
LOW-NOISE AIR CONDITIONER AND VIEWING SHELTER

TECHNICAL FIELD

[001] The present disclosure relates to the field of air conditioners, and particularly to a low-noise air conditioner and a viewing shelter.

BACKGROUND ART

[002] Air conditioner, as an essential household appliance for common temperature control, is widely used in daily life. It mainly consists of three key components: the condenser, the evaporator, and the compressor, and is generally categorized into split-type air conditioners and integrated air conditioners. In split-type air conditioners, the condenser and the evaporator are arranged in separate units, with an outdoor unit and an indoor unit. On the other hand, integrated air conditioners combine the condenser, the evaporator, and the compressor into a single unit.

[003] In existing integrated air conditioners, the integration of the condenser, the evaporator, and the compressor into one unit often leads to significant operational noise during the use of the air conditioners, which can negatively impact the user experience.

SUMMARY

[004] The objective of the embodiments of the present disclosure is to provide a low-noise air conditioner and a viewing shelter, wherein the air conditioner operates with low noise and the user experience is good.

[005] In a first aspect, the embodiments of the present disclosure provide a low-noise air conditioner, including a housing and a heat exchange module, wherein a partition is arranged inside the housing to divide the housing into an upper cavity and at least one lower cavity, the heat exchange module is arranged inside the upper cavity. The lower cavity includes a first channel and a second channel, wherein the first channel and the second channel are respectively configured to communicate indoor air with a chamber inside the housing.

[006] In the aforementioned implementation, a partition is applied to divide the housing into an upper cavity and at least one lower cavity. The noise-generating heat exchange module is arranged within the upper cavity, thus effectively isolating and confining the noise produced by the heat exchange module within the upper cavity. The first channel and the second channel located in the lower cavity not only serve as pathways for indoor air outlet and air return, facilitate the heat-exchanged airflow to enter the indoor space, but they also serve as noise

reduction spaces to further reduce the operational noise of the air conditioner and enhance the user experience indoors. Specifically, the housing is divided into an upper cavity and a lower cavity, and the lower cavity is further divided into a first channel and a second channel. The multi-cavity formed by the two channels can reduce the airflow inside the lower cavity, thereby achieving a thermal insulation effect. At the same time, the arrangement of the multi-cavity also facilitates the use of the cavities to isolate and buffer noise, further improving the sound insulation and noise reduction effect.

[007] The low-noise air conditioner of the present disclosure not only adopts a layered structure with an upper cavity and a lower cavity, but also further divides the lower cavity into different channels, thereby forming a multi-chamber structure. Compared to directly arranging the noise-generating heat exchange module in a noise reduction box, the low-noise air conditioner of the present disclosure effectively isolates the noise generated by the heat exchange module during operation, significantly enhancing the noise reduction effect of the air conditioner and improving the sound insulation and tranquility during operation of the air conditioner. Additionally, this maintains the operation effect of the air conditioner, reduces the size of the air conditioner, and allows for hidden mounting of the air conditioner.

[008] In one possible embodiment, the first channel and the second channel are respectively configured to communicate the indoor air with the upper cavity.

[009] In the above implementation process, when the evaporator is arranged in the upper cavity, the indoor air is drawn into the upper cavity through the first channel and the second channel for processing and then discharged.

[010] In one possible embodiment, a height dimension of the housing is 415-450mm, a height of the upper cavity is 250-300mm, and a height of the lower cavity is 100-150mm.

[011] In the above implementation process, the height of the air conditioner is small, making it suitable for hidden mounting as a crossbeam-type air conditioner.

[012] In one possible embodiment, the heat exchange module comprises a compressor, and the compressor is arranged within the upper cavity.

[013] In the above implementation process, the compressor, as a major noise-producing component of the air conditioner during the operation of the air conditioner, is arranged in the upper cavity. Additionally, by using the isolation effect of other chambers, a better noise reduction effect is achieved.

[014] In one possible embodiment, one or more compressors are provided in different chambers of the upper cavity.

[015] In the above implementation process, multiple compressors can increase the power of the air conditioner, thus ensuring the operational effect of the air conditioner. Furthermore, each compressor is arranged in separate chambers, which can improve the overall noise isolation effect for the compressors.

[016] In one possible embodiment, the compressor is arranged within the upper cavity in a middle of the air conditioner or the upper cavity in an end portion of the air conditioner.

[017] In the above implementation process, arranging the compressor in the middle of the air conditioner is beneficial for the arrangement of various air conditioner components. Arranging the compressor at the end portion of the air conditioner can reduce its impact on indoor noise.

[018] In one possible embodiment, the compressor is a horizontal compressor, wherein the compressor is arranged along the length direction of the housing.

[019] In the above implementation process, using a horizontal compressor can reduce the overall height dimension of the air conditioner, thus meeting the mounting and usage needs of the air conditioner in specific scenarios.

[020] In one possible embodiment, a vibration-damping mechanism is further arranged between the compressor and the upper cavity, the vibration-damping mechanism comprises a base mounted on the compressor and a vibration-damping spring positioned between the base and the upper cavity.

[021] In the above implementation process, the arrangement of the vibration-damping mechanism facilitates the buffering and reduction of vibration noise generated by the compressor during operation, thereby reducing the operating noise of the air conditioner and improving the noise reduction effect.

[022] In one possible embodiment, a condenser and an evaporator are further arranged inside the housing; the evaporator and the lower cavity arranged with the first channel and the second channel are of different chambers; a chamber where the evaporator is arranged is provided with an air outlet duct communicating with the first channel and a return air duct communicating with the second channel; and the first channel and the second channel are respectively configured to communicate the indoor air with the chamber where the evaporator is arranged.

[023] In the above implementation process, the condenser and the evaporator, among other air conditioner components, generate relatively low noise. They are arranged within the housing to form an integrated air conditioner. The evaporator, the first channel, and the second channel are in different chambers to facilitate the formation of an indoor air circulation channel among the evaporator, the first channel, and the second channel.

[024] In one possible embodiment, two condensers are provided and the two condensers are each provided at one end of the air conditioner.

[025] In the above implementation process, the design of multiple condensers can increase the power of the air conditioner.

[026] In one possible embodiment, the housing is provided with an outdoor unit air outlet corresponding to a position of the condenser and configured for communicating with outdoor air.

[027] In the above implementation process, the condenser can form a channel with the outdoor environment, thus promptly discharging the heat generated by the condenser.

[028] In one possible embodiment, the evaporator comprises a heat exchange plate and a heat exchange fan, an output end of the heat exchange fan is arranged in a manner of facing the air outlet duct, and the heat exchange plate is positioned above the return air duct.

[029] In the above implementation process, the output end of the heat exchange fan is oriented towards the air outlet duct, facilitating the guiding of airflow into the first channel and being discharged into the room through the air outlet on the first channel.

[030] In one possible embodiment, the heat exchange plate is arranged in an inclined manner.

[031] In the above implementation process, the inclined arrangement of the heat exchange plate facilitates the guidance and collection of condensation water on its surface during the heat exchange process of the heat exchange plate. Additionally, the inclined arrangement also helps to increase the contacting area between the air input from the return air duct and the heat exchange plate, thereby improving the heat exchange effect of the evaporator.

[032] In one possible embodiment, the first channel comprises a first diversion cavity arranged in an extended manner, the first diversion cavity is provided with an air outlet on a surface of the housing, the second channel includes a second diversion cavity arranged in an extended manner, and the second diversion cavity is provided with a return air inlet on the surface of the housing.

[033] In the above implementation process, with the aforementioned arrangement, indoor air can sequentially pass through the return air inlet, the second diversion cavity, the chamber arranged with the evaporator, and then through the first diversion cavity and the air outlet into the room, thus forming a circulation channel. This facilitates the heating or cooling of the air by the evaporator when the air passes through the chamber arranged with the evaporator. Meanwhile, the lower cavity is divided into the first diversion cavity and the second diversion cavity, which utilizes the multi-cavity characteristics to reduce air flow within the lower cavity, thereby also achieving noise reduction and heat insulation effects.

[034] In one possible embodiment, the first diversion cavity and the second diversion cavity are each arranged in a manner of extending along a length direction of the housing.

[035] In the above implementation process, the upper cavity, the first channel, and the second channel can communicate with each other to form a one-way channel. The indoor air used for heat exchange can enter the chamber arranged with the evaporator through the second channel, undergo heat exchange in the evaporator inside the chamber arranged with the evaporator, and then be output through the first channel into the room, thereby effectively preventing the problem of mixing the un-exchanged airflow with the exchanged airflow, which would otherwise affect the heat exchange efficiency of the air conditioner.

[036] In one possible embodiment, the air outlet is arranged on a side surface or a slanted side surface of the housing, and the return air inlet is arranged at a bottom of the housing.

