

RANGE HOOD

TECHNICAL FIELD

[0001]

The present invention relates to a range hood that gathers oil contents from oily smoke generated by cooking.

BACKGROUND ART

[0002]

A range hood installed in a kitchen or the like is configured to inhale steam, oily smoke or 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 content contained in the oily smoke to the outdoors or the like without change causes the oil content to adhere to facilities such as a 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.

[0003]

Therefore, the range hood needs to include a filter having a high gathering efficiency to catch and collect most of the oil contents contained in the oily smoke. However, in contrast, in such a case, the oil content adhering to the filter clogs the filter, which encourages an increase in ventilation resistance and a decrease in gathering efficiency, causes the poor ventilation, and thus, compels a user to perform frequent washing and cleaning of the filter, thereby requiring great labor and time. Therefore, conventionally, a lot of schemes for improving the cleaning characteristics of the filter have been made.

[0004]

For example, a technology disclosed in Patent Literature 1 discloses a range hood having a filter cleaning function that is able to remove 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 means) that moves while abutting against a surface of the filter.

[0005]

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,

the range hood does not suggest a technology for improving an oil gathering efficiency in the filter.

[0006]

As a scheme capable of preventing 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 2. This document discloses a range hood in which a rotatable filter having a blade and formed in a substantially disk shape for removing oil in exhaust gas 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.

[0007]

In such a range hood, there is no need for a large and complicated structure as much as in Patent Literature 1, but the range hood is the same in terms of the fact that the oil content adhering to the filter while operating the range hood is 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 relieved somewhat, 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 cleans the range hood.

CITATION LIST

PATENT LITERATURE

[0008]

Patent Literature 1: JP 2006-292248 A

Patent Literature 2: JP 2006-38240 A

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0009]

Thus, the present invention has been made in view of the above-described problems, and an object thereof is to provide a range hood provided with a filter that has an oil gathering efficiency greatly exceeding the conventional oil gathering efficiency, has a small pressure loss, and hardly clogs, and in which adhering and sticking of the oil

content to the filter is reduced to relieve time and effort for cleaning/washing the filter.

Furthermore, another object of the present invention is to provide a range hood which operates the filter, but reduces an influence of sound of a power source of the operation applied to a user.

SOLUTION TO PROBLEM

[0010]

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, and have found that it is possible to reduce the influence of the sound generated from the power source or the like applied to a user by controlling the power source configured to move the filter, which led to completion of the present invention.

[0011]

In order to solve the above-described problems, there is provided a range hood which includes a fan configured to generate a flow of air, a filter which is present on an upstream side of the fan on a flow path of the flow of air and has holes that allow the flow of air to pass through, an electric motor configured to rotate the filter, an oil content gathering member that surrounds a periphery of the filter, and a control unit configured to control the rotation of the fan and the electric motor, wherein the control unit may rotate the fan and the electric motor simultaneously.

With this configuration, by simultaneously rotating the fan and the filter, it is possible to set the noise generated by the electric motor for rotating the filter and the wind noise caused by the rotation of the filter to an extent that a user does not mind. Furthermore, by simultaneously performing the rotation of the fan, that is, the operation of the range hood, and the rotation of the filter at least at a point of time, an adherence amount of the oil content to the filter decreases, and thus it is possible to prevent sticking of the oil content onto the surface of the filter.

[0012]

Furthermore, the control unit may perform the control such that a time when starting the rotation of the fan is simultaneous with a time when starting the rotation of the electric motor, and/or a time when terminating the rotation of the fan is simultaneous with a time when terminating the rotation of the electric motor.

With this configuration, by simultaneously performing start or termination of the rotation of the electric motor serving as a power source for moving the filter and the rotation of the fan, it is possible to provide a range hood in which a user does not mind

generation of noise of the electric motor.

[0013]

Furthermore, the control unit may perform the control such that the time when starting the rotation of the fan is simultaneous with the time when starting the rotation of the electric motor and may perform the control such that the rotation of the electric motor is terminated after a predetermined time elapses after termination of the rotation of the fan.

With this configuration, by rotating the filter for a while even after termination of the operation of the range hood, it is possible to blow off the oil content still adhering to the filter, thereby maintaining the filter in a clean condition. As a result, it is possible to provide a range hood that reduces adhering and sticking of the oil content to the filter to relieve time and effort for cleaning/washing the filter. Furthermore, when the oil content still adheres to the filter after termination of the operation of the range hood, the oil content sticks to generate clogging or unbalance in the filter, thereby generating an unnecessary noise when starting the operation next time, but such a noise can be prevented with this configuration.

