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(54) Air Conditioner and Control Method thereof

Klimaanlage und Betriebsverfahren dafür

Climatiseur et son procédé de fonctionnement

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an air conditioner and a control method thereof, and, more particularly, to an air conditioner capable of detecting whether there is a human body in an indoor space and a control method thereof.

2. Description of the Related Art

[0002] Generally, an air conditioner is an apparatus which cools or heats the circumference using heat absorbing action and heat generating action performed when a circulated coolant is evaporated or liquefied in a refrigeration cycle in which a compressor, a four-way valve, an outdoor heat exchanger, an outdoor expansion unit, an indoor expansion unit and an indoor heat exchanger are connected to each other by coolant lines to form a closed circuit.

[0003] Recently, the air conditioner detects whether there is a human body in an indoor space and a position of the human body, and controls a flow direction and a flow rate based on the detected results, thereby cooling and heating the indoor space in a user-desired optimal state.

[0004] Korean Patent Registration No. 0166933 discloses an air conditioner, wherein an acoustic wave sensor, which is installed to interwork with lateral louvers, is used to sequentially detect a distance to an object or a human body in various directions by dividing a rotational range of the lateral louvers at specific angle intervals, and existence of the human body and a position of the human body are determined based on a variation in the detected distance, thereby controlling a flow direction and a flow rate based on the determination information.

[0005] However, since it is determined whether an obstacle is an object or a human body only based on a distance variation, when the human body is hardly moving (for example, sleeping), it is difficult to distinguish an object from a human body.

[0006] The U.S. patent US 4,294,404 discloses an environmental control system, wherein a room of a building is provided with a temperature sensing device and an occupancy sensor, which is able to detect whether a person is in a room. However, the flow of air in the room cannot be adapted to the position of the person.

[0007] The U.S. patent US 5,180,333 discloses a ventilation device, wherein a sensor unit is supposed to monitor the location and existence of a human body within the ventilation area by comparing the signal of an infrared sensor to a reference signal. Therefore, the reference signal includes any fixed thermal source. However, this requires that if the position of a thermal source in the room is altered, the reference signal has to be adapted.

[0008] The U.S. patent US 5,815,078 discloses a louver driving device for an air conditioner, wherein a plurality of human body sensors detect the position and distance of a human body from the air conditioner and a microcomputer controls the louver driving sections so as to provide heat exchanged air towards the human body. However, as only a distance detection is carried out objects can be confused with a human body.

SUMMARY OF THE INVENTION

[0009] The present invention has been made in order to solve the above problems. It is an aspect of the invention to provide an air conditioner capable of improving a human body detection performance to quickly and accurately determine whether there is a human body and a position of the human body and a control method thereof.

[0010] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

[0011] In accordance with an aspect of the invention, there is provided an air conditioner comprising: a distance detection unit which detects a distance to an obstacle in an indoor space; a temperature detection unit which detects a space temperature of the indoor space; a rotation unit which rotates the distance detection unit and the temperature detection unit; and a controller which controls to detect distance information and temperature information according to space regions obtained by dividing the indoor space into a plurality of regions in a rotation direction while the distance detection unit and the temperature detection unit are rotated, to sequentially store the distance information and temperature information according to the space regions, and to determine whether there is a human body in a corresponding space region and a position of the human body based on a variation in the stored distance information and temperature information.

[0012] In accordance with another aspect of the invention, there is provided a method of controlling an air conditioner to rotate a sensor which detects a distance to an obstacle in an indoor space and a sensor which detects a space temperature of the indoor space, the method comprising: rotating the sensors; detecting distance information and temperature information according to space regions obtained by dividing the indoor space into a plurality of regions in a rotation direction while the sensors are rotated; sequentially storing the detected distance information and temperature information according to the space regions; and determining whether there is a human body in a corresponding space region and a position of the human body based on a variation in the distance information and temperature information stored according to the space regions.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] These and/or other aspects and advantages of the exemplary embodiments of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings, of which:

FIG. 1 illustrates a perspective view of an air conditioner according to an embodiment of the present invention;

FIG. 2 illustrates a side cross-sectional view of the air conditioner according to the embodiment of the present invention;

FIG. 3 illustrates a control block diagram of the air conditioner according to the embodiment of the present invention;

FIG. 4 is a diagram to explain distance values and temperature values in respective space regions obtained by dividing an indoor space into a plurality of regions in the air conditioner according to the embodiment of the present invention;

FIG. 5 is a table to explain distance information and temperature information stored in a storing unit;

FIG. 6 illustrates a control flowchart to explain a method of controlling the air conditioner according to the embodiment of the present invention; and

FIG. 7 illustrates a table to explain an operation of determining whether there is a human body according to the respective space regions in FIG. 6.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] Reference will now be made in detail to exemplary embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

[0015] Hereinafter, an embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0016] As shown in FIGS. 1 and 2, an air conditioner according to the embodiment of the present invention includes a main body 10 having a box-shaped cabinet 11 with an open front surface and a front panel 12 which covers the open front surface of the cabinet 11. Further, the air conditioner includes a heat exchanger 13 to exchange heat and a blower fan 14 to blow air, which are installed in the main body 10.

[0017] First suction ports 15 are formed on opposite side surfaces of a lower portion of the main body 10 to suck indoor air into the main body 10. A discharge port 16 is formed at an upper portion of the front panel 12 of the main body 10 to discharge conditioned air into an indoor space.

[0018] An infrared distance sensor 17a and an infrared temperature sensor 17b are installed at the lower side of the discharge port 16 to reciprocatingly rotatable within a specific angle range. The infrared distance sensor 17a and the infrared temperature sensor 17b are rotated by a motor 18. The infrared distance sensor 17a detects a distance to an obstacle in the indoor space in the rotation direction. The infrared temperature sensor 17b detects a space temperature in the rotation direction.

[0019] Lateral louvers 19a which guide the discharged air in a lateral direction and vertical louvers 19b which guide the discharged air in a vertical direction are installed in the discharge port 16.

[0020] The heat exchanger 13 is installed in an upper inner space of the main body 10 to have a predetermined inclination to exchange heat with air passing through the inside of the main body 10. Further, the blower fan 14 is installed in a lower inner space of the main body 10 to blow air, which is sucked into the main body 10 through the suction ports 15 of the opposite sides, toward the discharge port 16 through the heat exchanger 13 disposed at the upper portion of the main body 10. A reference numeral 19 is a fan casing which forms an air blowing path inside the main body 10.

