(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 764 018 A1

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
13.01.2021 Bulletin 2021/02

(21) Application number: **18908734.9**

(22) Date of filing: **06.03.2018**

(51) Int Cl.:
F24F 13/20 *(2006.01)* ***F24F 11/62*** *(2018.01)*
F24F 11/74 *(2018.01)* ***F24F 13/14*** *(2006.01)*

(86) International application number:
PCT/JP2018/008536

(87) International publication number:
WO 2019/171461 (12.09.2019 Gazette 2019/37)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(71) Applicant: **Mitsubishi Electric Corporation**
Tokyo 100-8310 (JP)

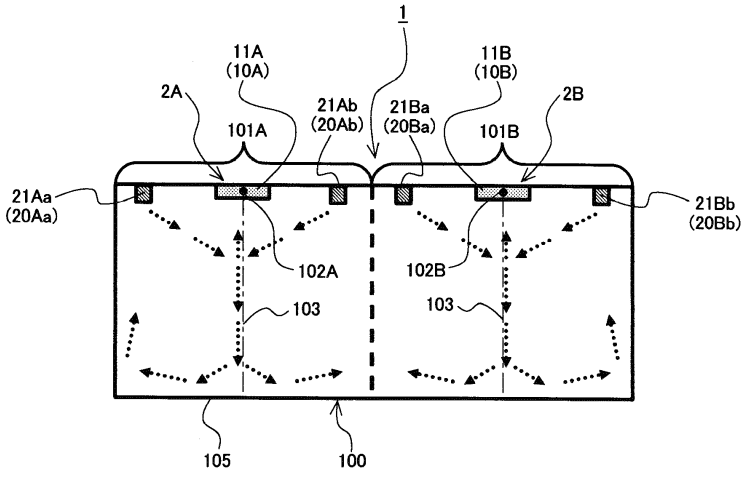
(72) Inventors:
- **TAMAKI, Shogo**
  Tokyo 100-8310 (JP)
- **HAMADA, Mamoru**
  Tokyo 100-8310 (JP)
- **MATSUDA, Takuya**
  Tokyo 100-8310 (JP)

(74) Representative: **Studio Torta S.p.A.**
Via Viotti, 9
10121 Torino (IT)

(54) **AIR-CONDITIONING SYSTEM**

(57) An air-conditioning system according to an embodiment of the present disclosure is an air-conditioning system that conditions air of a room partitioned into a plurality of rectangular air-conditioning target areas in a plan view, and includes a use-side unit that is installed above a ceiling of one of the air-conditioning target areas and is configured to perform air-conditioning operation to condition air of the one air-conditioning target area. Where the air-conditioning target area where the use-side unit is installed is an installation area, the use-side unit includes a main body unit that cools and heats air of the installation area sucked from an air inlet provided on a bottom surface, and a blowout unit that is connected to the main body unit by a duct, and blows out air supplied from the main body unit, from an air outlet provided on a bottom surface, the blowout unit includes a vertical wind direction louver that adjusts a direction of the air blown out from the air outlet in a vertical direction, and the vertical wind direction louver is inclined against a vertical line and guides the air toward a center of the installation area.

FIG. 5



EP 3 764 018 A1

Description

Technical Field

[0001] The present disclosure relates to an air-conditioning system used in a room in which air is conditioned by a plurality of use-side units.

Background Art

[0002] To condition air inside a large room such as an office, an air-conditioning system including a plurality of use-side units is used. In other words, the plurality of use-side units are installed in the room, and each of the plurality of use-side units performs air-conditioning operation to adjust temperature in the room to comfortable temperature. The air-conditioning operation is cooling operation or heating operation. In such an existing air-conditioning system, for example, each of the plurality of use-side units detects, by a temperature sensor, temperature of an air-conditioning target area covered by the own unit, and performs the air-conditioning operation until a value detected by the temperature sensor becomes set temperature. The existing air-conditioning system uniformizes the temperature in the room in the above-described manner.

[0003] Further, as one kind of the existing air conditioning system, an air-conditioning system that selectively conditions air of a partial area in the room to save energy has been proposed (see Patent Literature 1). More specifically, an inside of the room where the air-conditioning system disclosed in Patent Literature 1 is used is partitioned into a plurality of rectangular air-conditioning target areas in a plan view. The air-conditioning system disclosed in Patent Literature 1 includes a plurality of use-side units, and the use-side units are provided above ceilings of the respective air-conditioning target areas of the room. Further, each of the use-side units of the air-conditioning system disclosed in Patent Literature 1 includes a human detection sensor that detects whether a person is present. In the air-conditioning system disclosed in Patent Literature 1, the use-side unit installed in the air-conditioning target area where a person is present performs the air-conditioning operation. At this time, the use-side unit installed in the air-conditioning target area where no person is present, adjacent to the air-conditioning target area where a person is present, performs air-sending operation, and blows out air downward from an air outlet on a side close to the air-conditioning target area where a person is present. In other words, in the air-conditioning system disclosed in Patent Literature 1, the air blown out from the use-side unit installed in the air-conditioning target area where no person is present forms an air curtain that prevents the temperature-conditioned air blown out from the use-side unit installed in the air-conditioning target area where a person is present, from flowing out to the air-conditioning target area where no person is present. According to Patent Literature 1, operating the air-conditioning system in the above-described manner allows for selective air conditioning of the air-conditioning target area where a person is present, thereby saving energy.

Citation List

Patent Literature

[0004] Patent Literature 1: Japanese Unexamined Patent Application Publication No. 2017-083084

Summary of Invention

Technical Problem

[0005] In a case where a boundary between the air-conditioning target area where a person is present and the air-conditioning target area where no person is present is viewed, the air blown out from the use-side unit installed in the air-conditioning target area where no person is present flows only to a region below the air outlet. In other words, at the boundary between the air-conditioning target area where a person is present and the air-conditioning target area where no person is present, an air curtain is formed below the air outlet of the use-side unit installed in the air-conditioning target area where no person is present, but an air curtain is not formed in the most part of the area. Accordingly, in the air-conditioning system disclosed in Patent Literature 1, the temperature-conditioned air blown out from the use-side unit installed in the air-conditioning target area where a person is present leaks to the air-conditioning target area where no person is present from a position where the air curtain is not formed. Thus, the air-conditioning system disclosed in Patent Literature 1 cannot selectively condition the air of a partial area in the room, and cannot sufficiently save energy.

[0006] The present disclosure is made to solve the above-described issues, and an object of the present disclosure is to provide an air-conditioning system that can selectively condition air of a partial area in a room, and can save energy as compared with the existing air-conditioning system.

Solution to Problem

[0007] An air-conditioning system according to an embodiment of the present disclosure is an air-conditioning system that conditions air of a room partitioned into a plurality of rectangular air-conditioning target areas in a plan view, and includes a use-side unit that is installed above a ceiling of one of the air-conditioning target areas and is configured to perform air-conditioning operation to condition air of the one air-conditioning target area. In a case where the air-conditioning target area where the use-side unit is installed is defined as an installation area, the use-side unit includes a main body unit that is installed

above the ceiling of the installation area, and cools and heats air of the installation area sucked from an air inlet provided on a bottom surface, and a blowout unit that is connected to the main body unit by a duct, is installed above the ceiling of the installation area, and blows out air supplied from the main body unit, from an air outlet provided on a bottom surface, the blowout unit includes a vertical wind direction louver that adjusts a direction of the air blown out from the air outlet in a vertical direction, and the vertical wind direction louver is inclined against a vertical line and guides the air toward a center of the installation area.

Advantageous Effects of Invention

[0008] In the air-conditioning system according to the embodiment of the present disclosure, temperature-conditioned air blown out from the air outlet of the blowout unit flows toward the center of the installation area of the use-side unit, and then flows out from the installation area. Accordingly, the temperature-conditioned air blown out from the air outlet of the blowout unit flows out from the installation area after sufficiently exchanging heat with the air of the installation area. In other words, the air-conditioning system according to the embodiment of the present disclosure can suppress outflow of cooling energy or heating energy to the outside of the installation area of the use-side unit as compared with the existing air-conditioning system. Thus, the air-conditioning system according to the embodiment of the present disclosure can selectively condition the air of a partial area in the room, and can save energy, as compared with the existing air-conditioning system.

Brief Description of Drawings

[0009]

[Fig. 1] Fig. 1 is a diagram used to explain an arrangement configuration of an air-conditioning system according to Embodiment 1 of the present disclosure.

[Fig. 2] Fig. 2 is a diagram illustrating a schematic configuration of a use-side unit of the air-conditioning system according to Embodiment 1 of the present disclosure.

[Fig. 3] Fig. 3 is a block diagram used to explain a controller of the air-conditioning system according to Embodiment 1 of the present disclosure.

[Fig. 4] Fig. 4 is a side view used to explain operation of an existing air-conditioning system.

[Fig. 5] Fig. 5 is a side view used to explain operation of the air-conditioning system according to Embodiment 1 of the present disclosure when the use-side unit performs cooling operation.

[Fig. 6] Fig. 6 is a side view used to explain the operation of the air-conditioning system according to Embodiment 1 of the present disclosure when the use-side unit performs heating operation.

[Fig. 7] Fig. 7 is a flowchart illustrating an example of a method of controlling the air-conditioning system according to Embodiment 1 of the present disclosure.

[Fig. 8] Fig. 8 is a diagram used to explain an example of the operation of the air-conditioning system according to Embodiment 1 of the present disclosure.

[Fig. 9] Fig. 9 is a diagram used to explain an arrangement configuration of an air-conditioning system according to Embodiment 2 of the present disclosure.

[Fig. 10] Fig. 10 is a diagram used to explain an arrangement configuration of an air-conditioning system according to Embodiment 3 of the present disclosure. Description of Embodiments

[0010] An example of an air-conditioning system according to an embodiment of the present disclosure is described below with reference to drawings and the like. Note that modes of configurations described in the following embodiments are illustrative. The configuration of the air-conditioning system according to the present disclosure is not limited to the configurations described in the following embodiments. Further, a combination of the configurations is not limited only to a combination in one embodiment, and the configurations described in some embodiments may be combined.

Embodiment 1.

[Arrangement Configuration of Air-Conditioning System 1]

[0011] Fig. 1 is a diagram used to explain an arrangement configuration of an air-conditioning system according to Embodiment 1 of the present disclosure. Fig. 1 is a diagram illustrating installation positions of main body units 10 and blowout units 20 of use-side units 2 of an air-conditioning system 1 when a room 100 that is an air-conditioned space is observed from above. Note that positions of air inlets 11 of the main body units 10 and positions of air outlets 21 of the blowout units 20 are illustrated in Fig. 1.

[0012] The air-conditioning system 1 according to Embodiment 1 is used in the room 100, air of which is conditioned by a plurality of use-side units, such as an office. In Embodiment 1, an inside of the room 100 is partitioned into two rectangular air-conditioning target areas 101 in a plan view. More specifically, the inside of the room 100 is partitioned into a rectangular air-conditioning target area 101A and a rectangular air-conditioning target area 101B in a plan view. The air-conditioning target area 101A and the air-conditioning target area 101B are adjacent to each other.

[0013] Further, the use-side unit 2 of the air-conditioning system 1 is installed above a ceiling of each of the air-conditioning target area 101A and the air-conditioning

target area 101B. The use-side unit 2 installed above the ceiling of the air-conditioning target area 101A conditions air in the air-conditioning target area 101A during air-conditioning operation. The use-side unit 2 installed above the ceiling of the air-conditioning target area 101B conditions air in the air-conditioning target area 101B during the air-conditioning operation. The air-conditioning operation is cooling operation or heating operation. Note that the use-side units 2 according to Embodiment 1 can perform the cooling operation and the heating operation. In other words, in Embodiment 1, each of the air-conditioning target area 101A and the air-conditioning target area 101B is an installation area where the use-side unit 2 of the air-conditioning system 1 according to Embodiment 1 is installed.

[0014] At this time, one of the use-side unit 2 installed in the air-conditioning target area 101A and the use-side unit 2 installed in the air-conditioning target area 101B serves as a first use-side unit. The other of the use-side unit 2 installed in the air-conditioning target area 101A and the use-side unit 2 installed in the air-conditioning target area 101B serves as a second use-side unit. An area where the first use-side unit is installed out of the air-conditioning target area 101A and the air-conditioning target area 101B is a first installation area. An area where the second use-side unit is installed out of the air-conditioning target area 101A and the air-conditioning target area 101B is a second installation area.

[0015] In the following, in a case where the use-side units 2 installed above the ceilings of the respective air-conditioning target areas 101 are distinguished from each other, a capital letter at the end of the reference numeral of the air-conditioning target area 101 where each of the use-side units 2 is installed is appended at the end of a reference numeral of each component of the use-side units 2. For example, a capital letter "A" is appended to the end of a reference numeral of each component of the use-side unit 2 installed above the ceiling of the air-conditioning target area 101A. Further, for example, a capital letter "B" is appended at the end of a reference numeral of each component of the use-side unit 2 installed above the ceiling of the air-conditioning target area 101B. Further, a plurality of components having the same configuration may be installed in one air-conditioning target area 101. In this case, to distinguish the components having the same configuration, a lowercase letter is appended at the end of a reference numeral for distinction. For example, as described below, a use-side unit 2A installed in the air-conditioning target area 101A includes four blowout units 20A. In a case where these blowout units 20A are distinguished from one another, the blowout units 20A are denoted by a blowout unit 20Aa, a blowout unit 20Ab, a blowout unit 20Ac, and a blowout unit 20Ad.

[0016] Each of the use-side units 2 includes one main body unit 10 and the four blowout units 20. The main body units 10 are installed above the ceilings of the respective air-conditioning target areas 101. Further, each of the main body units 10 includes an air inlet 11 that communicates with the corresponding air-conditioning target area 101 on a bottom surface. Each of the main body units 10 has a configuration that cools and heats air of the corresponding air-conditioning target area 101 sucked from the own air inlet 11. Each of the main body units 10 is installed such that, for example, a center 12 of the own inlet 11 agrees with a center 102 of the corresponding air-conditioning target area 101 in a plan view. Note that each of the main body units 10 may be installed such that the center 12 of the own inlet 11 is not coincident with the center 102 of the corresponding air-conditioning target area 101 in a plan view.

