Abstract: Embodiments of a modular chiller system are described. In some embodiments, a housing of the modular chiller system may generally have a Y-shaped end profile with a lower housing compartment and a tapered upper housing compartment. In some embodiment, components of the modular chiller system are in a vertical and/or rotational symmetric arrangement in the lower housing compartment, which may facilitate access to the components in the lower housing compartment from multiple sides of the modular chiller system, and may save the time and cost of manufacturing the modular chiller system. The Y-shaped end profile of the modular chiller systems may form a space between neighboring modular chiller systems and facilitate an air flow and/or access to components of the modular chiller system from the space between the neighboring modular chiller systems.
MODULAR CHILLER SYSTEM

FIELD OF TECHNOLOGY

[1] Embodiments disclosed herein relate generally to a heating, ventilating, or air conditioning (HVAC) system. More specifically, the embodiments disclosed herein relate to a modular chiller system.

BACKGROUND

[2] A HVAC system is typically used to regulate the temperature of an interior space of a building. Various HVAC systems have been developed. Depending on the size of the interior space, the HVAC systems may be configured to have different capacities, i.e. loads. One example of an HVAC system is a modular chiller system that is generally a self-contained air conditioning unit that can be installed alone or in combination with other modules. The capability of combining multiple modular chiller systems may enable a user to expand or decrease the capacity of the combined chiller system.

SUMMARY

[3] Embodiments of a modular chiller system are described. In some embodiments, a housing of the modular chiller system may generally have a 'Y' shaped end profile with a lower housing compartment (a stem section of the 'Y' shaped profile) and an upper housing compartment with diverging branches. In some embodiments, components of the modular chiller system are in a vertical arrangement in the lower housing compartment, which may facilitate access to the components in the lower housing compartment from multiple sides of the modular chiller system. When a plurality of the modular chiller systems with the 'Y' shaped end profile is installed in series, the neighboring modular chiller systems may form a space that facilitates an air flow and/or access to components of the modular chiller system between the neighboring modular chiller systems. The vertical arrangement of the components within the lower housing compartment allows the components in the lower housing compartment to be accessed from a space between the neighboring modular chiller systems.

[4] In some embodiments, the stem section of the 'Y' shaped end profile may be defined by a lower housing compartment of the housing that has a generally rectangular shape. In some embodiments, the upper housing compartment may be configured to support two coils diagonally positioned to each other.

[5] In some embodiment, a compressor (and/or other components such as receiver, separator, etc.) may be positioned above an evaporator (i.e. a heat exchanger) in a vertical arrangement in the lower housing compartment.

[6] In some embodiments, the lower housing compartment may be configured to have two portions along a longitudinal direction defined by a length of the lower housing
compartment, each of which has components such as a compressor, a receiver and/or a separator. The configuration of the components in one portion is generally rotational symmetric to the configuration of the components in the other portion. The vertical and/or longitudinal configurations may allow components of the chiller system that are configured to be used in one portion of the lower housing compartment to be replaceable with components that are configured to be used in the other portion of the lower housing compartments. Further, in some embodiments, configurations of two coils situated in the upper compartment may be also rotational symmetric. Therefore, the two coils situated in the upper compartment may be interchangeable too.

In some embodiments, the lower housing compartment may be configured to have a panel with a hole. A center of the hole may be configured to be at about half height of the lower housing compartment.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FigS. 1A to 1C illustrate a housing of a modular chiller system. FIG. 1A is an end view. FIG. 1B is a side view. FIG. 1C is a top view.

FIGS. 2A to 2C illustrate schematic views of the inside of a modular chiller system. FIG. 2A is an end view. FIG. 2B is a top view. FIG. 2C is a side view.

FIG. 3 illustrates an elevated view of an embodiment with a plurality of modular chiller systems connected together in series.

FIG. 4 illustrates a side view of two modular chiller systems positioned side by side and connected together in series.

**DETAILED DESCRIPTION**

A modular chiller system is generally a self-contained air conditioning system. The modular chiller system can be installed alone or in combination with one or more modular chiller systems. By changing the number of the modular chiller systems in combination, the total capacity (or load) of the combined system may be changed. The modular chiller system is generally installed outside of a building. When multiple modular chiller systems are installed side by side in series, the space between the neighboring modular chiller systems may be limited. The space limitation may hinder an air flow to flow through coils of the modular chiller systems, causing inefficiency in the modular chiller system. The space limitation may also restrict access to components of the modular chiller system from the space between two neighboring systems.

