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(54) **AN INDIVIDUAL AIR SUPPLY METHOD OF AN AIR CONDITIONER**

(57) A personalized ventilation method for an air conditioner is realized by adjusting air blowing angles to the left and to the right; wherein said air blowing angles to the left and to the right are adjusted based on the respective distance between the installation position of air conditioner and each of the two side walls of the room, that is, when the respective distance between the air conditioner and each of the left and right walls is equal to each other, air blowing angles to the left and the right are ad-

justed to be equal to each other; when the distance between the air conditioner and the left wall is smaller than the distance between the air conditioner and the right wall, air blowing angle to the left is adjusted to be smaller than that to the right; when the distance between the air conditioner and the left wall is larger than the distance between the air conditioner and the right wall, air blowing angle to the left is adjusted to be larger than that to the right.

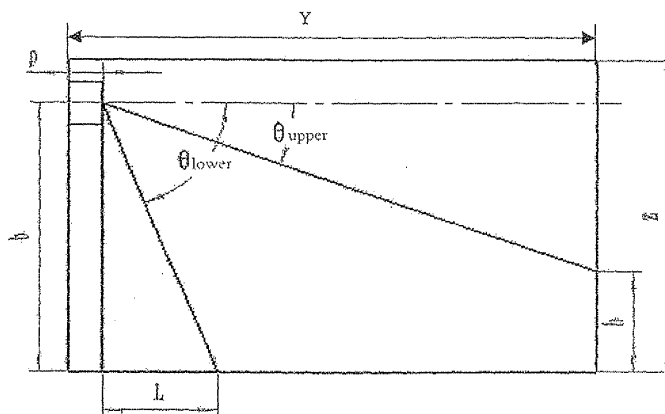


Figure 1

Description**FIELD OF THE INVENTION**

5 [0001] The present invention relates to the field of air conditioner, more particularly, to a ventilation method for an air conditioner.

BACKGROUND OF THE INVENTION

10 [0002] Normally in the air conditioner of prior art, air is ventilated in a fixed angle and direction because they are already determined when designing the air conditioner, moreover, the way of ventilating air in need of cooling is identical to the way in need of heating, without taking into consideration of factors such as actual room size, room structure, actual ventilation effects when the air conditioner is installed at different positions of the room, and characteristics of cold air and hot air. In fact, the practical usage of air conditioner is affected by the above mentioned factors, as a result, the efficiency of the air conditioner is decreased, and it is difficult to meet personal requirements on comfort, more important, it causes waste of resources.

SUMMARY OF THE INVENTION

20 [0003] The present invention overcomes deficiencies of prior art technology by providing a personalized ventilation method for an air conditioner, by which the air blowing angle can be adjusted in accordance with external environment. [0004] The goal of the present invention is achieved by the following technical scheme:

25 A personalized ventilation method for an air conditioner is realized by adjusting air blowing angles to the left and to the right according to the installation position of the air conditioner, the room dimension and the shape of the air conditioner itself; wherein said air blowing angles to the left and to the right are adjusted based on the respective distance between the installation position of air conditioner and each of the two side walls of the room, that is, when the respective distance between the air conditioner

30 and each of the left and right walls is equal to each other, air blowing angles to the left and to the right are adjusted to be equal to each other; when the distance between the air conditioner and the left wall is smaller than the distance between the air conditioner and the right wall, air blowing angle to the left is adjusted to be smaller than that to the right; when the distance between the air conditioner and the left wall is larger than the distance between the air conditioner and the right wall, air blowing angle to the left is adjusted to be larger than that to the right.

35 [0005] Furthermore, air blowing durations to the left and to the right are adjusted at the same time when the air blowing angles to the left and to the right are adjusted; wherein said air blowing durations to the left and to the right comprises air blowing duration to the left and air blowing duration to the right, which are respectively in direct proportion to the air blowing angle to the left and to the air blowing angle to the right.

