BULKHEAD ASSEMBLIES FOR AIR CONDITIONER UNITS

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ABSTRACT

Air conditioner units and bulkhead assemblies for air conditioner units are provided. A bulkhead assembly includes a bulkhead which includes a first sidewall, a second sidewall spaced apart from the first sidewall along a lateral direction, and a rear wall extending laterally between the first sidewall and the second sidewall. The rear wall includes an indoor facing surface and an opposing outdoor facing surface. The bulkhead assembly further includes a vent aperture defined in the rear wall. The bulkhead assembly further includes a filter chute extending from one of the indoor facing surface or the outdoor facing surface, the filter chute defining a passage extending between a first end and a second end, the second end disposed proximate the vent aperture.
BULKHEAD ASSEMBLIES FOR AIR CONDITIONER UNITS

FIELD OF THE INVENTION

[0001] The present disclosure relates generally to air conditioner units, and more particularly to improved apparatus for accessing filters associated with bulkheads of air conditioner units.

BACKGROUND OF THE INVENTION

[0002] Air conditioner units are conventionally utilized to adjust the temperature within structures such as dwellings and commercial buildings. In particular, one-unit type room air conditioner units may be utilized to adjust the temperature in, for example, a single room or group of rooms of a structure. A typical such air conditioner unit includes an indoor portion and an outdoor portion. The indoor portion is generally located indoors, and the outdoor portion is generally located outdoors. Accordingly, the air conditioner unit generally extends through a wall, window, etc. of the structure.

[0003] In the outdoor portion of a conventional air conditioner unit, a compressor that operates a refrigerating cycle is provided. At the back of the outdoor portion, an outdoor heat exchanger connected to the compressor is disposed, and facing the outdoor heat exchanger, an outdoor fan for cooling the outdoor heat exchanger is provided. At the front of the indoor portion of a conventional air conditioner unit, an air inlet is provided, and above the air inlet, an air outlet is provided. A blower fan and a heating unit are additionally provided in the indoor portion. Between the blower fan and heating unit and the air inlet, an indoor heat exchanger connected to the compressor is provided.

[0004] When cooling operation starts, the compressor is driven to operate the refrigerating cycle, with the indoor heat exchanger serving as a cold-side evaporator of the refrigerating cycle, and the outdoor heat exchanger as a hot-side condenser. The outdoor heat exchanger is cooled by the outdoor fan to dissipate heat. As the blower fan is driven, the air inside the room flows through the air inlet into the air passage, and the air has its temperature lowered by heat exchange with the indoor heat exchanger, and is then blown into the room through the air outlet. In this way, the room is cooled.

[0005] When heating operation starts, the heating unit is operated to raise the temperature of air in the air passage. The air, having had its temperature raised, is blown out through the air outlet into the room to heat the room.

[0006] Furthermore, conventional air conditioner units include a bulkhead which is positioned between the indoor portion and outdoor portion, and thus generally separates the components within the indoor portion from the components in the outdoor portion. Various components may additionally be connected to the bulkhead, such as the blower fan and heating unit.

[0007] In some cases, it may be desirable to allow outdoor air through the bulkhead into a room into which the air conditioner unit extends. Accordingly, many bulkheads include vent apertures for allowing such airflow. A filter is typically positioned in alignment with a vent aperture of a bulkhead to filter the air flowing through the vent aperture.

[0008] One issue with many presently known bulkheads and air conditioner units is the difficulty in accessing the filters aligned with the bulkhead vent apertures. For example, in many cases, accessing a filter may require that the internal components of the air conditioner unit are removed from the housing of the air conditioner unit, and particularly from the wall sleeve of the housing. Further disassembly of various of the internal components may additionally be required. Accordingly, the inspection or replacement of such filters is a time-consuming and labor intensive procedure.

[0009] Accordingly, improved apparatus for accessing filters associated with bulkheads in air conditioner units is desired in the art. In particular, apparatus which facilitate such filter access while reducing the number of air conditioner unit components requiring disassembly and thus reducing the associated time and labor would be advantageous.

BRIEF DESCRIPTION OF THE INVENTION

[0010] Aspects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention.

