REFRIGERATION DECK SYSTEM FOR VENDING MACHINE

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ABSTRACT

A vending machine includes a product compartment, a duct opening into the product compartment, and a self-contained refrigeration system. The refrigeration system includes a housing having a first chamber and a second chamber. The first chamber includes first and second openings. The second chamber includes third and fourth openings. An evaporator coil and evaporator fan are mounted in the first chamber. The evaporator fan moves air from the first opening, through the evaporator coil, to the second opening. A condensing coil, compressor, and compressor fan are mounted in the second chamber. The compressor fan moves air from the third opening, through the condensing coil, over the compressor, to the fourth opening. The housing thermally insulates the first chamber from both the second chamber and an exterior of the housing. The housing also seals the first chamber, such that substantially all air in the first chamber enters the first chamber through the first opening and exits the first chamber through the second opening. The housing is further adapted to automatically couple the first opening to the product storage compartment and the second opening to the duct when the housing is inserted into the vending machine.
REFRIGERATION DECK SYSTEM FOR VENDING MACHINE

CROSS-REFERENCE TO RELATED APPLICATION AND CLAIM OF PRIORITY


TECHNICAL FIELD OF THE INVENTION

[0002] The present application relates generally to refrigerated vending machines and, more specifically, to a refrigeration deck for a vending machine.

BACKGROUND OF THE INVENTION

[0003] A vending machine may be used for providing various products, such as soft drinks or snacks. Some vending machines provide refrigeration within the vending machine to refrigerate the products that are available for purchase. Such vending machines employ multiple refrigeration components for this purpose. The refrigeration components may be mounted individually inside the vending machine. In such vending machines, these refrigeration components can be difficult to repair or replace due to difficulties in accessing a broken component. Working components may need to be disconnected and removed in order to remove broken components. Vending machine components unrelated to the refrigeration system may need to be removed in order to gain access to refrigeration system components.

SUMMARY OF THE INVENTION

[0004] In one embodiment, a self-contained refrigeration system includes a housing having a first chamber and a second chamber. The first chamber includes first and second openings. The second chamber includes third and fourth openings. An evaporator coil and an evaporator fan are mounted in the first chamber. The evaporator fan is adapted to move air from the first opening, through the evaporator coil, and to the second opening. A condensing coil, a compressor, and a condensate fan are mounted in the second chamber. The compressor fan is adapted to move air from the third opening, through the condensing coil, over a surface of the compressor, and to the fourth opening. The housing is adapted to thermally insulate the first chamber from both the second chamber and an exterior of the housing. The housing is further adapted to seal the first chamber, such that substantially all air in the first chamber enters the first chamber through the first opening and exits the first chamber through the second opening. The housing is further adapted to automatically couple the first opening and the second opening to a product compartment of a vending machine when the housing is inserted into the vending machine.

[0005] In another embodiment, a vending machine includes a product compartment, a duct opening into the product compartment, and a self-contained refrigeration system. The self-contained refrigeration system includes a housing having a first chamber and a second chamber. The first chamber includes first and second openings. The second chamber includes third and fourth openings. An evaporator coil and an evaporator fan are mounted in the first chamber. The evaporator fan is adapted to move air from the first opening, through the evaporator coil, and to the second opening. A condensing coil, a compressor, and a condensate fan are mounted in the second chamber. The compressor fan is adapted to move air from the third opening, through the condensing coil, over a surface of the compressor, and to the fourth opening. The housing is adapted to thermally insulate the first chamber from both the second chamber and an exterior of the housing. The housing is further adapted to seal the first chamber, such that substantially all air in the first chamber enters the first chamber through the first opening and exits the first chamber through the second opening. The housing is further adapted to automatically couple the first opening and the second opening to a product compartment of a vending machine when the housing is inserted into the vending machine.