[037] In the above implementation process, the air outlet is arranged on the side surface of the housing, thereby facilitating the output air to be blown horizontally into the room so as to allow for the convenience of the rapid distribution of cold or hot air indoors. The return air inlet is arranged at the bottom, thus allowing air to enter the second channel through the return air inlet. The arrangement of the air outlet and the return air inlet also aligns with the mounting of the integrated air conditioner, thereby preventing the air outlet or the return air inlet from being obstructed by other components after mounting.

[038] In one possible embodiment, two return air inlets are arranged at both ends of the bottom of the housing.

[039] In the above implementation process, the return air inlet can correspond to the energy storage cabinet located at the end portion of the air conditioner. By allowing the return air from inside the energy storage cabinet to enter the air conditioner, the objective of cooling the energy storage cabinet is achieved.

[040] In one possible embodiment, the upper cavity and/or the return air inlet are provided with a fan.

[041] In the above implementation process, the fan accelerates the return air rate of the air conditioner.

[042] In one possible embodiment, the heat exchange module comprises a compressor, a condenser, and/or an evaporator. The compressor, the condenser, and/or the evaporator are arranged in a same chamber or different chambers of the upper cavity.

[043] In the above implementation process, by arranging the compressor, the condenser, and/or the evaporator in the upper cavity, which is relatively far from the indoor space, not only can the

noise reduction effect be improved, but the larger space of the lower cavity, which is closer to the indoor area, facilitates the arrangement of the return air inlet and the air outlet, thus allowing a better operational effect of the air conditioner.

[044] In one possible embodiment, the upper cavity forms multiple mounting cavities along the length direction of the housing through a splitter plate, and the compressor, the condenser, and the evaporator are respectively arranged in different mounting cavities.

[045] In the above implementation process, by dividing the upper cavity into multiple different mounting cavities, the benefits include the following. First, arranging multiple cavities can block the noise generated by the compressor, the evaporator, and the condenser during operation, preventing excessive noise when all three are running simultaneously, thus improving the noise reduction effect of the air conditioner. Second, the design of multiple mounting cavities in conjunction with the first channel and second channel divides the interior of the housing into at least five cavities, and the use of the multi-cavity arrangement can further improve the noise reduction effect.

[046] In one possible embodiment, a position of the partition corresponding to the evaporator is provided with an air outlet duct communicating with the first channel and a return air duct communicating with the second channel.

[047] In the above implementation process, by arranging the air outlet duct and the return air duct at specific positions on the partition, the return air of the second channel can be directed into the mounting cavity at which the evaporator is located through the return air duct for heat exchange treatment. The treated air is then blown out through the air outlet duct and the first channel.

[048] In one possible embodiment, the heat exchange module comprises a compressor, the compressor is arranged within the upper cavity, and a position within the housing, where the partition is not arranged, is further arranged with the condenser and/or the evaporator.

[049] In the above implementation process, by arranging the compressor, which generates the main noise, in the upper cavity to reduce noise, and by arranging the condenser and/or the evaporator and other air conditioner components in the positions where the partition is not arranged, the larger space facilitates mounting.

[050] In one possible embodiment, the housing forms multiple independent cavities along the length direction of the housing through the dividing plate, at least one independent cavity is divided into the upper cavity and the lower cavity by the partition, and the condenser and the evaporator are arranged in different independent cavities where the partition is not arranged.

[051] In one possible embodiment, a position of the dividing plate corresponding to the evaporator is provided with an air outlet duct communicating with the first channel and a return air duct communicating with the second channel.

[052] In the above implementation process, by arranging the air outlet duct and the return air duct at specific positions on the dividing plate, the return air of the second channel can be directed into the independent cavity at which the evaporator is located through the return air duct for heat exchange treatment. The treated air is then blown out through the air outlet duct and the first channel.

[053] In one possible embodiment, the heat exchange module comprises a compressor, the compressor is arranged within the upper cavity, and the lower cavity is further arranged with the condenser and/or the evaporator.

[054] In the above implementation process, by arranging the compressor, which generates the main noise, in the upper cavity, and arranging the condenser and/or the evaporator and other air conditioner components in the lower cavity, not only is there a larger mounting space provided for the compressor, but a better noise reduction effect is also achieved.

[055] In one possible embodiment, the lower cavity forms multiple separated chambers along the length direction of the housing through the splitter plate, and the condenser and the evaporator are respectively arranged in different mounting cavities.

[056] In one possible embodiment, a position of the splitter plate corresponding to the evaporator is provided with an air outlet duct communicating with the first channel and a return air duct communicating with the second channel.

[057] In the above implementation process, by arranging the air outlet duct and the return air duct at specific positions on the splitter plate, the return air of the second channel can be directed into the separated chamber at which the evaporator is located through the return air duct for heat exchange treatment. The treated air is then blown out through the air outlet duct and the first channel.

[058] In one possible embodiment, an inner wall of the housing is lined with a vibration-damping soundproofing material.

[059] In the above implementation process, the arrangement of vibration-damping soundproofing materials can effectively absorb the noise generated by the heat exchange module and other air conditioner components during operation, improving the noise reduction effect of the air conditioner.

[060] In one possible embodiment, the vibration-damping soundproofing material comprises at least one of a polyurethane sound-absorbing layer, a polyester fiber vibration-damping layer, a rubber-plastic sponge soundproofing layer, a double-sided aluminum foil extruded board, or an Ovapro thermal insulation cotton.

[061] In the above implementation process, the combination of different materials mentioned above has a certain vibration-damping effect, and air conditioning components such as the heat exchange module are positioned within these materials above, which can effectively absorb the noise and minor vibrations generated during the operation of the air conditioner.

[062] In the second aspect, the embodiments of the present disclosure provide a viewing shelter, which includes a structural frame and the low-noise air conditioner provided in the first aspect. The low-noise air conditioner is mounted on the structural frame.

[063] In the above implementation process, by the arrangement of the low-noise air conditioner in the viewing shelter, the air conditioner operates with low noise and the user experience is good.

[064] In one possible embodiment, the structural frame comprises a crossbeam and a column, and the low-noise air conditioner is mounted on the crossbeam or suspended between the crossbeams.

[065] In the above implementation process, the air conditioner can achieve hidden mounting, occupying little or no space within the viewing shelter.

[066] In one possible embodiment, the crossbeam is provided with a fastener, the fastener comprises an extension that can be embedded into a slot, a surface of the housing of the air conditioner is provided with a slot and is provided with a pre-connection port that therein accommodates a vertical movement of the extension, the pre-connection port is provided with an insertion strip that can be embedded into an opening cavity, and after the extension is embedded into the pre-connection port, the insertion strip is allowed to move relative to the opening cavity and then inserted into the opening cavity, thereby enabling a snap-fit connection between the fastener and the slot.

[067] In the above implementation process, by directly arranging the slot on the surface of the air conditioner and using the insertion strip formed by the slot to replace the pin in the prior art, and by arranging a corresponding opening cavity on the extension of the fastener, when the fastener and the slot are snapped, the insertion strip is embedded into the opening cavity, and the support points of the extension for the insertion strip are distributed on the insertion strip of the air conditioner. Compared to the design where the force application points of the fastener are

focused on the pin, this can effectively improve the support strength of the fastener to the air conditioner. Additionally, when the fastener and the slot are mated, the situation in which the force is over-concentrated and can easily be localized to result in excessive pressure, leading to damage to the corresponding product components, does not occur. This effectively improves the stability and reliability of the connection of the snap-fit structure.

[068] Specifically, the slot is arranged with a pre-connection port that can accommodate the vertical movement of the extension of the fastener. The size of the pre-connection port is relatively larger than the extension, making it easier for the fastener and the slot to be pre-connected, avoiding the problem of difficult assembly due to the close size match between the slot and the fastener when assembling the snap-fit structure between the corresponding crossbeam and the air conditioner, thereby facilitating the assembly of the air conditioner. An opening cavity is arranged on the extension and forms a plug-in fit with the insertion strip on the slot. One advantage is that the arrangement of the opening cavity reduces the likelihood of rainwater entering the interior of the corresponding product through the connection gap between the insertion strip and the opening cavity in environments where rainwater is present, by using the opening cavity as a drainage channel. The second advantage is that when the fastener and slot are engaged, the corresponding extension is embedded into the slot, and the insertion strip of the slot is also embedded into the opening cavity of the extension, which improves the tightness of the connection between the fastener and the slot, making the structure relatively stable and reliable after connecting the two.

[069] In one possible embodiment, both ends of the pre-connection port are provided with elastic clamping jaws, and when the fastener is connected to the slot, the elastic clamping jaws snap onto a bottom of the fastener so as to restrict a vertical separation of the fastener from the slot.