[0021] The air conditioner is configured such that air, which is sucked into the main body 10 through the suction ports 15 when the blower fan 14 is operated, is heat-exchanged through the heat exchanger 13 disposed at an upper inner portion of the main body 10, and then the heat-exchanged air is supplied to the indoor space again through the discharge port 16 disposed at the upper portion, thereby cooling and heating the indoor air.

[0022] As shown in FIG. 3, the air conditioner having the above configuration according to the embodiment of the present invention includes a controller 20 which performs an overall control.

[0023] The input side of the controller 20 is electrically connected to the infrared distance sensor 17a and the infrared temperature sensor 17b. The infrared distance sensor 17a and the infrared temperature sensor 17b are rotated by the motor 18. The infrared distance sensor 17a detects a distance to an obstacle in the indoor space in the rotation direction. The infrared distance sensor 17a includes a light emitting part and a light receiving part to measure the distance by transmitting infrared ray and receiving infrared ray reflected from the obstacle. The infrared temperature sensor 17b detects a space temperature in the rotation direction. The infrared temperature sensor 17b includes a lens, a thermopile and an embedded signal processor to measure the space temperature by transmitting infrared ray and receiving infrared ray reflected from the obstacle.

[0024] The output side of the controller 20 is electrically connected to a fan driving unit 22 which drives the blower fan 14, a louver driving unit 23 which drives the lateral louvers 19a and the vertical louvers 19b, a rotation unit 24 which drives the motor 18 to rotate the infrared distance sensor 17a and the infrared temperature sensor 17b, and a compressor driving unit 25 which drives a

compressor 26.

[0025] Further, the controller 20 is electrically connected to a storing unit 21 which sequentially stores distance information and temperature information detected by the infrared distance sensor 17a and the infrared temperature sensor 17b according to the respective space regions.

[0026] After the infrared distance sensor 17a and the infrared temperature sensor 17b are reciprocatingly rotated by the rotation unit 24, as shown in FIG. 4, the controller 20 measures distance values to the obstacle and temperature values according to the space regions in the respective directions at specific time intervals while the infrared distance sensor 17a and the infrared temperature sensor 17b are reciprocatingly rotated. The measured distance values and temperature values in the respective space regions are stored in the storing unit 21 according to the corresponding space regions. FIG. 5 illustrates a pattern of the temperature values and the distance values stored according to the respective space regions when the indoor space is divided into n space regions.

[0027] As an example, when the infrared distance sensor 17a and the infrared temperature sensor 17b are rotated from a G1 space region to a Gn space region, a first distance value Y1-1 to the obstacle and a first temperature value X1-1 in the G1 space region are measured and stored while passing through the G1 space region, and a first distance value Y2-1 to the obstacle and a first temperature value X2-1 in a G2 space region are measured and stored while passing through the G2 space region. In this manner, the measuring and storing operations are performed in the remaining space regions. Finally, a first distance value Yn-1 and a first temperature value Xn-1 in the Gn space region are measured and stored. Then, when the infrared distance sensor 17a and the infrared temperature sensor 17b are rotated in an opposite direction, a second distance value Yn-2 and a second temperature value Xn-2 in the Gn space region are measured and stored, and a second distance value Yn-1-2 to the obstacle and a second temperature value Xn-1-2 in a Gn-1 space region are measured and stored while passing through the Gn-1 space region. In this manner, the measuring and storing operations are performed in the remaining space regions, and a second distance value Y1-2 and a second temperature value X1-2 in the G1 space region are measured and stored while passing through the G1 space region. This process is repeatedly performed in the same way while the infrared distance sensor 17a and the infrared temperature sensor 17b are rotated. In this case, respective temperature values X1-0 to Xn-0 in the G1 space region to the Gn space region are previously stored initial values to determine whether an object, a human body, or a heat source exists in each space region in the indoor space before the air conditioner is operated.

[0028] If there is no obstacle in the corresponding space region, infrared ray is transmitted and then returns after being reflected from the wall surface. If there is an obstacle in the corresponding space region, transmitted infrared ray returns after being reflected from the obstacle. Accordingly, there is a difference in time until infrared ray returns according to whether there is an obstacle. The controller 20 can determine whether there is an obstacle in the corresponding space region and a position of the obstacle in the corresponding space region based on a variation between a previous distance value and a current distance value. Further, if there is an obstacle, it may be determined that the obstacle is an object if there is no variation between the current distance and the previous distance, and it may be determined that the obstacle is a human body if the current distance is smaller than the previous distance. However, if a human is sleeping in the corresponding space region from before the air conditioner is operated, since the human hardly moves and there is no variation in the distance, it may be wrongly determined that the obstacle is an object even though the obstacle is a human body. Consequently, it is difficult to correctly determine whether the obstacle is an object or a human body with only a variation in the distance, and it is possible to correctly determine only whether there is an obstacle and the position of the obstacle based on a variation in the distance. In this case, the previous distance may be a distance just prior to the current distance or an average value of all previous distances.

[0029] Thus, in the present invention, both a distance variation and a temperature variation are measured in the corresponding space region. If there is no human body in the corresponding space region, a low temperature value is measured in the corresponding space region. However, if there is a human body, a relatively high temperature value is measured due to a body temperature. Particularly, if there is a heat source, not a human body, a much higher temperature value is measured. Accordingly, the controller 20 can determine whether there is a human body in the corresponding space region by comparing a current temperature with a previous temperature. In this case, it is possible to easily distinguish a human body from a heat source since the measured temperature values have a large difference. In this case, the previous temperature may be a temperature just prior to the current temperature or an average value of all previous temperatures.

[0030] As described above, if there are both a distance variation having a current distance smaller than a previous distance and a temperature variation having a current temperature higher than a previous temperature in a specific space region, the controller 20 determines that there is an obstacle newly coming into the corresponding space region and the obstacle is a human body or a heat source. Since the heat source has a temperature value higher than that of the human body, it is determined that the obstacle is a heat source if the temperature variation is equal to or larger than a reference value, and it is determined that the obstacle is a human body if the temperature variation is smaller than the reference value.

[0031] Further, if there is only a distance variation having a current distance smaller than a previous distance and there is no temperature variation having a current temperature higher than a previous temperature, the controller 20 determines that there is an obstacle newly coming into the corresponding space region and the obstacle is an object.