[0014]

Furthermore, the control unit may perform the control such that the time when starting the rotation of the fan is different from the time when starting the rotation of the electric motor, and the time when terminating the rotation of the fan is different from the time when terminating the rotation of the electric motor.

With this configuration, it is possible to flexibly perform the control by independently rotating the fan and the filter.

[0015]

Furthermore, the control unit may change a number of rotations of the fan to change a number of rotations of the electric motor depending on the number of rotations of the fan.

With this configuration, it is possible to prevent clogging of the filter by applying stronger centrifugal force when a lot of oil contents adhere to the filter to quickly blow off the oil contents from the filter, thereby reducing the adherence amount of the oil contents, and it is possible to prevent the filter from rotating at a higher speed than necessary when the rotational speed of the range hood is low.

[0016]

Furthermore, the control unit may change the number of rotations of the fan and the electric motor in stages.

With this configuration, it is possible to perform the control as a number of rotations

that is easy for a user to understand, such as, strong, medium, and weak operations.

[0017]

Furthermore, in order to solve the above-described problems, there is provided a range hood which includes a fan configured to generate a flow of air, a filter which is present on an upstream side of the fan on a flow path of the flow of air and has holes that allow the flow of air to pass through, an electric motor configured to rotate the filter, an oil content gathering member that surrounds a periphery of the filter, and a control unit capable of changing the number of rotations of the fan and the electric motor in stages, wherein the control unit does not rotate the electric motor at a stage in which the number of rotations of the fan is the smallest.

With this configuration, it is possible to provide a quiet range hood by preventing the filter from rotation when the sound accompanied by the rotation of the filter is noticeable.

[0018]

Furthermore, the control unit may rotate the electric motor when the rotation of the fan is terminated, in a case where the rotation is terminated after the fan rotates only at a stage in which the number of rotations of the fan is the smallest.

With this configuration, it is possible to provide a range hood in which after termination of the operation of the range hood, for example, when a user is apart from the vicinity of a cooking table, it is possible to blow off the adhering oil content by immediately rotating the filter, it is possible to prevent clogging of the filter by quickly blowing off the oil content from the filter, thereby reducing the adherence amount of the oil content, and the user apart from the range hood does not mind the noise.

[0019]

Furthermore, a filter rotation control switch configured to control the rotation of the electric motor may be included.

With this configuration, a user is able to personally and flexibly control the rotation of the filter.

ADVANTAGEOUS EFFECTS OF INVENTION

[0020]

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 and has a small pressure loss, and hardly clogs, in which the adhering and sticking of the oil content to the filter decrease, and time and effort for cleaning/washing the filter is relieved.

Furthermore, according to the present invention, it is possible to provide a range hood that reduces the influence of noise of the power source of the operation of the filter applied to a user.

BRIEF DESCRIPTION OF DRAWINGS

[0021]

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 plain view thereof, Fig. 3(D) is a bottom view thereof, and Fig. 3(E) is a cross-sectional view thereof.

Fig. 4 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. 5 is a diagram illustrating the operation of the first embodiment of the range hood according to the present invention.

Fig. 6 is an enlarged view illustrating the operation of the first embodiment of the range hood according to the present invention.

Fig. 7 is an explanatory view illustrating a modified example of a control method of the first embodiment of the range hood according to the present invention.

Fig. 8 is a test block diagram used for a test for obtaining a relation between a gathering rate of the filter and oil content adherence to a downstream component in the first embodiment of the range hood according to the present invention and the prior art.

DESCRIPTION OF EMBODIMENTS

[0022]

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.

[0023]

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.

[0024]

Furthermore, the hood section 80 is provided with a control unit 90 that controls the rotation of the electric motor 20 configured to rotate the filter 10 and the rotation of the fan 60. In the present embodiment, the control unit 90 is provided in the hood section 80, but is not limited thereto, and the control unit 90 may be provided at any position of the range hood 1 and may be provided outside the range hood 1. The control unit 90 may perform control so as to rotate the fan 60 and the electric motor 20 simultaneously. That is, the control unit 90 performs control so as to rotate the electric motor 20 at least at a time while the range hood 1 rotates the fan 60 configured to generate the flow of air so as to gather the oily smoke or the like generated by cooking. In addition, the rotation of the fan 60 and the electric motor 20 (the filter 10) specifically refers to supply of the electric power to the fan 60 and the electric motor 20, and non-rotation refers to stop of the supply of the electric power.

