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

(11) **EP 2 045 541 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
**08.04.2009 Bulletin 2009/15**

(51) Int Cl.:
***F24F 11/00*** *(2006.01)*

(21) Application number: **08251886.1**

(22) Date of filing: **30.05.2008**

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

(30) Priority: **02.10.2007 KR 20070099259**
**24.10.2007 KR 20070107207**

(71) Applicant: **LG Electronics Inc.**
**Seoul 150-875 (KR)**

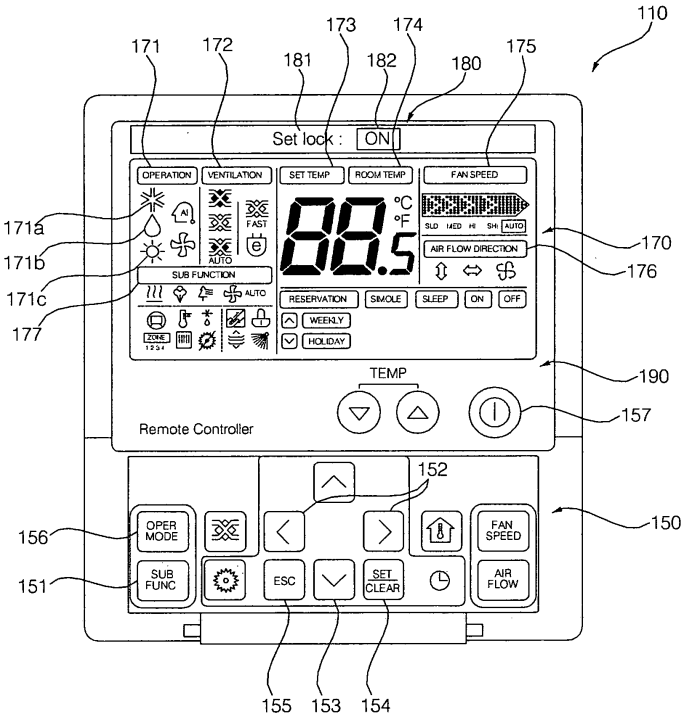
(72) Inventors:
- **Lee, Jin Bok**
  **Kyungsangnam-do 641-110 (KR)**
- **Shin, Jung Yeop**
  **Kyungsangnam-do 641-110 (KR)**

(74) Representative: **Palmer, Jonathan R.**
**Boult Wade Tennant,**
**Verulam Gardens,**
**70 Gray's Inn Road**
**London WC1X 8BT (GB)**

(54) **Control device for air conditioner**

(57) A control device for an air conditioner includes a first display unit for changeably displaying a first image on at least a first region and a second display unit for displaying on a preset second image on at least a second region. Accordingly, various methods of representation of operating conditions can be provided, and a user can easily visually check a change in the operating conditions.

**Fig. 3**




EP 2 045 541 A1

## Description

**[0001]** The present invention relates to a control device for an air conditioner, and more specifically, to a control device for an air conditioner, which can increase user convenience by providing various methods of representation of operating conditions.

**[0002]** Generally, an air conditioner is controlled by a control device. The control device includes function keys, such as an operation/stop key, a temperature up/down key, and so forth, corresponding one by one to user' s operation setting items. Hence, the user controls the operation of the air conditioner by the function keys.

**[0003]** However, when the operation setting items are displayed only in graphic images on the display unit of the control device by manipulating the function keys, it is inconvenient to visually check various changes in operating conditions. Moreover, even if the operating conditions are displayed in images, such as characters, numerals, etc., the operating conditions in operation cannot be easily checked, thereby lowering user convenience.

## SUMMARY OF THE INVENTION

**[0004]** It would be desirable to provide a control device for an air conditioner, which can provide various methods of representation of operating conditions.

**[0005]** The present invention provides a control device for an air conditioner, comprising: a plurality of function keys for inputting a manipulation signal for manipulating operating conditions of the air conditioner; a first display unit for displaying a changeable first image; and a second display unit for displaying a preset second image, wherein the operating conditions include predetermined setting items, and when one of the setting items is selected by the manipulation of the plurality of the function keys, the first image and second image corresponding to the selected setting item or a set value of the selected setting item are simultaneously displayed on the first display unit and the second display unit.

**[0006]** In the control device for an air conditioner according to the present invention, different images are displayed on the same coordinate plane of the first display unit, and only a set image is displayed on the same coordinate plane of the second display unit. Accordingly, various methods of representation of operating conditions can be provided, and the user can easily visually check a change in the operating conditions.

**[0007]** Furthermore, in the device for controlling the air conditioner according to the present invention, the user can easily check the progress of the manipulation of the operating conditions.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0008]** The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

FIG. 1 is a block diagram showing the construction of an air conditioning system with a control device in accordance with one embodiment of the present invention;

FIG. 2 is a block diagram showing the flow of a control signal in the air conditioning system as shown in FIG. 1;

FIG. 3 is a schematic plan view of the control device as shown in FIG. 1;

FIG. 4 is a plan view showing a state in which an " operation mode" item is selected in the display unit of FIG. 3;

FIG. 5 is a plan view showing a state in which a " ventilation" item is selected in the display unit of FIG. 3;

FIG. 6 is a plan view showing a state in which the set value is changed in the " operation mode" item of the display unit of FIG. 4;

FIG. 7 is a plan view showing another embodiment of a state where an " operation mode" item is selected in the display unit of FIG. 3;

FIG. 8 is a plan view showing another embodiment of a state in which a " ventilation" item is selected in the display unit of FIG. 3;

FIG. 9 is a plan view showing a case where the set value is " cooling" in the " operation mode" item of the display unit of FIG. 7;

FIG. 10 is a plan view showing a state in which the set value is changed to " ventilation" in the " operation mode" item of the display unit of FIG. 4;

FIG. 11 is a plan view showing another embodiment in which the setting item is changed from the " operation mode" item to the " ventilation" item in the display unit of FIG. 3;

FIG. 12 is a plan view showing another embodiment in which the set value is changed from " cooling" to " dehumidification" in the " operation mode" item in the display unit of FIG. 3;

FIG. 13 is a block diagram showing the construction of an air conditioning system with a control device in accordance with another embodiment of the present invention;

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0009]** FIG. 1 is a block diagram showing the construction of an air conditioning system 100 with a control device 110 in accordance with one embodiment of the present invention. FIG. 2 is a block diagram showing the flow of a control signal in the air conditioning system 100 as shown in FIG. 1. FIG. 3 is a schematic plan view of the control device 110 as shown in FIG. 1. FIG. 4 is a plan view showing a state in which an " operation mode"

item is selected in the display unit of FIG. 3; Referring to FIG. 1, the air conditioning system 100 includes an air conditioner 140 and a remote controller 110. The air conditioner 140 includes an indoor unit 130 disposed in an indoor space and an outdoor unit 120 disposed in an outdoor space. The indoor unit 130 and the outdoor unit 120 are communicatively connected to each other via a network 161. While the air conditioner 140 includes one outdoor unit 120 and one indoor unit 130, the present invention is not limited thereto. The air conditioner 140 may include one outdoor unit and a plurality of indoor units, or include a plurality of outdoor units and a plurality of indoor units.