[0032] Further, if there is no distance variation having a current distance smaller than a previous distance and there is only a temperature variation having a current temperature higher than a previous temperature, it means that there is no obstacle newly coming into the corresponding space region, but there is a heat source or a human body from the beginning. Thus, the controller 20 determines that there is a heat source if the temperature variation is equal to or larger than a reference value, and determines that there is a human body if the temperature variation is smaller than the reference value. In this case, the human body is a hardly moving body.

[0033] Further, if there is no distance variation having a current distance smaller than a previous distance and there is no temperature variation having a current temperature higher than a previous temperature, the controller 20 determines that there is no obstacle newly coming into the corresponding space region and there is no human body, object or heat source the beginning.

[0034] Meanwhile, the controller 20 controls the lateral louvers 19a toward the space region in which a human body exists and controls the vertical louvers 19b corresponding to a position of the human body. That is, as the human body is far separated from the main body 10, the vertical louvers 19b are controlled upward.

[0035] Hereinafter, an operation of the controller 20 will be described with reference to FIG. 6. First, the controller 20 performs a cooling operation or a heating operation at operation 100.

[0036] Then, the controller 20 controls the rotation unit 24 to rotate the infrared distance sensor 17a and the infrared temperature sensor 17b at operation 110.

[0037] After the infrared distance sensor 17a and the infrared temperature sensor 17b are rotated, the controller 20 detects a distance and a temperature in the corresponding space region by transmitting infrared ray and receiving reflected infrared ray according to respective space regions at operations 120 and 130.

[0038] The controller 20 controls the storing unit 21 to store detected distance information and temperature information according to the respective space regions at operation 140.

[0039] Then, the controller 20 determines whether there is a human body and a position of the human body according to the respective space regions at operation 150. That is, as shown in FIG. 7, if there are both a distance variation having a current distance smaller than a previous distance and a temperature variation having a current temperature higher than a previous temperature, it is determined that there is an obstacle newly coming into the corresponding space region and the obstacle is a human body or a heat source. Since the heat source has a temperature value higher than that of the human body, it is determined that the obstacle is a heat source if the temperature variation is equal to or larger than a reference value, and it is determined that the obstacle is a human body if the temperature variation is smaller than the reference value. Further, if there is only a distance variation having a current distance smaller than a previous distance and there is no temperature variation having a current temperature higher than a previous temperature, it is determined that there is an obstacle newly coming into the corresponding space region and the obstacle is an object. Further, if there is no distance variation having a current distance smaller than a previous distance and there is only a temperature variation having a current temperature higher than a previous temperature, it means that there is no obstacle newly coming into the corresponding space region, but there is a heat source or a human body from the beginning. Thus, it is determined that there is a heat source if the temperature variation is equal to or larger than a reference value, and that there is a human body if the temperature variation is smaller than the reference value. Further, if there is no distance variation having a current distance smaller than a previous distance and there is no temperature variation having a current temperature higher than a previous temperature, it is determined that there is no obstacle newly coming into the corresponding space region and there is no human body, object or heat source from the beginning.

[0040] Further, at operation 160, the controller 20 controls the lateral louvers 19a toward the space region in which a human body exists and controls the vertical louvers 19b corresponding to a position of the human body such that the vertical louvers 19b are controlled upward as the human body is far separated from the main body 10.

[0041] As described above, according to the present invention, while rotating the distance sensor which detects a distance to an obstacle in the indoor space and the temperature sensor which detects a temperature of the indoor space, distance information and temperature information are detected and stored according to a plurality of space regions divided in the rotation direction. Then, existence of a human body and a position of the human body are determined based on a variation in the stored distance information and temperature information. Accordingly, it is possible to quickly and accurately distinguish an object from a human body, and also possible to quickly and accurately determine even a hardly moving body. Thus, there is an effect of improving pleasantness of a human body by concentrating or removing cool air or warm air to or from the human body according to a user's preference.

[0042] Further, according to the present invention, since the infrared distance sensor and the infrared temperature sensor having a relatively high detection rate are used, there is an effect of determining whether there is a human body in real time.

[0043] Further, according to the present invention, since the rotation operation of the infrared distance sensor and the infrared temperature sensor is performed by an independent rotation unit without interworking with the lateral louvers having a relatively low speed. Accordingly, since it is possible to increase a rotational speed, there is an effect of more quickly determining whether there is a human body.

[0044] Although embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles of the invention, the scope of which is defined in the claims.

Claims

1. An air conditioner comprising:

a distance detection unit (17a,20) which detects a distance to an obstacle in an indoor space; and
a temperature detection unit (17b,20);
characterized by
a rotation unit (24) which rotates the distance detection unit and the temperature detection unit, wherein the temperature detection unit detects a space temperature of the indoor space; and
a controller (20) which controls to detect distance information and temperature information according to space regions obtained by dividing the indoor space into a plurality of regions in a rotation direction while the distance detection unit and the temperature detection unit are rotated, to sequentially store the distance information and temperature information according to the space regions, and to determine whether there is a human body in a corresponding space region and a position of the human body based on a variation in the stored distance information and temperature information.

2. The air conditioner according to claim 1, wherein the distance detection unit includes an infrared distance sensor (17a).

3. The air conditioner according to claim 1, wherein the temperature detection unit includes an infrared temperature sensor (17b).

4. The air conditioner according to claim 1, wherein the controller (20) determines that there is a human body or a heat source in the corresponding space region if a current distance is shorter than a previous distance and a current temperature is higher than a previous temperature in the corresponding space region.

5. The air conditioner according to claim 4, wherein the controller (20) determines that there is a heat source in the corresponding space region if the current temperature is higher than a predetermined temperature in the corresponding space region, and determines that there is a human body in the corresponding space region if the current temperature is lower than the predetermined temperature.

6. The air conditioner according to claim 1, wherein the controller (20) determines that there is a human body or a heat source in the corresponding space region if there is no distance variation between a current distance and a previous distance and a current temperature is higher than a previous temperature in the corresponding space region.

7. The air conditioner according to claim 6, wherein the controller (20) determines that there is a heat source in the corresponding space region if the current temperature is higher than a predetermined temperature in the corresponding space region, and determines that there is a hardly moving human body in the corresponding space region if the current temperature is lower than the predetermined temperature.

8. The air conditioner according to claim 1, wherein the controller (20) determines that there is an object in the corresponding space region if a current distance is shorter than a previous distance and there is no temperature variation between a current temperature and a previous temperature in the corresponding space region.

