US 20160116204A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2016/0116204 A1**

(43) **Pub. Date: Apr. 28, 2016**

Li et al.

(54) **FAN WITH INTEGRATED PLENUM**

(71) Applicant: **General Electric Company**, Schenectady, NY (US)

(72) Inventors: **Jianwu Li**, Louisville, KY (US); **Stephanos Kyriacou**, Louisville, KY (US)

(21) Appl. No.: **14/520,407**

(22) Filed: **Oct. 22, 2014**

Publication Classification

(51) **Int. Cl.**

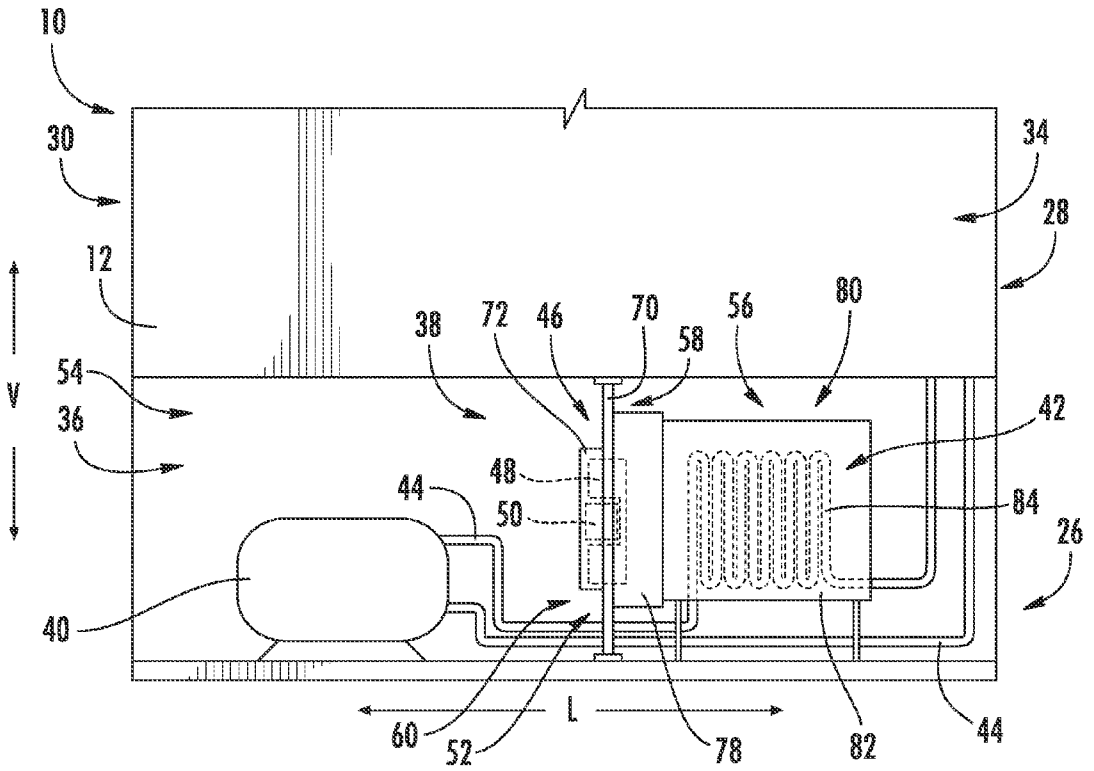
F25D 23/00	(2006.01)
F04D 25/12	(2006.01)
F25B 39/04	(2006.01)

(52) **U.S. Cl.**

CPC ***F25D 23/003*** (2013.01); ***F25D 23/006*** (2013.01); ***F25B 39/04*** (2013.01); ***F04D 25/12*** (2013.01)

(57) **ABSTRACT**

A condenser fan assembly for a refrigerator appliance is provided including a plurality of blades, an electric motor in mechanical communication with the plurality of blades, and a fan housing. The fan housing is configured to separate the utility compartment defined by a cabinet of the refrigerator appliance into two zones. The fan housing includes a plenum, one or more support arms, and a backplate. The electric motor is attached the backplate, and the plenum, the one or more support arms, and the backplate are all formed integrally to increase an efficiency of the condenser fan assembly.



