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(54) **AIR FLOW DIRECTION CHANGING DEVICE FOR AIR CONDITIONING DEVICE**

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(57) **ABSTRACT**

An air flow direction changing device of an air conditioning device according to the present invention includes: a lateral louver which is rotatably provided on the front side of a blowout port of a cabinet; a control section which changes the blowout direction of air sent from a fan by rotatably driving and controlling the lateral louver in the front surface of the blowout port; and a straightening plate which is provided on the rear side of the lateral louver in the blowout port and straighten the air flow from the fan located on the rear side in the passageway, and is configured such that the control section improves the blowing performance by controlling the rotation attitude of the lateral louver in such a manner that, when the lateral louver is held in an upward blowout attitude, an air blowing guide passage longer than the depth length of the lateral louver itself is formed by cooperation of the upper surface of the lateral louver with the upper surface of the straightening plate.

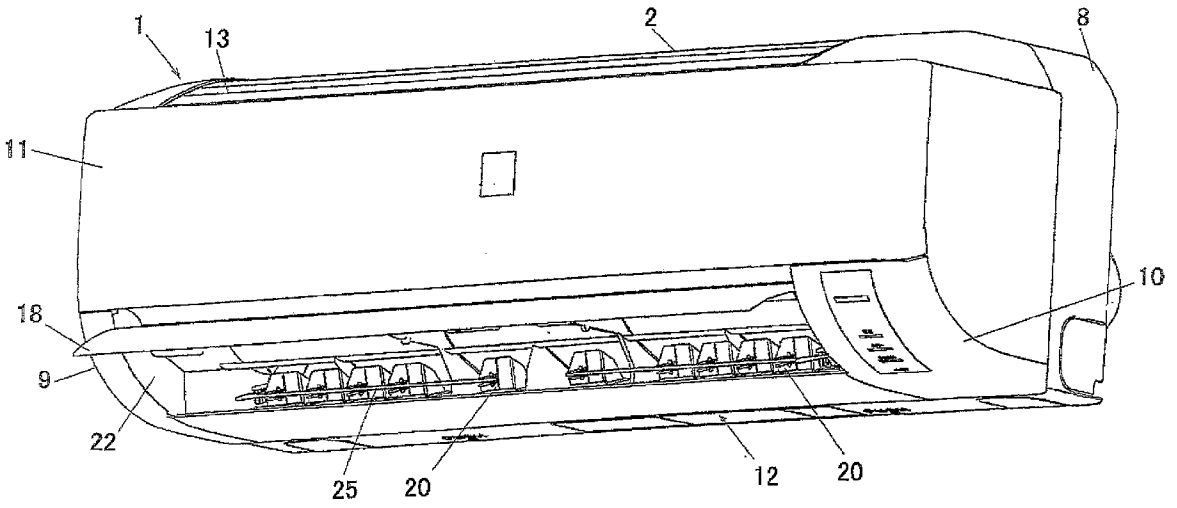


FIG. 1

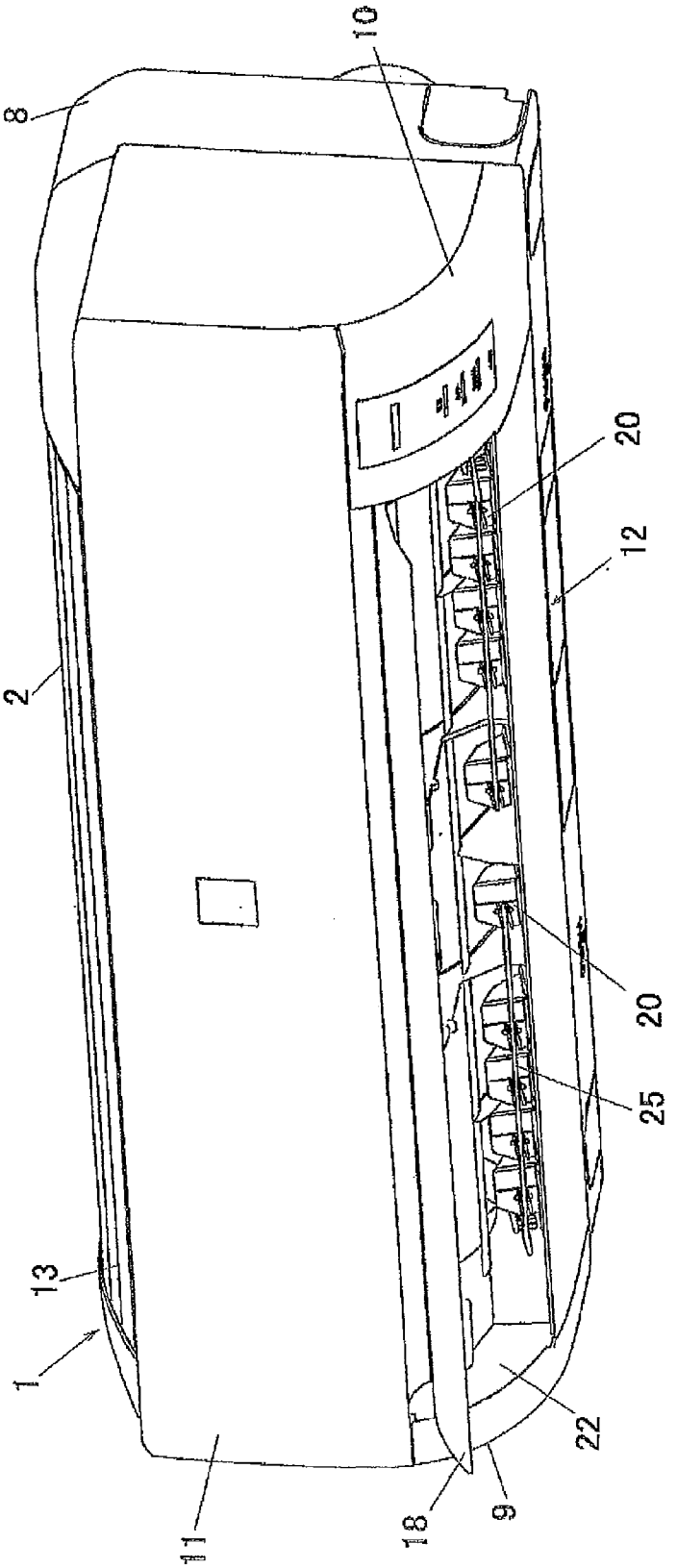


FIG. 2

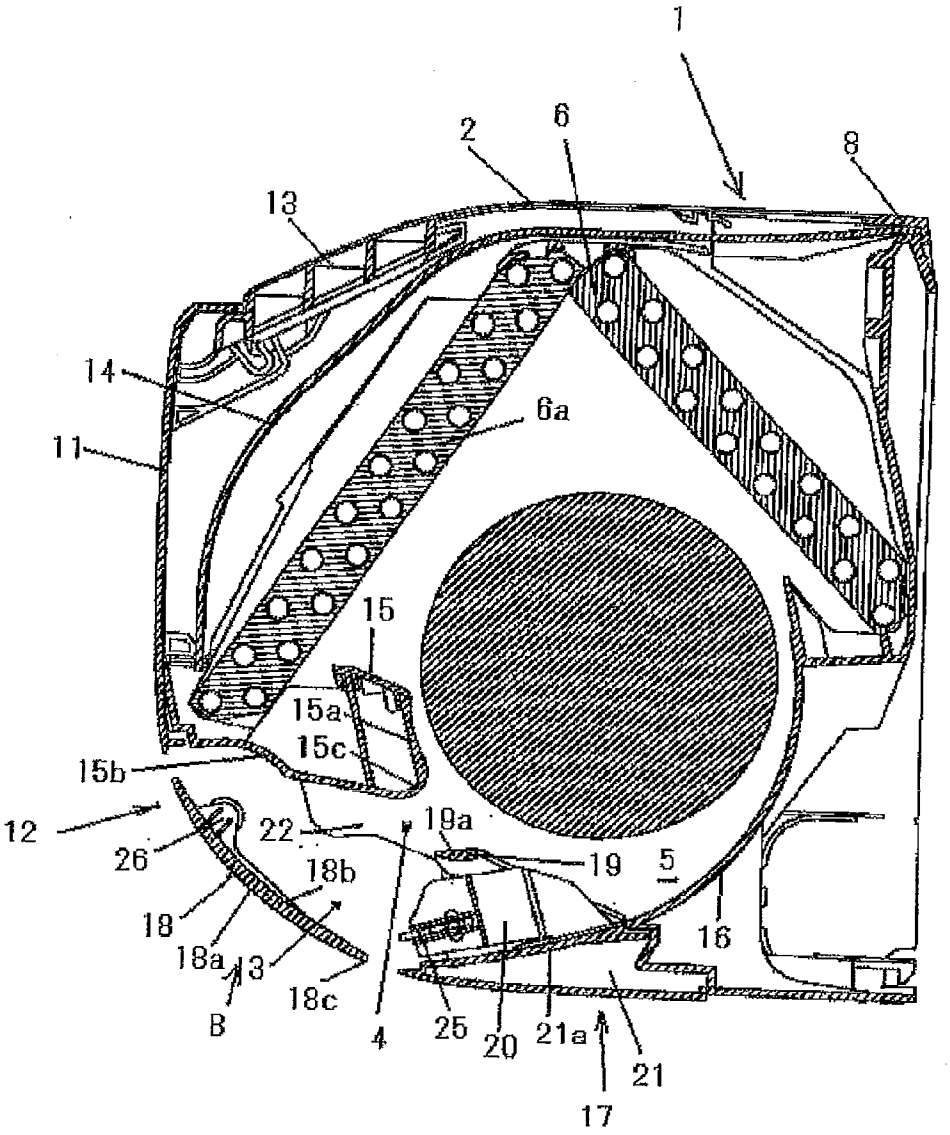

1
2
6
8
13
14
6a
11
15
15a
15c
15b
12
22
19a
26
19
5
18b
18
16
18a
13
18c
B
4
25
20
21a
21
17

