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(54) **METHOD FOR PREVENTING CONDENSATION BY AIR SUPPLY APPARATUS OF AIR CONDITIONER**

(57) A method for preventing condensation on an air-conditioner air supply apparatus is disclosed, and is based on the following air supply apparatus (1). The air supply apparatus (1) includes at least two annular air guiding bodies. The annular air guiding bodies are sequentially arranged from front to back. A front-back through duct is formed in the middle. An annual heat-exchange air duct is formed two adjacent annular air guiding bodies. An air inlet of a rear-end annular air guiding body (12) located at the rear is a non-heat-exchanged air inlet (122), and an air outlet of a front-end annular air guiding body (11) located in the front is a mixed air outlet (111). Because of the rear annular air guiding body in the two front-back adjacent annular air guiding bodies, heat-exchanged air blown out from the annular heat-exchanged air duct formed between the two adjacent annular air guiding bodies forms a heat-exchanged air film on a whole annular surface of the front annular air guiding body.

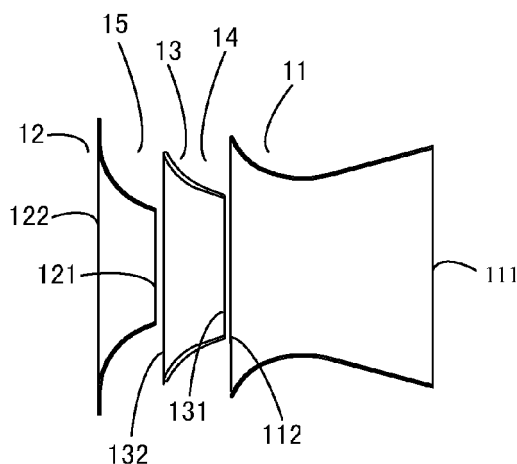


FIG. 4

Description

BACKGROUND

Technical Field

[0001] The present invention relates to the field of air conditioning technologies, and particularly to a method for preventing an air-conditioner air supply apparatus used in an air conditioner from generating condensation.

Related Art

[0002] When a conventional vertical air-conditioner supplies air, air is subjected to heat exchange by a heat exchanger and is directly blown out from an air outlet provided on the air-conditioner under the action of an internal fan, and all of the blown-out air is heat-exchanged air. Generally, no additional air supply apparatus is disposed between the heat exchanger and the air outlet. One disadvantage of such an air supply method of the air-conditioner is that indoor air circulation is slow because the supplied air is all heat-exchanged air, an air volume is small, and the air flow rate is low; another disadvantage is that the supplied air is not mild enough, and especially in the cooling mode, the blown-out cool air directly blows on a user, making the user feel uncomfortable.

[0003] To solve the foregoing problems, the applicant proposed an air-conditioner air supply apparatus that can be applied to an air-conditioner. The air-conditioner air supply apparatus includes an annular cover body. A through-duct running through the annular cover body is formed in the middle of the annular cover body. An annular opening is formed on a wall of the annular cover body. Several annular deflectors are provided on the annular opening, and an annular air outlet duct is formed between adjacent annular deflectors. After the air-conditioner air supply apparatus is disposed between an air conditioner heat exchanger and an air conditioner housing, not only the air intake volume can be increased, and indoor air circulation can be accelerated, but also the air-conditioner is enabled to supply milder air, thereby making the user feel more comfortable and improving the user experience. However, when the air conditioner is running, particularly during cooling and air supply, cold air blown out from the annular air outlet duct of the air-conditioner air supply apparatus is directly mixed with air at a room temperature that is introduced from the back of the apparatus, so that condensation is easily generated on an air outlet of a mixed air and on the annular deflectors, thereby affecting air supply performance of the air conditioner, and causing complaints of a user.

SUMMARY

[0004] An objective of the present invention is to provide a method for preventing condensation on an air-

conditioner air supply apparatus, which effectively prevents generation of condensation by setting the air-conditioner air supply apparatus to being in a proper structure, thereby improving usage performance of an air supply apparatus.

[0005] To achieve the foregoing objective of the present invention, the present invention is implemented by means of the following technical solutions:

A method for preventing condensation on an air-conditioner air supply apparatus is provided, and the method is based on the following air supply apparatus, where the air supply apparatus includes at least two annular air guiding bodies that are hollow and have front and rear openings, a rear opening of the annular air guiding body is an air inlet, a front opening of the annular air guiding body is an air outlet, each of the annular air guiding bodies is a single component, multiple annular air guiding bodies are sequentially arranged from front to back, a front-back through though-duct is formed in the middle, an annular heat-exchanged air duct is formed between two adjacent annular air guiding bodies, an air inlet of a rear-end annular air guiding body located at the rear forms a non-heat-exchanged air inlet, an air outlet of a front-end annular air guiding body located in the front forms a mixed air outlet, and because of the rear annular air guiding body disposed in a direction from the non-heat-exchanged air inlet to the mixed air outlet, of the two front-back adjacent annular air guiding bodies, heat-exchanged air blown out from the annular heat-exchanged air duct formed between the two adjacent annular air guiding bodies forms a heat-exchanged air film on a whole annular surface of the front annular air guiding body.

[0006] Preferably, in the method, the multiple annular air guiding bodies are coaxially disposed, the annular air guiding bodies are set in a manner that inner bores of air outlets of the annular air guiding bodies gradually increase in the direction from the non-heat-exchanged air inlet to the mixed air outlet, each of the annular air guiding bodies is set in a manner that the annular air guiding body is at least partially tapered from back to front, where an inner bore of the air inlet is larger than the inner bore of the air outlet, and radial sections of the multiple annular air guiding bodies are set to curved surfaces that are not exactly identical.

[0007] Preferably, the air supply apparatus is set to including the front-end annular air guiding body, the rear-end annular air guiding body, and at least one middle annular air guiding body between the front-end annular air guiding body and the rear-end annular air guiding body, where a bottom surface contour in the radial section of the middle annular air guiding body is an arc segment of which a curvature radius ranges from 50 to 80mm, a top surface contour of the radial section at least includes a first arc segment close to the air outlet of the middle

annular air guiding body, and a second arc segment close to the air inlet of the middle annular air guiding body, a curvature radius of the first arc segment is greater than the curvature radius of the bottom surface contour of the radial section, a curvature radius of the second arc segment is less than the curvature radius of the bottom surface contour of the radial section, a distance between the second arc segment and the bottom surface contour of the radial section is greater than a distance between the first arc segment and the bottom surface contour of the radial section, and a top surface contour and a bottom surface contour in the radial section of a guiding portion of the rear-end annular air guiding body are both arc segments of which a curvature radius ranges from 50 to 80mm.