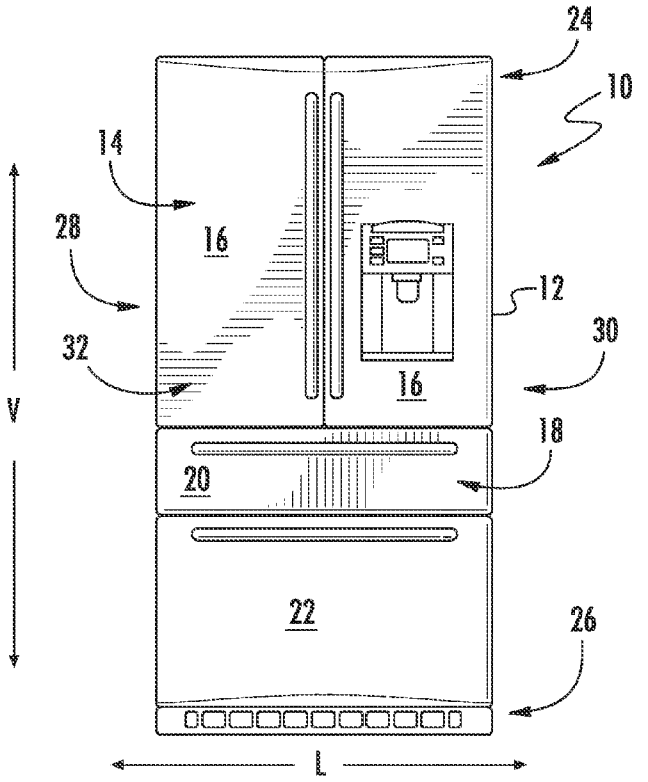

24
10
14
16
28
12
30
32
16
V
18
20
22
26
L

FIG. 1

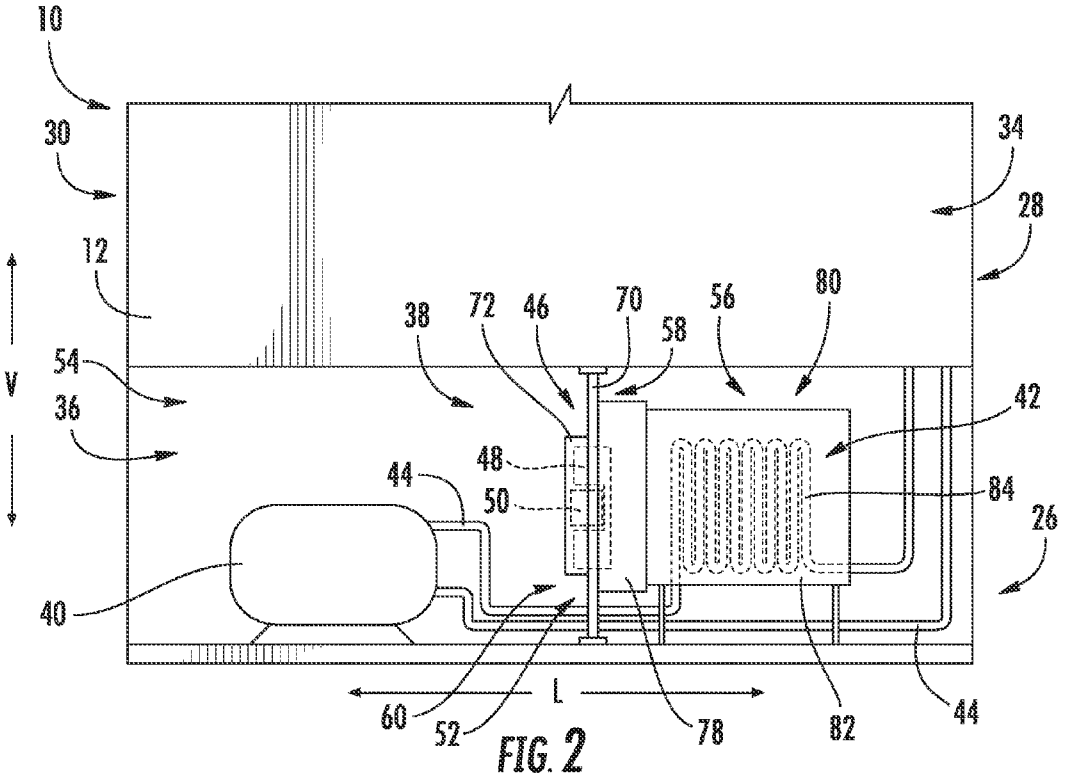

10
30
34
28
12
38
72
46
70
58
56
80
54
V
36
42
48
44
50
84
26
40
L
60
52
78
82
44

FIG. 2

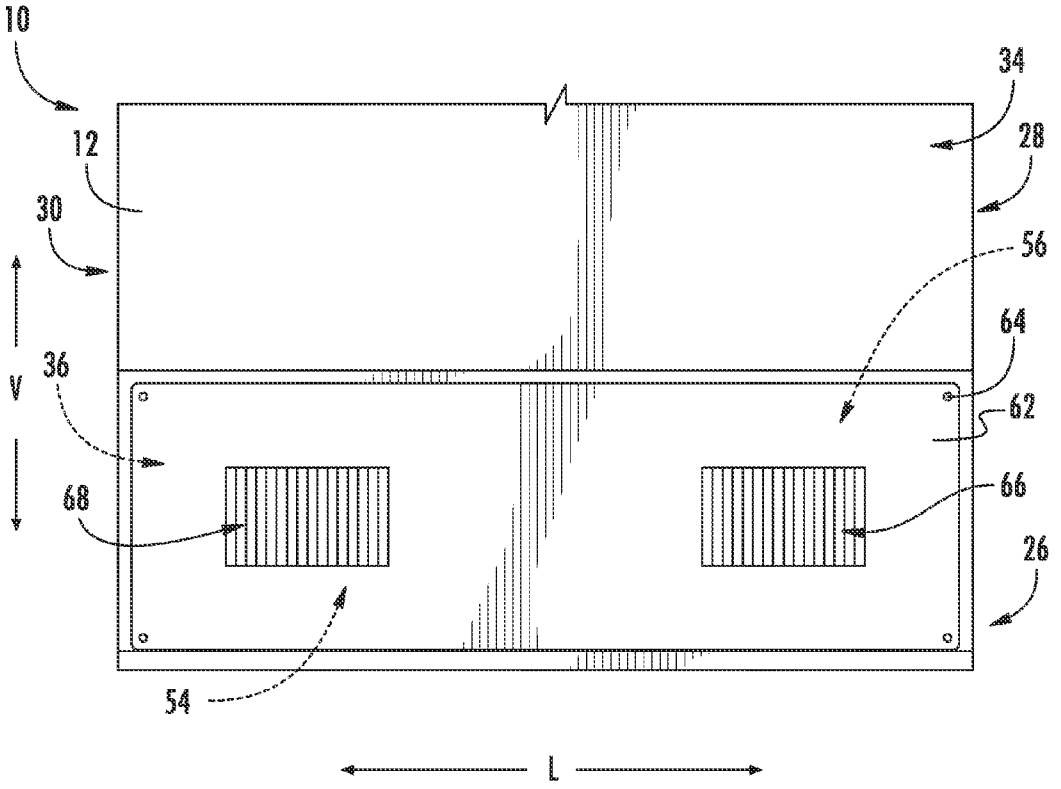


FIG. 3

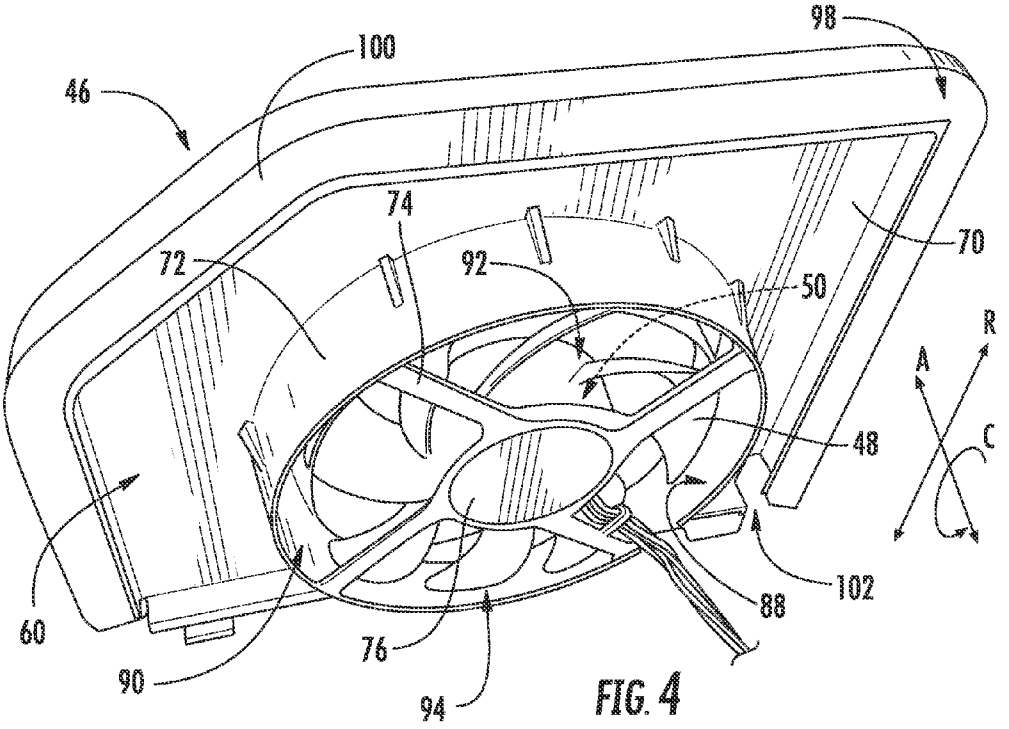

98
100
46
74
72
92
70
50
R
A
C
48
102
88
60
76
90
94

FIG. 4

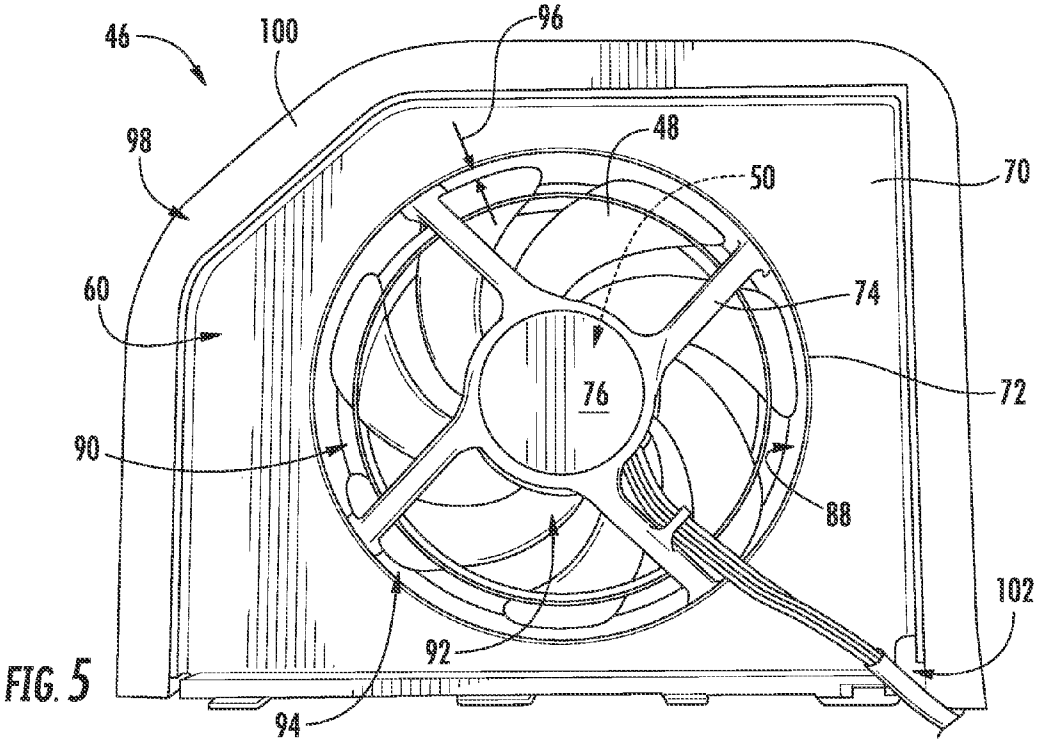

46
100
96
98
48
50
70
60
74
76
72
90
88
102
92
94

FIG. 5

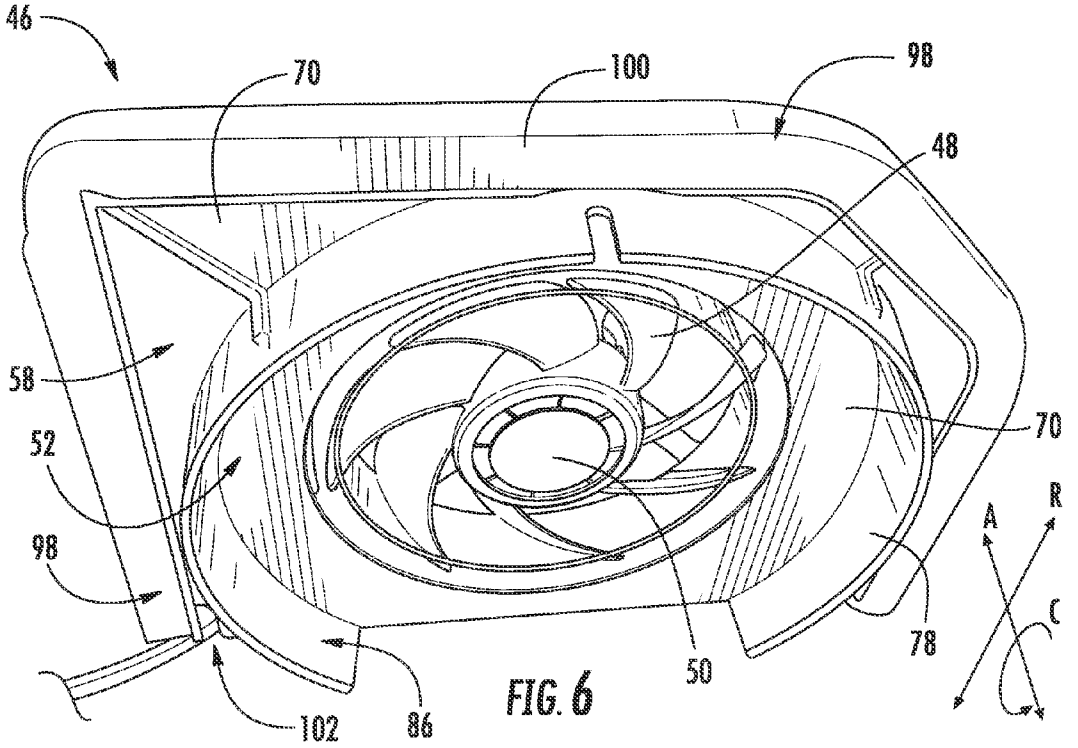

46
70
100
98
48
58
52
98
70
A
R
C
78
50
102
86

FIG. 6

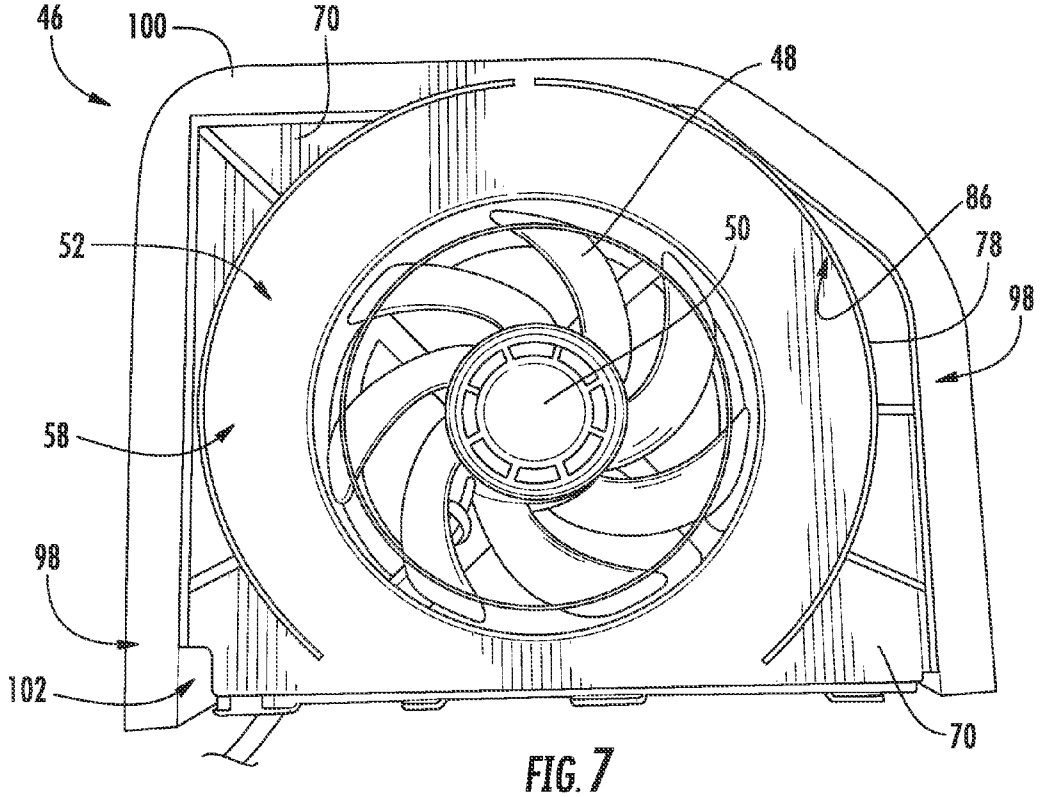

46
100
70
48
52
50
86
78
98
58
98
102
70

FIG. 7

FAN WITH INTEGRATED PLENUM

FIELD OF THE INVENTION

[0001] The present subject matter relates generally to a refrigerator appliance, or more particularly, to a condenser fan assembly for a refrigerator appliance.

BACKGROUND OF THE INVENTION

[0002] Consumer refrigerator appliances generally utilize a relatively simple sealed system that includes a compressor, a condenser, an expansion device, and an evaporator connected in series, in parallel, or in a hybrid configuration. The system is charged with a refrigerant, such as R-134a. During operation, the refrigerant is pressurized using the compressor, raising the temperature of the refrigerant. The refrigerant is then flowed to the condenser, wherein heat from the refrigerant is exchanged, lowering the temperature of the refrigerant. From the condenser, the refrigerant enters the expansion device and, upon exiting the expansion device, the refrigerant enters the evaporator to further reduce the temperature and pressure of the refrigerant. Additionally, the refrigerant may change phase from a liquid to a gas in the evaporator. Heat from a chilled chamber of the refrigerator appliance (e.g., a freezer chamber or a fresh food chamber) is transferred to the refrigerant within the evaporator, reducing a temperature of the chilled chamber of the refrigerator appliance.

