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Zhang et al.(10) **Pub. No.: US 2013/0023194 A1**(43) **Pub. Date: Jan. 24, 2013**(54) **INDOOR UNIT OF AIR CONDITIONER****Publication Classification**(75) Inventors: **Hui Zhang**, Zhuhai (CN); **Shaolin Chen**, Zhuhai (CN); **Jianqun Yang**, Zhuhai (CN); **Wenwei Ji**, Zhuhai (CN); **Zhi Meng**, Zhuhai (CN); **Jian Li**, Zhuhai (CN); **Liu Cao**, Zhuhai (CN)(51) **Int. Cl.**
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F24F 7/007 (2006.01)(52) **U.S. Cl.** **454/233; 454/234**(73) Assignee: **GREE ELECTRIC APPLIANCES, INC. OF ZHUHAI**, Zhuhai (CN)(21) Appl. No.: **13/638,609**(22) PCT Filed: **Mar. 25, 2011**(86) PCT No.: **PCT/CN2011/072171**

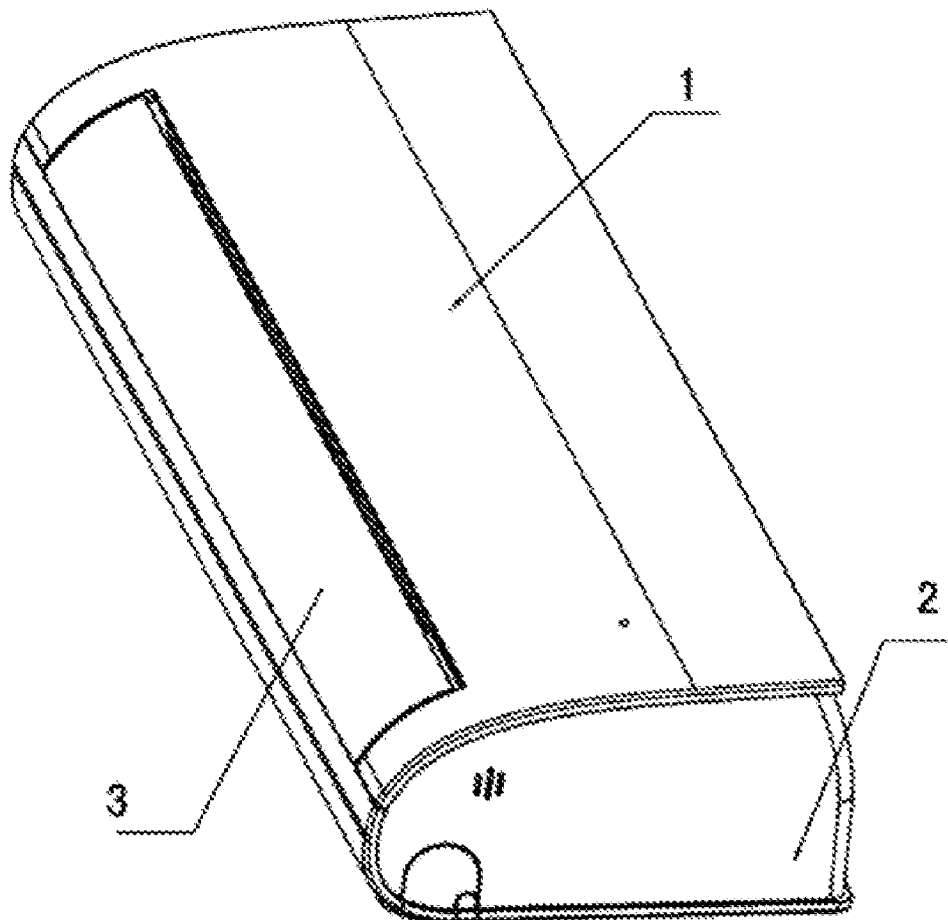
§ 371 (c)(1),

(2), (4) Date: **Sep. 30, 2012**(30) **Foreign Application Priority Data**

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(57) **ABSTRACT**

An indoor unit of air conditioner comprises: a panel body (2) enclosing side portions of the air conditioner for installing a front panel (1), a rear shell, and the front panel (1) closely connected to the panel body; the rear shell, the panel body (2) and the front panel (1) form an inner chamber of the air conditioner in which a heat exchanger (5), a control element, and a ventilating component (4) are provided; an air outlet is provided at a lower portion of the front panel (1), and an air deflector (3) is mounted on the front panel (1) or is arranged on the panel body (2) for opening or closing the air outlet; a vortex forming device is provided at a bottom surface of the air outlet. The vortex forming device is configured as a serrated surface with a plurality of concave grooves.