[0008] Preferably, the front-end annular air guiding body includes a front segment and a rear segment, the front segment close to the air outlet of the annular air guiding body is a mixed air guiding portion that is extended outward, the rear segment close to the air inlet of the annular air guiding body is a heat-exchanged air guiding portion, a top surface contour and a bottom surface contour in a radial section of the mixed air guiding portion are both straight segments or slightly arched segments, a top surface contour and a bottom surface contour in a radial section of the heat-exchanged air guiding portion are both arc segments of which a curvature radius ranges from 40 to 100mm, and a width of the heat-exchanged air guiding portion is greater than a width of the middle annular air guiding body.

[0009] Preferably, a width of the mixed air guiding portion is 0.9-1.1 times the width of the heat-exchanged air guiding portion.

[0010] In the foregoing method, in order to prevent generation of condensation, an airflow distribution assembly is disposed in the at least one annular heat-exchanged air duct, to distribute, by using the airflow distribution assembly, heat-exchanged air that has been subjected to heat exchange by a heat exchanger in an internal air duct of the air conditioner and then send the heat-exchanged air to the annular heat-exchanged air duct.

[0011] Preferably, the airflow distribution assembly is disposed, in the annular heat-exchanged air duct, in a structure of uniformly distributing, along a circumferential direction of the annular heat-exchanged air duct, the heat-exchanged air entering the annular heat-exchanged air duct.

[0012] Preferably, airflow distribution assemblies are disposed in all the annular heat-exchanged air ducts.

[0013] Preferably, the airflow distribution assembly includes multiple airflow distribution plates, and the multiple airflow distribution plates are bilaterally symmetrically arranged in the circumferential direction of the annular heat-exchanged air duct, and along an air supply direction of the heat-exchanged air.

[0014] Preferably, the multiple airflow distribution plates are bent distribution plates of the same bending direction, and the bending direction of the multiple bent

distribution plates is reverser to the air supply direction of the heat-exchanged air from the heat exchanger.

[0015] Compared with the prior art, the present invention has the following advantages and positive effects: in the method of the present invention, an air-conditioner air supply apparatus constituted by multiple annular air guiding bodies that are single components are disposed, and a rear annular air guiding body is set in a manner that heat-exchanged air that is blown out from an annular heat-exchanged air duct formed between the rear annular air guiding body and a front annular air guiding body adjacent to the rear annular air guiding body forms a heat-exchanged air film on a whole annular surface of the front annular air guiding body, so that a problem that when the air-conditioner air supply apparatus supplies heat-exchanged air and non-heat-exchanged air at the same time, mixed air of the two encounters with each other on surfaces of annular air guiding bodies to generate condensation is effectively avoided, thereby improving supply air performance.

[0016] Other features and advantages of the present invention will become apparent after reading the detailed description of the present invention with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a schematic structural view of an embodiment of an air conditioner in which a method of the present invention is applied;

FIG. 2 is a schematic structural three-dimensional assembly view of an air-conditioner air supply apparatus in the embodiment of FIG. 1;

FIG. 3 is an exploded schematic structural view of the air-conditioner air supply apparatus of FIG. 2;

FIG. 4 is a schematic structural radial section view of the air-conditioner air supply apparatus of FIG. 2;

FIG. 5 is a schematic structural radial section view of a front-end annular air guiding body in FIG. 4;

FIG. 6 is a schematic structural radial section view of a rear-end annular air guiding body in FIG. 4;

FIG. 7 is a schematic structural radial section view of a middle annular air guiding body in FIG. 4;

FIG. 8 is a schematic structural view of another embodiment of an air conditioner in which an air supply method of the present invention is applied;

FIG. 9 is a schematic structural three-dimensional assembly view of an air-conditioner air supply appa-

ratus in the embodiment of FIG. 8; and

FIG. 10 is a schematic structural rear view of the air-conditioner air supply apparatus in FIG. 9.

DETAILED DESCRIPTION

[0018] The technical solutions of the present invention are further described in detail below with reference to the accompanying drawings and the detailed description.

[0019] First, technical terms involved in the detailed description are briefly described. The front end or rear end of each structural component as mentioned below is defined in terms of the position of the structural component in the normal use state relative to the user; front or rear, when used to describe the positions at which multiple structural components are arranged, is also defined in terms of the position of an apparatus formed by the multiple structural components in the normal use state relative to the user. In the following description, heat-exchanged air refers to air that is from the inside of an air-conditioner and has been subjected to heat exchange by a heat exchanger; non-heat-exchanged air refers to air from the environmental space in which the air-conditioner is located, is relative to the heat-exchanged air, and is part of air that is not directly from the heat exchanger; and mixed air refers to air formed by mixing the heat-exchanged air with the non-heat-exchanged air. In the following description, the shape being annular refers an enclosed structure that is formed by encircling, but is not limited to a circular ring.

[0020] Then, the design concept of the present invention is briefly described. To conveniently and flexibly supply mixed air in an air conditioner, an air-conditioner air supply apparatus formed by a combination of multiple annular air guiding bodies in the form of a single component may be disposed, so that external non-heat-exchanged air is introduced while heat-exchanged air in an internal air duct of the air conditioner is supplied, so as to supply mixed air at a proper temperature, and increase the amount of air supplied. When such an air-conditioner air supply apparatus supplies air, to avoid generation of condensation on the annular air guiding body of the air-conditioner air supply apparatus because of convergence and collision of cold and hot air at different temperatures, the present invention proposes a method for preventing condensation. Specifically, a structure of the air-conditioner air supply apparatus is properly set, so that because of the rear annular air guiding body disposed in a direction from a non-heat-exchanged air inlet to a mixed air outlet, in two front-back adjacent annular air guiding bodies, heat-exchanged air blown out from an annular heat-exchanged air duct formed between the two adjacent annular air guiding bodies forms a heat-exchanged air film on a whole annular surface of a front annular air guiding body. The mixed air is avoided, by using the heat-exchanged air film, from mixing on the surface of the annular air guiding body, thereby effectively

avoid the generation of condensation on the annular air guiding body, and improving air supply performance.

[0021] Referring to FIG. 1, FIG. 1 is a schematic structural view of an embodiment of an air conditioner in which a method for preventing condensation of the present invention is applied.