[0017] The blowout units 20 are installed above the ceilings of the air-conditioning target areas 101. Further, each of the blowout units 20 includes an air outlet 21 that communicates with the corresponding air-conditioning target area 101 on a bottom surface. In addition, the blowout units 20 are connected to the main body units 10 by ducts 30. In other words, each of the blowout units 20 has a configuration that blows out temperature-conditioned air supplied from the connected main body unit 10, to the corresponding air-conditioning target area 101 from the own air outlet 21. The blowout units 20 are installed at positions where the respective air outlets 21 are located near sides of the air-conditioning target areas 101 in a plan view. Further, the blowout units 20 are installed such that longitudinal directions of the respective air outlets 21 extend along the sides of the air-conditioning target areas 101.

[0018] More specifically, a main body unit 10A of the use-side unit 2A is installed such that a center 12A of an air inlet 11A agrees with a center 102A of the air-conditioning target area 101A in a plan view. The blowout unit 20Aa of the use-side unit 2A is installed at a position where an air outlet 21Aa is located near a left side of the air-conditioning target area 101A on a paper surface of Fig. 1 that illustrates the air-conditioning target area 101A in a plan view. The blowout unit 20Ab of the use-side unit 2A is installed at a position where an air outlet 21Ab is located near a right side of the air-conditioning target area 101A on a paper surface of Fig. 1 that illustrates the air-conditioning target area 101A in a plan view. The blowout unit 20Ac of the use-side unit 2A is installed at a position where an air outlet 21Ac is located near an upper side of the air-conditioning target area 101A on a paper surface of Fig. 1 that illustrates the air-conditioning target area 101A in a plan view. The blowout unit 20Ad of the use-side unit 2A is installed at a position where an air outlet 21Ad is located near a lower side of the air-conditioning target area 101A on a paper surface of Fig. 1 that illustrates the air-conditioning target area 101A in a plan view.

[0019] A main body unit 10B of a use-side unit 2B is installed such that a center 12B of an air inlet 11B agrees with a center 102B of the air-conditioning target area 101B in a plan view. A blowout unit 20Ba of the use-side unit 2B is installed at a position where an air outlet 21Ba

is located near a side on a left side of the air-conditioning target area 101B on a paper surface of Fig. 1 that illustrates the air-conditioning target area 101B in a plan view. A blowout unit 20Bb of the use-side unit 2B is installed at a position where an air outlet 21Bb is located near a right side of the air-conditioning target area 101B on a paper surface of Fig. 1 that illustrates the air-conditioning target area 101B in a plan view. A blowout unit 20Bc of the use-side unit 2B is installed at a position where an air outlet 21Bc is located near an upper side of the air-conditioning target area 101B on a paper surface of Fig. 1 that illustrates the air-conditioning target area 101B in a plan view. A blowout unit 20Bd of the use-side unit 2B is installed at a position where an air outlet 21Bd is located near a lower side of the air-conditioning target area 101B on a paper surface of Fig. 1 that illustrates the air-conditioning target area 101B in a plan view.

[0020] In a plan view, one side of the air-conditioning target area typically has a length of about 7.2 m. Further, when the air outlets 21 are installed inside the air-conditioning target areas 101 as air-conditioned objects in a plan view, it is possible to selectively condition the air of the air-conditioning target areas 101 as the air conditioned objects. Accordingly, each of the blowout units 20 is preferably installed such that, in a plan view, a distance between the center 102 of the corresponding air-conditioning target area 101 and the center 22 of the own air outlet 21 is lower than or equal to 3.6 m that is a half of the length of one side of each of the air-conditioning target areas 101. Each of the main body units 10 is often installed such that, in a plan view, the center 12 of the own air inlet 11 agrees with the center 102 of the corresponding air-conditioning target area 101. Accordingly, each of the blowout units 20 is preferably installed such that the distance of the center 12 of the corresponding air inlet 11 and the center 22 of the own air outlet 21 is lower than or equal to 3.6 m that is a half of the length of one side of each of the air-conditioning target areas 101.

[Device Configuration of Use-Side Unit 2]

[0021] Fig. 2 is a diagram illustrating a schematic configuration of the use-side unit of the air-conditioning system according to Embodiment 1 of the present disclosure. Fig. 2 is a vertical cross-sectional view of the room 100 on a cross section passing through the main body unit 10, the blowout unit 20Aa, and the blowout unit 20Ab of the use-side unit 2A. The use-side unit 2A and the use-side unit 2B each have the same configuration. Therefore, in the following, the use-side units 2 are described using the use-side unit 2A. Further, the blowout unit 20Ac and the blowout unit 20Ad respectively have the configurations same as the blowout unit 20Aa and the blowout unit 20Ab. Therefore, illustration of the blowout unit 20Ac and the blowout unit 20Ad is omitted.

[0022] As described above, the use-side unit 2A includes the main body unit 10A installed above a ceiling 104A of the air-conditioning target area 101A. A fan 14A and a heat exchanger 13A are housed in the main body unit 10A. The fan 14A sucks the air of the air-conditioning target area 101A from the air inlet 11A of the main body unit 10A, and feeds the sucked air to the blowout units 20A. The heat exchanger 13A cools and heats the air of the air-conditioning target area 101A sucked into the main body unit 10A by the fan 14A, thereby adjusting temperature of the sucked air. More specifically, when the use-side unit 2A performs the cooling operation, refrigerant lower in temperature than the air of the air-conditioning target area 101A flows through the heat exchanger 13A, and the air of the air-conditioning target area 101A sucked into the main body unit 10A is cooled by the refrigerant. When the use-side unit 2A performs the heating operation, the refrigerant higher in temperature than the air of the air-conditioning target area 101A flows through the heat exchanger 13A, and the air of the air-conditioning target area 101A sucked into the main body unit 10A is heated by the refrigerant.

[0023] As described above, the use-side unit 2A further includes the blowout unit 20Aa, the blowout unit 20Ab, the blowout unit 20Ac, and the blowout unit 20Ad that are installed above the ceiling 104A of the air-conditioning target area 101A. Each of the blowout unit 20Aa, the blowout unit 20Ab, the blowout unit 20Ac, and the blowout unit 20Ad is connected to the main body unit 10 by ducts 30A. Note that, in Fig. 2, a duct 30Aa that connects the main body unit 10 and the blowout unit 20Aa and a duct 30Ab that connects the main body unit 10 and the blowout unit 20Ab are illustrated. In other words, the air that has been sucked into the main body unit 10A and adjusted in temperature flows into the ducts 30A connected to the respective blowout units 20A, and is distributed into four directions. The air flowing into the ducts 30A is blown out to the air-conditioning target area 101A from the air outlets 21A of the respective blowout units 20A.

[0024] Each of the blowout unit 20Aa, the blowout unit 20Ab, the blowout unit 20Ac, and the blowout unit 20Ad includes a vertical wind direction louver 23A that adjusts a direction of the air blown out from the own air outlet 21A in a vertical direction. In Fig. 2, a vertical wind direction louver 23Aa of the blowout unit 20Aa and a vertical wind direction louver 23Ab of the blowout unit 20Ab are illustrated. The vertical wind direction louvers 23A provided on the respective blowout units 20A are each inclined against a vertical line during the air-conditioning operation, and guide the air blown out from the air outlets 21A toward the center 102A of the air-conditioning target area 101A.

[0025] Each of the vertical wind direction louvers 23A may be of a fixed type not moved during operation of the use-side unit 2A, or of a movable type changeable in inclination by power during operation of the use-side unit 2A. Each of the vertical wind direction louvers 23A according to Embodiment 1 is of the movable type changeable in inclination by power during operation of the use-side unit 2A, and is changeable to optional inclination. Accordingly, inclination of each of the vertical wind direc-

tion louvers 23A according to Embodiment 1 can be changed between that in the cooling operation and that in the heating operation. To do so, the use-side unit 2A according to Embodiment 1 includes feeder lines 3A that supply power to the respective vertical wind direction louvers 23A. The feeder lines 3A are connected to unillustrated driving sources of the respective vertical wind direction louvers 23A. The driving sources are, for example, motors. In Fig. 2, a feeder line 3Aa that supplies power to the vertical wind direction louver 23Aa and a feeder line 3Ab that supplies power to the vertical wind direction louver 23Ab are illustrated.

[0026] More specifically, the feeder lines 3A are connected to an electric box 6A. The electric box 6A is connected to an unillustrated power supply that is laid in a building including the room 100. The power is supplied from the unillustrated power supply to the vertical wind direction louvers 23A. In Embodiment 1, the feeder lines 3A are disposed at least partially in contact with the respective ducts 30A. In other words, the feeder lines 3A are at least partially disposed along the respective ducts 30A. The feeder lines 3A are disposed in the above-described manner, which results in a neat wiring state.

[0027] In the use-side unit 2A according to Embodiment 1, each of the blowout unit 20Aa, the blowout unit 20Ab, the blowout unit 20Ac, and the blowout unit 20Ad includes a lateral wind direction louver 24A that adjusts the direction of the air blown out from the own air outlet 21A in a lateral direction. In Fig. 2, a lateral wind direction louver 24Aa of the blowout unit 20Aa and a lateral wind direction louver 24Ab of the blowout unit 20Ab are illustrated.

[0028] Each of the lateral wind direction louvers 24A may be of a fixed type not moved during operation of the use-side unit 2A, or of a movable type changeable in inclination by power during operation of the use-side unit 2A. Each of the lateral wind direction louvers 24A according to Embodiment 1 is of the movable type changeable in inclination by power during operation of the use-side unit 2A, and is changeable to optional inclination. To do so, unillustrated driving sources of the respective lateral wind direction louvers 24A according to Embodiment 1 are connected to the feeder lines 3A. The driving sources are, for example, motors.

[0029] The use-side unit 2A according to Embodiment 1 further includes a human detection sensor 4A that detects whether a person is present in the air-conditioning target area 101A. The human detection sensor is, for example, a sensor using an infrared sensor. In Embodiment 1, the human detection sensor 4A is installed in the use-side unit 2A; however, the sensor is not limited thereto. For example, the human detection sensor 4A may be a sensor that detects whether a person is present in the air-conditioning target area 101A by detecting presence/absence of keyboard operation of an unillustrated personal computer placed in the air-conditioning target area 101A. In other words, it is sufficient for the human detection sensor 4A to be provided in the air-conditioning system 1.

[0030] The use-side unit 2A according to Embodiment 1 further includes a temperature sensor 5A that detects temperature of the air of the air-conditioning target area 101A. In Embodiment 1, the temperature sensor 5A is installed on a downstream of the air inlet 11A inside the main body unit 10. In other words, in Embodiment 1, the temperature sensor 5A detects the temperature of the air of the air-conditioning target area 101A sucked into the main body unit 10.

[Controller of Air-Conditioning System 1]

[0031] Fig. 3 is a block diagram used to explain a controller of the air-conditioning system according to Embodiment 1 of the present disclosure. Fig. 3 is a block diagram of a controller 50A provided in the use-side unit 2A among controllers 50.

[0032] In Embodiment 1, the controllers 50 of the air-conditioning system 1 are separately provided as the controller 50A provided in the use-side unit 2A and a controller 50B provided in the use-side unit 2B. Further, control of the components by the controller 50A and control of the components by the controller 50B are the same as each other. Accordingly, in the following, the controllers 50 are described using the controller 50A. Note that the controller 50A and the controller 50B may be integrally configured. In this case, one controller 50 controls the components of the use-side unit 2A and the components of the use-side unit 2B.

[0033] The controller 50A includes a dedicated hardware or a central processing unit (CPU) that executes a program stored in a memory. The CPU is also referred to as a central processing device, a processing device, a calculation device, a microprocessor, a microcomputer, or a processor.

[0034] In a case where the controller 50A includes the dedicated hardware, the controller 50A corresponds to, for example, a single circuit, a composite circuit, an application specific integrated circuit (ASIC), a field-programmable gate array (FPGA), or a combination thereof. Each of functional units realized by the controller 50A may be realized by individual hardware, or the functional units may be realized by a piece of hardware.

[0035] In a case where the controller 50A includes the CPU, functions executed by the controller 50A are realized by software, firmware, or a combination of software and firmware. The software and the firmware are each expressed as a program, and stored in the memory. The CPU reads out the program stored in the memory and executes the program, thereby realizing each of the functions of the controller 50A. Examples of the memory include a nonvolatile or volatile semiconductor memory such as a RAM, a ROM, a flash memory, an EPROM, and an EEPROM.

[0036] Some of the functions of the controller 50A may be realized by the dedicated hardware, and some of the functions of the controller 50A may be realized by the

software or the firmware.

[0037] The controller 50A according to Embodiment 1 includes, as the functional units, an input unit 51, a calculation unit 52, a control unit 53, and a storage unit 54. The input unit 51 is a functional unit that receives values detected by the temperature sensor 5A and the human detection sensor 4A. The input unit 51 also receives, from an unillustrated remote controller and the like, an instruction to start or stop the cooling operation, an instruction to start or stop the heating operation, information on set temperature of the use-side unit 2A during the cooling operation, information on set temperature of the use-side unit 2A during the heating operation, and the like. The calculation unit 52 is a functional unit that calculates control parameters during the air-conditioning operation of the use-side unit 2A, such as inclination of each of the vertical wind direction louvers 23A, inclination of each of the lateral wind direction louvers 24A, and a rotation speed of the fan 14A, based on the information input to the input unit 51 and the information stored in the storage unit 54. The control unit 53 is a functional unit that controls the inclination of each of the vertical wind direction louvers 23A, the inclination of each of the lateral wind direction louvers 24A, the rotation speed of the fan 14A, and the like, based on the control parameters calculated by the calculation unit 52, and the like. The storage unit 54 is a functional unit that stores the information input to the input unit 51, set values and control target values used by the control unit 53, and the like.