[070] In the above implementation process, the arrangement of the elastic clamping jaw can support the bottom of the fastener when the fastener and the slot are mated, thereby restricting their separation and improving the snap-fit firmness between the crossbeam and the air conditioner. Additionally, the arrangement of the elastic clamping jaw, with its elastic bending properties, also facilitates the separation of the fastener from the slot.

[071] In one possible embodiment, a vibration-damping structure is provided between the low-noise air conditioner and the structural frame.

[072] In the above implementation process, the use of a vibration-damping structure can reduce the noise conduction of the air conditioner through the structural frame, thereby further reducing the impact of air conditioner noise indoors.

[073] In one possible embodiment, an energy storage cabinet is further included. The surface of the housing of the air conditioner is provided with an air outlet and a return air inlet, wherein the air outlet or return air inlet communicates with the ventilation port of the energy storage cabinet.

[074] In the above implementation process, the air outlet or return air inlet is connected to the ventilation opening of the energy storage cabinet, thus cooling the interior of the energy storage cabinet through the air conditioning outlet or return air.

[075] In one possible embodiment, the top of the energy storage cabinet is provided with a first ventilation port, and the bottom of the energy storage cabinet is provided with a second ventilation port. The first ventilation port is correspondingly in communication with the return air inlet to form a circulating airflow path between the air conditioner and the energy storage cabinet, following the path of the air outlet, the second ventilation port, the first ventilation port, and the return air inlet.

[076] In the above implementation process, a circulating airflow path is formed between the air conditioner and the energy storage cabinet, allowing the air outlet of the air conditioner to normally discharge air to regulate the temperature of the space within the viewing shelter, and simultaneously cooling the interior of the energy storage cabinet during air conditioning return. This ensures the proper operation of various electrical components within the energy storage cabinet.

BRIEF DESCRIPTION OF DRAWINGS

[077] In order to more clearly illustrate the technical solutions of the embodiments of the present disclosure, the following will briefly introduce the drawings used in the embodiments of the present disclosure. It should be understood that the following drawings only show some embodiments of the present disclosure, and therefore it should not be regarded as a limitation on the scope. Those ordinary skilled in the art can also obtain other related drawings based on these drawings without inventive effort.

[078] FIG. 1 is a schematic structural diagram of a low-noise air conditioner provided by a first embodiment of the present disclosure;

[079] FIG. 2 is a top view of FIG. 1;

[080] FIG. 3 is a schematic structural diagram of a housing portion in FIG. 1 (with an upper cavity uncovered with a cover plate);

[081] FIG. 4 is another schematic structural diagram of a housing portion in FIG. 1 (with a first mounting region uncovered with a cover plate);

[082] FIG. 5 is a schematic structural diagram from another perspective of FIG. 4;

[083] FIG. 6 is a side view of a first mounting cavity portion in FIG. 1;

[084] FIG. 7 is a side view of a second mounting cavity portion in FIG. 1;

[085] FIG. 8 is a schematic structural diagram of a vibration-damping soundproofing material laid on an inner wall of a housing;

[086] FIG. 9 is a schematic structural diagram of a silencer arranged in a housing;

[087] FIG. 10 is a schematic structural diagram of a low-noise air conditioner provided by a second embodiment of the present disclosure;

[088] FIG. 11 is a side view of a first mounting cavity portion in FIG. 10;

[089] FIG. 12 is a schematic structural diagram of a low-noise air conditioner provided by a third embodiment of the present disclosure;

[090] FIG. 13 is a top view of FIG. 12;

[091] FIG. 14 is a schematic structural diagram of a low-noise air conditioner provided by a fourth embodiment of the present disclosure;

[092] FIG. 15 is a top view of FIG. 14;

[093] FIG. 16 is a schematic structural diagram of a low-noise air conditioner provided by a fifth embodiment of the present disclosure;

[094] FIG. 17 is a schematic structural diagram of a low-noise air conditioner provided by a sixth embodiment of the present disclosure;

[095] FIG. 18 is a schematic structural diagram of a low-noise air conditioner provided by a seventh embodiment of the present disclosure;

[096] FIG. 19 is a schematic structural diagram of a low-noise air conditioner provided by an eighth embodiment of the present disclosure;

[097] FIG. 20 is a schematic structural diagram of a viewing shelter provided by a ninth embodiment of the present disclosure; and

[098] FIG. 21 is a schematic diagram of a circulating airflow path within a viewing shelter in FIG. 20.

[099] In the figures: 100- housing; 110- upper cavity; 111- first mounting cavity; 112- second mounting cavity; 113- third mounting cavity; 1131- outdoor unit air outlet; 1132- outdoor unit

return air inlet; 114- fourth mounting cavity; 120- lower cavity; 121- first channel; 1211- air outlet; 122- second channel; 1221- return air inlet; 130- splitter plate; 140- vertical plate; 151- independent cavity; 152- dividing plate; 161- first separated chamber; 162- second separated chamber; 163- third separated chamber; 200- partition; 210- air outlet duct; 220- return air duct; 310- evaporator; 311- heat exchange fan; 312- heat exchange plate; 320- compressor; 330- condenser; 400- base; 410- vibration-damping spring; 420- vibration-damping soundproofing material; 430- silencer; 510- crossbeam; 520- column; 600- louvered roof; 700- energy storage cabinet.

DETAILED DESCRIPTION OF EMBODIMENTS

[0100] The technical solutions in the embodiments of the present disclosure will be described below with reference to the drawings in the embodiments of the present disclosure.

[0101] In order to make the objective, technical solutions, and advantages of the embodiments of the present disclosure clearer, the following description will provide a clear and comprehensive explanation of the technical solutions in the embodiments of the present disclosure with reference to the drawings of the present disclosure. Clearly, the described embodiments are part of the embodiments of the present disclosure and not the entire embodiments. The components of embodiments of the present disclosure which are generally described and illustrated in the drawings herein can be arranged and designed in a variety of different configurations.

[0102] Accordingly, the following detailed description of the embodiments of the present disclosure provided in the drawings is not intended to limit the scope of the present disclosure for which protection is claimed, but merely represents selected embodiments of the present disclosure. Based on the embodiments in the present disclosure, all other embodiments obtained by those of ordinary skill in the art without making inventive efforts are within the scope of protection of the present disclosure.

[0103] It should be noted that similar numerals and letters denote similar terms in the following drawings so that once an item is defined in one drawing, it does not need to be further discussed in subsequent drawings.

[0104] In the description of the present disclosure, the term “and/or” is used as a way to describe the relationship between associated objects, indicating that there can be three possible relationships. For example, “A and/or B” can represent: the presence of A, the presence of both A and B, or the presence of B. Additionally, the character “/” in the present disclosure generally represents an “or” relationship between the preceding and following associated objects.

[0105] In the present disclosure, the term "multiple" refers to two or more (including two). Similarly, "multiple groups" refers to two or more groups (including two groups), and "multiple pieces" refers to two or more pieces (including two pieces).

[0106] In the description of the present disclosure, it should be noted that the orientation or positional relationship indicated by the term "center", "up", "down", "left", "right", "vertical", "horizontal", "inside", "outside", etc. is based on the orientation or positional relationship shown in the drawings or the orientation or positional relationship in which the product of the present disclosure is customarily placed when used. It is intended only to facilitate the description of the present disclosure and to simplify the description, and not to indicate or imply that the devices or elements referred to must have a particular orientation, be constructed and operated in a particular orientation. Accordingly, it is not to be construed as a limitation of the present disclosure. In addition, the terms "first", "second", and "third" are only used to distinguish the descriptive and are not to be construed as indicating or implying relative importance.

[0107] In addition, the terms "horizontal", "vertical" and "overhang" do not mean that elements are required to be absolutely horizontal or overhanging, but can be slightly inclined. For example, "horizontal" only means that its direction is more horizontal than "vertical", and it does not mean that the structure must be completely horizontal, but can be slightly inclined.

[0108] In the description of the present disclosure, it is further important to note that unless otherwise clearly stipulated and limited, the terms "provide", "mount", "interconnect", and "connect" should be understood in a broad sense, for example, it can be a fixed connection, a detachable connection, or an integral connection; it can be a mechanical connection or an electrical connection; and it can be a direct connection, an indirect connection through an intermediary, or an internal communication between two components. Those of ordinary skill in the art can understand the meanings of the above terms in the present disclosure according to specific situations.

[0109] First embodiment

[0110] Referring to FIG. 1 to FIG. 7, the present disclosure provides a low-noise air conditioner, which includes a housing 100 and a heat exchange module. A partition 200 is arranged inside the housing 100 to divide the housing 100 into an upper cavity 110 and at least one lower cavity 120. The heat exchange module is arranged inside the upper cavity 110, and the lower cavity 120 includes a first channel 121 and a second channel 122, wherein the first channel 121 and the second channel 122 are respectively configured to communicate indoor air with a certain chamber inside the housing 100.