[0006] In still another embodiment, a vending machine includes a product compartment and a self-contained refrigeration system adapted for insertion into the vending machine. The self-contained refrigeration system includes a molded housing having a first chamber and a second chamber, first thermal insulation between the first chamber and the second chamber, and second thermal insulation between the first chamber and an exterior of the housing. The self-contained refrigeration system is adapted to pull air from the product compartment into the first chamber through a first opening in the molded housing, cool the air, and return the cooled air to the product compartment through a second opening in the molded housing. Substantially all air in the first chamber enters and exits the first chamber through the first opening and the second opening, respectively. The self-contained refrigeration system is further adapted to pull air from outside the vending machine through a third opening in the molded housing into the second chamber, transfer heat into the air, and return the heated air outside the vending machine through a fourth opening in the molded housing. The self-contained refrigeration system is also adapted to automatically couple the first opening and the second opening to the product storage compartment when the housing is inserted into the vending machine.

[0007] Before undertaking the DETAILED DESCRIPTION OF THE INVENTION below, it may be advantageous to set forth definitions of certain words and phrases used throughout this patent document: the terms “include” and “comprise,” as well as derivatives thereof, mean inclusion without limitation; the term “or,” is inclusive, meaning and/or; the phrases “associated with” and “associated therewith,” as well as derivatives thereof, may mean to include, be included within, interconnect with, contain, be contained within, connect to or with, couple to or with, be communicable with, cooperate with, interleave, juxtapose, be proximate to, be bound to or with, have, have a property of, or the like; and the term “controller” means any device, system or part thereof that controls at least one operation, such as a device may be implemented in hardware, firmware or software, or some combination of at least two of the same. It should be noted that the functionality associated with any particular controller may be centralized or distributed, whether locally or remotely. Definitions for certain words and phrases are provided throughout this patent document, those of ordinary skill in the art should understand that in many, if not most
instances, such definitions apply to prior, as well as future uses of such defined words and phrases.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] For a more complete understanding of the present disclosure and its advantages, reference is now made to the following description taken in conjunction with the accompanying drawings, in which like reference numerals represent like parts:

[0009] FIG. 1a illustrates a first oblique view of a refrigeration deck system according to an embodiment of the present disclosure;

[0010] FIG. 1b illustrates a refrigeration deck system in a vending machine according to an embodiment of the present disclosure;

[0011] FIG. 1c illustrates an embodiment of the present disclosure;

[0012] FIG. 1d illustrates a refrigeration deck system according to an embodiment of the present disclosure;

[0013] FIG. 2a illustrates a refrigeration deck system with a modified condenser access panel according to an embodiment of the present disclosure;

[0014] FIG. 2b illustrates a universal refrigeration system for use in multiple different types of vending machines requiring refrigeration.

[0023] The refrigeration deck system 100 includes a molded housing 105. The molded housing 105 can be manufactured from injection-molding techniques, rotational molding techniques, blow molding, vacuum forming or any molding/forming technique as is known in the art. The molded housing 105 provides an insulated barrier between an evaporator side and a venting side (or compressor/condenser side) of the refrigeration deck system 100. The molded housing 105 further provides an insulated barrier between some components (e.g., components within the venting side) of the refrigeration deck system 100 and the refrigerated compartment 15 of the vending machine 10.

[0024] The molded housing 105 includes a top side 110, a bottom side 115, a right wall panel 120 and a left wall panel 125. The molded housing 105 further includes a front face wall 130 and a rear face wall 135 (illustrated on FIG. 3a). The right wall panel 120 and the left wall panel 125 are configured for interconnection with multiple different vending machine platforms. In some embodiments, as illustrated in FIGS. 2a, 2b and 2c, the molded housing comprises two or more molded portions adapted to be inter-connected to house the components of the refrigeration deck system 100. In such embodiments, the molded housing 105 includes a top portion 210 and a bottom portion 215.

[0025] In such embodiment, the molded housing 105 includes exposed handles 140. The exposed handles 140 are positioned on a front of the refrigeration deck system 100 (e.g., on the front face wall 130 of the molded housing 105). The exposed handles 140 are positioned to assist installation and removal of the refrigeration deck system 100 from the vending machine 10. Additionally, the handles 140 provide a handling mechanism for an operator to transport the refrigeration deck system 100. In other embodiments, the refrigeration deck system 100 includes additional exposed handles to assist installation and removal of the refrigeration deck system 100 from the vending machine 10.