[0025]

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.

[0026]

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 or 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.

[0027]

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.

[0028]

Fig. 2 illustrates a filter rotation control switch 91 that controls the rotation of the electric motor 20. As described below, the control unit 90 performs various controls on the electric motor 20 that rotates the filter 10, but in addition, a user is able to personally control the rotation of the flexible filter by operating the filter rotation control switch 91. The filter rotation control switch 91 is able to start the rotation of the electric motor 20, terminate the rotation, and change the speed of rotation, by the operation of the user. Furthermore, as the maintenance operation of the filter 10, it is possible to perform the operation of automatically stopping the filter 10 after rotating only the electric motor 20 for a predetermined time.

[0029]

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.

[0030]

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.

[0031]

Figs. 3 and 4 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 hole which allows 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 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.

[0032]

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.

[0033]

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.

[0034]

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.

[0035]

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 upstream end portion of the oil content gathering member 30. The extension section 52 preferably increases the rate capable of gathering the oil content that has passed through the hole, thereby being able to provide a range hood having a high oil gathering rate.

[0036]

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.

[0037]

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.

[0038]

Figs. 5 and 6 illustrate the operation of gathering the oil content accompanied by the flow of air in the range hood 1. Fig. 5 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 towards 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. 5 and 6. 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.

[0039]

A 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. When the filter 10 rotates at a relatively high speed, the surface of the filter 10 (a section having no hole 11) 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, 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.

[0040]

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.

[0041]

Fig. 6 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 the flow of air A and reach the surface near the upstream side of the filter 10. In oil contents OP2 reaching the surface near the upstream side, a part thereof (oil content having a small particle size) 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.

[0042]

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 the fan 60, the exhaust duct D or the like of the downstream section of the filter 10.

[0043]

When the oil contents collide with the surface (a portion having no hole 11) of the upstream side of the filter, most of the oil contents are blown off in the direction of the peripheral edge of the filter, but a part thereof may adhere to the surface. When the rotational speed of the filter becomes faster, the oil contents once adhered to the surface of the filter are blown off in the direction of the outer peripheral edge by centrifugal force. As a result, since the remaining oil contents adhering to the filter decrease, the range hood according to the present invention can reduce the effort of washing of the filter itself.

[0044]

The control unit 90 may perform control so as to rotate the fan 60 and the electric motor 20 simultaneously. That is, the control unit 90 performs control so as to rotate the electric motor 20 at least at a time while rotating the fan 60 that generates the flow of air so that the range hood 1 gathers the oily smoke or the like generated by cooking. In other words, the control unit 90 may rotate the filter 10 by the electric motor 20 while the fan 60 rotates to generate the flow of air. Furthermore, the control unit 90 may perform the control so as to generate the flow of air by rotating the fan 60 while rotating the filter 10 by the electric motor 20.

[0045]

According to this configuration, by simultaneously rotating the fan 60 and the filter 10, it is possible to set the noise generated by the electric motor 20 for rotating the filter 10 and the wind noise caused by the rotation of the filter to an extent that a user does not mind. That is, in a case where the filter rotates while the fan stops, since there is no noise generated by the fan, the noise generated by the electric motor and the wind noise caused by the rotation of the filter are noticeable, but by simultaneously rotating the filter and the fan, since the noise generated by the electric motor and the wind noise caused by the rotation of the filter are masked by the noise generated by the fan, the noise can be set to the extent that a user does not mind. Furthermore, by simultaneously performing the rotation of the fan 60, that is, the operation of the range hood 1, and the rotation of the filter 10 at least at a time, an adherence amount of the oil content to the filter 10 is reduced, and it is possible to prevent the oil content from sticking onto the surface of the filter.

[0046]

Fig. 7 is an explanatory diagram illustrating a modified example of the control

method of the fan 60 and the electric motor 20 of the present embodiment. The time when rotating the fan 60 and the electric motor 20 is represented by ON (a solid line) and the time when not rotating fan 60 and the electric motor 20 is represented by OFF (a dotted line). In Modified Example 0 of the rotation of the filter, the control unit 90 performs control such that the fan 60 and the electric motor 20 may rotate at the same time as described above. In Modified Example 0, the electric motor 20 (the filter 10) rotates at some point during the rotation of the fan 60. The electric motor 20 may rotate at some point during the rotation of the fan 60, and the rotation time is not also particularly limited.