FIG. 3

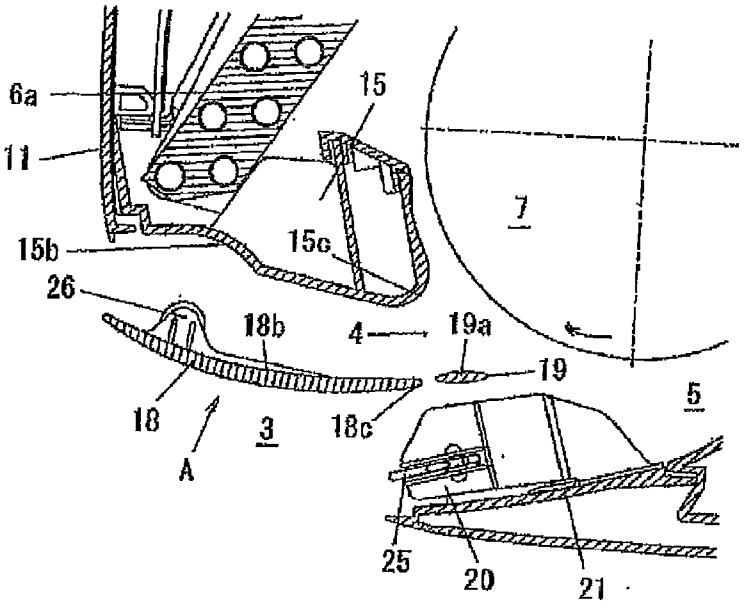

6a
11
15
7
15b
15c
26
18b
4
19a
19
5
18
3
18c
A
25
20
21

FIG. 4

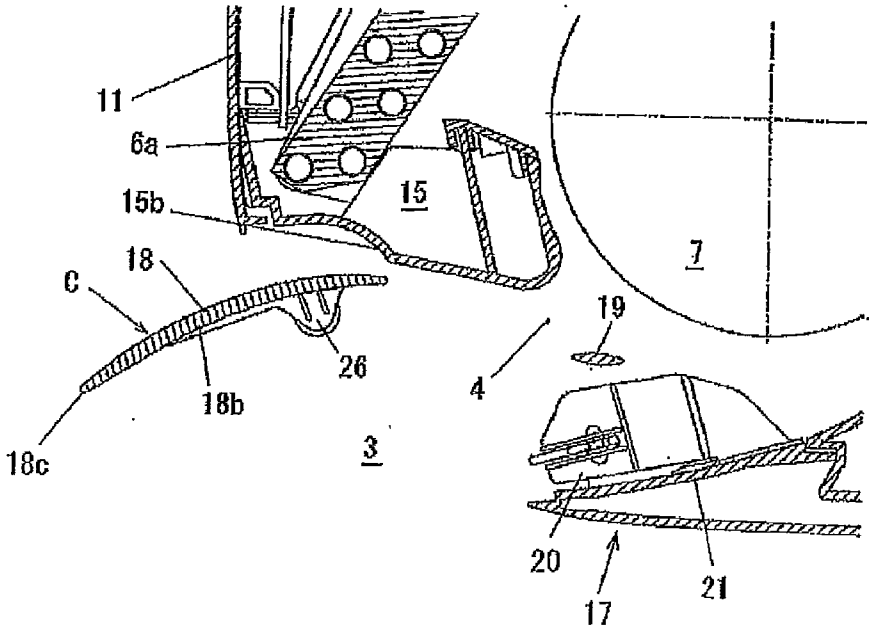

11
6a
15
15b
7
18
C
19
26
4
18b
18c
3
20
21
17

FIG. 5

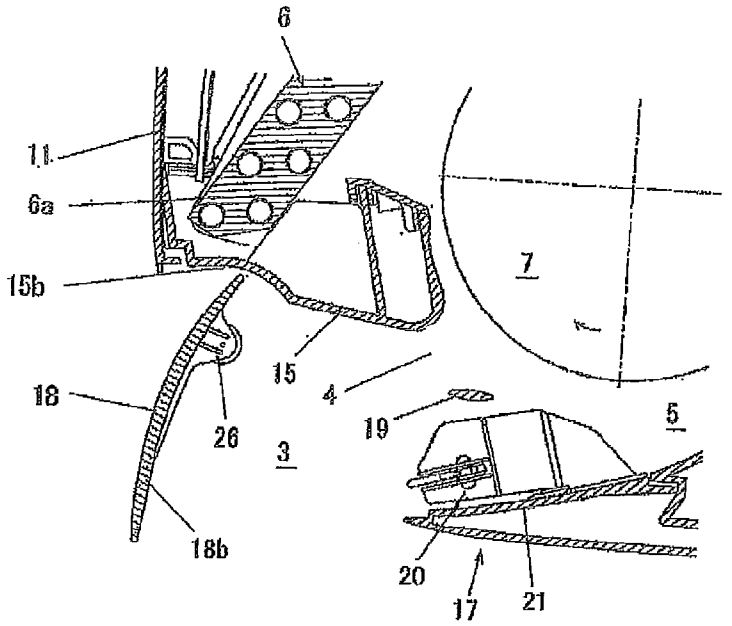

6
11
6a
15b
7
15
4
18
26
19
5
3
18b
20
17
21

FIG. 6

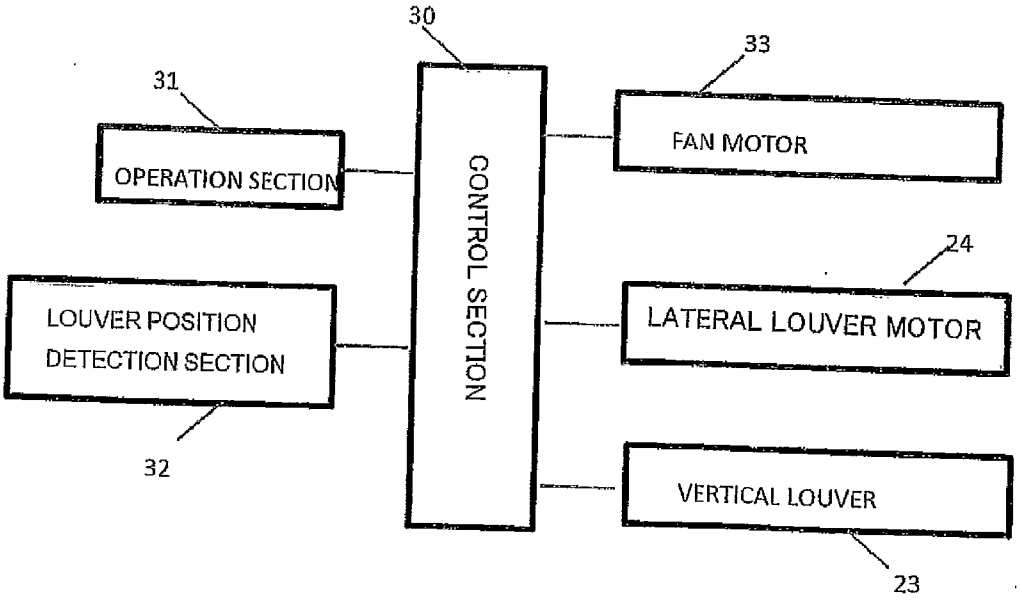
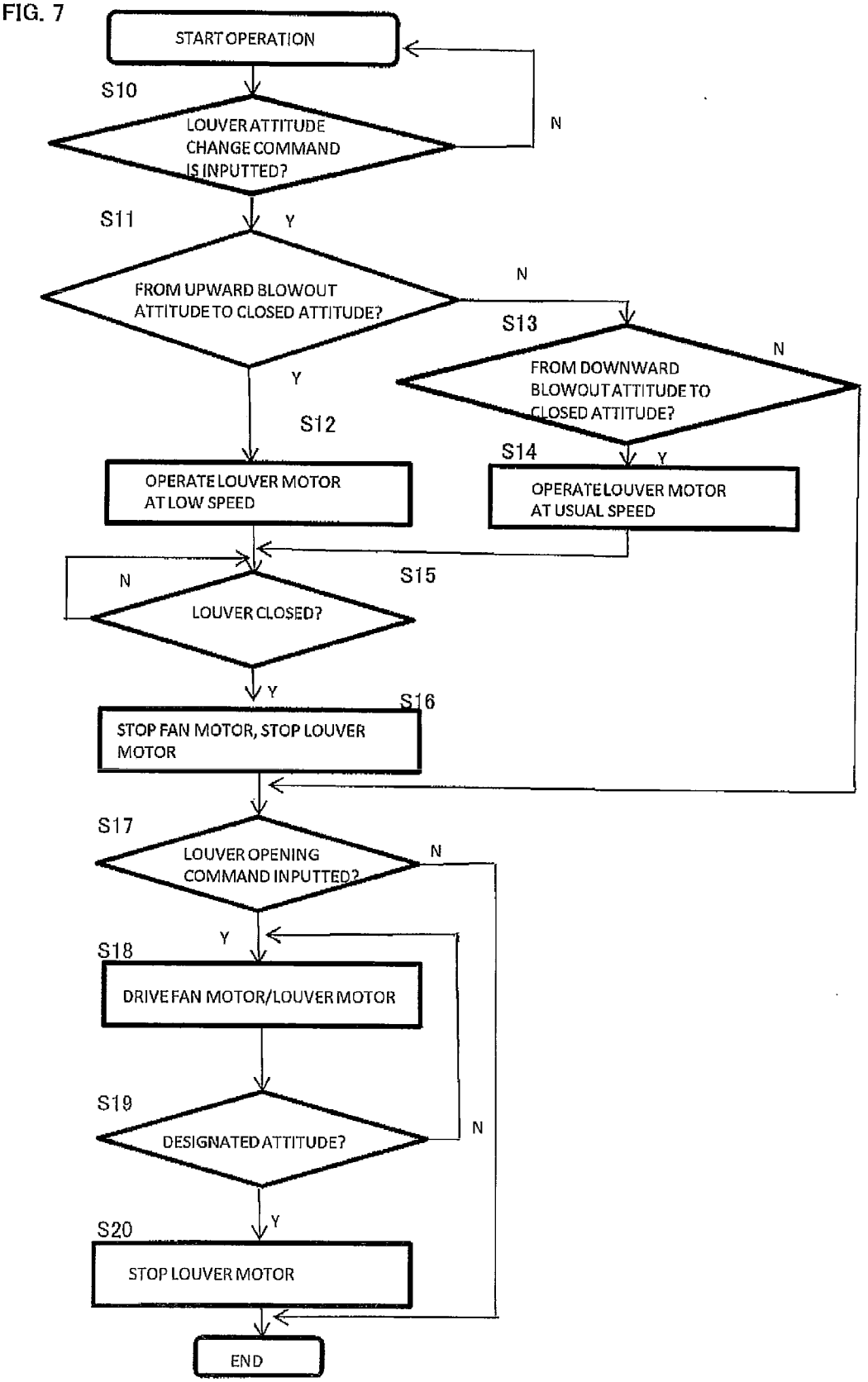

30
31
33
OPERATION SECTION
FAN MOTOR
CONTROL SECTION
24
LOUVER POSITION
DETECTION SECTION
LATERAL LOUVER MOTOR
32
VERTICAL LOUVER
23

FIG. 7


START OPERATION
S10
LOUVER ATTITUDE CHANGE COMMAND IS INPUTTED?
N
Y
S11
FROM UPWARD BLOWOUT ATTITUDE TO CLOSED ATTITUDE?
N
Y
S13
FROM DOWNWARD BLOWOUT ATTITUDE TO CLOSED ATTITUDE?
N
Y
S12
OPERATE LOUVER MOTOR AT LOW SPEED
S14
OPERATE LOUVER MOTOR AT USUAL SPEED
S15
N
LOUVER CLOSED?
Y
S16
STOP FAN MOTOR, STOP LOUVER MOTOR
S17
LOUVER OPENING COMMAND INPUTTED?
N
Y
S18
DRIVE FAN MOTOR/LOUVER MOTOR
S19
DESIGNATED ATTITUDE?
N
Y
S20
STOP LOUVER MOTOR
END

AIR FLOW DIRECTION CHANGING DEVICE FOR AIR CONDITIONING DEVICE

TECHNICAL FIELD

[0001] The present invention relates to an air conditioning device including an air flow direction changing device which changes the direction of air blown out from a blowout port of a cabinet.

