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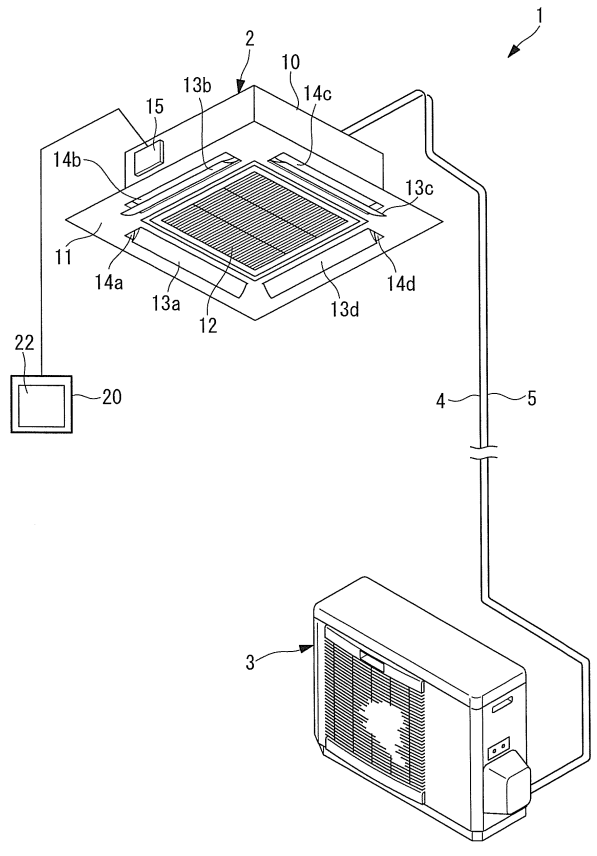
(54) INDOOR UNIT AND AIR-CONDITIONING APPARATUS INCLUDING THE SAME, CONTROL METHOD FOR INDOOR UNIT, AND CONTROL PROGRAM FOR THE SAME

(57) It is an object to easily set the wind direction for a wind direction plate and achieve a desired air-conditioning status. There is provided an indoor unit (2) for an air-conditioning apparatus (1) including a plurality of air outlets and wind direction adjustment louvers (13a, 13b, 13c, 13d) which adjust wind directions of airflows blown outward from the respective outlets, an open-close status of each of the wind direction plates being set from a remote control (20). The indoor unit (2) includes a control section (30) which puts all of the wind direction plates of the indoor unit into a closed state, and subsequently lets the open-close status of one (13a) of the wind direction plates be set from the remote control, performs control after completion of the setting such that the one wind direction plate is kept in the set open-close status, and lets the open-close status of a different one (13b) other than the one wind direction plate of the wind direction plates be set from the remote control after the completion of the setting for the one wind direction plate.

FIG. 1



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Description

{Technical Field}

[0001] The present invention relates to an indoor unit and an air-conditioning apparatus including the same, a control method for the indoor unit, and a control program for the same.

{Background Art}

[0002] For example, a wind direction plate which adjusts a blowing direction for cool air or hot air to be blown is provided at an outlet of an indoor unit of a ceiling-recessed air-conditioning apparatus. The wind direction of cool air or hot air sent out from the outlet is adjusted by changing the orientation of the wind direction plate.

[0003] In an indoor unit including a plurality of outlets, when the wind direction for each of wind direction plates corresponding to the respective outlets is adjusted with a remote control, there is proposed a method for judging which one of a plurality of wind direction plates of the indoor unit actually corresponds to the wind direction plate being set on the remote control.

[0004] PTL 1 below discloses a technique for allowing identification of a wind direction plate being set by causing a wind direction plate selected with a remote control to swing as a temporary motion and by putting other wind direction plates not selected with the remote control into a fully-closed state.

[0005] PTL 2 below discloses a technique, with a remote control for manipulating a plurality of indoor units, for allowing checking of an indoor unit to be set and the position of a wind direction plate by causing a specific wind direction plate to perform temporary swinging that refers to swinging without being actually set to swing and causing wind direction plates other than the specific wind direction plate to perform temporary downward blowing that refers to blowing downward without being actually set to blow downward.

{Citation List}

{Patent Literature}

[0006]

{PTL 1} Japanese Unexamined Patent Application, Publication No. 2013-113469
{PTL 2} Japanese Unexamined Patent Application, Publication No. 2012-154593

{Summary of Invention}

{Technical Problem}

[0007] In the above-described method according to PTL 1, however, a next wind direction plate is set after an air volume for an indoor unit to be set is reduced to one-quarter of the state before a wind direction setting manipulation, and a wind direction plate after setting is made fully closed. Thus, an indoor unit having a plurality of wind direction plates suffers from the problem of the inability to accurately know an actual air-conditioning status of the whole indoor unit after the positions of the plurality of wind direction plates are all set.

[0008] As for PTL 2 described above, temporary swinging or temporary downward blowing is performed just to check a wind direction plate to be set. PTL 2 also cannot solve the problem of the inability to know an actual air-conditioning status.

[0009] The present invention has been made to solve the above-described problems, and has as its object to provide an indoor unit capable of easily setting a wind direction for a wind direction plate and achieving a desired air-conditioning status and an air-conditioning apparatus including the same, a control method for the indoor unit, and a control program for the same.

{Solution to Problem}

[0010] According to a first aspect of the present invention, there is provided an indoor unit for an air-conditioning apparatus including a plurality of outlets and wind direction plates which are configured to adjust wind directions of airflows blown outward from the respective outlets, an open-close status of each of the wind direction plates being settable from a remote control, the indoor unit including control means, the control means being configured to put all of the wind direction plates of the indoor unit into a closed state, and subsequently let the open-close status of one of the wind direction plates be set from the remote control, perform control after completion of the setting such that the one wind direction plate is kept in the set open-close status, and let the open-close status of a different one other than the one wind direction plate of the wind direction plates be set from the remote control after the completion of the setting for the one wind direction plate.

[0011] According to the configuration of the aspect, after all of the respective wind direction plates provided at the outlets, through which airflows of the indoor unit are blown outward, are put into a closed state, the open-close status of the one wind direction plate is set. After completion of the setting, the open-close status of the different wind direction plate other than the one wind direction plate is set while the open-close status of the one wind direction plate is kept.

[0012] As described above, the open-close status of a next wind direction plate is adjusted in order while the open-close status of a wind direction plate after completion of adjustment is kept. The air-conditioning status of a region to be air-conditioned by the indoor unit is obtained as an actual air-conditioning status. The open-close status of a wind direction plate, i.e., the wind direction for an airflow outlet corresponding to the wind direc-

tion plate can be adjusted while checking whether a desired air-conditioning status is achieved. Since a next wind direction plate is adjusted while a wind direction plate after completion of adjustment is kept in an open state, it is possible for a remote control manipulator to easily know that adjustment of the open-close statuses of all the wind direction plates is complete by identifying (visually checking) that the plurality of wind direction plates provided in the indoor unit are all in an open state.

[0013] The indoor unit for an air-conditioning apparatus may further include storage means for storing the open-close status of each wind direction plate before all of the wind direction plates are put into a closed state. If a set command to set the open-close status of the one wind direction plate is not acquired from the remote control, and an OK command to fix a setting of the open-close status of the one wind direction plate is acquired, the open-close status of the wind direction plate may be read out from the storage means, and the open-close status of the different wind direction plate may be set from the remote control while the open-close status of the one wind direction plate is kept in the read-out open-close status.

[0014] If the open-close status of a wind direction plate is not set from the remote control on an as-needed basis, an open-close status stored in the storage means is read out through acquiring an OK command from the remote control and controlling a wind direction plate using the read-out open-close status. This allows quick completion of setting of the wind direction plate.

[0015] According to a second aspect of the present invention, there is provided an air-conditioning apparatus including the above-described indoor unit, a remote control for setting the open-close status of each wind direction plate of the indoor unit, and an outdoor unit corresponding to the indoor unit.

[0016] According to a third aspect of the present invention, there is provided a control method for an indoor unit for an air-conditioning apparatus, the indoor unit including a plurality of outlets and wind direction plates which are configured to adjust wind directions of airflows blown outward from the respective outlets, an open-close status of each of the wind direction plates being settable from a remote control, the control method including putting all of the wind direction plates of the indoor unit into a closed state, and subsequently letting the open-close status of one of the wind direction plates be set from the remote control, performing control after completion of the setting such that the one wind direction plate is kept in the set open-close status, and letting the open-close status of a different one other than the one wind direction plate of the wind direction plates be set from the remote control after the completion of the setting for the one wind direction plate.

[0017] According to a fourth aspect of the present invention, there is provided a control program for an indoor unit for an air-conditioning apparatus, the indoor unit including a plurality of outlets and wind direction plates which are configured to adjust wind directions of airflows blown outward from the respective outlets, an open-close status of each of the wind direction plates being settable from a remote control, the control program causing a computer to execute putting all of the wind direction plates of the indoor unit into a closed state, and subsequently letting the open-close status of one of the wind direction plates be set from the remote control, performing control after completion of the setting such that the one wind direction plate is kept in the set open-close status, and letting the open-close status of a different one other than the one wind direction plate of the wind direction plates be set from the remote control after the completion of setting of the one wind direction plate.

{Advantageous Effects of Invention}

[0018] The present invention produces the effect of easily setting a wind direction for a wind direction plate and achieving a desired air-conditioning status.

{Brief Description of Drawings}

[0019]

{Fig. 1}
Fig. 1 is a schematic configuration view of an air-conditioning apparatus according to the present invention.
{Fig. 2}
Fig. 2 is a functional block diagram of a control device in the air-conditioning apparatus according to the present invention.
{Fig. 3}
Fig. 3 is a view showing examples of a screen of a remote control in the air-conditioning apparatus according to the present invention. Fig. 3(A) shows one example of normal display and Fig. 3(B) shows one example of a wind direction switching screen.
{Fig. 4}
Fig. 4 shows one example of a wind-direction-per-louver setting screen of the remote control.
{Fig. 5}
Fig. 5 shows other examples of the wind-direction-per-louver setting screen of the remote control. Fig. 5(A) shows an example of a setting screen for a second wind direction adjustment louver and Fig. 5(B) shows an example of a setting screen for a fourth wind direction adjustment louver.
{Fig. 6}
Fig. 6 shows other examples of the wind-direction-per-louver setting screen of the remote control. Fig. 6(A) shows an example of a screen for prompting checking as to whether setting of all wind direction adjustment louvers is complete and Fig. 6(B) shows an example of a screen for the normal display.
{Fig. 7}
Fig. 7 shows an example of a view in which a first

wind direction adjustment louver at a ceiling panel is set to an open state.

{Fig. 8}

Fig. 8 shows an example of a view in which the second wind direction adjustment louver at the ceiling panel is set to an open state while the open-close status of the first wind direction adjustment louver at the ceiling panel is kept.

{Fig. 9}

Fig. 9 shows an example of a view in which the fourth wind direction adjustment louver at the ceiling panel is set to an open state while the open-close statuses of first to third wind direction adjustment louvers at the ceiling panel are kept.

{Fig. 10}

Fig. 10 shows an example of a view showing the appearance of the ceiling panel when the open-close statuses of the first to fourth wind direction adjustment louvers are fixed.

{Fig. 11}

Fig. 11 shows an example of a view in which all the wind direction adjustment louvers at the ceiling panel are put in a fully-closed state.

{Fig. 12}

Fig. 12 shows a motion flow of the air-conditioning apparatus according to the present invention.

{Fig. 13}

Fig. 13 is a sequel to the motion flow of the air-conditioning apparatus shown in Fig. 12.

