathering member 30 be provided so as to be freely attachable and detachable for washing. Furthermore, the oil content gathering member 30 is provided with a U-shaped oil sump 31 at the end portion (lower end) of the upstream side, thereby collecting the oil.

[0046]

Figs. 11(A1) and 11(A2) illustrate the shape of the holes 11 of the filter 10 in this embodiment. Fig. 11(A2) is an enlarged view of a circular dotted line of Fig. 11(A1) (hereinafter, the same as in the drawings). The shape of the holes 11 of the filter 10 is circular, and the diameter of the holes 11 is about 0.75 to 5 mm. As illustrated in Fig. 11(A1), the holes 11 in the disk-shaped filter 10 are arranged concentrically around the rotational center of the disk. However, the shape, the size, and the arrangement of the holes are not limited thereto. For example, the arrangement of the holes may be any arrangement, such as the holes opened at the apexes of an equilateral triangle, the holes opened at the apex of the square, or the holes irregularly opened at random. Furthermore, in addition to a modified example to be described below, the shape of the holes may be in the shape of a triangle, a square, and a regular polygon.

[0047]

Figs. 11(B1) to 11(E2) illustrate modified examples of the shape of the holes 11. As illustrated in Figs. 11(B1) and 11(B2), the shape of the holes 11a is an elliptical shape having a long diameter in the radial direction of the disk-shaped filter. In this modified example, the ratio of a short diameter to the long diameter is about 1:2.2, but is not limited thereto. As in Figs. 11(A1) and (A2), the holes 11a are arranged concentrically around the rotational center of the disk, but are not limited thereto.

[0048]

As illustrated in Figs. 11(C1) and 11(C2), the shape of the holes 11b is an elliptical form having a short diameter in the radial direction of the disk-shaped filter. In this modified example, the ratio of the short diameter to the long diameter is about 1:2.4, but is not limited thereto. As in Figs. 11(B1) and 11(B2), the holes 11b are arranged concentrically around the rotational center of the disk, but is not limited thereto.

[0049]

As illustrated in Figs. 11(D1) and 11(D2), the shape of the holes 11c is rectangular. In this modified example, the ratio of the short side to the long side is about 1:3.5, but is not limited thereto. The direction of the long side of the holes 11c form an angle that is neither in the radial direction nor in the circumferential direction, but is not limited thereto, and, for example, the direction of the long side may form the radial direction.

[0050]

As illustrated in Figs. 11(E1) to 11(E2), the shape of the holes 11d is an irregular polygon. The holes are formed by a combination of the rectangular shape and the triangular shape and have a shape in which the apex of the triangle faces in the direction of the rotation, but are not limited thereto, and the apex of the triangle may be oriented in a direction opposite to the direction of the rotation.

In addition, the holes having the shape of one type may be provided on one filter, and holes having the shapes of two types or more may be combined with each other. Furthermore, in the case of forming the holes by cutting and bending the holes (the slits), there may be cut and raised sections as in the common slot filters, together with the holes (slits).

[0051]

A region provided with the holes on the filter may be an entire filter surface or may be a part thereof. In the case of a part, the region provided with the holes may be a region close to the outer peripheral edge of the disk-shaped filter (that is, the region close to the rotational center is not provided with the holes), and in contrast, may be a region close to the rotational center of the disk-shaped filter (that is, the region close to the outer peripheral edge is not provided with the holes). However, if the shape and size of the holes are the same, since the rotational speed of the region closer to the outer peripheral edge is high, it is preferred to provide the holes in a region close to the outer peripheral edge of the disk-shaped filter.

[0052]

As illustrated in Figs. 11(A1) to 11(E2), a diameter DA (m) in the circumferential direction of the holes refers to a maximum value of the length of the arc interposed by two ends of the holes in the concentric circle across the holes around the rotational center of the filter. Furthermore, when the circumferential velocity is set to Vx (m/s) in a distance Rx (m) from the rotational center, the hole diameter pass time is represented by DA/Vx (sec). Furthermore, the average hole diameter pass time tx (sec) is obtained by averaging the hole diameter pass time over the entire filter and is represented by Formula (1). Here, an outer radius of the region in which the holes are present in the filter is set to Rmax (m), a radius on the inner side of the region in which the holes are present in the filter is set to Rmin (m), an number of rotations per second of the filter is set to N (/sec), and an angular velocity of the filter is set to ω (rad/sec). In addition, a region in which the holes are present on the filter is concentrically present about the rotary shaft, and the holes are assumed to be uniformly distributed in that region. In regard to the hole diameter pass time, at a location of $DA/2\pi NRx$, the average hole diameter pass time tx is as follows.