In the following description of the illustrated embodiments, embodiments of a modular chiller system are described. A housing of the modular chiller system may generally have a 'Y' shaped end profile such as when viewed from its longitudinal end. The stem section of the 'Y' shaped profile may be defined by a lower housing compartment that has a generally rectangular shape. The housing of the modular chiller
system may also have an upper housing compartment that is configured to support two coils diagonally positioned to each other so that the two coils form a tapered shaped toward a top of the lower housing compartment. A compressor (and/or other components such as a receiver, a separator, etc.) and an evaporator (i.e., a heat exchanger) may be positioned in the lower housing compartment, and may be configured in a vertical arrangement. When a plurality of the modular chiller systems with the 'Y' shaped end profile are installed in series, the neighboring modular chiller systems may form a space that allows an air flow and/or access to components of the modular chiller system within the space between the neighboring modular chiller systems. The vertical arrangement of the components allows the components to be accessed from multiple sides of the modular chiller system. In some embodiments, the lower housing compartment is configured to have two portions for example arranged in a longitudinal direction defined by a length of the lower housing compartment, each of which has components such as a compressor, an evaporator, a receiver and/or a separator. The configuration of the components in one portion may be generally rotational symmetric to the configuration of the components in the other portion. The vertical arrangement and/or the longitudinal configurations of the components in the lower housing compartment may allow for rotational symmetry in the chiller system, where components that are configured to be used in one portion of the lower housing compartment can be replaceable with the components that are configured to be used in the other portion of the lower housing. This vertical arrangement and/or rotational symmetry can allow for flexibility in manufacturing and assembly, as error in assembly can be reduced.

References are made to the accompanying drawings that form a part hereof, and in which is shown by way of illustration of the embodiments in which the embodiments may be practiced. It is to be understood that the terms used herein are for the purpose of describing the figures and embodiments and should not be regarding as limiting the scope of the present application. It is further to be understood that the dimensions mentioned in the description herein are exemplary.

Figs. 1A to 1C illustrate an embodiment of a housing 100 of a modular chiller system. Fig. 1A is an end view of the housing 100. The housing 100 generally has a 'Y' shaped end profile. A stem of the 'Y' shaped end profile is generally defined by a lower housing compartment 110 of the housing 100. Two branches of the 'Y' shaped end profile are generally defined by an upper housing compartment 120.

A lower housing compartment end panel 112 removably attaches to the lower housing compartment 110 to cover an internal space (e.g. as shown in Fig. 2A) of the lower housing compartment 110. It is noted that another end panel that is similar to the lower housing compartment end panel 112 may be attached to an end of the lower housing
compartment that is opposite to the end as shown in Fig. 1A.

Each side 115a or 115b of the lower housing compartment 110 has an exit hole(s)(1 17c and/or 117d as shown later in Fig. 1B) respectively. The exit holes are configured to allow a pipe 130 to extend from the internal space of the lower housing compartment through the sides 115a and 115b. The lower housing compartment 110 has a height hi. The pipe 130 has a center axis C that has a height h2. The height h2 is about half of the height hi. In one embodiment, the hi is about 1160 cm, and the h2 is about 580 cm.

The lower housing compartment 110 in the embodiment as shown in Fig. 1A has a generally rectangular shape and has a width w1. The width w1 is generally less than the height hi. In one embodiment, the width w1 is about 410 cm. The sides 115a and 115b of the lower housing compartment are also equipped with rails (or feet) 119. In the end view as shown in Fig. 1A, the rails 119 are shown to be attached to the sides 115a and 115b respectively. As it will be clear in the description below, another two rails 119 are attached to the sides 115a and 115b at a position that is close to the end that is opposite to the end as shown in Fig. 1A. The rails 119 are configured to support and stabilize the housing 100 or the modular chiller system when the modular chiller system is installed. The rails 119 have a footprint of a width w2. In one embodiment, the width w2 is about 950 cm.