{Description of Embodiments}

[0020] Embodiments of an indoor unit according to the present invention and an air-conditioning apparatus including the same, a control method for the indoor unit, and a control program for the same will be described below with reference to the drawings.

[0021] One embodiment of the present invention will be described below with reference to Figs. 1 to 13.

[0022] Fig. 1 shows a schematic configuration view of an air-conditioning apparatus according to the one embodiment of the present invention.

[0023] As shown in Fig. 1, an air-conditioning apparatus 1 is composed of an indoor unit 2 which is installed in a ceiling or the like in a room and an outdoor unit 3 which is installed in the right place outside and is connected to the indoor unit 2 via two refrigerant pipes 4 made up of a liquid pipe and a gas pipe and a communication line 5. Note that although the air-conditioning apparatus 1, in which one indoor unit 2 is connected to one outdoor unit 3, will be described here, the present invention is not limited to this. A multitype air-conditioning apparatus in which a plurality of indoor units 2 are connected in parallel may be adopted.

[0024] Pieces of equipment (not illustrated), such as a refrigerant compressor, a four-way switching valve, an outdoor-side electronic expansion valve, an outdoor-side heat exchanger, an outdoor-side fan including a fan motor, and an outdoor controller, are disposed in the outdoor unit 3. The outdoor unit 3, together with an indoor-side heat exchanger, an indoor-side electronic expansion valve, and the like (to be described later) which are provided inside the indoor unit 2, constitutes a refrigeration cycle and bears a function of adjusting a refrigerant to be supplied to the indoor unit 2.

[0025] As shown in Fig. 1, the indoor unit 2 includes a unit main body 10 which is recessed in the ceiling and a ceiling panel 11 which is mounted to a lower portion of the unit main body 10. An indoor-side fan, the indoor-side heat exchanger, the indoor-side electronic expansion valve, a bellmouth which guides suction air into the indoor-side fan, a drain pan, and the like (not illustrated) are disposed in the unit main body 10. A suction grille 12 for sucking indoor air is installed at a central portion of the ceiling panel 11 that is installed so as to cover a lower surface of the unit main body 10.

[0026] Air outlets 14a, 14b, 14c, and 14d are provided in four directions around the suction grille 12, and wind direction adjustment louvers (wind direction plates) 13a, 13b, 13c, and 13d are provided to adjust the wind directions of airflows (air-conditioning winds) blown outward from the air outlets 14a, 14b, 14c, and 14d, respectively. Unless otherwise specified, each air outlet may be referred to as an air outlet 14, and each wind direction adjustment louver may be referred to as a wind direction adjustment louver 13.

[0027] The open-close status of the wind direction adjustment louver 13 is adjusted by changing an angle by which the wind direction adjustment louver 13 is made to pivot. With the adjustment of the open-close status of the wind direction adjustment louver 13, the vertical wind direction of an airflow blown outward from the air outlet 14 is changed.

[0028] Note that although a case where four wind direction adjustment louvers 13 are provided around the suction grille 12 will be described as an example in the present embodiment, the present invention is not limited to this. The number of wind direction adjustment louvers 13 to be provided in the indoor unit 2 only needs to be two or more.

[0029] With this configuration, the indoor unit 2 is configured such that indoor air sucked in through the suction grille 12 due to rotation of the indoor-side fan circulates through the indoor-side heat exchanger and such that cooled or heated air after exchange of heat with a refrigerant in the indoor-side heat exchanger is blown in a direction adjusted by the wind direction adjustment louver 13 through the air outlet 14.

[0030] A control device 15 is provided at the indoor unit 2, and a wired-type remote control is connected to the control device 15. The air-conditioning apparatus 1 is manipulated via the remote control 20.

[0031] The remote control 20 includes a display and setting screen 22 which has various operational manipulation buttons, such as an operation stop button, an operation mode selection button, a set temperature switch-

ing button, an air volume switching button, and a wind direction switching button for adjusting the open-close status of the wind direction adjustment louver 13 to control a wind direction, for operating the air-conditioning apparatus 1. Note that although a case where a remote control for operational manipulation of the air-conditioning apparatus 1 is of a wired type will be described as an example in the present embodiment, the present invention is not limited to this. A wireless-type remote control may be adopted.

[0032] Although an example where the remote control 20 according to the present embodiment is a touch-screen type one in which a display section is integral with a manipulation section will be described in the present embodiment, the present invention is not limited to this. A remote control in which a display section is separate from a manipulation section may be adopted.

[0033] The remote control 20 appropriately transmits and receives a piece of information to and from the control device 15, outputs a command input through a manipulation by a manipulator to the control device 15, and displays a piece of information acquired from the control device 15 on the display and setting screen 22.

[0034] As shown in Fig. 2, the control device 15 includes a control section (control means) 30 and a storage section (storage means) 31.

[0035] The storage section 31 stores the piece of information of the open-close status of each wind direction adjustment louver 13 (i.e., the wind direction of an airflow blown outward from the corresponding air outlet 14) and various pieces of information, such as an air volume and an operation mode, before all the wind direction adjustment louvers 13 are put into a closed state. The setting order at the time of setting the open-close statuses of the plurality of wind direction adjustment louvers 13 is stored in the storage section 31.

[0036] The control section 30 puts all the wind direction adjustment louvers 13 of the indoor unit 2 into a closed state and then lets the open-close status of one wind direction adjustment louver 13 be set from the remote control 20. After completion of the setting, the control section 30 performs control such that the one wind direction adjustment louver 13 is kept in the set open-close status. The control section 30 also sets the open-close statuses of the wind direction adjustment louvers 13 other than the one wind direction adjustment louver 13 after the completion of the setting for the one wind direction adjustment louver 13.

[0037] More specifically, if the control section 30 acquires a wind-direction-per-louver set command from the remote control 20 during operation of the air-conditioning apparatus 1, the control section 30 stops the indoor unit 2 or the air-conditioning apparatus 1 to put all the wind direction adjustment louvers 13 into a fully-closed state and causes the storage section 31 to store the piece of information of the wind direction for each air outlet 14 before the stop of the indoor unit 2 or the air-conditioning apparatus 1 as the piece of information of the open-close status of the corresponding wind direction adjustment louver 13. The control section 30 puts the wind direction adjustment louver 13a that is the first in the setting order stored in the storage section 31 into a fully-open state, puts the wind direction adjustment louvers 13b, 13c, and 13d that are the second to fourth into a fully-closed state, and displays a message that the open-close status (the wind direction) of the first wind direction adjustment louver 13a is being set on the remote control 20.

[0038] If the control section 30 acquires a command to set the open-close status of the first wind direction adjustment louver 13a (i.e., the wind direction for the air outlet 14a corresponding to the first wind direction adjustment louver 13a) from the remote control 20, the control section 30 controls the first wind direction adjustment louver 13a to move to a position indicated by an acquired open-close status. At this time, concurrently with the control of the open-close status of the first wind direction adjustment louver 13a, control is performed such that an airflow is blown outward from the air outlet 14a corresponding to the first wind direction adjustment louver 13a. With this configuration, it is possible to experience a feeling of air conditioning gained by adjusting the open-close status of the first wind direction adjustment louver 13a in the vicinity of a region to be air-conditioned by the indoor unit 2. If the control section 30 acquires an OK command to fix a setting of the open-close status of the wind direction adjustment louver 13 from the remote control 20, the control section 30 causes the storage section 31 to store, as a new open-close status of the first wind direction adjustment louver 13a, the open-close status of the first wind direction adjustment louver 13a acquired earlier (i.e., the piece of information of a wind direction) and performs control to keep the open-close status of the first wind direction adjustment louver 13a and keep an airflow blowing outward from the air outlet 14a.

[0039] Note that if the control section 30 acquires an OK command from the remote control 20 without acquiring a command to set the open-close status of the wind direction adjustment louver 13, the control section 30 regards new setting of the open-close status of the wind direction adjustment louver 13 as being skipped, reads out the piece of information of an open-close status of the wind direction adjustment louver 13 stored in the storage section 31, and controls the open-close status of the wind direction adjustment louver 13 on the basis of the read-out piece of information. At this time, concurrently with the control of the open-close status of the wind direction adjustment louver 13, control is performed such that an airflow is blown outward from the air outlet 14 corresponding to the wind direction adjustment louver 13.

[0040] As described above, it is possible to quickly advance to setting of the open-close status of the next wind direction adjustment louver 13 by controlling the open-close status of the wind direction adjustment louver 13 currently being set, using the piece of information of an open-close status stored in the storage section 31.

[0041] After the wind direction for the first wind direc-

tion adjustment louver 13a is set in the above-described manner, the control section 30 performs control such that the second wind direction adjustment louver 13b is put into a fully-open state while keeping the open-close status of the first wind direction adjustment louver 13a and keeping an airflow blowing outward from the air outlet 14a. The control section 30 displays, on the remote control 20, a message that the open-close status of the second wind direction adjustment louver 13b (i.e., the wind direction of an airflow blown outward from the air outlet 14b corresponding to the second wind direction adjustment louver 13b) is being set. The open-close status of the second wind direction adjustment louver 13b is set in the same manner as the open-close status of the first wind direction adjustment louver 13a. After a setting is fixed, the control section 30 shifts to setting of the open-close status of the third wind direction adjustment louver 13c while keeping the open-close statuses of the first and second wind direction adjustment louvers 13a and 13b and keeping airflows from the air outlets 14a and 14b corresponding to the first and second wind direction adjustment louvers 13a and 13b. After that, setting is similarly performed, and the open-close statuses of all the wind direction adjustment louvers 13 are set in order.

[0042] As described above, the open-close statuses of all the wind direction adjustment louvers 13a to 13d are set in order by manipulation with the remote control 20 and control by the control device 15.

[0043] Fig. 3 shows screen examples of the display and setting screen 22 of the remote control 20. Fig. 3(A) shows a normal display of the remote control 20. In Fig. 3(A), an operation mode selection button 40 for switching the operation mode among cooling, heating, dehumidification, and the like, a timer setting button 41, a set temperature switching button 42 which displays a set temperature, a wind direction switching button 43 for setting the wind direction of an airflow from the air outlet 14, an air volume switching button 44 for setting the air volume, a menu button 45 for various other settings, and the like are provided. For example, if the wind direction switching button 43 is pressed, the screen shifts to a wind direction switching screen in Fig. 3(B). On the wind direction switching screen shown in Fig. 3(B), the wind directions of airflows from the air outlets 14 corresponding to all the wind direction adjustment louvers 13 provided in the indoor unit 2 can be collectively set to, for example, one of four levels from a first direction (a first angle) to a fourth direction (a fourth angle) or auto swing.

[0044] If a wind-direction-per-louver setting button 50 in the upper right of the wind direction switching screen in Fig. 3(B) is pressed, the screen shifts to a wind-direction-per-louver setting screen (Fig. 4) which allows adjustment of the open-close status (the wind direction) of each wind direction adjustment louver 13.

[0045] Fig. 4 shows one example of the wind-direction-per-louver setting screen. An illustration of the wind direction adjustment louvers 13 at the ceiling panel 11 attached to the indoor unit 2 is shown on the left-hand side of a screen such that the wind direction adjustment louver 13 currently being set can be identified. Fig. 4 shows that the first wind direction adjustment louver 13a is being set. An open-close status (a wind direction) set for the wind direction adjustment louver 13 currently being set is illustrated at the center of the screen in Fig. 4 such that a currently set wind direction can be identified. Fig. 4 shows that the open-close status (the wind direction) is currently set to a second direction.