[0111] In the embodiment of the present disclosure, the upper cavity 110 and the lower cavity 120 refer to a configuration where each space is arranged in layers along the same direction. Viewed along the same direction (the height direction of the air conditioner), the upper cavity 110 is located above the lower cavity 120, and the lower cavity 120 is located below the upper cavity 110. The upper cavity 110 and the lower cavity 120 refer to mutually independent chambers inside the housing 100. They can be completely sealed chambers (where air cannot circulate) or non-sealed chambers with openings (where air can circulate). Additionally, the space inside the housing 100 can be entirely divided into the upper cavity 110 and the lower cavity 120, or the space can be partially divided into the upper cavity 110 and the lower cavity 120, without specific limitations.

[0112] The heat exchange module refers to an air conditioning component arranged inside the upper cavity 110. It can be a single air conditioning component or multiple air conditioning components. Besides the heat exchange module arranged in the upper cavity 110, other air conditioning components can also be arranged in other positions inside the housing 100.

[0113] The first channel 121 and the second channel 122 are arranged inside the lower cavity 120 and are respectively configured for air supply and return of indoor air, that is, to discharge the air processed by the air conditioner into the room and to draw the indoor air into the air conditioner.

[0114] In the embodiment of the present disclosure, a hollow cavity accommodating the heat exchange module and other air conditioning components is arranged inside the housing 100. To reduce the noise generated by the heat exchange module during operation, so as to achieve a low-noise effect when the air conditioner is in use, a partition 200 is arranged inside the housing 100. The partition 200 divides the hollow cavity of the housing 100 into the upper cavity 110 and the lower cavity 120. When the heat exchange module operates, due to the arrangement of the partition 200, the heat exchange module is arranged inside the upper cavity 110, and the lower cavity 120 communicates with the indoor space, thereby effectively isolating the noise generated by the operation of the heat exchange module and improving the noise reduction effect of the product, so that the noise during the operation of the air conditioner is isolated from the indoor space. The first channel 121 and the second channel 122 are formed inside the lower cavity 120. The multi-cavity formed by the two channels can reduce the airflow inside the lower cavity 120, thereby achieving a thermal insulation effect. At the same time, the arrangement of the multi-cavity formed by the upper cavity 110, the first channel 121, and the second channel 122 also

facilitates the use of the cavities to isolate and buffer noise, further improving the sound insulation and noise reduction effect.

[0115] In some embodiments of the present disclosure, the housing 100 can be a rectangular structure or a strip-shaped structure. Unless specifically stated, the description of the air conditioner (housing 100) and its internal air conditioning components is based on a state in which the air conditioner (housing 100) is horizontally arranged along the length direction. However, the state does not limit the mounting state of the air conditioner. For example, the air conditioner can be mounted horizontally along the length direction, or it can be mounted vertically or at an inclined angle along the length direction.

[0116] In some embodiments of the present disclosure, the height dimension of the housing 100 can be 415-450mm, the height of the upper cavity 110 can be 250-300mm, and the height of the lower cavity 120 can be 100-150mm.

[0117] The height of the housing 100 refers to the height when the housing 100 is in a horizontally arranged state along the length direction. For the housing 100 with a rectangular structure, the height of the housing 100 corresponds to the length or width of its rectangular shape. Exemplarily, the partition 200 inside the housing 100 is arranged horizontally, thereby separating the upper cavity 110 and the lower cavity 120 within the housing 100. The upper cavity 110 and the lower cavity 120 are arranged in layers from top to bottom along the height direction of the housing 100. The space distance of the upper cavity 110 along the height direction of the housing 100 is the height of the upper cavity 110, and the space distance of the lower cavity 120 along the height direction of the housing 100 is the height of the lower cavity 120.

[0118] For the air conditioner structure, the air conditioning components mainly include the compressor 320, the condenser 330, and the evaporator 310. The compressor 320 is the "heart" of the air conditioning unit, playing a qualitative role in the performance of the unit. It is responsible for compressing the refrigerant into high-temperature and high-pressure gas, driving the refrigerant to circulate within the air conditioning system. The role of the condenser 330 is to cool and condense the high-temperature and high-pressure gaseous refrigerant discharged by the compressor 320 into liquid refrigerant. In this process, the refrigerant releases a large amount of heat, which is usually discharged outdoors. The role of the evaporator 310 is to evaporate the liquid refrigerant into gas, absorbing heat from the indoor air, and thereby lowering the indoor temperature. The refrigerant that has absorbed heat will return to the compressor 320 to complete the entire cooling cycle.

[0119] The air conditioning components can also include other components such as a liquid storage tank and an expansion valve, which are not elaborated on herein, and only the main components are described.

[0120] Based on the fact that the compressor 320 is the main noise-generating air conditioning component during air conditioning operation, in some embodiments of the present disclosure, the heat exchange module includes the compressor 320, wherein the compressor 320 is arranged inside the upper cavity 110, with the design of the lower cavity 120 and the first channel 121 and the second channel 122 therein, to isolate the noise generated by the compressor 320 within the upper cavity 110. For other air conditioning components, it is required that they be arranged inside the housing 100, without limitation to specific locations. Specifically, the condenser 330, the evaporator 310, and other air conditioning components are also arranged inside the housing 100.

[0121] To ensure that the evaporator 310 can process the indoor air, the chamber where the evaporator 310 is located needs to communicate with the first channel 121 and the second channel 122. The first channel 121 and the second channel 122 are respectively configured to communicate the indoor air with the chamber where the evaporator 310 is arranged. In some embodiments of the present disclosure, the evaporator 310 and the lower cavity 120 with the first channel 121 and the second channel 122 are of different chambers. The chamber where the evaporator 310 is arranged is provided with an air outlet duct 210 communicating with the first channel 121 and a return air duct 220 communicating with the second channel 122. The first channel 121 includes a first diversion cavity arranged in an extended manner, and the first diversion cavity is provided with an air outlet 1211 on the surface of the housing 100. The second channel 122 includes a second diversion cavity arranged in an extended manner, and the second diversion cavity is provided with a return air inlet 1221 on the surface of the housing 100. Optionally, the first channel 121 (first diversion cavity) and the second channel 122 (second diversion cavity) are each arranged in a manner of extending along the length direction of the housing 100.

[0122] To ensure that the condenser 330 can use the outdoor air, in some embodiments of the present disclosure, referring to FIG. 2, the housing 100 is provided with an outdoor unit air outlet 1131 corresponding to the position of the condenser 330 and configured for communicating with the outdoor air, so that the chamber where the condenser 330 is arranged can discharge heat to the outside. A fan is arranged at the position of the outdoor unit air outlet 1131 to actively discharge heat in time.

[0123] Based on the above embodiments, to facilitate maintenance and mounting of internal air conditioning components such as the evaporator 310, condenser 330, and compressor 320, in the embodiment, the upper end of the housing 100 is provided with an open opening, wherein the open opening is then sealed and closed with a cover plate, thus making it convenient to open the cover plate for the mounting and maintenance of the corresponding heat exchange module.

[0124] In some embodiments of the present disclosure, referring to FIG. 1 and FIG. 2, the heat exchange module includes the compressor 320, the condenser 330, and/or the evaporator 310. The compressor 320, the condenser 330, and/or the evaporator 310 are arranged in the same chamber or different chambers of the upper cavity 110. Exemplarily, the heat exchange module includes the compressor 320 and the condenser 330, both arranged inside the upper cavity 110, with other air conditioning components arranged at any position inside the housing 100; or, the heat exchange module includes the compressor 320 and the evaporator 310, both arranged inside the upper cavity 110, with other air conditioning components arranged at any position inside the housing 100; or, the heat exchange module includes the compressor 320, the condenser 330, and the evaporator 310, with all arranged inside the upper cavity 110.

[0125] In some embodiments of the present disclosure, one compressor 320 can be provided, which is arranged inside the upper cavity 110. In other embodiments of the present disclosure, one, two, or more compressors 320 can be arranged in different chambers of the upper cavity 110. A single compressor 320 can be arranged inside the upper cavity 110 in the middle of the air conditioner (for example, between the condenser 330 and the evaporator 310), or arranged inside the upper cavity 110 at the end portion of the air conditioner, without special restrictions in the present disclosure.

[0126] In some embodiments of the present disclosure, the compressor 320 is a horizontal compressor 320, wherein the compressor 320 is arranged along the length direction of the housing 100. For the case where the housing 100 is a rectangular component, the horizontal compressor 320 is usually arranged inside the upper cavity 110 along the length direction of the housing 100. The use of a horizontal compressor 320, compared to a vertical compressor 320, can reduce the height dimension of the air conditioner.