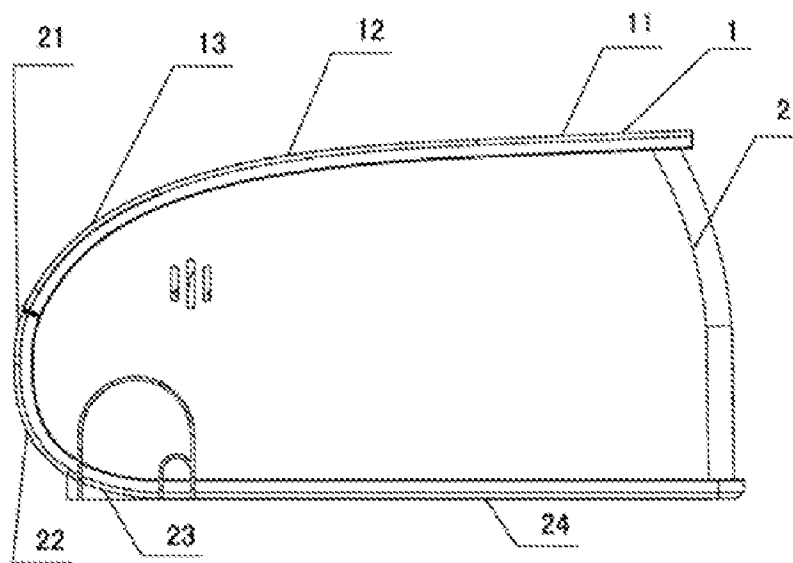


Fig. 1

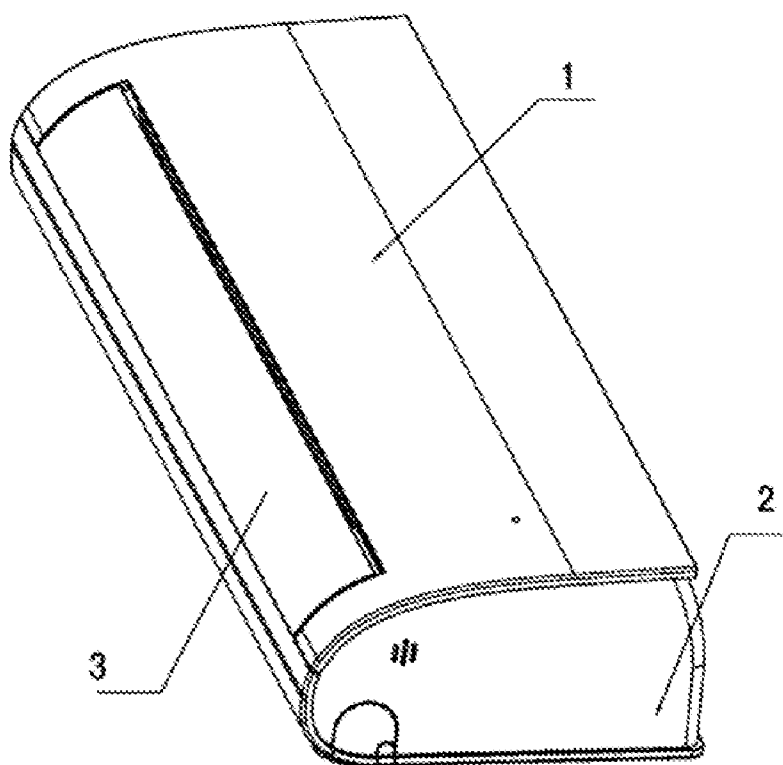


Fig. 2

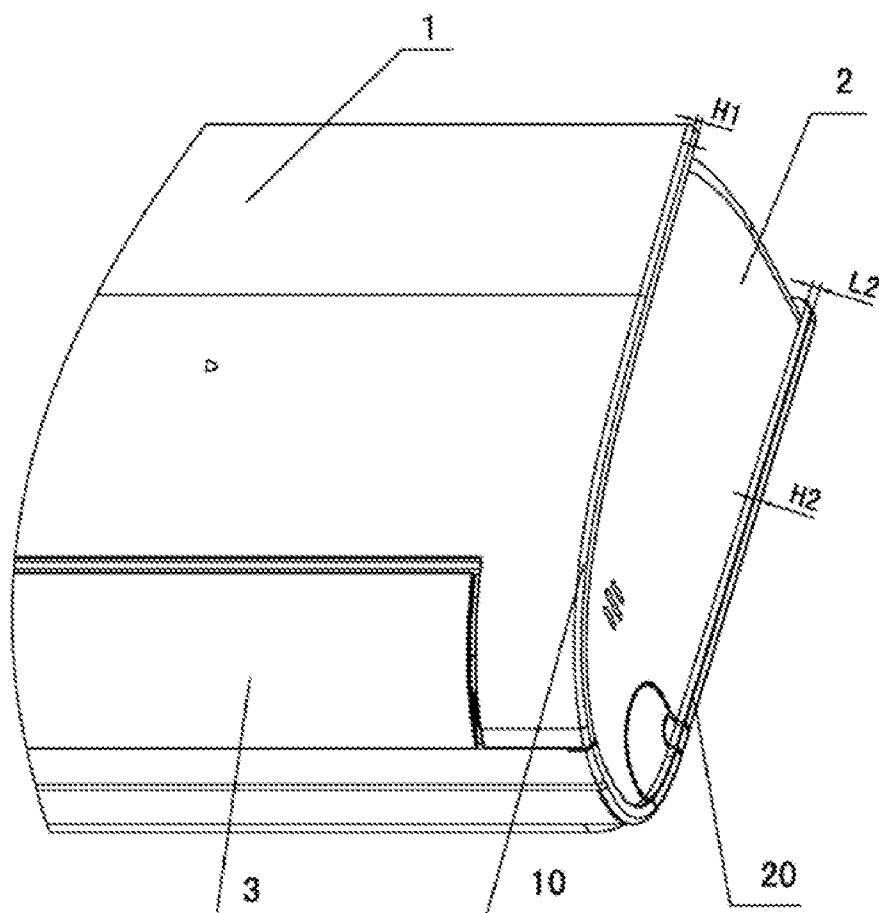


Fig. 3

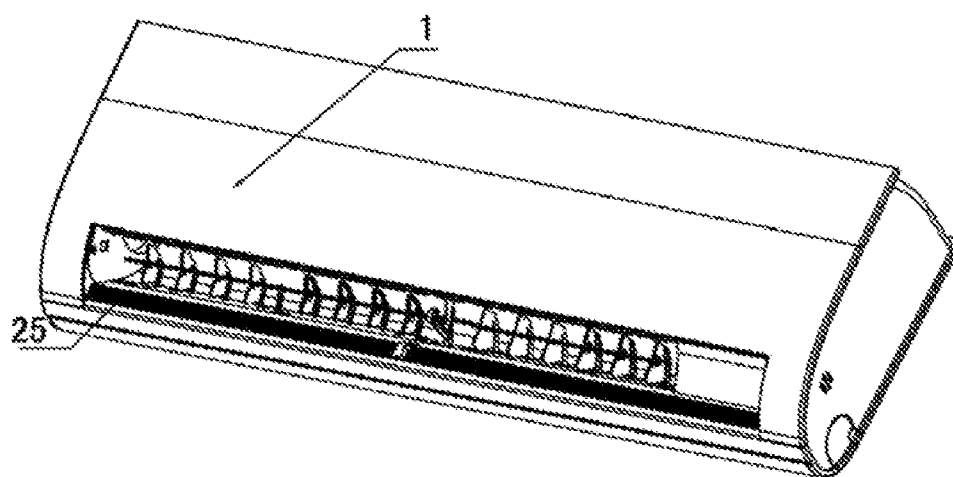


Fig. 4

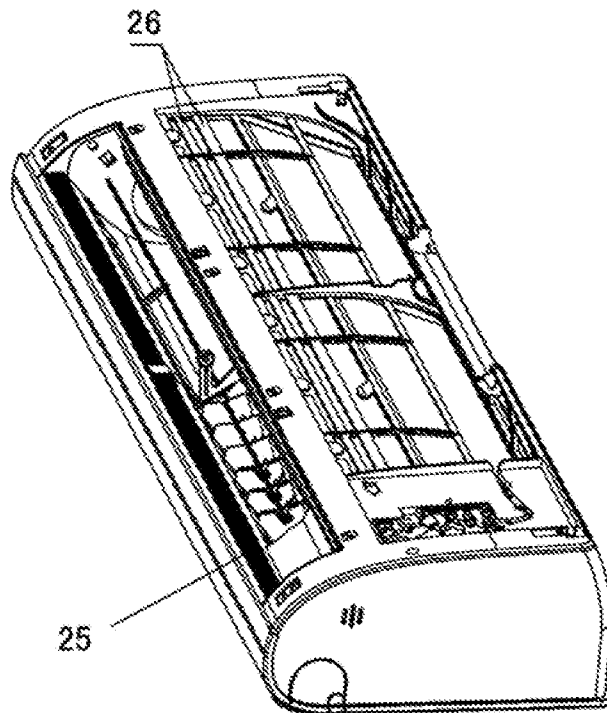


Fig. 5

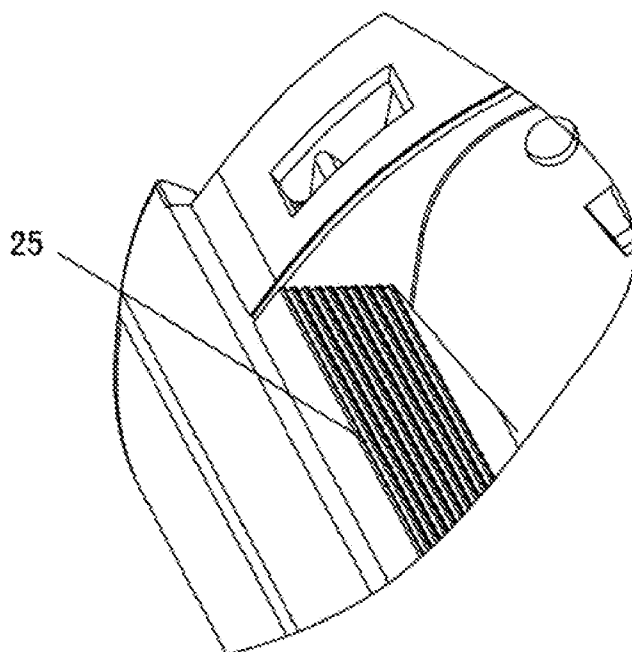


Fig. 6

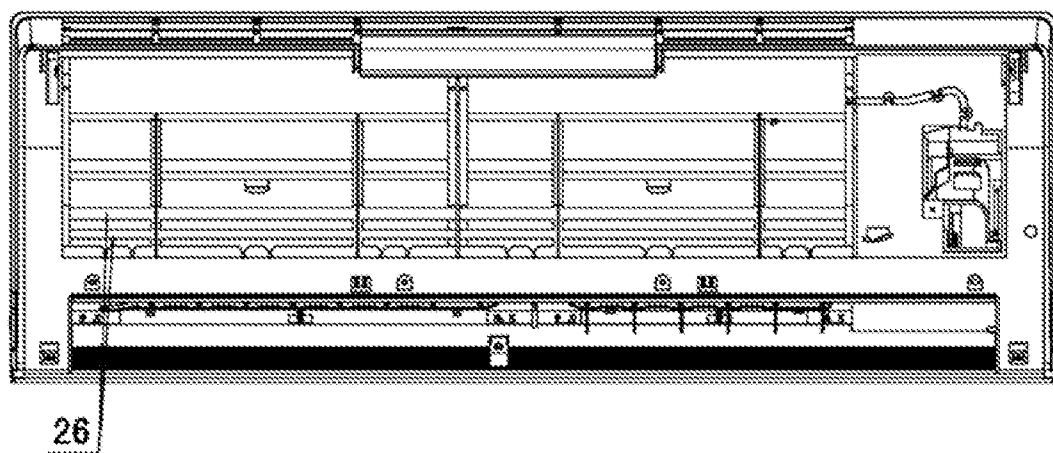


Fig. 7

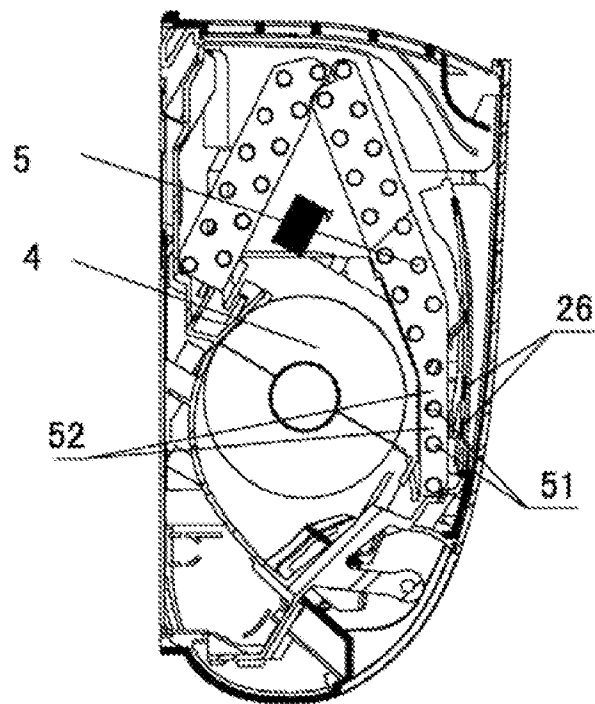


Fig. 8

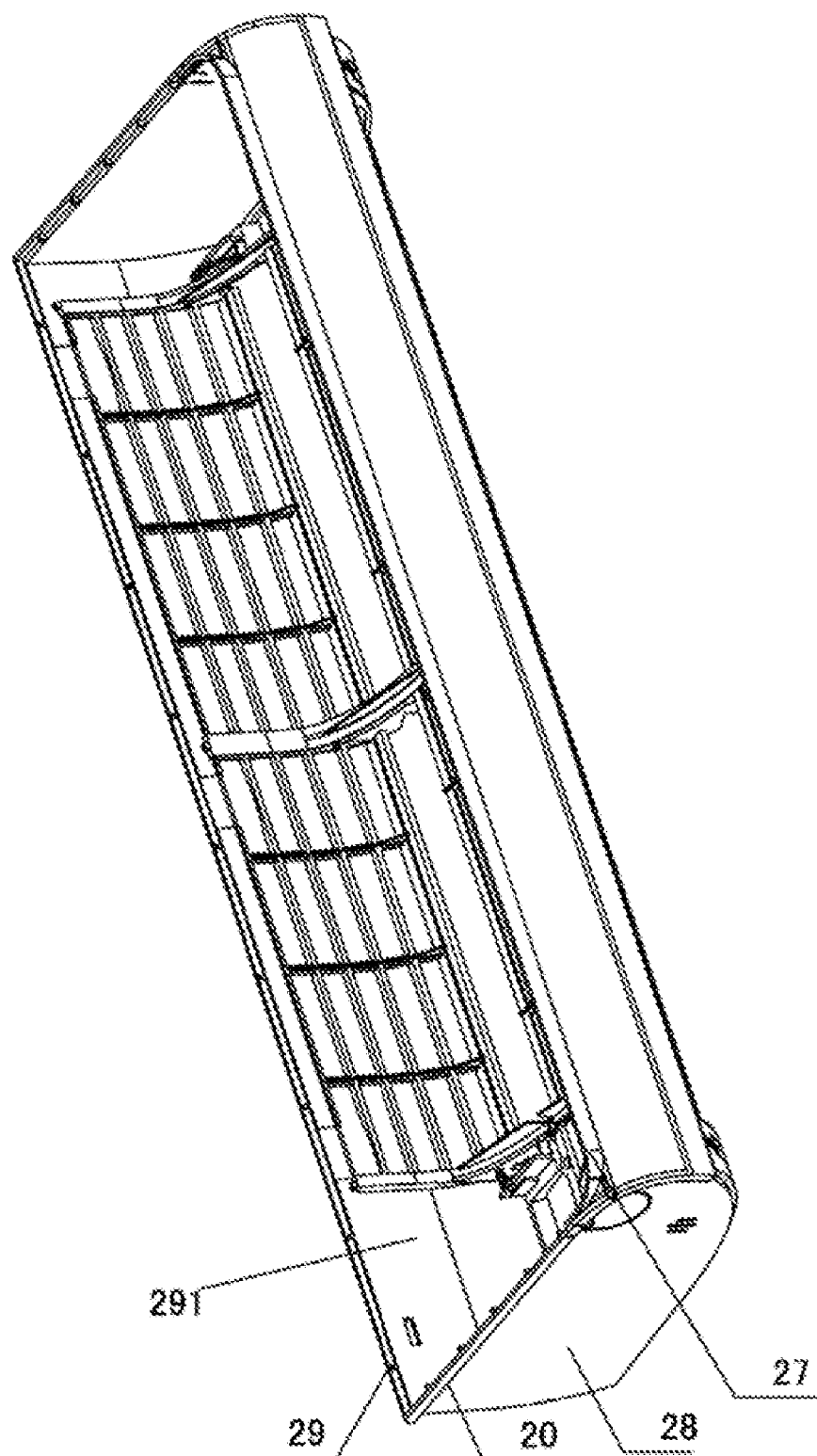


Fig. 9

INDOOR UNIT OF AIR CONDITIONER

[0001] The present application claims the benefit of priority to Chinese patent application No. 201020157467.4 titled "INDOOR UNIT OF AIR CONDITIONER", filed with the State Intellectual Property Office of China on Apr. 7, 2010, the entire disclosures of which is incorporated herein by reference.

TECHNICAL FIELD OF THE INVENTION

[0002] The present application relates to an indoor unit of air conditioner, and particularly, to an indoor unit of air conditioner with optimized performance and notable effects.