[0046] The open-close status (the wind direction) of the wind direction adjustment louver 13 can be set by selecting among numeric buttons 51 (the buttons 1 to 6 in Fig. 4) on the right-hand side of the screen. A region 52 indicating an open-close status (a wind direction) at the center of the screen is displayed in synchronization with the numeric buttons 51. In the present embodiment, the open-close status of the wind direction adjustment louver 13 can be adjusted in six levels from a first direction (a first angle) in which the wind direction adjustment louver 13 is in a horizontal state (i.e., a fully-closed state) to a sixth direction (a sixth angle) in which the wind direction adjustment louver 13 is in a downward-facing state.

[0047] If an auto swing button 53 on the right-hand side of the screen is pressed, the wind direction adjustment louver 13 is set to pivot (swing) between the first direction and the sixth direction.

[0048] At this time, since wind direction adjustment of only the first wind direction adjustment louver 13a is being performed in the indoor unit 2, only the first wind direction adjustment louver 13a at the ceiling panel 11 is controlled to be opened or closed in response to a manipulation from the remote control 20, as shown in Fig. 7.

[0049] If the numeric button 51 of the remote control 20 is pressed to set the open-close status (the wind direction) of the first wind direction adjustment louver 13a, a command to set the open-close status is output to the control device 15, and the control device 15 controls the open-close status of the corresponding first wind direction adjustment louver 13a in the indoor unit 2. If an OK button 54 of the remote control 20 is further pressed, an OK command is output to the control device 15, and the piece of information of the open-close status (the wind direction) of the first wind direction adjustment louver 13a in the set command output earlier is fixed.

[0050] When the open-close status of the first wind direction adjustment louver 13a is fixed, notification that the second wind direction adjustment louver 13b, which is the next wind direction adjustment louver 13, is being set is given from the control device 15. The screen shifts to a wind-direction-per-louver setting screen (see Fig. 5(A)) for the second wind direction adjustment louver 13b.

[0051] As illustrated on the left-hand side of the screen in Fig. 5(A), the open-close status of the first wind direction adjustment louver 13a is already set, and the second wind direction adjustment louver 13b can be identified as a wind direction adjustment louver currently being set.

[0052] As shown in Fig. 8, at the ceiling panel 11 of the

indoor unit 2, the fixed open-close status of the first wind direction adjustment louver 13a is kept, and only the second wind direction adjustment louver 13b is in a state of being opened or closed in response to a manipulation from the remote control 20.

[0053] An open-close status (a wind direction) selected with the numeric button 51 in Fig. 5(A) is set only on the second wind direction adjustment louver 13b currently being set. For this reason, it is possible to set different wind directions for the respective wind direction adjustment louvers 13 (e.g., set the wind direction of the first wind direction adjustment louver 13a to the second direction and the wind direction of the second wind direction adjustment louver 13b to the fourth direction).

[0054] If the OK button 54 is pressed after completion of the setting of the wind direction of the second wind direction adjustment louver 13b (i.e., after transmission of a set command from the remote control 20), a setting of the open-close status (the wind direction) of the second wind direction adjustment louver 13b is fixed, and the screen shifts to setting of the wind direction for the third wind direction adjustment louver 13c that is the next wind direction adjustment louver 13. The open-close statuses (the wind directions) of all the wind direction adjustment louvers 13 are set in order.

[0055] At the time of setting the wind direction for the fourth wind direction adjustment louver 13d, the fourth wind direction adjustment louver 13d is in a state of being opened or closed in response to a manipulation from the remote control 20 while the open-close statuses of the first to third wind direction adjustment louvers 13a to 13c are kept at fixed wind directions, as shown in Fig. 9. If the OK button 54 is pressed (see Fig. 5(B)) after completion of the setting of the wind direction for the fourth wind direction adjustment louver 13d, the screen shifts to a screen in Fig. 6(A). At this time, at the ceiling panel 11, all the wind direction adjustment louvers 13a to 13d are kept in open-close statuses set from the remote control 20, as shown in Fig. 10.

[0056] If the first to fourth wind direction adjustment louvers 13a to 13d are each set to an open state corresponding to any of the second to sixth directions, all the wind direction adjustment louvers 13 are in an open state, as shown in Fig. 10. It is possible to easily identify completion of setting of the open-close statuses (the wind directions) of all the wind direction adjustment louvers 13 not only by checking a screen on the remote control 20 but also by visually checking the ceiling panel 11.

[0057] Fig. 6(A) shows an example of a screen for prompting a manipulator to check whether setting of the open-close statuses (the wind directions) of all the wind direction adjustment louvers 13 provided in the indoor unit 2 is complete. In Fig. 6(A), the open-close statuses (the wind directions) set for the respective wind direction adjustment louvers 13 are illustrated in a region 55. If the manipulator presses "Yes", the screen shifts to the normal display as shown in Fig. 6(B). On the other hand, if the manipulator presses "No", the screen shifts to the wind-direction-per-louver setting screen for the first wind direction adjustment louver 13a in Fig. 4. It is possible to repeat setting of all the wind direction adjustment louvers 13 in order from the first wind direction adjustment louver 13a.

[0058] The action of the air-conditioning apparatus 1 according to the present embodiment will be described below with reference to Figs. 1 to 13.

[0059] In the case of normal operation, the air-conditioning apparatus 1 starts operating when the start/stop button is turned on with the remote control 20. Cooling operation, dehumidification operation, heating operation, or the like is performed by switching the operation mode among cooling, dehumidification, heating, and the like with the operation mode selection button 40 and arbitrarily setting a set value for room temperature, the air volume, and the like with the set temperature switching button 42 and the air volume switching button 44. As a result, a refrigerant adjusted to a predetermined state is supplied from the outdoor unit 3 to the indoor-side heat exchanger of the indoor unit 2, indoor air circulated by the indoor-side fan is cooled or heated due to exchange of heat between the refrigerant and the indoor air, and temperature adjustment is performed such that the room interior is at a set temperature. When the operation of the air-conditioning apparatus 1 is stopped, the piece of information of the open-close statuses of all the wind direction adjustment louvers 13 at the ceiling panel 11 and various pieces of information, such as the air volume and the operation mode, before the stoppage of the operation are stored in the storage section 31.

[0060] If the wind direction switching button 43 of the remote control 20 is pressed by a manipulator on the normal display in Fig. 3(A), and the wind-direction-per-louver setting button 50 is pressed after a shift to Fig. 3(B), a command to start wind-direction-per-louver setting is transmitted from the remote control 20 to the control device 15, and the wind-direction-per-louver setting is started (step SA1 in Fig. 12). It is judged whether the air-conditioning apparatus 1 is in operation (step SA2 in Fig. 12). If the air-conditioning apparatus 1 is in operation, the indoor unit 2 is stopped, the piece of information of current open-close statuses of all the wind direction adjustment louvers 13 at the ceiling panel 11 is stored in the storage section 31, and all the wind direction adjustment louvers 13 at the ceiling panel 11 are put into a fully-closed state (step SA3 in Fig. 12).

[0061] After that, the first wind direction adjustment louver 13a at the ceiling panel 11 of the indoor unit 2 is controlled to be put into a fully-open state, the second to fourth wind direction adjustment louvers 13b to 13d at the ceiling panel 11 are controlled to be put into a fully-closed state, and a message that the first wind direction adjustment louver 13a is being set is displayed on the remote control 20, as shown in Fig. 4 (step SA4 in Fig. 12).

[0062] If the air-conditioning apparatus 1 is not in operation in step SA2 in Fig. 12, the flow shifts to step SA4 in Fig. 12. The first wind direction adjustment louver 13a

at the ceiling panel 11 is controlled to be put into a fully-open state, the second to fourth wind direction adjustment louvers 13b to 13d are controlled to be put into a fully-closed state, and a message that the first wind direction adjustment louver 13a is being set is displayed on the remote control 20.

[0063] If the manipulator sets the open-close status of the first wind direction adjustment louver 13a with the numeric button 51 of the remote control 20 shown in Fig. 4 (e.g., selects the second direction), a set command to set the open-close status of the first wind direction adjustment louver 13a (e.g., to the second direction) is output from the remote control 20 to the control device 15.

[0064] It is judged in the control device 15 whether a command to set the first wind direction adjustment louver 13a is acquired or an OK command is acquired. If a set command is acquired ("SET COMMAND IS ACQUIRED" in step SA5 in Fig. 12), the control device 15 moves the first wind direction adjustment louver 13a at the ceiling panel 11 in a direction (e.g., the second direction) as an open-close status in the acquired set command. The second to fourth wind direction adjustment louvers 13b to 13d at the ceiling panel 11 are left in a fully-closed state. As shown in Fig. 4, a message that the first wind direction adjustment louver 13a is being set is displayed on the remote control 20 (step SA6 in Fig. 12).

[0065] If the manipulator presses the OK button 54 in Fig. 4 on the remote control 20 after a command to set the open-close status of the wind direction adjustment louver 13, an OK command is output from the remote control 20 to the control device 15. The manipulator can also press the OK button 54 in Fig. 4 without setting the open-close status of the wind direction adjustment louver 13 on the remote control 20 (i.e., without selecting the numeric button 51). In this case, a set command is not output from the remote control 20 to the control device 15, and an OK command is output.

[0066] It is judged in the control device 15 whether an OK command is acquired after the acquisition of the set command. If an OK command is acquired (YES in step SA7 in Fig. 12), a position of the first wind direction adjustment louver 13a at the ceiling panel 11 is fixed. After the fixation, while the open-close status of the first wind direction adjustment louver 13a at the ceiling panel 11 is kept in the open-close status set by the set command, the piece of information of the new open-close status (the wind direction) of the first wind direction adjustment louver 13a is stored in the storage section 31 (step SA8 in Fig. 12). If an OK command is not acquired after the acquisition of the set command (NO in step SA7 in Fig. 12), the control device 15 waits for a command to set the wind direction adjustment louver 13 to be acquired, and the flow returns to step SA6 in Fig. 12.

[0067] If a command to set the first wind direction adjustment louver 13a is not acquired and an OK command is acquired in step SA5 in Fig. 12 ("OK COMMAND IS ACQUIRED" in step SA5 in Fig. 12), setting of the open-close status of the first wind direction adjustment louver 13a is regarded as being skipped, the piece of information of the open-close status of the first wind direction adjustment louver 13a stored in the storage section 31 is read out, the first wind direction adjustment louver 13a at the ceiling panel 11 is moved to a position indicated by the read-out open-close status, and the open-close status of the first wind direction adjustment louver 13a is kept at the position (step SA9 in Fig. 12)

[0068] While the open-close status of the first wind direction adjustment louver 13a at the ceiling panel 11 is kept, the second wind direction adjustment louver 13b is then put into a fully-open state, and the third and fourth wind direction adjustment louvers 13c and 13d are put into a fully-closed state. As shown in Fig. 5(A), a message that the second wind direction adjustment louver 13b is being set is displayed on the remote control 20 (step SA10 in Fig. 13). Like the setting of the open-close status of the first wind direction adjustment louver 13a, open-close status setting is performed for the wind direction adjustment louvers 13 subsequent to the second wind direction adjustment louver 13b (steps are not shown).

[0069] If the open-close status of the fourth wind direction adjustment louver 13d is set to an open-close status from the remote control 20 or is set by reading out the open-close status stored in the storage section 31, setting of the open-close statuses of all of the first to fourth wind direction adjustment louvers 13a to 13d is complete, and all of the wind direction adjustment louvers 13a to 13d at the ceiling panel 11 are kept at respective set positions (see Fig. 9). As shown in Fig. 6(A), a screen for prompting checking as to whether details shown in the region 55 are satisfactory as settings for the wind direction adjustment louvers 13 is displayed on the remote control 20 (step SA11 in Fig. 13).