[0053]

$$tx = \frac{DA}{\dfrac{\int_{Rmin}^{Rmax} 4\pi^2 N Rx^2 dR}{\pi (Rmax^2 - Rmin^2)}}$$

$$= \frac{3\,DA(Rmax + Rmin)}{4\pi N (Rmax^2 + RmaxRmin + Rmin^2)} \quad \cdots (1)$$

[0054]

In addition, in other words, it is also possible to say that the average hole diameter pass time is an average value in the filter of the time required for one end and the other end of the diameter in the circumferential direction of the holes of the filter to pass through a point on the circumference, and for convenience, the average hole diameter pass time is the time required to move by the length of the arc in the circumferential direction crossing the holes present at the radial position where the areas of the inside and the outside are the same, in the region in which there are holes, that is, the length of the diameter in the circumferential direction of the hole.
The description is made with reference to Fig. 11(A2). The circular holes 11 move in the circumferential direction at a speed of V (m/s), while drawing from left to right in Figs. 11(A1) to 11(E2) around the rotational center (not illustrated) of the filter. A point α and a point β are points on an outer periphery of the holes 11 and on the same circumference of the rotational center, and a point γ is a midpoint of the arcαβ. Thus, the point α and the point β become one end and the other end of the diameter in the circumferential direction of the holes 11.

[0055]

Since the diameter in the circumferential direction of the holes 11 is a maximum value of the length of the arc interposed by two ends of the holes 11 in the concentric circle crossing the holes 11, the length of the arc αβ becomes the maximum value in a case where a straight line connecting the point α and the point β becomes the diameter of the holes 11. In this case, the length of the arc αγβ becomes DA. The time required for one end (point α) and the other end (point β) of the diameter in the circumferential direction of the holes 11 to pass through one point (point γ) on the circumference is a time until the point β passes through the point γ and then the point α passes through

the point γ. Furthermore, when assuming an outer radius of the region in which the holes are present in the filter as Rmax (not illustrated) and assuming an inner radius of the region in which the holes are present in the filter as Rmin (not illustrated), the region in which holes are present is the outside of Rmin and the inside of Rmax, and is a region in which the width becomes (Rmax - Rmin). Furthermore, the radial position Rctr (not illustrated) at which areas are the same on the inside and outside satisfies the following formula.

$$\pi Rmax^2 - \pi Rctr^2 = \pi Rctr^2 - \pi Rmin^2$$

[0056]

Furthermore, a circumferential velocity Vav of the holes 11 can be obtained by integrating a total value of the circumferential velocity of the mass points arranged on the same circumference around the rotational center of the filter between Rmin and Rmax, and by dividing the integrated value by the area of the region (region from Rmin to Rmax) in which the holes are present in the filter.

More specifically, the circumferential velocity Vav of the holes 11 satisfies the following formula.

$$Vav = 4\pi N(Rmax^2 + Rmax\ Rmin + Rmin^2)/3(Rmax + Rmin)$$

[0057]

Based on the circumferential velocity determined as described above and the length of the arc in Rctr, it is possible to obtain an average value in the filter of the time required for one end and the other end of the diameter in the circumferential direction of the holes to pass through a point on the circumference.

In addition, even in the filter in which all the same holes are uniformly disposed in the filter as in this embodiment, and even in the filter in which the holes having the different shapes and sizes are disposed in the filter, by determining the length of the arc of the respective holes and the circumferential velocity of the position (distance from the rotational center) of the holes, by determining the times required for the respective holes to move by the length (length of the diameter in the circumferential direction) of the arc of the respective holes, and by determining the average value of those times, it is possible to determine the average value in the filter of the time required for one end and the other end of the diameter in the circumferential direction of the holes to pass

through a point on the circumference.