[0003] One or more of the components of the sealed system may be positioned in a utility compartment of the refrigerator appliance, with a back panel provided to cover the utility compartment. A condenser fan assembly can be positioned within the utility compartment adjacent to the condenser to provide an airflow over the condenser and increase an amount of heat transfer from the condenser to, e.g., ambient surroundings of the refrigerator appliance. Moreover, the condenser fan assembly can be positioned within the utility compartment between an inlet vent and an exhaust vent on the back panel to allow such an airflow over the condenser.

[0004] The condenser fan assembly includes various components to generate the airflow over the condenser. However, it can be difficult to create a durable and effective seal between the various components. For example, the seal can break down over continued use, allowing for airflow to circulate from the downstream side of the utility compartment back to the upstream side of the utility compartment between the various components of the condenser fan assembly, reducing the fan assembly's efficiency. Additionally, such a configuration can allow for an undesirable rattling noise between the components.

[0005] Therefore, a condenser fan assembly that allows for an effective and durable seal between the various components would be beneficial. More particularly, a condenser fan assembly that can reduce a risk of air circulation from the downstream side to the upstream side of the plenum and reduce a risk of undesirable rattling noises of the components would be particularly useful.

BRIEF DESCRIPTION OF THE INVENTION

[0006] Aspects and advantages of the invention are set forth below in the following description, or may be obvious from the description, or may be learned through practice of the invention.

[0007] In one exemplary embodiment of the present disclosure, a condenser fan assembly for a refrigerator appliance is provided including a plurality of blades, an electric motor in mechanical communication with the plurality of blades, and a fan housing configured to separate a utility compartment within the refrigerator into two zones. The fan housing includes a plenum, one or more support arms, and a backplate. The electric motor is attached to the backplate and the one or more support arms extend from the backplate towards the plenum. Additionally, the plenum, the backplate, and the one or more support arms are formed integrally.

[0008] In another exemplary embodiment of the present disclosure, a refrigerator appliance is provided including a cabinet defining at least one refrigerated compartment and a utility compartment. The refrigerator appliance also includes a sealed system configured to provide cooled air to the at least one refrigerated compartment. The sealed system includes a condenser positioned in the utility compartment. The refrigerator appliance additionally includes an electric motor positioned in the utility compartment adjacent to the condenser and in mechanical communication with a plurality of blades, and a condenser fan housing. The condenser fan housing is configured to separate the utility compartment into a high pressure zone and a low pressure zone. The condenser fan housing includes a plenum, one or more support arms, and a backplate. The electric motor is attached to the backplate and the one or more support arms extend from the backplate towards the plenum, wherein the plenum, the backplate, and the one or more support arms are formed integrally.

[0009] These and other features, aspects and advantages of the present disclosure 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 disclosure and, together with the description, serve to explain the principles of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] A full and enabling disclosure of the present invention, including the best mode thereof to one skilled in the art, is set forth more particularly in the remainder of the specification, including reference to the accompanying figures, in which:

[0011] FIG. **1** provides a front view of a refrigerator appliance according to an exemplary embodiment of the present subject matter.

[0012] FIG. **2** provides a rear view of a bottom portion of the exemplary refrigerator appliance of FIG. **1**, with a cover panel removed.

[0013] FIG. **3** provides a rear view of the bottom portion of the exemplary refrigerator appliance of FIG. **1**, including the cover panel.

[0014] FIG. **4** provides a downstream perspective view of a condenser fan assembly according to an exemplary embodiment of the present subject matter.

[0015] FIG. **5** provides a downstream plan view of the exemplary condenser fan assembly of FIG. **4**.

[0016] FIG. **6** provides an upstream perspective view of the exemplary condenser fan assembly of FIG. **4**.

[0017] FIG. **7** provides an upstream plan view of the exemplary condenser fan assembly of FIG. **4**.

DETAILED DESCRIPTION OF THE INVENTION

[0018] 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.

[0019] FIG. **1** depicts a refrigerator appliance **10** according to an exemplary embodiment of the present subject matter. The refrigerator appliance depicted **10** is an upright, vertically oriented refrigerator having a cabinet or casing **12** that defines at least one refrigerated compartment. In particular, refrigerator appliance **10** includes an upper fresh-food compartment **14** having doors **16** and a lower freezer compartment **18** having upper drawer **20** and lower drawer **22**. The drawers **20**, **22** are "pull-out" drawers in that they can be manually moved into and out of the freezer compartment **18** on suitable slide mechanisms.

[0020] Refrigerator appliance **10** depicted defines a vertical direction V, a lateral direction L, and a transverse direction (not shown). The vertical direction V, lateral direction L, and transverse direction are mutually perpendicular and form an orthogonal direction system. Additionally, refrigerator appliance **10** extends between a top portion **24** and a bottom portion **26** generally along the vertical direction V, between a first side portion **28** and a second side portion **30** generally along the lateral direction L, and between a front side **32** and a rear side **34** (see FIG. **2**) generally along the transverse direction.

[0021] It should be appreciated, however, that the refrigerator appliance **10** depicted in FIG. **1** is provided by way of example only and that the term "refrigerator appliance" is used in a generic sense herein to encompass any manner of refrigeration appliance, such as a freezer, refrigerator/freezer combination, and any style or model of conventional refrigerator. Thus, it is within the scope of the present subject matter for other configurations of the refrigerator appliance **10** to be used as well. For example, refrigerator appliance **10** may be provided with any suitable configuration of, e.g., fresh food compartment **14** and/or freezer compartment **20**, including any suitable hinged or pull-out doors. Additionally, although refrigerator appliance **10** is depicted as a vertically oriented refrigerator appliance, in other embodiments, the refrigerant appliance **10** may, e.g., be a horizontally oriented refrigerator appliance with a door positioned at e.g. a top side of the refrigerator appliance.