[0026] The molded housing 105 further includes structural elements 145 to increase a strength of the housing 105. The structural elements are positioned on the top side 105, right wall panel 120 and left wall panel 125 of the refrigeration deck system 100. In some embodiments, the structural elements 145 are positioned on a bottom side 115 of the refrigeration deck system 100. In some embodiments, the structural elements 145 comprise a rigid member molded within the structural element 145 to assist in increasing the strength of the housing 105. In additional embodiments, the structural elements 145 comprise a different thickness of the molded material such that the structural elements 145 represent a more rigid portion of the housing 105.

[0027] The refrigeration deck system 100 includes a condenser coil access panel 150. The condenser coil access panel 150 is configured to be placed over a condenser coil access opening 220, or via, (illustrated in FIG. 2c) in the molded housing 105. One or more seals (not illustrated) are positioned around the condenser coil access opening 220 so as to inhibit a passage of air through the condenser coil access opening 220. The condenser coil access panel 150 can be detachably connected to the housing 105. Alternatively, the condenser coil access panel 150 can be hinge mounted to the
housing 105. Further, the condenser coil access panel 150 is secured in a closed position by one or more locking means.

As illustrated in FIGS. 2a and 2b, the condenser coil access panel 150 covers the condenser coil access opening 220 and inhibits the passage of a gas (e.g., chilled air from a refrigerated compartment 15 in the vending machine 10 or external air from external to the vending machine 10), liquid, or any other substance through the condenser coil access opening 220. As illustrated in FIG. 2c, when the condenser coil access panel 150 is removed from the housing 105, the condenser coil access opening 405 provides access to internal components, such as the condenser coil, of the refrigeration deck system 100, as will be discussed in further detail herein below with reference to FIG. 3. Such access may be used for purposes such as cleaning the condenser coil.

In one embodiment illustrated in FIG. 2d, the condenser coil access panel 150 comprises the front face 130 of the housing 105. As such the condenser coil access panel 150 provides access to internal components from a side of the refrigeration deck system 100 that is accessible from outside the vending machine 10 without removing the refrigeration deck system 100 from the vending machine 10. In such embodiments, the condenser coil access panel 150 is secured in a closed position by one or more locking devices. Additionally, one or more seals (not illustrated) are positioned around the condenser coil access opening 220 to inhibit a passage of air through the condenser coil access opening 220. The condenser coil access panel 150 and top side 110 include a tongue and groove joint 230.

As illustrated in FIG. 2d, the refrigeration deck system 100 includes a deflector 240 for directing air flow evenly across the condenser coil. In an alternate embodiment illustrated in FIG. 2e, the refrigeration deck system 100 does not include deflector 240. In such embodiment, the refrigeration deck system 100 includes a modified condenser coil access panel 250 that incorporates the directing capability of the deflector 240. As such, the modified condenser coil access panel 250 is configured to direct air flow evenly across the condenser coil. The modified condenser access panel 250 and topside 110 include a tongue and groove joint 230. Thus, in one example, an operator can readily access the components of the refrigeration deck system 100 by removing the top side 110 and the modified condenser access panel 250 (or the condenser access panel 150 and the deflector 240).

The refrigeration deck system 100 includes circulation openings, 155 and 160. A first circulation opening 155 provides an intake path on a low-pressure side for a gas (e.g., air). The air is drawn (e.g., pulled or pushed) from an area internal to the cabinet (e.g., from within refrigerated product compartment area) of the vending machine 10 through an evaporator chamber (to be discussed in further detail with reference to FIG. 3 below) of the refrigeration deck system 100. A second circulation opening 160 provides an outtake path on a high-pressure side for the gas (e.g., chilled air) that has been channeled through the evaporator chamber to be directed into the refrigerated product compartment 15 of the vending machine 10. The chilled air passes from the second circulation opening 160 through a duct structure 20 into the product compartment 15 of the vending machine 10.

The front wall 130 is slanted from its bottom to its top toward the back of the vending machine 10. In some embodiments, when the refrigeration deck system 100 is inserted into the vending machine 10, the front wall 130 forms at least a portion of a wall of the refrigerated product compartment area of the vending machine 10. In other embodiments, when the refrigeration deck system 100 is inserted into the vending machine 10, the first circulation opening 155 mates with a corresponding opening into the refrigerated product compartment area of the vending machine 10. In both embodiments, inserting the refrigeration deck system 100 into the vending machine 10 automatically couples the circulation openings 155 and 160 to the refrigerated product compartment area of the vending machine 10.