[0047]

In addition, Fig. 7 illustrates the conventional range hood as a conventional example. Since the conventional example is configured so that the oil contents adhering to the filter while operating the hood range, that is, while the fan rotates, are removed while not operating the range hood (during stop of the range hood), that is, while the fan does not rotate, after the fan is turned OFF from ON, the function of removing the oil content is turned ON. Thus, the present invention is entirely different from the conventional example in view of the fact that the control may be performed so as to rotate the fan 60 and the electric motor 20 simultaneously.

[0048]

In Modified Example 1 of the rotation of the filter, during the rotation of the fan 60, the control unit 90 turns ON twice with one OFF interposed therebetween, that is, rotates the filter by dividing into two periods of rotation. In Modified Example 1, the rotation is divided into two periods of rotation, but is not limited thereto, and turning ON and OFF may be repeated any number of times during the rotation of the fan 60. With this configuration, it is possible to reduce the adherence amount of the oil content to the filter and to minimize the noise generated by the electric motor and the wind noise caused by the rotation of the filter.

[0049]

In Modified Example 2 of the rotation of the filter, the control unit 90 always rotates the electric motor 20 (filter 10) during the rotation of the fan 60. That is, the control unit 90 performs control such that the time when starting the rotation of the fan 60 is simultaneous with the time when starting the rotation of the electric motor 20, and the time when terminating the rotation of the fan 60 is simultaneous with the time when terminating the rotation of the electric motor 20. Furthermore, the control unit 90 may perform the control such that the time when starting the rotation of the fan 60 is simultaneous with the time when starting the rotation of the electric motor 20, or the

time when terminating the rotation of the fan 60 is simultaneous with the time when terminating the rotation of the electric motor 20. With this configuration, by simultaneously performing start and termination of the rotation of the electric motor 20 as a power source for moving the filter 10 and the rotation of the fan 60, it is possible to provide a range hood in which a user does not mind generation of the noise of the electric motor 20.

[0050]

Of course, as in Modified Example 5, the control unit 90 may perform the control such that the time when starting the rotation of the fan 60 is simultaneous with the time when starting the rotation of the electric motor 20, and the time when terminating the rotation of the fan 60 is simultaneous with the time when terminating the rotation of the electric motor 20, thereby interrupting the rotation of the electric motor 20 during the rotation of the fan 60.

[0051]

In Modified Example 3 of the rotation of the filter, the control unit 90 performs control such that the time when starting the rotation of the fan 60 is simultaneous with the time when starting the rotation of the electric motor 20, and after a predetermined time elapses after termination of the rotation of the fan 60, the rotation of the electric motor 20 is terminated. That is, the control during the rotation of the fan 60 is the same as Modified Example 2, but the electric motor 20 (the filter 10) continues to rotate for a while, even after termination of the rotation of the fan 60. With this configuration, it is possible to blow off the oil content that still adheres to the filter 10 after termination of the rotation of the fan 60, thereby maintaining the filter 10 in a clean condition, and as a result, it is possible to provide a range hood in which adherence and sticking of the oil content to the filter 10 decrease to relieve time and effort for cleaning/washing the filter 10. Furthermore, when the oil contents still adhere to the filter 10 after termination of the operation of the range hood, the oil contents stick to the filter 10 to cause clogging and unbalance, and when starting the operation next time, unnecessary noise generates, but it is possible to prevent such noise with the present invention. In addition, in regard to how long the control unit 90 rotates the fan after termination of the rotation of the fan 60, an appropriate predetermined time is defined, but, for example, when the strong operation of the fan is performed long, the time may be set to long, and when the weak operation is performed long, the time may be set to short.

[0052]

Of course, as in Modified Example 6, the control unit 90 may perform the control

such that the time when starting the rotation of the fan 60 is simultaneous with the time when starting the rotation of the electric motor 20, and the rotation of the electric motor 20 is terminated after a predetermined time elapses after termination of the rotation of the fan 60, thereby interrupting the rotation of the electric motor 20 during the rotation of the fan 60.