40 [0006] Furthermore, (1), the air blowing angles to the left and to the right can be calculation by formulas as illustrated below:

$$\textcircled{1} a^2 \operatorname{ctg} \theta_{\text{left}} + (X - a)^2 \operatorname{ctg} \theta_{\text{right}} = 2 * X * Y * N ;$$

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$$\textcircled{2} \frac{\theta_{\text{left}}}{\theta_{\text{right}}} = \frac{a}{X - a} ;$$

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$\theta_{\text{left\&right}} = \theta_{\text{left}} + \theta_{\text{right}}$; wherein $\theta_{\text{left\&right}}$ denotes the sum of the air blowing angles to the left and to the right, "X" and "Y" respectively denote the length and width of the room, wherein the value of "Y" is the distance between the wall on which the air conditioner is located and the opposite wall, "a" denotes the distance between the center of the air conditioner and the left wall, "N" denotes the proportion ratio of the dead angle area when the air conditioner is blowing air to the left and to the right; θ_{left} denotes air blowing angle of air conditioner to the left, θ_{right} denotes air blowing angle of air conditioner to the right. Different values of height "H" and distance "L" are given for the two modes of cooling respectively and heating under a comprehensive consideration of flow characteristics of cold air and hot air, and thermal comfort of human body.

[0007] Furthermore, (2), a calculation formula for air blowing angles to the upper and lower is illustrated as below:

$$\theta_{upper\&lower} = \arctg \frac{b}{L} - \arctg \frac{b-H}{Y-p};$$

wherein "Y" denotes the distance between the wall on which the air conditioner is located and the opposite wall, "p" denotes the depth of the air conditioner, "b" denotes the distance from the center of the air conditioner to the ground, "H" denotes the distance from the ground to the highest point on the opposite wall at which the air flow from the air conditioner can reach, "L" denotes the distance between the projection of the air conditioner on the ground and the nearest point at which the air flow from the air conditioner can reach on the ground.

[0008] The initial parameters required, such as room dimension, dimension of the air conditioner itself, relative dimension of the installation position of the air conditioner, can be obtained by means of the air conditioner's intelligent sensing or manual measurements; wherein the intelligent sensing is realized by installing an intelligent sensing device in the air conditioner so as to automatically scan the initial parameters of the room dimension and relative dimension of the installation position of the air conditioner; the manual measurement is realized by on-site measuring so as to determine the initial parameters.

[0009] Air blowing angle and air blowing duration are controlled by an air ventilation motor, the air ventilation motor can be controlled in way of continuous accurate controlling. Wherein said way of continuous accurate controlling comprises the following steps: after obtaining the initial parameters by means of intelligent sensing or manual measurement, data is input in a controller chip of an air ventilation control system, particular data of air blowing angles for the installation position of the air conditioner is calculated by the calculation formula which is preset in the system, each group of different initial data corresponding to a group of data of air blowing angles, thereby the way of continuous accurate controlling is achieved.

[0010] Air blowing angle and air blowing duration are controlled by an air ventilation motor, the air ventilation motor can be controlled in way of dial-code controlling; wherein said way of dial-code controlling comprises the following steps: considering different capacities of air conditioners corresponding to different dimensions of rooms, based on the typical relative installation position of the air conditioner, several groups of initial parameters are predetermined and set into a plurality of fixed control modes, then a proper control mode is chosen therefrom in accordance with room dimension and the actual installation position of the air conditioner. The way of dial-code controlling comprises a direct dial-code controlling and a remote dial-code controlling.

[0011] Compared with technology of prior art, air flows can be more evenly distributed with the present invention, room can be cooled down at the same cooling level with 15% time off and warmed up with 20% time off. Thereby room temperature is able to reach at what user desires quickly and stably in a more comfortable way, besides the air conditioner works more efficiently and lots of resources are saved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

Figure 1 is a side view showing the installation of the air conditioner with personalized ventilation according to the present invention;

Figure 2 is a top view showing the installation of the air conditioner with personalized ventilation according to the present invention.

DETAIL DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0013] In combination with the appended drawings, further features and advantages of the present invention will become apparent from the following detailed description.

[0014] A personalized ventilation method for an air conditioner is realized by adjusting air blowing angles and air blowing durations to the left and to the right according to the installation position of the air conditioner, the room dimension and the shape of the air conditioner itself. Wherein the air blowing angles comprise air blowing angle to the upper, air blowing angle to the lower, air blowing angle to the left, and air blowing angle to the right.