Additionally, the refrigeration deck system 100 includes one or more cabinet positioned gaskets 165 to assist in the prevention of gas (e.g., air) from transiting in a direction other than through the refrigeration deck system 100 (e.g., to assist in preventing leakage of refrigerated air from the refrigerated compartment or the leakage of external gases into the refrigerated compartment). The gaskets 165 are positioned along the front wall 130, on the top side 110, along the edges of the second circulation opening 160 and along elements of the housing 105 where the refrigeration deck system 100 is adjacent to one or more openings within the refrigerated product compartment 15 of the vending machine 10.

The gaskets 165 inhibit a leakage of refrigerated air from the product compartment to an area external to the product compartment as well as inhibiting the leakage of gases (e.g., external air) into the refrigerated product compartment. In embodiments comprising the top portion 210 and the bottom portion 215, the housing 105 further includes one or more gaskets 165 along edges where the top portion 210 and the bottom portion 215 is adjacent to the bottom portion 215. In some embodiments, the gaskets 165 are attached to the refrigeration deck system 100 and engage a surface or edge of the vending machine 10. In other embodiments, the gaskets 165 are attached to the vending machine 10 and engage a surface or edge of the refrigeration deck system 100.

Because of the angle of the front wall 130, the gaskets 165 that seal the housing 100 to the vending machine 10 are engaged directly and compressed by insertion of the refrigeration deck system 100 into the vending machine 10. Such a configuration reduces sliding along the gaskets 165, which can increase the operating life of the gaskets 165 and improve the seal provided by the gaskets 165 against leakage of outside air.

The molded housing 105 includes a four point contact 170 adapted to provide an elevated interface between the refrigeration deck system 100 and the vending machine 10. The refrigeration deck system 100 further includes one or more interlocking mechanisms 280, shown on FIG. 2/ adapted to hold the refrigeration deck system 100 in a specified position within the vending machine 10. The interlocking mechanisms 280 are configured to adjust a position of the refrigerated deck system 100 such that a positive pressure is created along the gaskets 165. Accordingly, an enhanced seal is created between the housing 105 and the edges of the one or more openings of the product compartment 15 of the vending machine 10. In some embodiments, the refrigeration deck system 100 includes wheels (not illustrated) to assist in the installation and removal, as well as transport, of the refrigeration deck system 100.

Referring now to FIG. 3a, the refrigeration deck system 100 includes an evaporator chamber 305 and a venting chamber 310. The evaporator chamber 305 is adapted to receive air from the vending machine 10 cabinet (e.g., from the refrigerated compartment 15) via the first circulation opening 155, cool the air, and release the air into the vending
machine 10 cabinet (e.g., into the refrigerated compartment 15) via the second circulation opening 160. The venting chamber 310 is adapted to draw in air from an area external to the vending machine 10 via a third circulation opening 315. The venting chamber channels the external air along a venting path and expels the external air via a fourth circulation opening 335.

[0038] The evaporator chamber 305 includes an evaporator coil 365 and a circulation (or evaporator) fan 340. The circulation fan 340 is operable to establish a flow of the air (or another suitable gas) such that the air is drawn from within the refrigerated compartment 15 of the vending machine 10 via the first circulation opening 155. Thereafter the air flows through the evaporator coil 365 wherein a temperature of the air is reduced. Then, the air is channeled into the refrigerated cabinet of the vending machine through the second opening 160. The evaporator chamber 305 is separated from the venting chamber 310 by an insulated barrier 345. The insulated barrier 345 includes an insulating foam 350. The evaporator chamber 305 further includes insulating walls 355. The insulating walls 355 include the insulating foam 350. In some embodiments, illustrated in FIG. 3b, one or more of the insulating walls 355 are positioned to direct the flow of chilled air towards the second circulation opening 160.

[0039] The venting chamber 310 includes a condensing coil 320, a circulation (or compressor) fan 325, and compressor 330. The compressor 330 is coupled to the evaporator coil 365 and condensing coil 320 as is known in the art. The circulation fan 325 is operable to create a flow of air such that air is drawn from an area external to the vending machine 10 via the third circulation opening 315. The external air flows through the condensing coil 320 wherein a heat exchange occurs. Thereafter, the circulating fan 325 draws the external air over and around the compressor 330 and expels the air via the fourth circulation opening 335 to an area external to the vending machine 10. In some embodiments, the venting chamber includes insulating walls 360. Insulation walls 360 include insulation foam 350.