[0127] In some embodiments of the present disclosure, one condenser 330 can be provided. In other embodiments of the present disclosure, two condensers 330 can also be provided, with no specific restrictions on the specific arrangement of the condensers 330.

[0128] As an embodiment, referring to FIG. 1 to FIG. 2 and FIG. 5 to FIG. 7, the heat exchange module is mainly composed of the compressor 320, the condenser 330, and the evaporator 310.

The upper cavity 110 forms multiple mounting cavities along the length direction of the housing 100 through a vertically arranged splitter plate 130. The compressor 320, the condenser 330, and the evaporator 310 are respectively arranged in different mounting cavities. The mounting cavity where the evaporator 310 is arranged is configured for communication with the indoor space through the first channel 121 and the second channel 122. Specifically, the partition 200 is provided with an air outlet duct 210 communicating with the first channel 121 and a return air duct 220 communicating with the second channel 122 at the position corresponding to the evaporator 310. The mounting cavity where the condenser 330 is arranged is configured for communication with the outdoor space. The compressor 320 can be arranged in the middle mounting cavity or the end mounting cavity. One, two, or more compressors 320 can be provided, and they are arranged in different mounting cavities.

[0129] Based on the above embodiment, to further improve the quietness during air conditioner in use, the partition 200 divides the housing 100 into an upper cavity 110 and a lower cavity 120. The upper cavity 110 is sequentially divided into a first mounting cavity 111, a second mounting cavity 112, and a third mounting cavity 113 along its length direction by a splitter plate 130. One compressor 320, one condenser 330, and one evaporator 310 are provided, with the evaporator 310 arranged in the first mounting cavity 111, the compressor 320 arranged in the middle second mounting cavity 112, and the condenser 330 arranged in the third mounting cavity 113. The return air duct 220 and the air outlet duct 210 corresponding to the evaporator 310 are arranged in the region of the partition 200 which is located in the first mounting cavity 111. Specifically, the partition 200 at the bottom of the first mounting cavity 111 is provided with a return air duct 220 and an air outlet duct 210, wherein the air outlet duct 210 directly communicates with the first channel 121 below it, and the return air duct 220 directly communicates with the second channel 122 below it. This arrangement includes the following benefits. First, arranging multiple cavities can block the noise generated by the compressor 320, the evaporator 310, and the condenser 330 during operation, preventing excessive noise when all three are running simultaneously, thus improving the noise reduction effect of the air conditioner. Second, the design of multiple mounting cavities in conjunction with the first channel 121 and second channel 122 divides the interior of the housing 100 into five cavities, and the use of the multi-cavity arrangement can further improve the noise reduction effect.

[0130] Based on the above insight, the upper cavity 110 can be divided into three mounting cavities corresponding to the arrangement of the compressor 320, the evaporator 310, and the condenser 330 by the splitter plate 130. The splitter plate 130 can isolate the noise generated by

the adjacent mounting cavities during the operation of the heat exchange module, thereby enhancing the noise reduction effect of the air conditioner. It is conceivable that the upper cavity 110 can also be divided into four, five, or more cavities, as long as it does not hinder the arrangement of the air conditioner components serving as the heat exchange module. The mounting cavities of the upper cavity 110 can also be arranged in a honeycomb pattern, and the number of mounting cavities is not limited to the three mentioned above.

[0131] The first channel 121 and the second channel 122 are formed inside the lower cavity 120. One benefit is that the multi-cavity formed by the two channels can reduce the airflow within the lower cavity 120, thereby achieving an insulating effect. Simultaneously, the arrangement of the multi-cavity formed by the upper cavity 110, the first channel 121, and the second channel 122 also facilitates the isolation and buffering of noise through the air cavity, further improving sound insulation and noise reduction. Another benefit is that the upper cavity 110 (first mounting cavity 111) arranged with the evaporator 310, the first channel 121, and the second channel 122 are in communication with each other, thus forming a one-way channel. The indoor air used for heat exchange can enter the first mounting cavity 111 through the second channel 122, undergo heat exchange in the evaporator 310 inside the first mounting cavity 111, and then be output through the first channel 121 into the room, thereby effectively preventing the problem of mixing the un-exchanged airflow with the exchanged airflow, which would otherwise affect the heat exchange efficiency of the air conditioner.

[0132] Referring to FIG. 3 to FIG. 5, in the embodiment, the first channel 121 includes a first diversion cavity arranged along the length direction of the air conditioner. The second channel 122 includes a second diversion cavity arranged adjacent to the first diversion cavity, and the two are separated by a vertical plate 140. The first diversion cavity is provided with an air outlet 1211 on the side surface or the slanted side surface of the housing 100, and the upper end of the first diversion cavity is provided with an air outlet duct 210 on the partition 200. The bottom of the second diversion cavity is provided with a return air inlet 1221 on the housing 100. When the air conditioner is operating, the indoor airflow enters the second diversion cavity through the return air inlet 1221, and then enters the upper cavity 110 through the return air duct 220. After the evaporator 310 exchanges heat with the airflow, the airflow is input into the first diversion cavity through the air outlet duct 210 and discharged indoors through the air outlet 1211, thus completing the air heat exchange and temperature control.

[0133] Based on the above insight, more first channels 121 (first diversion cavities) and second channels 122 (second diversion cavities) inside the lower cavity 120 can also be arranged

correspondingly. It is not limited to the aforementioned arrangement, and more channels can be arranged to enhance the effects of heat insulation, sound absorption, and noise reduction by forming multiple air cavities in the housing 100.

[0134] Referring to FIG. 3, FIG. 5, and FIG. 7, in the embodiment, the air outlet 1211 is arranged on the side surface of the housing 100, thereby facilitating the output air to be blown horizontally into the room so as to allow for the convenience of the rapid distribution of cold or hot air indoors. The return air inlet 1221 is arranged at the bottom, thus allowing air to enter the second diversion cavity through the return air inlet 1221. The arrangement of the air outlet 1211 and the return air inlet 1221 also aligns with the mounting of the integrated air conditioner, thereby preventing the air outlet 1211 or the return air inlet 1221 from being obstructed by other components after mounting.

[0135] Based on the above insight, as long as the normal operation of the components is not affected and the corresponding air outlet 1211 and return air inlet 1221 allow normal airflow, the air outlet 1211 and the return air inlet 1221 can also be arranged in other parts of the housing 100. In some embodiments of the present disclosure, two return air inlets 1221 configured for corresponding to the energy storage cabinet 700 are arranged at both ends of the bottom of the housing 100. Depending on the different viewing shelters, the energy storage cabinet 700 can be arranged at either end (left or right) of the air conditioner. Therefore, the return air inlets 1221 are arranged at both ends of the bottom along the length direction of the air conditioner, and are in conjunction with the sealing components configured to open or close the return air inlets 1221, thereby allowing customers to select the return air inlet 1221 and the method of use.

[0136] In some embodiments of the present disclosure, a vibration-damping mechanism is also arranged between the compressor 320 and the upper cavity 110. The vibration-damping mechanism includes a base 400 mounted on the compressor 320 and a vibration-damping spring 410 positioned between the base 400 and the upper cavity 110. Based on the above embodiment and referring to FIG. 7, to further reduce the noise generated during air conditioner operation, in the embodiment, a vibration-damping mechanism is also arranged between the compressor 320 and the bottom of the second mounting cavity 112. Specifically, the vibration-damping mechanism includes a base 400 supporting the compressor 320, and the base 400 is connected to the bottom of the second mounting cavity 112 through a vibration-damping spring 410. The vibrations generated by the compressor 320 during operation are cushioned and neutralized by the vibration-damping spring 410, thereby reducing the vibration noise generated by the compressor 320 during operation.

[0137] Based on the above insight, the vibration-damping mechanism can use the aforementioned vibration-damping spring 410 combined with the base 400 to dampen vibrations for the compressor 320. The vibration-damping mechanism can also be a vibration-damping airbag or other components or structures that absorb the vibrations generated by the compressor 320 during operation, and this is not further elaborated here.

[0138] In some embodiments of the present disclosure, referring to FIG. 8, the inner walls of the housing 100 (upper cavity 110 and/or lower cavity 120) are lined with vibration-damping soundproofing material 420. The vibration-damping soundproofing material 420 includes at least one of a polyurethane sound-absorbing layer, a polyester fiber vibration-damping layer, a rubber-plastic sponge soundproofing layer, a double-sided aluminum foil extruded board, or an Ovapro thermal insulation cotton. Exemplarily, the vibration-damping soundproofing material 420 includes a polyurethane sound-absorbing layer, a polyester fiber vibration-damping layer, and a rubber-plastic sponge soundproofing layer stacked in sequence.