**[0010]** Referring to FIG. 2, the control device 110 is connected to the air conditioner 140 by wires. The control device 110 sets operating conditions of the air conditioner 140, and includes a control unit 160, a first display unit 180, a second display unit 170, a database 190, and function keys 150. A user can change the operating conditions of the air conditioner 140 after manipulating the control device 110 to a predetermined setting mode state. Here, the setting mode is a setting mode in which various operating conditions of the air conditioner 140 can be inputted by the user.

**[0011]** Referring to FIG. 2, the database 190 stores various displayable image data in the first display unit 180 and the second display unit 170, and the control unit 160 represents images on the first display unit 180 and the second display unit 170 based on the image data stored in the database 190.

**[0012]** Referring to FIG. 3, the control device 110 can display the operating conditions of the air conditioner 140 through the first display unit 180 and the second display unit 170. The first display unit 180 can be disposed longitudinally in the control device 110, spaced apart a predetermined gap from the second display unit 170.

**[0013]** The first display unit 180 displays the operating conditions of the air conditioner 140 in various images. Specifically, the first display unit 180 has an LCD panel structure, and the LCD panel structure is an FSTN (Film Super Twist Nematics). The LCD panel structure is divided into a TN LCD (Twsited Nematic LCD), a CTN (Complementary Tn), an STN (Super Twisted Nematic), a DSTN (Double Layer Super Twisted Nematic), an FSTN (Film Super Twist Nematics) and so forth depending on the physical properties of liquid crystal, the material of the panel, etc. The FSTN type uses a very thin polymerized film in place of a color compensating liquid crystal cell, and the first display unit 180 of the present invention employs an LCD panel structure of FSTN type that can obtain a wide view angle and is suitable for thinning.

**[0014]** In the present invention, a first image is changeably displayed on at least a first region of the first display unit 180. Specifically, the first image represented on the first display unit 180 is a set of dots which is represented as one dot on the coordinate plane of the first display unit 180. That is, the first display unit 180 is a dot type LCD which represents an image in the set of dots, and can represent image data as an image by lighting the dots with the use of the image data stored in the database 190.

**[0015]** The user can vary the image data in various ways by manipulation. The user can select the setting items and use the plurality of function keys for manipulating set values of the selected setting items to represent the setting items and the set values in a first image.

**[0016]** The image data stored in the database 190 is image data that can change the first image into various images, such as characters, numerals, etc. by a combination of dots. Thus, various images can be displayed by lighting the dots on the coordinate plane of the first display unit 180 by various combinations. For instance, the control unit 160 can apply a signal for transmitting different image data on the first display unit 180. The signal is a signal which transmits image data in response to a signal for setting operating conditions, and turns on or off the dots on a predetermined coordinate of the first display unit 180. Hence, even on the same coordinate plane on the dot type LCD, which is the first display unit 180, an image can be represented as the characters, such as " set lock" as shown in FIG. 3 or " operation mode" as shown in FIG. 4. That is, the image of " set lock" can be converted into the image of " operation mode" and represented on the first display unit 180. Accordingly, the characters indicating " set lock" and the characters indicating " operation mode" , which are different images, can be displayed on the same coordinate plane of the first display unit 180.

**[0017]** The operating conditions include predetermined setting items, and a first image of the setting items can be represented on the first display unit 180. Here, on the first display unit 180, a setting item display part 181 for representing the names of the setting items in the first image and a set value display part 182 for representing set values of the respective setting items in the first image are provided. Here, the setting items include an operation mode item, a ventilation item, a set temperature item, a room temperature item, a fan speed item, an air flow direction item, a sub function item, and a reservation item. The respective setting items have set values that the user can select or change. The first image corresponds to the respective setting items and the respective set values of the setting items, and the first image corresponding to the respective setting items and the respective set values are displayed on the setting item display part 181 and set value display part 182, respectively, of the first display unit 180.

**[0018]** On the second display unit 170, only a preset second image can be represented on at least a second region. Here, the second display unit 170 has an LCD panel structure like the above-described first display unit 180, and the structure of the LCD panel may be an FTSN. The second display unit 170 displays the operating conditions of the air conditioner in a graphic image display method or in an 88-segment method. Here, the second image is a preset graphic image.

**[0019]** Here, the size of the first display unit 180 may

be smaller than the size of the second display unit 170. Since a graphic image can be easily visually checked by the user, the size of the second display unit 170 is formed larger in order to easily visually check the operating conditions and precisely ascertain the operating conditions through the display contents of the first display unit 180.

**[0020]** Meanwhile, the operating conditions include predetermined setting items, and a second image of the setting items can be represented on the second display unit 170. The second image corresponds to the setting items and respective set values of the setting items. That is, whenever the operating conditions are changed, the second image corresponds to the changed operating conditions. Here, the setting items include an operation mode item 171, a ventilation item 172, a set temperature item 173, a room temperature item 174, a fan speed item 175, an air flow direction item 176, a sub function item 177, and a reservation item 178.

**[0021]** The respective setting items have set values that the user can select or change, and the set values are displayed in a second image on the second display unit 170. Here, the second image can be represented in a graphic image as described above. The graphic image may be an pictogram which is represented so as to understand by intuition or an icon displayed in a small figure or symbol on the display screen, but the graphic image is not limited to the pictogram or icon.

**[0022]** Here, the graphic image is an image based on the image data stored in the database 190. The graphic image can be represented on the second display unit 170 by lighting the graphic image with the use of the image data stored in the database 190. Hence, only a set image can be represented by lighting the graphic image on the coordinate plane of the second display unit 170. Specifically, the control unit 160 can apply a signal for transmitting the image data stored in the database 190 on the second display unit 170. The signal is a signal which transmits set image data to the second display unit 170 in response to a signal for setting operating conditions and represents an image on the second display unit 170, and also a signal which turns on or off a graphic image on a predetermined coordinate plane of the second display unit 170 based on the set image data. Accordingly, on the same coordinate plane of the second display unit 170, only a set image can be displayed. That is, graphic images specific to the respective setting items and set values are preset on a predetermined coordinate plane of the second display unit 170. For instance, the respective operation items and set values as shown in FIG. 4 are represented in graphic images on the second display unit 170. Referring to FIG. 4, an image 171 of " operation" indicating an operation mode and a cooling operation graphic image 171a displaying a cooling operation, which is one of the set values of the operation mode, are represented on the second display unit 170. Besides, a dehumidification operation graphic image 171b corresponding to a set value of dehumidification operation in the operation mode item 171 among the setting items and a heating operation graphic image 171c corresponding to a set value of heating operation are displayed on the second display unit. On the coordinate plane of the second display unit where the cooling operation graphic image 171a is lighted, the display of the dehumidification operation graphic image 171b is impossible. This is because only the cooling operation graphic image 171a is preset to be lighted on the coordinate plane where the cooling operation graphic image 171a is lighted.

**[0023]** Specifically, when the above-described setting mode is entered, the user can select the setting items and use the plurality of function keys for manipulating set values of the selected setting items to represent the setting items and the set values in a second image. For example, set values of cooling operation, dehumidification operation, and heating operation in the operation mode item 171 among the setting items can be represented in graphic images 171a, 171b, and 171c on the second display unit. Here, the graphic images 171a, 171b, and 171c, which are the second image corresponding to the respective set values of cooling operation, dehumidification operation, and heating operation, can be displayed only on a predetermined coordinate plane of the second display unit.

