

VENTILATION DEVICE

1. Field of the Invention

The present invention relates to a ventilation device, especially to a ventilation device that blocks rain, guides heated air to flow out of the ventilation device, and allows the heated air to be sucked by high pressure wind outside the ventilation device.

2. Description of the Prior Arts

When heated air is generated in a large-sized building, such as a factory, warehouse, or the like, the heated air flows upwardly and is trapped under a roof of the building, causing interior temperature of the building to rise gradually. A conventional way to prevent the interior temperature of the building from rising is to install air conditioners in the building. However, installation, operation, and maintenance of the air conditioners cost a lot of money and consume large amount of electricity.

Another conventional way to lower down the interior temperature of the building is to install exhaust fans on the roof of the building. As the exhaust fans rotate, the heated air that is trapped under the roof is forced to be expelled from the building. Accordingly, cool air flows into the building, such that a great deal of air inside the building is ventilated and the interior temperature of the building is lowered.

Still another conventional way to expel the heated air from the building is to install at least one conventional ventilation device on the roof of the building. Each of the at least one conventional ventilation device is hollow and has an outtake opening and an intake opening. The outtake opening is formed

on a top of the conventional ventilation device. The intake opening is formed on a bottom of the conventional ventilation device and communicates with an opening that is formed on the roof of the building. As the heated air flows upward to the conventional ventilation device, the conventional ventilation device guides the heated air to further flow out of the conventional ventilation device.

However, when strong wind blows, wind pressure outside the building may be higher than air pressure inside the exhaust fan or the conventional ventilation device, causing wind drag and turbulence. Accordingly, the heated air is trapped inside the building and cannot be expelled out of the building. Moreover, when torrential rain falls, the exhaust fan or the conventional ventilation device cannot block the rain, such that the rain may drop into the building via the exhaust fan or the conventional ventilation device.

To overcome the shortcomings, the present invention provides a ventilation device to mitigate or obviate the aforementioned problems.

The main objective of the present invention is to provide a ventilation device.

The ventilation device has a base, a guiding assembly, and an upper cover assembly. The base is a hollow housing and has at least one drainage outlet. The guiding assembly is mounted in the base and has a guiding panel, an inner arched panel, and a rain shield panel. The guiding panel is hollow and semi-pyramidal. The inner arched panel protrudes up from the guiding panel. The rain shield panel is mounted above the guiding panel. The upper cover assembly is pyramidal, is mounted in the base, and is mounted on the guiding

panel via multiple supports. A first interval is formed between the rain shield panel and the guiding panel. A second interval is formed between the upper cover assembly, the rain shield panel, and the inner arched panel. A third interval is formed between the upper cover assembly and the outer arched panel.

The ventilation device guides heated air to flow out of the ventilation device and allows the heated air to be sucked by high pressure wind outside the ventilation device. Moreover, the ventilation device blocks rain and prevents the rain from floating into the ventilation device.

Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description when taken in conjunction with the accompanying drawings.

IN THE DRAWINGS

Fig. 1 is a perspective view of a ventilation device in accordance with a first embodiment of the present invention;

Fig. 2 is a cross-sectional perspective view of the ventilation device in Fig. 1;

Fig. 3 is an exploded perspective view of the ventilation device in Fig. 1;

Fig. 4 is a front view in partial section of the ventilation device in Fig. 1;

Fig. 5 is an exploded perspective view of an upper cover assembly of the ventilation device in Fig. 1;

Fig. 6 is an enlarged cross-sectional front view of the ventilation device

in Fig. 1;

Fig. 7 is an operational front view in partial section of the ventilation device in Fig. 1;

Fig. 8 is an operational perspective view of the ventilation device in Fig. 1;

Fig. 9 is a front view in partial section of the ventilation device in accordance with a second embodiment of the present invention;

Fig. 10 is a perspective view of a main body of an upper cover assembly of the ventilation device in Fig. 9; and

Fig. 11 is an enlarged cross-sectional front view of the ventilation device in Fig. 9, showing a pressing strut mounted on the upper cover assembly.

With reference to Figs. 1 to 3, a ventilation device in accordance with a first embodiment of the present invention comprises a base 10, a guiding assembly 20, and an upper cover assembly 30.