[0070] It is judged whether "Yes" is pressed on the screen for prompting checking in Fig. 6(A). If "No" is pressed (NO in step SA12 in Fig. 13), the flow returns to step SA4 in Fig. 12 to return to the setting of the first wind direction adjustment louver 13a. If "Yes" is pressed in Fig. 6(A) (YES in step SA12 in Fig. 13), it is judged whether the operation status of the air-conditioning apparatus 1 at the start of the wind-direction-per-louver setting is in-operation. If the operation status of the air-conditioning apparatus 1 is in-operation (YES in step SA13 in Fig. 13), the operation of the air-conditioning apparatus 1 is resumed in a state before the operation stoppage (step SA14 in Fig. 13). At this time, all of the wind direction adjustment louvers 13a to 13d at the ceiling panel 11 are put into the set open-close statuses, and the operation is resumed while various settings other than the open-close statuses of the wind direction adjustment louvers 13 (e.g., the air volume and the operation mode) are unchanged from the state before the stoppage of the indoor unit 2. The remote control 20 returns to the normal display, as shown in Fig. 6(B) (step SA15 in Fig. 13), and the process ends.

[0071] If the operation status of the air-conditioning apparatus 1 at the start of the wind-direction-per-louver set-

ting is not in-operation (NO in step SA13 in Fig. 13), all the wind direction adjustment louvers 13 at the ceiling panel 11 are put into a fully-closed state (see Fig. 11) after the set open-close statuses of all the wind direction adjustment louvers 13 are stored in the storage section 31, the remote control 20 is turned off (step SA16 in Fig. 13), and the process ends.

[0072] The control device 15 according to the above-described embodiment may be configured such that all or some of the above-described processes may be handled separately by software. In this case, the control device 15 includes a CPU, a main storage device, such as a RAM, and a computer-readable recording medium having recorded thereon a program for implementing all or some of the above-described processes. The CPU reads out the program recorded on the recording medium and executes information processing and computation processing, thereby implementing the same processes as the control device 15.

[0073] Examples of the computer-readable recording medium include a magnetic disk, a magneto-optical disk, a CD-ROM, a DVD-ROM, and a semiconductor memory. The computer program may be distributed to a computer via a communication link, and the computer having received the distributed program may execute the program.

[0074] As has been described above, in the indoor unit 2 according to the present embodiment and the air-conditioning apparatus 1 including the same, a control method for the indoor unit 2, and a control program for the same, all of the first to fourth wind direction adjustment louvers 13a to 13d provided at the respective air outlets 14a to 14d, through which airflows from the indoor unit 2 are blown outward, are put into a closed state, and then the open-close status of one wind direction adjustment louver 13 is set. After completion of the setting, the open-close statuses of the wind direction adjustment louvers 13 other than the one wind direction adjustment louver 13 are set while the open-close status of the one wind direction adjustment louver 13 is kept.

[0075] As described above, the open-close status of the next wind direction adjustment louver 13 is set in order while the open-close status of the wind direction adjustment louver 13 after completion of setting is kept. The air-conditioning status of a region to be air-conditioned by the indoor unit 2 is obtained as an actual air-conditioning status. The open-close status of the wind direction adjustment louver 13 can be adjusted while checking whether a desired air-conditioning status is achieved. It is possible for a remote control manipulator to easily know that adjustment of the open-close statuses of all the wind direction adjustment louvers 13 is complete by visually checking that a plurality of wind direction adjustment louvers 13 provided in the indoor unit 2 are all in an open state.

[0076] If the open-close status of the wind direction adjustment louver 13 is not set from the remote control 20, not a set command but an OK command is output from the remote control 20. This allows the control section 30 to control the wind direction adjustment louver 13 using an open-close status stored in the storage section 31 and quickly complete setting of the wind direction adjustment louver 13.

[0077] Note that although the above-described embodiment has explained that wind-direction-per-louver setting is performed after stoppage of the indoor unit 2 of the air-conditioning apparatus 1 if the indoor unit 2 is in operation, the present invention is not limited to this. For example, wind-direction-per-louver setting may be performed while operation of the indoor unit 2 is stopped.

[0078] Note that the present invention is not limited to the above-described embodiment and that appropriate changes can be made without departing from the scope thereof.

{Reference Signs List}

[0079]

1 air-conditioning apparatus
2 indoor unit
13a, 13b, 13c, 13d wind direction adjustment louver (wind direction plate)
14a, 14b, 14c, 14d air outlet (outlet)
15 control device
20 remote control
30 control section (control means)
31 storage section (storage means)

Claims

1. An indoor unit (2) for an air-conditioning apparatus (1) including a plurality of outlets (14a, 14b, 14c, 14d) and wind direction plates (13a, 13b, 13c, 13d) which are configured to adjust wind directions of airflows blown outward from the respective outlets, an open-close status of each of the wind direction plates being settable from a remote control (20), the indoor unit (2) comprising:

control means (30), the control means being configured to

put all of the wind direction plates (13a, 13b, 13c, 13d) of the indoor unit into a closed state, and
subsequently let the open-close status of one (13a) of the wind direction plates (13a, 13b, 13c, 13d) be set from the remote control (20), perform control after completion of the setting such that the one wind direction plate (13a) is kept in the set open-close status, and let the open-close status of a different one (13b) other than the one wind direction plate of the wind direction plates (13a, 13b, 13c, 13d) be set from the remote

control (20) after the completion of the setting for the one wind direction plate (13a).

2. The indoor unit for an air-conditioning apparatus according to Claim 1, further comprising:

storage means (31) for storing the open-close status of each wind direction plate before all of the wind direction plates (13a, 13b, 13c, 13d) are put into a closed state, wherein
if a set command to set the open-close status of the one wind direction plate (13a) is not acquired from the remote control (20), and an OK command to fix a setting of the open-close status of the one wind direction plate (13a) is acquired, the open-close status of the wind direction plate is read out from the storage means (31), and the open-close status of the different wind direction plate (13a) is set from the remote control (20) while the open-close status of the one wind direction plate (13a) is kept in the read-out open-close status.

3. An air-conditioning apparatus (1) comprising:

an indoor unit (2) according to Claim 1 or 2;
a remote control (20) for setting the open-close status of each wind direction plate (13a, 13b, 13c, 13d) of the indoor unit (2); and
an outdoor unit (3) corresponding to the indoor unit.

4. A control method for an indoor unit (2) for an air-conditioning apparatus (1), the indoor unit including a plurality of outlets (14a, 14b, 14c, 14d) and wind direction plates (13a, 13b, 13c, 13d) which are configured to adjust wind directions of airflows blown outward from the respective outlets, an open-close status of each of the wind direction plates being settable from a remote control (20), the control method comprising:

putting all of the wind direction plates (13a, 13b, 13c, 13d) of the indoor unit (2) into a closed state; and
subsequently letting the open-close status of one (13a) of the wind direction plates be set from the remote control (20), performing control after completion of the setting such that the one wind direction plate (13a) is kept in the set open-close status, and letting the open-close status of a different one (13b) other than the one wind direction plate of the wind direction plates be set from the remote control (20) after the completion of the setting for the one wind direction plate (13a).

5. A control program for an indoor unit (2) for an air-conditioning apparatus (1), the indoor unit including a plurality of outlets (14a, 14b, 14c, 14d) and wind direction plates (13a, 13b, 13c, 13d) which are configured to adjust wind directions of airflows blown outward from the respective outlets, an open-close status of each of the wind direction plates being settable from a remote control (20), the control program causing a computer to execute:

putting all of the wind direction plates (13a, 13b, 13c, 13d) of the indoor unit (2) into a closed state; and
subsequently letting the open-close status of one (13a) of the wind direction plates be set from the remote control (20), performing control after completion of the setting such that the one wind direction plate (13a) is kept in the set open-close status, and letting the open-close status of a different one (13b) other than the one wind direction plate of the wind direction plates be set from the remote control (20) after the completion of the setting for the one wind direction plate.