[0058]

Fig. 12 is a graph illustrating a relation between average hole diameter pass time tx and the gathering rate in the range hood according to the present invention. Each of the plots on the graph illustrates the average hole diameter pass time and the gathering rate as measured by rotating the filters of various hole diameters at various number of rotations per unit time. A regression curve (second order polynomial regression curve, $R^2 = 0.97$) was drawn so that the R-squared value is maximized with respect to the plot on the graph. In this way, according to the regression curve of the dotted line in consideration of an error of about 3% of the average hole diameter pass time, a case of exceeding 70% which is the best gathering rate of the conventional filter is the case where the average hole diameter pass time is $3.2 * 10^{-4}$ sec, and preferably by the regression curve of the solid line, the case is near the case where the average hole diameter pass time is $2.7 * 10^{-4}$ sec. Thus, if the average hole diameter pass time is equal to or less than $3.2 * 10^{-4}$ sec, it is possible to provide a range hood with a high oil gathering efficiency.

[0059]

As is apparent from Formula (1), the average hole diameter pass time tx becomes smaller when the number of rotations N per second of the filter becomes higher, or when the diameter DA of the hole decreases. Therefore, the range hood according to the present invention can adjust the average hole diameter pass time, based on the number of rotations of the filter and the diameter of the holes of the filter as parameters. Since the regression curve is lowered to the right lower side, in order to improve the gathering rate, it is preferable to reduce the average hole diameter pass time. Therefore, in order to set the gathering rate to approximately 80%, the time may be approximately $1.8 * 10^{-4}$ sec, and preferably, may be approximately $1.5 * 10^{-4}$ sec. In addition, in order to set the gathering rate to approximately 90%, the time may be approximately $0.98 * 10^{-4}$ sec, and preferably, may be approximately $8.0 * 10^{-5}$ sec.

[0060]

Table 1 illustrates a relation among hole diameter (mm), the number of rotations (rpm), and the gathering rate of the filter in the present embodiment. The gathering rate was measured in the hole diameter of four types of 0.75 mm, 1 mm, 1.5 mm, and 2 mm. It is understood that when the number of rotations of the filter is 0 rpm, the gathering rate of every hole diameter is below 70%, which is the most favorable gathering rate in the conventional filter, and in the filter that does not rotate, the gathering rate is not high.

[0061]

Meanwhile, when rotating the filter at 1000 rpm, even in the filter with a hole diameter of 2 mm having the lowest gathering rate, the gathering rate is 77% that is greater than the gathering rate of the best conventional filter. In addition, as the hole diameter decreases to 1.5 mm, 1 mm, and 0.75 mm, the gathering rate further increases to 80%, 86%, and 88%. Furthermore, when the number of rotations of the filter to 1500 rpm, as the hole diameter decreases to 2 mm, 1.5 mm, 1 mm, and 0.75 mm, the gathering rate becomes higher to 84%, 86%, 91%, and 93%. Furthermore, when the number of rotations of the filter to 2000 rpm, as the hole diameter decreases to 2 mm, 1.5 mm, and 1 mm, the gathering rate becomes 88%, 90%, and 90%. Thus, by rotating the filter while generating the flow of air by the fan, the range hood according to the present invention gathers the oil content contained in the air. Furthermore, it is understood that when the number of rotations per unit time of the filter increases, or when the hole diameter decreases, the higher oil gathering rate is obtained.

[0062]

[Table 1]

Gathering rate		Hole diameter			
		0.75	1	1.5	2
number of rotations	0	54%	48%	-	39%
	1000	88%	86%	80%	77%
	1500	93%	91%	86%	84%
	2000	-	90%	90%	88%

[0063]

As described above, the average hole diameter pass time greater than the gathering rate of 70% is $3.2 * 10^{-4}$ sec, and the average hole diameter pass time is determined by a combination of the hole diameter and the number of rotations of the filter. Then, in the case of combining of the hole diameter and the number of rotations as described below, the average hole diameter becomes $3.2 * 10^{-4}$ sec, and it is possible to achieve the gathering rate of 70%. In other words,

- when the hole diameter, that is, the diameter in the circumferential direction of the holes is 0.75 mm or less, and the number of rotations of the filter is 230 rpm or more,
- when the hole diameter is 1.00 mm or less, and the number of rotations of the filter is 310 rpm or more,
- when the hole diameter is 1.50 mm or less, and the number of rotations of the filter may be 460 rpm or more,

- when the hole diameter is 2.00 mm or less, and the number of rotations of the filter is 620 rpm or more, or
- when the hole diameter is 5.00 mm or less, and the number of rotations of the filter is 1500 rpm or more, it is possible to provide a range hood with a high oil gathering efficiency.