With further reference to Fig. 4, the base 10 is a hollow square housing and has an annular sidewall, at least one drainage outlet 13, an intake opening 110 and an upper opening. The annular sidewall has a bottom panel 11 and an outer arched panel 12. The bottom panel 11 is on a lower end of the base 10. The bottom panel 11 is annular and is straight in longitudinal cross-section. The outer arched panel 12 is annular, protrudes up from the bottom panel 11, and has an inner side surface. The inner side surface of the outer arched panel 12 is concave, such that the outer arched panel 12 is arched in longitudinal cross-section. The at least one drainage outlet 13 is formed through the annular

sidewall of the base 10, is disposed between the bottom panel 11 and the outer arched panel 12, and allows fluid to flow therethrough. Each of the at least one drainage outlet 13 is transversely elongated. The intake opening 110 of the base 10 is formed at the lower end of the base 10 and is surrounded by the bottom panel 11. The upper opening of the base 10 is formed at a top of the base 10 and is opposite the intake opening 110.

Specifically, the base 10 is a hollow and substantially rectangular housing. Accordingly, the bottom panel 11 is rectangular and has four side walls. The outer arched panel 12 protrudes up from the four side walls of the bottom panel 11 and forms the upper opening of the base 10, i.e., the upper opening of the base 10 is surrounded by the outer arched panel 12.

The guiding assembly 20 is mounted in the base 10 and has a guiding panel 21, an inner arched panel 23, multiple guiding fins 24, multiple supports 25, and a rain shield panel 22.

The guiding panel 21 is annular and semi-pyramidal. The guiding panel 21 has an upper opening. The guiding panel 21 extends and slopes downward from an upper inner edge of the guiding panel 21 toward a lower outer edge of the guiding panel 21. The lower outer edge of the guiding panel 21 is attached to the base 10 and corresponds in size and shape to the base 10. The upper opening of the guiding panel 21 is surrounded by the upper inner edge of the guiding panel 21 and communicates with the intake opening 110 of the base 10.

The inner arched panel 23 is annular and protrudes up from the upper inner edge of the guiding panel 21. An inner side surface of the inner arched panel 23 surrounds the upper opening of the guiding panel 21. An outer side

surface of the inner arched panel 23 faces toward the inner side surface of the outer arched panel 12 and is concave, such that the inner arched panel 23 is arched in longitudinal cross-section.

The guiding fins 24 are separately mounted on the outer side surface of the inner arched panel 23. Each of the guiding fins 24 extends longitudinally from an upper edge of the inner arched panel 23 to a lower edge of the inner arched panel 23. The supports 25 are separated from each other and each one of the supports is securely mounted on and protrudes up from the guiding panel 21, and the supports are arranged around the inner arched panel 23. The rain shield panel 22 is annular, is mounted on the guiding panel 21, is arranged around an outer edge of the inner arched panel 23 and is connected to the supports 25. The rain shield panel 22 has an outer side surface. The outer side surface of the rain shield panel 22 faces toward the inner side surface of the outer arched panel 12 and is concave, such that the rain shield panel 22 is arched in longitudinal cross-section. An arched direction of the rain shield panel 22 and an arched direction of the inner arched panel 23 are the same but contrary to an arched direction of the outer arched panel 12. A first interval 231 is formed between a lower edge of the rain shield panel 22 and the guiding panel 21. The first interval 231 is elongated and allows fluid to flow therethrough.

Specifically, the semi-pyramidal guiding panel 21 is square-based, so as to correspond in shape to the base 10. The upper inner edge of the guiding panel 21 is divided into four sub-edges for forming the upper opening of the guiding panel 21. The inner arched panel 23 and the rain shield panel 22 are

disposed along the four sub-edges of the upper inner edge of the guiding panel 21.

With further reference to Figs. 4 to 6, the upper cover assembly 30 is a pyramidal housing, is mounted in the base 10 and on the guiding assembly 20, and has an inner surface and an outer surface. The inner surface of the upper cover assembly 30 faces and is securely mounted on the supports 25. A second interval 35 is formed between the inner surface of the upper cover assembly 30, the rain shield panel 22, and the inner arched panel 23. A third interval 36 is formed between the outer surface of the upper cover assembly 30 and the outer arched panel 12. The second interval 35 and the third interval 36 are elongated and allow fluid to flow therethrough.

Specifically, the upper cover assembly 30 has a main body 31, multiple cover panels 32, multiple pressing struts 33, and a cap 34.