BACKGROUND OF THE INVENTION

[0003] Generally, an air conditioner is an apparatus which utilizes an air cooler, a heater or an air purifier to cool, warm or purify a room, such that an internal environment of the room becomes more comfortable. The air conditioner is provided with a ventilating device, an air cooling and heating device and an air purifier. The ventilating device makes the air forcibly circulated in the room, absorbs air for the room, performs heat exchanging or purifies the air, and then discharges the air into the room. Improvements have been continually made to the air conditioner in the prior art. Generally, an indoor unit of air conditioner comprises a rear shell enclosing side portions and a rear portion of the air conditioner, and a panel body arranged in front side of the air conditioner and closely connected to the rear shell. The rear shell and the panel body form an inner chamber of the air conditioner in which a heat exchanger, a control element and a ventilating component are provided. The panel body is usually fixedly connected to the rear shell in the manner of screw or clip. As air conditioner market becomes increasing mature, the requirement on the energy-saving performance of the air conditioner is higher and higher. There is a need to make improvements to the air conditioner so as to develop an air conditioner with a higher energy efficiency ratio to meet the requirement of the trend.

SUMMARY OF THE INVENTION

[0004] A purpose of the application is to provide an indoor unit of air conditioner which has a simple structure, improves the performance of the air conditioner and increases the energy efficiency ratio.

[0005] In order to achieve the above purpose, the application provides the following technical solutions.

[0006] An indoor unit of air conditioner comprising: a panel body enclosing side portions and a top portion of the air conditioner for installing a front panel, a rear shell enclosing a rear portion of the air conditioner, and the front panel arranged in the front of the air conditioner and closely connected to the panel body; the rear shell, the panel body and the front panel form an inner chamber of the air conditioner in which a heat exchanger, a control element, and a ventilating component are provided; an air outlet is provided at a lower portion of the front panel, an air deflector is mounted on the front panel or is arranged on the panel body for opening or closing the air outlet; wherein a vortex forming device is provided at a bottom surface of the air outlet.

[0007] The vortex forming device is configured as a serrated surface with a plurality of concave grooves.