**[0024]** Meanwhile, the first display unit and the second display unit 170 display only the items settable in the air conditioner 140 connected to the control device 110, among the setting items. That is, when the control device 110 requests for settable items to the air conditioner 140, the air conditioner 140 sends settable items to the control device 110. If a signal sent by the air conditioner 140 is a model name, the control unit 160 displays only the setting items corresponding to the model name among all the setting items based on the data stored in the database 190.

**[0025]** The function keys that can be manipulated by the user include a first function key 151 for inputting a manipulation signal to enter the setting mode, second function keys 152 representing left/right directions, third function keys 153 representing up/down directions, a fourth function key 154 representing set/clear, a fifth function key 155 representing exit, and sub function keys. The sub function keys correspond to the items with a high frequency of use among first setting items. For example, an operation mode function key 156 is a key for manipulating a set value of the operation mode item, and temperature function keys 157 are keys for manipulating a set value of the set temperature item.

**[0026]** Hereinafter, a method for setting operating conditions of an air conditioner 140 using the control device 110 as shown in FIG. 1 will be described in detail.

**[0027]** FIG. 4 is a plan view showing a state in which an " operation mode" item is selected in the display unit of FIG. 3. FIG. 5 is a plan view showing a state in which a " ventilation" item is selected in the display unit of FIG. 3. FIG. 6 is a plan view showing a state in which the set value is changed in the " operation mode" item of the display unit of FIG. 4.

**[0028]** When the user presses the first function key 151 for more than a predetermined time period, a manipulation signal for entering a predetermined setting mode is inputted, and the control device 110 enters the setting mode. Here, the setting mode is a user setting mode. The predetermined time period may be selected in various ways, for example, it may be a value less than 1 second.

**[0029]** In the setting mode state, the name of an operable setting item is represented in a first image in the setting item display part 181. Referring to FIG. 3, a case where the " set lock" item is set as a setting item displayed at an initial stage on the setting item display part 181 is illustrated. That is, if the user presses the first function key 151 for more than a predetermined time period, a predetermined setting mode is entered, and with the setting mode entered, the " set lock" , which is the initial setting item, is displayed in a first image on the setting item display part 181, and " ON" , which is an initial set value, is displayed in a first image on the setting value display unit 182. It is needles to say that the initial setting item and the initial set value may be set in various ways according to user convenience.

**[0030]** With the initial setting item and the initial set value displayed in a first image on the setting item display part 181 and the set value display part, respectively, when the user presses the first function key 151, the setting item is sequentially changed on the setting item display part 181. FIG. 4 illustrates a state where the operation mode item 171 is selected. Afterwards, whenever the user presses the first function key 151, the setting item to be selected is sequentially changed. FIG. 5 illustrates a state where the ventilation item 172 is selected if the user presses the first function key 151 once more on the first display unit 180 of FIG. 4. At this time, when one of the setting items is selected by the manipulation of the plurality of function keys, the first image and second image corresponding to the selected setting item and a set value of the selected setting item can be simultaneously displayed on the first display unit 180 and the second display unit 170. Specifically, when the setting items are selected on the setting item display part 181 of the first display unit 180, a graphic image corresponding to the setting item displayed on the setting item display part 181 of the first display unit 180 is selected. Then, when the setting items are sequentially changed on the setting item display part 181 of the first display unit 180, the graphic image corresponding to the setting item displayed on the setting item display part 181 can be sequentially changed and displayed on the second display unit 170. That is to say, as shown in FIGs. 4 and 5, in a case where the setting item on the setting item display part 181 of the first display unit 180 is changed from the operation mode item to the ventilation item, the graphic image 171 corresponding to the operation mode item on the second display unit 170 can be changed into a graphic image 172 corresponding to the ventilation item. Accordingly, the first image and second image corresponding to the same setting item can be represented simultaneously on the first display unit 180 and the second display unit 170.

**[0031]** With a specific setting item selected among the setting items, the user can move a manipulation target from the selected setting items to an item for selecting a set value by using the second function keys 152. Afterwards, the user changes set values of the selected setting item within an operable range by the third function keys 153 to select a specific set value. Referring to FIGs. 4 and 6, FIG. 4 illustrates a state where an image representing cooling is selected as a set value in the operation mode item, and FIG. 6 illustrates a state where the set value is changed to " dehumidification" by using the second function keys. The image representing dehumidification is displayed on the set value display part 182. When the user presses the fourth function key 154 after selecting a set value of the selected setting item by the third function keys 153, the set value of the selected setting item is set to the selected set value. If the user presses the fifth function key 155, or does not manipulate the function keys for a predetermined time period, the setting mode is finished. A method of setting the setting items excluding the operation mode item is similar to the method of setting in the operation mode item, so a description thereof will be omitted below.

**[0032]** As described above, the control device110 is able to perform the setting of setting items in a predetermined setting mode on the first display unit 180 by using the plurality of function keys 150. Subsequently, the user can easily visually check a change in the operating conditions, such as setting items and set values of the respective setting items. Also, because the user operates set values of setting items by the function keys 150 while precisely ascertaining the setting items on the first display unit 180, the operational convenience of the user is greatly enhanced.

**[0033]** FIG. 7 is a plan view showing another embodiment of a state where an " operation mode" item is selected in the display unit of FIG. 3. FIG. 8 is a plan view showing another embodiment of a state in which a " ventilation" item is selected in the display unit of FIG. 3. FIG. 9 is a plan view showing a case where the set value is " cooling" in the " operation mode" item of the display unit of FIG. 7. FIG. 10 is a plan view showing a state in which the set value is changed to " ventilation" in the " operation mode" item of the display unit of FIG. 4.

**[0034]** The size of a first image can be varied in response to a manipulation signal inputted from the plurality of function keys. Referring to FIG. 7, when the user enters a signal for manipulating the setting items by the function keys, the characters saying " operation mode" become larger than the characters saying " cooling" , which is an image displayed on the set value display part 182. The size of the characters saying " operation mode" displayed on the setting item display part 181 is variable.

**[0035]** Though not shown, when the user enters a signal for manipulating set values of the setting items by the

function keys, the characters saying " cooling" , which is an image displayed on the set value display part 182, can become larger than the characters saying " operation mode" displayed on the setting item display part 181. That is, the size of the characters saying " cooling" displayed on the set value display part 182 is variable.

**[0036]** When the user manipulates the setting items and the set values of the setting items by the function keys, the user can easily visually check the setting items and set values being entered. Here, the size of the characters displayed on the setting item display part 181 and the set value display part 182 can be adjusted according to user convenience by varying the image data stored in the database 190.

**[0037]** Another method for setting operating conditions of the air conditioner 140 by the control device 110 as shown in FIG. 1 will be described in detail.

**[0038]** When the user presses the first function key 151 for less than a first time period, a manipulation signal for entering a predetermined setting mode is inputted, and the control device 110 enters the setting mode. Here, the setting mode is a user setting mode. The first time period may be selected in various ways, for example, it may be a value less than 1 second. In the above setting mode, predetermined setting items and set values of the setting items can be changed. The setting mode includes a display all mode and a simple display mode. Here, the display all mode refers to a setting mode that represents all the set values of the setting items on the first display unit 180, and the size of an image of the respective setting items and the size of an image of the set values are different from each other. Further, the simple display mode refers to a mode that displays only either one of the image of the respective setting items and the image of the set values of the setting items on the first display unit 180.