[0015] Wherein "Y" denotes the distance between the wall on which the air conditioner is located and the opposite wall, "p" denotes the depth of the air conditioner, "b" denotes the distance from the center of the air conditioner to the ground, "H" denotes the distance from the ground to the highest point on the opposite wall at which the air flow from the air conditioner can reach, "L" denotes the distance between the projection of the air conditioner on the ground and the

nearest point at which the air flow from the air conditioner can reach on the ground.

[0016] As illustrated in Figures 1 and 2, of which Figure 1 is a side view showing the installation of the air conditioner with personalized ventilation according to the present invention; wherein the value of "Y" is the distance between the wall on which the air conditioner is located and the opposite wall, "p" denotes the depth of the air conditioner, "b" denotes the distance from the center of the air conditioner to the ground, "H" denotes the distance from the ground to the highest point on the opposite wall at which the air flow from the air conditioner can reach, "L" denotes the distance between the projection of the air conditioner on the ground and the nearest point at which the air flow from the air conditioner can reach on the ground. Wherein the values of "H" and "L" are target parameters of the present invention, which are determined according to the air conditioner ability (corresponding to the dimension of the installation space), characteristics of cold and hot air, the thermal comfort of human body, etc.; wherein the characteristics of cold and hot air mainly refer to the flow characteristics of cold air descending and hot air ascending that happen in a normal situation; the thermal comfort of human body mainly refers to the sensitivity of human body to the changes of room temperature above. Different values of "H" and "L" are given corresponding to different working modes of the air conditioner such as in cooling or heating, so as to get the room temperature reaching the user set temperature quickly, under the precondition of meeting the thermal comfort of human body. The corresponding air blowing angles to the upper and to the lower can be calculated by formulas as illustrated below:

$$\theta_{upper} = \arctg \frac{b-h}{X-p}, \quad \theta_{lower} = \arctg \frac{b}{L};$$

$\theta_{upper\&lower} = \theta_{lower} - \theta_{upper}$, wherein $\theta_{upper\&lower}$ denotes the difference of the air blowing angles to the upper and to the lower.

[0017] Wherein the values of "H" and "L" are target parameters of the present invention to be set in the designing stage.

[0018] For example: a 1P air conditioner is installed in a room of 4m*4m*3m, wherein the installation height of the air conditioner is 2.5m, and the width of the air conditioner is 0.2m.

[0019] In cooling mode, because cold air has descending characteristic and air ventilation area is mainly focused in a higher space such as 3m - 1.5m above the ground, to ensure cold air to be well felt in most areas above 1.2m in room, it is calculated that H=3m and L=3.4-0.2=3.2m based on the above mentioned data.

[0020] In heating mode, because hot air has ascending characteristic and air ventilation area is mainly focused in a lower space such as 2m - 1 m above the ground, to ensure warm air to be well felt in most areas below 2m in room, it is calculated that H=1.8m and L=1.2-0.2=1m based on the above mentioned data.

[0021] Figure 2 is a top view showing the installation of the air conditioner with personalized ventilation according to the present invention, in which "X" and "Y" respectively denote the length and width of room, wherein the value of "Y" is the distance between the wall on which the air conditioner is located and the opposite wall, "a" denotes the distance between the center of the air conditioner and the left wall, "S_{left}" and "S_{right}" respectively denote the dead angle areas that the air flow can not reach when the air conditioner is blowing air to the left and to the right, θ_{left} denotes air blowing angle of the air conditioner to the left, θ_{right} denotes air blowing angle of the air conditioner to the right. "S_{total}" denotes the total room area (= X*Y), "N" denotes the proportion ratio of the dead angle area when the air conditioner is blowing air to the left and to the right, particularly, it is the ratio between the dead angle area and the total area of the room, $N = (S_{left} + S_{right}) / S_{total}$, the value of "N" is given. Air blowing angles θ_{left} and θ_{right} to the left and to the right can be calculation by equations as illustrated below:

$$\left\{ a^2 \ctg \theta_{left} + (X-a)^2 \ctg \theta_{right} = 2 * X * Y * N; \right.$$

$$\frac{\theta_{left}}{\theta_{right}} = \frac{a}{X-a};$$

[0022] $\theta_{left\&right} = \theta_{left} + \theta_{right}$, wherein $\theta_{left\&right}$ denotes the sum of the air blowing angles to the left and to the right.