[0008] To sum up, the application has the following advantageous effects:

[0009] In the indoor unit of air conditioner according to the application, since the vortex forming device is provided at the bottom surface of the air outlet and the vortex forming device is configured as a serrated surface with a plurality of concave grooves, air flow passing through the heat exchanger can form a vortex flow at the serrated surface, which can ensure a relatively even temperature at the air outlet, and avoid forming condensate water due to a partially large temperature difference. Thus the condensation could be improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 is a side structural schematic view of an indoor unit of air conditioner according to the application;

[0011] FIG. 2 is a perspective structural schematic view of an indoor unit of air conditioner according to the application;

[0012] FIG. 3 is a schematic view of a skirt structure of an indoor unit of air conditioner according to the application;

[0013] FIG. 4 is an overall structural schematic view of an indoor unit of air conditioner according to the application;

[0014] FIG. 5 is a structural schematic view of a panel body of an indoor unit of air conditioner according to the application;

[0015] FIG. 6 is a structural schematic view of a bottom surface of an air outlet of a panel body of an indoor unit of air conditioner according to the application;

[0016] FIG. 7 is a front structural schematic view of a panel body of an indoor unit of air conditioner according to the application;

[0017] FIG. 8 is a structural schematic view of a panel body of an indoor unit of air conditioner according to the application; and

[0018] FIG. 9 is a rear structural schematic view of a panel body of an indoor unit of air conditioner according to the application.

REFERENCE NUMERALS

[0019] 1. front panel; 2. panel body; 10. front panel skirt structure; 20. panel body skirt structure; 11. first combining surface; 12. second combining surface; 13. third combining surface; 21. fourth combining surface; 22. fifth combining surface; 23. sixth combining surface; 24. seventh combining surface; 25. serrated surface; 26. wind-proof rib; 27. rear boss; 28. side plate; 29. rear frame; 291. opening; 3. air deflector; 4. ventilating component; 5. heat exchanger; 51. copper pipe; 52. fin

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0020] The application provides an indoor unit of air conditioner. As shown in FIGS. 1, 2, 5 and 6, the indoor unit of air conditioner comprises: a panel body 2 enclosing side portions and a top portion of the air conditioner for installing a front panel, a rear shell enclosing a rear portion of the air conditioner, and the front panel 1 arranged in the front of the air conditioner and closely connected to the panel body; the rear shell, the panel body 2 and the front panel 1 form an inner chamber of the air conditioner in which a heat exchanger 5, a control element, and a ventilating component 4 are provided; an air outlet is provided at a lower portion of the front panel 1, an air deflector is mounted on the front panel 1 or is arranged

on the panel body 2 for opening or closing the air outlet; wherein, a vortex forming device is provided at a bottom surface of the air outlet.

[0021] The vortex forming device is configured as a serrated surface 25 with a plurality of concave grooves. Air flow passing through the heat exchanger 5 can form a vortex flow at the serrated surface 25, which can ensure a relatively uniform temperature at the air outlet, and avoid forming condensate water due to a partially large temperature difference. Thus the condensation could be improved.

[0022] As shown in FIGS. 1, 2, 5, 7 and 8, windproof ribs 26 are provided on the panel body 1, and windproof ribs 26 locate in a region between the front panel and the heat exchanger.

[0023] The windproof ribs 26 comprise more than one horizontal windproof ribs.

[0024] The windproof ribs 26 further comprise more than one connecting strips distributed at intervals in a direction perpendicular to the horizontal windproof ribs.

[0025] The heat exchanger 5 includes fins 52 and a plurality of copper pipes 51 penetrating the fins 52. The horizontal windproof ribs are arranged in front of a gap between two adjacent copper pipes 51, which are close to an air outlet region of the ventilating component 4, of the heat exchanger 5.

[0026] The rear shell is mounted at the rear portion of the panel body 2. The front lower portion of the panel body 2 is closely spliced to a bottom portion of the front panel 1. The side surfaces of the indoor unit of air conditioner are of a U shape structure. The front, rear and bottom surfaces of the lower portion of the indoor unit of air conditioner are formed by more than one curved surface.

[0027] The front panel 1 comprises, from the top downwards in sequence, a first combining surface 11, a second combining surface 12 and a third combining surface 13. The sectional profile line of the first combining surface 11 is of a straight line segment or an arc line with a curvature approaching to zero. The sectional profile line of the second combining surface 12 is of a curve with a curvature gradually increased from top to bottom, and the maximum curvature is less than or equal to 0.025. The sectional profile line of the third combining surface 13 is of a curve with a curvature gradually decreased from top to bottom, and the minimum curvature is larger than 0.0005.

[0028] A combination of the panel body 2 and the rear shell comprises, from front end backwards in sequence, a fourth combining surface 21, a fifth combining surface 22, a sixth combining surface 23 and a seventh combining surface 24.

[0029] The sectional profile lines of the fourth combining surface 21, the fifth combining surface 22, the sixth combining surface 23 and the seventh combining surface 24 have different curvatures, respectively, such that a bottom of the air conditioner has an arc transition structure.