The upper housing compartment 120 has coil supporting arms 121a and 121b. The coil supporting arms 121a and 121b are configured to receive and support a coil(s) of the modular chiller system. The coil supporting arms 121a and 121b generally define the two branches of the 'Y' shaped end profile. The coil supporting arms 121a and 121b are spaced apart by a width w3 at a bottom 122 of the upper housing compartment 120. The width w3 can be about the same as the width w1. The coil supporting arms 121a and 121b diverge (i.e. tilt outwardly/divergently) from the bottom 122 of the upper housing compartment 120 to a top panel 123. The top panel 123 has a top width w4 that is larger than the width w3, so that the coil supporting arms 121a and 121b form a tapered shape converging toward a top of the lower housing compartment 110 and diverging toward the top panel 123. In one embodiment, the top width w4 is about 1000 cm.

In the embodiment shown, the lower housing compartment 110 has a generally rectangular shaped longitudinal end view. This is exemplary. It is to be appreciated that in some embodiments, the lower housing compartment may not have a generally rectangular shape. For example, the lower housing compartment may have a tapered shaped toward the upper compartment. In such a configuration, the lower housing compartment may have a bottom width and a top width, wherein the bottom width is smaller than the top width. In addition, the bottom width of the lower housing com-
partment may be smaller than the top width of the upper housing compartment (such as the top width w4 as shown in Fig. IB). In general, the lower housing compartment may have a bottom width of the lower housing compartment that is smaller than a width of a top panel of the upper housing compartment (such as the top width w4 as shown in Fig. IB).

[21] The diverging coil supporting arms 121a and 121b can form angles α1 and α2 respectively with the sides 115a and 115b of the lower housing compartment 110 respectively. The angles α1 and α2 can be in a range of for example about 90 to 180 degrees, and in some embodiments preferably in a range of 135 degrees to 170 degrees. In one embodiment, the angles α1 and α2 are about 159 degrees. From the end view as shown in Fig. 1A, an upper compartment end panel 124 can be seen, which is removably attached to the upper housing compartment 120 to cover an internal space of the upper housing compartment 120. A similar upper compartment panel can be attached to an opposite side (not shown) of the upper housing compartment 120.

[22] The housing 100, including both the lower housing compartment 110 and the upper housing compartment 120, also has a height h3. In one embodiment, the height h3 is about 1987cm.

[23] Referring to Fig. IB, a side view of the housing 100 of the modular chiller system is shown. The top compartment 120 has coil supporting arms 121c and 121d that are configured to receive and support coils (such as coil 227a and/or coil 227b as shown later in Fig. 2A). When installed, the coil supporting arms 121c and 121d are configured to support two sides of the coils, while allowing airflow to flow through the coils between the coil supporting arms 121c and 121d. The coil supporting arms 121c and 121d in Fig. IB can correspond to either of the coil supporting arms 121a and 121b as shown in Fig. 1A.

[24] The upper housing compartment 120 is also equipped with one or more lifting loops 132c and 132d. In some embodiments, the upper housing compartment 120 can be equipped with four lifting loops. The lifting loops can be configured to accept cables and withstand a weight of the modular chiller system when the modular chiller system is lifted by cables tied to the lifting loops.

[25] The lower housing compartment 110 is configured to have side panels 133c and 133d, as well as doors 135c and 135d. The side panels 133c and 133d are configured to have holes 117c and 117d respectively. As illustrated in Fig. IB, pipes 130 extend from the internal space of the lower housing compartment 110 through the exit holes 117c and 117d respectively. The pipes 130 have center axes C1 and C2 respectively. The center axes C1 and C2 are generally both about the height h2, which is about half of the height h1 of the lower housing compartment 110. Because the pipes 130 exit the lower housing compartment 110 at about the middle point of the height h1 of the lower
housing compartment 110, in some embodiments, the side panels 133c and 133d can be configured to be generally identical to each other. That is, the same side panel can be used either as the panel 133c on a left side of the housing 100 or as the right panel 133d on a right side of the housing 100 in an orientation as shown in Fig. 1B.