BACKGROUND ART

[0002] When the air flow direction control of an air passageway is performed in an air conditioning device, an air guide panel configured to freely open and close a front opening of a cabinet, and an auxiliary louver arranged near a blowout port located on the rear side of the air guide panel are controlled (see Patent Literature 1). However, since the air guide panel and the auxiliary louver are respectively arranged near the blowout port and also independently controlled, the air blowing performance is influenced by the length of the auxiliary louver and of the air guide panel. Therefore, in an air conditioning device whose size and cost are to be reduced, it is difficult to improve the air blowing performance by using a configuration in which both the auxiliary louver and the air guide panel are simultaneously assembled.

[0003] For this reason, as another method for improving the air blowing performance by using either the panel structure or the auxiliary louver, a method is conceivable in which the size (depth length) of the auxiliary louver (lateral louver) is increased to improve the air blowing performance. However, when the lateral louver which freely changes the air flow direction is used in a portion of the blowout port, the air blowing performance is influenced by the rotational angle and the shape of the lateral louver, and further by the operation torque of the lateral louver, the increase in the depth length of the auxiliary louver is limited and may result in cost increase.

[0004] In Patent Literature 2, an air conditioning device is disclosed in which a horizontal blade corresponding to the lateral louver, and an auxiliary plate located on the rear side of the horizontal blade are used, and in which air passing between the auxiliary plate and a guide plate provided on the rear surface side of the air passageway is guided along the guide plate so that discharge air can be made to flow along the guide plate even by using the guide plate having a length shorter than the length of a conventional guide plate.

CITATION LIST

Patent Literature

[0005] Patent Literature 1: Japanese Patent Laid-Open No. 2008-138892

[0006] Patent Literature 2: Japanese Utility Model Laid-Open No. 61-29221 (microfilm)

SUMMARY OF INVENTION

Technical Problem

[0007] However, the air conditioning device disclosed in Patent Literature 2 provides only an improvement in the air blowing structure between the auxiliary plate and the guide plate, and provides no contribution to the improvement of the air blowing performance that sends air to a distant place by using the horizontal blade (horizontal louver).

[0008] In view of the above, it is an object of the present invention to provide an air flow direction changing device of an air conditioning device, the air flow direction changing device being capable of improving the air blowing performance without enlarging the shape of the lateral louver.

Solution to Problem

[0009] In order to achieve the above described object, an air flow direction changing device of an air conditioning device according to the present invention is featured by including: a blowout port formed in a front surface of an air passageway in a cabinet; a lateral louver rotatably provided on the front side of the blowout port; a control section configured to change the blowout direction of air sent from a fan by rotatably driving and controlling the lateral louver in the front surface of the blowout port; and a straightening plate which is provided on the rear side of the lateral louver in the blowout port and straighten the air flow from the fan located on the rear side in the passageway, and is featured in that the control section controls the rotation attitude of the lateral louver so that, when the lateral louver is held in an upward blowout attitude, an air blowing guide passage longer than the length of the lateral louver itself is formed by cooperation of the upper surface of the lateral louver with the upper surface of the straightening plate.

[0010] In the above-described configuration, the control section performs the rotation control of the lateral louver. The control section controls the rotation attitude of the lateral louver so that, when the lateral louver is held in the upward blowout attitude, the air blowing guide passage is formed by cooperation of the upper surface of the lateral louver with the upper surface of the straightening plate. At this time, the lateral louver and the straightening plate are integrated together in a pseudo manner, so as to form the air blowing guide passage longer than the air blowing guide passage of the lateral louver itself. Thereby, it is possible to improve the air blowing performance by combining the existing straightening plate and the existing lateral louver with each other.

[0011] In this way, it is possible to provide a blowout port structure which is compact and capable of reducing cost while improving the air blowing performance without increasing the number of components and without increasing the depth length of the lateral louver itself, that is, without increasing the length of the plate surface of the lateral louver in the direction perpendicular to the left and right direction.

[0012] Here, the lateral louver is configured by one lateral louver member, and is arranged to cover the front opening of the cabinet when the lateral louver is held in a closed attitude. The lateral louver can be formed to have a curved surface shape corresponding to the curved surface shape of the front opening of the cabinet. Thereby, the lateral louver can close the blowout port so as to configure a part of the exterior portion of the cabinet.

[0013] Note that the lateral louver can take the closed attitude in which the lateral louver closes the opening of the cabinet, the upward blowout attitude in which the lower end of the lateral louver is rotated to the side of the straightening plate so that the air blowing guide passage is formed by cooperation of the upper surface of the lateral louver with the upper surface of the straightening plate, and a downward blowout attitude in which the lower end of the lateral louver is exposed to the outside of the cabinet so as to guide downward the air blown out from the blowout port. The lateral louver is made rotatable between the upward blowout attitude and the downward blowout attitude. The closed attitude, in which the opening of the cabinet is closed by the lateral louver, exists

between the upward blowout attitude and the downward blowout attitude of the lateral louver.

[0014] The rotary shaft of the lateral louver may be arranged at any position of the louver. For example, the rotary shaft may be arranged at the central position of the lateral louver in the depth direction, or may also be arranged at a position close to the upper end position of the lateral louver.

[0015] Further, in the state where the lateral louver is held in the upward blowout attitude, the inner surface side of the lateral louver is formed in a recessed curved surface. Thereby, the air blowing guide passage longer than the length of the lateral louver itself can be formed by cooperation of the inner surface side of the lateral louver with the straightening plate arranged on the rear side of the lateral louver. The inner surface side of the lateral louver is formed in the recessed curved surface. Therefore, the air blowing guide passage enables the air blown out from the blowout port to be blown out along the recessed curved surface in the obliquely upward direction so as to be sent to a distant place.

[0016] Further, a plurality of vertical louvers are arranged on the rear side of the lateral louver in a swingable manner, so that the direction of air from the fan can be changed in the left and right direction. The direction of the air blown out from the blowout port can be changed by the plurality of vertical louvers, so that the air can be sent to a most suitable place.

Advantageous Effects of Invention

[0017] As described above, according to the present invention, the rotation attitude of the lateral louver is controlled so that, when the lateral louver is held in the upward blowout attitude, the air blowing guide passage is formed by cooperation of the upper surface of the lateral louver with the upper surface of the straightening plate. Thereby, the lateral louver and the straightening plate are integrated together in a pseudo manner, so as to form the air blowing guide passage which is longer than the air blowing guide passage of the lateral louver itself. As a result, it is possible to provide a blowing structure which is compact and capable of reducing cost while improving the air blowing performance by combining the existing straightening plate and the existing lateral louver with each other.