The main body 31 corresponds in shape to the base 10 and the guiding assembly 20. As such, the main body 31 is a square semi-pyramid corresponding to the guiding panel 21 and formed by four triangular panels. Each of the triangular panels has a penetration opening 311 and a stop protrusion 312. The stop protrusion 312 is formed on an outer surface of the triangular panel and is disposed adjacent to and below the penetration opening 311. The main body 31 has multiple side fastening holes 313 and a tip fastening hole 314. The side fastening holes 313 are formed through the main body 31 and are disposed between each two of the triangular panels that are arranged next to each other. The tip fastening hole 314 is formed through a top of the main body 31.

The cover panels 32 are mounted on the main body 31, cover the penetration openings 311 respectively, and abut the stop protrusion 312 respectively. Each of the cover panels 32 is made of any material that is light permeable or has enhanced strength and safety with metal wires mounted within the material.

Each of the pressing struts 33 is mounted on and between each two of the adjacent cover panels 32 that are arranged next to each other. Each of the pressing struts 33 is elongated and has an upper end and a fastening protrusion 331. The fastening protrusion 331 has a threaded hole on a distal end surface . The threaded hole of the fastening protrusion 331 aligns with a corresponding one of the side fastening holes 313 of the main body 31. Thus, when multiple fasteners are respectively mounted through the side fastening holes 313 of the main body 31 and are respectively fastened in the threaded holes of the fastening protrusions 331 of the pressing struts 33, the main body 31, the cover panels 32, and the pressing struts 33 can be securely fixed together.

The cap 34 is pyramidal, is mounted on the upper ends of the pressing struts 33, and has a fastening protrusion 341. The fastening protrusion 341 of the cap 34 has a threaded hole on a distal end surface. The threaded hole of the fastening protrusion 341 of the cap 34 aligns with the tip fastening hole 314 of the main body 31. Thus, when another fastener is mounted through the tip fastening hole 314 of the main body 31 and is fastened in the threaded hole of the fastening protrusion 341 of the cap 34, the main body 31, the pressing struts 33, and the cap 34 can be securely held together.

With further reference to Figs. 7 and 8, the ventilation device in

accordance with the present invention is used for being installed on a roof of a building 40, such as a warehouse. The building 40 has a ventilation tube 41 disposed on the roof. An end of the ventilation tube 41 communicates with an interior of the building 40. The ventilation device is mounted on another end of the ventilation tube 41. Thus, the intake opening 110 of the ventilation device communicates with the ventilation tube 41.

As shown in Fig. 7, when heated air inside the building 40 flows upward, the guiding panel 21 and the inner arched panel 23 guide the heated air to flow toward the upper cover assembly 30 and flow into the second interval 35. Then the guiding fins 24 guide the heated air to pass through the third interval 36 and flow out of the ventilation device.

When strong wind blows, the strong wind that hits the outer arched panel 12 is guided toward the outer surface of the upper cover assembly 30. Therefore, the strong wind does not blow into the building 40 via the ventilation tube 41 but draws the heated air out of the building 40 instead. When torrential rain falls, the rain flows downward along the outer surface of the upper cover assembly 30, drops on the guiding panel 21 via the third interval 36, and then flows out of the ventilation device via the at least one drainage outlet 13. When some of the rain is blown by the strong wind to flow toward the intake opening 110, the rain would be blocked by the rain shield panel 22, flows downward along the rain shield panel 22 and the guiding panel 21, and then flows out of the ventilation device via the at least one drainage outlet 13. The ventilation device in accordance with the present invention ensures that the rain does not drop into the building 40 and the heated air inside

the building 40 can be expelled from the roof even under strong wind and torrential rain.

With reference to Figs. 9 to 11, a ventilation device in accordance with a second embodiment of the present invention is similar to the first embodiment, but the difference is that each one of the side fastening holes 313A of the main body 31A forms an enlarged hole 3131A and an elongated groove 3132A. The elongated groove 3132A extends upward from an upper edge of the enlarged hole 3131A, i.e., the enlarged hole 3131A and the elongated groove 3132A communicate to each other.

Another difference is that the fastening protrusion 331A of each one of the pressing struts 33A does not have any threaded hole, but forms a column 3311A and a head 3312A. The column 3311A protrudes from a lower surface of the pressing struts 33A and an outer diameter of the column 3311A is equal to a width of the elongated groove 3132A, or may be slightly larger than the width of the elongated groove 3132A. The head 3312A is formed on a lower end of the column 3311A, and an outer diameter of the head 3312A is larger than the width of the elongated groove 3132A but smaller than a width of the enlarged hole 3131A.