[0011] In accordance with one embodiment, an air conditioner unit is provided. The air conditioner unit includes an outdoor heat exchanger, an indoor heat exchanger, and a bulkhead disposed between the outdoor heat exchanger and the indoor heat exchanger along a transverse direction. The bulkhead includes a first sidewalk, a second sidewalk spaced apart from the first sidewalk along a lateral direction, and a rear wall extending laterally between the first sidewalk and the second sidewalk. The rear wall includes an indoor facing surface and an opposing outdoor facing surface. The air conditioner unit further includes a vent aperture defined in the rear wall. The air conditioner unit further includes a filter chute extending from one of the indoor facing surface or the outdoor facing surface, the filter chute defining a passage extending between a first end and a second end, the second end disposed proximate the vent aperture. The air conditioner unit further comprises a filter, the filter including a filter body positionable in alignment with the vent aperture and movable through the passage of the filter chute.

[0012] In accordance with another embodiment, a bulkhead assembly for an air conditioner unit is provided. The bulkhead assembly includes a bulkhead which includes a first sidewalk, a second sidewalk spaced apart from the first sidewalk along a lateral direction, and a rear wall extending laterally between the first sidewalk and the second sidewalk. The rear wall includes an indoor facing surface and an opposing outdoor facing surface. The bulkhead assembly further includes a vent aperture defined in the rear wall. The bulkhead assembly further includes a filter chute extending from one of the indoor facing surface or the outdoor facing surface, the filter chute defining a passage extending between a first end and a second end, the second end disposed proximate the vent aperture.

[0013] These and other features, aspects and advantages of the present invention will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.
BRIEF DESCRIPTION OF THE DRAWINGS

[0014] A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures, in which:

[0015] FIG. 1 provides a perspective view of an air conditioner unit, with a room front exploded from a remainder of the air conditioner unit for illustrative purposes, in accordance with one embodiment of the present disclosure;

[0016] FIG. 2 is a perspective view of components of an indoor portion of an air conditioner unit in accordance with one embodiment of the present disclosure;

[0017] FIG. 3 is a rear perspective view of a bulkhead assembly in accordance with one embodiment of the present disclosure;

[0018] FIG. 4 is a front perspective view of a bulkhead assembly in accordance with one embodiment of the present disclosure;

[0019] FIG. 5 is a cross-sectional view of a bulkhead assembly in accordance with one embodiment of the present disclosure;

[0020] FIG. 6 is a cross-sectional view of a bulkhead assembly in accordance with another embodiment of the present disclosure; and

[0021] FIG. 7 is a front perspective view of a bulkhead assembly in accordance with another embodiment of the present disclosure.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Reference now will be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope or spirit of the invention. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

[0023] Referring now to FIG. 1, an air conditioner unit 10 is provided. The air conditioner unit 10 is a one-unit type air conditioner, also conventionally referred to as a room air conditioner. The unit 10 includes an indoor portion 12 and an outdoor portion 14, and generally defines a vertical direction V, a lateral direction L, and a transverse direction T. Each direction V, L, T is perpendicular to each other, such that an orthogonal coordinate system is generally defined.

[0024] A housing 20 of the unit 10 may contain various other components of the unit 10. Housing 20 may include, for example, a rear grill 22 and a room front 24 which may be spaced apart along the transverse direction by a wall sleeve 26. The rear grill 22 may be part of the outdoor portion 14, which the room front 24 is part of the indoor portion 12. Components of the outdoor portion 14, such as an outdoor heat exchanger 30, outdoor fan (not shown), and compressor (not shown) may be housed within the wall sleeve 26. A casing 34 may additionally enclose the outdoor fan, as shown.

[0025] Referring now also to FIG. 2, an indoor portion 12 may include, for example, an indoor heat exchanger 40, a blower fan 42, and a heating unit 44. These components may, for example, be housed behind the room front 24. Additionally, a bulkhead 46 may generally support and/or house various other components or portions thereof of the indoor portion 12, such as the blower fan 42 and the heating unit 44. Bulkhead 46 may generally separate and define the indoor portion 12 and outdoor portion 14.

[0026] Bulkhead 46 may include various peripheral surfaces that define an interior 50 thereof. For example, and additionally referring to FIGS. 3 and 4, bulkhead 46 may include a first sidewall 52 and a second sidewall 54 which are spaced apart from each other along the lateral direction L. A rear wall 56 may extend laterally between the first sidewall 52 and second sidewall 54. The rear wall 56 may, for example, include an upper portion 60 and a lower portion 62. Upper portion 60 may for example have a generally curvilinear cross-sectional shape, and may accommodate a portion of the blower fan 42 when blower fan 42 is housed within the interior 50. Lower portion 62 may have a generally linear cross-sectional shape, and may be positioned below upper portion 60 along the vertical direction V. Rear wall 56 may further include an indoor facing surface 64 and an opposing outdoor facing surface. The indoor facing surface 64 may face the interior 50 and indoor portion 12, and the outdoor facing surface 66 may face the outdoor portion 14.