FIG. 1

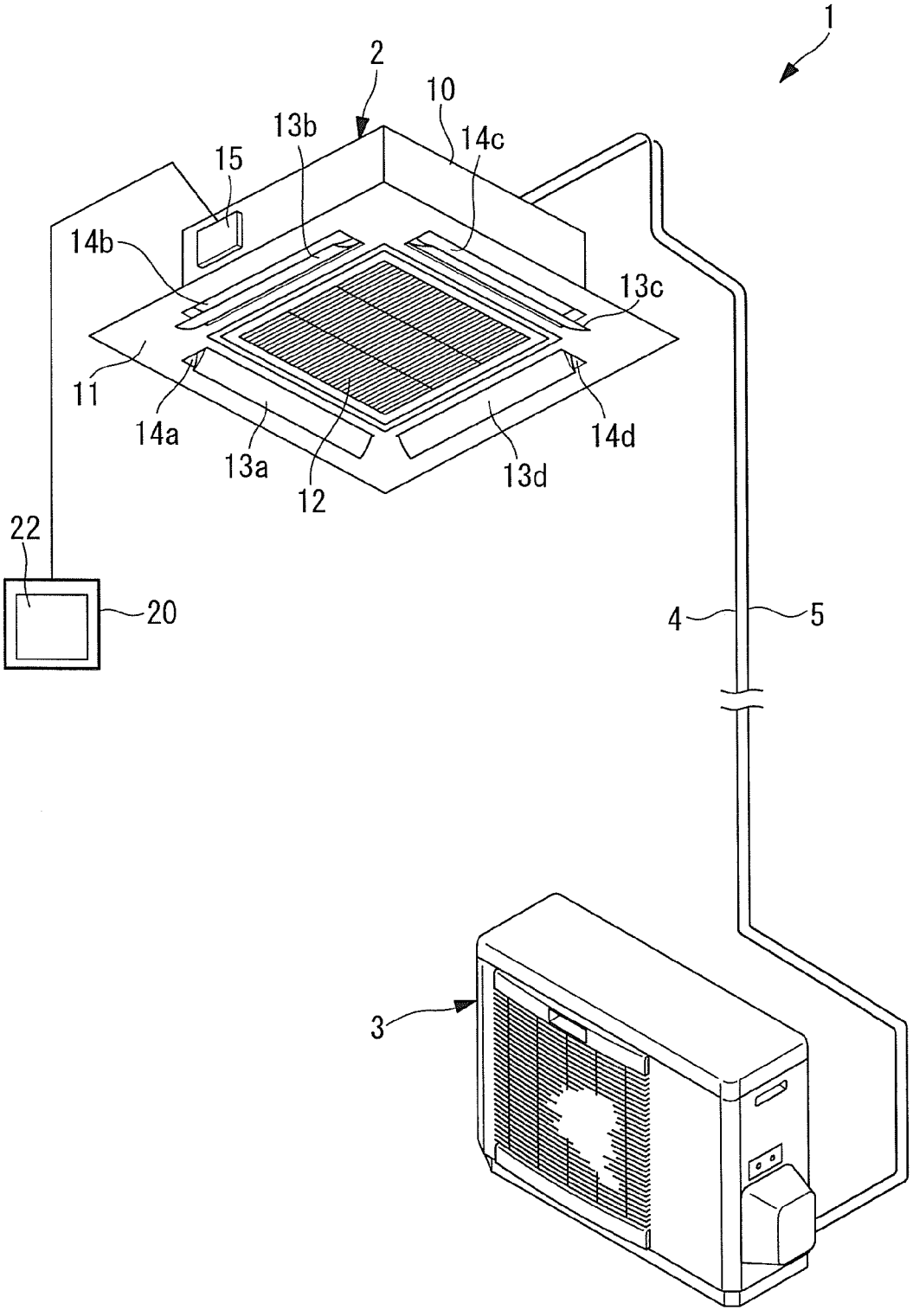


FIG. 2

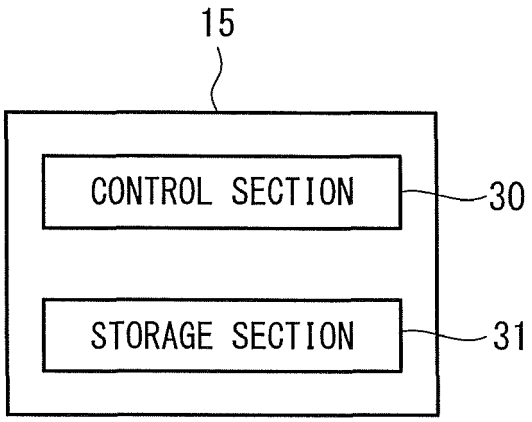


FIG. 3

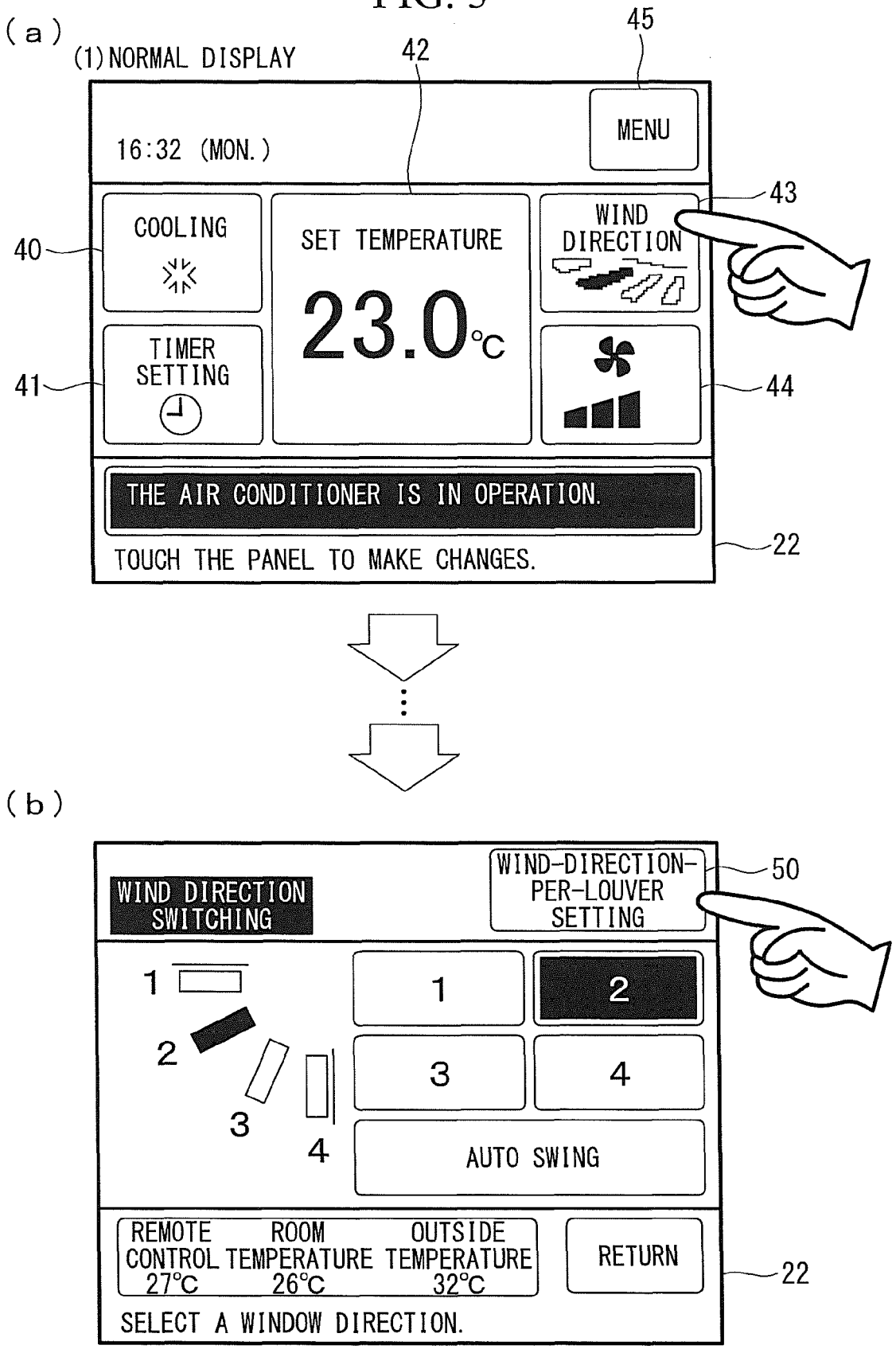

(a)
(1) NORMAL DISPLAY
45
42
MENU
16:32 (MON.)
43
COOLING
SET TEMPERATURE
WIND DIRECTION
40
23.0°C
TIMER SETTING
41
44
THE AIR CONDITIONER IS IN OPERATION.
22
TOUCH THE PANEL TO MAKE CHANGES.
(b)
WIND DIRECTION SWITCHING
WIND-DIRECTION-PER-LOUVER SETTING
50
1
2
3
4
1
2
3
4
AUTO SWING
REMOTE CONTROL 27°C
ROOM TEMPERATURE 26°C
OUTSIDE TEMPERATURE 32°C
RETURN
22
SELECT A WINDOW DIRECTION.

FIG. 4

(2) WIND-DIRECTION-PER-LOUVER SETTING DISPLAY 1

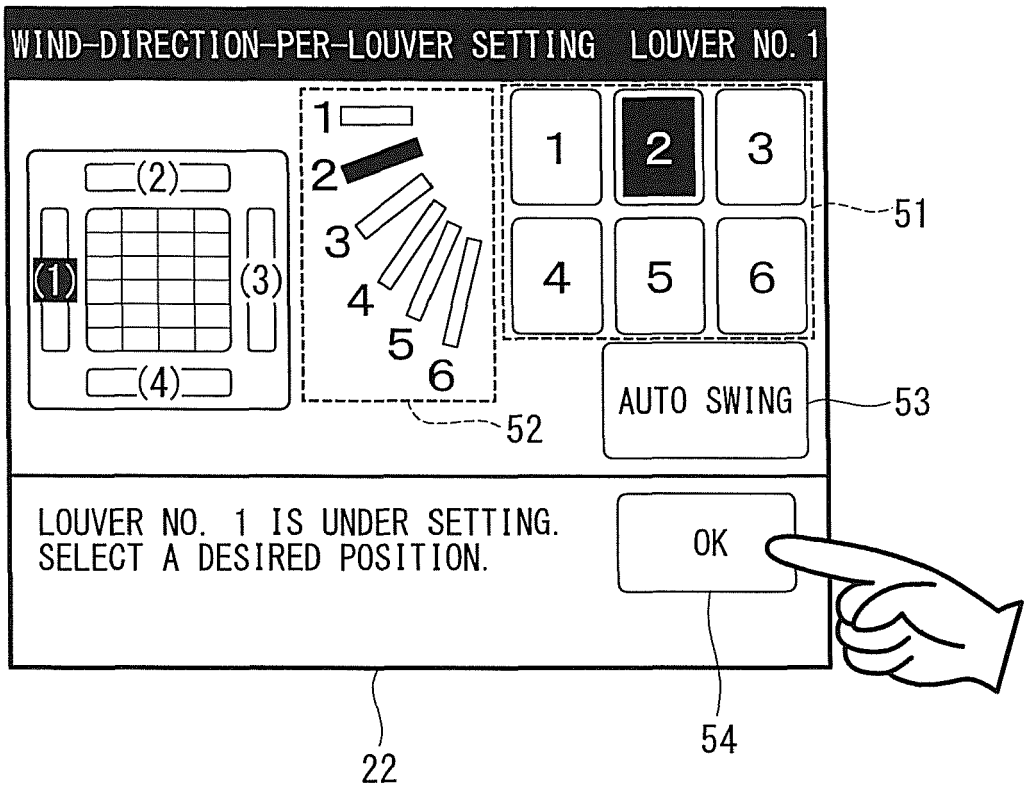
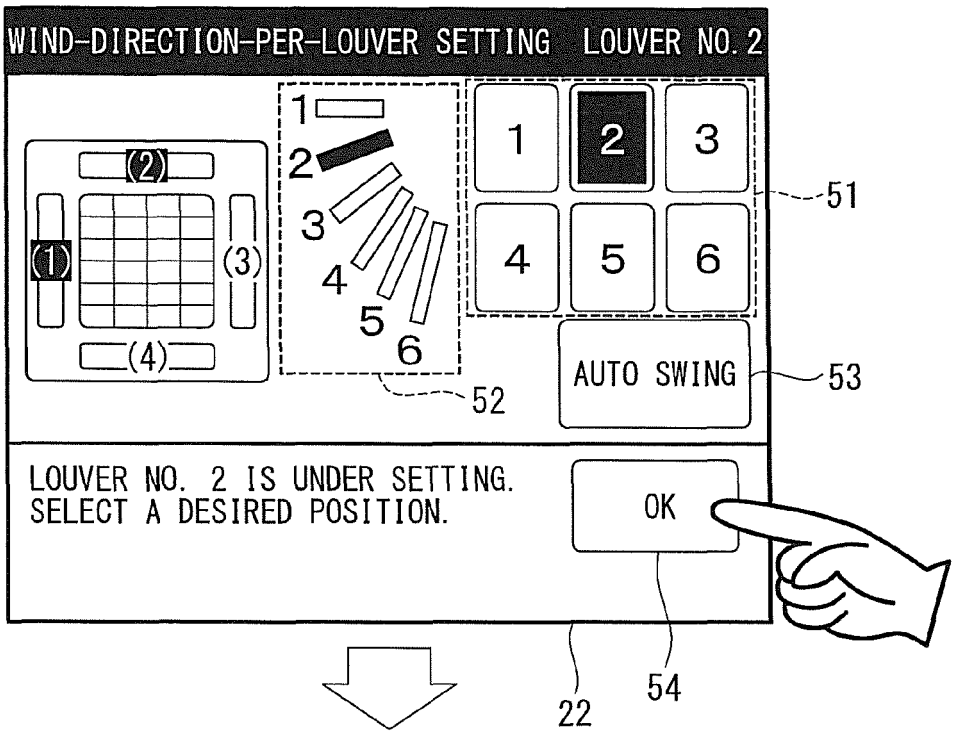


FIG. 5

(a)

(3) WIND-DIRECTION-PER-LOUVER SETTING DISPLAY 2



(b)