[Operation of Air-Conditioning System 1]

[0038] Subsequently, operation of the air-conditioning system 1 according to Embodiment 1 is described. In the following, to facilitate understanding of effects of the air-conditioning system 1, operation of an existing air-conditioning system 201 is first described. Thereafter, operation of the air-conditioning system 1 according to Embodiment 1 is described.

[0039] Fig. 4 is a side view used to explain the operation of the existing air-conditioning system. Fig. 4 is a side view illustrating a state where the existing air-conditioning system 201 is installed in the room 100. In the existing air-conditioning system 201, a use-side unit 202 is installed above the ceiling of each of the air-conditioning target area 101A and the air-conditioning target area 101B. Each of the use-side units 202 is a four-way ceiling cassette type use-side unit. More specifically, each of the use-side units 202 includes a substantially rectangular-parallelepiped housing 210 that is provided with an air inlet 211 and four air outlets 221 on a bottom surface. The air inlet 211 is provided at a center of the bottom surface of each of the housings 210. The four air outlets 221 are provided on the bottom surface of each of the housings 210 to surround four sides of the corresponding air inlet 211. Further, an unillustrated fan that sucks the air from the corresponding air inlet 211 and blows out the air from the corresponding air outlets 221, and an unillustrated heat exchanger that cools and heats the air sucked into the corresponding housing 210 are housed in each of the housings 210.

[0040] The use-side units 202 each having the above-described configuration are disposed at substantially center of the respective air-conditioning target areas 101 in a plan view. Further, the unillustrated fans rotate inside the housings 210 to suck the air of the air-conditioning target areas 101 from the air inlets 211 into the housings 210. The sucked air is adjusted in temperature by the unillustrated heat exchangers, and is then blown out from the air outlets 221.

[0041] At this time, the temperature-conditioned air in each of the existing use-side units 202 is blown out toward an outer periphery of the own housing 210 as illustrated in Fig. 1. Accordingly, the temperature-conditioned air blown out to the air-conditioning target area 101A from the use-side unit 202 installed in the air-conditioning target area 101A flows out to the air-conditioning target area 101B before sufficiently exchanging heat with the air of the air-conditioning target area 101A. Therefore, in a case where the use-side unit 202 installed in the air-conditioning target area 101A performs the cooling operation, cooling energy to be supplied to the air of the air-conditioning target area 101A flows out to the air-conditioning target area 101B before the cooling energy is sufficiently supplied to the air of the air-conditioning target area 101A. Further, in a case where the use-side unit 202 installed in the air-conditioning target area 101A performs the heating operation, heating energy to be supplied to the air of the air-conditioning target area 101A flows out to the air-conditioning target area 101B before the heating energy is sufficiently supplied to the air of the air-conditioning target area 101A.

[0042] Accordingly, the existing air-conditioning system 201 cannot selectively condition the air of the air-conditioning target area 101A, and cannot sufficiently save energy. This is also true of a case where the use-side unit 202 installed in the air-conditioning target area 101B performs the cooling operation and the heating operation.

[0043] Fig. 5 is a side view used to explain the operation of the air-conditioning system according to Embodiment 1 of the present disclosure when the use-side units perform the cooling operation. Fig. 6 is a side view used to explain the operation of the air-conditioning system according to Embodiment 1 of the present disclosure when the use-side units perform the heating operation.

[0044] In the air-conditioning system 1 according to Embodiment 1, the blowout units 20 of the use-side units 2 are connected to the main body units 10 by the ducts 30. Accordingly, the blowout units 20 can be installed such that the air outlets 21 are located near the sides of the air-conditioning target areas 101. In other words, the air outlets 21 can be disposed on the outer peripheral side in the air-conditioning target areas 101 as much as possible in a plan view. Further, in the air-conditioning system 1 according to Embodiment 1, the directions of

the air blown out from the blowout units 20 during the air-conditioning operation are inclined toward the centers 102 of the air-conditioning target areas 101 from the vertical line, by the vertical wind direction louvers 23.

[0045] Accordingly, in the air-conditioning target area 101, the temperature-conditioned air blown out from each of the air outlets 21A to the air-conditioning target area 101 flows from the outer peripheral side toward the center in the air-conditioning target area 101A. Thereafter, the air flows toward the outer peripheral side in the air-conditioning target area 101A again, and flows from the air-conditioning target area 101A to the air-conditioning target area 101B. Accordingly, the temperature-conditioned air blown out from each of the air outlets 21A to the air-conditioning target area 101A stays in the air-conditioning target area 101A for a long time, and flows out to the air-conditioning target area 101B after sufficiently exchanging heat with the air of the air-conditioning target area 101A.

[0046] Thus, in the case where the use-side unit 2A installed in the air-conditioning target area 101A performs the cooling operation, the use-side unit 2A can sufficiently supply cooling energy to the air of the air-conditioning target area 101A. As a result, the air blown out from each of the air outlets 21A to the air-conditioning target area 101A has little cooling energy, namely, becomes substantially equal in temperature to the air of the air-conditioning target area 101A when the air flows out to the air-conditioning target area 101B. In the case where the use-side unit 2A installed in the air-conditioning target area 101A performs the heating operation, the use-side unit 2A can sufficiently supply heating energy to the air of the air-conditioning target area 101A. As a result, the air blown out from each of the air outlets 21A to the air-conditioning target area 101A has little heating energy, namely, becomes substantially equal in temperature to the air of the air-conditioning target area 101A when the air flows out to the air-conditioning target area 101B.

[0047] Accordingly, the air-conditioning system 1 according to Embodiment 1 can selectively condition the air of the air-conditioning target area 101A, and can save energy as compared with the existing air-conditioning system. This is also true of a case where the air-conditioning system 1 selectively conditions the air of the air-conditioning target area 101B.

[0048] Further, in each of the use-side units 2 of the air-conditioning system 1 according to Embodiment 1, the inclination of each of the vertical wind direction louvers 23 is changed between that in the cooling operation and that in the heating operation. In other words, each of the use-side units 2 of the air-conditioning system 1 according to Embodiment 1 changes the direction of the air blown out from the air outlets 21 between that in the cooling operation and that in the heating operation.

[0049] More specifically, the inclination to the vertical line, of the air blown out from each of the air outlets 21 during the cooling operation is larger than the inclination to the vertical line, of the air blown out from each of the air outlets 21 during the heating operation. In other words, the air blown out from the air outlets 21 during the cooling operation is supplied to upper parts of the air-conditioning target areas 101 than is in the heating operation. The air blown out from the air outlets 21 during the cooling operation is cooler than the air of the air-conditioning target areas 101. Therefore, the air easily flows downward in the air-conditioning target areas 101. Accordingly, during the cooling operation, supplying the air blown out from the air outlets 21 to the upper parts of the air-conditioning target areas 101 makes it possible to lengthen the staying time of the air blown out from the air outlets 21 in the air-conditioning target areas 101. This makes it possible to further suppress outflow of the cooling energy to the adjacent air-conditioning target area 101 during the cooling operation, and to improve the energy saving effect.

[0050] Further, the air blown out from the air outlets 21 during the heating operation is supplied to lower parts of the air-conditioning target areas 101 than is in the cooling operation. The air blown out from the air outlets 21 during the heating operation is warmer than the air of the air-conditioning target areas 101. Therefore, the air easily flows upward in the air-conditioning target areas 101. Accordingly, during the heating operation, supplying the air blown out from the air outlets 21 to the lower parts of the air-conditioning target areas 101 makes it possible to lengthen the staying time of the air blown out from the air outlets 21 in the air-conditioning target areas 101. This makes it possible to further suppress outflow of the heating energy to the adjacent air-conditioning target area 101 during the heating operation, and to improve the energy saving effect.

[0051] More specifically, in each of the use-side units 2 according to Embodiment 1, the inclination to the vertical line, of the air blown out from each of the air outlets 21 during the cooling operation is as illustrated in Fig. 5. In the following, the inclination of the air blown out from each of the air outlets 21 during the cooling operation is described using the use-side unit 2A. During the cooling operation of the use-side unit 2A, the air blown out from each of the air outlets 21A reaches a vertical line 103 passing through the center 102A of the air-conditioning target area 101A before reaching a floor surface 105 of the air-conditioning target area 101 A in a side view. Setting the inclination to the vertical line, of the air blown out from each of the air outlets 21A during the cooling operation in the above-described manner makes it possible to lengthen the staying time of the air blown out from each of the air outlets 21A in the air-conditioning target area 101A. This makes it possible to further suppress outflow of the cooling energy from the air-conditioning target area 101A to the air-conditioning target area 101B during the cooling operation of the use-side unit 2A, and to improve the energy saving effect.

[0052] In addition, in Embodiment 1, during the cooling operation of the use-side unit 2A, the vertical wind direction louvers 23A of the respective blowout units 20A are inclined by the substantially same amount. Accordingly,

the air blown out from each of the air outlets 21A collides with one another near the vertical line 103 passing through the center 102A of the air-conditioning target area 101A, and can stay for a long time near the center 102A of the air-conditioning target area 101A in a plan view. Further, it is possible to prevent the air blown out from each of the air outlets 21A from directly colliding with the floor surface 105 of the air-conditioning target area 101A. As a result, it is possible to prevent the air blown out from each of the air outlets 21A from being changed in flow direction due to collision with the floor surface 105 and to prevent the air from flowing out to the air-conditioning target area 101B. Accordingly, during the cooling operation of the use-side unit 2A, inclining the vertical wind direction louvers 23A of the respective blowout units 20A by the same amount makes it possible to further suppress outflow of the cooling energy from the air-conditioning target area 101A to the air-conditioning target area 101B. In other words, during the cooling operation of the use-side unit 2A, inclining the vertical wind direction louvers 23A of the respective blowout units 20A by the substantially same amount makes it possible to further improve the energy saving effect.

[0053] More specifically, in each of the use-side units 2 according to Embodiment 1, the inclination to the vertical line, of the air blown out from each of the air outlets 21 during the heating operation is as illustrated in Fig. 6. In the following, the inclination of the air blown out from each of the air outlets 21 during the heating operation is described using the use-side unit 2A. During the heating operation of the use-side unit 2A, the air blown out from each of the air outlets 21A reaches the floor surface 105 of the air-conditioning target area 101A before reaching the vertical line 103 passing through the center 102A of the air-conditioning target area 101A in a side view. Setting the inclination to the vertical line, of the air blown out from each of the air outlets 21A during the heating operation in the above-described manner makes it possible to supply the warm air blown out from each of the air outlets 21A up to the lower part of the air-conditioning target area 101A. In other words, it is possible to supply the warm air blown out from each of the air outlets 21A up to a position of a person present in the air-conditioning target area 101A.

[0054] When the inclination to the vertical line, of the air blown out from each of the air outlets 21A during the heating operation is set as described above, the air blown out from each of the air outlets 21A directly collides with the floor surface 105 of the air-conditioning target area 101A. However, even when the flow direction of the air blown out from each of the air outlets 21A is changed due to collision with the floor surface 105, most of the air flows toward the center 102A of the air-conditioning target area 101A in a plan view. Accordingly, the heating energy flowing out from the air-conditioning target area 101A to the air-conditioning target area 101B is hardly increased.

[0055] As described above, making the inclination of each of the vertical wind direction louvers 23 different between that in the cooling operation and that in the heating operation makes it possible to maintain comfortable environment of the air-conditioning target areas 101 during both of the cooling operation and the heating operation.

[0056] Further, in the air-conditioning system 1 according to Embodiment 1, since the use-side units 2 can selectively condition the air of the respective air-conditioning target areas 101, it is possible to make the set temperature of the use-side unit 2A and the set temperature of the use-side unit 2B different by two degrees C or more. For example, it is assumed that persons sensitive to heat are gathered in the air-conditioning target area 101A, and the set temperature of the use-side unit 2A is 24 degrees C. In addition, it is assumed that persons sensitive to cold are gathered in the air-conditioning target area 101B, and the set temperature of the use-side unit 2B is 26 degrees C. In the air-conditioning system 1 according to Embodiment 1, since the use-side units 2 can selectively condition the air of the respective air-conditioning target areas 101, it is possible to adjust the temperature of both of the air-conditioning target area 101A and the air-conditioning target area 101B to the respective set temperature. In other words, the air-conditioning system 1 according to Embodiment 1 can provide a comfortable space to both of a person sensitive to heat and a person sensitive to cold.

[0057] Further, the air-conditioning system 1 according to Embodiment 1 includes the human detection sensor that detects whether a person is present in the air-conditioning target areas 101. Accordingly, changing the operation of the use-side units 2 based on presence/absence of a person in the air-conditioning target areas 101 makes it possible to further save the energy. An example of a control flow to change the operation of the use-side units 2 based on presence/absence of a person in the air-conditioning target areas 101 is described below. Note that, in the following, a method of changing the operation based on presence/absence of a person in the air-conditioning target area 101 is described using the use-side unit 2A. A method of changing the operation of the use-side unit 2B is similar to the method of changing the operation of the use-side unit 2A.

[0058] Fig. 7 is a flowchart illustrating an example of a method of controlling the air-conditioning system according to Embodiment 1 of the present disclosure.

[0059] When an instruction of the air-conditioning operation is input from an unillustrated remote controller or the like to the input unit 51 of the controller 50A, the control unit 53 of the controller 50A starts the air-conditioning operation of the use-side unit 2A in step S1. In other words, the control unit 53 starts the cooling operation or the heating operation of the use-side unit 2A.

[0060] In step S2, it is determined whether a person is present in the air-conditioning target area 101A. In a case where the human detection sensor 4A does not detect presence of a person in step S2, namely, in a case where

no person is present in the air-conditioning target area 101A, the processing proceeds to step S3.

[0061] In a case where no person is present in the air-conditioning target area 101A, the control unit 53 changes the operation of the use-side unit 2A from the air-conditioning operation to air-sending operation, and performs the air-sending operation of the use-side unit 2A in step S3. As described below, the processing from step S2 to step S7 illustrated in Fig. 7 is repeated until an instruction to stop the air-conditioning operation of the use-side unit 2A is input. Therefore, the operation of the use-side unit 2A may be the air-sending operation at the time in step S2. In this case, in step S3, the control unit 53 continues the air-sending operation of the use-side unit 2A.