[0022] Referring now to FIG. **2**, a rear view of the bottom portion **26** of the exemplary refrigerator appliance **10** of FIG. **1** is provided. As shown, the cabinet **12** of the refrigerant appliance **10** further defines a utility compartment **36**, which for the embodiment depicted, is positioned at the rear side **34** of the refrigerator appliance **10** towards the bottom portion **26** of the refrigerator appliance **10**. The utility compartment **36** includes one or more components of a sealed system **38** of refrigerator appliance **10**.

[0023] The sealed system **38** provides cooled air to the at least one refrigerated compartments, e.g., the fresh food compartment **14** and/or the freezer compartment **18** of the refrigerator appliance **10**. The sealed system **38** generally includes a compressor **40**, a condenser **42**, an expansion device (not shown), and an evaporator (not shown) connected in series, connected in parallel, or in a hybrid connection configuration by one or more pipes or conduits **44**. For example, a refrigerant may be compressed by the compressor **40** to increase a temperature and pressure of the refrigerant such that the refrigerant is in a superheated vapor phase. The pressurized refrigerant may then flow through the condenser **42**, wherein at least a portion of the superheated vapor refrigerant is condensed into a liquid phase refrigerant by removing heat from the refrigerant. From the condenser **42**, refrigerant may flow through the expansion device whereby the temperature and pressure of the refrigerant is further reduced before traveling to the evaporator. Heat from the one or more refrigerated compartments, e.g., fresh food compartment **14** or freezer compartment **20**, may be transferred to the evaporator (and the refrigerant therein), cooling the one or more refrigerated compartments.

[0024] For the embodiment depicted, the compressor **40** and the condenser **42** of the sealed system **38** are positioned in the utility compartment **36**, with the expansion device and the evaporator positioned elsewhere within the cabinet **12** of the refrigerator appliance **10**. The various components are connected using the pipes **44**. However, in other exemplary embodiments, one or more of the expansion device and evaporator may also be positioned in the utility compartment **36**, or alternatively the compressor **40** may be positioned outside of the utility compartment **36**.

[0025] As shown, the refrigerator appliance **10** further includes a condenser fan assembly **46** positioned in the utility compartment **36** configured to provide a flow of air over the condenser **42**, increasing an efficiency of the sealed system **38**. The condenser fan assembly **46** generally includes a plurality of blades **48**, an electric motor **50** in mechanical communication with a plurality of blades **48**, and a fan housing **52**. The fan housing **52** is configured to separate the utility compartment **36** within the refrigerator appliance into two zones. More particularly, the fan housing **52** is configured to separate utility compartment **36** into a high pressure zone **54** and a low pressure zone **56**. Accordingly, the fan housing **52** defines a first side **58**, which for the embodiment depicted is an upstream side, and a second and opposite side **60**, which for the embodiment depicted is a downstream side.

[0026] Referring now to FIG. **3**, another rear view of the bottom portion **26** of the exemplary refrigerator appliance **10** of FIG. **1** is provided. For the embodiment shown, the refrigerator appliance **10** also includes a back cover panel **62** extending over the utility compartment **36** and attached to the cabinet **12** of the refrigerator appliance **10** using a plurality of screws **64**. However, in other embodiments, the back cover panel **62** may instead be attached to the cabinet **12** in any other suitable manner. For example, in other embodiments, the back cover panel **62** may be attached at a first side using one or more hinges, and attached at and opposite side using one or more suitable latches. The back cover panel **62** includes an airflow inlet **66** and an airflow exhaust **68**. The airflow inlet **66** may be positioned over the low pressure zone **56** of the utility compartment **36**, while the airflow exhaust **68** may be positioned over the high pressure zone **54** of the utility compartment **36**. Accordingly, the condenser fan assembly **46** may provide for a flow of air from an ambient surrounding of the refrigerator appliance **10**, through the airflow inlet **66** of the back cover panel **62**, over the condenser **42** (exchanging heat with the condenser), and out through the airflow exhaust **68** of the back cover panel **62**.

[0027] It should be appreciated, however, that in other exemplary embodiments, the refrigerator appliance **10** may instead define an airflow inlet **66** and an airflow exhaust **68** in any other suitable location. For example, the cabinet **12** of the refrigerator appliance **10** may define an airflow inlet **66** on the first side **28** of the cabinet and an airflow exhaust **68** on the second side **30** of the cabinet **12**.

[0028] Reference will now be made to FIGS. **4** and **5**. FIG. **4** provides a downstream perspective view of a condenser fan assembly **46** in accordance with an exemplary embodiment of the present disclosure. Additionally, FIG. **5** provides a downstream plan view of the exemplary condenser fan assembly **46** of FIG. **4**.

[0029] As is shown, the exemplary fan housing **52** of the condenser fan assembly **46** generally includes a plate structure or plenum **70**, a fan shroud **72**, one or more support arms **74**, and a backplate **76**. The electric motor **50** is attached to the backplate **76** and the one or more support arms **74** extend from the backplate **76** towards the plenum **70**. More particularly, the one or more support arms **74** extend from the backplate **76** to the fan shroud **72**, and the fan shroud **72** extends between the support arms **74** and the plenum **70**.

[0030] The plenum **70**, the fan shroud **72**, the one or more support arms **74**, and the backplate **76** are all formed integrally. As used herein, "formed integrally" refers to one or more components being made from the same material with no seams or gaps therebetween. For example, two components may be formed integrally when they are formed simultaneously using a single mold or die.