[0040] In another embodiment illustrated in FIGS. 4a, 4b, 4c and 4d, the refrigeration deck system 100 includes a bottom tray 405. In such embodiment, a venting area 415 is not enclosed by the housing 105 (e.g., does not include insulation walls 360). In alternate embodiments, the venting area 415 is enclosed by the housing 105. In one such embodiment, the bottom tray 405 comprises a sheet of metal dimensioned and configured to support an evaporator chamber 415 and the venting area 410 of the refrigeration deck system 100. The metal for the bottom tray 405 can be formed via press brake forming, stamp bending or any other sheet metal forming process as is known in the art.

[0041] The evaporator chamber 415 includes an evaporator coil 435 and a circulation (or evaporator) fan 440. The circulation fan 440 is operable to establish a flow of the air (or other suitable gas) such that the air is drawn from within the refrigerated compartment 15 of the vending machine 10 via a first circulation opening 475 illustrated on FIG. 4b. Thereafter the air flows through the evaporator coil 465 wherein a temperature of the air is reduced. Then, the air is channeled into the refrigerated compartment 15 of the vending machine 10 through the second opening 480. The evaporator chamber 415 is separated from the venting area 410 by an insulated barrier 445. The insulated barrier 445 includes an insulating foam 450. The evaporator chamber 415 further includes insulating walls 455. The insulating walls 455 include the insulating foam 450. In some embodiments, the evaporator chamber 415 includes panels to direct the cooled air to the second opening 480. In some embodiments, illustrated in FIG. 4c, one or more of the insulating walls 355 are positioned to direct the flow of chilled air towards the second circulation opening 160.

[0042] The venting area 410 includes a condensing coil 420, a circulation (or compressor) fan 425, and compressor 430. The compressor 430 is coupled to the evaporator 435 and condensing coil 420 as is known in the art. The circulation fan 425 is operable to create a flow of air such that air is drawn from an area external to the vending machine 10 via the third circulation opening 415. The external air flows through the condensing coil 420 wherein a heat exchange occurs. The circulating fan 425 draws the external air over and around the compressor 430. Thereafter, the external air is expelled to an area external to the vending machine 10.

[0043] In yet another embodiment, illustrated in FIG. 5, an evaporator fan draws air into an evaporator chamber from within the refrigerated compartment 15 of the vending machine 10, as indicated by airflow 502. The air flows through an evaporator coil 565 wherein a temperature of the air is reduced. Then, the air is channeled back into the refrigerated compartment 15 of the vending machine 10, as indicated by airflow 504. A compressor fan draws air from an area external to the vending machine 10 into a venting chamber via an opening 515, as indicated by airflow 506. The air passes through condensing coil 520 wherein a heat exchange occurs, and past a compressor 530. Thereafter, the heated external air is expelled to an area external to the vending machine 10, as indicated by airflow 508.

[0044] Accordingly, embodiments of the refrigeration deck system 100 provide a self-contained refrigeration system for use in a vending machine 10. The refrigeration deck system 100 is operable to draw-in air from inside a compartment 15 of the vending machine 10, cool the air, and return the chilled air to the compartment 15 of the vending machine 10. Additionally, the refrigeration deck system 100 is operable to draw-in external air from an area external to the vending machine 10, transfer a heat energy and vent the external air back out to an area external to the vending machine 10.

[0045] The refrigeration deck system 100 is configured to fit within multiple different vending machine platforms. The refrigeration deck system 100 is adapted to couple to one or more openings in the refrigerated compartment 15 of the vending machine 10. The refrigeration deck system 100 is adapted to form a portion of at least one surface of the refrigerated compartment 15 of the vending machine 10. The refrigeration deck system 100 includes an electrical connector (not illustrated) adapted to connect to connectors within the vending machine 10. The electrical connector is coupled to the various components of the refrigeration deck system 100 (e.g., the evaporator fans 430, 440, the compressor fans 325, 425, and the compressor 430, 430, 530). In some embodiments, the refrigeration deck system 100 includes a plurality of electrical connectors electrically coupled to each of the components of the refrigeration deck system 100 (e.g., the circulation fans 430, 440, 425, 425 and the compressor 330, 430). In such embodiment, a first electrical connector is electrically coupled to a first component of the refrigeration deck system 100.