[0062] The air-sending operation is operation in which the air of the air-conditioning target area 101A sucked from the air inlet 11A is blown out with the temperature as it is from each of the air outlets 21A without being cooled and heated by the heat exchanger 13A. When the use-side unit 2A performs the air-sending operation, the temperature of the air-conditioning target area 101A where no person is present is not adjusted. This makes it possible to reduce power consumption of the air-conditioning system 1. Note that in a case where the use-side unit 2A performs the air-sending operation and the use-side unit 2B performs the cooling operation, the temperature of the air-conditioning target area 101A becomes higher than the temperature of the air-conditioning target area 101B. In a case where the use-side unit 2A performs the air-sending operation and the use-side unit 2B performs the heating operation, the temperature of the air-conditioning target area 101A becomes lower than the temperature of the air-conditioning target area 101B. However, since the use-side unit 2B can selectively condition the air of the air-conditioning target area 101B as described above, it is possible to maintain comfortability of the air-conditioning target area 101B even when the use-side unit 2A performs the air-sending operation.

[0063] Further, in the case where no person is present in the air-conditioning target area 101A, the control unit 53 controls the rotation speed of the fan 14A to be lower than the set value of the fan 14A during the air-conditioning operation in step S4 after step S3. In other words, the rotation speed of the fan 14A when the use-side unit 2A performs the air-sending operation is lower than the rotation speed of the fan 14A when the use-side unit 2A performs the air-conditioning operation. Lowering the rotation speed of the fan 14A in the case where no person is present in the air-conditioning target area 101A makes it possible to reduce air-sending power of the fan 14A, and to reduce power consumption of the air-conditioning system 1.

[0064] In step S7 after step S4, it is determined whether the instruction to stop the air-conditioning operation of the use-side unit 2A has been issued from the unillustrated remote controller or the like. In a case where the instruction to stop the air-conditioning operation of the use-side unit 2A has not been input to the input unit 51 of the controller 50A in step S7, the processing returns to step S2. In a case where the instruction to stop the air-conditioning operation of the use-side unit 2A has been input to the input unit 51 of the controller 50A in step S7, the control unit 53 stops the air-conditioning operation of the use-side unit 2A.

[0065] In contrast, in a case where the human detection sensor 4A detects presence of a person in step S2, namely, in a case where a person is present in the air-conditioning target area 101A, the processing proceeds to step S5. In the case where a person is present in the air-conditioning target area 101A, the control unit 53 continues the air-conditioning operation in step S5. Note that the processing from step S2 to step S7 illustrated in Fig. 7 is repeated until the instruction to stop the air-conditioning operation of the use-side unit 2A is input. Therefore, the operation of the use-side unit 2A may be the air-sending operation at the time in step S2. In this case, in step S5, the control unit 53 switches the operation of the use-side unit 2A from the air-sending operation to the air-conditioning operation.

[0066] In step S6 after step S5, the control unit 53 controls the rotation speed of the fan 14A to the set rotation speed during the air-conditioning operation. The processing then proceeds to step S7. In step S7, in a case where the instruction to stop the air-conditioning operation of the use-side unit 2A has not been input to the input unit 51 of the controller 50A, the processing returns to step S2. In a case where the instruction to stop the air-conditioning operation of the use-side unit 2A has been input to the input unit 51 of the controller 50A in step S7, the control unit 53 stops the air-conditioning operation of the use-side unit 2A.

[0067] In the air-conditioning system 1 according to Embodiment 1, each of the blowout units 20 of the use-side units 2 includes the lateral wind direction louver 24 that adjusts the direction of the air blown out from the own air outlet 21 in the lateral direction. Accordingly, the blowout directions of the air from the two blowout units 20 that face each other with the center 102 of each of the air-conditioning target areas 101 in between in a plan view are adjusted in the following manner, which makes it possible to prevent a drafty feeling from being given to a person in each of the air-conditioning target areas 101. The drafty feeling is a feeling of receiving wind, and gives a person an unpleasant feeling. In the following, an operation method that can suppress the drafty feeling is described using the use-side unit 2A. Further, in the following, the operation method that can suppress the drafty feeling is described while the blowout unit 20Aa is defined as a first blowout unit and the blowout unit 20Ab is defined as a second blowout unit.

[0068] Fig. 8 is a diagram used to explain an example of the operation of the air-conditioning system according to Embodiment 1 of the present disclosure. Fig. 8 is a diagram illustrating arrangement positions of the main body units 10 and the blowout units 20 of the use-side

units 2 of the air-conditioning system 1 when the room 100 that is an air-conditioned space is observed from above. Note that the positions of the air inlets 11 of the main body units 10 and the air outlets 21 of the blowout units 20 are illustrated in Fig. 8.

[0069] To describe the operation method that can suppress the drafty feeling, a first virtual straight line 111, a second virtual straight line 112, a first direction 121, and a second direction 122 are defined as follows. In a plan view, a virtual straight line that connects the center 22Aa of the air outlet 21Aa of the blowout unit 20Aa and the center 102A of the air-conditioning target area 101A is defined as the first virtual straight line 111. In a plan view, a virtual straight line that connects a center 22Ab of the air outlet 21Ab of the blowout unit 20Ab and the center 102A of the air-conditioning target area 101A is defined as the second virtual straight line 112. In a plan view, one of directions perpendicular to the first virtual straight line 111 is defined as the first direction 121. In a plan view, the other of the directions perpendicular to the first virtual straight line 111 is defined as the second direction 122.

[0070] In the case of the above-described definition, the lateral wind direction louver 24Aa of the blowout unit 20Aa is inclined such that the direction of the air blown out from the air outlet 21Aa is inclined in the first direction 121 to the first virtual straight line 111. Further, the lateral wind direction louver 24Ab of the blowout unit 20Ab is inclined such that the direction of the air blown out from the air outlet 21Ab is inclined in the second direction 122 to the second virtual straight line 112.

[0071] It is assumed that, when the air of the air-conditioning target area 101A is conditioned, the directions of the air blown out from the air outlets 21A of the respective blowout units 20A are all directed to the center 102A of the air-conditioning target area 101A in a plan view. In this case, when a total amount of the air blown out from the air outlets 21A is large, a region where a wind speed is relatively high is generated near the center of the air-conditioning target area 101A. Accordingly, the drafty feeling may be given to a person located near the center of the air-conditioning target area 101A. In contrast, when the lateral wind direction louver 24Aa of the blowout unit 20Aa and the lateral wind direction louver 24Ab of the blowout unit 20Ab are set as illustrated in Fig. 8, the air amount blown to near the center of the air-conditioning target area 101A is reduced. This makes it possible to suppress the wind speed near the center of the air-conditioning target area 101A, and to prevent the drafty feeling from being given to a person located near the center of the air-conditioning target area 101A.

[0072] Note that the above-described configuration of the air-conditioning system 1 is illustrative. For example, at least one of the use-side units 2 may include a plurality of main body units 10. Further, for example, at least one of the blowout units 20 may be disposed at a corner of the air-conditioning target areas 101 in a plan view.

[0073] Further, for example, the number of blowout units 20 included in each of the use-side units 2 is not limited to four. Each of the use-side units 2 may include five or more blowout units 20, for example, two or more blowout units are disposed near at least one of the sides of the air-conditioning target area 101 in a plan view. For example, the number of blowout units 20 may be three or less as long as the amount of the air blown out from the blowout units 20 satisfies the desired air amount. In other words, it is sufficient for each of the use-side units 2 to include at least one blowout unit 20.

[0074] Further, for example, the number of the use-side units 2 included in the air-conditioning system 1 is not limited to the same number of air-conditioning target areas 101. It is sufficient to install the use-side unit 2 according to Embodiment 1 in at least one air-conditioning target area 101. In this case, to condition the air of the entire region inside the room 100, it is sufficient to install a use-side unit different from the use-side unit 2 according to Embodiment 1, in the other air-conditioning target area 101. In the air-conditioning target area 101 where the use-side unit 2 according to Embodiment 1 is installed, the use-side unit 2 can selectively condition the air of the air-conditioning target area 101. Accordingly, when the air-conditioning system 1 includes at least one use-side unit 2, the air-conditioning system 1 can save energy as compared with the existing air-conditioning system.

[0075] As described above, the air-conditioning system 1 according to Embodiment 1 is an air-conditioning system that conditions the air of the room 100 partitioned into the plurality of rectangular air-conditioning target areas 101 in a plan view. The air-conditioning system 1 includes the use-side unit 2 that is installed above the ceiling 104 of one of the air-conditioning target areas 101 and performs the air-conditioning operation to condition the air of the one air-conditioning target area 101. In a case where the air-conditioning target area 101 where the use-side unit 2 is installed is defined as an installation area, the use-side unit 2 includes the main body unit 10 that is installed above the ceiling 104 of the installation area, and cools and heats the air of the installation area sucked from the air inlet 11 provided on the bottom surface, and the blowout unit 20 that is connected to the main body unit 10 by the duct 30, is installed above the ceiling 104 of the installation area, and blows out air supplied from the main body unit 10, from the air outlet 21 provided on the bottom surface. The blowout unit 20 includes the vertical wind direction louver 23 that adjusts the direction of the air blown out from the air outlet 21 in the vertical direction. Further, the vertical wind direction louver 23 is inclined against the vertical line and guides the air toward a center of the installation area.

[0076] In the air-conditioning system 1 according to Embodiment 1, the temperature-conditioned air blown out from the air outlets 21 of the blowout units 20 flows toward the center of the installation area, and then flows out from the installation area. Accordingly, the temperature-conditioned air blown out from the air outlets 21 of the blowout units 20 flows out from the installation area

after sufficiently exchanging heat with the air of the installation area. In other words, the air-conditioning system 1 according to Embodiment 1 can suppress outflow of the cooling energy or the heating energy to the outside of the installation area as compared with the existing air-conditioning system. Thus, the air-conditioning system 1 according to Embodiment 1 can selectively condition the air of a partial area of the room 100, and can save energy, as compared with the existing air-conditioning system.

Embodiment 2.

[0077] In Embodiment 1, the air-conditioning system 1 is used in the room 100 that is partitioned into the two air-conditioning target areas 101 in a plan view. The room where the air-conditioning system 1 is usable, however, is not limited to the room 100 described in Embodiment 1. As described in Embodiment 2, the air-conditioning system 1 can be adopted in a room that is larger than the room described in Embodiment 1, namely, a room that is partitioned into three or more air-conditioning target areas 101 in a plan view. Note that, in Embodiment 2, components not specifically described are similar to the components in Embodiment 1, and the functions and the configurations same as those in Embodiment 1 are described with use of the same reference numerals.

[0078] Fig. 9 is a diagram used to explain an arrangement configuration of an air-conditioning system according to Embodiment 2 of the present disclosure. Fig. 9 is a diagram illustrating arrangement positions of the main body units 10 and the blowout units 20 of the use-side units 2 of the air-conditioning system 1 when the room 100 that is an air-conditioned space is observed from above. Note that the positions of the inlets 11 of the main body units 10 and the air outlets 21 of the blowout units 20 are illustrated in Fig. 9.

[0079] The room 100 according to Embodiment 2 is a room larger than the room 100 described in Embodiment 1, for example, an office of a medium scale or above. The inside of the room 100 according to Embodiment 2 is partitioned into six rectangular air-conditioning target areas 101 in a plan view. More specifically, the inside of the room 100 is partitioned into a rectangular air-conditioning target area 101A, a rectangular air-conditioning target area 101B, a rectangular air-conditioning target area 101C, a rectangular air-conditioning target area 101D, a rectangular air-conditioning target area 101E, and a rectangular air-conditioning target area 101F in a plan view. Further, the use-side unit 2 is installed above the ceiling of each of the air-conditioning target areas 101. The main body unit 10 of each of the use-side units 2 is installed such that the center 12 of the own air inlet 11 agrees with the center 102 of the corresponding air-conditioning target area 101 in a plan view. Note that the installation positions of the blowout units 20 of the use-side units 2 are described below.

[0080] In details, three desk groups 131 in which seats of workers in the office are gathered are disposed in the room 100. More specifically, a desk group 131A, a desk group 131B, and a desk group 131C are disposed in the room 100. The desk groups 131 are disposed in an interior zone of the room 100. The interior zone is a zone hardly influenced by sunlight, outdoor air, and the like in the room 100, for example, a zone on an aisle side. Further, a desk 132 that is used by a manager, a senior, or the like is disposed on a side of each of the desk groups 131. More specifically, a desk 132D is disposed on a side of the desk group 131A. A desk 132E is disposed on a side of the desk group 131B. A desk 132F is disposed on a side of the desk group 131C. These desks 132 are disposed in a perimeter zone of the room 100. The perimeter zone is a zone easily influenced by sunlight, outside air, and the like in the room 100, for example, a zone near a window. Further, a passage 133 is provided on a side opposite to the desk 132 side of each of the desk groups 131. A door 134 for going in/out of the room 100 is provided at one end of the passage 133.

[0081] As common seat layout in the office of the medium scale or above, there is a case where the desk groups 131 in which the seats of the workers are gathered are disposed in the interior zone and the desks 132 that are used by the manager, the senior, or the like are disposed in the perimeter zone, as illustrated in Embodiment 2. In such a case, as illustrated in Embodiment 2, the air-conditioning target areas 101 are provided. More specifically, one desk group 131 and one desk 132 disposed on the side of the desk group 131 are defined as one set. Further, for the set, the air-conditioning target area 101 in the interior zone and the air-conditioning target area 101 in the perimeter zone are provided. The sets of the air-conditioning target area 101 in the interior zone and the air-conditioning target area 101 in the perimeter zone are provided by the number of the sets of the desk group 131 and the desk 132. Note that, depending on the size of each of the desk groups 131, two desk groups 131 and the two desks 132 disposed on the sides of the respective desk groups 131 may be defined as one set.

