A backflow prevention device is connected to a bathroom air duct and includes a case having two opposite gas inlet-end opening and gas outlet-end opening; a gas inlet-end unit and a gas outlet-end unit respectively mounted to and communicating with the gas inlet-end opening and the gas outlet-end opening; and at least one backflow prevention unit mounted in the case. The backflow prevention unit includes a frame and a plurality of baffle plates pivotally mounted in the frame. The baffle plates are arranged in the frame from top to bottom to overlap with each other, and can be pivotally turned only in one way toward the gas outlet-end opening to an open position. Thus, gas in a bathroom is allowed to flow from the gas inlet-end opening to the gas outlet-end opening, while gas with bad odor in a public pipe shaft is prevented from flowing back into the bathroom.
BACKFLOW PREVENTION DEVICE FOR BATHROOM AIR DUCT

RELATED APPLICATIONS

[0001] This application claims priority to Taiwan Application Serial Number 97140022, filed Oct. 17, 2008, which is herein incorporated by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to a backflow prevention device, and more particularly to a backflow prevention device for bathroom air duct.

BACKGROUND OF THE INVENTION

[0003] Apartment dwellings and condominiums usually have bathrooms designed as spaces without any vent directly led to an outdoor environment. With the door thereof being shut, such a bathroom in use forms a closed space almost isolated from the external environment, and any hot air or biogas or other poisonous gases produced in the closed bathroom in use just could not be exhausted but diffuses into the living room, bedrooms or other spaces in the apartment. In some worse conditions, such biogas or poisonous gases would seriously affect the dwellers’ health and safety.

[0004] To overcome this problem, an extraction fan is usually mounted to the ceiling of such bathroom having an almost closed space. The extraction fan is connected to an air duct that is led to a public pipe shaft in the apartment building and then to an external environment, such as the roof of the building. With the extraction fan, gases in the bathroom can be extracted to flow through the air duct and the public pipe shaft to be finally exhausted into ambient air.

[0005] That is, all the bathrooms at different floors in the same apartment building communicate with the public pipe shaft via the bathroom extraction fans and the air ducts connected thereto, so that the gases produced in the bathrooms at all floors of the apartment building are exhausted into external environment via the same public pipe shaft. This also means that the public pipe shaft, the air ducts connecting the bathroom extraction fans to the public pipe shaft, and the bathrooms in the same apartment building together form a network of mutually communicable ventilation spaces.

[0006] The gases produced by the bathrooms of all dwellers in the apartment building and collected in the public pipe shaft frequently emit bad odors, which tend to flow from the public pipe shaft back to the bathrooms at different floors of the apartment building. That is, when the bathroom extraction fans are not in operation, air in the public pipe shaft carrying the bad odor gases can very easily invade into the bathrooms via the air ducts to largely reduce the dwellers’ living quality or even bring hazards to the dwellers’ physical and mental health. Such undesirable condition is particularly serious in windy days when strong wind blows down into the public pipe shaft from the roof of the building. The bad odors will quickly flow back through the air ducts and invade into the bathrooms in all floors.

[0007] Further, other bad odors and even poisonous gases, such as smoke from burning cigarettes, carbon monoxide produced by burning charcoal, etc., produced in the bathrooms at some floors will also flow along the public pipe shaft and the air ducts into the bathrooms at other floors to seriously threaten the health and living safety of the dwellers in the apartment building.

[0008] Therefore, the conventional bathroom extraction fan and the air ducts connected thereto have poor applicability.

SUMMARY OF THE INVENTION

[0009] A primary object of the present invention is to provide a backflow prevention device for bathroom air duct for preventing gas flow in the air duct from flowing back into the bathroom.

[0010] Another object of the present invention is to provide a backflow prevention device that can be conveniently installed on a bathroom air duct.

[0011] A further object of the present invention is to provide a backflow prevention device for bathroom air duct that has good applicability.

[0012] To achieve the above and other objects, the backflow prevention device for bathroom air duct according to the present invention is connected to an air duct which communicates with a bathroom and leads to external facilities. The backflow prevention device for bathroom air duct includes a case defining a receiving space having two opposite gas inlet-end opening and gas outlet-end opening; a gas inlet-end unit and a gas outlet-end unit respectively mounted to and communicating with the gas inlet-end opening and the gas outlet-end opening; and at least one backflow prevention unit mounted in the receiving space of the case. The backflow prevention unit includes a frame defining an internal space and a plurality of baffle plates pivotally mounted on the frame to locate in the internal space of the frame. The baffle plates are arranged in the frame from top to bottom to overlap with each other, and can be pivotally turned only in one way toward the gas outlet-end opening to an open position. Thus, the backflow prevention device allows gas in a bathroom to flow to a public pipe shaft via the air duct but stops gas with bad odor in the public pipe shaft from flowing back into the bathroom via the air duct, ensuring a sanitary, healthy and safe living environment.