[0046] Further, the refrigeration deck system 100 is dimensioned to be readily installed and removed from either a front side or a back side of the vending machine 10. For example, an operator can remove the refrigeration deck system 100 by
opening a front door of the vending machine 10, detaching an interlocking mechanism and sliding the refrigeration deck system 100 out from the vending machine 10 using the handles 140. Additionally or alternatively, the operator can remove the refrigeration deck system 100 by opening a rear panel of the vending machine 10, detaching an interlocking mechanism and sliding the refrigeration deck system 100 out from the vending machine 10. Accordingly, the refrigeration deck system 100 provides for an improved method for repair and replacement of refrigeration components for a vending machine 10.

Component selection and arrangement within the refrigeration deck system 100 result in a more compact size, which permits the refrigeration deck system 100 to be used in a range of vending machine models. Typical refrigeration systems are designed with an evaporator coil that is larger than the condensing coil, increasing pressures on the ‘high side’ of the condensing coil. Such increased pressures may cause problems and shorten the operational life of such systems.

In contrast, the refrigeration deck system 100 employs a condensing coil 320 that is larger than the evaporator coil 365. This permits the condensing coil 320 to more efficiently dissipate the heat removed from the refrigerated compartment of the vending machine 10, as well as the heat produced by the compressor 330. Because of this balance between the sizes of the condensing coil 320 and the evaporator coil 365, both coils may be made smaller in some embodiments than in typical vending machine refrigeration systems.

Similarly, because the refrigeration deck system 100 has a smaller size than typical vending machine refrigeration systems, a smaller charge of refrigerant may be used. In some embodiments, 6.5 to 7 ounces of refrigerant are used.

As such, the refrigeration deck system 100 employs a balanced condensing and evaporating system composed of appropriately sized: capillary tube, compressor, condenser coil, condenser fan motor, condenser fan blade, evaporator coil, evaporator fan motor, evaporator fan blades, shrouds, and refrigerant charge. The components are selected and optimized for optimal airflow, condenser heat of rejection, and evaporator cooling. This permits the systems to more efficiently dissipate the heat removed from the refrigerated compartment of the vending machine 10, as well as the heat produced by the compressor 330 and other motor and lighting loads. Because of this system balance, all system components may be scaled up and scaled down in other embodiments for smaller and larger capacity vending applications.

Due to the balance of the system components and the optimum component sizing and airflow, lower condensing pressures may be used. Lower condensing pressures may result in less generated waste heat of the compressor, which may provide for a longer operating lifetime as well as more efficient use of electrical power by the refrigeration deck system 100. Also as a result of the lower condenser operating pressures, the system will still function within its design parameter even if the condenser experiences 50% blockage due to lack of cleaning and servicing.

Although the present disclosure has been described with exemplary embodiments, various changes and modifications may be suggested to one skilled in the art. It is intended that the present disclosure encompass such changes and modifications as fall within the scope of the appended claims.

What is claimed is:

1. A self-contained refrigeration system, comprising:
   a housing comprising a first chamber and a second chamber, wherein the first chamber includes a first opening and a second opening and the second chamber includes a third opening and a fourth opening;
   an evaporator coil and an evaporator fan are mounted in the first chamber, the evaporator fan adapted to move air from the first opening, through the evaporator coil, and to the second opening; and
   a condensing coil, a compressor, and a compressor fan are mounted in the second chamber, the compressor fan adapted to move air from the third opening, through the condensing coil, over a surface of the compressor, and to the fourth opening.

2. The self-contained refrigeration system of claim 1, wherein the housing is adapted to:
   thermally insulate the first chamber from the second chamber and from an exterior of the housing;
   seal the first chamber, such that substantially all air in the first chamber enters and exits the first chamber through the first opening and the second opening, respectively; and
   automatically couple the first opening and the second opening to a product compartment of a vending machine when the housing is inserted into the vending machine.