[0082] More specifically, in Embodiment 2, the air-conditioning target area 101A in the interior zone and the air-conditioning target area 101D in the perimeter zone are provided for the set of the desk group 131A and the desk 132D. The air-conditioning target area 101B in the interior zone and the air-conditioning target area 101E in the perimeter zone are provided for the set of the desk group 131B and the desk 132E. The air-conditioning target area 101C in the interior zone and the air-conditioning target area 101F in the perimeter zone are provided for the set of the desk group 131C and the desk 132F. Note that, in Embodiment 2, the passage 133 is not included in the air-conditioning target areas 101 because active air conditioning of the passage 133 is unnecessary in the room 100.

[0083] Even in the case where the air-conditioning system 1 is used in the room 100 that is partitioned into the three or more air-conditioning target areas 101 as with Embodiment 2, when each of the use-side units 2 oper-

ates in the manner described in Embodiment 1, it is possible to selectively condition the air of the partial area in the room 100, and to save energy, as compared with the existing air-conditioning system. For example, it is assumed that, in a case where each of the use-side units 2 includes the human detection sensor 4, no sitting person is present in the desk group 131A in the interior zone and the senior of the desk 132E is absent in the perimeter zone. In this case, the use-side unit 2A and the use-side unit 2E perform the air-sending operation as illustrated in Fig. 7 in Embodiment 1, and the other use-side units 2 continue the air-conditioning operation. This makes it possible to reduce heat quantity processed by the use-side unit 2A and the use-side unit 2E while maintaining comfortability of the air-conditioning target areas 101 other than the air-conditioning target area 101A and the air-conditioning target area 101E. In other words, it is possible to reduce the power consumption of the air-conditioning system 1 while maintaining comfortability of the air-conditioning target areas 101 other than the air-conditioning target area 101A and the air-conditioning target area 101E.

[0084] The room 100 according to Embodiment 2 is partitioned into the six air-conditioning target areas 101; however, the air conditioning system 1 may be adopted to the room 100 that is partitioned into seven or more air-conditioning target areas 101.

[0085] The installation positions of the blowout units 20 of the use-side units 2 of the air-conditioning system 1 according to Embodiment 2 are different depending on the air-conditioning target areas 101 where the use-side units 2 are installed. More specifically, in the air-conditioning target area 101 that has a side facing a side wall 106 of the room 100 in a plan view, the plurality of blowout units 20 are provided only along sides not facing the side wall 106 of the room 100 in a plan view.

[0086] For example, none of four sides of the air-conditioning target area 101B face the side wall 106. Accordingly, the use-side unit 2B of the air-conditioning target area 101B includes the blowout units 20B provided along the respective four sides of the air-conditioning target area 101B, in a manner similar to Embodiment 1. Further, for example, each of the air-conditioning target area 101A, the air-conditioning target area 101C, and the air-conditioning target area 101E includes one side facing the side wall 106. Accordingly, each of the use-side units 2 of these air-conditioning target areas 101 includes no blowout unit 20 provided along the side of the air-conditioning target area 101 facing the side wall 106, and includes the blowout units 20 provided along three sides of the air-conditioning target area 101 not facing the side wall 106. Note that each of the use-side units 2 of these air-conditioning target areas 101 includes the blowout unit 20 that has been provided on the side facing the side wall 106 in Embodiment 1, near the side not facing the side wall 106 such that the total blowout air amount is equal to the total blowout air amount in Embodiment 1. The total blowout air amount may be adjusted by increasing an opening port area of at least one of the air outlets 21 of the blowout units 20.

[0087] For example, two sides of each of the air-conditioning target area 101D and the air-conditioning target area 101F face the side wall 106. Accordingly, each of the use-side units 2 of these air-conditioning target areas 101 includes no blowout unit 20 provided along each of the two sides of the air-conditioning target area 101 facing the side wall 106, but includes the blowout unit 20 provided along each of the two sides of the air-conditioning target area 101 not facing the side wall 106. Note that each of the use-side units 2 of these air-conditioning target areas 101 includes the blowout unit 20 that has been provided on the side facing the side wall 106 in Embodiment 1, near the side not facing the side wall 106 such that the total blowout air amount is equal to the total blowout air amount in Embodiment 1. The total blowout air amount may be adjusted by increasing an opening port area of at least one of the air outlets 21 of the blowout units 20.

[0088] In the air-conditioning target area 101, at least one side of which faces the side wall 106 of the room 100 in a plan view, at least a part of the air blown out from the blowout unit 20 provided near the side not facing the side wall 106 passes near the center of the air-conditioning target area 101, and then collides with the side wall 106. Further, the air that has collided with the side wall 106 again flows toward the center of the air-conditioning target area 101. Accordingly, it is unnecessary to install the blowout unit 20 near the side facing the side wall 106 of the room 100 in a plan view. If the blowout unit 20 is provided near the side facing the side wall 106 of the room 100 in a plan view, the air blown out from the blowout unit 20 passes near the center of the air-conditioning target area 101, and then flows out to the adjacent air-conditioning target area 101. Accordingly, it is possible to more selectively condition the air of the air-conditioning target area 101 by using reflection of the air blown out from the blowout unit 20 by the side wall 106.

Embodiment 3.

[0089] The configuration of the air-conditioning system 1 is not limited to the configuration described in each of Embodiment 1 and Embodiment 2, and the air-conditioning system 1 may have a configuration as described in Embodiment 3, for example. Note that, in Embodiment 3, components not specifically described are similar to the components in Embodiment 1 or Embodiment 2, and the functions and the configurations same as those in Embodiment 1 or Embodiment 2 are described with use of the same reference numerals.

[0090] Fig. 10 is a diagram used to explain an arrangement configuration of an air-conditioning system according to Embodiment 3 of the present disclosure. Fig. 10 is a diagram illustrating arrangement positions of the main body units 10 and the blowout units 20 of the use-side units 2 of the air-conditioning system 1 when the

room 100 that is an air-conditioned space is observed from above. Note that the positions of the air inlets 11 of the main body units 10 and the air outlets 21 of the blowout units 20 are illustrated in Fig. 10.

[0091] The room 100 according to Embodiment 3 is assumed to be an office of a small scale. Accordingly, the inside of the room 100 according to Embodiment 3 is partitioned into two rectangular air-conditioning target areas 101 in a plan view. More specifically, the inside of the room 100 is partitioned into the rectangular air-conditioning target area 101A and the rectangular air-conditioning target area 101B in a plan view. Further, the use-side unit 2 is installed above the ceiling of each of the air-conditioning target areas 101.

[0092] In details, two desk groups 131 are disposed in the room 100. More specifically, the desk group 131A and the desk group 131B are disposed in the room 100. The desk groups 131 are disposed across the interior zone and the perimeter zone. The air-conditioning target areas 101 are separated based on the desk groups. More specifically, the desk group 131A is disposed in the air-conditioning target area 101A, and the desk group 131B is disposed in the air-conditioning target area 101B. Further, the main body unit 10 of each of the use-side units 2 is disposed such that the center 12 of the own air inlet 11 agrees with the center 102 of the corresponding air-conditioning target area 101 in a plan view. Each of the use-side units 2 according to Embodiment 3 further includes the four blowout units 20. The blowout units 20 of each of the use-side units 2 are disposed such that the air outlets 21 are located near the respective sides of the corresponding air-conditioning target area 101 in a plan view.

[0093] Further, the passage 133 is provided on the side of each of the desk groups 131. The door 134 for going in/out of the room 100 is provided at one end of the passage 133. Note that, in Embodiment 3, the passage 133 is not included in the air-conditioning target areas 101 because active air conditioning of the passage 133 is unnecessary in the room 100.

[0094] Even in the case where the air-conditioning system 1 is used in the room 100 according to Embodiment 3, when each of the use-side units 2 operates in the manner described in Embodiment 1, it is possible to selectively condition the air of the partial area in the room 100, and to save the energy, as compared with the existing air-conditioning system. For example, it is assumed that a department using the desk group 131 is a department that involves a lot of outside work such as sales. In this case, the sitting person is often absent in the desk group 131. At this time, each of the use-side units 2 according to Embodiment 3 includes the human detection sensor 4. Therefore, when the sitting person is absent in the desk group 131A, the use-side unit 2A performs the air-sending operation as illustrated in Fig. 7 in Embodiment 1, and the air-conditioning operation of the use-side unit 2B is continued. This makes it possible to reduce the heat quantity processed by the use-side unit 2A while maintaining comfortability of the air-conditioning target area 101B. In other words, it is possible to reduce the power consumption of the air-conditioning system 1 while maintaining comfortability of the air-conditioning target area 101B.

[0095] In the air-conditioning system 1 according to Embodiment 3, each of the blowout units 20 of the use-side units 2 includes the lateral wind direction louver 24 that adjusts the direction of the air blown out from the own air outlet 21 in the lateral direction. Accordingly, the blowout directions of the air from the two blowout units 20 that face each other with the center 102 of each of the air-conditioning target areas 101 in between in a plan view are adjusted in the following manner, which makes it possible to selectively condition the air of the air-conditioning target areas 101. In the following, the operation method that can more selectively condition the air of the air-conditioning target area 101A is described using the use-side unit 2A. Further, in the following, the operation method that can more selectively condition the air of the air-conditioning target area 101A is described while the blowout unit 20Ac is defined as a third blowout unit and the blowout unit 20Ad is defined as a fourth blowout unit.

[0096] To describe the operation method that can more selectively condition the air of the air-conditioning target area 101A, a third virtual straight line 113, a fourth virtual straight line 114, a third direction 123, and a fourth direction 124 are defined as follows. In a plan view, a virtual straight line that connects a center 22Ac of the air outlet 21Ac of the blowout unit 20Ac and the center 102A of the air-conditioning target area 101A is defined as the third virtual straight line 113. In a plan view, a virtual straight line that connects a center 22Ad of the air outlet 21Ad of the blowout unit 20Ad and the center 102A of the air-conditioning target area 101A is defined as the fourth virtual straight line 114. In a plan view, one of directions perpendicular to the third virtual straight line 113 is defined as the third direction 123. In a plan view, the other of the directions perpendicular to the third virtual straight line 113 is defined as the fourth direction 124.

[0097] In the case of the above-described definition, the air-conditioning target area 101B adjacent to the air-conditioning target area 101A is present in the fourth direction 124 of the air-conditioning target area 101A. Further, the lateral wind direction louver 24Ac of the blowout unit 20Ac is inclined such that the direction of the air blown out from the air outlet 21Ac is inclined in the third direction 123 to the third virtual straight line 113. In addition, the lateral wind direction louver 24Ad of the blowout unit 20Ad is inclined such that the direction of the air blown out from the air outlet 21Ad is inclined in the third direction 123 to the fourth virtual straight line 114.

[0098] When the lateral wind direction louver 24Ac of the blowout unit 20Ac and the lateral wind direction louver 24Ad of the blowout unit 20Ad are inclined as described above, the temperature-conditioned air is blown out from the air outlet 21Ac of the blowout unit 20Ac and the air outlet 21Ad of the blowout unit 20Ad to go away from the

air-conditioning target area 101B. This makes it possible to further suppress outflow of the cooling energy or the heating energy from the air-conditioning target area 101A to the air-conditioning target area 101B, and to more selectively condition the air of the air-conditioning target area 101A.

[0099] Further, the air-conditioning system 1 according to Embodiment 3 includes a plurality of ventilators 40 that ventilate the respective air-conditioning target areas 101. More specifically, the ventilator 40 is installed in each of the air-conditioning target areas 101. Each of the ventilators 40 includes an air supply port 41 and an air exhaust port 42 each communicating with the corresponding air-conditioning target area 101. In other words, the ventilators 40 suck the air of the air-conditioning target areas 101 from the respective air exhaust ports 42 to exhaust the air to the outside. Further, the ventilators 40 supply the outside air from the respective air supply ports 41 to the air-conditioning target areas 101.

[0100] More specifically, the air-conditioning system 1 includes a ventilator 40A that ventilates the air-conditioning target area 101A, and a ventilator 40B that ventilates the air-conditioning target area 101B. The ventilator 40A includes an air supply port 41A and an air exhaust port 42A each communicating with the air-conditioning target area 101A. Therefore, the ventilator 40A sucks the air of the air-conditioning target area 101A from the air exhaust port 42A to exhaust the air to the outside. Further, the ventilator 40A supplies the outside air from the air supply port 41A to the air-conditioning target area 101A. Likewise, the ventilator 40B includes an air supply port 41B and an air exhaust port 42B each communicating with the air-conditioning target area 101B. Therefore, the ventilator 40B sucks the air of the air-conditioning target area 101B from the air exhaust port 42B to exhaust the air to the outside. Further, the ventilator 40B supplies the outside air from the air supply port 41B to the air-conditioning target area 101B.

[0101] In the case where no person is present in the air-conditioning target area 101A or the air-conditioning target area 101B, the air-conditioning system 1 according to Embodiment 3 operates the ventilators 40 in the following manner. Operating the ventilators 40 in the following manner makes it possible to realize ventilation with saved energy while preventing concentration of contaminants in the air-conditioning target areas 101 from increasing. In the following, the method of operating the ventilators 40 is described with a case where no person is present in the air-conditioning target area 101 B taken as an example. In this case, the ventilator 40A serves as a first ventilator, the air supply port 41A of the ventilator 40A serves as a first air supply port, the ventilator 40B serves as a second ventilator, and the air supply port 41B of the ventilator 40B serves as a second supply port.

[0102] More specifically, in a case where a person is present in the air-conditioning target area 101A but no person is present in the air-conditioning target area 101B, a flow rate of the outside air supplied from the air supply port 41B of the ventilator 40B to the air-conditioning target area 101B is made larger than a flow rate of the outside air supplied from the air supply port 41A of the ventilator 40A to the air-conditioning target area 101A. In other words, a ventilation amount of the air-conditioning target area 101A is made smaller than a ventilation amount of the air-conditioning target area 101B.