[0064]

Furthermore, more preferably, the average hole diameter pass time having the gathering rate greater than 70% is $2.7 * 10^{-4}$ sec. Thus, in the same way,
- when the hole diameter, that is, the diameter in the circumferential direction of the holes is 0.75 mm or less, and the number of rotations of the filter is 270 rpm or more,
- when the hole diameter is 1.00 mm or less, and the number of rotations of the filter is 360 rpm or more,
- when the hole diameter is 1.50 mm or less, and the number of rotations of the filter is 540 rpm or more,
- when the hole diameter is 2.00 mm or less, and the number of rotations of the filter is 720 rpm or more, or
- when the hole diameter is 5.00 mm or less, and the number of rotations of the filter is 1800 rpm or more, it is possible to provide a range hood with a high oil gathering efficiency.

[0065]

Furthermore, when the oil contents collide with the surface (a section having no hole 11) on the upstream side of the filter, most of the oil contents is blown off in the outer peripheral edge direction of the filter, but a part thereof may adhere to the surface. When the number of rotations of the filter becomes higher, the oil contents once having adhered to the surface of the filter are blown away in the outer peripheral edge direction by the centrifugal force. As a result, since the oil contents hardly adheres and remains on the filter, the range hood according to the present invention can reduce the effort of washing the filter itself.

[0066]

Fig. 13 is a test block diagram used in the test for obtaining a relation between the gathering rate of the filter in the range hood using the slot filter of this embodiment and the prior art type and the oil content adherence to the downstream component such as a fan and a duct. In order to check the state of the oil content adherence to the downstream component by a difference in the gathering rates of the filter, using the difference in the gathering rates by the difference in the hole diameter of the filter of this embodiment, the test was performed as follows:

[0067]

The test method is as follows. The range hood equipped with the filter or the like according to the present invention is provided at a position of 800 mm above a temperature-controllable hotplate. A stainless steel cylinder is placed on the hot plate heated to 245 degrees C, and oil at 2.5 g/min and water at 8 g/min are dropped onto the stainless steel cylinder from the pump. The test time is 10 minutes. Furthermore, the number of rotations of the filter is 1500 rpm.

[0068]

The results of the test are illustrated in Table 2. According to this test, in the range hood using the slot filter as the range hood of the conventional type, the oil content of 50% is gathered in the filter, and the oil content of 23% adheres to the downstream component. The remaining oil content of 27% is discharged to the outside together with the air. Meanwhile, the range hood equipped with the filter having a hole diameter of 2.0 mm as the range hood of the present embodiment gathers the oil content of 83% in the filter, and the oil content of 7% adheres to the downstream component. In addition, the range hood equipped with the filter having a hole diameter of 1.5 mm gathers the oil content of 83% in the filter, and the oil content of 2% adheres to the downstream component. Furthermore, the range hood equipped with the filter having a hole diameter of 1.0 mm gathers the oil content of 87% in the filter, and surprisingly, the adherence of the oil content is not observed in the downstream component.

[0069]

According to this test, as compared to the gathering rate of the range hood of the conventional type, in the range hood according to the present embodiment, the gathering rate of the filter is clearly high to 83% or more. As a result, it is possible to significantly reduce the adherence of the oil content to the downstream component that requires time and effort for cleaning/washing or the like. Considering that the gathering rate of the range hood known from the prior art is 70% at best, the range hood according to the present invention used in this test has the gathering rate of 83% or higher in spite of the change in the hole diameter, and thus it may be said that the range hood according to the present invention has the high gathering efficiency. Accordingly, since the oil content hardly adheres to the downstream section of the filter in the path flow of air, the range hood according to the present invention is able to greatly relieve time and effort for cleaning/washing the downstream section of the filter.