3. A self-contained refrigeration system of claim 1, wherein the housing comprises a molded housing.

4. The self-contained refrigeration system of claim 3, wherein the molded housing comprises an insulating material.

5. The self-contained refrigeration system of claim 3, wherein the molded housing comprises a first portion and a molded second portion, one of the first portion and the second portion adapted to interconnect to the other of the first portion and the second portion.

6. A self-contained refrigeration system of claim 3, wherein the housing comprises structural elements adapted to increase a strength of the housing.

7. The self-contained refrigeration system of claim 1, wherein the housing comprises a plurality of handles adapted to facilitate manual insertion of the housing into the vending machine.

8. The self-contained refrigeration system of claim 1, wherein the housing comprises a detachable access panel, wherein removal of the access panel provides access to the condensing coil while the housing is inserted in the vending machine.

9. The self-contained refrigeration system of claim 1, wherein the condensing coil is larger than the evaporator coil.

10. A vending machine, comprising:
    a product compartment;
    a duct opening into the product compartment; and
    a self-contained refrigeration system,
    wherein the self-contained refrigeration system comprises:
    a housing comprising a first chamber and a second chamber, wherein the first chamber includes a first opening and a second opening and the second chamber includes a third opening and a fourth opening;
an evaporator coil and an evaporator fan mounted in the first chamber and adapted to move air from the first opening, through the evaporator coil, to the second opening; and a condensing coil, a compressor and a compressor fan mounted in the second chamber, the compressor fan adapted to move air from the third opening, through the condensing coil, over a surface of the compressor, to the fourth opening.

wherein the housing is adapted to:
- thermally insulate the first chamber from the second chamber and from an exterior of the housing;
- seal the first chamber, such that substantially all air in the first chamber enters and exits the first chamber through the first opening and the second opening, respectively; and
- automatically couple the first opening to the product storage compartment and the second opening to the duct when the housing is inserted into the vending machine.

11. The vending machine of claim 10, wherein the housing is further adapted to seal the second chamber, such that substantially all air in the second chamber enters and exits the second chamber through the third opening and the fourth opening, respectively.

12. The vending machine of claim 10, wherein the housing comprises a molded housing.

13. The vending machine of claim 12, wherein the molded housing comprises an insulating material.

14. The vending machine of claim 12, wherein the molded housing comprises a first portion and a molded second portion, one of the first portion and the second portion adapted to interconnect to the other of the first portion and the second portion.

15. The vending machine of claim 10, wherein the housing comprises a detachable access panel, wherein removal of the access panel provides access to the condensing coil while the housing is inserted in the vending machine.

16. The vending machine of claim 10, wherein the condensing coil is larger than the evaporator coil.

17. The vending machine of claim 10, wherein one of the vending machine and the housing comprises a gasket, the gasket adapted to improve one of the coupling of the first opening to the product storage compartment and the coupling of the second opening to the duct.

18. The vending machine of claim 17, wherein the vending machine further comprises an interlocking mechanism mechanically coupling the housing to the vending machine, the interlocking mechanism adapted to position the housing to apply positive pressure to the gasket.

19. A vending machine, comprising:
- a product compartment; and
- a self-contained refrigeration system adapted for insertion into the vending machine, wherein the self-contained refrigeration system includes a molded housing comprising a first chamber and a second chamber, first thermal insulation between the first chamber and the second chamber, and second thermal insulation between the first chamber and an exterior of the housing,

wherein the self-contained refrigeration system is adapted to:
- pull air from the product compartment into the first chamber through a first opening in the molded housing, cool the air pulled from the product compartment, and return the cooled air to the product compartment through a second opening in the molded housing, such that substantially all air in the first chamber enters and exits the first chamber through the first opening and the second opening, respectively; and
- pull air from outside the vending machine into the second chamber through a third opening in the molded housing, transfer heat into the air pulled from outside the vending machine, and return the heated air outside the vending machine through a fourth opening in the molded housing, and automatically couple the first opening and the second opening to the product storage compartment when the housing is inserted into the vending machine.

20. The vending machine of claim 19, wherein one of the vending machine and the housing comprises a gasket, the gasket adapted to improve the coupling of one of the first opening and the second opening to the product storage compartment.

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