BRIEF DESCRIPTION OF DRAWINGS

[0018] FIG. **1** is an external perspective view of an indoor unit of an air conditioning device according to a present embodiment.

[0019] FIG. **2** is a side sectional view showing a closed attitude of a lateral louver in the indoor unit shown in FIG. **1**.

[0020] FIG. **3** is a side sectional view showing an upward blowout attitude of the lateral louver shown in FIG. **1**.

[0021] FIG. **4** is a side sectional view showing a downward blowout attitude of the lateral louver shown in FIG. **1**.

[0022] FIG. **5** is a side sectional view showing a rotating state of the lateral louver shown in FIG. **1**.

[0023] FIG. **6** is a control block diagram of the louver and the fan of the indoor unit shown in FIG. **1**.

[0024] FIG. **7** is a control flow chart of the louver and the fan of the indoor unit shown in FIG. **1**.

REFERENCE SIGNS LIST

[0025] **1** Cabinet
[0026] **2** Suction port
[0027] **3** Opening of cabinet
[0028] **4** Blowout port
[0029] **5** Air passageway
[0030] **6** Heat exchanger
[0031] **7** Fan
[0032] **8** Rear plate
[0033] **9** Left cover
[0034] **10** Right cover
[0035] **11** Front panel
[0036] **12** Louver unit
[0037] **13** Grille
[0038] **14** Filter
[0039] **15** Drain pan
[0040] **15***a* Rear wall surface of drain pan
[0041] **15***b* Bottom wall surface of drain pan
[0042] **15***c* Tip section of drain pan
[0043] **16** Rear guide wall of rear plate
[0044] **17** Peripheral edge member
[0045] **18** Lateral louver
[0046] **18***a* Surface of lateral louver
[0047] **18***b* Back surface of lateral louver
[0048] **18***c* Lower end of lateral louver
[0049] **19** Straightening plate
[0050] **19***a* Surface of straightening plate
[0051] **20** Vertical louver
[0052] **21** Lower member
[0053] **22** Side plate
[0054] **23** Vertical louver motor
[0055] **24** Lateral louver motor
[0056] **25** Coupling rod
[0057] **26** Rotary shaft
[0058] **30** Control section
[0059] **31** Operation section
[0060] **32** Louver position detection section
[0061] **33** Fan motor

Description of Embodiments

[0062] An embodiment according to the present invention will be described with reference to the accompanying drawings. The present embodiment is described by using, as an example, an indoor unit of a separate type air conditioner which is an example of an air conditioning device. In the air conditioner of this type, a heat exchanger housed in an indoor unit, and a compressor, a four way valve, an outdoor heat exchanger, and a restriction apparatus (all not shown), which are housed in an outdoor unit (not shown), are connected by a refrigerant pipe to form a refrigerating cycle, and thereby various modes of operation, such as cooling, heating, and dehumidification operations, can be performed.

[0063] As shown in FIG. **2**, in the indoor unit, a suction port **2** for sucking indoor air is formed in the upper surface of a cabinet **1**, and a blowout port **4** is formed in an opening **3** below the front surface of the cabinet **1**. In the inside of the cabinet **1**, an air passageway **5** extending from the suction port **2** to the blowout port **4** is formed, and a heat exchanger **6** and a fan **7** are arranged in the air passageway **5**.

[0064] As shown in FIG. **1**, the exterior portion of the cabinet **1** is configured by combining together a rear plate **8**, a left cover **9**, a right cover **10**, a front panel **11**, and a louver unit **12**.

[0065] A grille **13** is provided on the front surface side of the suction port **2**, and a filter **14** is arranged on the back surface side of the suction port **2**. The filter **14** can be taken out from the front side by opening the front panel **11**. The heat exchanger **6** is arranged in a reverse V-shape on the side of the

suction port in the air passageway **5**. Under a heat exchanger **6***a* which is a front portion of the heat exchanger arranged in the reverse V-shape, a drain pan **15** having an upward-opening U shape in cross section is arranged.

[0066] The fan **7** is arranged on the downstream side of the heat exchanger **6** in the air passageway **5**. The fan **7** is a cross flow fan and is arranged so as to be surrounded by the heat exchanger **6** arranged in the reverse V-shape.

[0067] An air blowing guide walls are formed on both front and rear sides on the downstream side of the fan **7** in the air passageway **5** so as to guide the air from the fan **7** from the blowout port **4** to the front opening of the cabinet **1**. In the air passageway **5**, the air blowing guide wall on the front side is configured by a rear wall surface **15***a* and a bottom wall surface **15***b* of the drain pan **15**. The air blowing guide wall on the rear side is configured by a rear guide wall **16** formed on the front side of the rear plate **8** of the cabinet **1**. The rear guide wall **16** is formed in a recessed curved surface so as to guide the air from the fan **7** toward the front side. The fan **7** is arranged in a space formed between the rear wall surface **15***a* of the drain pan **15** and the rear guide wall **16** on the side of the rear plate **8**.

[0068] The louver unit **12** configures a part of an air flow direction changing device. The louver unit **12** includes a peripheral edge member **17** in the central portion of which the blowout port **4** is formed, a lateral louver **18** which is rotatably provided in front of the blowout port **4**, a straightening plate **19** which is arranged on the rear side of the lateral louver **18** in the blowout port **4** and straightens the air flow from the fan **7**, and a plurality of vertical louvers **20** which are arranged on the rear side of the lateral louver **18** in a swingable manner.

[0069] The peripheral edge member **17** is configured such that a lower member **21** for supporting the vertical louver **20** in a swingable manner, left and right side plates **22**, and an upper member are formed integrally in a frame shape, and such that the blowout port **4** is formed in the central portion of the frame shape. The upper member is configured by the drain pan **15**, and the bottom wall surface **15***b* of the drain pan **15** configures the port wall surface on the upper side of the blowout port **4**.

[0070] The lower member **21** configures the lower exterior portion of the cabinet **1**. The rear end section of the lower member **21** is engaged with the front section of the rear plate **8**, and the peripheral edge member **17** is fixed to the rear plate **8** with screws. The upper surface of the lower member **21** is formed as an air blowing guide surface **21***a* which is gradually inclined downward to the front side so as to be connected to the rear guide wall **16** of the rear plate **8**.

[0071] On the air blowing guide surface **21***a*, a plurality of the vertical louvers **20** are provided in a swingable manner so as to change the direction of the air from the fan **7** in the left and right direction. Each of the vertical louvers **20** is formed in a plate shape having a thin middle section in the front and rear direction, and is configured to be swingable in the left and right direction. The rear end section of each of the vertical louvers **20** is detachably engaged, from the rear side, with an engagement section formed on the lower member **21**. The front end section of each of the vertical louvers **20** is configured to change the air flow direction, and is configured to be able to change the angle of the air flow direction in the left and right direction by the thin middle section.

[0072] The plurality of vertical louvers **20** are laterally connected with each other by a coupling rod **25** in the left and right direction connected to the front end section of each of the vertical louvers **20**, so that the plurality of vertical louvers **20** are swung in unison with each other in the left and right direction by a vertical louver motor **23** connected to one end of coupling rod **25** (not shown, see FIG. **6**).