[0103] Under an environment where the use-side units 2 perform the cooling operation, the outside air is warmer than the air of the air-conditioning target areas 101. Under an environment where the use-side units 2 perform the heating operation, the outside air is cooler than the air of the air-conditioning target areas 101. Accordingly, an air conditioning load of the use-side units 2 is increased and the power consumption of the air-conditioning system 1 is also increased as the ventilation amount is increased. However, when the ventilation amount of the air-conditioning target area 101A where a person is present is reduced in the above-described manner, it is possible to reduce the air conditioning load of the use-side unit 2A, and to reduce the power consumption of the air-conditioning system 1.

[0104] When the ventilation amount of the air-conditioning target area 101A is reduced as described above, increase in concentration of the contaminants in the air-conditioning target area 101A may be concerned. However, extreme deviation does not occur on the distribution of the contaminants between the air-conditioning target area 101A and the air-conditioning target area 101B because the outside air supplied to the adjacent air-conditioning target area 101 B flows to the air-conditioning target area 101 A. Accordingly, it is also possible to prevent the concentration of the contaminants in the air-conditioning target area 101A from increasing.

[0105] Note that, in Embodiment 3, the air supply port 41A of the ventilator 40A communicates with the air-conditioning target area 101A at a position away from the air-conditioning target area 101B more than the center 102A of the air-conditioning target area 101A in a plan view. When the air supply port 41A of the ventilator 40A is disposed as described above, the outside air supplied from the air supply port 41A of the ventilator 40A to the air-conditioning target area 101A flows into the air-conditioning target area 101 B after sufficiently exchanging heat with the air of the air-conditioning target area 101A. This makes it possible to prevent the air conditioning load of the use-side unit 2B installed in the air-conditioning target area 101B from increasing. Likewise, the air supply port 41B of the ventilator 40B communicates with the air-conditioning target area 101B at a position away from the air-conditioning target area 101A more than the center 102B of the air-conditioning target area 101 B. When the air supply port 41 B of the ventilator 40B is disposed as described above, the outside air supplied from the air supply port 41B of the ventilator 40B to the air-conditioning target area 101B flows into the air-conditioning target area 101A after sufficiently exchanging heat with the air of the air-conditioning target area 101B. This makes it

possible to prevent the air conditioning load of the use-side unit 2A installed in the air-conditioning target area 101A from increasing.

Reference Signs List

[0106] 1 air-conditioning system 2 use-side unit 3 (3A) feeder line 4 human detection sensor 5 (5A) temperature sensor 6 (6A) electric box 10 main body unit 11 air inlet 12 center 13 (13A) heat exchanger 14 (14A) fan 20 blowout unit 21 air outlet 22 center 23 vertical wind direction louver24 lateral wind direction louver 30 duct 40 ventilator 41 air supply port 42 air exhaust port 50 controller 50A controller 50B controller 51 input unit 52 calculation unit 53 control unit 54 storage unit 100 room 101 air-conditioning target area 102 center 103 vertical line 104 (104A) above ceiling 105 floor surface 106 side wall 111 first virtual straight line 112 second virtual straight line 113 third virtual straight line 114 fourth virtual straight line 121 first direction 122 second direction 123 third direction 124 fourth direction 131 desk group 132 desk 133 passage 134 door 201 (existing) air-conditioning system 202 (existing) use-side unit 210 (existing) housing 211 (existing) air inlet 221 (existing) air outlet

Claims

1. An air-conditioning system that conditions air of a room partitioned into a plurality of rectangular air-conditioning target areas in a plan view, the air-conditioning system comprising a use-side unit that is installed above a ceiling of one of the air-conditioning target areas and is configured to perform air-conditioning operation to condition air of the one air-conditioning target area, wherein
where an installation area is the one air-conditioning target area in which the use-side unit is installed,
the use-side unit includes a main body unit that is installed above the ceiling of the installation area, and cools and heats air of the installation area sucked from an air inlet provided on a bottom surface, and a blowout unit that is connected to the main body unit by a duct, is installed above the ceiling of the installation area, and blows out air supplied from the main body unit, from an air outlet provided on a bottom surface of the use-side unit,
the blowout unit includes a vertical wind direction louver that adjusts a direction of the air blown out from the air outlet in a vertical direction, and
the vertical wind direction louver is inclined against a vertical line and guides the air toward a center of the installation area.

2. The air-conditioning system of claim 1, wherein the blowout unit is installed at a position where a distance between a center of the air inlet and a center of the air outlet is 3.6 m or less in a plan view.

3. The air-conditioning system of claim 1 or 2, wherein the vertical wind direction louver is of a movable type changeable in inclination by power during operation of the use-side unit,
the use-side unit includes a feeder line supplying the power to the vertical wind direction louver, and
the feeder line is at least partially disposed in contact with the duct.

4. The air-conditioning system of any one of claims 1 to 3, wherein
the vertical wind direction louver is of a movable type changeable in inclination by power during operation of the use-side unit,
the use-side unit is configured to perform cooling operation and heating operation as the air-conditioning operation, and
inclination of the vertical wind direction louver to the vertical line during the cooling operation is larger than inclination of the vertical wind direction louver to the vertical line during the heating operation.

5. The air-conditioning system of any one of claims 1 to 4, wherein
the use-side unit is configured to perform cooling operation as the air-conditioning operation, and
in a side view, the air blown out from the air outlet during the cooling operation reaches a vertical line passing through the center of the installation area before reaching a floor surface of the installation area.

6. The air-conditioning system of any one of claims 1 to 5, wherein
the use-side unit is configured to perform heating operation as the air-conditioning operation, and
in a side view, the air blown out from the air outlet during the heating operation reaches a floor surface of the installation area before reaching a vertical line passing through the center of the installation area.

7. The air-conditioning system of any one of claims 1 to 6, further comprising a human detection sensor configured to detect presence of a person in the installation area, wherein
the use-side unit includes a fan that feeds the air of the installation area sucked from the air inlet, to the blowout unit,
the use-side unit performs air-sending operation when no person is present in the installation area, and
a rotation speed of the fan when the use-side unit performs the air-sending operation is lower than a rotation speed of the fan when the use-side unit performs the air-conditioning operation.

8. The air-conditioning system of any one of claims 1 to 7, wherein

the use-side unit includes the blowout unit at each of two positions,
each of the two blowout units includes a lateral wind direction louver that adjusts the direction of the air blown out from the air outlet in a lateral direction,
where one of the two blowout units is a first blowout unit and an other of the two blowout units is a second blowout unit,
the first blowout unit and the second blowout unit face each other with the center of the installation area in between in a plan view,
where, in a plan view, a virtual straight line connecting a center of the air outlet of the first blowout unit and the center of the installation area is a first virtual straight line, a virtual straight line connecting a center of the air outlet of the second blowout unit and the center of the installation area is a second virtual straight line, one of directions perpendicular to the first virtual straight line is a first direction, and an other of the directions perpendicular to the first virtual straight line is a second direction,
the lateral wind direction louver of the first blowout unit is inclined to cause the air blown out from the air outlet to be inclined in the first direction to the first virtual straight line, and
the lateral wind direction louver of the second blowout unit is inclined to cause the air blown out from the air outlet to be inclined in the second direction to the second virtual straight line.

9. The air-conditioning system of any one of claims 1 to 8, wherein
the use-side unit includes the blowout unit at each of a plurality of positions,
at least one side of the installation area faces a side wall of the room in a plan view, and
the plurality of blowout units are provided only along a side not facing the side wall of the room in a plan view.

10. The air-conditioning system of any one of claims 1 to 9, wherein
the use-side unit includes the blowout unit at each of two positions,
each of the two blowout units includes a lateral wind direction louver that adjusts the direction of the air blown out from the air outlet in a lateral direction,
where one of the two blowout units is a third blowout unit and an other of the two blowout units is a fourth blowout unit,
the third blowout unit and the fourth blowout unit face each other with the center of the installation area in between in a plan view,
where, in a plan view, a virtual straight line connecting a center of the air outlet of the third blowout unit and the center of the installation area is a third virtual straight line, a virtual straight line connecting a center of the air outlet of the fourth blowout unit and the center of the installation area is a fourth virtual straight line, one of directions perpendicular to the third virtual straight line is a third direction, and an other of the directions perpendicular to the third virtual straight line is a fourth direction,
the air-conditioning target area adjacent to the installation area is present in the fourth direction of the installation area in a plan view,
the lateral wind direction louver of the third blowout unit is inclined to cause the air blown out from the air outlet to be inclined in the third direction to the third virtual straight line, and
the lateral wind direction louver of the fourth blowout unit is inclined to cause the air blown out from the air outlet to be inclined in the third direction to the fourth virtual straight line.

11. The air-conditioning system of any one of claims 1 to 10, wherein
the use-side unit is provided at each of two positions, and
where one of the two use-side units is a first use-side unit, an other of the two use-side units is a second use-side unit, the air-conditioning target area where the first use-side unit is installed is a first installation area, and the air-conditioning target area where the second use-side unit is installed is a second installation area,
the first installation area and the second installation area are adjacent to each other.

12. The air-conditioning system of claim 11, wherein set temperature of the first use-side unit and set temperature of the second use-side unit are different by two degrees C or more.

13. The air-conditioning system of claim 11 or 12, further comprising:

a first ventilator that includes a first air supply port communicating with the first installation area; and
a second ventilator that includes a second air supply port communicating with the second installation area, wherein
each of the first use-side unit and the second use-side unit includes a human detection sensor that detects whether a person is present, and
where a person is present in the first installation area and no person is present in the second installation area, a flow rate of outside air supplied from the second air supply port to the second installation area is larger than a flow rate of outside air supplied from the first air supply port to the first installation area.

14. The air-conditioning system of claim 13, wherein
the first air supply port communicates with the first

installation area at a position more away from the second installation area than a center of the first installation area is from the second installation area in a plan view, and

the second air supply port communicates with the second installation area at a position more away from the first installation area than a center of the second installation area is from the first installation area in a plan view.

FIG. 1

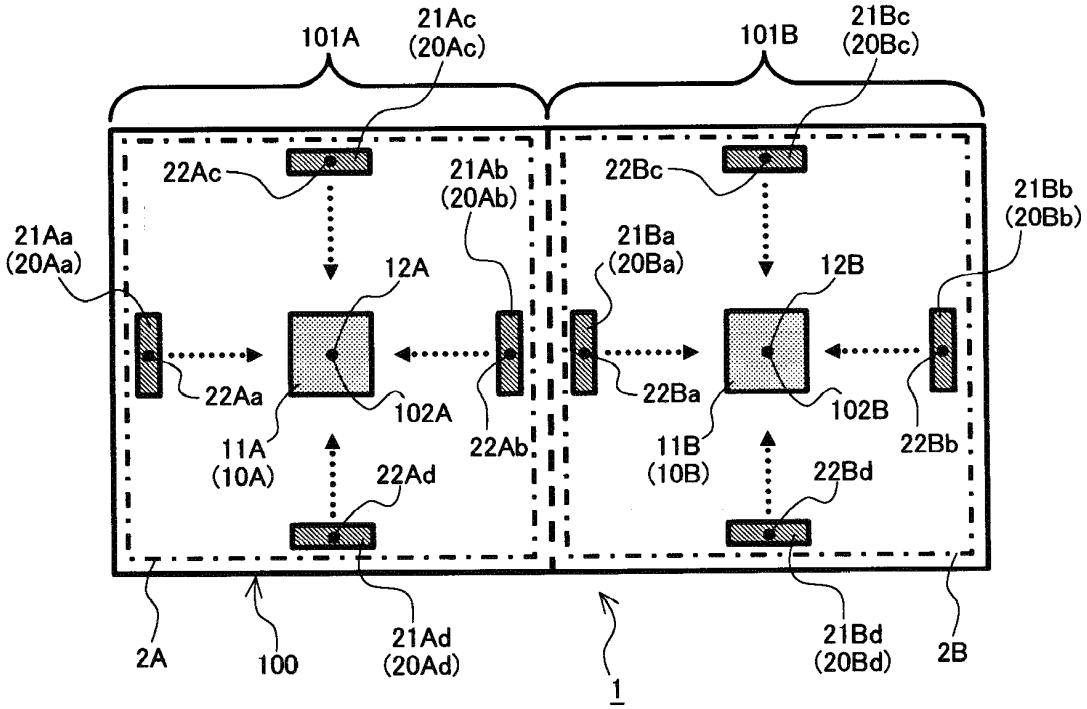

101A
21Ac
(20Ac)
101B
21Bc
(20Bc)
22Ac
21Ab
(20Ab)
22Bc
21Bb
(20Bb)
21Aa
(20Aa)
21Ba
(20Ba)
12A
12B
22Aa
22Ba
102A
102B
11A
(10A)
22Ab
11B
(10B)
22Bb
22Ad
22Bd
2A
100
21Ad
(20Ad)
1
21Bd
(20Bd)
2B