[0070]

[Table 2]

	Filter in the present embodiment				Conventional type
	Hole diameter	ϕ 1[mm]	ϕ 1.5[mm]	ϕ 2[mm]	Slot filter
Gathering rate	Filter	87%	83%	83%	50%
	Downstream component	0%	2%	7%	23%
	Total	87%	85%	90%	73%

[0071]

<Modified Example of First Embodiment>

Fig. 14 illustrates a range hood 1' that is a modified example of the first embodiment according to the present invention. The redundant description with the first embodiment is not provided, and only the differences are described. The range hood 1' has a thin hood section 80' having an upward concave inner surface panel 81' on the inner surface thereof for gathering the steam, the oily smoke or the like generated by cooking performed under the range hood 1'. The hood section 80' is connected to an exhaust duct D in the vicinity of an opening section 2' positioned substantially at the center, and is connected to a blower box 82 having a fan 60 that generates the flow of air therein. A inhalation opening 62 of the fan 60 is disposed so as to be located at the opening section 2' of the hood section 80'. Thus, when the fan 60 is operated, air in the lower part of the inner surface panel 81' is inhaled through the opening section 2' and is discharged to the outside through the exhaust duct D. That is, the opening section 2' is located on the upstream side of the fan 60 on a flow path of the flow of air generated by the fan 60.

[0072]

In the opening section 2', there are a disk-shaped filter 10 having the holes that allow the flow of air to pass through, an electric motor 20 that is connected to the center of the disk of the filter 10 at the rotary shaft to rotate the filter 10, an electric motor fixture 40' for mounting the electric motor 20 to the inner surface panel 81', and an oil content gathering member 30' that is mounted to the inner surface panel 81' and surrounds the outer peripheral edge of the filter 10'. Therefore, the range hood 1' is provided with a filter 10 that is present on the upstream side of the flow from the fan 60 on the flow path of the flow of air generated by the fan 60 and has holes that allow the flow of air to pass from bottom to top in the drawings in a rotatable manner.

[0073]

The air in the lower part of the inner surface panel 81' contains the steam, the oily smoke and the like generated by cooking, when the fan 60 is operated, the air is sucked to the holes of the filter 10 that is present on the opening section 2', that is, located on the upstream side of the fan 60 on the flow path of the flow of air generated by the fan 60, and passes through the holes. The filter 10 is provided so as to be rotatable by the electric motor 20, when the range hood 1' is operated, the fan 60 generates the flow of air, and the electric motor 20 rotates the filter 10. By rotating the filter 10, the range hood 1' gathers the oil contents contained in the air to an oil content gathering member 30'.

[0074]

The main difference between this embodiment and the modified example of this embodiment is that this modified example is not provided with the mounting plate 50 provided in this embodiment, and the oil content gathering member 30' is directly mounted to the inner surface panel 81'. Since the configuration of the range hood 1' reduces the number of components, and is able to increase the area of the surface of the filter (the inner portion of the hole) configured to gather the oil contents and the total area of the holes that allow the flow of air to pass through, it is possible to provide a range hood with a high oil gathering efficiency and a small pressure loss.

[0075]

<Second Embodiment>

Fig. 15 illustrates a range hood 1A of a second embodiment according to the present invention. The redundant description with the first embodiment is not provided, and only the differences are described. The range hood 1A has a thin hood section 80A having an upward concave inner surface panel 81A on the inner surface thereof for gathering the steam, the oily smoke or the like generated by cooking performed under the range hood 1A. The hood section 80A is connected to a blower box 82A connected to the exhaust duct DA in the vicinity of an opening section 2A positioned substantially at the center. The blower box 82A has a fan casing 61A therein, and the fan casing 61A has a fan 60A that generates a flow of air AA as a sirocco fan therein.

[0076]

A inhalation opening 62A of the fan 60A is opened into the approximately vertical plane, and is disposed to be spaced apart from the opening section 2A of the hood section 80A that is opened into the approximately horizontal plane. Since the blower box 82A itself and the connection portion between the blower box 82A and the hood section 80A has airtightness, when the fan 60A is operated, the interior of the blower box 82A becomes a negative pressure, the air in the lower part of the inner surface panel 81A is

inhaled through the opening section 2A and is discharged to the outside through the exhaust duct DA. That is, the opening section 2A is located on the upstream side of the fan 60A on the flow path of the flow of air AA generated by the fan 60A.

[0077]

In the opening section 2A, there are a mounting plate 50A that is mounted so as not to generate a gap capable of serving as a flow path of air between the mounting plate 50A and the inner surface panel 81A, a disk-shaped filter 10A having holes that allow the flow of air AA to pass through, an electric motor 20A which is connected to the center of the disk of the filter 10A at a rotary shaft to rotate the filter 10A, an electric motor fixture 40A for mounting the electric motor 20A to the mounting plate 50A, and an oil content gathering member 30A that is mounted to the mounting plate 50A and surrounds the outer peripheral edge of the filter 10A. Accordingly, the range hood 1A is provided with a filter 10A that is present on the upstream side of the flow from the fan 60A on the flow path of the flow of air AA generated by the fan 60A and has holes that allow the flow of air AA to pass from bottom to top in the drawings in a rotatable manner.