[0013] Preferably, the frame of the backflow prevention unit includes two opposite upper and lower side boards, and two opposite left and right side boards; and each of the plurality of baffle plates includes a plate body and a shaft. The plate body has an upper edge portion and a lower edge portion opposite to each other, and the shaft is located at the upper edge portion with two opposite ends of the shaft separately projected from two lateral ends of the plate body to pivotally connect to the left side board and the right side board. Therefore, the baffle plate can be pivotally turned about the shaft to an open position or a closed position.

[0014] Preferably, each of the baffle plates includes a gas inlet-end surface and a gas outlet-end surface, which are opposite to each other and face toward the gas inlet-end opening and the gas outlet-end opening of the case, respectively; and the lower edge portion of the plate body is formed into an outward bent cover portion, such that the outward bent cover portion of one upper plate body overlaps and covers an area of the gas outlet-end surface of an adjacent lower plate body at the upper edge portion thereof. With these arrangements, all the baffle plates can only be opened toward the gas outlet-end opening of the case without the possibility of being opened toward the gas inlet-end opening. Thus, gas in the air duct is prevented from flowing back into the bathroom.

[0015] Preferably, on each of the baffle plates, the gas outlet-end surface at the upper edge portion is formed into an outer slope, and the gas inlet-end surface at the outward bent
cover portion at the lower edge portion is formed into an inner slope. Therefore, any two of the vertically adjacent and overlapped baffle plates can be pivotally turned without interfering with each other to maintain smooth operation thereof.

[0016] Preferably, an inner frame is further provided in the internal space of the frame at a position facing toward the gas inlet-end opening of the case, so as to stop gas flow with bad odors from passing through clearances between the baffle plates and the frame to provide an enhanced backflow prevention effect.

[0017] Preferably, a leak-preventive gasket packing is provided on outer faces of the frame of the backflow prevention unit, so as to ensure a leak-tight contact between the case and the backflow prevention unit.

[0018] Preferably, a first spacing frame is further provided in the receiving space of the case to locate at one side of the backflow prevention unit facing toward the gas outlet-end opening for retaining a space thereat, so as to prevent the baffle plates of the backflow prevention unit from pushing against other objects when the baffle plates are pivotally turned toward the gas outlet-end opening to the open position.

[0019] Preferably, the gas inlet-end unit includes a gas inlet-end plate and a gas inlet pipe connected to and communicating with the gas inlet-end plate; and the gas inlet-end plate is mounted to the gas inlet-end opening with the gas inlet pipe communicating with the gas inlet-end opening. And, an outer end of the gas inlet pipe opposite to the gas inlet-end plate is connected to and communicable with one side of the air duct closer to a bathroom extraction fan.

[0020] Preferably, the gas outlet-end unit includes a gas outlet-end plate and a gas outlet pipe connected to and communicating with the gas outlet-end plate; and the gas outlet-end plate is mounted to the gas outlet-end opening with the gas outlet pipe communicating with the gas outlet-end opening. And, an outer end of the gas outlet pipe opposite to the gas outlet-end plate is connected to and communicable with one side of the air duct closer to the external facilities.

[0021] Preferably, a fan unit is further provided in the receiving space of the case to locate at a position facing toward the gas inlet-end opening, so that the backflow prevention device also provides the gas extraction function.