[0053]

In Modified Example 4 of the rotation of the filter, the control unit 90 performs control so as to start the rotation of the electric motor 20 before the rotation of the fan 60, resume the rotation again after the temporary interruption during the rotation of the fan 60, and terminate the rotation of the electric motor 20 after a predetermined time elapses after termination of the rotation of the fan 60. According to this configuration, by rotating the filter 10 at a high speed just before the rotation of the fan 60, it is possible to blow off the oil contents remaining on the filter at the last use, and perform gathering of the oil contents by the clean filter without clogging. In addition, in this case, since the fan 60 starts to rotate a little later by turning the range hood ON, the rotation of the filter 10 immediately before the rotation of the fan 60 is performed in a short time. In this way, the control unit 90 may perform the control such that the time when starting the rotation of the fan 60 is different from the time when starting the rotation of the electric motor 20, and the time when terminating the rotation of the fan 60 is different from the time when terminating the rotation of the electric motor 20. With this configuration, it is possible to perform the flexible control by independently rotating the fan and the filter.

[0054]

Of course, as in Modified Example 7, the control unit 90 may perform the control such that the rotation of the electric motor 20 starts before the rotation of the fan 60, the rotation is resumed again after the temporary interruption during the rotation of the fan 60, and the time when terminating the rotation of the fan 60 is simultaneous with the time when terminating the rotation of the electric motor 20.

[0055]

In Modified Examples 8 and 9 of the rotation of the filter, the control unit 90 performs control so as to change the number of rotations per unit time of the fan 60, and change the number of rotations of the electric motor 20 (the filter 10) in response to the number of rotations of the fan 60. A rate of change of the number of rotations of the fan 60 and a rate of change of the number of rotations of the electric motor 20 may be the same as in Modified Example 8 and may be different as Modified Example 9. With this configuration, when a lot of oil contents adhere, it is possible to prevent clogging of

the filter 10 by applying the stronger centrifugal force to quickly blow off the oil content from the filter 10, thereby reducing the adherence amount of the oil content, and when the rotational speed of the range hood is low, it is possible to prevent the filter 10 from being rotated at a higher speed than necessary. Furthermore, as in Modified Example 8, the control unit 90 may change the number of rotations of the fan 60 and the electric motor 20 in stages. According to this configuration, it is possible to perform the control as the number of rotations that is easy for a user to understand, such as, strong, medium, and weak operations. In addition, the number of rotations such as strong, medium, and weak operations is the number of rotations relative to one another and is not intended to mean the absolute number of rotations.

[0056]

Typically, when performing cooking that generates a lot of oily smoke, the fast rotational speed of the fan is selected and used. Therefore, as the rotational speed of the fan is fast, a lot of oily smoke tends to generate. In other words, as the rotational speed of the fan is fast, the amount of oil content adhering to the filter 10 increases to quickly cause clogging. Therefore, by increasing or decreasing the number of rotations per unit time of the filter 10 depending on the rotational speed of the fan, when a lot of oil contents adhere, by rotating the filter at a higher speed to apply the stronger centrifugal force, and rapidly blowing off the oil content from the filter 10 to prevent clogging of the filter 10, and when the rotational speed of the fan is low, it is possible to prevent the filter 10 from rotating at a higher speed than necessary.

[0057]

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.

[0058]

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.

[0059]

[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%

[0060]

Fig. 8 is a test configuration diagram used for a test for obtaining a relation between the gathering rate of the filter in the range hood using the slot filter of and the conventional type and the filter of the present embodiment, and adherence of the oil content to the downstream components such as a fan and a duct. In order to check the state of the oil content adhering to the downstream components by a difference in gathering rates of the filter, using the difference in the gathering rate due to the difference in the hole diameter of the filter in this embodiment, the test was performed as follows:

[0061]

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.

[0062]

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.

[0063]

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.

[0064]

[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%

[0065]

<Second Embodiment>

The redundant description of the first embodiment is not provided and only the difference is described. Compared with the first embodiment, the present embodiment is different only in the control method of the control unit with respect to the fan 60 and

the electric motor 20, and thus the control unit is described as a control unit 90A.

The control unit 90A performs control so as not to rotate the electric motor 20 at a step in which the number of rotations of the fan 60 is the smallest. That is, in the case of changing the number of rotations of the fan 60 as in the above-described Modified Examples 8 and 9, when the number of rotations of the fan 60 is small, the control unit 90A performs control so as not to rotate the electric motor 20. As the main source of noise generated from the range hood, there is a fan that generates the flow of air to be exhausted or a wind noise. That is, since the noise is small as a whole when operating the fan at a low number of rotations, such as a weak operation of the fan 60, the sound accompanied by the rotation of the filter 10 and the electric motor 20 becomes noticeable. Therefore, at the time of the weak operation, in some cases, the filter may not be rotated. According to this configuration, it is possible to provide a quiet range hood, by preventing the filter from rotating when the sound accompanied by the rotation of the filter is noticeable.