**[0039]** First, when the user presses the first function key 151 for less than a first predetermined time period, the setting mode enters any one setting mode between the display all mode and the simple display mode. If the user presses the first function key 151 for more than a second predetermined time period, the setting mode enters another setting mode. Specifically, if the user presses the first function key 151 for less than a first predetermined time, the setting mode is set to enter the display all mode, or if the user presses the first function key for more than a second predetermined time period, the setting mode is set to enter the simple display mode.

**[0040]** In the display all mode state, the name of an operable setting item is represented in a first image in the setting item display part 181. Referring to FIG. 7, a case where the " operation mode" item is set as a setting item displayed at an initial stage on the setting item display part 181 is illustrated. That is, with the display all mode entered, the " operation mode" , which is the initial setting item, is displayed in a first image on the setting item display part 181, and " cooling" , which is an initial set value, is displayed in a first image on the setting value display unit 182. It is needles to say that the initial setting item and the initial set value may be set in various ways according to user convenience.

**[0041]** As shown in FIG. 7, as for the first image displayed on the first display unit 180, the size of the image of the respective setting items and the size of the image of the respective set values of the setting items may be different in the display all mode. Specifically, in the display all mode, the size of the image of the setting items is larger than the size of the image of the respective set values of the setting items during the input of a manipulation signal for manipulating the setting items from the plurality of function keys. Also, the size of the image of the set values is larger than the size of the image of the setting items during the input of a manipulation signal for manipulating the set values of the setting items from the plurality of function keys. Specifically, the size of the characters saying " operation mode" , which is an image of the setting item displayed on the setting item display part 181 is larger than the size of the characters saying " cooling" , which is an image of the set value displayed on the set value display part 182. This is to enable the user to easily understand the current operation status by enlarging the size of the first image displayed on the setting item display part 181 during the input of a manipulation signal for selecting a setting item.

**[0042]** With the initial setting item and the initial set value displayed in a first image on the setting item display part 181 and the set value display part, respectively, when the user presses the first function key 151, the setting item is sequentially changed on the setting item display part 181. FIG. 7 illustrates a state where the operation mode item 171 is selected. Afterwards, whenever the user presses the first function key 151, the setting item to be selected is sequentially changed. FIG. 7 illustrates a state where the ventilation item 172 is selected if the user presses the first function key 151 once more on the first display unit 180 of FIG. 4.

**[0043]** With a specific setting item selected among the setting items, the user can move a manipulation target from the selected setting items to an item for selecting a set value by using the second function keys 152. Afterwards, the user selects a specific set value while moving set values of the selected setting item by the third function keys 153. Referring to FIGs. 9 and 10, with the " operation mode" item selected in FIG. 7, in order to change the set value from " cooling" to " dehumidification" , the second function keys 152 are manipulated. When the second function keys 152 are manipulated, the manipulation target is moved to an item for selecting a set value. Afterwards, the user changes the set value from " cooling" to " dehumidification" by the third keys 153. At this time, the first images representing " cooling" and " dehumidification" are respectively displayed on the set value display unit 182. When the manipulation target is moved to the item for selecting a set value by manipulating the second function key 152, the size of the first image displayed on the set value display part 182 becomes larger. That is, during the input of a manipulation

signal for manipulating the set value from the plurality of function keys 150, the user can easily check the manipulation status by making the size of the image of the set values displayed on the set value display part 182 larger than the size of the image of the setting item.

**[0044]** When the user presses the fourth function key 154 after selecting a set value of the selected setting item, the set value of the selected setting item is set to the selected set value. If the user presses the fifth function key 155, or does not manipulate the function keys for a predetermined time period, the setting mode is finished. A method of setting the setting items excluding the operation mode item is similar to the method of setting in the operation mode item, so a description thereof will be omitted below. As described above, the control device 110 is able to perform the setting of setting items in a predetermined setting mode on the first display unit 180 by using the plurality of function keys 150.

**[0045]** FIG. 11 is a plan view showing another embodiment in which the setting item is changed from the " operation mode" item to the " ventilation" item in the display unit of FIG. 3. FIG. 12 is a plan view showing another embodiment in which the set value is changed from " cooling" to " dehumidification" in the " operation mode" item in the display unit of FIG. 3. The following description will be focused on differences from the foregoing embodiments.

**[0046]** When the user presses the first function key 151 for more than a second predetermined time period, the setting mode enters a simple display mode. Only the image of the setting items is displayed during the input of a manipulation signal for manipulating the setting items from the plurality of function keys, and only the image of the set values is displayed during the input of a manipulation signal for manipulating set values of the setting items from the plurality of function keys. Specifically, in the simple display mode state, the name of an operable setting item is represented in a first image in the setting item display part 181. Referring to FIG. 11(a), only the " operation mode" item is shown on the entire first display unit 180. That is, with the simple display mode entered, the " operation mode" is displayed in a first image on the first display unit 180. With the " operation mode" displayed in the first image, when the user presses the first function key 151, the setting item is sequentially changed on the first display unit 180. FIG. 11(b) illustrates a state in which the setting item is changed from the " operation mode" item to the " ventilation" item. Afterwards, whenever the user presses the first function key 151, the setting item to be selected is sequentially changed.

**[0047]** With a specific setting item selected among the setting items, the user can move a manipulation target from the selected setting items to an item for selecting a set value by using the second function keys 152. Afterwards, the user selects a specific set value while moving set values of the selected setting item by the third function keys 153. With the " operation mode" item selected in FIG. 11(a), in order to change the set value from " cooling" to " dehumidification" , the second function keys 152 are manipulated. When the second function keys 152 are manipulated, the manipulation target is moved to a screen for selecting a set value. Referring to FIGs. 12(a) and 12(b), the user changes the set value from " cooling" to " dehumidification" by the third keys 153. The first images representing " cooling" and " dehumidification" are respectively displayed on the entire first display unit 180. Since only the first image representing the set values is in a large size on the first display unit 180, the user can easily check the current manipulation status.

**[0048]** The control device of this invention may be installed in various air conditioning systems. FIG. 13 is a block diagram showing the construction of an air conditioning system with a control device in accordance with another embodiment of the present invention.

**[0049]** Referring to FIG. 13, the air conditioning system 200 includes air conditioners 240, control devices 210, and a remote controller 215. Each of the air conditioners 240 includes a plurality of indoor units 230 and an outdoor unit 220. However, the present invention is not limited thereto. The indoor units 230 are disposed in indoor spaces, respectively, and the outdoor unit 220 is disposed in an outdoor space. In each air conditioner 240, the indoor units 230 and the outdoor unit 220 are communicatively connected to each other via a network 261. Also, the outdoor units 220 are communicatively connected to each other via a second network 262. RS-485 communication is performed over the first network 261 and the second network 262. However, the present invention is not limited to the above communication method.