[0030] As shown in FIGS. 3, 4 and 9, the front panel 1 covers the front of the panel body 2, and the width of the front panel 1 is larger than the width of the front portion of the panel body 2, thereby a front panel skirt structure 10 is formed at at least one side of joint between the front panel 1 and the panel body 2. As shown in FIGS. 3 and 6, the panel body 2 comprises a rear frame 29 at a rear portion, a left side plate 28 and a right side plate 28. At least one side of the rear frame 29 protrudes outside the side plate 28 and forms a panel body skirt structure 20. The front panel skirt structure 10 and the

panel body skirt structure 20 are connected to form a U shape decorative edge of side portion of the indoor unit of air conditioner.

[0031] Preferably, each of a left side and a right side of the joint of the front panel 1 and the panel body 2 is formed with the skirt structure 10, and each of a left side and a right side of the panel body 2 is formed with the panel body skirt structure 20, and each of a left side and a right side of the indoor unit has a decorative edge.

[0032] Top portions of the front panel 1 and the rear frame 29 are higher than a top surface of the rear shell.

[0033] The width of the front panel skirt structure 10 and the width L2 of the panel body skirt structure 20 are between 2 and 8 mm, and preferably are 4 mm. The height H1 of the front panel skirt structure 10 and the height H2 of the panel body skirt structure 20 are between 3 and 10 mm, and preferably are 8 mm.

[0034] As shown in FIG. 6, an opening 291 for installing the rear shell is provided at a back portion of the panel body 2, and a rear boss 27 is provided at a lower edge of the opening 291. After the air conditioner is mounted, the rear boss 27 withstands a wall to form an installing space for a drain pipe and a refrigerant connecting pipe between the rear shell and the wall.

[0035] The rear boss 27 is arranged in a transverse direction, and has upward bending portions at left and right ends thereof.

[0036] The size of the rear boss 27 in a horizontal direction is less than that of the rear frame 29.

[0037] The above embodiments are not intended to limit the application. Various improvements and variations made by the person skilled in the art, without departing from the scope of the application, are deemed to fall into the protection scope of the application.

What is claimed is:

1. An indoor unit of air conditioner comprising: a panel body (2) enclosing side portions and a top portion of the air conditioner for installing a front panel, a rear shell enclosing a rear portion of the conditioner, and the front panel (1) arranged in the front of the air conditioner and closely connected to the panel body; the rear shell, the panel body (2) and the front panel (1) form an inner chamber of the air conditioner in which a heat exchanger (5), a control element, and a ventilating component (4) are provided; an air outlet is provided at a lower portion of the front panel (1), and an air deflector is mounted on the front panel (1) or is arranged on the panel body (2) for opening or closing the air outlet; wherein, a vortex forming device is provided at a bottom surface of the air outlet.

2. The indoor unit of air conditioner according to claim 1, wherein the vortex forming device is configured as a serrated surface (25) with a plurality of concave grooves.

3. The indoor unit of air conditioner according to claim 2, wherein windproof ribs (26) are provided on the panel body (1), the windproof ribs locate in a region between the front panel and the heat exchanger.

4. The indoor unit of air conditioner according to claim 3, wherein the windproof ribs (26) comprise more than one horizontal windproof ribs.

5. The indoor unit of air conditioner according to claim 4, wherein the windproof ribs (26) comprise more than one connecting strips distributed at intervals in a direction perpendicular to the horizontal windproof ribs.

6. The indoor unit of the air conditioner according to claim 5, wherein the heat exchanger (5) comprises fins (52) and a plurality of copper pipes (51) penetrating the fins, and the horizontal windproof ribs are arranged in front of a gap between two adjacent copper pipes (51), which are close to an air outlet region of the ventilating component (4), of the heat exchanger (5).

7. The indoor unit of air conditioner according to claim 1, wherein the rear shell is mounted at the rear portion of the panel body (2), the front lower portion of the panel body (2) is closely spliced to a bottom portion of the front panel (1), the side surfaces of the indoor unit of air conditioner are of a U shape structure, and the front, rear and bottom surfaces of the lower portion of the indoor unit of the air conditioner are formed by more than one curved surface.

8. The indoor unit of air conditioner according to claim 7, wherein the front panel (1) comprises, from top downwards in sequence, a first combining surface (11), a second combining surface (12) and a third combining surface (13); the sectional profile line of the first combining surface (11) is of a straight line segment or an arc line with a curvature approaching to zero; the sectional profile line of the second combining surface (12) is of a curve with a curvature gradually increased from top to bottom, the maximum curvature is less than or equal to 0.025; and the sectional profile line of the third combining surface (13) is of a curve with a curvature gradually decreased from top to bottom, the minimum curvature is larger than 0.0005.