[0066]

Conversely, when the fan 60 is operated at a relatively high number of rotations, such as the medium or strong operation, since the rotation sound of the filter 10 is masked by the noise generated by the fan 60, the control unit 90A rotates the filter 10. Furthermore, when the fan 60 is in the state of weak operation, the oily smoke generated by cooking usually decreases, and the total amount of oil content adhering to the filter 10 also decreases, it is not necessary to prevent clogging of the filter 10 by the rotation.

[0067]

Furthermore, the control unit 90A may perform the control so as to rotate the electric motor 20 (the filter 10) when the rotation of the fan 60 is terminated in a case where the rotation is terminated after the fan 60 rotates only at the stage in which the number of rotations per unit time of the fan 60 is the smallest. According to this configuration, it is possible to provide a range hood in which after termination of the operation of the range hood, for example, when a user is apart from the vicinity of a cooking table, it is possible to immediately blow off the adhering oil content by rotating the filter 10, the oil content is rapidly blown off from the filter 10 to prevent clogging of the filter, thereby reducing the adherence amount of the oil content, and the user apart from the range hood does not mind the noise.

[0068]

In addition, the stage in which the number of rotations per unit time of the fan 60 is the smallest may be the smallest stage of the number of rotations of the fan 60 assumed

to be used during cooking. That is, in the range hood equipped with a constant ventilation function of the entire interior, typically, the number of rotations at the time of the constant ventilation operation is the smallest, and then, the number of rotations of the fan 60 increases for example, in the order of weak, medium, and strong operations. However, the constant ventilation operation is not assumed to be used during cooking. Therefore, in such a case, the weak operation may be adopted as the stage in which the number of rotations per unit time of the fan 60 is the smallest.

[0069]

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

LIST OF REFERENCE SYMBOL

[0070]

- 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
- 90 control unit

91 filter rotation control switch

D exhaust duct

A flow of air

OP oil content

OL oil

CLAIMS

1. A range hood comprising:
 - a fan configured to generate a flow of air;
 - 5 a filter which is present on an upstream side of the fan on a flow path of the flow of air, and has holes that allow the flow of air to pass through;
 - an electric motor configured to rotate the filter;
 - an oil content gathering member that surrounds a
 - 10 periphery of the filter; and
 - a control unit configured to control rotation of the fan and the electric motor,
 - wherein the control unit may rotate the electric motor at least at a time while rotating the fan, and
 - 15 the control unit changes a number of rotations of the fan to change the number of rotations of the electric motor depending on the number of rotations of the fan.
2. The range hood according to claim 1, wherein the
- 20 control unit performs control such that a time when starting the rotation of the fan is simultaneous with a time when starting the rotation of the electric motor, and/or a time when terminating the rotation of the fan is simultaneous with a time when terminating the rotation of
- 25 the electric motor.
3. The range hood according to claim 2, wherein the control unit performs control such that the time when starting the rotation of the fan is simultaneous with the
- 30 time when starting the rotation of the electric motor, and

performs control such that the rotation of the electric motor is terminated after a predetermined time elapses after termination of the rotation of the fan.

5 4. The range hood according to claim 1, wherein the control unit performs control such that the time when starting the rotation of the fan is different from the time when starting the rotation of the electric motor, and the time when terminating the rotation of the fan is different
10 from the time when terminating the rotation of the electric motor.

5. The range hood according to claim 1, wherein the control unit changes the number of rotations of the fan and
15 the electric motor in stages.

6. A range hood comprising:
 a fan configured to generate a flow of air;
 a filter which is present on an upstream side of the
20 fan on a flow path of the flow of air, and has holes that allow the flow of air to pass through;
 an electric motor configured to rotate the filter;
 an oil content gathering member that surrounds a periphery of the filter; and
25 a control unit capable of changing a number of rotations of the fan and the electric motor in stages,
 wherein the control unit does not rotate the electric motor at a stage in which the number of rotations of the fan is the smallest and rotate the electric motor at least
30 at a time while rotating the fan at a stage other than said

stage in which the number of rotations of the fan is the smallest.

7. The range hood according to claim 6, wherein the control unit rotates the electric motor when the rotation of the fan is terminated, in a case where the rotation is terminated after the fan rotates only at a stage in which the number of rotations of the fan is the smallest.
8. The range hood according to any of claims 1 to 7, further comprising: a filter rotation control switch configured to control the rotation of the electric motor.