[0139] Based on the above embodiment, to further improve the quietness effect of the air conditioner, the inner walls of the first mounting cavity 111, the second mounting cavity 112, and the third mounting cavity 113 are lined with vibration-damping soundproofing material 420. The vibration-damping soundproofing material 420 absorbs the noise generated during the operation of the compressor 320, the evaporator 310, and the condenser 330. Of course, the vibration-damping soundproofing material 420 can also be independently arranged in the first mounting cavity 111, the second mounting cavity 112, or the third mounting cavity 113. The following is an example where the vibration-damping soundproofing material 420 is arranged in the first mounting cavity 111.

[0140] The vibration-damping soundproofing material 420 includes a polyurethane sound-absorbing layer, a polyester fiber vibration-damping layer, and a rubber-plastic sponge soundproofing layer arranged in sequence, with the rubber-plastic sponge soundproofing layer mounted on the inner wall of the first mounting cavity 111 and the polyurethane sound-absorbing layer arranged in a manner of facing the center of the upper cavity 110 to directly absorb the heat generated during the operation of the evaporator 310.

[0141] In some embodiments of the present disclosure, the evaporator 310 includes a heat exchange plate 312 and a heat exchange fan 311. The output end of the heat exchange fan 311 is arranged in a manner of facing the air outlet duct 210, and the heat exchange plate 312 is positioned above the return air duct 220. The heat exchange plate 312 is arranged in an inclined manner. Based on the above embodiments and referring to FIG. 2 and FIG. 6, in the embodiment,

the evaporator 310 includes a heat exchange plate 312 and a heat exchange fan 311. The output end of the heat exchange fan 311 is arranged in a manner of facing the air outlet duct 210. The heat exchange plate 312 is arranged in an inclined manner at the upper end of the return air duct 220. The output end of the heat exchange fan 311 is arranged in a manner of facing the air outlet duct 210, which facilitates the guidance of airflow into the first diversion cavity and discharges it indoors through the air outlet 1211 on the first diversion cavity. The inclined arrangement of the heat exchange plate 312 facilitates the collection of condensation on the surface of the heat exchange plate 312 during the heat exchange process, and the inclined arrangement also helps to increase the contacting area between the air input from the return air duct 220 and the heat exchange plate 312, thereby improving the heat exchange effect of the evaporator 310.

[0142] In some embodiments of the present disclosure, the upper cavity 110 and/or the return air inlet 1221 is provided with a fan. In the embodiment, multiple fans are mounted in the upper cavity 110 and the return air inlet 1221.

[0143] Referring to FIG. 9, in some embodiments of the present disclosure, silencers 430 are arranged at the air outlets of the housing 100 to reduce airflow noise caused by the return and outlet air of the air conditioner. Exemplarily, the silencers 430 are arranged at the positions corresponding to the air outlet 1211 and the return air inlet 1221 on the inner wall of the housing 100 (within the lower cavity 120), and the silencers 430 are arranged at the positions corresponding to the outdoor unit air outlet 1131 inside the housing 100 (within the third mounting cavity 113 where the condenser 330 is arranged in the upper cavity 110).

[0144] Second embodiment

[0145] Referring to FIG. 10 and FIG. 11, the embodiment provides a low-noise air conditioner, which differs from the first embodiment in that: multiple lower cavities 120 can be arranged in the height direction, with the multiple lower cavities 120 arranged in a stacked manner in the height direction. The multi-layers of the lower cavities 120 provide multiple insulations of the noises generated by the operation of the heat exchange module in the upper cavity 110, thereby enhancing the quietness of the air conditioner during use. Specifically, referring to FIG. 6, in the embodiment, two lower cavities 120 are arranged as an example, with two partitions 200 provided. The relative positions of the two partitions 200 are respectively provided with the return air duct 220 and the air outlet duct 210. The housing 100 corresponding to the lowest lower cavity 120 is provided with a return air inlet 1221 and an air outlet 1211, to ensure that the air processed by the evaporator 310 in the first mounting cavity 111 can be discharged indoors through the air outlet duct 210, the first channel 121, and the air outlet 1211, and the indoor air

enters the first mounting cavity 111 where the evaporator 310 is arranged through the return air inlet 1221, the second channel 122, and the return air duct 220.

[0146] Based on the above insight, the air outlet 1211 can be arranged on the housing 100 corresponding to each lower cavity 120, and the number of air outlets 1211 can vary more flexibly to allow the air in the upper cavity 110 to be quickly discharged indoors. Correspondingly, the number of return air inlets 1221 arranged on the surface of the housing 100 can also be increased without affecting the normal air intake of the air conditioner.

[0147] Third embodiment

[0148] Referring to FIG. 12 and FIG. 13, the embodiment provides a low-noise air conditioner, which differs from the first embodiment in that: the compressor 320 is located within the upper cavity 110 at the end of the air conditioner. Specifically, the partition 200 divides the housing 100 into an upper cavity 110 and a lower cavity 120. The upper cavity 110 is sequentially divided into a first mounting cavity 111, a second mounting cavity 112, and a third mounting cavity 113 along its length direction by a splitter plate 130. The evaporator 310 is arranged in the first mounting cavity 111, the condenser 330 is arranged in the middle second mounting cavity 112, and the compressor 320 is arranged in the third mounting cavity 113. The return air duct 220 and the air outlet duct 210 corresponding to the evaporator 310 are arranged in the region of the partition 200 corresponding to the first mounting cavity 111.

[0149] Fourth embodiment

[0150] Referring to FIG. 14 and FIG. 15, the embodiment provides a low-noise air conditioner, which differs from the first embodiment in that: two compressors 320 are provided, and they are respectively located within the upper cavities 110 at both ends of the air conditioner. Specifically, the partition 200 divides the housing 100 into an upper cavity 110 and a lower cavity 120. The upper cavity 110 is sequentially divided into a first mounting cavity 111, a second mounting cavity 112, a third mounting cavity 113, and a fourth mounting cavity 114 along its length direction by a splitter plate 130. One compressor 320 is arranged in the first mounting cavity 111, the evaporator 310 is arranged in the second mounting cavity 112, the condenser 330 is arranged in the third mounting cavity 113, and the other compressor 320 is arranged in the fourth mounting cavity 114. The return air duct 220 and the air outlet duct 210 corresponding to the evaporator 310 are arranged in the region of the partition 200 corresponding to the second mounting cavity 112.

[0151] Fifth embodiment

[0152] Referring to FIG. 16, the embodiment provides a low-noise air conditioner, which differs from the first embodiment in that: the heat exchange module includes the compressor 320, wherein the compressor 320 is arranged within the upper cavity 110, and the position within the housing 100, where the partition 200 is not arranged, is also arranged with the condenser 330 and/or the evaporator 310. Exemplarily, the heat exchange module includes the compressor 320 and is arranged within the upper cavity 110, and the position within the housing 100, where the partition 200 is not arranged, is also arranged with the condenser 330 or the evaporator 310, or both the condenser 330 and the evaporator 310.

[0153] As an embodiment, the heat exchange module is mainly the compressor 320, and the housing 100 forms multiple independent cavities 151 along the length direction of the housing 100 through a dividing plate 152, wherein at least one independent cavity 151 is divided into an upper cavity 110 and a lower cavity 120 by a partition 200. The condenser 330 and the evaporator 310 are arranged within different independent cavities 151 where the partition 200 is not arranged. The independent cavity 151 where the evaporator 310 is arranged is configured to communicate with the interior through the first channel 121 and the second channel 122, and the independent cavity 151 where the condenser 330 is arranged is configured to communicate with the exterior. The condenser 330 and/or the evaporator 310 can be arranged within the independent cavity 151 at both ends or the independent cavity 151 in the middle. The dividing plate 152 corresponding to the evaporator 310 is provided with an air outlet duct 210 communicating with the first channel 121 and a return air duct 220 communicating with the second channel 122.

[0154] In the embodiment, the housing 100 forms three independent cavities 151 along the length direction of the housing 100 through the dividing plate 152. The middle independent cavity 151 is divided into an upper cavity 110 and a lower cavity 120 that are layered on top and bottom by a partition 200. One compressor 320, one condenser 330, and one evaporator 310 are arranged. The evaporator 310 is arranged within the independent cavity 151 at the right end as shown in the figure, the condenser 330 is arranged within the independent cavity 151 at the left end as shown in the figure, the compressor 320 is arranged within the upper cavity 110 in the middle, and the first channel 121 and the second channel 122 are arranged within the middle lower cavity 120. The return air duct 220 and the air outlet duct 210 corresponding to the evaporator 310 are arranged on the right dividing plate 152. Specifically, the left dividing plate 152 near the bottom of the lower cavity 120 is provided with a return air duct 220 and an air outlet duct 210, with the air outlet duct 210 directly communicating with the adjacent first

channel 121 and the return air duct 220 directly communicating with the adjacent second channel 122. The arrangement includes the following benefits. First, the arrangement of multiple cavities can isolate the noise generated by the compressor 320 during operation, thus improving the noise reduction effect of the air conditioner. Second, the combination of the independent cavity 151, the upper cavity 110, and the lower cavity 120, along with the design of the first channel 121 and the second channel 122, divides the interior of the housing 100 into five cavities, and by using multiple cavities, the noise reduction effect is further enhanced.