[0023] The initial parameters required, such as room dimension, dimension of the air conditioner itself, relative dimension of the installation position of the air conditioner, can be obtained by means of the air conditioner's intelligent sensing or manual measurements; wherein the intelligent sensing is realized by installing an intelligent sensing device (such as an infrared scanning device, etc.) in the air conditioner so as to automatically scan the initial parameters such as room dimension and relative dimension of the installation position of the air conditioner, etc.; the manual measurement is realized by on-site measuring so as to determine the initial parameters.

[0024] The air blowing angle is controlled by an air ventilation motor, the air ventilation motor can be controlled in way of continuous accurate controlling, direct dial-code controlling or remote dial-code controlling.

[0025] Based on the typical relative installation position of the air conditioner, wherein dial-code controlling is to design several groups of different combinations of ventilation angles, which correspond to different codes, so that different combinations of air ventilation angles can be chosen by selection of the codes in the control system. Dial-code controlling can be realized by direct dial-code controlling on the main board or remote dial-code controlling, etc.

[0026] Comparing with dial-code controlling, the continuous accurate controlling refers to a full intelligent way of controlling. Wherein the control program calculates the air blowing angles to different directions with the above mentioned computing formulas based on the initial conditions which are sensed or manually input, so as to realize an air ventilation mode which completely satisfies the current installation of the air conditioner.

[0027] An example in the way of direct dial-code controlling is illustrated below.

[0028] An air conditioner with capacity of KF-26G is installed in a room of 16 square meters with 4m of length and 4m of width, wherein four position ranges are set during installation such as " $a \leq 1$ ", " $1 < a \leq 2$ ", " $2 < a \leq 3$ ", " $3 < a \leq 4$ " (wherein " a " denotes the distance between the center of the air conditioner and the left wall), and the four position ranges are respectively set into four shifts, that is, " $a \leq 1$ " is the first shift, " $1 < a \leq 2$ " is the second shift, " $2 < a \leq 3$ " is the third shift, " $3 < a \leq 4$ " is the fourth shift. When the user installs an air conditioner on the wall which is 1.5m far away from the left wall, " $1 < a \leq 2$ " of the second shift should be chosen. Different shifts are chosen corresponding to the different positions where the air conditioner is installed by the user, so that by controlling air flow angles, comfort air flows can be obtained meanwhile the efficiency of the air conditioner is improved.

[0029] The above descriptions and illustrations should not be construed as limiting the scope of the present invention, which is defined by the appended claims. Various modifications, alternate constructions and equivalents made by technicians of the field may be employed without departing from the true spirit and scope of the present invention.

Claims

1. A personalized ventilation method for an air conditioner, **characterized in that**, it is realized by adjusting air blowing angles to the left and to the right; wherein said air blowing angles to the left and to the right are adjusted based on the respective distance between the installation position of air conditioner and each of the two side walls of the room, that is, when the respective distance between the air conditioner and each of the left and right walls is equal to each other, air blowing angles to the left and to the right are adjusted to be equal to each other; when the distance between the air conditioner and the left wall is smaller than the distance between the air conditioner and the right wall, air blowing angle to the left is adjusted to be smaller than that to the right; when the distance between the air conditioner and the left wall is larger than the distance between the air conditioner and the right wall, air blowing angle to the left is adjusted to be larger than that to the right.
2. The ventilation method according to claim 1, **characterized in that**, air blowing durations to the left and to the right are adjusted at the same time when the air blowing angles to the left and to the right are adjusted; wherein said air blowing durations to the left and to the right comprises air blowing duration to the left and air blowing duration to the right, which are respectively in direct proportion to the air blowing angle to the left and to the air blowing angle to the right.
3. The ventilation method according to claim 1, **characterized in that**, the air blowing angles to the left and to the right can be calculation by formulas as illustrated below:

$$\textcircled{1} a^2 \text{ctg} \theta_{left} + (X - a)^2 \text{ctg} \theta_{right} = 2 * X * Y * N ;$$

$$\textcircled{2} \frac{\theta_{left}}{\theta_{right}} = \frac{a}{X-a};$$

$$\theta_{left\&right} = \theta_{left} + \theta_{right};$$

wherein $\theta_{left\&right}$ denotes the sum of the air blowing angles to the left and to the right, "X" and "Y" respectively denote the length and width of the room, wherein the value of "Y" is the distance between the wall on which the air conditioner is located and the opposite wall, "a" denotes the distance between the center of the air conditioner and the left wall, "N" denotes the ratio between the dead angle area when the air conditioner is blowing air to the left and to the right and the total area of the room, θ_{left} denotes air blowing angle of air conditioner to the left, θ_{right} denotes air blowing angle of air conditioner to the right.