FIG. 2

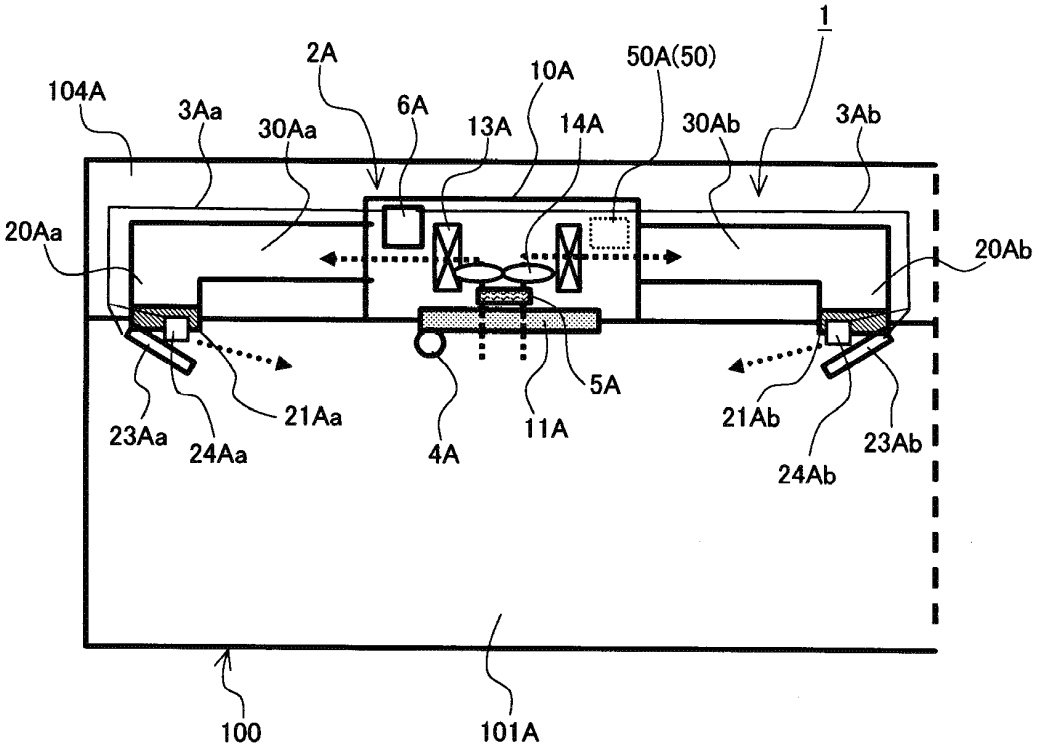

1
2A
50A(50)
10A
104A
3Aa
6A
13A
14A
30Ab
3Ab
30Aa
20Aa
20Ab
5A
23Aa
24Aa
21Aa
4A
11A
21Ab
23Ab
24Ab
100
101A

FIG. 3

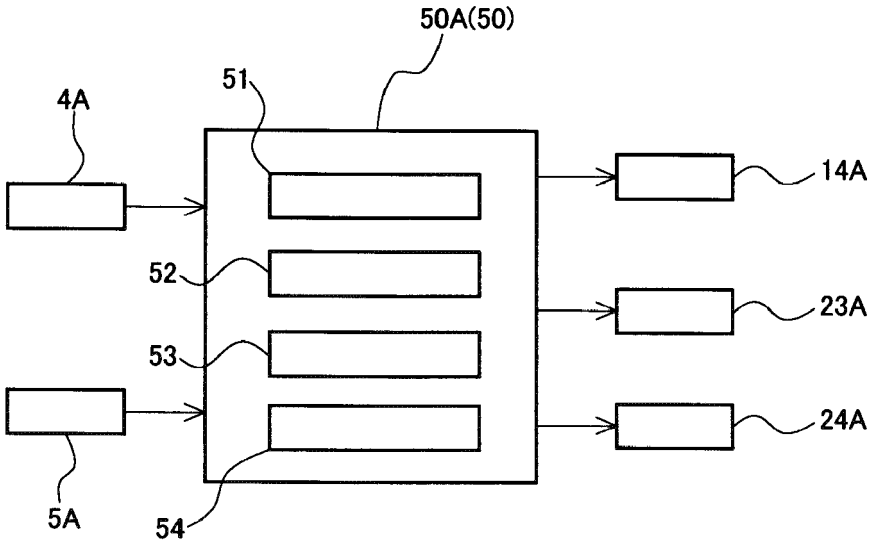

50A(50)
51
4A
14A
52
23A
53
24A
5A
54

FIG. 4

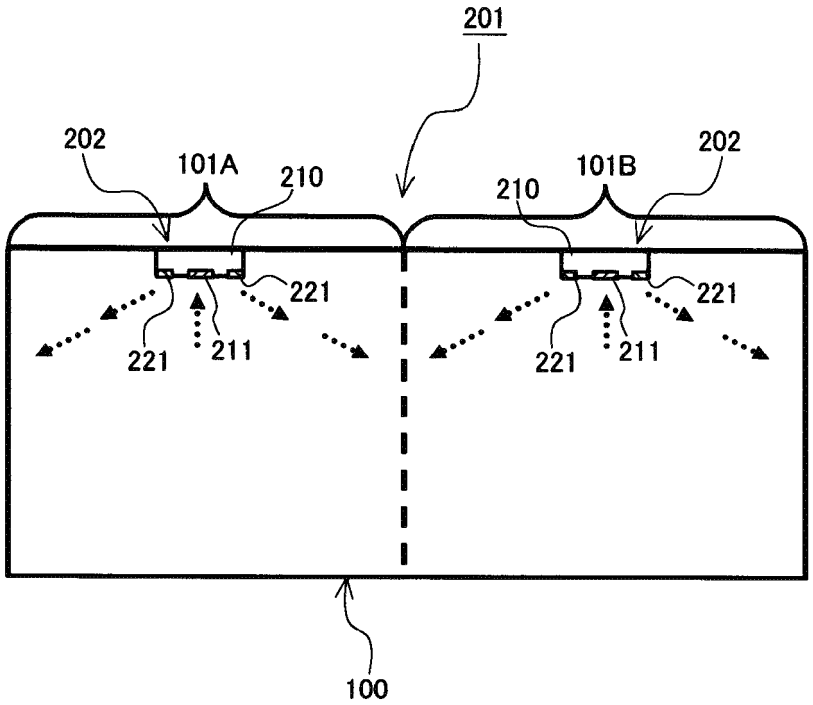

201
202
101A
210
101B
210
202
221
221
211
221
221
211
100

FIG. 5

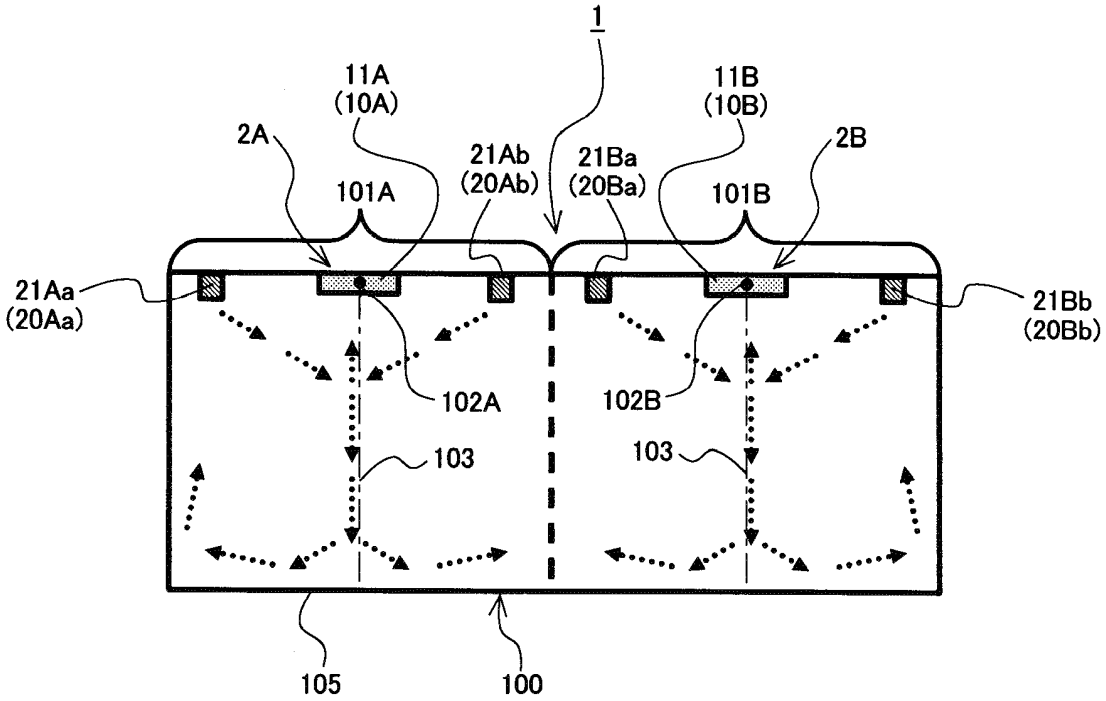

1
11A
(10A)
11B
(10B)
2A
2B
21Ab
(20Ab)
21Ba
(20Ba)
101A
101B
21Aa
(20Aa)
21Bb
(20Bb)
102A
102B
103
103
105
100

FIG. 6

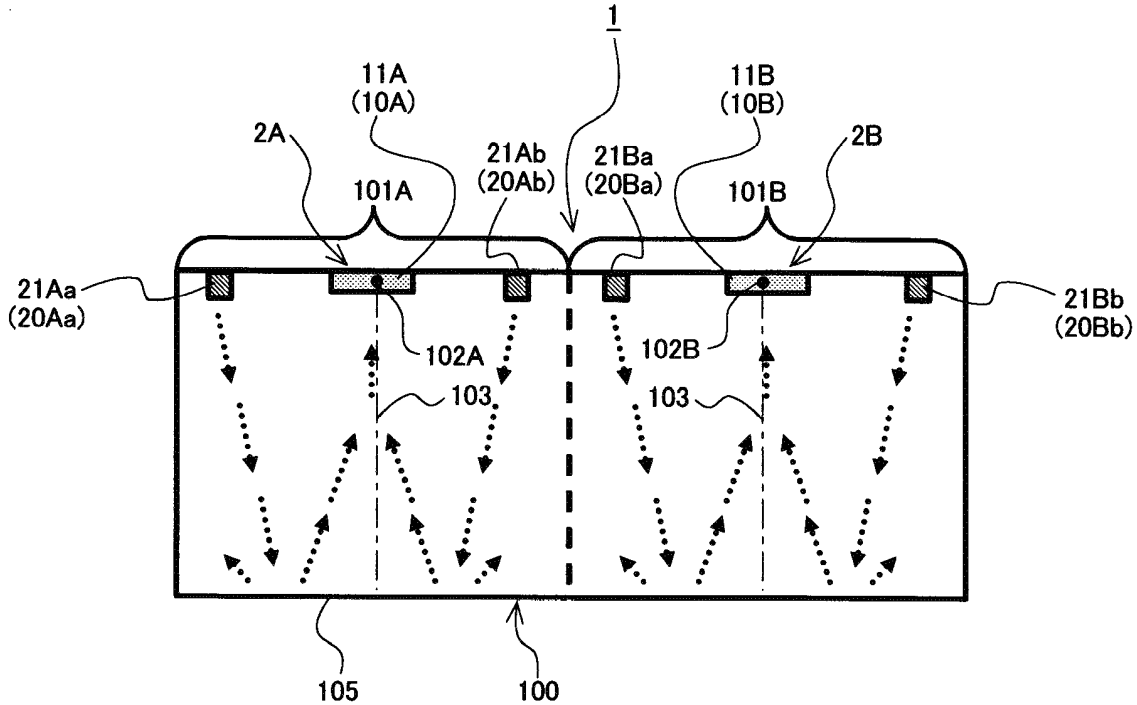

1
11A
(10A)
11B
(10B)
2A
2B
21Ab
(20Ab)
21Ba
(20Ba)
101A
101B
21Aa
(20Aa)
21Bb
(20Bb)
102A
102B
103
103
105
100

FIG. 7

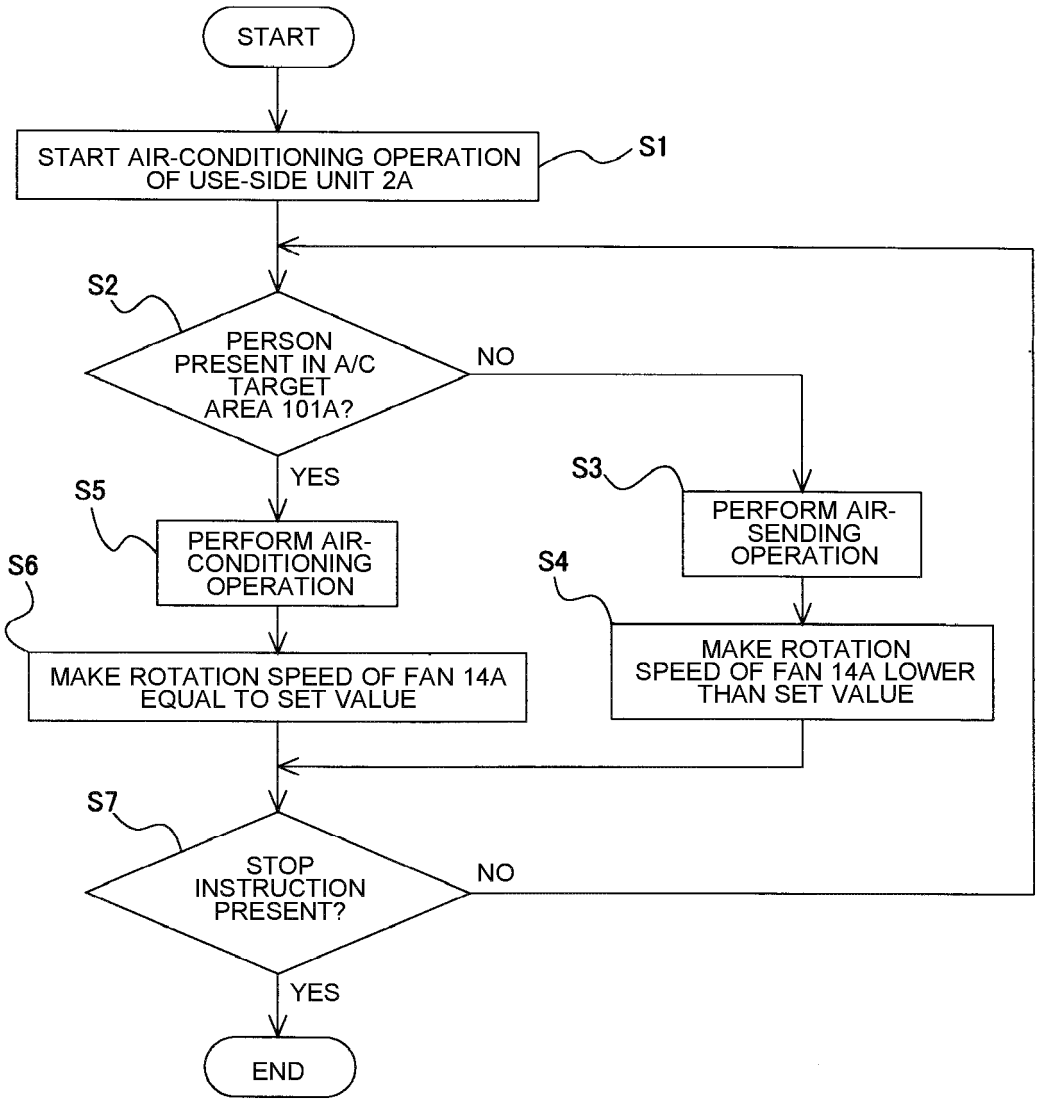

START
START AIR-CONDITIONING OPERATION OF USE-SIDE UNIT 2A
S1
S2
PERSON PRESENT IN A/C TARGET AREA 101A?
NO
YES
S3
PERFORM AIR-SENDING OPERATION
S5
PERFORM AIR-CONDITIONING OPERATION
S6
S4
MAKE ROTATION SPEED OF FAN 14A EQUAL TO SET VALUE
MAKE ROTATION SPEED OF FAN 14A LOWER THAN SET VALUE
S7
STOP INSTRUCTION PRESENT?
NO
YES
END