[0027] Bulkhead 46 may additionally extend between a top end 61 and a bottom end 63 along vertical axis V. Upper portion 60 may, for example, include top end 61, while lower portion 62 may, for example, include bottom end 63.

[0028] Bulkhead 46 may additionally include, for example, an air diverter 68, which may extend between the sidewalls 52, 54 along the lateral direction L and which may flow air therethrough.

[0029] In exemplary embodiments, blower fan 42 may be a tangential fan. Alternatively, however, any suitable fan type may be utilized. Blower fan 42 may include a blade assembly 70 and a motor 72. The blade assembly 70, which may include one or more blades disposed within a fan housing 74, may be disposed at least partially within the interior 50 of the bulkhead 46, such as within the upper portion 60. As shown, blade assembly 70 may for example extend along the lateral direction L between the first sidewall 52 and the second sidewall 54. The motor 72 may be connected to the blade assembly 70, such as through the housing 74 to the blades via a shaft. Operation of the motor 72 may rotate the blades, thus generally operating the blower fan 42. Further, in exemplary embodiments, motor 72 may be disposed exterior to the bulkhead 46. Accordingly, the shaft may for example extend through one of the sidewalls 52, 54 to connect the motor 72 and blade assembly 70.

[0030] Heating unit 44 in exemplary embodiments includes one or more heater banks 80. Each heater bank 80 may be operated as desired to produce heat. In some embodiments, as shown, three heater banks 80 may be utilized. Alternatively, however, any suitable number of heater banks 80 may be utilized. Each heater bank 80 may further include at least one heater coil or coil pass 82, such as in exemplary embodiments two heater coils or coil passes 82. Alternatively, other suitable heating elements may be utilized.
[0031] The operation of air conditioner unit 10 including blower fan 42, heating unit 44, and other suitable components may be controlled by a processing device such as a controller 85. Controller 85 may be in communication (via for example a suitable wired or wireless connection) to such components of the air conditioner unit 10. By way of example, the controller 85 may include a memory and one or more processing devices such as microprocessors, CPUs or the like, such as general or special purpose microprocessors operable to execute programming instructions or micro-control code associated with operation of unit 10. The memory may represent random access memory such as DRAM, or read only memory such as ROM or FLASH. In other embodiments, the processor may execute programming instructions stored in memory. The memory may be a separate component from the processor or may be included onboard within the processor.

[0032] Unit 10 may additionally include a control panel 87 and one or more user inputs 89, which may be included in control panel 87. The user inputs 89 may be in communication with the controller 85. A user of the unit 10 may interact with the user inputs 89 to operate the unit 10, and user commands may be transmitted between the user inputs 89 and controller 85 to facilitate operation of the unit 10 based on such user commands. A display 88 may additionally be provided in the control panel 87, and may be in communication with the controller 85. Display 88 may, for example be a touchscreen or other text-readable display screen, or alternatively may simply be a light that can be activated and deactivated as required to provide an indication of, for example, an event or setting for the unit.

[0033] Referring now to FIGS. 3 through 7, embodiments of a bulkhead assembly 100 which includes a bulkhead 46 are illustrated. As discussed, bulkhead 46 includes a first side surface 52 and second side surface 54, as well as a rear wall 56 extending therebetween. Further, a vent aperture 102 may be defined in the rear wall 56. Vent aperture 102 may allow air flow therethrough between the indoor portion 12 and outdoor portion 14, and may be utilized in an installed air conditioner unit 10 to allow outdoor air to flow therethrough into the indoor portion 12.

[0034] In order to filter the air flowing through vent aperture 102, a filter 110 may be provided. The filter 110 may generally include a filter body 112 which is provided for filtering air flowing therethrough. Any suitable material(s) may be utilized for filter body 112 and filter 110 generally. In some embodiments, for example, filter body 112 and/or filter 110 (or components thereof) may be formed from one or more suitable plastics. In some embodiments, filter body 112 may include a polypropylene or acrylonitrile butadiene styrene frame and/or a polypropylene filter mesh. The filter body 112 may be positionable in alignment with the vent aperture 102, such that when in position in such alignment the body 112 may extend across the vent aperture 102 to provide filtering of the air flow. As discussed further herein, filter 110 may additionally be movable through a passage of a filter chute. Filter 110 may thus further include a handle 114 which may extend from the filter body 112 and between a first end 116 and a second end 118. The second end 118 may be connected to the filter body 112, and the first end 116 may be distal from the filter body 112.