[0031] Additionally, as stated, the fan housing **52** defines the first side **58** (FIGS. **6** and **7**), or upstream side, and the second side **60**, or downstream side. The fan shroud **72** extends outwardly along an axial direction A from the plenum **70** on the second side **60** and is cylindrical in shape. Additionally, the fan shroud **72** defines an inner surface **88** and an orifice **90**, the inner surface **88** extending along the circumferential direction C around the orifice **90**. The electric motor **50** is attached to the backplate **76**, and the plurality of blades **48** and electric motor **50** are positioned within the orifice **90** of the fan shroud **72**. The fan shroud **72** may assist in directing airflow generated by the plurality of blades **48** and electric motor **50**.

[0032] Additionally, the plurality of blades **48** each extend between a base **92** and a tip **94**. A clearance **96** is defined by the condenser fan assembly **46** between the tips **94** of the plurality of blades **48** and the inner surface **88** of the fan shroud **72**. In certain exemplary embodiments, the clearance **96** may be less than or equal to seven (7) millimeters (mm). However, in other exemplary embodiments, the clearance **96** may be less than or equal to three (3) mm, less than or equal to one (1) mm, or less than or equal to eight tenths (0.8) of a mm. Such a configuration is allowable due to the integral formation of the backplate **76**, the support arms **74**, and the fan shroud **72**. More particularly, by forming the backplate **76**, the support arms **74**, and the fan shroud **72** integrally and attaching the electric motor **50** to the backplate **76**, the electric motor **50** may be mounted with relatively high precision within the orifice **90** of the fan shroud **72**, and relative to the inner surface **88** of the fan shroud **72**. Accordingly, the plurality of blades **48** may define the above clearance **96**, increasing an efficiency of the condenser fan assembly **46**. More specifically, such a clearance **96** between the tips **24** of the plurality of blades **48** and the inner surface **88** of the fan shroud **72** may reduce an amount of airflow that swirls back upstream around the tips **94** of the plurality of blades **48** (i.e., from the high pressure zone **54** to the low pressure zone **56**) during operation of the condenser fan assembly **46**.

[0033] Referring now to FIGS. **6** and **7**, FIG. **6** provides an upstream perspective view of the exemplary condenser fan assembly **46** of FIG. **4** and FIG. **7** provides an upstream plan view of the exemplary condenser fan assembly **46** of FIG. **4**. For the embodiment depicted, the first side **58** includes a lip **78** also extending outwardly along the axial direction A from the plenum **70**. The exemplary lip **78** is configured to support a condenser assembly **80** (see FIG. **2**) of the refrigerator appliance **10**. For example, referring back to FIG. **2**, the condenser assembly **80** generally includes a cylindrically shaped housing **82** with condenser coils **84** of the condenser **42** positioned therein. The cylindrically shaped housing **82** may correspond in shape with the lip **78** extending from the plenum **70**. More particularly, the exemplary lip **78** depicted also defines a generally cylindrical shape having a diameter along a radial direction R slightly larger than a diameter of the cylindrically shaped housing **82** of the condenser assembly **80** along the radial direction R. The housing **82** may therefore be received within the lip **78** of the fan housing **52** condenser fan assembly **46**. It should be appreciated, however, that in other exemplary embodiments, the housing **82** and lip **78** may have any other shape. For example, in other exemplary embodiments, the housing **82** and lip **78** may define a squared or rectangular cross-sectional shape.

[0034] Additionally, the lip **78** may further include a gasket or foam seal (not shown) extending along the circumferential direction C around an inside surface **86** of the lip **78**. Such a configuration may further assist in providing a desired amount of airflow over the condenser coils **84** of the condenser **42**. More particularly, such a configuration may ensure airflow from the airflow inlet **66** on the back cover panel **62** flows through the housing **82** of the condenser assembly **80**, and thus, over the condenser coils **84** of the condenser **42**, to provide the desired amount of heat exchange with the condenser **42**. The gasket or foam seal may be a separate component attached to the lip **78**, or alternatively may be formed integrally with the lip **78**. For example, the gasket may be overmolded with the lip **78** using any suitable material, such as a rubber material.

[0035] It should be appreciated, however, that in other exemplary embodiments of the present disclosure, the first side **58** of the fan housing **52** may have any other suitable configuration. For example, in other embodiments, the fan housing **22** may not define the lip **78** for supporting the condenser assembly **80**, or alternatively may define any other suitable shape for the lip **78**.

[0036] Referring now generally to FIGS. **4** through **7**, the fan housing **52** further defines an outer perimeter **98**. Due to the integral formation of the fan shroud **72** and the plenum **70**, the fan housing **52** extends continuously between the fan shroud **72** and the outer perimeter **98** to form an airtight seal between the first side **58** and the second side **60** of the housing **52** from between the fan shroud **72** and the outer perimeter **98** of the housing **52**. More particularly, for the embodiment depicted, the orifice **90** of the fan shroud **72** is the only opening in the fan housing **52**. The outer perimeter **98** is configured to form a seal within the utility compartment **36** and, for the embodiment depicted, includes a gasket **100** extending around the outer perimeter **98** to assist with such a function. In certain exemplary embodiments the gasket **100** may be a foam gasket, or alternatively may be made of a

resilient material, such as a rubber material. Further, the gasket **100** may be a separate component attached to the outer perimeter **98** in any suitable manner, or alternatively may be formed integrally with the outer perimeter **98** of the housing **52**. For example, in certain exemplary embodiments, the gasket **100** may be overmolded with the outer perimeter **98** using any suitable material. Accordingly, for the embodiment depicted, the fan housing **52** may allow for a more durable and efficient condenser fan assembly **46**, as the risk of air leaking from the high pressure zone **54** to the low pressure zone **56** through the plenum **70**, the fan shroud **72**, or a seal therebetween is eliminated. Additionally, by forming the plenum **70** integrally with the fan shroud **72**, the support arms **74**, and the backplate **76**, a risk of the fan housing **52** developing one or more unwanted noises during operation of the condenser fan assembly **46** is minimized. More particularly, the risk of a "rattling" between one or more of the plenum **70**, the fan shroud **72**, the support arms **74**, and the backplate **76** due to vibrations of, e.g., the electric motor **50** and the plurality of blades **48**, is minimized.