[0078]

The air in the lower part of the inner surface panel 81A contains the steam, the oily smoke and the like generated by cooking, when the fan 60A is operated, the air is sucked to the holes of the filter 10A that is present on the opening section 2A, that is, located on the upstream side of the fan 60A on the flow path of the flow of air AA generated by the fan 60A, and passes through the holes. The filter 10A is provided so as to be rotatable by the electric motor 20A, when the range hood 1A is operated, the fan 60A generates the flow of air AA, and the electric motor 20A rotates the filter 10A. By rotating the filter 10A, the range hood 1A gathers the oil contents contained in the air to the oil content gathering member 30A.

[0079]

<Third Embodiment>

Fig. 16 illustrates a range hood 1B in a third embodiment according to the present invention. The redundant description with the first embodiment is not provided, and only the differences are described. The range hood 1B has a hood section 80B provided with an inner surface panel 81B having an obliquely tilted section for gathering the steam, the oily smoke or the like generated by cooking performed under the range hood 1B. The hood section 80B is connected to a blower box 82B connected to an exhaust duct DB in the vicinity of a coupling section between the hood section 80B and the inner surface panel 81B. The blower box 82B has a fan casing 61B therein, and the fan

casing 61B has a fan 60B that generates a flow of air AB as a sirocco fan therein.

[0080]

A inhalation opening 62B of the fan 60B is opened into an approximately vertical plane, and is disposed to be spaced apart from the opening section 2B that is opened into the inner surface tilted to the horizontal plane by approximately 45degrees. Since the blower box 82B itself and the connection portion between the blower box 82B and the hood section 80B has airtightness, when the fan 60B is operated, the interior of the blower box 82B becomes a negative pressure, the air in the inside of the hood section panel 80B is inhaled through the opening section 2B and is discharged to the outside through the exhaust duct DB. That is, the opening section 2B is located on the upstream side of the fan 60B on the flow path of the flow of air AB generated by the fan 60B.

[0081]

In the opening section 2B, there are a mounting plate 50B that is mounted so as not to generate a gap capable of serving as a flow path of air between the mounting plate 50B and the inner surface panel 81B, a disk-shaped filter 10B having holes that allow the flow of air AB to pass through, an electric motor 20B which is connected to the center of the disk of the filter 10B at a rotary shaft to rotate the filter 10B, an electric motor fixture 40B for mounting the electric motor 20B to the mounting plate 50B, and an oil content gathering member 30B that is mounted to the mounting plate 50B and surrounds the outer peripheral edge of the filter 10B. Accordingly, the range hood 1B is provided with a filter 10B that is present on the upstream side of the flow from the fan 60B on the flow path of the flow of air AB generated by the fan 60B and has holes that allow the flow of air AB to pass from bottom to top in the drawings in a rotatable manner.

[0082]

The air in the lower part of the inner surface panel 81B contains the steam, the oily smoke and the like generated by cooking, when the fan 60B is operated, the air is sucked to the holes of the filter 10B that is present on the opening section 2B, that is, located on the upstream side of the fan 60B on the flow path of the flow of air AB generated by the fan 60B, and passes through the holes. The filter 10B is provided so as to be rotatable by the electric motor 20B, when the range hood 1B is operated, the fan 60B generates the flow of air AB, and the electric motor 20B rotates the filter 10B. By rotating the filter 10B, the range hood 1B gathers the oil contents contained in the air to the oil content gathering member 30B.

[0083]

<Fourth Embodiment>

Fig. 17 illustrates a range hood 1C of a fourth embodiment according to the present invention. The redundant description with the first embodiment is not provided, and only the differences are described. The range hood 1C has a hood section 80C having an upward concave inner surface panel 81C on the inner surface thereof for gathering the steam, the oily smoke or the like generated by cooking performed under the range hood 1C. The hood section 80C is connected to an exhaust duct DC in the vicinity of the opening section 2C positioned substantially at the center, and is connected to a blower box 82C having a fan 60C that generates a flow of air therein. A inhalation opening 62C of the fan 60C is disposed so as to be located in the opening section 2C of the hood section 80C. Accordingly, when the fan 60C is operated, the air in the lower part of the inner surface panel 81C is inhaled through the opening section 2C and is discharged to the outside through the exhaust duct DC. That is, the opening section 2C is located on the upstream side of the fan 60C on the flow path of the flow of air generated by the fan 60C.