[0073] The straightening plate **19** is arranged substantially at a middle position in the vertical direction in the blowout port **4** and above the vertical louver **20**, so as to face a lower tip section **15***c* which is the corner section between the rear wall surface **15***a* and the bottom wall surface **15***b* of the drain pan **15**. The straightening plate **19** is formed to have a flat elliptically-shaped cross-section formed by a short axis extending in the vertical direction and a long axis extending in the front and rear direction so that turbulent flows generated around the lower tip section **15***c* of the drain pan **15** can be straightened to be blown out toward the front side. The straightening plate **19** is extended between the left and right side plates **22** of the peripheral edge member **17**. In addition to the straightening function, the straightening plate **19** also has a role to prevent a user's fingertip from entering the blowout port **4** to contact the fan **7**.

[0074] The lateral louver **18** is configured by one lateral louver member, and each of left and right end sections of the lateral louver **18** is supported by each of the side plates **22** of the peripheral edge member **17** so as to be rotatable about a rotary shaft **26** whose axis direction is set in the left and right direction. The lateral louver **18** is driven by a lateral louver motor **24** (see FIG. **6**) connected to the rotary shaft **26**. In the present embodiment, the rotary shaft **26** of the lateral louver **18** is located at an upper end section of the lateral louver **18**. Note that the bottom wall surface **15***b* of the drain pan **15** is formed in a recessed shape in order to prevent that, when the lateral louver **18** is rotated, the upper end section of the lateral louver **18** collides with the bottom wall surface **15***b* of the drain pan **15** to regulate the rotation of the lateral louver **18**.

[0075] The lateral louver **18** is arranged so as to cover the front opening **3** of the cabinet **1** in the closed attitude of the lateral louver **18**, and is formed to have a curved surface shape corresponding to the curved surface shape of the front opening **3** of the cabinet **1**. Therefore, when the lateral louver **18** is held in the closed attitude, the blowout port **4** is substantially closed by the lateral louver **18**, and the front surface side **18***a* of the lateral louver **18** forms a part of the exterior portion of the cabinet **1**.

[0076] The inner surface (back surface) shape of the lateral louver **18** is also formed in a curved surface shape corresponding to the surface side shape of the lateral louver **18**. That is, the lateral louver **18** is formed to be curved in an arched shape in side view, and the inner surface side (back surface side) of the lateral louver **18** is formed into a recessed curved surface. When the lateral louver **18** is held in an upward blowout attitude A, an air blowing guide passage longer than the depth length of the lateral louver itself is formed by cooperation of the lateral louver **18** with the straightening plate **19** located on the rear side of the lateral louver **18**.

[0077] Further, the lateral louver **18** can take a closed attitude B in which the opening **3** of the cabinet **1** is closed by the lateral louver **18**, the upward blowout attitude A in which the lower end **18***c* of the lateral louver **18** is rotated to the side of the straightening plate **19** so that the air blowing guide passage is formed by cooperation of the upper surface (back surface) **18***b* of the lateral louver **18** with the upper surface **19***a* of the straightening plate **19**, and a downward blowout attitude C in which the lower end **18***c* of the lateral louver **18**

is rotated to project to the outside of the cabinet **1** so as to guide downward the air blown out from the blowout port **4**.

[0078] That is, the lateral louver **18** is made rotatable between the upward blowout attitude A and the downward blowout attitude C. The closed attitude B, in which the opening **3** of the cabinet **1** is closed, exists in the middle of the rotation trajectory of the lateral louver **18** between the upward blowout attitude A and the downward blowout attitude C.

[0079] Further, a control section **30** is provided, which drives and controls the lateral louver **18** rotatably in the front surface of the blowout port **4** so as to change the blowout direction of the air from the fan **7**. The control section **30** is configured by a microcomputer, and the input side of the control section **30** is connected, as shown in FIG. **6**, to an operation section **31** provided in a remote controller, or the like, and to a louver position detection section **32** which detects the position of the lateral louver **18**. The output side of the control section **30** is connected to the lateral louver motor **24**, the vertical louver motor **23**, and a fan motor **33**.

[0080] The control section **30** performs switching for starting a mode of operation and switching between operation modes according to a command signal from the operation section **31** mounted in a remote controller, or the like. For example, when a command signal indicating a heating operation mode is inputted from the operation section **31**, the control section **30** drives and controls the lateral louver motor **24** so that the lateral louver **18** is rotated from the closed attitude B to the downward blowout attitude C. Further, when a command signal indicating a cooling operation mode is inputted from the operation section **31**, the control section **30** drives and controls the lateral louver motor **24** so that the lateral louver **18** is rotated from the closed attitude to the upward blowout attitude A. Further, according to each operation mode, the control section **30** performs an attitude changing operation from the upward blowout attitude A to the downward blowout attitude C, or an attitude changing operation from downward blowout attitude C to the upward blowout attitude A. For example, there is an operation mode in which the lateral louver **18** is held in the downward blowout attitude C to guide the air from the fan **7** to the floor surface side, so that the rapid cooling is locally performed on the floor surface side, and in which the attitude of the lateral louver **18** is then changed from the downward blowout attitude C to the upward blowout attitude A, so that the cool air from the fan **7** is discharged toward the side of the ceiling so as to reach a distant place.

[0081] The louver position detection section **32**, which is provided to detect the attitude of the lateral louver **18**, can be configured by a micro-switch, a photo sensor, or the like, which is arranged at the peripheral edge member **17** so as to correspond to each of the attitudes A, B and C. Alternatively, when the lateral louver motor **24** is a stepping motor, it is possible to adopt a configuration in which the position of the lateral louver **18** is detected by performing calculation based on the pulse signal applied to the lateral louver motor **24**.

[0082] In response to the signal from the louver position detection section **32**, the control section **30** can stop the lateral louver **18** at each of the positions respectively corresponding to the upward blowout attitude A, the closed attitude B, and the downward blowout attitude C. In particular, the control section **30** controls the rotation attitude (upward blowout attitude) of the lateral louver **18** so that, when the lateral louver **18** is held in the upward blowout attitude A, the air blowing guide passage longer than the depth length of the lateral louver itself is formed by cooperation of the upper surface (inner surface **18***b*) of the lateral louver **18** with the upper surface **19***a* of the straightening plate **19**.

[0083] Further, according to a command signal from the operation section **31** or a temperature signal from a temperature sensor (not shown), the control section **30** can control the rotational speed of the fan motor **33**, so as to control the air volume of the fan **7**.

[0084] Further, the control section **30** can also control the rotational speed of the fan motor **33** according to the rotation state of the lateral louver **18**. That is, the control section **30** controls the fan motor **33** to be operated at a low speed or to be stopped when changing the attitude of the lateral louver **18** from the downward blowout attitude C or the upward blowout attitude A to the closed attitude B. This is because, when the lateral louver **18** is held in the closed attitude B, the opening of the cabinet **1** is substantially closed as shown in FIG. **2**, and hence, when the fan motor **33** is operated as usual in this state, the load applied to the fan **7** is reduced. As a result, the number of revolutions of the fan **7** is increased, which becomes a cause of noise generation. To cope with this, the control section **30** performs control so that the fan **7** is stopped when the attitude of the lateral louver **18** is changed to the closed attitude B.