FIG. 8

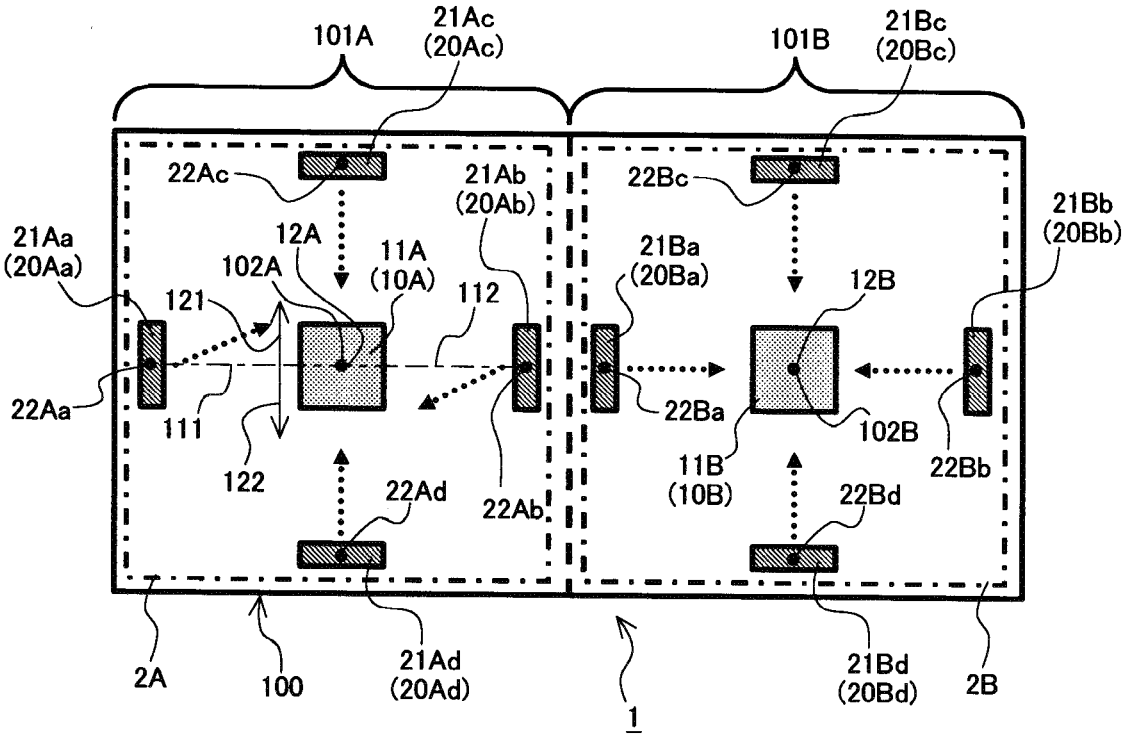

101A
21Ac
(20Ac)
101B
21Bc
(20Bc)
22Ac
21Ab
(20Ab)
22Bc
21Bb
(20Bb)
21Aa
(20Aa)
12A
102A
11A
(10A)
121
112
21Ba
(20Ba)
12B
22Aa
111
122
22Ad
22Ab
22Ba
102B
11B
(10B)
22Bb
22Bd
2A
100
21Ad
(20Ad)
1
21Bd
(20Bd)
2B

FIG. 9

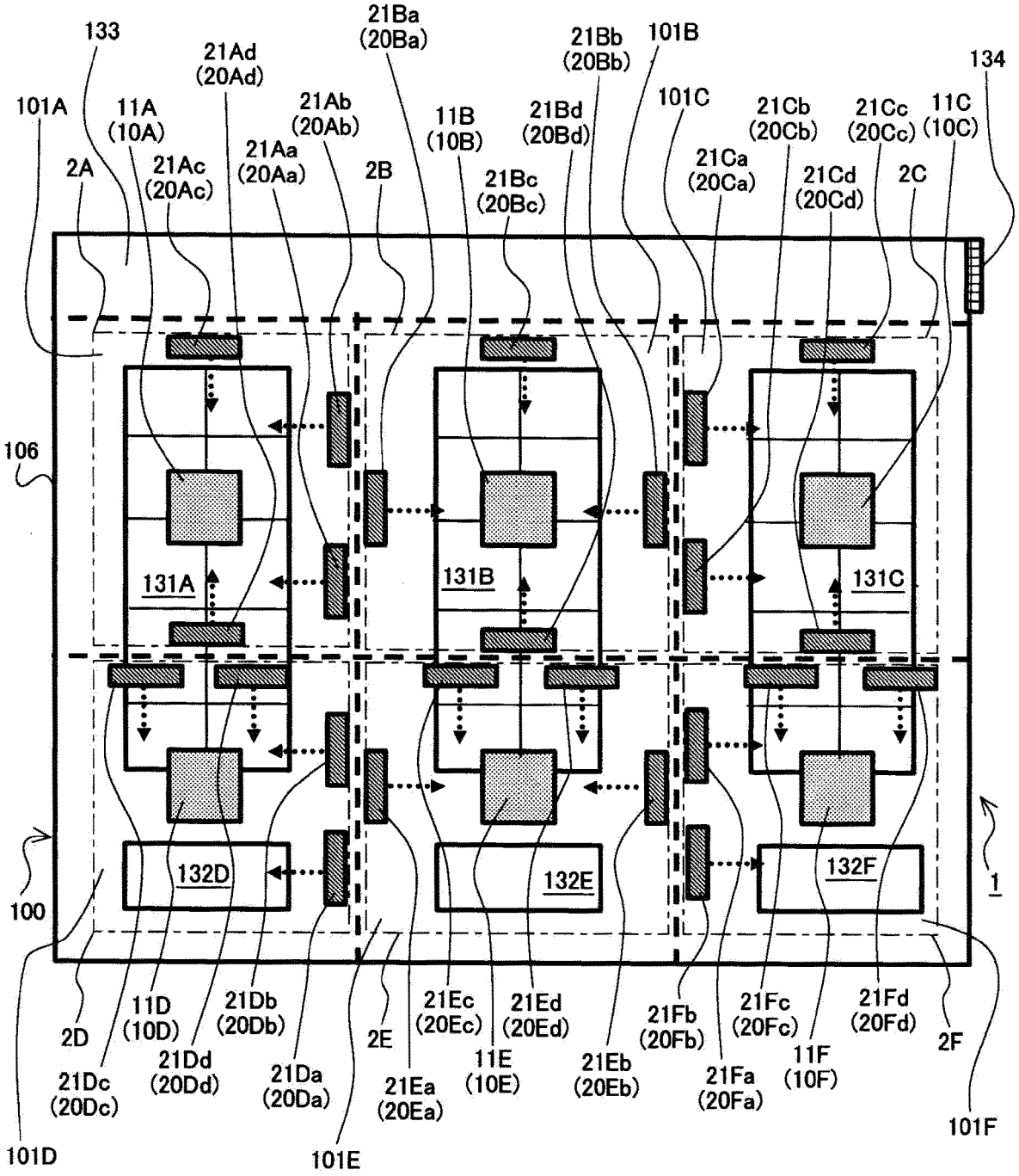
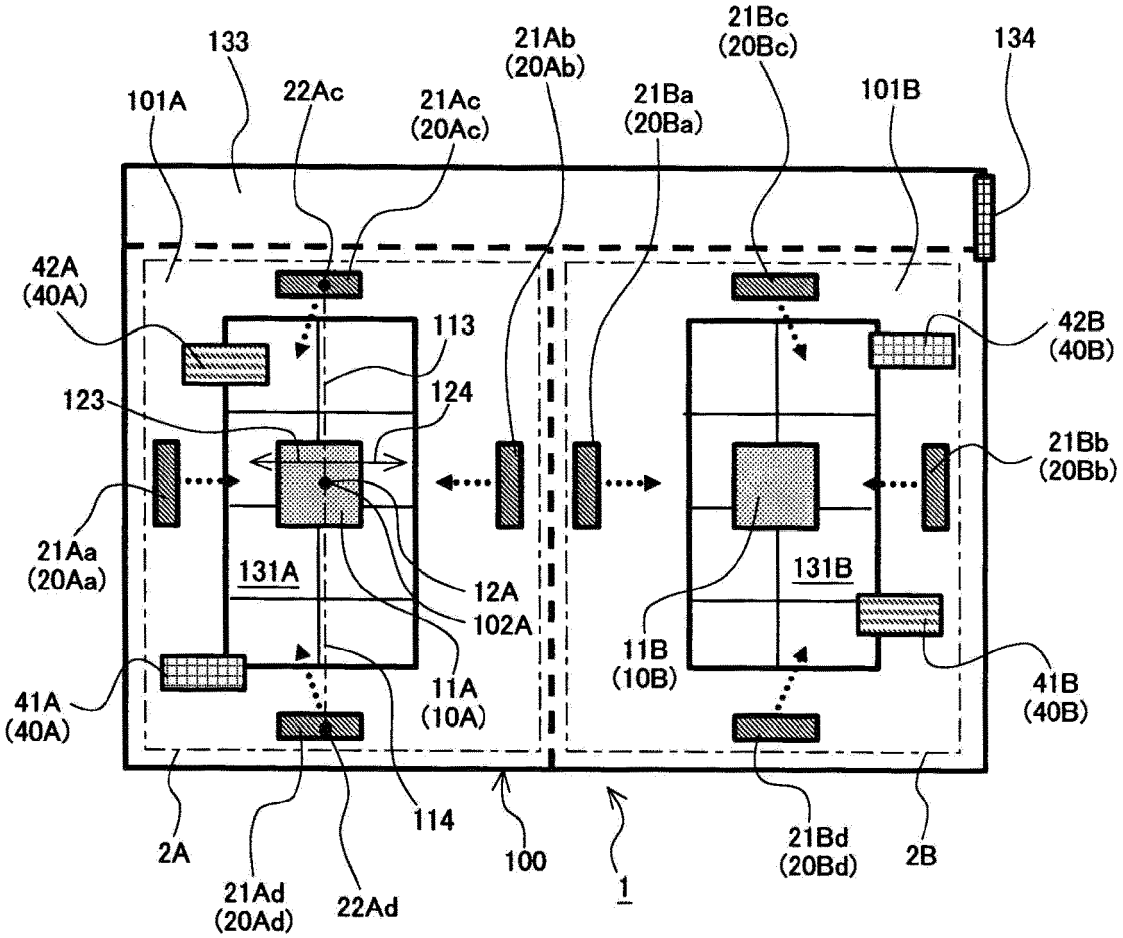

133
21Ad (20Ad)
21Ba (20Ba)
21Bb (20Bb)
101B
134
101A
11A (10A)
21Ab (20Ab)
11B (10B)
21Bd (20Bd)
101C
21Cb (20Cb)
21Cc (20Cc)
11C (10C)
2A
21Ac (20Ac)
21Aa (20Aa)
2B
21Bc (20Bc)
21Ca (20Ca)
21Cd (20Cd)
2C
106
131A
131B
131C
132D
132E
132F
100
1
2D
11D (10D)
21Db (20Db)
2E
21Ec (20Ec)
21Ed (20Ed)
21Fb (20Fb)
21Fc (20Fc)
21Fd (20Fd)
2F
21Dc (20Dc)
21Dd (20Dd)
21Da (20Da)
21Ea (20Ea)
11E (10E)
21Eb (20Eb)
21Fa (20Fa)
11F (10F)
101D
101E
101F

FIG. 10


133
21Ab
(20Ab)
21Bc
(20Bc)
134
101A
22Ac
21Ac
(20Ac)
21Ba
(20Ba)
101B
42A
(40A)
113
42B
(40B)
123
124
21Bb
(20Bb)
21Aa
(20Aa)
131A
131B
12A
102A
11B
(10B)
41A
(40A)
11A
(10A)
41B
(40B)
2A
114
100
1
21Bd
(20Bd)
2B
21Ad
(20Ad)
22Ad

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2018/008536

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl. F24F13/20(2006.01)i, F24F11/62(2018.01)i, F24F11/74(2018.01)i, F24F13/14(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl. F24F13/20, F24F11/62, F24F11/74, F24F13/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan	1922-1996
Published unexamined utility model applications of Japan	1971-2018
Registered utility model specifications of Japan	1996-2018
Published registered utility model applications of Japan	1994-2018

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 2011-52958 A (DAIKIN INDUSTRIES, LTD.) 17 March 2011, paragraphs [0026]-[0099], fig. 1-18 (Family: none)	1-4, 7 5-6, 8-14
Y	JP 2007-255848 A (DAIKIN INDUSTRIES, LTD.) 04 October 2007, paragraphs [0037], [0038], fig. 9 (Family: none)	1-4, 7
Y	JP 2017-67401 A (DAIKIN INDUSTRIES, LTD.) 06 April 2017, paragraphs [0096]-[0102], fig. 12B & JP 6065959 B1 & WO 2017/057298 A1	4, 7

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25.05.2018	05.06.2018

Name and mailing address of the ISA/	Authorized officer
Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2017083084 A **[0004]**