9. A method of controlling an air conditioner to rotate a sensor (17a) which detects a distance to an obstacle in an indoor space and a sensor (17b) which detects a space temperature of the indoor space, the method comprising:

rotating the sensors (17a, 17b);
detecting distance information and temperature information according to space regions obtained by dividing the indoor space into a plurality of regions in a rotation direction while the sensors (17a, 17b) are rotated;
sequentially storing the detected distance information and temperature information according to the space regions; and
determining whether there is a human body in a corresponding space region and a position of the human body based on a variation in the distance information and temperature information stored according to the space regions.

10. The method according to claim 9, wherein it is determined that there is a human body or a heat source in the corresponding space region if a current dis-

tance is shorter than a previous distance and a current temperature is higher than a previous temperature in the corresponding space region.

11. The method according to claim 10, wherein it is determined that there is a heat source in the corresponding space region if the current temperature is higher than a predetermined temperature in the corresponding space region, and it is determined that there is a human body in the corresponding space region if the current temperature is lower than the predetermined temperature.

12. The method according to claim 9, wherein it is determined that there is a human body or a heat source in the corresponding space region if there is no distance variation between a current distance and a previous distance and a current temperature is higher than a previous temperature in the corresponding space region.

13. The method according to claim 12, wherein it is determined that there is a heat source in the corresponding space region if the current temperature is higher than a predetermined temperature in the corresponding space region, and it is determined that there is a hardly moving human body in the corresponding space region if the current temperature is lower than the predetermined temperature.

14. The method according to claim 9, wherein it is determined that there is an object in the corresponding space region if a current distance is shorter than a previous distance and there is no temperature variation between a current temperature and a previous temperature in the corresponding space region.

Patentansprüche

1. Klimatisierungsvorrichtung, die umfasst:

eine Abstanderfassungseinheit (17a, 20), die einen Abstand zu einem Hindernis in einem Innenraum erfasst; und
eine Temperaturerfassungseinheit (17b, 20);
gekennzeichnet durch
eine Dreheinheit (24), die die Abstanderfassungseinheit und die Temperaturerfassungseinheit dreht, wobei die Temperaturerfassungseinheit eine Raumtemperatur des Innenraums erfasst; und
eine Steuereinheit (20), die so steuert, dass Abstandsinformationen und Temperaturinformationen entsprechend Raumbereichen erfasst werden, die bestimmt werden, indem der Innenraum in einer Drehrichtung in eine Vielzahl von Bereichen unterteilt wird, während die Abstanderfassungseinheit und die Temperaturerfassungseinheit gedreht werden, die Abstandsinformationen und die Temperaturinformationen entsprechend den Raumbereichen sequenziell gespeichert werden und festgestellt wird, ob sich ein menschlicher Körper in einem entsprechenden Raumbereich befindet, und eine Position des menschlichen Körpers auf Basis einer Änderung der gespeicherten Abstandsinformationen und Temperaturinformationen bestimmt wird.

2. Klimatisierungsvorrichtung nach Anspruch 1, wobei die Abstanderfassungseinheit einen Infrarot-Abstandssensor (17a) enthält.

3. Klimatisierungsvorrichtung nach Anspruch 1, wobei die Temperaturerfassungseinheit einen Infrarot-Temperatursensor (17b) enthält.

4. Klimatisierungsvorrichtung nach Anspruch 1, wobei die Steuereinrichtung (20) feststellt, dass sich ein menschlicher Körper oder eine Wärmequelle in dem entsprechenden Raumbereich befindet, wenn ein aktueller Abstand kürzer ist als ein vorhergehender Abstand und eine aktuelle Temperatur höher ist als eine vorhergehende Temperatur in dem entsprechenden Raumbereich.

5. Klimatisierungsvorrichtung nach Anspruch 4, wobei die Steuereinrichtung (20) feststellt, dass sich eine Wärmequelle in dem entsprechenden Raumbereich befindet, wenn die aktuelle Temperatur höher ist als eine vorgegebene Temperatur in dem entsprechenden Raumbereich, und feststellt, dass sich ein menschlicher Körper in dem entsprechenden Raumbereich befindet, wenn die aktuelle Temperatur niedriger ist als die vorgegebene Temperatur.

6. Klimatisierungsvorrichtung nach Anspruch 1, wobei die Steuereinrichtung (20) feststellt, dass sich ein menschlicher Körper oder eine Wärmequelle in dem entsprechenden Raumbereich befindet, wenn keine Abstandsänderung zwischen einem aktuellen Abstand und einem vorhergehenden Abstand vorliegt und eine aktuelle Temperatur höher ist als eine vorhergehende Temperatur in dem entsprechenden Raumbereich.

7. Klimatisierungsvorrichtung nach Anspruch 6, wobei die Steuereinrichtung (20) feststellt, dass sich eine Wärmequelle in dem entsprechenden Raumbereich befindet, wenn die aktuelle Temperatur höher ist als eine vorgegebene Temperatur in dem entsprechenden Raumbereich, und feststellt, dass sich ein sich kaum bewegender menschlicher Körper in dem entsprechenden Raumbereich befindet, wenn die aktuelle Temperatur niedriger ist als die vorgegebene

Temperatur.

8. Klimatisierungsvorrichtung nach Anspruch 1, wobei die Steuereinrichtung (20) feststellt, dass sich ein Objekt in dem entsprechenden Raumbereich befindet, wenn ein aktueller Abstand kürzer ist als ein vorhergehender Abstand und keine Temperaturänderung zwischen einer aktuellen Temperatur und einer vorhergehenden Temperatur in dem entsprechenden Raumbereich vorliegt.

9. Verfahren, mit dem eine Klimatisierungsvorrichtung so gesteuert wird, dass ein Sensor (17a), der einen Abstand zu einem Hindernis in einem Innenraum erfasst, und ein Sensor (17b) gedreht werden, der eine Raumtemperatur des Innenraums erfasst, wobei das Verfahren umfasst:

Drehen der Sensoren (17a, 17b);
Erfassen von Abstandsinformationen und Temperaturinformationen entsprechend den Raumbereichen, die bestimmt werden, indem der Innenraum in eine Vielzahl von Bereichen in einer Drehrichtung unterteilt wird, während die Sensoren (17a, 17b) gedreht werden;
sequenzielles Speichern der erfassten Abstandsinformationen und Temperaturinformationen entsprechend den Raumbereichen; und
Feststellen, ob sich ein menschlicher Körper in einem entsprechenden Raumbereich befindet, und Feststellen einer Position des menschlichen Körpers auf Basis einer Änderung der Abstandsinformationen und der Temperaturinformationen, die entsprechend den Raumbereichen gespeichert sind.