(5) WIND-DIRECTION-PER-LOUVER SETTING DISPLAY 4

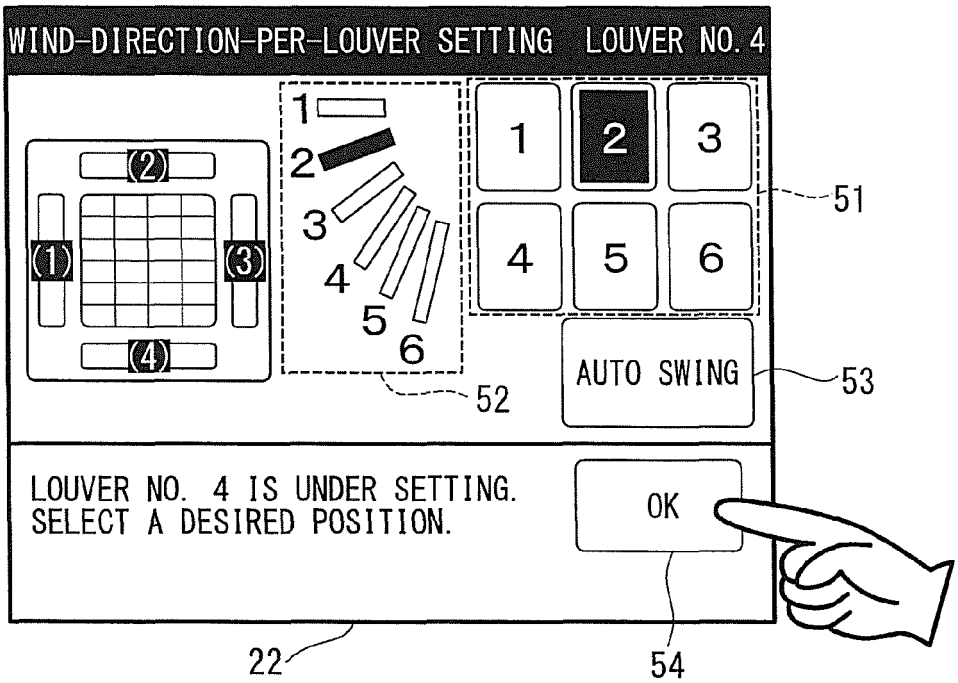
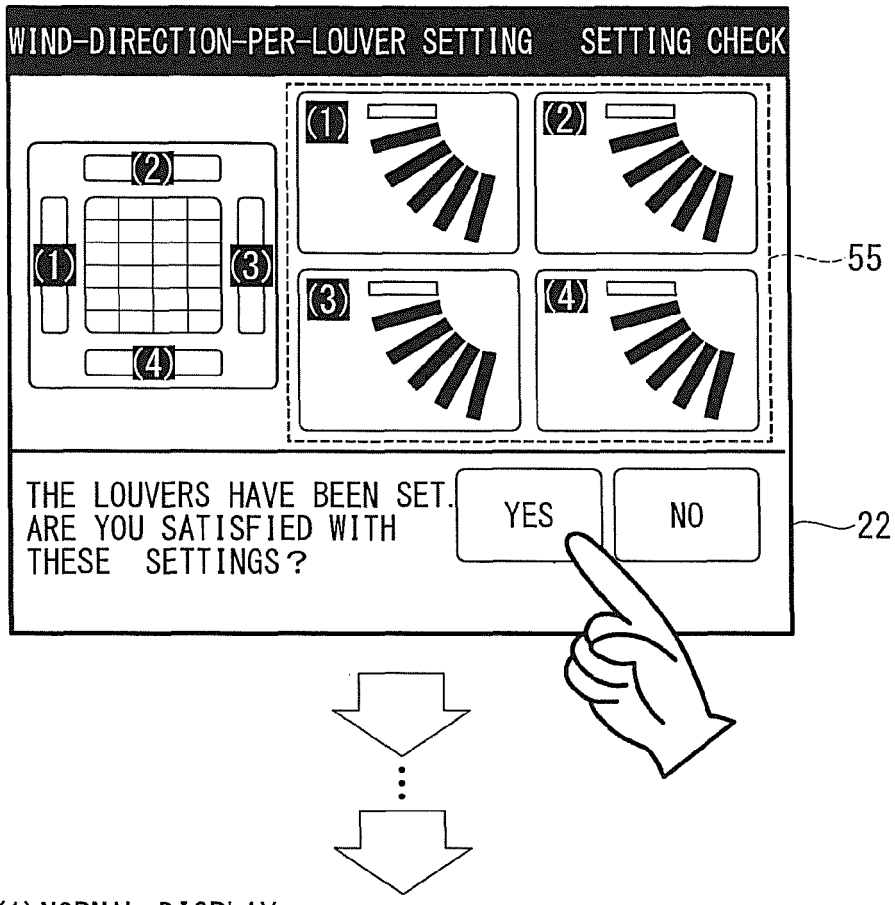


FIG. 6

(a)

(6) WIND-DIRECTION-PER-LOUVER SETTING DISPLAY 5



(b)