**[0050]** The respective control devices 210 are disposed in respective indoor spaces, and each of the control devices 210 controls the operation of the air conditioner 240 by wired communication with the indoor units 230 disposed in indoor spaces. The structure and operation of the control device 210 are similar to those of the above-stated control device 110 of FIG. 1, so a detailed description thereof will be omitted below. However, because each control device 210 is communicatively connected to the remote controller 215, the first display unit or second display unit of each control device 210 can display setting parameters corresponding to the setting items enabling the central control by the remote controller 215, such as a " central control address setting" item and a " master indoor unit/slave indoor unit setting" item, among the setting items.

**[0051]** Although the present invention has been described with reference to the embodiments shown in the drawings, these are merely illustrative, and those skilled in the art will understand that various modifications and equivalent other embodiments of the present invention are possible.

## Claims

1. A control device 110 and 210 for controlling an air conditioner, comprising:

   a plurality of function keys 150 for inputting a manipulation signal for manipulating operating conditions of the air conditioner 140 and 240;
   a first display unit 180 for displaying a changeable first image; and
   a second display unit 170 for displaying a preset second image,

   wherein the operating conditions include predetermined setting items, and when one of the setting items is selected by the manipulation of the plurality of the function keys, the first image and second image corresponding to the selected setting item or a set value of the selected setting item are simultaneously displayed on the first display unit and the second display unit.

2. The control device of claim 1, wherein the size of the image displayed on the first display unit can be varied in response to a manipulation signal inputted from the plurality of function keys.

3. The control device of claim 1, wherein the setting items are changed in a predetermined setting mode state, the setting mode includes a display all mode, and as for the image displayed on the first display unit, the size of the image of the respective setting items in the display all mode and the size of the image of the respective set values of the setting items are different from each other.

4. The control device of claim 3, wherein the size of the image of the setting items is larger than the size of the image of the respective set values of the setting items during the input of a manipulation signal for manipulating the setting items from the plurality of function keys, and the size of the image of the set values is larger than the size of the image of the setting items during the input of a manipulation signal for manipulating the set values of the setting items from the plurality of function keys.

5. The control device of claim 1, wherein the setting items are changed in a predetermined setting mode, the setting mode includes a simple display mode, and as for the image displayed on the first display unit, either one of the image of the respective setting items and the image of the respective set values of the setting items is displayed in the simple display mode.

6. The control device of claim 5, wherein only the image of the setting items is displayed during the input of a manipulation signal for manipulating the setting items from the plurality of function keys, and only the image of the set values is displayed during the input of a manipulation signal for manipulating set values of the setting items from the plurality of function keys.

7. The control device of claim 1, wherein the first image is a set of dots which is represented as one dot on the coordinate plane of the first display unit, and the second image is a preset graphic image.

8. The control device of claim 1, wherein the setting items are changed in a predetermined setting mode state, and the plurality of function keys include a first function key 151 for inputting a manipulation signal to enter the setting mode

9. The control device of claim 8, wherein the setting mode includes a display all mode and a simple display mode, if the first function key 151 is pressed for less than a first predetermined time period, any one setting mode between the display all mode and the simple display mode is entered, and if the first function key is pressed for more than a second predetermined time period, the other setting mode is entered.

10. The control device of claim 8, wherein whenever the first function key is pressed in the setting mode, the setting item capable of manipulating a set value is changed, and the plurality of function keys include second function keys 152 for moving a manipulation target between a selected setting item and a set value of the selected setting item when one of the setting items is selected, third function keys 153 for changing the set value of the setting item within an operable range, and a fourth function key 154 for setting the set value of the selected setting item.

11. The control device of claim 1, wherein the size of the first display unit is larger than the size of the second display unit.

12. The control device of claim 1, wherein at least one of the first display unit and the second display unit is of an LCD panel structure.

Fig. 1

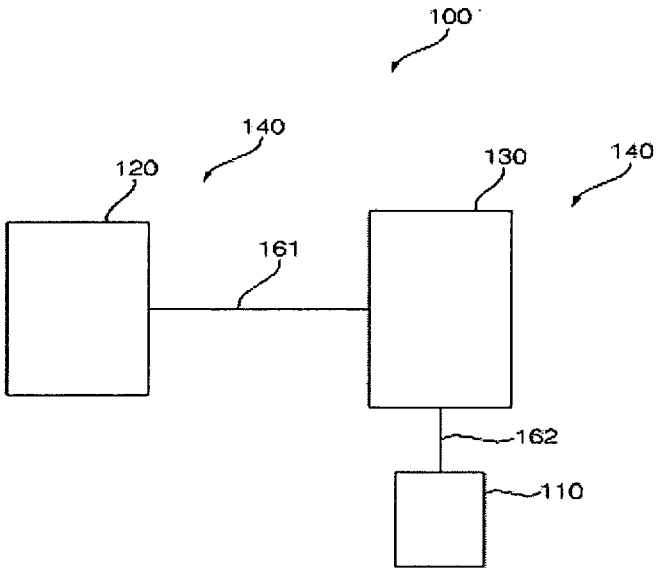


Fig. 2

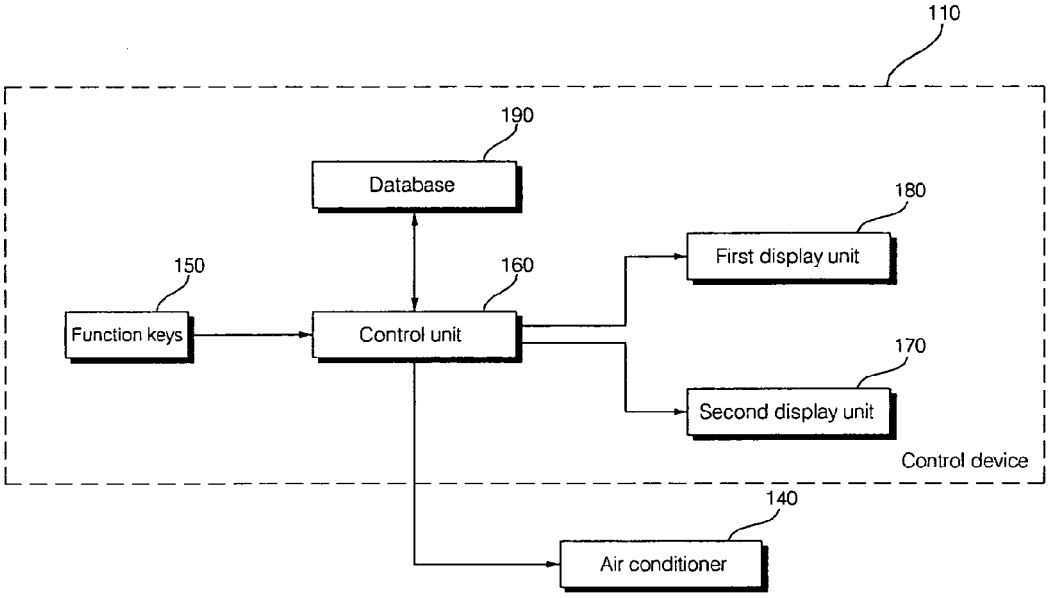

110
190
Database
180
First display unit
150
160
Function keys
Control unit
170
Second display unit
Control device
140
Air conditioner