[0022] As shown in FIG. 1, the air-conditioner of this embodiment includes a front panel 2, a rear panel 3, a left panel, a right panel, a top plate and a bottom plate (not marked in the figure) that constitute a housing of the air-conditioner. The housing defines an internal air duct 4 of the air-conditioner. Corresponding to a structure of an air-conditioner air supply apparatus 1, a mixed air outlet 21 is provided an upper part of the front panel 2 of the air-conditioner, and a non-heat-exchanged air inlet 31 is provided on an upper part of the rear panel 3 of the air-conditioner and at a position corresponding to the mixed air outlet 21 on the front panel 2. A blower 6, a heat exchanger 5 and the air-conditioner air supply apparatus 1 are disposed from bottom to top in the internal air duct 4, and the blower 6 is set in a manner that air from the internal air duct 4 of the air-conditioner is blown out from the mixed air outlet 21 on the front panel 2.

[0023] For the structure of the air-conditioner air supply apparatus 1, reference is made to a schematic structural three-dimensional assembly view of FIG. 2, an exploded schematic structural view of FIG. 3, and a schematic structural radial section view of FIG. 4.

[0024] As shown in FIG. 2, FIG. 3 and FIG. 4, the air-conditioner air supply apparatus 1 includes three annular air guiding bodies, which separately are a front-end annular air guiding body 11, a first middle annular air guiding body 13, and a rear-end annular air guiding body 12. Each of the three annular air guiding bodies that are sequentially arranged from front to rear is a single component and formed independently. The front-end annular air guiding body 11 is hollow and has two openings: a front opening and a rear opening, which respectively are a mixed air outlet 111, and an air inlet 112; the first middle annular air guiding body 13 is hollow and has two openings: a front opening and a rear opening, which respectively are an air outlet 131 and an air inlet 132; and the rear-end annular air guiding body 12 is hollow and has two openings: a front opening and a rear opening, which respectively are an air outlet 121 and a non-heat-exchanged air inlet 122. After the front-end annular air guiding body 11, the first middle annular air guiding body 13, and the rear-end annular air guiding body 12 are sequentially arranged from front to rear, a through-duct (not marked in the figure) that runs through all the three annular air guiding bodies from front to rear is formed in the middle. Moreover, a first annular heat-exchanged air duct 14 is formed between the front-end annular air guiding body 11 and the first middle annular air guiding body 13, and a second annular heat-exchanged air duct 15 is formed between the first middle annular air guiding body 13 and the rear-end annular air guiding body 12. The

internal air duct 4 of the air-conditioner is connected to the through-duct in the air-conditioner air supply apparatus 1 through the first annular heat-exchanged air duct 14 and the second annular heat-exchanged air duct 15.

[0025] Surfaces of the front-end annular air guiding body 11, the first middle annular air guiding body 13, and the rear-end annular air guiding body 12 are all curved surfaces, and an inner bore of the air inlet of each annular air guiding body is larger than an inner bore of the air outlet of the annular air guiding body. That is, by using the first middle annular air guiding body 13 as an example, the air outlet 131 of the first middle annular air guiding body 13 is a front opening, and the air inlet 132 of the first middle annular air guiding body 13 is a rear opening, and the inner bore of the air inlet 132 is greater than the inner bore of the air outlet 131 of the first middle annular air guiding body 13.

[0026] Moreover, the three annular air guiding bodies are coaxially disposed, inner bores of air outlets of the annular air guiding bodies gradually increase along a direction from the non-heat-exchanged air inlet 122 to the mixed air outlet 111. That is, from front to rear, the inner bore of the mixed air outlet 111 of the front-end annular air guiding body n is greater than the inner bore of the air outlet 131 of the first middle annular air guiding body 13, and the inner bore of the air outlet 131 of the first middle annular air guiding body 13 is greater than the inner bore of the air outlet 121 of the rear-end annular air guiding body 12. The inner bore herein refers to inner perimeter of the opening.

[0027] In this embodiment, the air-conditioner air supply apparatus 1 is formed by a combination of multiple annular air guiding bodies in the form of a single component, so that it is easier to flexibly control a structure of each annular air guiding body according to an air supply requirement, and produce each annular air guiding body having a different structure, thereby ensuring the uniformity and a speed of air supply. In addition, because each annular air guiding body is a single component, a manner in which the whole air-conditioner air supply apparatus 1 is assembled in the air-conditioner can be flexibly selected, thereby improving applicable scope of the air-conditioner air supply apparatus 1 and production efficiency of the air-conditioner.

[0028] When the air-conditioner air supply apparatus 1 is assembled in the air-conditioner, the rear-end annular air guiding body 12 is fastened with the rear panel 3 of the air-conditioner. The first middle annular air guiding body 13 is first fastened with the front-end annular air guiding body 11 by using a screw, and then the front-end annular air guiding body 11 fastened with the first middle annular air guiding body 13 is fixed on the front panel 2 of the air conditioner. After being fixed in place, the mixed air outlet 111 of the front-end annular air guiding body 11 acts as an air outlet of the whole air-conditioner air supply apparatus 1, and is enclosed and assembled with the mixed air outlet 21 on the front panel 2; and the non-heat-exchanged air inlet 122 in the rear-end annular air

guiding body 12 acts as a non-heat-exchanged air inlet of the whole air-conditioner air supply apparatus 1, and is enclosed and assembled with the non-heat-exchanged air inlet 31 on the rear panel 3.

[0029] Based on the air-conditioner air supply apparatus 1 of the foregoing structure, the method for preventing condensation during an air supply process, of this embodiment is implemented as follows:

When the air-conditioner is running, indoor air enters the air-conditioner, is accelerated, under the action of the blower 6, to be blown to a heat exchanger 5 for a heat exchange. The heat-exchanged air after the heat exchange is blown from the internal air duct 4 to the air-conditioner air supply apparatus 1, enters the through-duct through the first annular heat-exchanged air duct 14 and the second annular heat-exchanged air duct 15, and is further supplied to the mixed air outlet 21 through the through-duct. Meanwhile, a negative pressure is formed in the through-duct. Under the action of the negative pressure, indoor air, which is used as the non-heat-exchanged air, outside the air-conditioner, is sucked into the through-duct from the non-heat-exchanged air inlet 31 on the rear panel 3 and the non-heat-exchanged air inlet 122 of the rear-end annular air guiding body 12, and is mixed with the heat-exchanged air blown out from the annular heat-exchanged air duct to form mixed air, and sent indoors together with the heat-exchanged air from the mixed air outlet 21 of the air-conditioner air supply apparatus 1 and from the mixed air outlet 21 on the front panel 2. The mixed air is mild, which makes a user feel more comfortable, thereby improving the comfort of the user. Because the structure described above is used by the annular air guiding bodies, the heat-exchanged air (cold air in a cooling mode) sent out from the first annular heat-exchanged air duct 14 forms a uniform film on the surface of the front-end annular air guiding body 11. The film can effectively prevent the non-heat-exchanged air (for example, hot air) sucked into the through-duct from colliding on the surface of the front-end annular air guiding body 11, thereby avoiding generation of condensation on the surface of the front-end annular air guiding body 11. Correspondingly, the heat-exchanged air sent out from the second annular heat-exchanged air duct 15 forms a uniform film on a posterior surface of the middle annular air guiding body 13, and the film can effectively prevent the non-heat-exchanged air sucked into the through-duct from colliding on a posterior surface of the middle annular air guiding body 13, thereby avoiding generation of condensation on the surface of the middle annular air guiding body 13. For others, condensation is not generated on a surface of an annular air guiding body on which mixing of heat-exchanged air and non-heat-exchanged air does not exist, and therefore, condensation is not generated

on the whole air-conditioner air supply apparatus 1.

[0030] In addition to the foregoing structure, shapes of the annular air guiding bodies, particularly the shapes of the middle annular air guiding body 13 and the rear-end annular air guiding body 12, are also important to an effect of preventing condensation, and therefore, to improve performance of preventing condensation, the structures of the annular air guiding bodies are designed in this embodiment as follows.

[0031] The structures of the annular air guiding bodies are described in detail with reference to a schematic structural radial section view of the front-end annular air guiding body shown in FIG. 5, a schematic structural radial section view of the rear-end annular air guiding body shown in FIG. 6, and a schematic structural radial section view of the middle annular air guiding body shown in FIG. 7.

[0032] As shown in FIG. 5, the front-end annular air guiding body 11 includes two segments: a front segment and a rear segment, where the front segment close to the front opening thereof, that is, the mixed air outlet 111, is a mixed air guiding portion 113 that is extended outward, and the rear segment close to the rear opening thereof, that is, the air inlet 112, is a heat-exchanged air guiding portion 114. The mixed air guiding portion 113 acts as a main component for guiding the mixed air of the heat-exchanged air and the non-heat-exchanged air, where a top surface contour 1131 and a bottom surface contour 1132 in the radical section of the mixed air guiding portion 113 both preferably are straight segments or slightly arched segments similar to straight segments (an arc with a great curvature radius). The heat-exchanged air guiding portion 114 acts as a main component for guiding the heat-exchanged air, where a top surface contour 1141 and a bottom surface contour 1142 in the radical section of the heat-exchanged air guiding portion 114 both are arc segments of which a curvature radius ranges from 40 to 100mm. The top surface contour and the bottom surface contour of the mixed air guiding portion 113 and the heat-exchanged air guiding portion 114 are sequentially connected, to form an enclosed area by using end closure lines 1133 and 1143, so that a curved surface with a streamlined radical section is finally obtained. Moreover, the end closure line 1143 for blocking the top surface contour 1141 and the bottom surface contour 1142 of the heat-exchanged air guiding portion 114 preferably is an arc segment, to ensure that the heat-exchanged air smoothly enters the heat-exchanged air duct, and avoid generation of a vortex flow. Moreover, comprehensively considering air supply performance, performance of preventing condensation, and beauty, a surface width W1 of the mixed air guiding portion 113 is 0.9 to 1.1 times a surface width W2 of the heat-exchanged air guiding portion 114, and preferably, the two have a same width. For example, in this embodiment, $W1=W2=90.7\text{mm}$.

[0033] As shown in FIG. 6, the rear-end annular air

guiding body 12 also includes two segments: a front segment and a rear segment, where the front segment close to the front opening thereof, that is, the air outlet 121, is a guiding portion 123, and the rear segment close to the rear opening thereof, that is, the non-heat-exchanged air inlet 122, is a turn-up installation portion 124. The guiding portion 123 acts as a main component for guiding the heat-exchanged air, where a top surface contour 1231 and a bottom surface contour 1232 in the radical section of the guiding portion 123 both are arc segments of which a curvature radius ranges from 50 to 80mm. In this embodiment, the curvature radius is 61.4mm. The turn-up installation portion 124 acts as a main installation component, where a top surface contour 1241 and a bottom surface contour 1242 of the radical section of the turn-up installation portion 12 both are straight segments vertical to an axial direction of the rear-end annular air guiding body 12. The top surface contour and the bottom surface contour of the guiding portion 123 and the installation portion 124 are sequentially connected, to form an enclosed area by using end closure lines 1233 and 1243, so that a curved surface with a streamlined radical section is finally obtained. Preferably, the end closure line 1233 is an arc segment, so as to ensure that the heat-exchanged air smoothly enters the heat-exchanged air duct and avoid generation of a vortex flow. Moreover, a surface width W3 of the installation portion 124 should neither be excessively large nor excessively small. The width of the surface width W3 preferably is 15% to 30% of a surface width W4 of the air guiding portion 123, and more preferably is 25%.

[0034] As shown in FIG. 7, in the air-conditioner air supply apparatus having the first middle annular air guiding body 13, the first middle annular air guiding body 13 is located between the rear-end annular air guiding body 12 and the front-end annular air guiding body 11, and a surface width ($W5+W6$) of the first middle annular air guiding body 13 is not greater than the surface width W2 of the heat-exchanged air guiding portion 114 in the front-end annular air guiding body 12. For example, in this embodiment, W2 is 90.7mm, and ($W5+W6$) is 61.3mm. The bottom surface contour 133 in the radical section of the first middle annular air guiding body 13 is an arc segment with a curvature radius ranging from 50 to 80mm, and the top surface contour 134 of the first middle annular air guiding body 13 at least includes a first arc segment 1341 close to the front opening, that is, the air outlet 131, of the first middle annular air guiding body 13, and a second arc segment 1342 close to the rear opening, that is, the air inlet 132, of the first middle annular air guiding body 13. The top surface contour 134 and the bottom surface contour 133 are blocked by using the end closure lines 1343 and 1344, to form a curved surface having an enclosed streamline structure. The end closure lines 1343 and 1344 both are arc segments. In this embodiment, the first arc segment 1341 has a curvature radius greater than that of the bottom surface contour 133, while the second arc segment 1342 has a curvature radius less

than that of the bottom surface contour 133. For example, the curvature radius of the bottom surface contour 133 is 60.2mm, the curvature radius of the first arc segment 1341 is 115.3mm and the curvature radius of the second arc segment 1342 is 51.4mm. In addition, a distance between the second arc segment 1342 and the bottom surface contour 133 is greater than the distance between the first arc segment 1341 and the bottom surface contour 133, thereby forming a structure that is thin in the front and thick in the rear.