10. Verfahren nach Anspruch 9, wobei festgestellt wird, dass sich ein menschlicher Körper oder eine Wärmequelle in dem entsprechenden Raumbereich befindet, wenn ein aktueller Abstand kürzer ist als ein vorhergehender Abstand und eine aktuelle Temperatur höher ist als eine vorhergehende Temperatur in dem entsprechenden Raumbereich.

11. Verfahren nach Anspruch 10, wobei festgestellt wird, dass sich eine Wärmequelle in dem entsprechenden Raumbereich befindet, wenn die aktuelle Temperatur höher ist als eine vorgegebene Temperatur in dem entsprechenden Raumbereich, und festgestellt wird, dass sich ein menschlicher Körper in dem entsprechenden Raumbereich befindet, wenn die aktuelle Temperatur niedriger ist als die vorgegebene Temperatur.

12. Verfahren nach Anspruch 9, wobei festgestellt wird, dass sich ein menschlicher Körper oder eine Wärmequelle in dem entsprechenden Raumbereich befindet, wenn keine Abstandsänderung zwischen einem aktuellen Abstand und einem vorhergehenden Abstand vorliegt und eine aktuelle Temperatur höher ist als eine vorhergehende Temperatur in dem entsprechenden Raumbereich.

13. Verfahren nach Anspruch 12, wobei festgestellt wird, dass sich eine Wärmequelle in dem entsprechenden Raumbereich befindet, wenn die aktuelle Temperatur höher ist als eine vorgegebene Temperatur in dem entsprechenden Raumbereich, und festgestellt wird, dass sich ein sich kaum bewegender menschlicher Körper in dem entsprechenden Raumbereich befindet, wenn die aktuelle Temperatur niedriger ist als die vorgegebene Temperatur.

14. Verfahren nach Anspruch 9, wobei festgestellt wird, dass sich ein Objekt in dem entsprechenden Raumbereich befindet, wenn ein aktueller Abstand kürzer ist als ein vorhergehender Abstand und keine Temperaturänderung zwischen einer aktuellen Temperatur und einer vorhergehenden Temperatur in dem entsprechenden Raumbereich vorliegt.

Revendications

1. Climatiseur comprenant :

une unité de détection de distance (17a, 20) qui détecte la distance jusqu'à un obstacle dans un espace intérieur ;
et
une unité de détection de température (17b, 20) ;
caractérisé par
une unité de rotation (24) qui fait tourner l'unité de détection de distance et l'unité de détection de température, dans lequel l'unité de détection de température détecte la température d'espace de l'espace intérieur ; et
un contrôleur (20) qui contrôle les informations de distance et les informations de température détectées en fonction de régions de l'espace obtenues en divisant l'espace intérieur en une pluralité de régions dans un sens de rotation pendant qu'on fait tourner l'unité de détection de distance et l'unité de détection de température, pour enregistrer en séquence les informations de distance et les informations de température en fonction des régions de l'espace et pour déterminer si un corps humain se trouve dans une région correspondante de l'espace, ainsi que la position du corps humain en se basant sur la variation des informations de distance et des informations de température enregistrées.

2. Climatiseur selon la revendication 1, dans lequel l'unité de détection de distance comporte un détec-

teur de distance à infrarouge (17a).

3. Climatiseur selon la revendication 1, dans lequel l'unité de détection de température comporte un détecteur de température à infrarouge (17b).

4. Climatiseur selon la revendication 1, dans lequel le contrôleur (20) détermine qu'un corps humain ou une source de chaleur se trouve dans la région correspondante de l'espace si la distance actuelle est plus courte qu'une distance précédente et si la température actuelle est supérieure à une température précédente dans la région correspondante de l'espace.

5. Climatiseur selon la revendication 4, dans lequel le contrôleur (20) détermine qu'une source de chaleur se trouve dans la région correspondante de l'espace si la température actuelle est supérieure à une température prédéterminée dans la région correspondante de l'espace et détermine qu'un corps humain se trouve dans la région correspondante de l'espace si la température actuelle est inférieure à la température prédéterminée.

6. Climatiseur selon la revendication 1, dans lequel le contrôleur (20) détermine qu'un corps humain ou une source de chaleur se trouve dans la région correspondante de l'espace s'il n'y a aucune variation de distance entre la distance actuelle et une distance précédente et si la température actuelle est supérieure à une température précédente dans la région correspondante de l'espace.

7. Climatiseur selon la revendication 6, dans lequel le contrôleur (20) détermine qu'une source de chaleur se trouve dans la région correspondante de l'espace si la température actuelle est supérieure à une température prédéterminée dans la région correspondante de l'espace et détermine qu'un corps humain se déplaçant à peine se trouve dans la région correspondante de l'espace si la température actuelle est inférieure à la température prédéterminée.

8. Climatiseur selon la revendication 1, dans lequel le contrôleur (20) détermine qu'un objet se trouve dans la région correspondante de l'espace si la distance actuelle est plus courte qu'une distance précédente et s'il n'y a aucune variation de température entre la température actuelle et une température précédente dans la région correspondante de l'espace.

9. Procédé de contrôle d'un climatiseur faisant tourner un détecteur (17a) qui détecte la distance jusqu'à un obstacle dans un espace intérieur et un détecteur (17b) qui détecte la température d'espace de l'espace intérieur, le procédé comprenant les étapes consistant à :

faire tourner les détecteurs (17a, 17b) ;
détecter des informations de distance et des informations de température en fonction de régions de l'espace obtenues en divisant l'espace intérieur en une pluralité de régions dans un sens de rotation pendant qu'on fait tourner les détecteurs (17a, 17b) ;
enregistrer en séquence les informations de distance et les informations de température détectées en fonction des régions de l'espace ; et
déterminer si un corps humain se trouve dans une région correspondante de l'espace, ainsi que la position du corps humain en se basant sur la variation des informations de distance et des informations de température enregistrées, en fonction des régions de l'espace.