The lower housing compartment 110 also has doors 135c and 135d to cover the internal space of the lower housing compartment 110. Similar to the side panels 133c and 133d, in some embodiments, the doors 135c and 135d can also be configured to be generally identical to each other. By using the generally identical side panels 133c and 133d and/or doors 135c and 135d, the need to make two different side panels and/or doors to fit for the left or right side of the lower housing compartment 110 may be eliminated. Consequently, this configuration may save the time and costs required for manufacturing the housing 100 and reduce errors in the manufacturing process.

From a side view as illustrated in Fig. 1B, the lower housing compartment 110 can be seen to have rails 119. In the orientation as shown in Fig. 1B, the rails 119 are attached to the lower housing compartment 110 at places that are close to the very left and the very right of the lower housing compartment 110 respectively. The rails can also be attached to the lower housing compartment 110.

As shown in Fig. 1B, the housing 100 has a length 11. In one embodiment, the length 11 is about 2150 cm.

It is to be noted that Fig. 1B only illustrates one side of the housing 100. It is to be appreciated that the side opposite to the side shown in Fig. 1B may also have a similar configuration to the configuration as shown in Fig. 1B.

A top view of the housing 100 is illustrated in Fig. 1C. The top panel 123 can be configured to have one or more openings 136 that are configured to accept a fan. In the illustrated embodiment, there are two openings 136. However, it is to be appreciated that the top panel can be configured to have any number of openings. In some embodiments, the number of the openings can be 1; in some other embodiments, the top panel can have more than two openings.

Figs. 2A to 2C illustrate an embodiment of a modular chiller system 260 with a ‘Y’ shaped housing 200. Some of the end panels are removed for clearer illustration. Fig. 2A is an end view of the modular chiller system 260. Some connection refrigerant lines including discharge lines, suction lines, etc., of the modular chiller system 260 are omitted from Fig. 2A for clearer illustration.

As illustrated, a lower housing compartment 210 is configured to accommodate a compressor 262, an evaporator 264, a receiver 266 and a separator 268. In the illustrated embodiment, the evaporator 264 is a shell and tube evaporator. It will be clear from the description below that the embodiment illustrated in Figs. 2A to 2C is configured to have two compressors (262a and 262b in Figs. 2B and 2C), two receivers (266a and
The compressor 262, receiver 266 and separator 268 as shown in Fig. 2A can correspond to either of the two compressors 262a and 262b, receivers 266a and 266b and separators 268a and 268b respectively.

The compressor 262, evaporator 264, receiver 266 and separator 268 are in a vertical arrangement. As illustrated in Fig. 2A, in the vertical arrangement, the compressor 262, the receiver 266 and the separator 268 are generally positioned above the evaporator 264. The lower housing compartment 210 is further divided into an upper portion 210T and a lower portion 210B by a partition 270. The compressor 262, the receiver 266 and the separator 268 are generally positioned in the upper portion 210T, while the evaporator 264 is generally positioned in the lower portion 210B.

The upper housing compartment 220 has two coil supporting arms 221a and 221b that are configured to support coils 227a and 227b respectively, such as condenser coils, in a tilted position as shown in Fig. 2A. The upper housing compartment 220 also has a top panel 223 that is configured to accept a fan 274. The fan 274 is configured to facilitate an airflow through the coils 227a and 227b in operation. The coils 227a and 227b are connected to distributors 276a and 276b respectively.

Fig. 2A shows one end of the modular chiller 260, and the coil 227a is connected to the distributor 276a at a position that is about the endas shown in Fig. 2A. The coil 227b and the distributor 276b are connected at a position that is about an end that is opposite to the endas shown in Fig. 2A. The configuration of the coil 227a and the distributor 276a is generally rotational symmetric to the configuration of the coil 227b and the distributor 276b. That is the configuration of the coil 227a and the distributor 276a in the upper compartment 220 is about the same as the configuration of the coil 227b and the distributor 276b in the upper housing compartment 220, if the configuration of the coil 227a and the distributor 276a is rotated about 180 degrees around a central vertical axis A. In addition, the distributors 276a and 276b access the lower housing compartment 210 from opposite sides.