[0085] Further, when the attitude of the lateral louver **18** is changed to the closed attitude B according to the attitude changing operation from the upward blowout attitude A to the downward blowout attitude C, or on the contrary, when the attitude of the lateral louver **18** is changed to the closed attitude B according to the attitude changing operation from the downward blowout attitude C to the upward blowout attitude A, the control section **30** performs, upon reception of the signal from the louver position detection section **32**, control to stop the fan **7** or to operate the fan **7** at a low speed as the lateral louver **18** approaches the closed attitude B. When, after the lateral louver **18** is once held in the closed attitude B, the lateral louver **18** then opens the opening **3** in order to be held in the upward blowout attitude A or the downward blowout attitude C, the control section **30** again performs control to increase the rotation speed of the fan **7**. Thereby, it is possible to prevent the generation of noise at the time when the load applied to the fan **7** is reduced as the lateral louver **18** approaches the closed attitude B and when the number of revolutions of the fan **7** is thereby increased. Also, the air again starts to be blown out in the state where the opening **3** is opened, and hence a comfortable operation state can be obtained.

[0086] That is, while the control section **30** monitors the attitude of the lateral louver **18** on the basis of the signal from the louver position detection section **32**, the control section **30** controls the fan motor **33** to be stopped or to be driven at a low speed when the attitude of the lateral louver **18** is changed to the closed attitude. Further, when the attitude of the lateral louver **18** is changed from the closed attitude B to the upward blowout attitude A or the downward blowout attitude C, the control section **30** performs control to gradually increase the rotation speed of the fan motor **33** so that the fan motor **33** is driven at the original rotation speed.

[0087] Further, the control section **30** also controls the rotation speed of the lateral louver motor **24** so that the rotation speed of the lateral louver **18** is different between when the attitude of the lateral louver **18** is changed from the upward blowout attitude A to the closed attitude B, and when the

attitude of the lateral louver **18** is changed from the downward blowout attitude C to the closed attitude B.

[0088] This is because the rotation angle at the time when the attitude of the lateral louver **18** is changed from the upward blowout attitude A to the closed attitude B is smaller than the rotation angle at the time when the attitude of the lateral louver **18** is changed from the downward blowout attitude C to the closed attitude B. That is, the opening **3** of the cabinet **1** is formed in an obliquely downward direction at the front lower section of the cabinet, and hence when the lateral louver **18** is held in the closed attitude B, the lower end **18***c* of the lateral louver **18** is inclined to the side of the blowout port with respect to the vertical direction. On one hand, when the lateral louver **18** is held in the downward blowout attitude C, the lower end **18***c* of the lateral louver **18** is opened to the front side with respect to the vertical direction. On the other hand, when the lateral louver **18** is held in the upward blowout attitude A, the lower end **18***c* of the lateral louver **18** is located close to the straightening plate **19**.

[0089] Therefore, the rotation angle of the lateral louver **18** from the closed attitude B to the upward blowout attitude A is smaller than the rotation angle of the lateral louver **18** from the closed attitude B to the downward blowout attitude C. For this reason, when the attitude changing operations respectively corresponding to the different rotation angles are performed at the same speed, the time required for the change from the closed attitude B to the upward blowout attitude A is shorter than the time required for the change from the closed attitude B to the downward blowout attitude C. Therefore, when the attitude of the lateral louver **18** is changed from the upward blowout attitude A to the closed attitude B, the rotation speed control (stop control) to reduce the rotation speed of the fan motor **33** may not be able to catch up with the rotation speed of the lateral louver **18**.

[0090] To cope with this, when the attitude of the lateral louver **18** is changed from the upward blowout attitude A to the closed attitude B, the control section **30** controls the lateral louver motor **24** to be rotated at a speed lower than the speed at the time when the attitude of the lateral louver **18** is changed from the downward blowout attitude C to the closed attitude B. Thereby, the fan motor **33** is controlled to be surely stopped or driven at a low speed when the lateral louver **18** is held in the closed attitude B. In other words, in the attitude changing operation of the lateral louver **18** in which the lateral louver **18** is rotated by the smaller rotation angle between the rotation angle of the lateral louver **18** from the upward blowout attitude A to the closed attitude B and the rotation angle of the lateral louver **18** from the downward blowout attitude C to the closed attitude B, the rotation speed of the lateral louver motor **24** is controlled to be reduced so that, at the time of this attitude changing operation of the lateral louver **18**, the rotation speed control to reduce the rotation speed of the fan motor **33** can catch up with the attitude changing operation of the lateral louver **18**. Thereby, the generation of noise can be prevented when the load applied to the fan **7** is reduced as the lateral louver **18** approaches the closed attitude B, and when the rotation speed of the fan **7** is thereby increased.

[0091] In the above-described configuration, when the indoor unit is stopped, the lateral louver **18** is held in the closed attitude B in which the lateral louver **18** substantially closes the front opening **3** of the cabinet **1** as shown in FIG. **2**. Here, when an operation command, for example, a cooling operation command, is outputted from the operation section **31**, the control section **30** drives the refrigerating cycle in response to the signal. Further, the control section **30** changes the attitude of the lateral louver **18** from the closed attitude B to the upward blowout attitude A (see FIG. **3**), and drives and controls the fan motor **33**. Thereby, the fan **7** is rotated, so that the air is blown out to the front side from the blowout port **4** through the air passageway **5**.

[0092] When the lateral louver **18** is held in the upward blowout attitude A, the air blowing guide passage is formed in such a manner that the inner surface **18***b* of the lateral louver **18** and the upper surface **19***a* of the straightening plate **19** are integrated together in a pseudo manner by cooperation of the inner surface **18***b* with the upper surface **19***a*, so as to be substantially connected with each other. That is, since the air blowing guide passage formed in this way is longer in the front and rear direction than the air blowing guide passage of the lateral louver itself, the air can be sent to a distant place, and the air blowing performance can be improved.

[0093] In this case, since the air blowing guide passage long in the front and rear direction is formed by combining the existing lateral louver **18** and the existing straightening plate **19** with each other, the number of components can be reduced to thereby reduce the size and cost, as compared with the case where the depth length of the lateral louver itself is increased or where the other air guide members are added.

[0094] At this time, since the inner surface side of the lateral louver **18** is formed in a recessed curved surface, the air blowing guide passage is formed so as to allow the air blown out from the blowout port **4** to be blown off in the obliquely upward direction (direction of the ceiling) along the recessed curved surface, so that the air can be sent to a distant place.

[0095] On the other hand, when an operation command, for example, a heating operation command, is outputted from the operation section **31**, the control section **30** drives the refrigerating cycle in response to the signal, and when the predetermined conditions are satisfied, the control section **30** drives and controls the lateral louver motor **24** and the fan motor **33** so that the attitude of the lateral louver **18** is changed from the closed attitude B to the downward blowout attitude C (see FIG. **4**).

[0096] When the fan **7** is driven, the air is blown to the front side from the blowout port **4** through the air blowing guide passage. The air hits the inner surface **18***b* of the lateral louver **18** located in the front opening **3** of the cabinet **1** and is guided in the downward direction so that the operation state is set to the downward blowout state.

[0097] In an air blowing state, such as the state of heating or cooling operation, when the control section **30** receives an air flow direction changing command from the operation section **31**, the control section **30** drives and controls the vertical louver motor **23** so that the direction of the air flow from the fan **7** is changed in the left and right direction by swinging the vertical louver **20**.