10. Procédé selon la revendication 9, dans lequel on détermine qu'un corps humain ou une source de chaleur se trouve dans la région correspondante de l'espace si la distance actuelle est plus courte qu'une distance précédente et si la température actuelle est supérieure à une température précédente dans la région correspondante de l'espace.

11. Procédé selon la revendication 10, dans lequel on détermine qu'une source de chaleur se trouve dans la région correspondante de l'espace si la température actuelle est supérieure à une température prédéterminée dans la région correspondante de l'espace et on détermine qu'un corps humain se trouve dans la région correspondante de l'espace si la température actuelle est inférieure à la température prédéterminée.

12. Procédé selon la revendication 9, dans lequel on détermine qu'un corps humain ou une source de chaleur se trouve dans la région correspondante de l'espace s'il n'y a aucune variation de distance entre la distance actuelle et une distance précédente et si la température actuelle est supérieure à une température précédente dans la région correspondante de l'espace.

13. Procédé selon la revendication 12, dans lequel on détermine qu'une source de chaleur se trouve dans la région correspondante de l'espace si la température actuelle est supérieure à une température prédéterminée dans la région correspondante de l'espace et on détermine qu'un corps humain se déplaçant à peine se trouve dans la région correspondante de l'espace si la température actuelle est inférieure à la température prédéterminée.

14. Procédé selon la revendication 9, dans lequel on détermine qu'un objet se trouve dans la région correspondante de l'espace si la distance actuelle est plus courte qu'une distance précédente et s'il n'y a aucu-

ne variation de température entre la température actuelle et une température précédente dans la région correspondante de l'espace.