4. The ventilation method according to claim 1, **characterized in that**, air blowing angles to the upper and to the lower are adjusted, wherein a calculation formula for air blowing angles to the upper and lower is illustrated as below:

$$\theta_{upper\&lower} = \arctg \frac{b}{L} - \arctg \frac{b-H}{Y-p};$$

wherein "Y" denotes the distance between the wall on which the air conditioner is located and the opposite wall, "p" denotes the depth of the air conditioner, "b" denotes the distance from the center of the air conditioner to the ground, "H" denotes the distance from the ground to the highest point on the opposite wall at which the air flow from the air conditioner can reach, "L" denotes the distance between the projection of the air conditioner on the ground and the nearest point at which the air flow from the air conditioner can reach on the ground.

5. The ventilation method according to claim 4, **characterized in that**, different values of height "H" and distance "L" are given for the two modes of cooling and heating respectively under a comprehensive consideration of flow characteristics of cold air and hot air, and thermal comfort of human body.
6. The ventilation method according to claim 1, claim 3 or claim 4, **characterized in that**, the initial parameters required, such as room dimension, dimension of the air conditioner itself, relative dimension of the installation position of the air conditioner, can be obtained by means of the air conditioner's intelligent sensing or manual measurements; wherein the intelligent sensing is realized by installing an intelligent sensing device in the air conditioner so as to automatically scan the initial parameters of the room dimension and relative dimension of the installation position of the air conditioner; the manual measurement is realized by on-site measuring so as to determine the initial parameters.
7. The ventilation method according to claim 1, **characterized in that**, the air blowing angle is controlled by an air ventilation motor, the air ventilation motor can be controlled in way of continuous accurate controlling.
8. The ventilation method according to claim 7, **characterized in that**, the way of continuous accurate controlling comprises the following steps: after obtaining the initial parameters by means of intelligent sensing or manual measurement, data is input in a controller chip of an air ventilation control system, particular data of air blowing angles for the installation position of the air conditioner is calculated by the calculation formula which is preset in the system, so that air blowing angle is controlled by the air ventilation motor.
9. The ventilation method according to claim 1, **characterized in that**, the air blowing angle is controlled by an air ventilation motor, the air ventilation motor can be controlled in way of dial-code controlling.
10. The ventilation method according to claim 9, **characterized in that**, the way of dial-code controlling comprises the following steps: considering different capacities of air conditioners corresponding to different dimensions of rooms, based on the typical relative installation position of the air conditioner, several groups of initial parameters are

predetermined and set into a plurality of fixed control modes, then a proper control mode is chosen therefrom in accordance with room dimension and the actual installation position of the air conditioner.

- 5 **11.** The ventilation method according to claim 10, **characterized in that**, the way of dial-code controlling comprises a direct dial-code controlling and a remote dial-code controlling.