Fig. 2B illustrates a top view of the lower housing compartment 210 of the modular chiller system 260. Some of the panels, coils, and connection refrigerant lines, etc. are removed for clarification. As illustrated, the modular chiller system 260 has two compressors 262a and 262b, two receivers 266a and 266b, and two separators 268a and 268b that are positioned in the lower housing compartment 210 along a longitudinal direction that is defined by a length L of the lower housing compartment 210. A middle line m can divide the lower housing compartment 210 into two portions 210L and 210R along the longitudinal direction. The portion 210L contains the compressor 262a, the receiver 266a and the separator 268a. The portion 210R contains the compressor 262b, the receiver 266b and the separator 268b. The arrangement of the
compressors 262a and b, receivers 266a and b, and separators 268a and b are generally rotational symmetric in the lower housing compartment 210. That is, the arrangement of the compressor 262a, receiver 266a and separator 268a that are in the portion 210L is similar to the arrangement of the compressor 262b, receiver 266b and separator 268b in the portion 210R, if the arrangement of the compressor 262a, receiver 266a and separator 268a rotates about 180 degrees around the center vertical axis A.

Referring to Figs. 2A and 2B, and as discussed above, the configurations of the coils 227a and 227b are also about rotational symmetric. In the illustrated embodiment, the compressor 262a, the receiver 266a and the separator 268a can form a separate refrigerant circuit from the compressor 262b, the receiver 266b and the separator 268b. The coil 227a can be coupled to the compressor 262a, receiver 266a and separator 268a contained in the portion 210L. The coil 227b can be coupled to the compressor 262b, receiver 266b and separator 266b contained in the portion 210R. Because all the components are generally rotational symmetric, refrigerant lines configured to connect components in the portion 210L (such as the compressor 262a, the receiver 266a and the separator 268a) and the coil 227a can also be replaceable with the refrigerant lines configured to connect components in the portion 210R and the coils 227b. Generally, components that are configured to be used in the portion 210L including refrigerant lines connecting different components can also be used in the portion 210R, which makes the components interchangeable in both portions 210L and 210R. This may save the time and cost required to assemble the modular chiller system 260, as well as reduce errors in assembling the components of the chiller system 260. In addition, the coils 227a and 227b may also be interchangeable.

Referring to Fig. 2C, a side view of the modular chiller system 260. Some of the panels, doors, and connection refrigerant lines are removed for clearer illustration. In the lower housing compartment 210, the compressors 262a and b, the receivers 266a and b, and the separators 268a and b are generally positioned above the evaporator 264. This vertical arrangement of components in the lower housing compartment 210 can generally facilitate access to almost all of the components from a side (or multiple sides) of the modular chiller system 260.

Referring back to Fig. 2B, as further illustrated by arrows S1 and S2 in Fig. 2B, the vertical and rotational symmetric arrangement of components in the lower housing compartment 210 allows almost all angles of the components in the lower housing compartment 210 to be accessed from one or both of the two sides to which the arrows S1 and S2 point. For example, at least a portion of the receiver 266a in the portion 210L and the separator 268b in the portion 210R can be more easily accessed from the arrow S1, while at least a portion of the separator 268a in the portion 210L and the receiver 266b in the portion 210R can be more easily accessed from the arrow S2. Different
portions of the compressors 262a and 262b can be accessed from the arrow S1 and/or the arrow S2. Generally, the components in both of the portions 210L and 210R can be relatively easily accessed from at least one of the two sides illustrated by the arrows S1 and S2.

[40] In addition, because the evaporator 264 is positioned below the components (such as compressors 262a and b, the receivers 266a and b, and the separators 268a and b) in the lower housing compartment 210, the evaporator 264 does not generally limit the access to the components in the lower housing compartment 210 from the two sides pointed to by the arrows S1 and S2.

[41] Referring back to Fig. 2C, the components in the portion 210L and in the portion 210R form two separated refrigerant circuits. Generally, the compressor 262a, the receiver 266a and the separator 268a in the portion 210L can be coupled to the coil (not shown) in the upper compartment 220 through a four way valve 275a, pipe assembly 282a and the distributor 276a. Likewise, the compressor 262b, the receiver 266b and the separator 268b in the portion 210R can be coupled to the coil (not shown) in the upper compartment 220 through a four way valve 275b, pipe assembly 282b and the distributor 276b. The pipe assembly 282a and the distributor 276a can be located close to aside that is opposite to the pipe assembly 282b and the distributor 276b.