FIG. 1

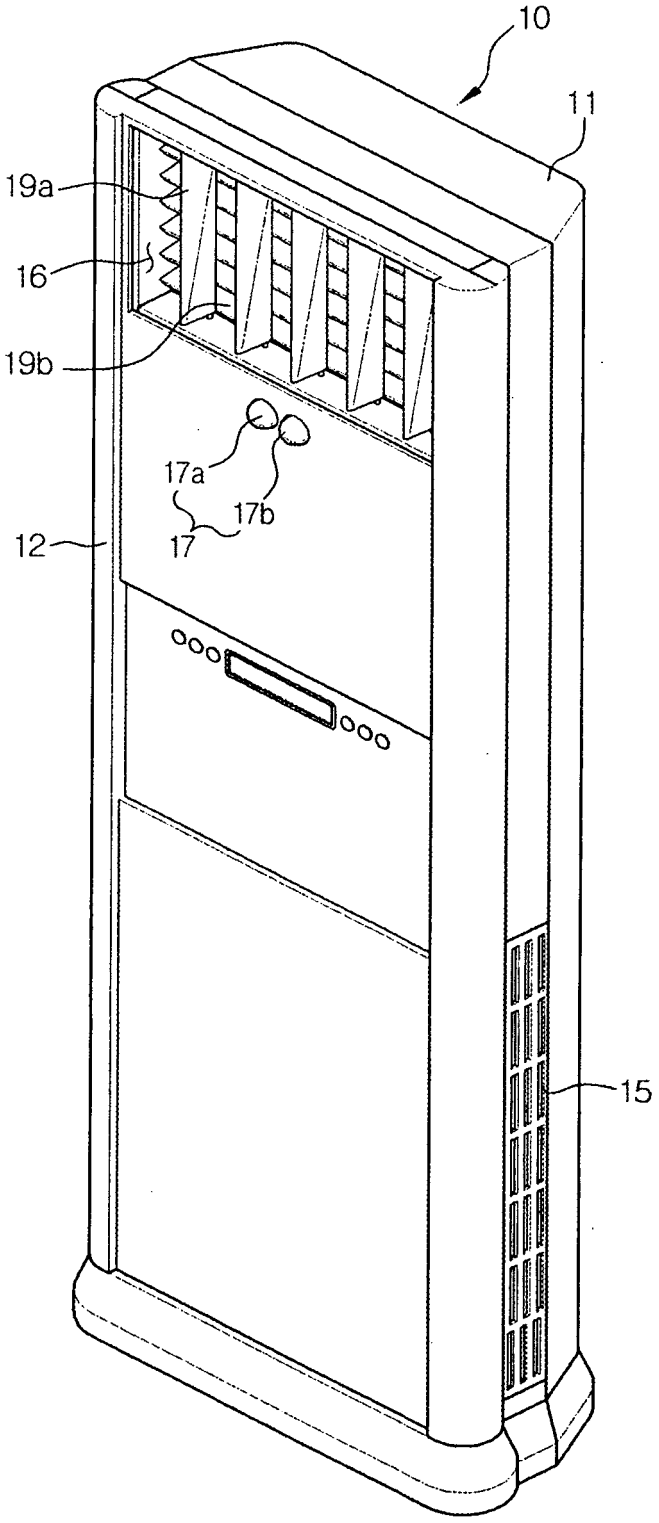

FIG. 2

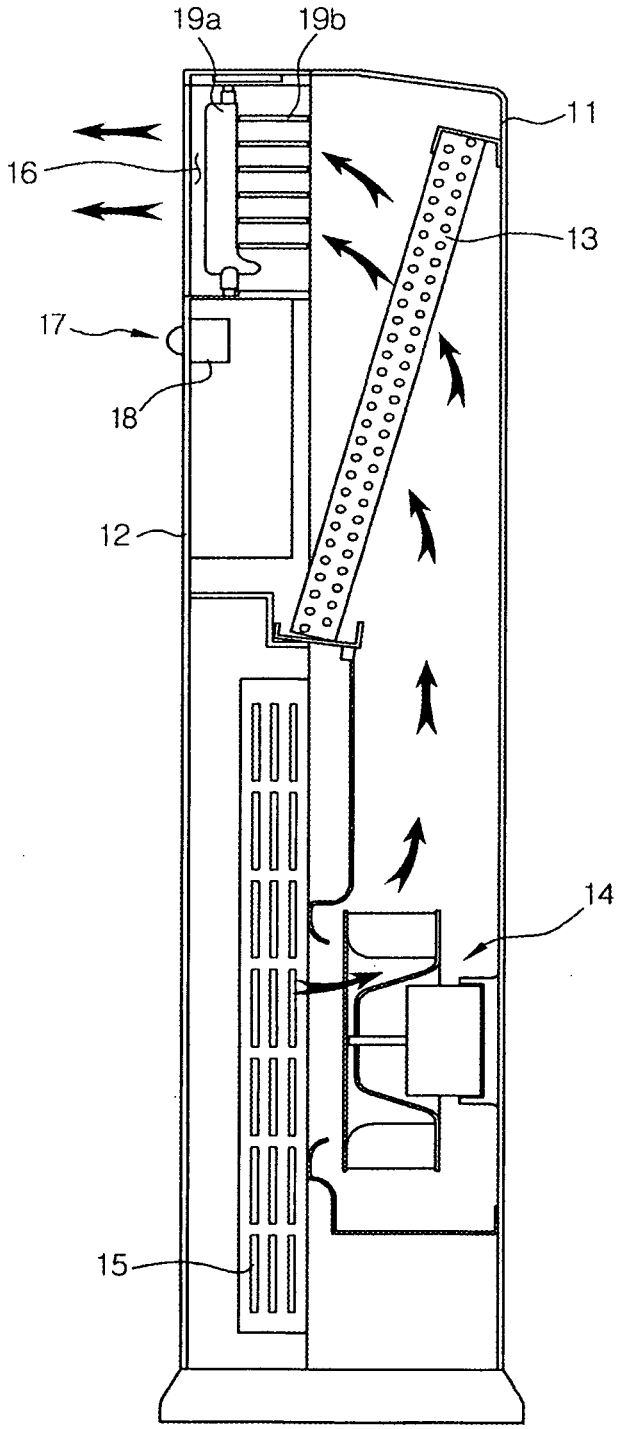

FIG. 3

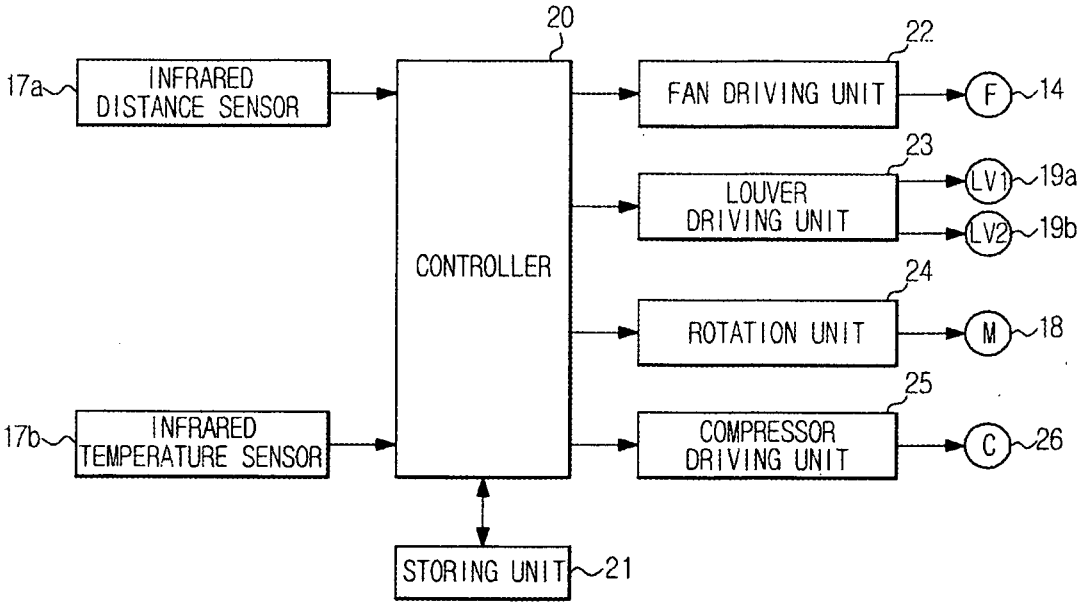
20
17a
INFRARED DISTANCE SENSOR
17b
INFRARED TEMPERATURE SENSOR
CONTROLLER
STORING UNIT
21
22
FAN DRIVING UNIT
F
14
23
LOUVER DRIVING UNIT
LV1
19a
LV2
19b
24
ROTATION UNIT
M
18
25
COMPRESSOR DRIVING UNIT
C
26