[0037] Referring still generally to FIGS. **4** through **7**, the outer perimeter **98** defines an indentation **102**, which may allow for one or more pipes, such as one or more of the pipes **44** of the sealed system **38** of the refrigerator appliance **10**, to extend therethrough. For example, the indentation **102** may allow for one or more of the pipes **44** to extend from the compressor **40** to the condenser **42**, and/or from, e.g., the evaporator to the compressor **40**. It should be appreciated, however, that in other exemplary embodiments of the present disclosure, the outer perimeter **98** may not define such an indentation **102**. Additionally, or alternatively, the fan housing **52** may define one or more openings with suitable gaskets or other sealing mechanisms (not shown) in, e.g., the plenum **70** allowing for one or more pipes **44** of the sealed system **38** to extend therethrough.

[0038] 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 and 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 language of the claims.

What is claimed:

1. A condenser fan assembly for a refrigerator appliance comprising:

a plurality of blades;

an electric motor in mechanical communication with the plurality of blades; and

a fan housing configured to separate a utility compartment within the refrigerator into two zones, the fan housing comprising

a plenum;

one or more support arms; and

a backplate, the electric motor attached to the backplate and the one or more support arms extending from the backplate towards the plenum, wherein the plenum, the backplate, and the one or more support arms are formed integrally.

2. The condenser fan assembly of claim **1**, wherein the fan housing further comprises

a fan shroud defining an orifice, wherein the plurality of blades are positioned in the orifice of the fan shroud, and wherein the fan shroud is formed integrally with the plenum, the backplate, and the one or more support arms.

3. The condenser fan assembly of claim **2**, wherein the one or more support arms extend from the backplate to the fan shroud, and wherein the fan shroud extends between the support arms and the plenum.

4. The condenser fan assembly of claim **2**, wherein the fan housing defines an upstream side, a downstream side, and an outer perimeter, wherein the fan housing extends continuously between the fan shroud and the outer perimeter to form an air tight seal between the upstream side and the downstream side from between the fan shroud and the outer perimeter.

5. The condenser fan assembly of claim **2**, wherein the fan housing defines an upstream side and a downstream side, and wherein the fan shroud extends outwardly along an axial direction from the plenum on the downstream side of the fan housing.

6. The condenser fan assembly of claim **2**, wherein the fan housing further comprises a lip extending outwardly along an axial direction from the plenum, the lip configured to support a condenser assembly.

7. The condenser fan assembly of claim **2**, wherein the plurality of blades each extend between a base and a tip, wherein the fan shroud defines an inner surface extending circumferentially around the orifice, and wherein the condenser fan assembly defines a clearance between the tips of the plurality of blades and the inner surface that is less than seven millimeters.

8. The condenser fan assembly of claim **1**, wherein the fan housing further defines an outer perimeter, the outer perimeter configured to form a seal with the utility compartment.

9. The condenser fan assembly of claim **8**, wherein the condenser fan assembly further comprises a gasket extending around the outer perimeter.

10. The condenser fan assembly of claim **9**, wherein the gasket is formed integrally with the fan housing.

11. A refrigerator appliance comprising

a cabinet defining at least one refrigerated compartment and a utility compartment;

a sealed system configured to provide cooled air to the at least one refrigerated compartment, the sealed system including a condenser positioned in the utility compartment;

an electric motor positioned in the utility compartment adjacent to the condenser and in mechanical communication with a plurality of blades; and

a condenser fan housing configured to separate the utility compartment into a high pressure zone and a low pressure zone, the condenser fan housing comprising

a plenum;

one or more support arms; and

a backplate, the electric motor attached to the backplate and the one or more support arms extending from the backplate towards the plenum, wherein the plenum, the backplate, and the one or more support arms are formed integrally.

12. The refrigerator appliance of claim **11**, wherein the fan housing further comprises

a fan shroud defining an orifice, wherein the plurality of blades are positioned in the orifice of the fan shroud, and wherein the fan shroud is formed integrally with the plenum, the backplate, and the one or more support arms.

13. The refrigerator appliance of claim **12**, wherein the one or more support arms extend from the backplate to the fan shroud, and wherein the fan shroud extends between the support arms and the plenum.

14. The refrigerator appliance of claim **12**, wherein the fan housing defines an upstream side, a downstream side, and an outer perimeter, wherein the fan housing extends continuously between the fan shroud and the outer perimeter to form an air tight seal between the upstream side and the downstream side from between the fan shroud and the outer perimeter.

15. The refrigerator appliance of claim **12**, wherein the fan housing defines an upstream side and a downstream side, and wherein the fan shroud extends outwardly along an axial direction from the plenum on the downstream side of the fan housing.

16. The refrigerator appliance of claim **12**, wherein the fan housing further comprises a lip extending outwardly along an axial direction from the plenum, the lip configured to support a condenser assembly.

17. The refrigerator appliance of claim **12**, wherein the plurality of blades each extend between a base and a tip, wherein the fan shroud defines an inner surface extending circumferentially around the orifice, and wherein the condenser fan housing defines a clearance between the tips of the plurality of blades and the inner surface that is less than seven millimeters.

18. The refrigerator appliance of claim **11**, wherein the fan housing further defines an outer perimeter, the outer perimeter configured to form a seal with the utility compartment.

19. The refrigerator appliance of claim **18**, wherein the refrigerator appliance further comprises a gasket extending around the outer perimeter.

20. The refrigerator appliance of claim **19**, wherein the gasket is formed integrally with the condenser fan housing.

* * * * *