[0022] Preferably, a second spacing frame is further provided to locate in the receiving space of the case at one side of the fan unit facing toward the gas outlet-end opening, so that a space is reserved at the second spacing frame to prevent the fan unit from interfering with the backflow prevention unit and ensure smooth operation of the fan unit as well as the backflow prevention unit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, wherein

[0024] FIG. 1 is an exploded perspective view of a backflow prevention device for bathroom air duct according to a first embodiment of the present invention;

[0025] FIG. 2 is an assembled sectional view of FIG. 1;

[0026] FIG. 3 is an exploded perspective view of a backflow prevention unit adopted in the first embodiment of the present invention;

[0027] FIG. 4 is an exploded perspective view of a backflow prevention device for bathroom air duct according to a second embodiment of the present invention;

[0028] FIG. 5 is an assembled sectional view of FIG. 4;

[0029] FIG. 6 is an exploded perspective view of a backflow prevention device for bathroom air duct according to a third embodiment of the present invention;

[0030] FIG. 7 is an assembled sectional view of FIG. 6; and

[0031] FIG. 8 is an assembled perspective view of FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0032] The present invention will now be described with three preferred embodiments thereof. For the purpose of easy to understand, elements that are the same in the preferred embodiments are denoted by the same reference numerals.

[0033] Please refer to FIGS. 1 and 2 that are exploded perspective view and assembled sectional view, respectively, of a backflow prevention device for bathroom air duct according to a first embodiment of the present invention; and to FIG. 3 that is an exploded perspective view of a backflow prevention unit adopted in the first embodiment of the present invention.

[0034] The backflow prevention device for bathroom air duct according to the present invention is connected to an air duct (not shown) communicating with a bathroom. The air duct is led to external facilities, such as a public pipe shaft. As shown in FIGS. 1 to 3, the backflow prevention device for bathroom air duct in the first embodiment of the present invention includes a case 1, a gas inlet-end unit 2, a gas outlet-end unit 3, and at least one backflow prevention unit 4.

In the illustrated first embodiment, two backflow prevention units 4 are shown.

[0035] The case 1 internally defines a receiving space 11, two opposite ends of which separately defining a gas inlet-end opening 12 and a gas outlet-end opening 13.

[0036] The gas inlet-end unit 2 includes a gas inlet-end plate 21 and a gas inlet pipe 22 connected to and communicating with the gas inlet-end plate 21. The gas inlet-end plate 21 is mounted to the gas inlet-end opening 12 of the case 1 with the gas inlet pipe 22 communicating with the gas inlet-end opening 12. An outer end of the gas inlet pipe 22 opposite to the gas inlet-end plate 21 is connected to one side of the air duct (not shown) closer to a bathroom extraction fan (not shown). Thus, gas flow extracted by the extraction fan from the bathroom flows into the case 1 via the gas inlet-end unit 2 and the gas inlet-end opening 12.

[0037] The gas outlet-end unit 3 includes a gas outlet-end plate 31 and a gas outlet pipe 32 connected to and communicating with the gas outlet-end plate 31. The gas outlet-end plate 31 is mounted to the gas outlet-end opening 13 of the case 1 with the gas outlet pipe 32 communicating with the gas outlet-end opening 13. An outer end of the gas outlet pipe 32 opposite to the gas outlet-end plate 31 is connected to one side of the air duct closer to the public pipe shaft (not shown). Thus, gas flow extracted by the extraction fan from the bathroom and sent into the case 1 is exhausted to the public pipe shaft via the gas outlet-end opening 13 and the gas outlet-end opening 13.

[0038] The backflow prevention unit 4 is mounted in the receiving space 11 of the case 1, and includes a frame 41 and a plurality of baffle plates 42. In the illustrated first embodiment, five baffle plates 42 are shown. The frame 41 defines an internal space 411. The baffle plates 42 are pivotally con-
The baffle plates 42 are arranged in the frame 41 from top to bottom with an upper one overlapping an adjacent lower one, and can only be pivotally turned in one way toward the gas outlet-end opening 13 of the case 1 to an open position. In implementation, the frame 41 includes two opposite upper and lower side boards 412 and 413, and two opposite left and right side boards 414 and 415. Each of the plurality of baffle plates 42 includes a plate body 421 and a shaft 422. The plate body 421 has an upper edge portion 423 and a lower edge portion 424 opposite to the upper edge portion 423, and the shaft 422 is located at the upper edge portion 423 with two opposite ends of the shaft 422 separately projected from two lateral ends of the plate body 421 to pivotally connect to the left side board 414 and the right side board 415, allowing the baffle plate 42 to pivotally turn about the shaft 422 to an open position or a closed position. The provision of multiple baffle plates 42 has the advantage of reducing the area of each of the baffle plates 42, so that baffle plates 42 can be pivotally turned open or closed by only a very small volume of gas flow. That is, with the reduced surface area, the baffle plates 42 each can show increased motion sensitivity.