[0098] FIG. **7** is a control flow chart of the louver and the fan. In the flow chart, a louver means the lateral louver **18**, and a louver motor means the lateral louver motor **24**. Further, in this example, for the sake of clarity of the description of the attitude changing operation from the upward blowout attitude A to the downward blowout attitude C of the lateral louver **18**, and for the sake of clarity of the description of the attitude changing operation from the downward blowout attitude C to the upward blowout attitude A of the lateral louver **18**, the attitude changing operation (step **11** (S**11**) to step **16** (S**16**)) from the upward blowout attitude A or the downward blowout attitude C to the closed attitude B, and the attitude changing

operation from the closed attitude B to the upward blowout attitude A or the downward blowout attitude C (step **17** (S**17**) to step **20** (S**20**)) are separately described.

[0099] Further, the attitude changing operation from the closed attitude B to the upward blowout attitude A or the downward blowout attitude C corresponds to the operation flow of step **17** (S**17**) to step **20** (S**20**). Further, since various modes of attitude changing operations of the lateral louver **18** are conceivable at the time of cooling and heating operations, the control method is described exclusively in connection with the switching operation of the lateral louver motor **24** and the fan motor **33** without describing the respective modes of attitude changing operations of the lateral louver **18**.

[0100] First, the control section **30** determines whether or not an attitude change command signal for the lateral louver **18** is inputted after the starting of operation (S**10**). When the attitude change command signal is inputted, the control section **30** proceeds to step **11** (S**11**), otherwise, the control section **30** waits until the attitude change command signal is inputted. In step **11**, the control section **30** determines whether or not the attitude change command signal is the command signal for changing the attitude of the lateral louver **18** from the upward blowout attitude A to the closed attitude B (including a command signal for changing the attitude of the lateral louver **18** from the upward blowout attitude A to the downward blowout attitude C). When the attitude change command signal is the command signal for changing the attitude of the lateral louver **18** from the upward blowout attitude A to the closed attitude B, the control section **30** changes the attitude of the lateral louver **18** from the upward blowout attitude A to the closed attitude B, while driving the louver motor **24** at a speed lower than the usual speed (S**12**), so as to make the fan motor **33** surely stopped or operated at a low speed at the time when the lateral louver **18** is held in the closed attitude.

[0101] When the attitude change command signal is the command signal for changing the attitude of the lateral louver **18** from the downward blowout attitude C to the closed attitude B (including the command signal for changing the attitude of the lateral louver **18** from the downward blowout attitude C to the upward blowout attitude A) (S**13**: Yes), the control section **30** controls the lateral louver motor **24** to be operated at the usual speed, and determines whether or not the attitude of the lateral louver **18** is changed to the closed attitude B (S**15**). When the attitude of the lateral louver **18** is changed to the closed attitude, the control section **30** once stops the fan motor **33** and the lateral louver motor **24** (S**16**).

[0102] Then, the control section **30** determines whether or not the command signal for opening the louver is further inputted (S**17**). In the case where the command signal for changing the attitude of the lateral louver **18** from the upward blowout attitude A to the closed attitude B is inputted, or where the command signal for changing the attitude of the lateral louver **18** from downward blowout attitude C to the closed attitude B is inputted, the control section **30** maintains the lateral louver **18** in the closed attitude, and hence in the case, the opening command signal is not inputted. When the opening command signal is not inputted in this way (S**17**: No), the control section **30** ends the processing as it is.

[0103] When the opening command signal is inputted (S**17**: Yes), the control section **30** again drives the lateral louver motor **24** and the fan motor **33** at the usual speed (S**18**). When the lateral louver **18** is held in the designated attitude (the upward blowout attitude A or the downward blowout attitude C), the control section **30** stops the lateral louver motor **24** (S**20**).

[0104] Here, the opening command signal includes the command signal for changing the attitude of the lateral louver **18** from the closed attitude B to the upward blowout attitude A or the downward blowout attitude C, and either the command signal for changing the attitude of the lateral louver **18** from the upward blowout attitude A to the downward blowout attitude C, or the command signal for changing the attitude of the lateral louver **18** from downward blowout attitude C to the upward blowout attitude A. When the command signal for changing the attitude of the lateral louver **18** from the upward blowout attitude A to the downward blowout attitude C, or the command signal for changing the attitude of the lateral louver **18** from downward blowout attitude C to the upward blowout attitude A is inputted, the control section **30** stores the command signal in a storage section. The control section **30** uses the stored command signal as the opening command signal to determine in step **17** (S**17**) "whether or not the louver opening command is inputted".

[0105] In this way, when the attitude of the lateral louver **18** is changed to the closed attitude B, the air blowing operation is surely stopped or performed at a low speed, so that the generation of noise can be prevented. Further, when the opening **3** is opened by the rotation of the lateral louver **18**, the air blowing operation is resumed, and hence a comfortable operation state can be obtained.

[0106] Further, the control section **30** performs control such that, at the time of the movement of the lateral louver **18** from the upward blowout attitude A to the closed attitude B, the rotation speed of the lateral louver motor **24** is reduced to be lower than the rotation speed of the lateral louver motor **24** at the time of the movement of the lateral louver **18** from the downward blowout attitude C to the closed attitude B, and thereby the operation of the fan motor **33** is surely stopped or performed at a low speed in the closed attitude B, so that the generation of noise can be prevented.

INDUSTRIAL APPLICABILITY

[0107] The present invention is configured such that the blowout direction of the air sent from the fan is changed by cooperation of the lateral louver provided at the blowout port with the straightening plate provided on the rear side of the lateral louver, and hence the present invention can be applied not only to an indoor unit of an air conditioner provided with a refrigerating cycle but also to other air conditioning devices, such as an air cleaner, a dehumidifier, a humidifier, and a refrigerator.

1. An air flow direction changing device of an air conditioning device, comprising: a blowout port which is formed in a front surface of an air passageway in a cabinet; a lateral louver which is rotatably provided on the front side of the blowout port; a control section which changes the blowout direction of air sent from a fan by rotatably driving and controlling the lateral louver in the front surface of the blowout port; and a straightening plate which is provided on the rear side of the lateral louver in the blowout port and straighten the air flow from the fan located on the rear side in the passageway,

wherein the control section controls the rotation attitude of the lateral louver so that, when the lateral louver is held in an upward blowout attitude, an air blowing guide passage longer than the depth length of the lateral louver

itself is formed by cooperation of the upper surface of the lateral louver with the upper surface of the straightening plate.

2. The air flow direction changing device of an air conditioning device according to claim **1**, wherein the lateral louver is configured by one lateral louver member, so as to be arranged to cover the front opening of the cabinet at the time when the lateral louver is held in a closed attitude, and is formed to have a curved surface shape corresponding to the curved surface shape of the front opening of the cabinet.

3. The air flow direction changing device of an air conditioning device according to claim **1**, wherein, when the lateral louver is held in the upward blowout attitude, the inner surface side of the lateral louver is formed in a recessed curved surface, and an air blowing guide passage longer than the depth length of the lateral louver itself is formed by cooperation of the inner surface side of the lateral louver with the straightening plate arranged on the rear side of the lateral louver.

4. The air flow direction changing device of an air conditioning device according to claim **1**, wherein a plurality of vertical louvers are arranged on the rear side of the lateral louver in a swingable manner so as to enable the direction of the air from the fan to be changed in the left and right direction.

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