[0035] In addition that the air-conditioner air supply apparatus 1 is constituted by using the foregoing three annular air guiding bodies, more middle annular air guiding bodies may further be disposed between the front-end annular air guiding body 11 and the rear-end annular air guiding body 12. Each middle annular air guiding body may be designed with reference to the radical section of the foregoing first middle annular air guiding body 13.

[0036] For an air-conditioner air supply apparatus with an annular air guiding body, uniformity of air supply in a circumferential direction also is a key factor affecting condensation. When air is supplied more uniformly in the circumferential direction, the condensation is generated less easily. Therefore, the effect of preventing condensation may be further improved by furthering considering uniformly and circumferentially distributing the heat-exchanged air entering the annular heat-exchanged air duct.

[0037] Referring to FIG. 8 to FIG. 10, FIG. 8 is a schematic structural diagram of another embodiment of an air conditioner in which the air supply method of the present invention is applied. FIG. 9 is a schematic structural three-dimensional assembly view of an air-conditioner air supply apparatus in FIG. 8, and FIG. 10 is a schematic structural rear view of the air-conditioner air supply apparatus in FIG. 9.

[0038] As shown in FIG. 8, the air conditioner of this embodiment includes a front panel 2, a rear panel 3, a left panel, a right panel, a top plate and a bottom plate (not marked in the figure) that constitute a housing of the air conditioner. The housing defines an internal air duct 4 of the air conditioner. A blower 6, a heat exchanger 5, and an air-conditioner air supply apparatus 1 are disposed from bottom to top in the internal air duct 4.

[0039] For a structure of the air-conditioner air supply apparatus 1, reference is made to the schematic structural three-dimensional assembly view of FIG. 9 and the schematic structural rear view of FIG. 10.

[0040] As shown in FIG. 9 and FIG. 10 together with FIG. 8, the air-conditioner air supply apparatus 1 of this embodiment includes three annular air guiding bodies, which separately are a front-end annular air guiding body 11, a first middle annular air guiding body 13, and a rear-end annular air guiding body 12. Each of the three annular air guiding bodies that are sequentially arranged from front to rear is a single component and formed independently. For a specific structure of each annular air guiding body, reference may be made to the embodiment shown

in FIG. 3 to FIG. 7, which is not described herein again. After the front-end annular air guiding body 11, the first middle annular air guiding body 13, and the rear-end annular air guiding body 12 are sequentially arranged from front to rear, a through-duct (not marked in the figure) that runs through all the three annular air guiding bodies from front to rear is formed in the middle. Moreover, a first annular heat-exchanged air duct 14 is formed between the front-end annular air guiding body 11 and the first middle annular air guiding body 13, and a second annular heat-exchanged air duct 15 is formed between the first middle annular air guiding body 13 and the rear-end annular air guiding body 12. The internal air duct 4 of the air-conditioner is connected to the through-duct in the air-conditioner air supply apparatus 1 through the first annular heat-exchanged air duct 14 and the second annular heat-exchanged air duct 15. An airflow distribution assembly 16 extending into the first annular heat-exchanged air duct 14 and the second annular heat-exchanged air duct 15 is disposed on the first middle annular air guiding body 13. Moreover, for ease of processing, the airflow distribution assembly 16 and the first middle annular air guiding body 13 are preferably integrally formed. Certainly, the airflow distribution assembly 16 and the first middle annular air guiding body 13 may also be formed separately, and then the airflow distribution assembly 16 is installed and fixed on the first middle annular air guiding body 13.

[0041] For a specific structure of the airflow distribution assembly 16, reference is made to a rear view of FIG. 10. The airflow distribution assembly 16 of this embodiment is implemented by using multiple airflow distribution plates. The airflow distribution assembly 16 of this embodiment totally includes four pairs (eight) of airflow distribution plates, which separately are primary airflow distribution plates 161 and 162, first auxiliary airflow distribution plates 163 and 164, second auxiliary airflow distribution plates 165 and 166, and third auxiliary airflow distribution plates 167 and 168. All the airflow distribution plates are bent distribution plates of a same bending direction, and a surface of each airflow distribution plate is an arc-shaped curved surface, which can effectively guide a direction of air, and reduce pressure loss and noise of airflow during a process of airflow distribution, thereby implementing high-speed air supply in low noise. The four pairs of the airflow distribution plates are bilaterally symmetrically arranged in a circumferential direction of the first annular heat-exchanged air duct 14 and the second annular heat-exchanged air duct 15 in a sequence that the primary airflow distribution plates 161 and 162 are at bottom, and the first auxiliary airflow distribution plates 163 and 164, the second auxiliary airflow distribution plates 165 and 166, and the auxiliary airflow distribution plate 167 and 168 are sequentially disposed upwards. That is, in a bottom-up air supply direction of the heat-exchanged air, the primary airflow distribution plate 161, the first auxiliary airflow distribution plate 163, the second auxiliary airflow distribution plate 165, and

the third auxiliary airflow distribution plate 167 are disposed from bottom up on the left side (in terms of the left and right sides in a rear view direction) of the air-conditioner air supply apparatus 1; and the primary airflow distribution plate 162, the first auxiliary airflow distribution plate 164, the second auxiliary airflow distribution plate 166 and the third auxiliary airflow distribution plate 168 are disposed in a bilaterally symmetrical form on the right side of the air-conditioner air supply apparatus 1. Moreover, the bending direction of the airflow distribution plates is reverse to the air supply direction of the heat-exchanged air. That is, the air supply direction of the heat-exchanged air is from bottom up, and the bending direction of the airflow distribution plates is reverse to the air supply direction, that is, the airflow distribution plates are bent at a counterclockwise direction shown in FIG. 7.