The plate body 421 includes a gas inlet-end surface 425 and a gas outlet-end surface 426, which are opposite to each other and face toward the gas inlet-end opening 12 and the gas outlet-end opening 13 of the case 1, respectively. The lower edge portion 424 of the plate body 421 is formed into an outward bent cover portion 424a, such that the outward bent cover portion 424a of an upper plate body 421 overlaps and covers an area of the gas outlet-end surface 426 of an adjacent lower plate body 421 at the upper edge portion 423 thereof. With this arrangement, all the baffle plates 42 can only be opened toward the gas outlet-end opening 13 of the case 1 without the possibility of being opened toward the gas inlet-end opening 12, and are in a naturally hanging position in normal state to overlap each other. In the overlapped position, the baffle plates 42 close the receiving space 11 of the case 1 and prevent gas with bad odor in the public pipe shaft from invading into the bathroom via the air duct connected to the bathroom extraction fan. On the other hand, when the bathroom exhaustion fan operates, the gas flow extracted from the bathroom pushes the baffle plates 42 toward the gas outlet-end opening 13, so that the baffle plates 42 are pivotally turned open to allow the extracted gas to flow through the air duct and be exhausted into the public pipe shaft.

Further, on each of the baffle plates 421, the gas outlet-end surface 426 at the upper edge portion 423 is formed into an outer slope 427, and the gas inlet-end surface 425 at the outward bent cover portion 424a at the lower edge portion 424 is formed into an inner slope 428. With these arrangements, any two of the vertically adjacent and overlapped baffle plates 42 can be pivotally turned without interfering with each other. That is, with the outer and inner slopes 427 and 428, all the baffle plates 42 can operate smoothly.

An inner frame 416 is further provided in the internal space 411 of the frame 41 of the backflow prevention unit 4 at a position facing toward the gas inlet-end opening 12 of the case 1, so as to stop bad odor gas flow from passing through clearances between the baffle plates 42 and the frame 41 to provide an enhanced backflow prevention effect.

A leak-preventive gasket packing 417 is provided on outer faces of the frame 41 of the backflow prevention unit 4, so as to ensure a leak-tight contact between the case 1 and the backflow prevention unit 4 when the latter is mounted in the receiving space 11 of the case 1.

In the present invention, all the components of the backflow prevention unit 4 are assembled into one module. When any of the components is damaged, simply replace the whole backflow prevention unit 4 with a new one. Therefore, the backflow prevention unit 4 can be conveniently installed and maintained.

In the backflow prevention device for bathroom air duct according to the present invention, since the plurality of vertically arranged and overlapped baffle plates 42 of the backflow prevention unit 4 can only be pivotally turned in one way toward the gas outlet-end opening 13, gas in the bathroom is allowed to flow into the public pipe shaft while gas with bad odor in the public pipe shaft is prevented from invading into the bathroom. With this design, a sanitary, healthy, and safe living environment can be ensured. Moreover, the baffle plates 42 and the frame 41 are assembled into an integral backflow prevention unit 4, which can be easily mounted to and dismounted from the receiving space 11 of the case 1 to facilitate installation and future maintenance thereof.

Please refer to FIGS. 4 and 5 that are exploded perspective view and assembled sectional view, respectively, of a backflow prevention device for bathroom air duct according to a second embodiment of the present invention.

The backflow prevention device in the second embodiment is designed based on the first embodiment, and further includes a first spacing frame 5 provided in the receiving space 11 of the case 1. The first spacing frame 5 is located at one side of the backflow prevention unit 4 facing toward the gas outlet-end opening 13 of the case 1 for reserving a space thereof, so as to prevent the baffle plates 42 of the backflow prevention unit 4 from pushing against other objects when the baffle plates 42 are pivotally turned toward the gas outlet-end opening 13 to the open position.

FIGS. 6 and 8 are exploded and assembled perspective views, respectively, of a backflow prevention device for bathroom air duct according to a third embodiment of the present invention, and FIG. 7 is an assembled sectional view of the third embodiment of the present invention.

The backflow prevention device in the third embodiment is designed based on the second embodiment and further includes a fan unit 6 provided in the receiving space 11 of the case 1 to locate at a position facing toward the gas inlet-end opening 12. The fan unit 6 cooperates with the bathroom extraction fan to provide an enhanced air extraction effect. In the event the standing bathroom extraction fan is damaged, the fan unit 6 can substitute for the bathroom extraction fan. That is, the backflow prevention device in the third embodiment provides both the backflow prevention function and the gas extraction function.