FIG. 4

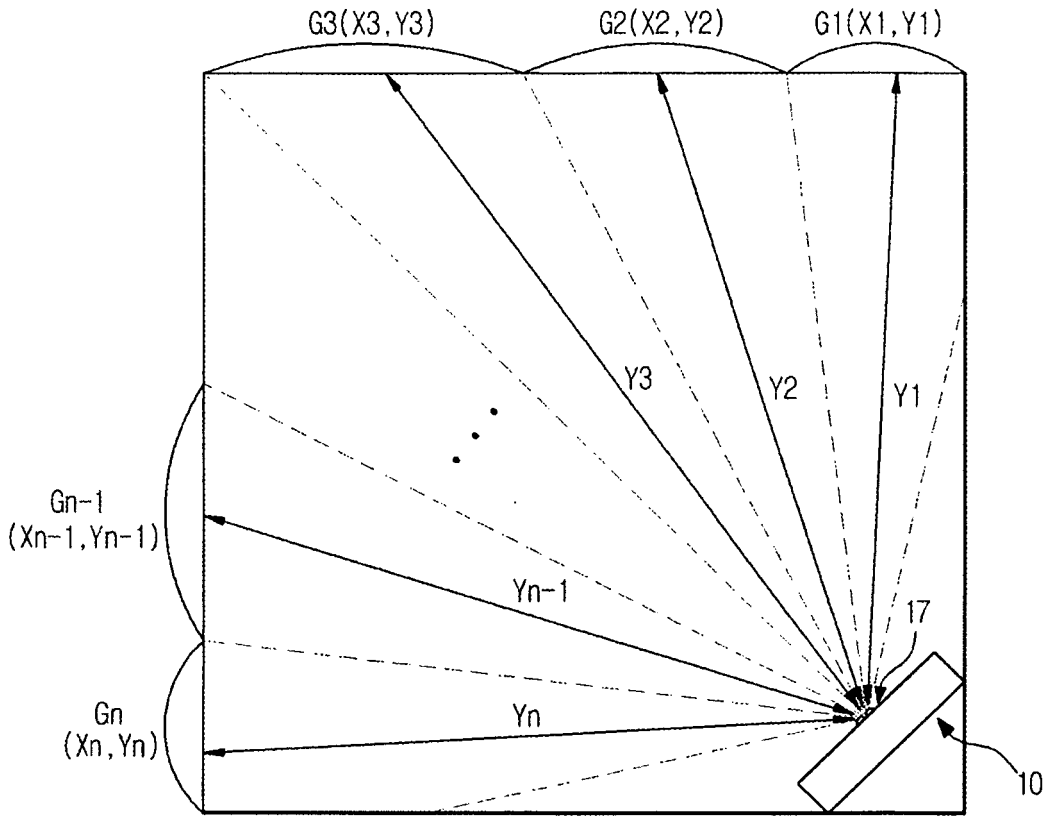

FIG. 5

REGION	G1	G2	G3	• • •	Gn
TEMPERATURE	X1-0	X2-0	X3-0	• • •	Xn-0
DISTANCE	Y1-0	Y2-0	Y3-0	• • •	Yn-0
TEMPERATURE	X1-1	X2-1	X3-1	• • •	Xn-1
DISTANCE	Y1-1	Y2-1	Y3-1	• • •	Yn-1
TEMPERATURE	X1-2	X2-2	X3-2	• • •	Xn-2
DISTANCE	Y1-2	Y2-2	Y3-2	• • •	Yn-2
TEMPERATURE	X1-3	X2-3	X3-3	• • •	Xn-3
DISTANCE	Y1-3	Y2-3	Y3-3	• • •	Yn-3
⋮	⋮	⋮	⋮	⋮	⋮
TEMPERATURE	X1-n	X2-n	X3-n	• • •	Xn-n
DISTANCE	Y1-n	Y2-n	Y3-n	• • •	Yn-n

FIG. 6

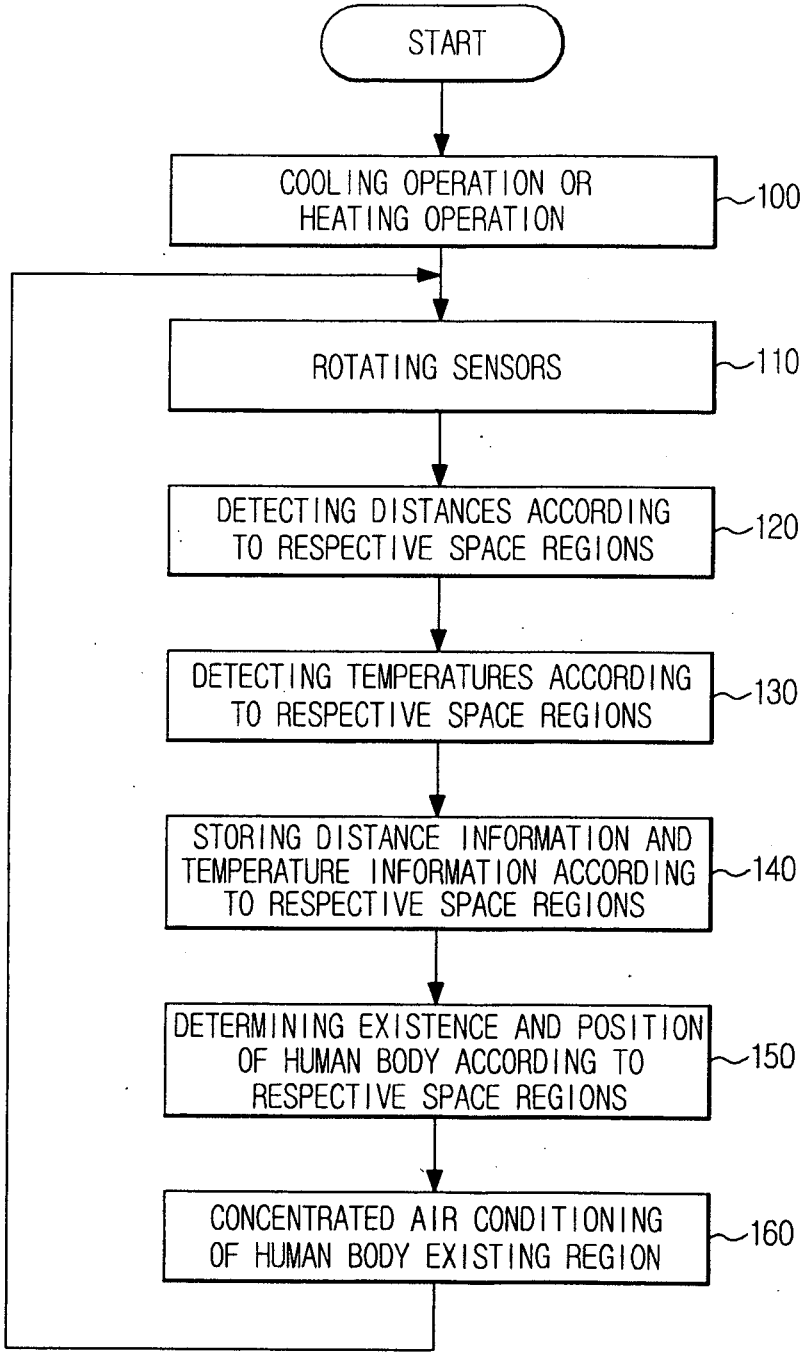
START
COOLING OPERATION OR HEATING OPERATION
100
ROTATING SENSORS
110
DETECTING DISTANCES ACCORDING TO RESPECTIVE SPACE REGIONS
120
DETECTING TEMPERATURES ACCORDING TO RESPECTIVE SPACE REGIONS
130
STORING DISTANCE INFORMATION AND TEMPERATURE INFORMATION ACCORDING TO RESPECTIVE SPACE REGIONS
140
DETERMINING EXISTENCE AND POSITION OF HUMAN BODY ACCORDING TO RESPECTIVE SPACE REGIONS
150
CONCENTRATED AIR CONDITIONING OF HUMAN BODY EXISTING REGION
160

FIG. 7

	TEMPERATURE VARIATION		NO TEMPERATURE VARIATION
DISTANCE VARIATION	TEMPERATURE VARIATION < Tref	HUMAN BODY	OBJECT
	TEMPERATURE VARIATION ≥ Tref	HEAT SOURCE	
NO DISTANCE VARIATION	TEMPERATURE VARIATION < Tref	HUMAN BODY	NO HUMAN BODY, OBJECT AND HEAT SOURCE
	TEMPERATURE VARIATION ≥ Tref	HEAT SOURCE	

REFERENCES CITED IN THE DESCRIPTION

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- US 5815078 A **[0008]**