With the aforesaid structure, in the second embodiment, when in the process of fixing the pressing struts 33A, the fastening protrusions 331A of the pressing struts 33A can pass through the side fastening holes 313A of the main body 31A; and after the pressing struts 33A are lifted along extending directions of bevel directions of the main body 31A, the fastening protrusions 331A are fitted in the side fastening holes 313A respectively. Finally, after the

cap 34 is fixed on the main body 31A, the cap 34 can fix the pressing struts 33A firmly.

CLAIMS:

1. A ventilation device comprising:

a base (10) being a hollow housing, each one of an upper end and a lower end of the base (10) forming an opening; the base (10) having:

an outer arched panel (12) on the upper end of the base (10) and around the opening that is formed on the upper end of the base (10); the outer arched panel (12) being arched in longitudinal cross-section; and

a drainage outlet (13) formed through the base (10);

a guiding assembly (20) mounted in the based (10) and having:

a guiding panel (21) being annular, being semi-pyramidal, and having an upper opening; the guiding panel (21) extending and sloping downward;

an inner arched panel (23) being annular and around the upper opening of the guiding panel (21); and

a rain shield panel (22) being annular, mounted on the guiding panel (21), and arranged around an outer edge of the inner arched panel (23);

an upper cover assembly (30) being a pyramidal housing, mounted on the base (10) and disposed above the guiding assembly (20); and the upper cover assembly (30) having:

multiple penetration openings (311) on the pyramidal housing;

and

multiple cover panels (32) mounted on and covering the penetration openings (311) respectively;

a main body (31A) having:

a tip fastening hole (314) formed on a top of the main body (31A); and

multiple side fastening holes (313A) formed on the main body (31); each one of the side fastening holes (313A) forming:

an enlarged hole (3131A); and

an elongated groove (3132A) extending from an edge of the enlarged hole (3131A);

multiple pressing struts (33A), each one of the pressing struts (33A) being elongated and mounted on and between two of the adjacent cover panels (32); each one of the pressing struts (33A) having:

a fastening protrusion (331A) fitted in one of the side fastening holes (313A) having:

a column (3311A), an outer diameter of the column (3311A) being equal to or slightly larger than a width of the elongated groove (3132A); and

a head (3312A) formed on an end of the column (3311A), an outer diameter of the head (3312A) is larger than the width of the elongated groove (3132A) but smaller than a width of the enlarged hole (3131A);

a cap (34) abutting top ends of the pressing struts (33A) which are

adjacent to the top of the main body (31), the cap (34) having:

a fastening protrusion (341), an end surface of the fastening protrusion (341) forming a hole; and

a fastener mounted through the tip fastening hole (314) and fastened in the hole of the fastening protrusion (341) of the cap (34);

a first interval (231) formed between the guiding panel (21) and the rain shield panel (22);

a second interval (35) formed between the upper cover assembly (30) and the inner arched panel (23); and

a third interval (36) formed between the upper cover assembly (30) and the outer arched panel (12).

2. The ventilation device as claimed in claim 1, wherein the guiding assembly (20) has:

multiple supports (25) on the guiding panel (21); one end of each one of the supports (25) securely mounted on the guiding panel (21), another end of each one of the supports (25) securely mounted on an inner surface of the upper cover assembly (30); the rain shield panel (22) connected to the supports (25).

3. The ventilation device as claimed in claim 1, wherein:

the rain shield panel (22) being arched in longitudinal cross-section, an arched direction of the rain shield panel (22) and an arched direction of the inner arched panel (23) being the same but contrary to an arched direction of the outer arched panel (12).

4. The ventilation device as claimed in claim 1, wherein:

the base (10) is a hollow square housing;

the guiding panel (21) of the guiding assembly (20) is a square semi-pyramidal; and

the main body (31) of the upper cover assembly (30) is another square semi-pyramidal corresponding to the guiding panel (21).

5. The ventilation device as claimed in claim 1,

wherein the base (10) has:

a bottom panel (11) on the lower end of the base (10) and around the opening that is formed on the lower end of the base (10); said opening formed on the lower end of the base (10) being an intake opening (110).

6. The ventilation device as claimed in claim 1, wherein the cover panels (32) are light permeable.