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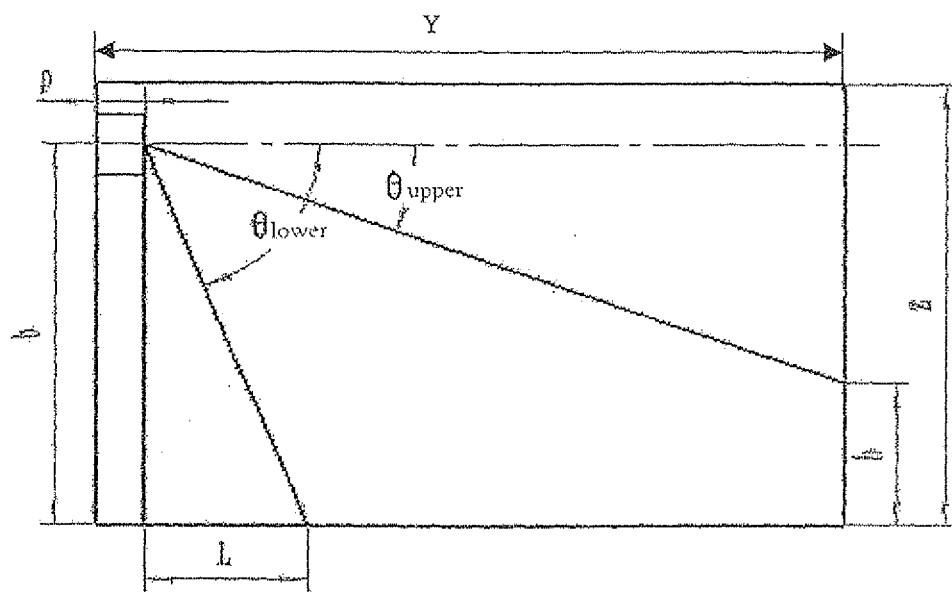


Figure 1

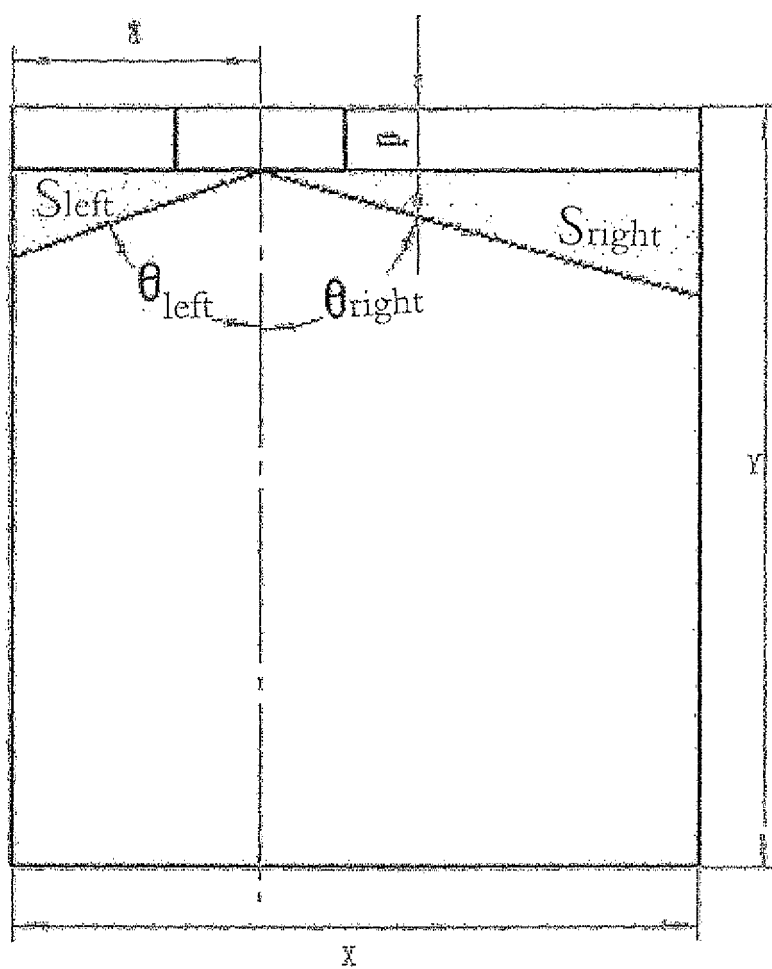


Figure 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2007/000348

A. CLASSIFICATION OF SUBJECT MATTER		
F24F11/02(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)		
IPC: F24F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
CHINA PATENT DOCUMENT (1985—)		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
WPI,PAJ,EPODOC,CNPAT air condition+ direction angle distance time		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN,A,1106524 (SAMSUNG ELECTRONICS CO LTD) 09.Aug.1995 (09.08.1995) abstract, Desc. Page 11 line 16 – page 21 line 23, Figs. 4b-8	1,6-11
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☐ 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 26 Apr. 2007 (26.04.2007)		Date of mailing of the international search report 17 May 2007 (17.05.2007)
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451		Authorized officer Yang, Xiangjun Telephone No. (86-10)62085046

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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