[0042] The airflow distribution assembly 16 constituted by multiple bent airflow distribution plates radially symmetrically arranged is disposed in the heat-exchanged air duct, so that the primary airflow distribution plates 161 and 162 can be used to divide the heat-exchanged air from the heat exchanger into left, middle and right parts, and the heat-exchanged air on the left and right sides may further be divided by the auxiliary airflow distribution plates, uniform air intake and outtake in the circumferential direction of the heat-exchanged air duct of the air-conditioner air supply apparatus 1 are finally implemented, thereby improving the uniformity of air supply from the air-conditioner air supply apparatus 1. When the heat-exchanged air is blown to the front annular air guiding body, a uniform air film can be formed on the whole surface of the annular air guiding body, so that a problem that because the air supply is not uniform, a vortex flow is generated, thereby leading to generation of condensation is effectively avoided.

[0043] Certainly, in addition to being implemented by using multiple bent airflow distribution plates, another structure may also be used by the airflow distribution assembly 16, as long as it can be ensured that the heat-exchanged air from the heat exchanger 5 is uniformly distributed in the circumferential direction.

[0044] The foregoing embodiments are merely used to describe rather than limit the technical solutions of the present invention. Although the present invention is described in detail with reference to the foregoing embodiments, a person of ordinary skill in the art can still make modifications to the technical solutions described in the foregoing embodiments, or make equivalent replacements to some technical features thereof. Such modifications or replacements should not make the essence of corresponding technical solutions depart from the spirit and scope of the technical solutions of the present invention.

Claims

1. A method for preventing condensation on an air-con-

ditioner air supply apparatus, wherein the method is based on the following air supply apparatus, wherein the air supply apparatus comprises at least two annular air guiding bodies that are hollow and have front and rear openings, a rear opening of the annular air guiding body is an air inlet, a front opening of the annular air guiding body is an air outlet, each of the annular air guiding bodies is a single component, multiple annular air guiding bodies are sequentially arranged from front to back, a front-back through though-duct is formed in the middle, an annular heat-exchanged air duct is formed between two adjacent annular air guiding bodies, an air inlet of a rear-end annular air guiding body located at the rear is a non-heat-exchanged air inlet, an air outlet of a front-end annular air guiding body located in the front is a mixed air outlet, and because of the rear annular air guiding body disposed in a direction from the non-heat-exchanged air inlet to the mixed air outlet, of the two front-back adjacent annular air guiding bodies, heat-exchanged air blown out from the annular heat-exchanged air duct formed between the two adjacent annular air guiding bodies forms a heat-exchanged air film on a whole annular surface of the front annular air guiding body.

2. The method according to claim 1, wherein in the method, the multiple annular air guiding bodies are coaxially disposed, the annular air guiding bodies are set in a manner that inner bores of air outlets of the annular air guiding bodies gradually increase in the direction from the non-heat-exchanged air inlet to the mixed air outlet, each of the annular air guiding bodies is set in a manner that the annular air guiding body is at least partially tapered from back to front, wherein an inner bore of the air inlet is larger than the inner bore of the air outlet, and radial sections of the multiple annular air guiding bodies are set to curved surfaces that are not exactly identical.
3. The method according to claim 2, wherein the air supply apparatus is set to comprising the front-end annular air guiding body, the rear-end annular air guiding body, and at least one middle annular air guiding body between the front-end annular air guiding body and the rear-end annular air guiding body, wherein a bottom surface contour in the radial section of the middle annular air guiding body is an arc segment of which a curvature radius ranges from 50 to 80mm, a top surface contour of the radial section at least comprises a first arc segment close to the air outlet of the middle annular air guiding body, and a second arc segment close to the air inlet of the middle annular air guiding body, a curvature radius of the first arc segment is greater than the curvature radius of the bottom surface contour of the radial section, a curvature radius of the second arc segment is less than the curvature radius of the bottom

surface contour of the radial section, a distance between the second arc segment and the bottom surface contour of the radial section is greater than a distance between the first arc segment and the bottom surface contour of the radial section, and a top surface contour and a bottom surface contour in the radial section of a guiding portion of the rear-end annular air guiding body are both arc segments of which a curvature radius ranges from 50-80mm.

4. The method according to claim 3, wherein the front-end annular air guiding body comprises a front segment and a rear segment, the front segment close to the air outlet of the annular air guiding body is a mixed air guiding portion that is extended outward, the rear segment close to the air inlet of the annular air guiding body is a heat-exchanged air guiding portion, a top surface contour and a bottom surface contour in a radial section of the mixed air guiding portion are both straight segments or slightly arched segments, a top surface contour and a bottom surface contour in a radial section of the heat-exchanged air guiding portion are both arc segments of which a curvature radius ranges from 40 to 100mm, and a width of the heat-exchanged air guiding portion is greater than a width of the middle annular air guiding body.
5. The method according to claim 4, wherein a width of the mixed air guiding portion is 0.9-1.1 times the width of the heat-exchanged air guiding portion.
6. The method according to any one of claims 2 to 5, wherein an airflow distribution assembly is disposed in the at least one annular heat-exchanged air duct, to distribute, by using the airflow distribution assembly, heat-exchanged air that has been subjected to heat exchange by a heat exchanger in an internal air duct of the air conditioner and then send the heat-exchanged air to the annular heat-exchanged air duct.
7. The method according to claim 6, wherein the airflow distribution assembly is disposed, in the annular heat-exchanged air duct, in a structure of uniformly distributing, along a circumferential direction of the annular heat-exchanged air duct, the heat-exchanged air entering the annular heat-exchanged air duct.
8. The method according to claim 7, wherein airflow distribution assemblies are disposed in all the annular heat-exchanged air ducts.
9. The method according to claim 6, wherein the airflow distribution assembly comprises multiple airflow distribution plates, and the multiple airflow distribution plates are bilaterally symmetrically arranged in the

circumferential direction of the annular heat-exchanged air duct, and along an air supply direction of the heat-exchanged air.

10. The method according to claim 9, wherein the multiple airflow distribution plates are bent distribution plates of the same bending direction, and the bending direction of the multiple bent distribution plates is reverser to the air supply direction of the heat-exchanged air from the heat exchanger.