In the third embodiment, a second spacing frame 7 is further provided in the receiving space 11 of the case 1 to locate at one side of the fan unit 6 facing toward the gas outlet-end opening 13 of the case 1, so that a space is reserved at the second spacing frame 7 to prevent the fan unit 6 from interfering with the backflow prevention unit 4 and ensure smooth operation of the blades of the fan unit 6 as well as the baffle plates 42 of the backflow prevention unit 4.

The present invention has been described with some preferred embodiments thereof and it is understood that many changes and modifications in the described embodiments can
be carried out without departing from the scope and the spirit of the invention that is intended to be limited only by the appended claims.

What is claimed is:

1. A backflow prevention device for bathroom air duct, being connected to an air duct which is communicating with a bathroom and led to external facilities, comprising:
   a case internally defining a receiving space, two opposite ends of the receiving space separately defining a gas inlet-end opening and a gas outlet-end opening;
   a gas inlet-end unit being mounted to and communicating with the gas inlet-end opening of the case;
   a gas outlet-end unit being mounted to and communicating with the gas outlet-end opening of the case; and
   at least one backflow prevention unit being mounted in the receiving space, and including:
   a frame defining an internal space; and
   a plurality of baffle plates being pivotally connected to the frame to locate in the internal space; the baffle plates being arranged in the frame from top to bottom with an upper one overlapping an adjacent lower one, and being pivotally turnable only in one way toward the gas outlet-end opening of the case to an open position.

2. The backflow prevention device for bathroom air duct as claimed in claim 1, wherein the frame of the backflow prevention unit includes two opposite upper and lower side boards, and two opposite left and right side boards; each of the plurality of baffle plates including a plate body and a shaft, the plate body having an upper edge portion and a lower edge portion opposite to the upper edge portion, and the shaft being located at the upper edge portion with two opposite ends of the shaft separately projected from two lateral ends of the plate body to pivotally connect to the left side board and the right side board.

3. The backflow prevention device for bathroom air duct as claimed in claim 2, wherein each of the baffle plates includes a gas inlet-end surface and a gas outlet-end surface, which are opposite to each other and face toward the gas inlet-end opening and the gas outlet-end opening of the case, respectively; and wherein the lower edge portion of the plate body is formed into an outward bent cover portion, such that the outward bent cover portion of one upper plate body overlaps and covers an area of the gas outlet-end surface of an adjacent lower plate body at the upper edge portion thereof.

4. The backflow prevention device for bathroom air duct as claimed in claim 3, wherein, on each of the baffle plates, the gas outlet-end surface at the upper edge portion is formed into an outer slope, and the gas inlet-end surface at the outward bent cover portion at the lower edge portion is formed into an inner slope.

5. The backflow prevention device for bathroom air duct as claimed in claim 4, further comprising an inner frame provided in the internal space of the frame at a position facing toward the gas inlet-end opening of the case.

6. The backflow prevention device for bathroom air duct as claimed in claim 5, wherein the frame is provided on outer faces thereof with a leak-preventive gasket packing.

7. The backflow prevention device for bathroom air duct as claimed in claim 5, further comprising a first spacing frame provided in the receiving space of the case to locate at one side of the backflow prevention unit facing toward the gas outlet-end opening.

8. The backflow prevention device for bathroom air duct as claimed in claim 5, wherein the gas inlet-end unit includes a gas inlet-end plate and a gas inlet pipe connected to and communicating with the gas inlet-end plate; and the gas inlet-end plate being mounted to the gas inlet-end opening with the gas inlet pipe communicating with the gas inlet-end opening.

9. The backflow prevention device for bathroom air duct as claimed in claim 5, wherein the gas outlet-end unit includes a gas outlet-end plate and a gas outlet pipe connected to and communicating with the gas outlet-end plate; and the gas outlet-end plate being mounted to the gas outlet-end opening with the gas outlet pipe communicating with the gas outlet-end opening.

10. The backflow prevention device for bathroom air duct as claimed in claim 5, further comprising a fan unit provided in the receiving space of the case to locate at a position facing toward the gas inlet-end opening.

11. The backflow prevention device for bathroom air duct as claimed in claim 10, further comprising a second spacing frame located in the receiving space of the case at one side of the fan unit facing toward the gas outlet-end opening.

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