[0035] As illustrated, a bulkhead assembly 100 may further include a filter chute 120. The filter chute 120 may accommodate filter bodies 112 therein as the bodies move through the filter chutes 120. Filter chutes 120 advantageously facilitate loading of filters 110 such that filter bodies 112 thereof are aligned with vent apertures 102, and further facilitate removal and replacement of such filters 110 and filter bodies 112 thereof, efficiently and without the need to dis-assemble an excessive number of components of air conditioner unit 10. For example, in exemplary embodiments, use of filter chutes 120 in accordance with the present disclosure may allow for loading, removal and replacement of filters 110 and filter bodies 112 without dis-assembling bulkhead 36 from wall sleeve 26.

[0036] Chute 120 may extend from the indoor facing surface 64 or the outdoor facing surface 66, and may thus be in contact with this surface. In the embodiments illustrated in FIGS. 3 through 6, for example, chute 120 extends from the outdoor facing surface 66. In the embodiment illustrated in FIG. 7, for example, chute 120 extends from the indoor facing surface 64. Chute 120 may further be in contact with the upper portion 60, and may further additionally be in contact with the lower portion 62.

[0037] Chute 120 may define a passage 122 extending between a first end 124 and a second end 126. Second end 126 may be disposed proximate vent aperture 102, while first end 124 is distal vent aperture 102 (at least relative to each other). Passage 122 may, for example, have a cross-sectional profile that corresponds to the cross-sectional profile of the portion of the outdoor facing surface 64 or the outdoor facing surface 66 that the chute 120 extends from.

[0038] Filter chute 120 may further include, for example, a top wall 132, a first sidewall 134, and a second sidewall 136. The top wall 132 may extend between the sidewalls 134, 136, and the walls 132, 134, 136 may define the passage 122. Further, in some embodiments, as illustrated in FIGS. 5 and 7, the one of the indoor facing surface 64 or the outdoor facing surface 66 may further define the passage 122. In other embodiments, as illustrated in FIG. 6, filter chute 120 may further include a bottom wall 138 which further defines the passage 122.

[0039] In some embodiments, one or more surfaces (such as the surfaces of top wall 132, sidewall 134, sidewall 136 and/or bottom wall 138, and/or the portions of surface 64 or 66 defining passage 122) deflecting passage 122 may be generally smooth, and thus free from protrusions. Further, in some embodiments, one or more surfaces (such as the surfaces of top wall 132, sidewall 134, sidewall 136 and/or bottom wall 138, and/or the portions of surface 64 or 66 defining passage 122) defining passage 122 may have low coefficients of friction. Accordingly, in some embodiments, the filter chute 120 or various walls 132, 134, 136 and/or 138 thereof, and/or at least portions of surface 64 or 66 defining passage 122, may be formed from a suitable material, such as stainless steel. Alternatively, however, other suitable materials may be utilized.

[0040] As discussed, first end 124 of chute 120 may be distal vent aperture 102. In some embodiments as illustrated, first end 124 may be disposed proximate or at top end 61 of bulkhead 46. Such positioning facilitates removal and replacement of filters 110 and filter bodies 112 without dis-assembling bulkhead 36 from wall sleeve 26. For example, as illustrated in FIGS. 5 and 6, first end 124 may be proximate top end 61 and positioned transversely forward (towards indoor portion 12) of an intersection and contact between the bulkhead 46 and the wall sleeve 26.
Accordingly, no disassembly of these components from each other may be required for accessing filters 110 and filter bodies 112.

[0041] Bulkhead assembly 100 may further include a bracket assembly 140. Bracket assembly 140 may be configured to accommodate filter body 112 therein when the filter body 112 is positioned in alignment with the vent aperture 102, thus generally holding the filter body 112 in such alignment. Bracket assembly 140 may be disposed proximate vent aperture 102, and may include for example one or more brackets 142. Various brackets 142 may, for example, be grouped in pairs of brackets which are positioned on opposing sides of vent aperture 102. In some embodiments as shown, a bracket 142 may be an L-shaped bracket, although in alternative embodiments any suitable bracket cross-sectional shapes may be utilized. As discussed, a filter body 112 may be positionable within a bracket assembly 140, such as between various brackets 142 of the bracket assembly 140, when in alignment with the vent aperture 102.