[0155] Based on the above insight, in other embodiments, one, three, or even more independent cavities 151, which are not divided by the partition 200, can be arranged, as long as it does not hinder the arrangement of the air conditioner components.

[0156] In the embodiment, the first channel 121 includes a first diversion cavity arranged along the length direction of the air conditioner, and the second channel 122 includes a second diversion cavity arranged adjacent to the first diversion cavity. The two are separated and divided by the vertical plate 140. The middle portion of the side surface of the housing 100 (corresponding to the first diversion cavity) is provided with an air outlet 1211. The upper end of the first diversion cavity is provided with an air outlet duct 210 on the partition 200. The middle portion of the bottom of the housing 100 (corresponding to the second diversion cavity) is provided with a return air inlet 1221. When the air conditioner is operating, indoor airflow enters the second diversion cavity through the return air inlet 1221, then enters the upper cavity 110 through the return air duct 220, and after the evaporator 310 performs heat exchange on the airflow, the airflow is input into the first diversion cavity through the air outlet duct 210 and discharged into the room through the air outlet 1211, thereby completing the airflow heat exchange and temperature control.

[0157] In the embodiment, a vibration-damping mechanism is also arranged at the bottom of the compressor 320 and the upper cavity 110. Specifically, the vibration-damping mechanism includes a base 400 that supports the compressor 320, and the base 400 and the bottom of the upper cavity 110 are connected through a vibration-damping spring 410. The vibration generated by the compressor 320 during operation is buffered and resolved by the vibration-damping spring 410, thereby reducing the vibration noise generated by the compressor 320 during operation.

[0158] In the embodiment, the evaporator 310 includes a heat exchange plate 312 and a heat exchange fan 311, which are arranged in parallel along the width direction of the air conditioner. The output end of the heat exchange fan 311 is arranged in a manner of facing the air outlet duct

210. The heat exchange plate 312 is arranged in an inclined manner at the upper end of the return air duct 220. The output end of the heat exchange fan 311 is arranged in a manner of facing the air outlet duct 210, which facilitates the guidance of airflow into the first diversion cavity and discharges it indoors through the air outlet 1211 on the first diversion cavity. The inclined arrangement of the heat exchange plate 312 facilitates the collection of condensation on the surface of the heat exchange plate 312 during the heat exchange process, and the inclined arrangement also helps to increase the contacting area between the air input from the return air duct 220 and the heat exchange plate 312, thereby improving the heat exchange effect of the evaporator 310.

[0159] Sixth embodiment

[0160] Referring to FIG. 17, the embodiment provides a low-noise air conditioner, which differs from the fifth embodiment in that: the housing 100 is divided into an upper layer and a lower layer by the partition 200. The upper layer of the housing 100 forms three independent cavities 151 along the length direction of the housing 100 through the dividing plate 152, and the lower layer forms the lower cavity 120. The independent cavity 151 in the middle of the upper layer is divided into an upper cavity 110 and a lower cavity 120 by the partition 200. The interior of the housing 100 includes an upper cavity 110, a lower cavity 120, and a lowermost lower cavity 120, which are arranged in a manner of layering from top to bottom, with the lowermost lower cavity 120 extending along the length direction. One compressor 320, one condenser 330, and one evaporator 310 are provided, with the evaporator 310 arranged within the independent cavity 151 at the right end as shown in the figure, the condenser 330 arranged within the independent cavity 151 at the left end as shown in the figure, and the compressor 320 arranged within the upper cavity 110 in the middle. The lowermost lower cavity 120 is provided with the first channel 121, the second channel 122, and the air outlet 1211.

[0161] Seventh embodiment

[0162] Referring to FIG. 18, the embodiment provides a low-noise air conditioner, which differs from the first embodiment in that: the heat exchange module includes a compressor 320, wherein the compressor 320 is arranged in the upper cavity 110. The lower cavity 120 is also arranged therein with a condenser 330 and/or an evaporator 310, which can be located in the same chamber or in different chambers within the lower cavity 120. Exemplarily, the heat exchange module includes the compressor 320 and is arranged within the upper cavity 110, and the lower cavity 120 is also arranged with the condenser 330 or the evaporator 310, or both the condenser 330 and the evaporator 310.

[0163] As one embodiment, the heat exchange module is primarily a compressor 320. The interior of the housing 100 is divided into an upper cavity 110 and a lower cavity 120 by a partition 200. The lower cavity 120 is further divided into multiple separated chambers along the length direction of the housing 100 by a vertically arranged splitter plate 130. The condenser 330 and the evaporator 310 are arranged in different separated chambers, respectively. The separated chamber arranged with the evaporator 310 is configured to communicate with the interior via the first channel 121 and the second channel 122, and the separated chamber arranged with the condenser 330 is configured to communicate with the exterior. The condenser 330 and/or the evaporator 310 can be arranged within the separated chamber at both ends or the separated chamber in the middle. The splitter plate 130 corresponding to the evaporator 310 is provided with an air outlet duct 210 communicating with the first channel 121 and a return air duct 220 communicating with the second channel 122.

[0164] In the embodiment, the lower cavity 120 is divided into three separated chambers along the length direction of the housing 100 by a dividing plate 152, which are the first separated chamber 161, the second separated chamber 162, and the third separated chamber 163. One compressor 320, one condenser 330, and one evaporator 310 are provided, with the compressor 320 located in the upper cavity 110, the evaporator 310 located in the first separated chamber 161, and the condenser 330 located in the third separated chamber 163. The second separated chamber 162 is arranged with the first channel 121 and the second channel 122 and is arranged with an air outlet 1211. The return air duct 220 and air outlet duct 210 corresponding to the evaporator 310 are arranged on the left splitter plate 130. Specifically, the left dividing plate 152 is provided with a return air duct 220 and an air outlet duct 210, wherein the air outlet duct 210 directly communicates with the first channel 121 in the middle separated chamber, and the return air duct 220 directly communicates with the second channel 122 in the middle separated chamber. The arrangement includes the following benefits. First, the arrangement of multiple cavities can isolate the noise generated by the compressor 320 during operation, thus improving the noise reduction effect of the air conditioner. Second, the combination of the upper cavity 110 and multiple separated chambers, along with the design of the first channel 121 and the second channel 122, divides the interior of the housing 100 into five cavities, and by using multiple cavities, the noise reduction effect is further enhanced.

[0165] Based on the above insight, in other embodiments, the upper cavity 110 can also be divided into multiple mounting cavities by the splitter plate 130, and two or even more separated

chambers formed by the lower cavity 120 can be arranged, as long as they do not interfere with the arrangement of the air conditioner components.

[0166] Eighth embodiment

[0167] Referring to FIG. 19, the embodiment provides a low-noise air conditioner, which differs from the first embodiment in that two condensers 330 are provided, and they are respectively located in the upper cavities 110 (the first mounting cavity 111 and the third mounting cavity 113) at both ends of the air conditioner. The outdoor air outlet 1211 corresponding to each condenser 330 is provided with a fan, wherein the fan is arranged at each end of the air conditioner. The chamber of each condenser 330 is also arranged with an outdoor unit return air inlet 1132, wherein the outdoor unit return air inlet 1132, the outdoor unit air outlet 1131, and the fan dissipate heat and cool the condenser 330. The compressor 320 and the evaporator 310 are placed in the upper cavity 110 in the middle (the second mounting cavity 112). An air outlet 1211 is arranged on the side surface of the housing 100 corresponding to the lower cavity 120, and a flow guide plate that can automatically open and close is arranged on the air outlet 1211. Additionally, a return air inlet 1221 corresponding to the energy storage cabinet 700 is provided at one end of the bottom of the housing 100.

[0168] Ninth embodiment

[0169] Referring to FIG. 20, the embodiment provides a viewing shelter, which includes a structural frame and the low-noise air conditioner of the eighth embodiment. The low-noise air conditioner is mounted on the structural frame. In some embodiments of the present disclosure, the structural frame includes a crossbeam 510 and a column 520. The low-noise air conditioner is mounted on the crossbeam 510 or suspended between the crossbeams 510. The structural frame is also provided with a louvered roof 600 that can be rotated to open and close.