(1) NORMAL DISPLAY

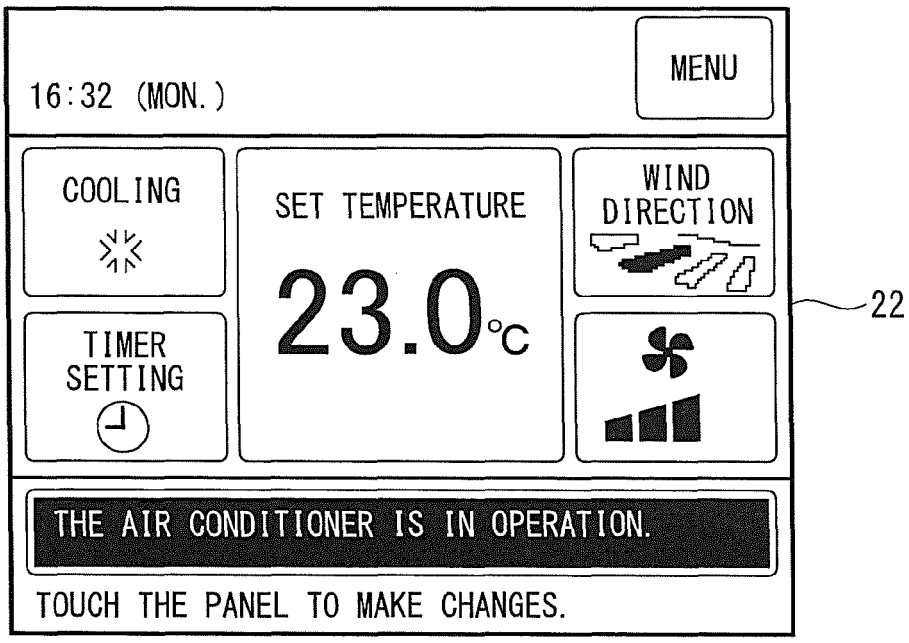


FIG. 7

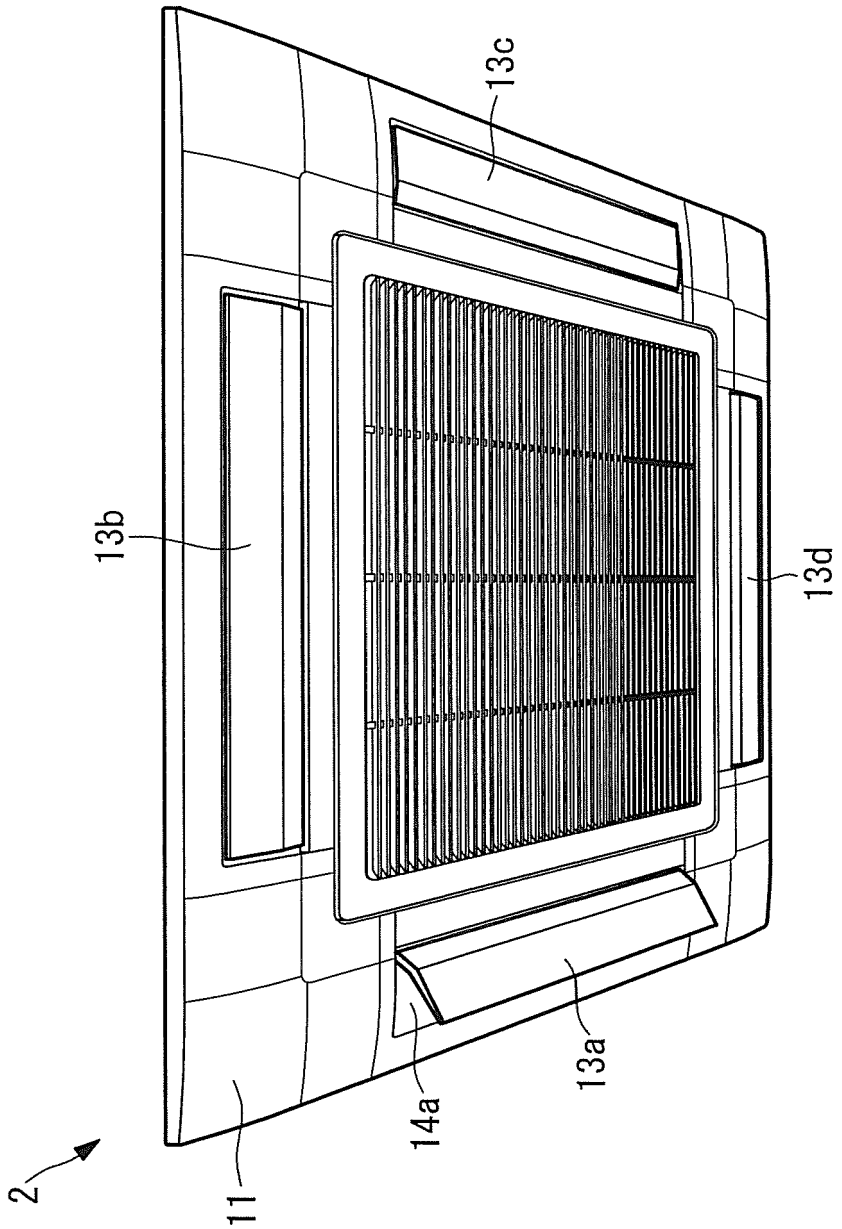


FIG. 8

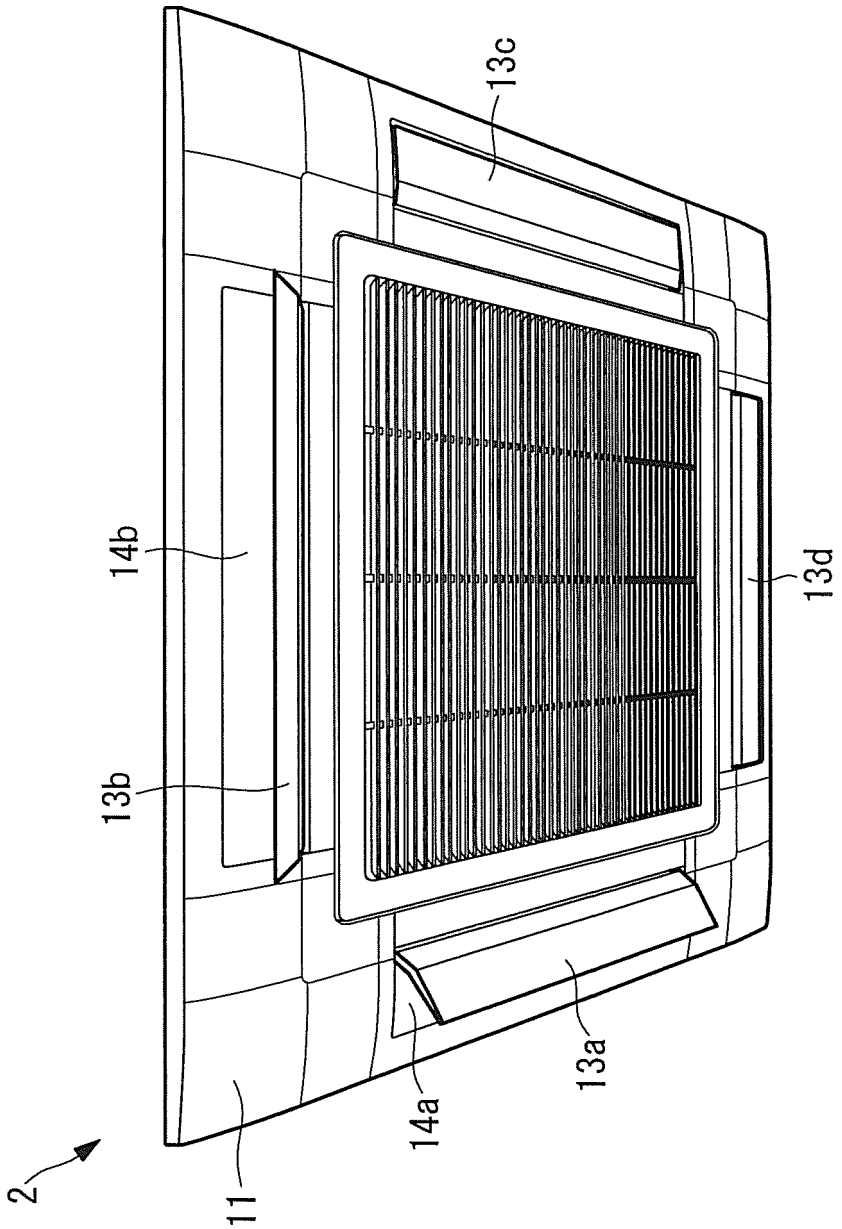


FIG. 9

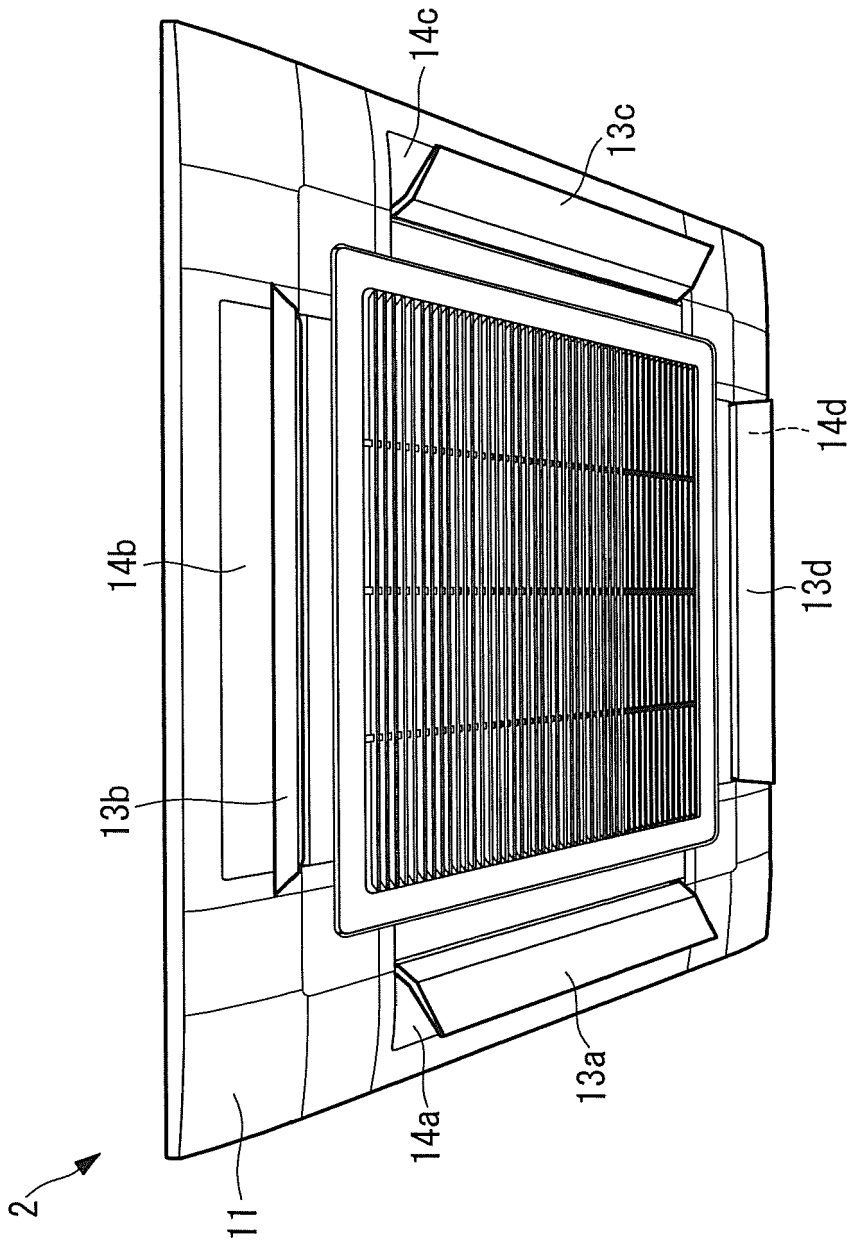


FIG. 10

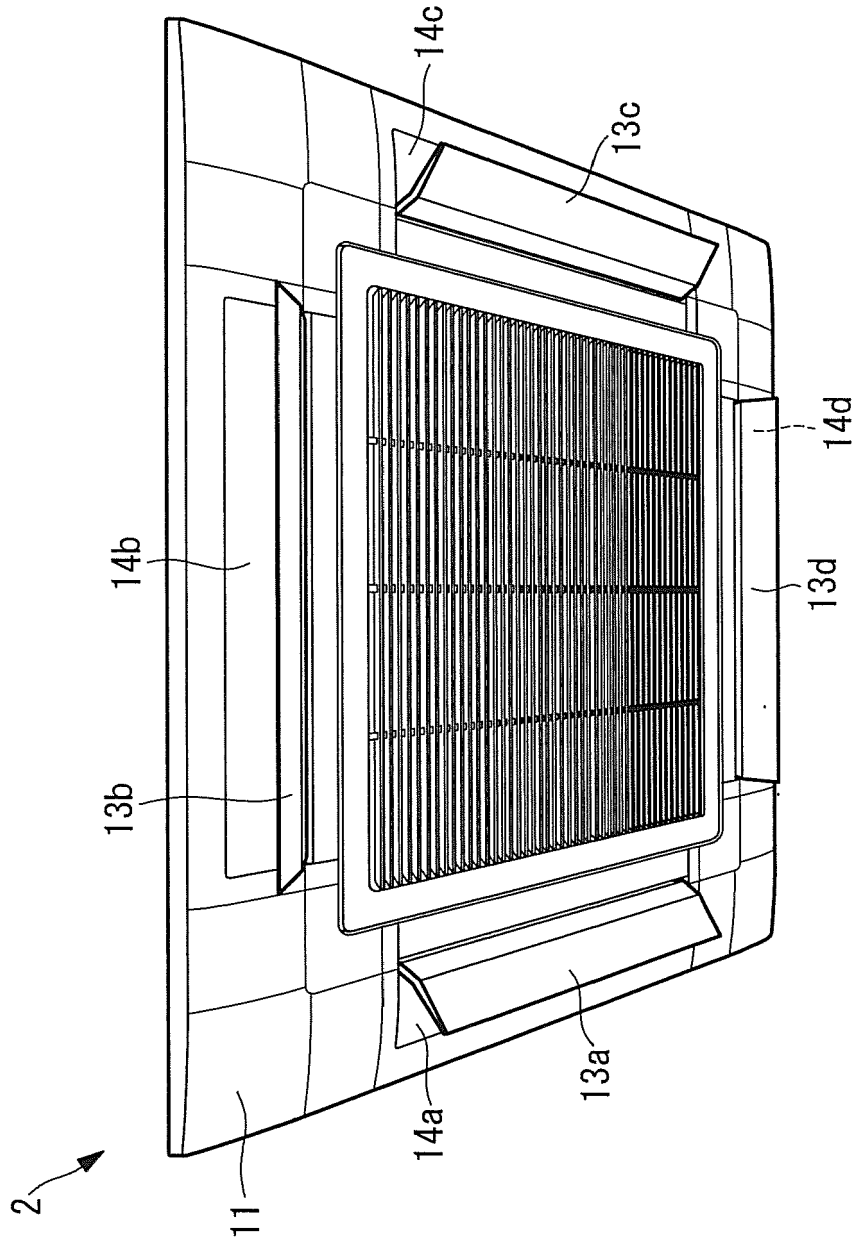


FIG. 11

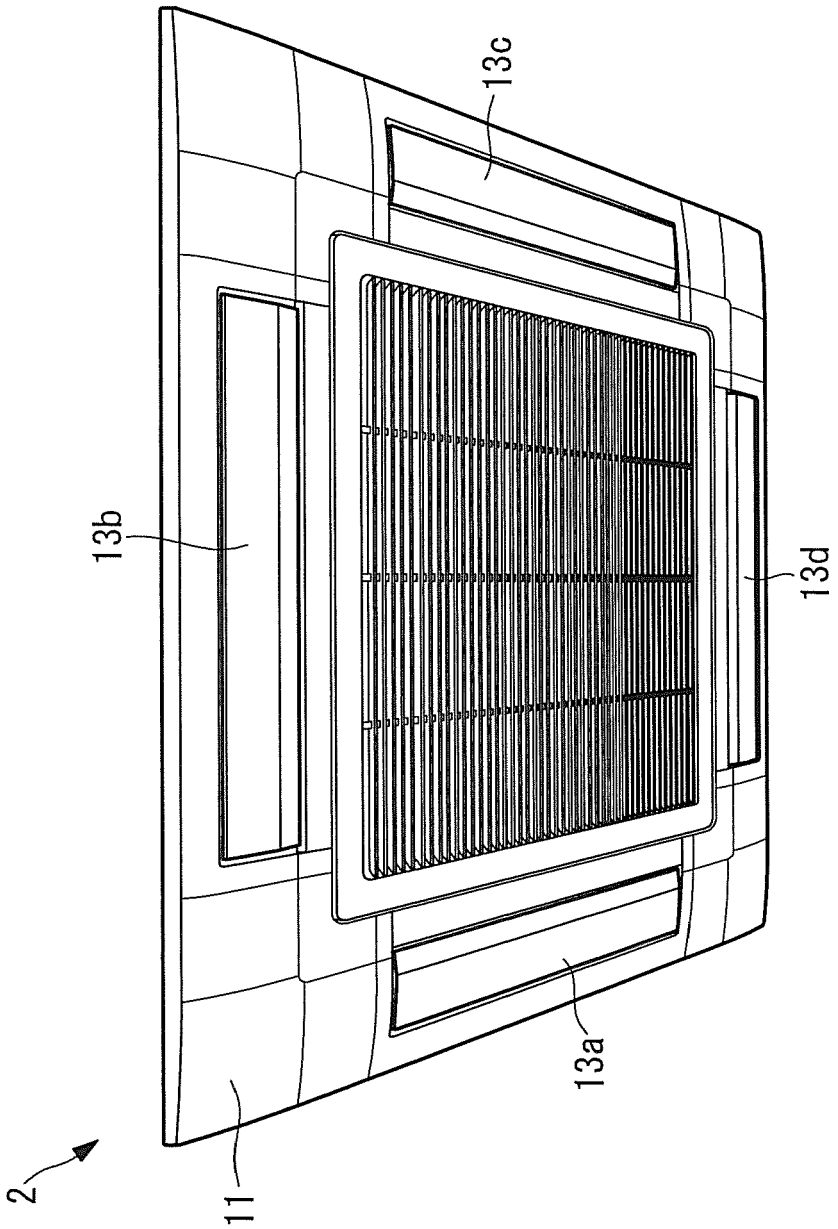


FIG. 12

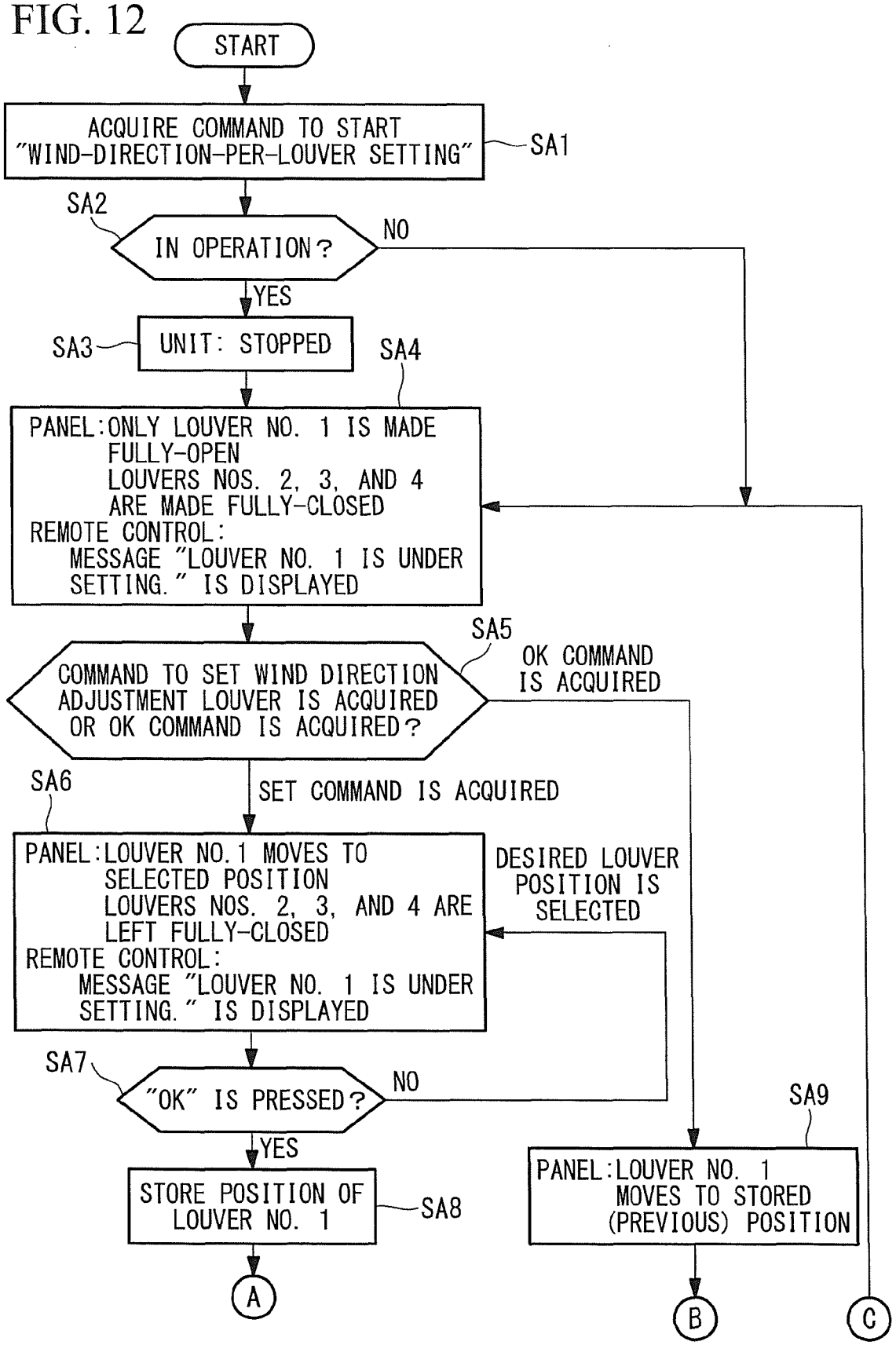
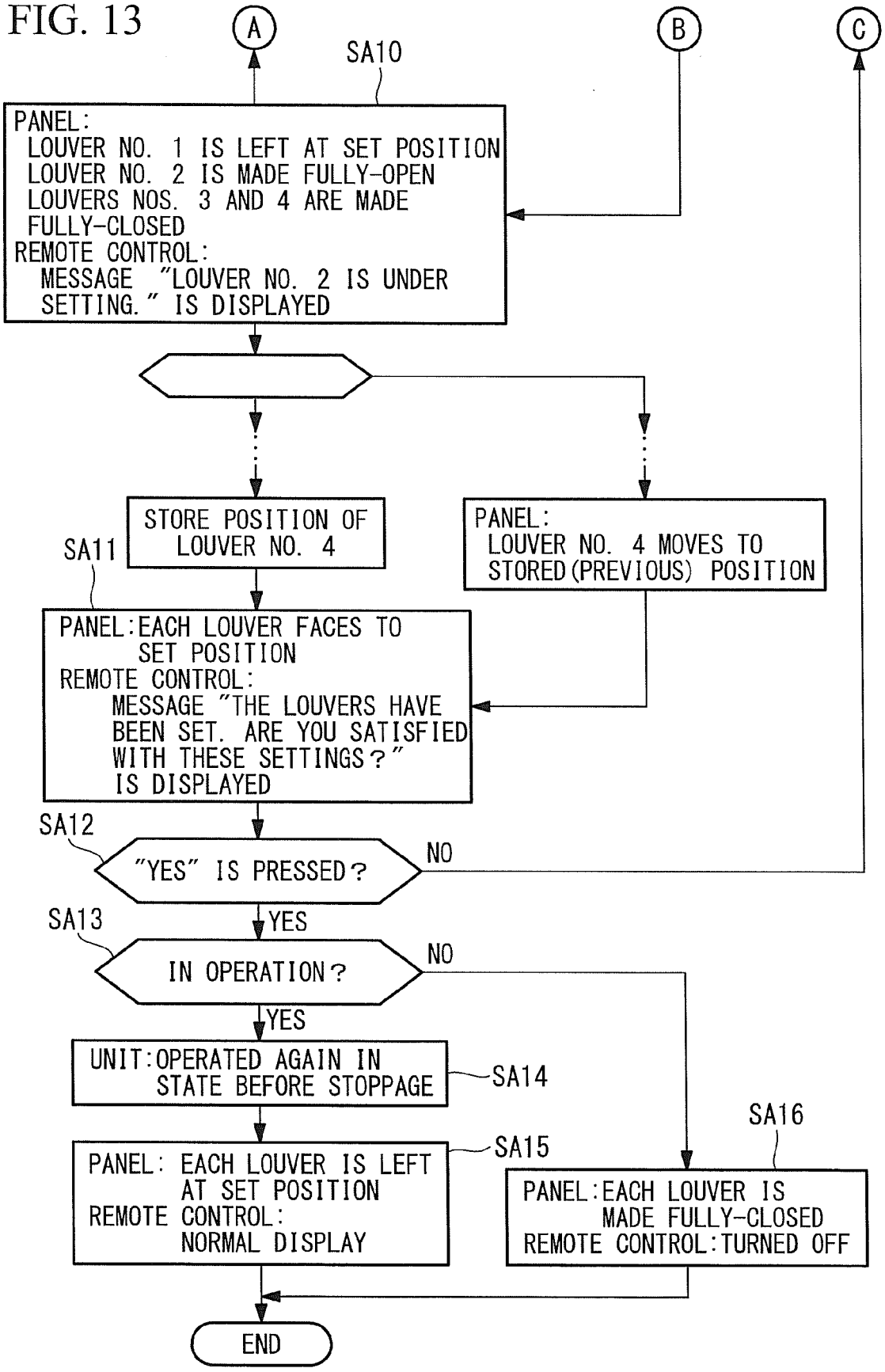

START
ACQUIRE COMMAND TO START "WIND-DIRECTION-PER-LOUVER SETTING"
SA1
SA2
IN OPERATION?
NO
YES
SA3
UNIT: STOPPED
SA4
PANEL:ONLY LOUVER NO. 1 IS MADE FULLY-OPEN
LOUVERS NOS. 2, 3, AND 4 ARE MADE FULLY-CLOSED
REMOTE CONTROL:
MESSAGE "LOUVER NO. 1 IS UNDER SETTING." IS DISPLAYED
SA5
COMMAND TO SET WIND DIRECTION ADJUSTMENT LOUVER IS ACQUIRED OR OK COMMAND IS ACQUIRED?
OK COMMAND IS ACQUIRED
SET COMMAND IS ACQUIRED
SA6
PANEL:LOUVER NO.1 MOVES TO SELECTED POSITION
LOUVERS NOS. 2, 3, AND 4 ARE LEFT FULLY-CLOSED
REMOTE CONTROL:
MESSAGE "LOUVER NO. 1 IS UNDER SETTING." IS DISPLAYED
DESIRED LOUVER POSITION IS SELECTED
SA7
"OK" IS PRESSED?
NO
YES
SA8
STORE POSITION OF LOUVER NO. 1
SA9
PANEL:LOUVER NO. 1 MOVES TO STORED (PREVIOUS) POSITION
A
B
C

FIG. 13


A
B
C
SA10
PANEL:
LOUVER NO. 1 IS LEFT AT SET POSITION
LOUVER NO. 2 IS MADE FULLY-OPEN
LOUVERS NOS. 3 AND 4 ARE MADE FULLY-CLOSED
REMOTE CONTROL:
MESSAGE "LOUVER NO. 2 IS UNDER SETTING." IS DISPLAYED
STORE POSITION OF LOUVER NO. 4