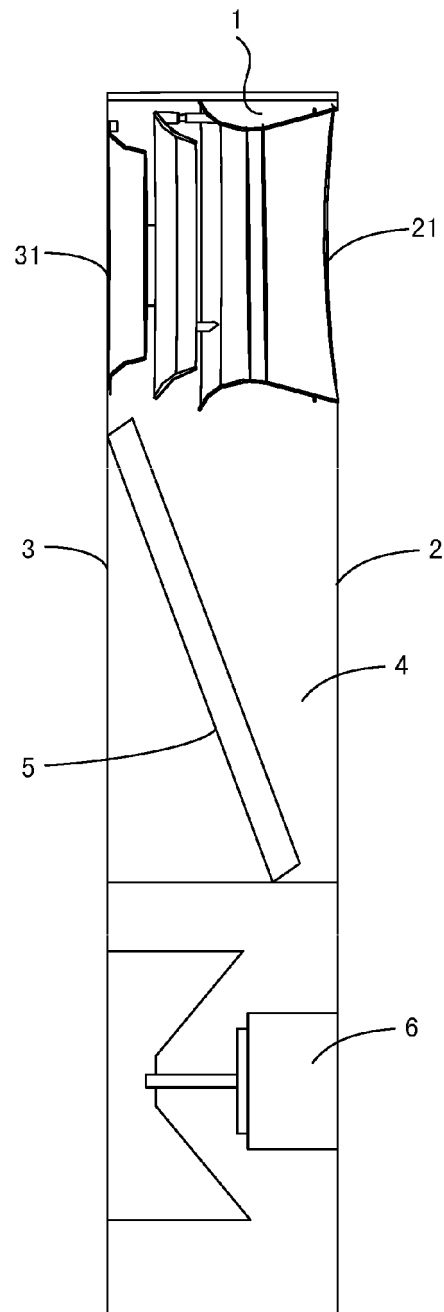


FIG. 1

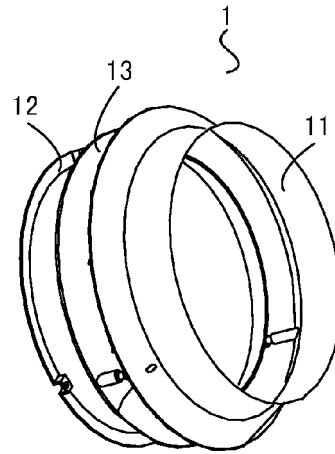


FIG. 2

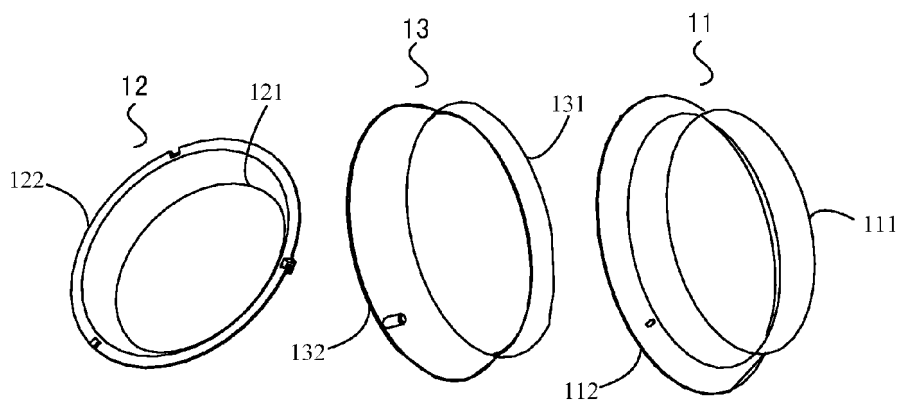


FIG. 3

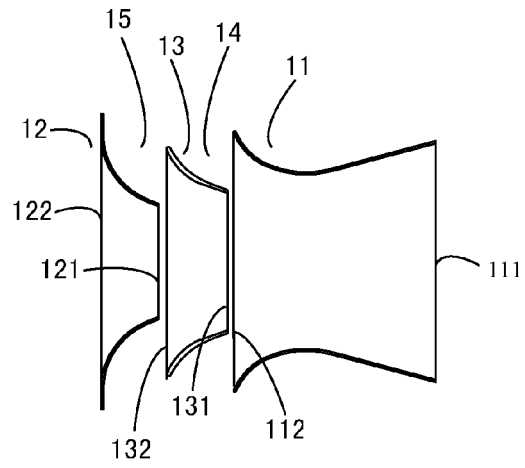


FIG. 4

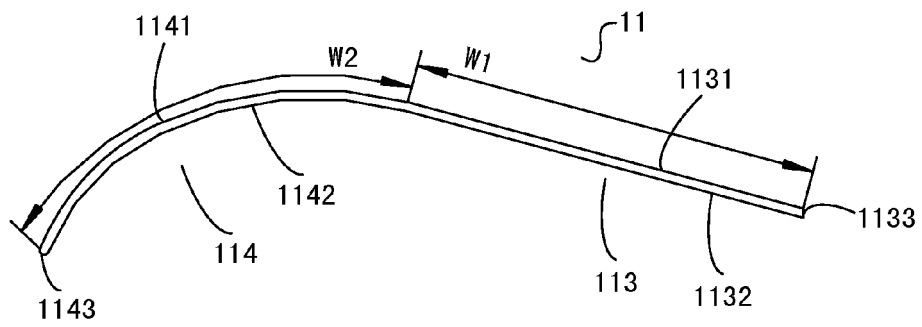


FIG. 5

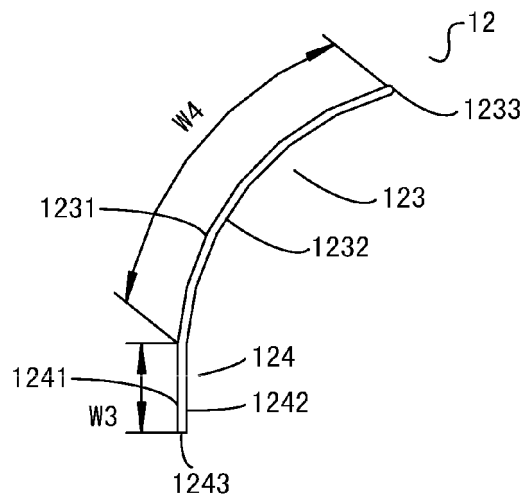


FIG. 6

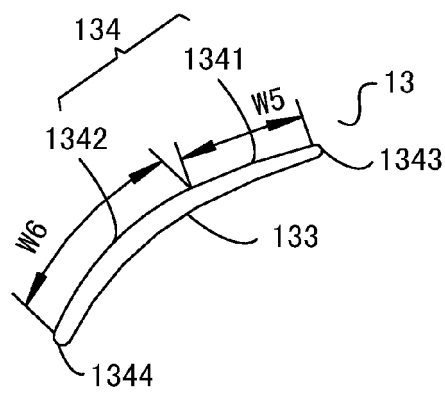


FIG. 7

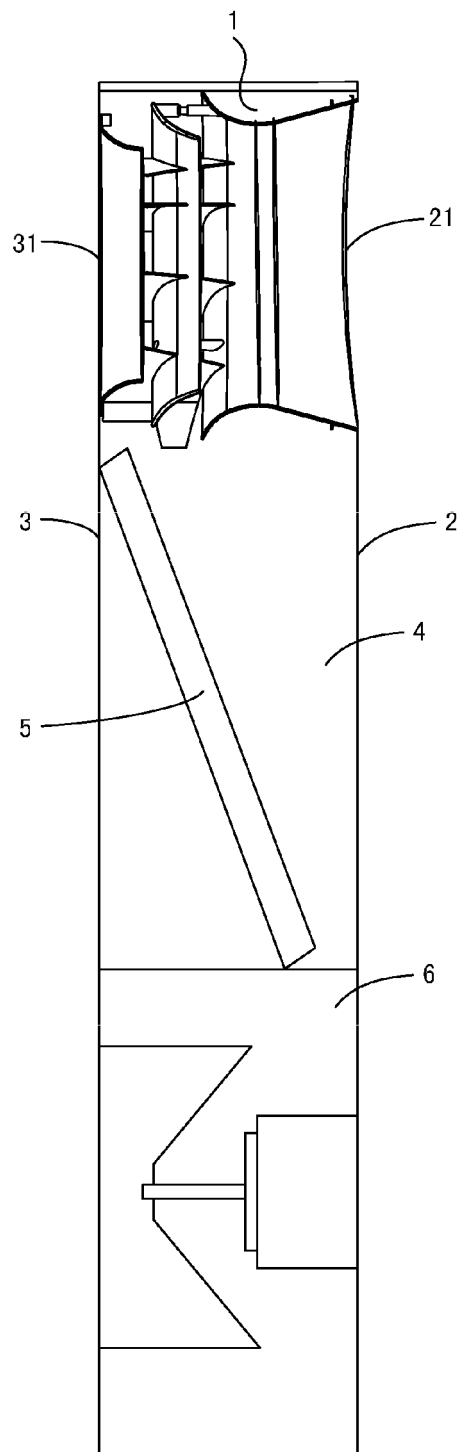


FIG. 8

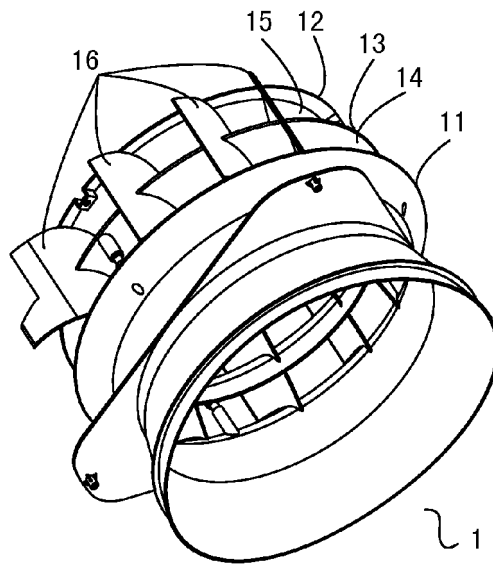


FIG. 9

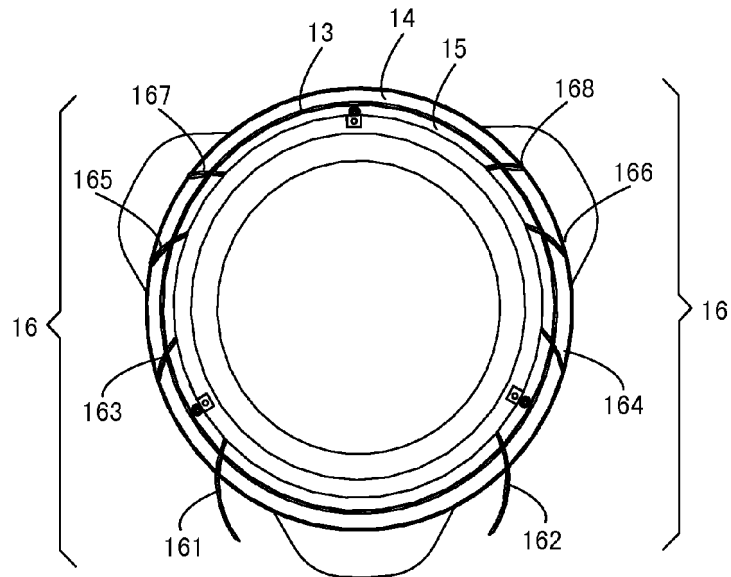


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2014/078205

A. CLASSIFICATION OF SUBJECT MATTER

F24F 13/22 (2006.01) i; F24F 13/08 (2006.01) i; F24F 13/062 (2006.01) n; F24F 1/01 (2011.01) n
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)

F24F; F25B

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)
CNPAT; CNKI: (anti-dew, dew, air supply, wind guide, annular, heat exchange, film, air conditioner, condensation)
WPI; EPODOC: (dew, discharg+, inlet?, outlet?, annulus, annular, heat, exchang+, air, condition+, water, film?, condensation)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 101234065 B1 (LG ELECTRONICS INC.), 15 February 2013 (15.02.2013), description, paragraphs 0029-0119, and figures 1-13	1, 2
Y	KR 101234065 B1 (LG ELECTRONICS INC.), 15 February 2013 (15.02.2013), description, paragraphs 0029-0119, and figures 1-13	6-10
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PX	CN 103453648 A (HAIER ELECTRONICS GROUP CO., LTD. et al.), 18 December 2013 (18.12.2013), the whole document	1-10
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A	CN 2597872 Y (SHI, Chuping), 07 January 2004 (07.01.2004), the whole document	1-10
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	
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"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	"&" document member of the same patent family

Date of the actual completion of the international search
18 July 2014 (18.07.2014)

Date of mailing of the international search report
26 August 2014 (26.08.2014)

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Authorized officer
BIAN, Kang
Telephone No.: (86-10) **62085045**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2014/078205

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Form PCT/ISA/210 (continuation of second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2014/078205

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