[0170] In some embodiments of the present disclosure, the viewing shelter also includes an energy storage cabinet 700. The surface of the housing 100 of the air conditioner is provided with an air outlet 1211 and a return air inlet 1221, wherein the air outlet 1211 or return air inlet 1221 communicates with the ventilation port of the energy storage cabinet 700. Referring to FIG. 21, in the embodiment, the top of the energy storage cabinet 700 is provided with a first ventilation port, and the bottom of the energy storage cabinet 700 is provided with a second ventilation port. The first ventilation port is connected to and in communication with the return air inlet 1221 of the air conditioner to form a circulating airflow path between the air conditioner and the energy storage cabinet 700, following the path of the air outlet 1211, the second ventilation port, the first ventilation port, and the return air inlet 1221. The airflow direction of

the circulating airflow path is indicated by the arrows in FIG. 21, thus enabling airflow within the energy storage cabinet 700 to achieve active heat dissipation.

[0171] In some embodiments of the present disclosure, the crossbeam 510 is provided with a fastener. The fastener includes an extension that can be embedded into a slot. The surface of the housing of the air conditioner 100 is provided with a slot, which is provided with a pre-connection port that accommodates the vertical movement of the extension within it. The pre-connection port is provided with an insertion strip that can be embedded into the opening cavity. After the extension is embedded into the pre-connection port, the insertion strip is allowed to move relative to the opening cavity and then inserted into the opening cavity, thereby enabling a snap-fit connection between the fastener and the slot. Both ends of the pre-connection port are provided with elastic clamping jaws. When the fastener is connected to the slot, the elastic clamping jaws snap onto the bottom of the fastener so as to restrict the vertical separation of the fastener from the slot.

[0172] In some embodiments of the present disclosure, a vibration-damping structure is provided between the low-noise air conditioner and the structural frame, and the vibration-damping structure includes a vibration-damping material.

[0173] In summary, the low-noise air conditioner and the air conditioner in the viewing shelter according to the embodiments of the present disclosure produce low operating noise and provide a better user experience.

[0174] The above is only an embodiment of the present disclosure, which is not intended to limit the scope of protection of the present disclosure, and the present disclosure can have various changes and variations for those skilled in the art. Any modification, equivalent substitution, improvement, etc. made within the spirit and principles of the present disclosure shall be included in the scope of protection of the present disclosure.

CLAIMS

What is claimed is:

1. A low-noise air conditioner, comprising a housing and a heat exchange module, wherein a partition is arranged inside the housing to divide the housing into an upper cavity and at least one lower cavity, the heat exchange module is arranged inside the upper cavity, the lower cavity comprises a first channel and a second channel, and the first channel and the second channel are respectively configured to communicate indoor air with a chamber inside the housing.
2. The low-noise air conditioner according to claim 1, wherein the first channel and the second channel are respectively configured to communicate the indoor air with the upper cavity.
3. The low-noise air conditioner according to claim 1, wherein a height dimension of the housing is 415-450mm, a height of the upper cavity is 250-300mm, and a height of the lower cavity is 100-150mm.
4. The low-noise air conditioner according to claim 1, wherein the heat exchange module comprises a compressor, and the compressor is arranged within the upper cavity.
5. The low-noise air conditioner according to claim 4, wherein one or more compressors are provided in different chambers of the upper cavity.
6. The low-noise air conditioner according to claim 4, wherein the compressor is arranged within the upper cavity in a middle of the air conditioner or the upper cavity in an end portion of the air conditioner.
7. The low-noise air conditioner according to claim 4, wherein a vibration-damping mechanism is further arranged between the compressor and the upper cavity, and the vibration-damping mechanism comprises a base mounted on the compressor and a vibration-damping spring positioned between the base and the upper cavity.

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8. The low-noise air conditioner according to claim 1, wherein a condenser and an evaporator are further arranged inside the housing; the evaporator and the lower cavity arranged with the first channel and the second channel are of different chambers; a chamber where the evaporator is arranged is provided with an air outlet duct communicating with the first channel and a return air duct communicating with the second channel; and the first channel and the second channel are respectively configured to communicate the indoor air with the chamber where the evaporator is arranged.
 9. The low-noise air conditioner according to claim 8, wherein two condensers are provided and the two condensers are each provided at one end of the air conditioner.
 10. The low-noise air conditioner according to claim 8, wherein the housing is provided with an outdoor unit air outlet corresponding to a position of the condenser and configured for communicating with outdoor air.
 11. The low-noise air conditioner according to claim 8, wherein the evaporator comprises a heat exchange plate and a heat exchange fan, an output end of the heat exchange fan is arranged in a manner of facing the air outlet duct, and the heat exchange plate is positioned above the return air duct.
 12. The low-noise air conditioner according to claim 11, wherein the heat exchange plate is arranged in an inclined manner.
 13. The low-noise air conditioner according to claim 1, wherein the first channel comprises a first diversion cavity arranged in an extended manner, the first diversion cavity is provided with an air outlet on a surface of the housing, the second channel comprises a second diversion cavity arranged in an extended manner, and the second diversion cavity is provided with a return air inlet on the surface of the housing.
 14. The low-noise air conditioner according to claim 13, wherein the first diversion cavity and the second diversion cavity are each arranged in a manner of extending along a length direction of the housing.

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15. The low-noise air conditioner according to claim 13, wherein the air outlet is arranged on a side surface or a slanted side surface of the housing, and the return air inlet is arranged in a bottom of the housing.
 16. The low-noise air conditioner according to claim 1, wherein the heat exchange module comprises a compressor, a condenser, and/or an evaporator, and the compressor, the condenser, and/or the evaporator are arranged in a same chamber or different chambers of the upper cavity.
 17. The low-noise air conditioner according to claim 16, wherein the upper cavity forms multiple mounting cavities along a length direction of the housing through a splitter plate, and the compressor, the condenser, and the evaporator are respectively arranged in different mounting cavities.
 18. The low-noise air conditioner according to claim 17, wherein a position of the partition corresponding to the evaporator is provided with an air outlet duct communicating with the first channel and a return air duct communicating with the second channel.
 19. The low-noise air conditioner according to claim 1, wherein the heat exchange module comprises a compressor, the compressor is arranged within the upper cavity, and a position within the housing, where the partition is not arranged, is further arranged with the condenser and/or the evaporator.
 20. The low-noise air conditioner according to claim 19, wherein the housing forms multiple independent cavities along a length direction of the housing through a dividing plate, at least one independent cavity is divided into the upper cavity and the lower cavity by the partition, and the condenser and the evaporator are arranged in different independent cavities where the partition is not arranged.
 21. The low-noise air conditioner according to claim 20, wherein a position of the dividing plate corresponding to the evaporator is provided with an air outlet duct

communicating with the first channel and a return air duct communicating with the second channel.

22. The low-noise air conditioner according to claim 1, wherein the heat exchange module comprises a compressor, the compressor is arranged within the upper cavity, and the lower cavity is further arranged therein with the condenser and/or the evaporator.
23. The low-noise air conditioner according to claim 22, wherein the lower cavity forms multiple separated chambers along a length direction of the housing through a splitter plate, and the condenser and the evaporator are respectively arranged in different mounting cavities.
24. The low-noise air conditioner according to claim 23, wherein a position of the splitter plate corresponding to the evaporator is provided with an air outlet duct communicating with the first channel and a return air duct communicating with the second channel.
25. The low-noise air conditioner according to claim 1, wherein an inner wall of the housing is lined with a vibration-damping soundproofing material.
26. The low-noise air conditioner according to claim 25, wherein the vibration-damping soundproofing material comprises at least one of a polyurethane sound-absorbing layer, a polyester fiber vibration-damping layer, a rubber-plastic sponge soundproofing layer, a double-sided aluminum foil extruded board, or an Ovapro thermal insulation cotton.
27. A viewing shelter, comprising a structural frame and the low-noise air conditioner according to any one of claims 1 to 26, wherein the low-noise air conditioner is mounted on the structural frame.
28. The viewing shelter according to claim 27, wherein the structural frame comprises a crossbeam and a column, and the low-noise air conditioner is mounted on the crossbeam or suspended between the crossbeams.

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29. The viewing shelter according to claim 28, wherein the crossbeam is provided with a fastener, the fastener comprises an extension that can be embedded into a slot, a surface of the housing of the air conditioner is provided with the slot, and is provided with a pre-connection port that therein accommodates a vertical movement of the extension, the pre-connection port is provided with an insertion strip that can be embedded into an opening cavity, and after the extension is embedded into the pre-connection port, the insertion strip is allowed to move relative to the opening cavity and then inserted into the opening cavity, to make a snap-fit connection between the fastener and the slot.
30. The viewing shelter according to claim 29, wherein both ends of the pre-connection port are provided with elastic clamping jaws, and when the fastener is connected to the slot, the elastic clamping jaws snap onto a bottom of the fastener so as to restrict a vertical separation of the fastener from the slot.
31. The viewing shelter according to claim 27, wherein a vibration-damping structure is provided between the low-noise air conditioner and the structural frame.