SA11
PANEL:
LOUVER NO. 4 MOVES TO STORED (PREVIOUS) POSITION
PANEL: EACH LOUVER FACES TO SET POSITION
REMOTE CONTROL:
MESSAGE "THE LOUVERS HAVE BEEN SET. ARE YOU SATISFIED WITH THESE SETTINGS?" IS DISPLAYED
SA12
"YES" IS PRESSED?
NO
YES
SA13
IN OPERATION?
NO
YES
UNIT: OPERATED AGAIN IN STATE BEFORE STOPPAGE
SA14
SA15
PANEL: EACH LOUVER IS LEFT AT SET POSITION
REMOTE CONTROL:
NORMAL DISPLAY
SA16
PANEL: EACH LOUVER IS MADE FULLY-CLOSED
REMOTE CONTROL: TURNED OFF
END

Europäisches Patentamt
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EUROPEAN SEARCH REPORT

Application Number
EP 16 18 1907

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	JP 4 495778 B1 (DENSHO CO LTD) 7 July 2010 (2010-07-07) * paragraphs [0020], [0028], [0029], [0040] - [0043]; figures 1,2,4,5 *	1-5	INV. F24F1/00 F24F11/00
A,D	JP 2013 113469 A (FUJITSU GENERAL LTD) 10 June 2013 (2013-06-10) * paragraphs [0008] - [0012]; figures 1,4 *	1-5	
A	EP 2 530 395 A1 (DAIKIN IND LTD [JP]) 5 December 2012 (2012-12-05) * abstract; figures 2,5,16,18 * * paragraphs [0067], [0075], [0076] *	1-5	

TECHNICAL FIELDS SEARCHED (IPC)

F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	13 December 2016	Salaün, Eric

CATEGORY OF CITED DOCUMENTS

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13-12-2016

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- JP 2012154593 A **[0006]**