[0042] As discussed, filter body 112 may be movable through passage 122. To facilitate such movement, a filter 110 may further include, as discussed, a handle 114. Handle 114 may be utilized to force filter body 112 through passage 122 towards and through first end 124 and/or second end to load or remove a filter body 112. For example, as shown, handle 114 may be extendable through passage 122 when the filter body 112 is positioned in alignment with the vent aperture 102 such that the first end 116 of the handle 114 protrudes from the first end 124 of the filter chute 120. Accordingly, for removal of the filter body 112, a user can simply grasp the first end 116 of the handle 114 and pull the filter 110, such that the filter body 112 moves from alignment with the vent aperture 102 into the passage 122 through second end 126, through passage 122, and out of passage 122 through first end 124. For loading of a filter body 112, a user can feed the filter body 112 into passage 112 through first end 124, and utilized handle 114 to push the filter body 112 through passage 122 and out of passage 122 through second end 126 into alignment with the vent aperture 102.

[0043] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they include structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

What is claimed is:

1. An air conditioner unit, comprising:
   an outdoor heat exchanger;
   an indoor heat exchanger;
   a bulkhead disposed between the outdoor heat exchanger and the indoor heat exchanger along a transverse direction, the bulkhead comprising a first sidewall, a second sidewall spaced apart from the first sidewall along a lateral direction, and a rear wall extending laterally between the first sidewall and the second sidewall, the rear wall comprising an indoor facing surface and an opposing outdoor facing surface;
   a vent aperture defined in the rear wall;
   a filter chute extending from one of the indoor facing surface or the outdoor facing surface, the filter chute defining a passage extending between a first end and a second end, the second end disposed proximate the vent aperture;
   and
   a filter, the filter comprising a filter body positionable in alignment with the vent aperture and movable through the passage of the filter chute.

2. The air conditioner unit of claim 1, wherein the filter chute comprises a top wall, a first sidewall, and a second sidewall.

3. The air conditioner unit of claim 2, wherein the filter chute further comprises a bottom wall.

4. The air conditioner unit of claim 3, wherein the bottom is formed from a metal.

5. The air conditioner unit of claim 1, wherein the filter chute is formed from a metal.

6. The air conditioner unit of claim 1, wherein the first end of the filter chute is disposed proximate a top end of the bulkhead.

7. The air conditioner unit of claim 1, further comprising a bracket assembly disposed proximate the vent aperture, the filter body positionable within the bracket assembly when in alignment with the vent aperture.

8. The air conditioner unit of claim 1, wherein the filter chute further comprises a handle extending from the filter body.

9. The air conditioner unit of claim 8, wherein the handle is extendable through the passage of the filter chute when the filter body is positioned in alignment with the vent aperture such that a first end of the handle protrudes from the first end of the filter chute.

10. The air conditioner unit of claim 1, wherein the filter chute extends from the outdoor facing surface.

11. The air conditioner unit of claim 1, wherein the filter chute extends from the indoor facing surface.

12. The air conditioner unit of claim 1, wherein the filter is formed from a plastic.

13. The air conditioner unit of claim 1, wherein the bulkhead further comprises an air diverter extending laterally between the first sidewall and the second sidewall.

14. The air conditioner unit of claim 1, further comprising a blower fan and a heating unit each disposed at least partially within an interior of the bulkhead.

15. A bulkhead assembly for an air conditioner unit, the bulkhead assembly comprising:
   a bulkhead, the bulkhead comprising a first sidewall, a second sidewall spaced apart from the first sidewall along a lateral direction, and a rear wall extending laterally between the first sidewall and the second sidewall, the rear wall comprising an indoor facing surface and an opposing outdoor facing surface;
   and a filter chute extending from one of the indoor facing surface or the outdoor facing surface, the filter chute defining a passage extending between a first end and a second end, the second end disposed proximate the vent aperture.

16. The bulkhead assembly of claim 15, wherein the filter chute comprises a top wall, a first sidewall, and a second sidewall.

17. The bulkhead assembly of claim 16, wherein the filter chute further comprises a bottom wall.
18. The bulkhead assembly of claim 15, wherein the first end of the filter chute is disposed proximate a top end of the bulkhead.

19. The bulkhead assembly of claim 15, further comprising a bracket assembly disposed proximate the vent aperture.

20. The bulkhead assembly of claim 15, further comprising an air diverter extending laterally between the first sidewall and the second sidewall.

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