[0084]

In the opening section 2C, there are a mounting plate 50C that is mounted so as not to generate a gap capable of serving as a flow path of air between the mounting plate 50C and the inner surface panel 81C, a cylindrical filter 10C having holes that allow the flow of air to pass through, an electric motor 20C that is connected so that a rotary shaft matches the shaft center of the cylinder of the filter 10C to rotate the filter 10C, an electric motor fixture 40C for mounting the electric motor 20C to an oil content gathering member 30C, and an oil content gathering member 30C that is mounted to the mounting plate 50C and surrounds the side surface of the filter 10C. Accordingly, the range hood 1C is provided with a filter 10C that is present on the upstream side of the flow from the fan 60C on the flow path of the flow of air generated by the fan 60C, and has holes, on the side surface of the cylinder, that allow the flow of air to pass from the outside to the inside of the cylinder in a rotatable manner.

[0085]

The air in the lower part of the inner surface panel 81C contains the steam, the oily smoke and the like generated by cooking, when the fan 60C is operated, the air is sucked to the holes of the filter 10C that is present on the opening section 2C, that is, located on the upstream side of the fan 60C on the flow path of the flow of air generated by the fan 60C, and passes through the holes. The filter 10C is provided so as to be rotatable by the electric motor 20C, when the range hood 1C is operated, the fan 60C generates the flow of air, and the electric motor 20C rotates the filter 10C. By rotating

the filter 10C, the range hood 1C gathers the oil contents contained in the air to the oil content gathering member 30C.

[0086]

The main difference between this embodiment and the first embodiment is in that the first embodiment is provided with the disk-shaped filter 10, and meanwhile, this embodiment is provided with the cylindrical filter 10C having a substantially vertical shaft center. In the cylindrical filter 10C, the cylinder rotates by connecting the rotary shaft of the electric motor 20C to the shaft center of the cylinder, and the side surface of the cylinder has holes that allow the flow of air to pass through. The range hood is configured so that the flow of air passes from the outside to the inside of the side surface of the cylinder. The bottom surface of the cylinder is not opened so that the filter 10C inhales the flow of air from the side surface of the cylinder. Furthermore, the oil content gathering member 30C is provided so as to surround the whole side surface of the filter 10C. When the air containing the oil contents hits the filter 10C, the oil contents collide with the side surface (surface having no holes) of the cylinder, and the collided oil contents are blown off to the oil content gathering member 30C by the side surface of the cylinder and are collected by the oil sump 31C.

[0087]

In addition, the present invention is not limited to the illustrated embodiments and can be implemented by the configuration within the scope that does not depart from the contents described in the claims.

LIST OF REFERENCE SYMBOL

[0088]

1 range hood
2 range opening section
3 filter unit
10 filter
11 hole
20 electric motor
21 rotary shaft of electric motor
30 oil content gathering member
31 oil sump
40 electric motor fixture
41 electric motor fixture hole
50 mounting plate

51 mounting plate opening section

52 extension section

60 fan

61 fan casing

62 inhalation opening

70 airflow guide plate

80 hood section

81 inner surface panel

82 blower box

D exhaust duct

A flow of air

OP oil content

OL oil

CLAIMS

1. A range hood comprising:

an inner surface panel of a hood which gathers oily smoke generated by cooking and has an opening section located substantially at the center of the inner surface panel;

a fan which locates above the opening section of the inner surface panel and generates a flow of air;

a filter which locates at the opening section, being a flow path of the flow of air, or on an upstream side of the opening section and the filter has holes which allow the flow of air to pass through the filter;

an electric motor configured to rotate the filter;

an oil content gathering member which is provided so as to be freely attachable and detachable and surrounds a periphery of the filter; and

an airflow guide plate which faces to the filter on an upstream side of the flow of air and locates on an upstream side of the filter;

wherein the filter is mounted to a rotary shaft of the electric motor in a freely attachable and detachable manner, and when the fan generates the flow of air, the electric motor rotates the filter so as to gather oil contents contained in the air to the oil content gathering member.