[42] Further, the evaporator 264 can be accessed from either a first end 265a or a second end 265b. The components in the portion 210L are coupled to the evaporator 264 from the first end 265a to form a refrigerant circuit; and the components in the portion 210R are coupled to the evaporator 264 from the second end 265b to form another refrigerant circuit. The evaporator 264 is configured to be connected to water pipes 280a and 280b. One of the water pipes 280a and 280b is configured to direct water to flow into the evaporator 264; while the other is configured to direct water to flow out of the evaporator 264.

[43] It is to be noted that the components illustrated in Figs. 2A to 2C are exemplary. The modular chiller system can have various configurations. In some embodiments, the modular chiller system may only have one compressor. In some embodiments, the modular chiller system may not have the separator, the receiver and/or other components. In some embodiments, the modular chiller system may have other components, such as an expansion valve, a driver, a pressure gauge, etc.

[44] It is also to be appreciated that the rotational symmetric arrangement of components in the lower compartment is exemplary. In some embodiments, the arrangements of the components in the two portions of the lower compartment can be generally mirror imaged so that similar parts of the components in the two different longitudinal portions of the lower compartment can be accessed from one side of the modular chiller system.
Referring to Fig. 3, in operation a plurality of modular chiller systems 360 can be connected in series. The water pipes 380 of each of the modular chiller systems 360 that are configured to direct water to flow into evaporators (not shown) can be connected together in series. Likewise, the water pipes 380 that are configured to direct water to flow out of the evaporator can be connected together in series. By connecting the water pipes 380 together in series, the plurality of modular chiller systems 360 can work as one chiller unit to regulate a temperature of a space of a building.

Fig. 4 illustrates an embodiment with two 'Y' shaped modular chiller systems 460a and 460b that are positioned next to each other. A water pipe 480a of the modular chiller system 460a is connected in series to the water pipe 480b of the modular chiller system 460b by a flexible tubing 490.

As illustrated, a width of a top of the upper housing compartments 420a or 420b (e.g., w4 in Fig. 1A) is larger than a width of rails 419 of one of the modular chiller systems 460a or 460b (i.e. w2 in Fig. 1A). When the modular chiller systems 460a and 460b are positioned side by side, the top of the upper housing compartment 420a is positioned close to the top of the upper housing compartment 420b in area B to minimize gap between the two modular chiller systems 460a and 460b in area B.

As illustrated in Fig. 4, one side of the modular chiller systems 460a and one side of the modular chiller system 460b form a space S between the two modular chiller systems 460a and 460b. The space S allows an air flow to move between the two modular chiller systems 460a and 460b. In addition, the space S can be configured to be suitable for an operator to have access to the sides of the modular chiller systems 460a and 460b so that the user, for example, can perform maintenance work on the components inside the modular chiller systems 460a and 460b. In some embodiments, the space S may be configured to allow an operator to walk into the space S. The rectangular shaped lower housing compartments 410a and 410b have a relatively small footprint, which allows the user to have relatively good access between the two lower housing compartments 410a and 410b.

It is to be appreciated that in some embodiments, the lower housing compartment may not be in a generally rectangular shape. For example, the lower housing compartment may have a tapered shaped toward the upper compartment. Generally, the lower housing compartment may have a width of the lower housing compartment (such as w1 as shown in Fig. 1A) that is smaller than a width of a top panel of the upper housing compartment (such as w4 as shown in Fig. 1B). Consequently, when two modular chiller systems are positioned next to each other, the space between the neighboring modular chiller systems may be sufficient for an operator to have access to the space and/or walk into the space.

With regard to the foregoing description, it is to be understood that changes may be
made in detail, especially in matters of the construction materials employed and the shape, size and arrangement of the parts without departing from the scope of the present invention. It is intended that the specification and depicted embodiment to be considered exemplary only, with a true scope and spirit of the invention being indicated by the broad meaning of the claims.
Claims

[Claim 1] A housing of a modular chiller comprising:
a lower housing compartment configured to accommodate a
compressor and a evaporator of the modular chiller, the lower housing
compartment having a bottom width; and
an upper housing compartment having coil supporting arms configured
to accommodate a coil of the modular chiller, the upper housing com-
partment positioned on top of the lower housing compartment, the
upper housing having a top width,
wherein the housing having a Y shaped end view, the end view of the
lower housing forms a stem of the Y shaped end view, an end view of
the coil supporting arms forms two branches of the Y shaped end view,
and the bottom width of the lower housing compartment is smaller than
the top width of the upper housing.