Fig. 3

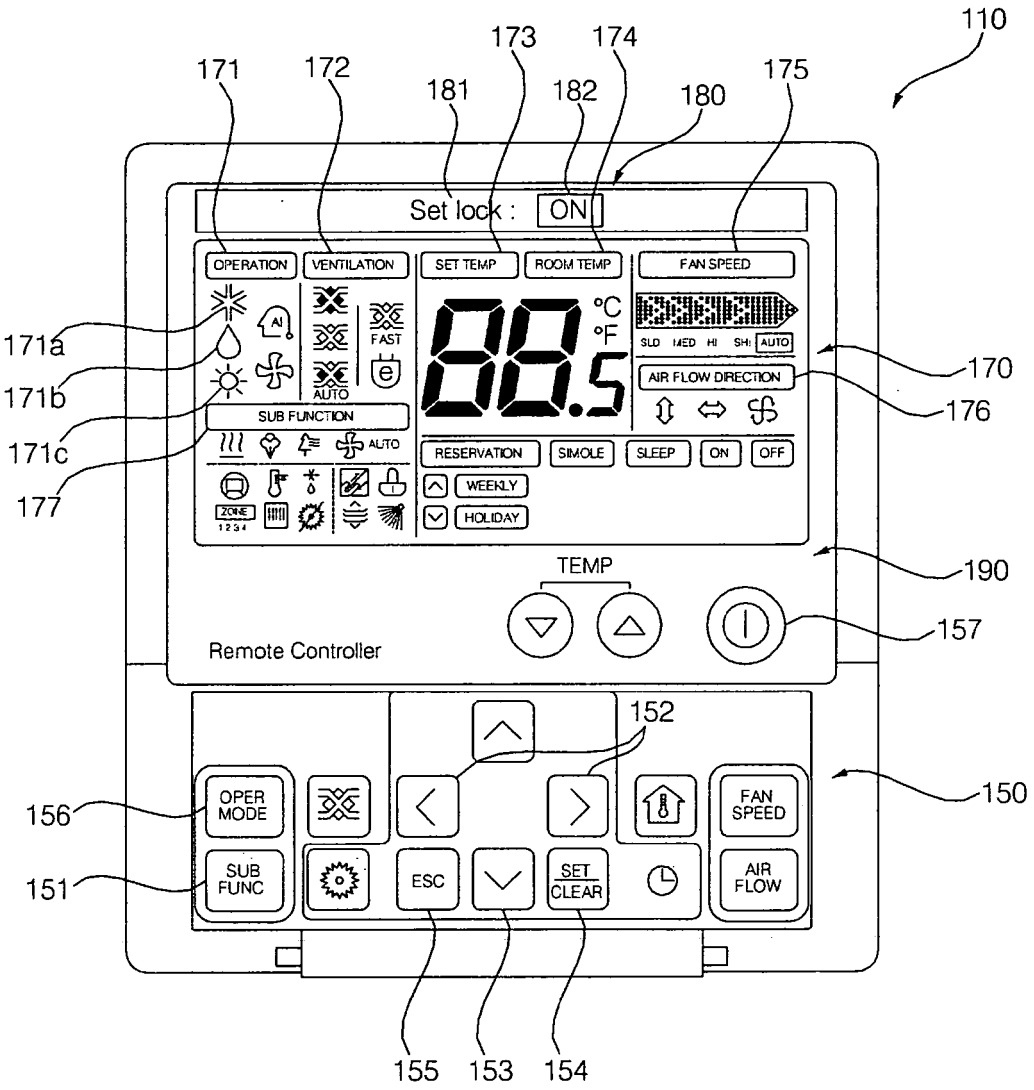

110
171
172
173
174
175
181
182
180
Set lock : ON
OPERATION
VENTILATION
SET TEMP
ROOM TEMP
FAN SPEED
FAST
AUTO
SLO MED HI SHI AUTO
AIR FLOW DIRECTION
SUB FUNCTION
AUTO
RESERVATION
SIMOLE
SLEEP
ON
OFF
WEEKLY
HOLIDAY
ZONE
1 2 3 4
TEMP
Remote Controller
171a
171b
171c
177
170
176
190
157
152
156
151
150
OPER MODE
SUB FUNC
ESC
SET CLEAR
FAN SPEED
AIR FLOW
155
153
154