9. The indoor unit of air conditioner according to claim 8, wherein the front panel (1) covers the front of the panel body (2), and the width of the front panel (1) is larger than the width of the front portion of the panel body (2), thereby a front panel skirt structure (10) is formed at at least one side of joint between the front panel (1) and the panel body (2); the panel body (2) comprises a rear frame (29) at the rear portion of the panel body (2), a left side plate (28) and a right side plate (28), at least one side of the rear frame (29) protrudes outside the side plate (28) and forms a panel body skirt structure (20); the front panel skirt structure (10) and the panel body skirt structure (20) are connected to form a U shape side decorative edge of the indoor unit of air conditioner.

10. The indoor unit of air conditioner according to claim 9, wherein an opening (291) for installing the rear shell is provided at a back portion of the panel body (2), and a rear boss (27) is provided at a lower edge of the opening (291).

11. The indoor unit of air conditioner according to claim 2, wherein the rear shell is mounted at the rear portion of the panel body (2), the front lower portion of the panel body (2) is closely spliced to a bottom portion of the front panel (1), the side surfaces of the indoor unit of air conditioner are of a U shape structure, and the front, rear and bottom surfaces of the lower portion of the indoor unit of the air conditioner are formed by more than one curved surface.

12. The indoor unit of air conditioner according to claim 11, wherein the front panel (1) comprises, from top downwards in sequence, a first combining surface (11), a second combining surface (12) and a third combining surface (13); the sectional profile line of the first combining surface (11) is of a straight line segment or an arc line with a curvature approaching to zero; the sectional profile line of the second combining surface (12) is of a curve with a curvature gradually increased from top to bottom, the maximum curvature is less than or equal to 0.025; and the sectional profile line of the

third combining surface (13) is of a curve with a curvature gradually decreased from top to bottom, the minimum curvature is larger than 0.0005.

13. The indoor unit of air conditioner according to claim 12, wherein the front panel (1) covers the front of the panel body (2), and the width of the front panel (1) is larger than the width of the front portion of the panel body (2), thereby a front panel skirt structure (10) is formed at at least one side of joint between the front panel (1) and the panel body (2); the panel body (2) comprises a rear frame (29) at the rear portion of the panel body (2), a left side plate (28) and a right side plate (28), at least one side of the rear frame (29) protrudes outside the side plate (28) and forms a panel body skirt structure (20); the front panel skirt structure (10) and the panel body skirt structure (20) are connected to form a U shape side decorative edge of the indoor unit of air conditioner.

14. The indoor unit of air conditioner according to claim 13, wherein an opening (291) for installing the rear shell is provided at a back portion of the panel body (2), and a rear boss (27) is provided at a lower edge of the opening (291).

15. The indoor unit of air conditioner according to claim 3, wherein the rear shell is mounted at the rear portion of the panel body (2), the front lower portion of the panel body (2) is closely spliced to a bottom of the front panel (1), the side surfaces of the indoor unit of air conditioner are of a U shape structure, and the front, rear and bottom surfaces of the lower portion of the indoor unit of the air conditioner are formed by more than one curved surface.

16. The indoor unit of air conditioner according to claim 15, wherein the front panel (1) comprises, from top downwards in sequence, a first combining surface (11), a second combining surface (12) and a third combining surface (13); the sectional profile line of the first combining surface (11) is of a straight line segment or an arc line with a curvature approaching to zero; the sectional profile line of the second combining surface (12) is of a curve with a curvature gradually increased from top to bottom, the maximum curvature is less than or equal to 0.025; and the sectional profile line of the third combining surface (13) is of a curve with a curvature gradually decreased from top to bottom, the minimum curvature is larger than 0.0005.

17. The indoor unit of air conditioner according to claim 16, wherein the front panel (1) covers the front of the panel body (2), and the width of the front panel (1) is larger than the width of the front portion of the panel body (2), thereby a front panel skirt structure (10) is formed at at least one side of joint between the front panel (1) and the panel body (2); the panel body (2) comprises a rear frame (29) at the rear portion of the panel body (2), a left side plate (28) and a right side plate (28), at least one side of the rear frame (29) protrudes outside the side plate (28) and forms a panel body skirt structure (20); the front panel skirt structure (10) and the panel body skirt structure (20) are connected to form a U shape side decorative edge of the indoor unit of air conditioner.

18. The indoor unit of air conditioner according to claim 17, wherein an opening (291) for installing the rear shell is provided at a back portion of the panel body (2), and a rear boss (27) is provided at a lower edge of the opening (291).

19. The indoor unit of air conditioner according to claim 4, wherein the rear shell is mounted at the rear portion of the panel body (2), the front lower portion of the panel body (2) is closely spliced to a bottom portion of the front panel (1), the side surfaces of the indoor unit of air conditioner are of a U shape structure, and the front, rear and bottom surfaces of the

lower portion of the indoor unit of the air conditioner are formed by more than one curved surface.

20. The indoor unit of air conditioner according to claim **5**, wherein the rear shell is mounted at the rear portion of the panel body (**2**), the front lower portion of the panel body (**2**) is closely spliced to a bottom portion of the front panel (**1**), the

side surfaces of the indoor unit of air conditioner are of a U shape structure, and the front, rear and bottom surfaces of the lower portion of the indoor unit of the air conditioner are formed by more than one curved surface.

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