[Claim 2] The housing of claim 1, wherein the lower housing compartment has a
generally rectangular shaped end view.

[Claim 3] The housing of claim 1, wherein the lower housing compartment has a
side panel, the side panel has a hole that is configured to accommodate
a pipe, and a center of the hole is positioned at about a middle point of
the height of the lower housing compartment.

[Claim 4] The housing of claim 1 further comprising a plurality of lifting loops
attached to the upper housing compartment.

[Claim 5] The housing of claim 1 further comprising a plurality of rails attached
to the lower housing compartment, wherein the rails are configured to
support the housing.

[Claim 6] The housing of claim 1, wherein the upper housing compartment
having a top and a bottom, the coil supporting arms of the Y shaped
end profile diverges from the bottom to the top, the two coil supporting
arms are spaced apart at the bottom of the upper housing compartment.

[Claim 7] The housing of claim 6, wherein the top side of the upper housing com-
partment has a panel that is configured to accommodate at least one
fan.

[Claim 8] The housing of claim 1, wherein the lower housing compartment is
configured to accommodate the evaporator and the compressor in a
vertical arrangement.

[Claim 9] The housing of claim 8, wherein the compressor is positioned above the
evaporator in the vertical arrangement.
[Claim 10] The housing of claim 3, wherein when the tops of the upper housing compartments of two of the housings are positioned next to each other, the lower housing compartments of the two of the housings form a space between the two housings that allows access to an internal space of the lower housing compartment from the space between the two housings.

[Claim 11] A modular chiller system comprising:

an evaporator;

a first compressor; and

a compartment configured to accommodate the first compressor and the evaporator;

wherein the first compressor and the evaporator are positioned in a vertical arrangement in the compartment.

[Claim 12] The modular chiller system of claim 12, wherein in the vertical arrangement, a bottom of the compressor is positioned above the evaporator.

[Claim 13] The modular chiller system of claim 12, wherein the vertical arrangement allows access to the compressor and the evaporator from two sides of the compartment.

[Claim 14] The modular chiller system of claim 12 further comprising a second compressor, wherein the second compressor is positioned in the compartment and in a vertical arrangement with the evaporator in the compartment.

[Claim 15] The modular chiller system of claim 12 further comprising a first and a second coil, wherein the first and second coils are positioned above the compartment.

[Claim 16] The modular chiller system of claim 16, wherein refrigerant lines connected to the first and second coils respectively access the compartment from different sides of the compartment.

[Claim 17] The modular chiller system of claim 12, wherein the compartment has a height, a water pipe for the evaporator exits the compartment at about half of the height.

[Claim 18] The modular chiller system of claim 12, wherein the compartment has a plurality of rails to support the modular chiller system.

[Claim 19] The modular chiller system of claim 12, wherein the compartment has a generally rectangular side profile that has a width, which is smaller than a height of the compartment.
INTERNATIONAL SEARCH REPORT

INTERNATIONAL APPLICATION NO.

International application No. PCT/CN2012/077088

A. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC:  F25B1/00;  F25B39/00;F25B29/00;F25B30/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNKI, WPI, EPDOC, hous+, chill+, modular, model, cell, compressor, evaporator, Y, coil

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.

X CN2449156Y (YU, Kuiming) 19 Sep. 2001 (19.09.2001) page 2, lines 4-14 of description, figure 12-20


A CN101975482A (GUANGDONG EUROKLMAT AIR CONDITIONING CO., LTD.) 16 Feb. 2011 (16.02.2011) the whole document 1-10,12-20

A CN2924423Y (JIANGSU ZHAOSHENG AIR CONDITIONING CO., LTD.) 18 July 2007 (18.07.2007) the whole document 1-10,12-20

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

'A' document defining the general state of the art which is not considered to be of particular relevance

'E' earlier application or patent but published on or after the international filing date

'L' document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

'O' document referring to an oral disclosure, use, exhibition or other means

'P' document published prior to the international filing date but later than the priority date claimed

'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

&' document member of the same patent family

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