Fig. 4

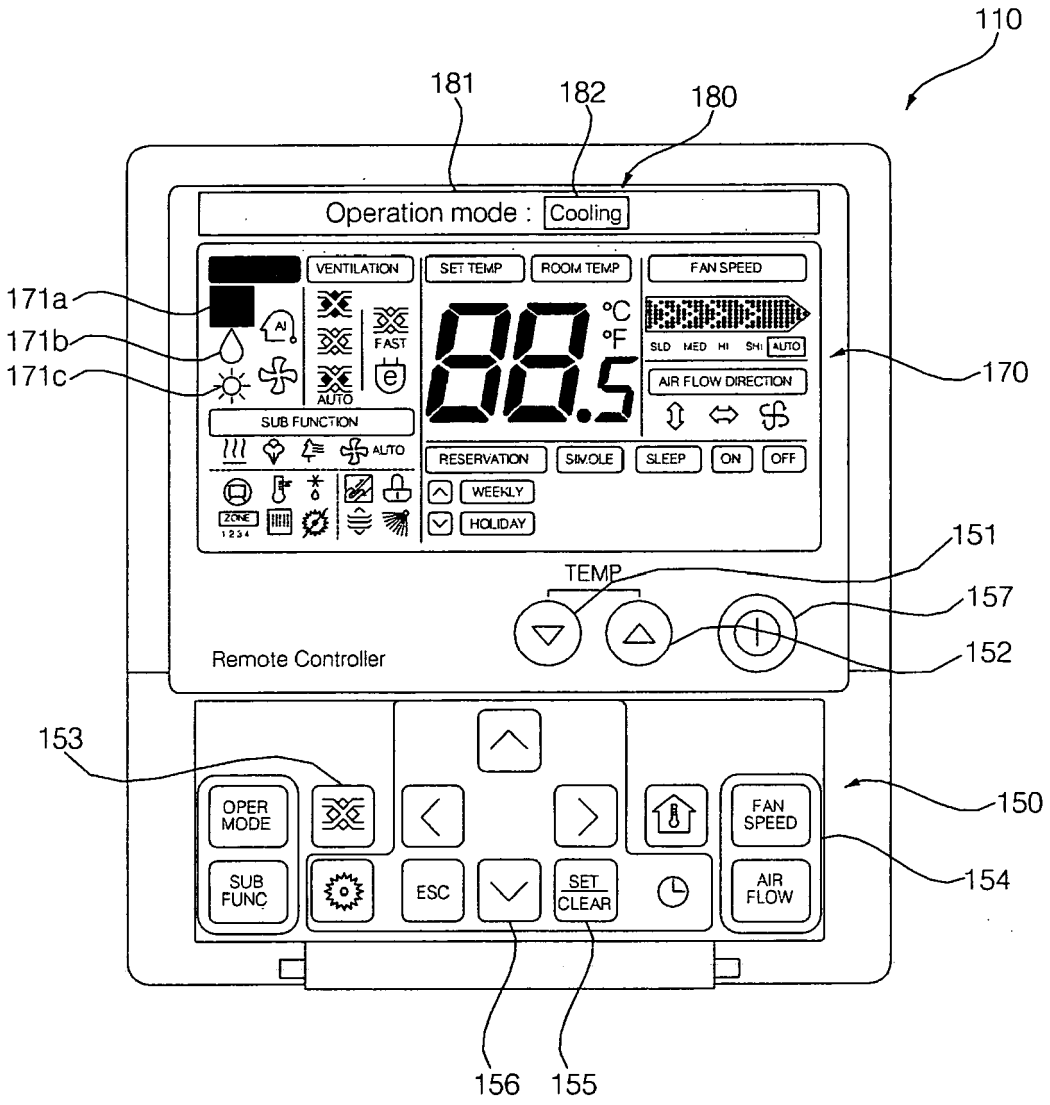

110
181
182
180
Operation mode : Cooling
VENTILATION
SET TEMP
ROOM TEMP
FAN SPEED
171a
171b
171c
FAST
AUTO
SUB FUNCTION
AUTO
°C
°F
SLO MED HI SHI AUTO
AIR FLOW DIRECTION
170
RESERVATION
SIMPLE
SLEEP
ON
OFF
WEEKLY
HOLIDAY
151
TEMP
157
152
Remote Controller
153
OPER MODE
SUB FUNC
ESC
SET CLEAR
FAN SPEED
AIR FLOW
150
154
156
155

Fig. 5

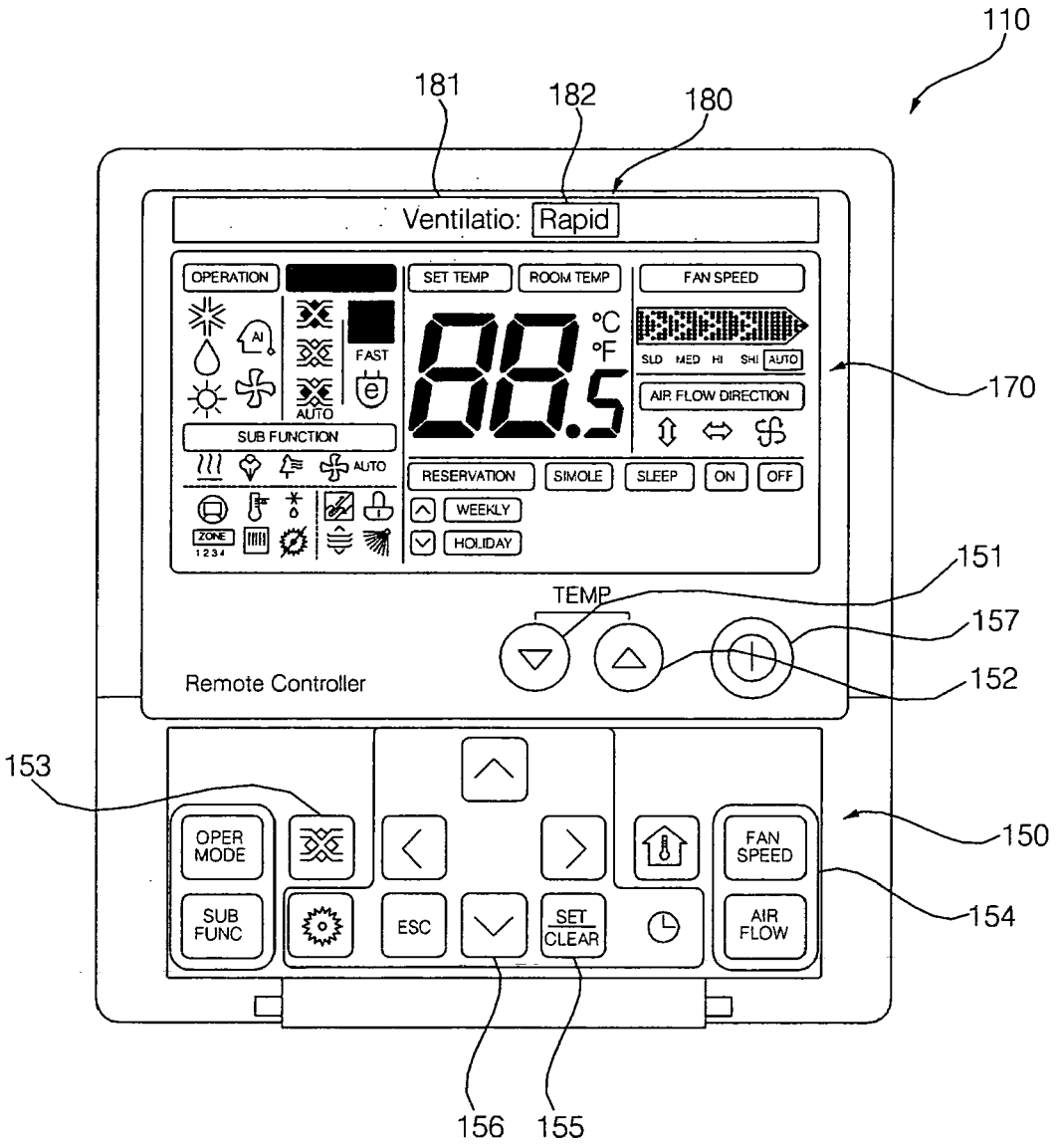

110
181
182
180
Ventilatio: Rapid
OPERATION
SET TEMP
ROOM TEMP
FAN SPEED
FAST
AUTO
SUB FUNCTION
RESERVATION
SIMOLE
SLEEP
ON
OFF
WEEKLY
HOLIDAY
AIR FLOW DIRECTION
170
151
TEMP
157
152
Remote Controller
153
OPER MODE
SUB FUNC
ESC
SET CLEAR
FAN SPEED
AIR FLOW
150
154
156
155

Fig. 6

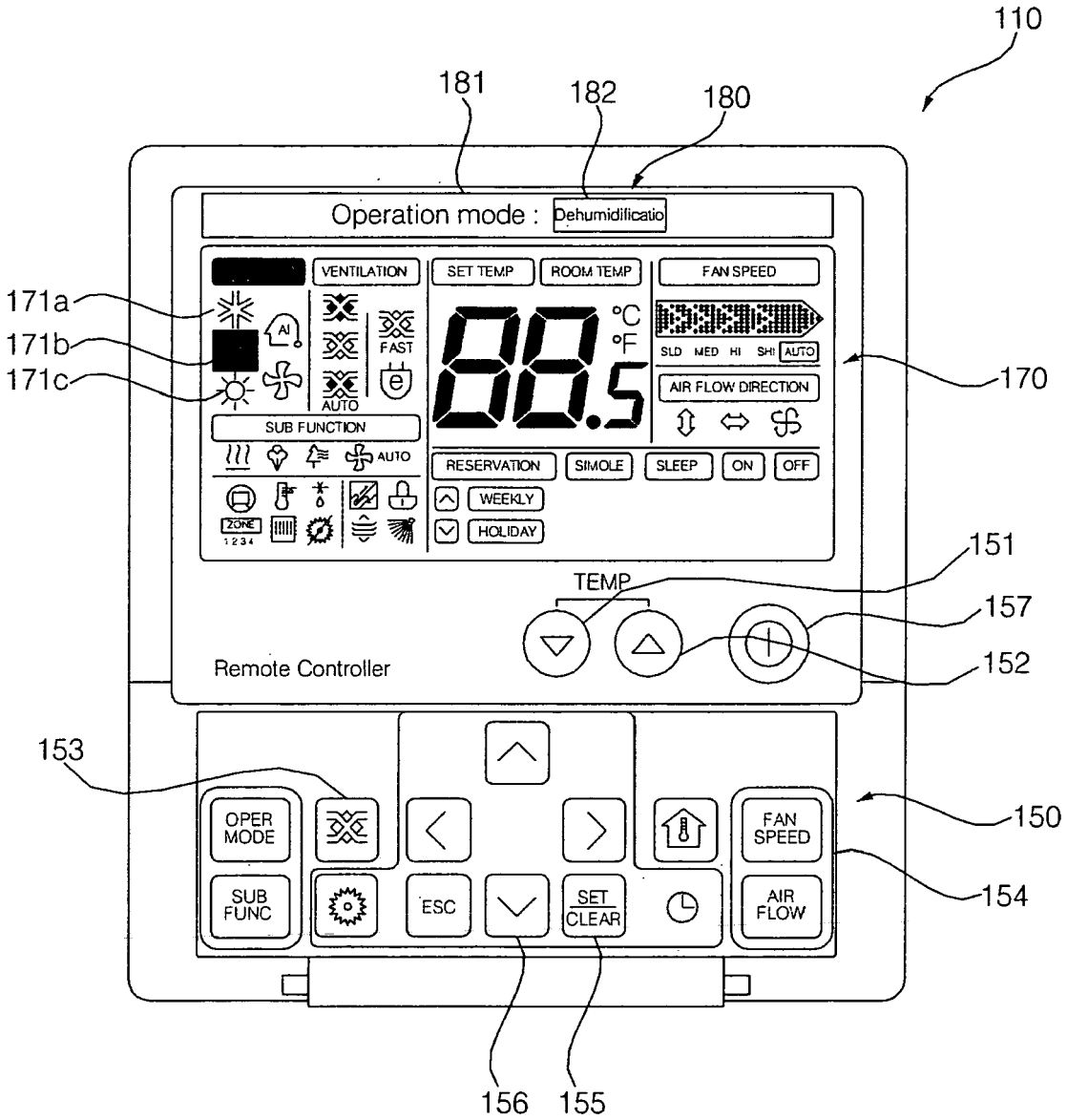

110
181
182
180
Operation mode :
Dehumidificatio
VENTILATION
SET TEMP
ROOM TEMP
FAN SPEED
171a
171b
171c
FAST
AUTO
SUB FUNCTION
AUTO
SLD MED HI SHI AUTO
AIR FLOW DIRECTION
170
RESERVATION
SIMOLE
SLEEP
ON
OFF
WEEKLY
HOLIDAY
151
TEMP
157
152
Remote Controller
153
OPER MODE
SUB FUNC
ESC
SET CLEAR
FAN SPEED
AIR FLOW
150
154
156
155

Fig. 7

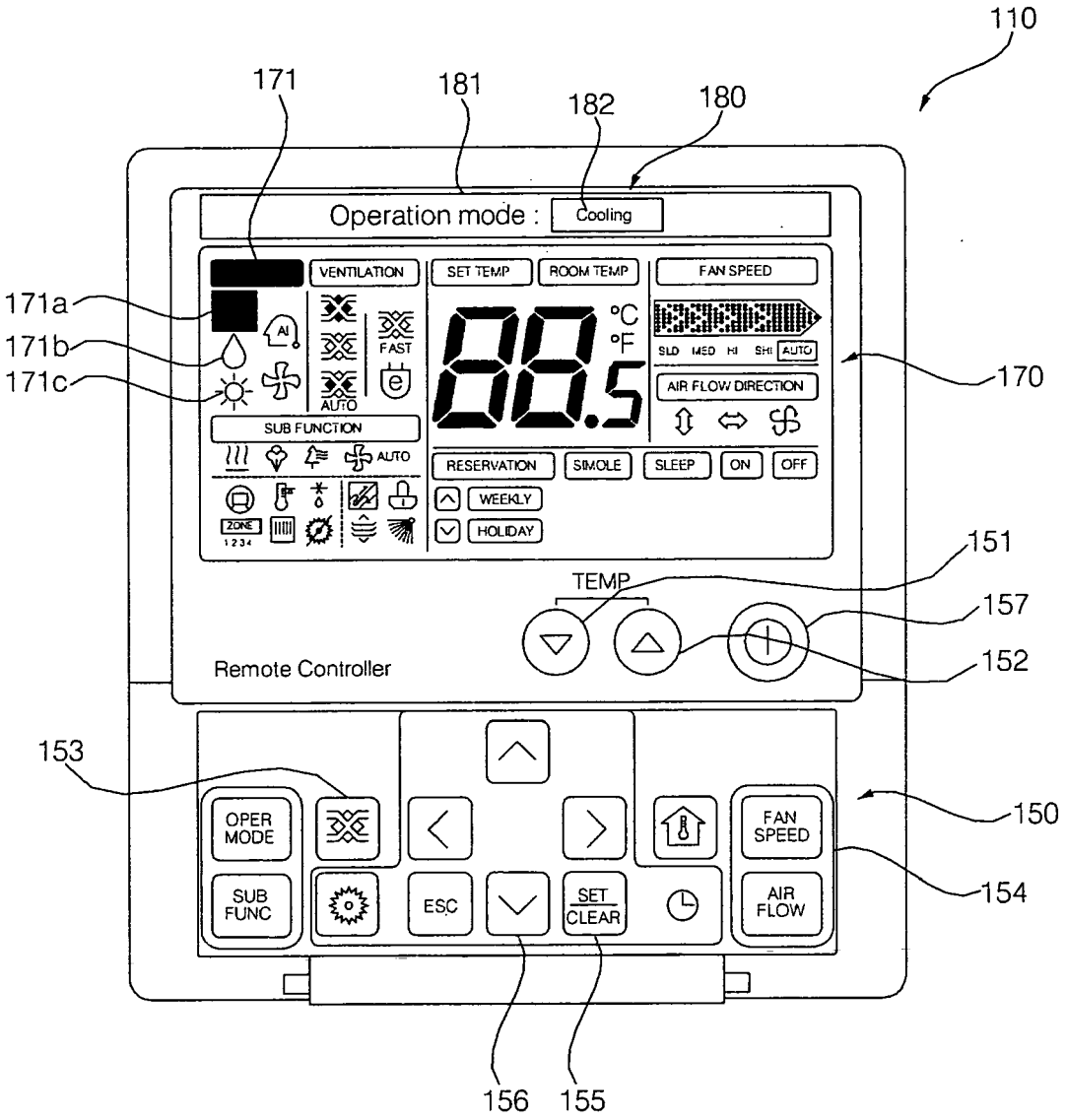

110
171
181
182
180
Operation mode :
Cooling
VENTILATION
SET TEMP
ROOM TEMP
FAN SPEED
171a
171b
171c
FAST
AUTO
SUB FUNCTION
AUTO
°C
°F
SLO MED HI SHI AUTO
AIR FLOW DIRECTION
170
RESERVATION
SIMOLE
SLEEP
ON
OFF
WEEKLY
HOLIDAY
151
TEMP
157
152
Remote Controller
153
OPER MODE
SUB FUNC
ESC
SET CLEAR
FAN SPEED
AIR FLOW
150
154
156
155

Fig. 8

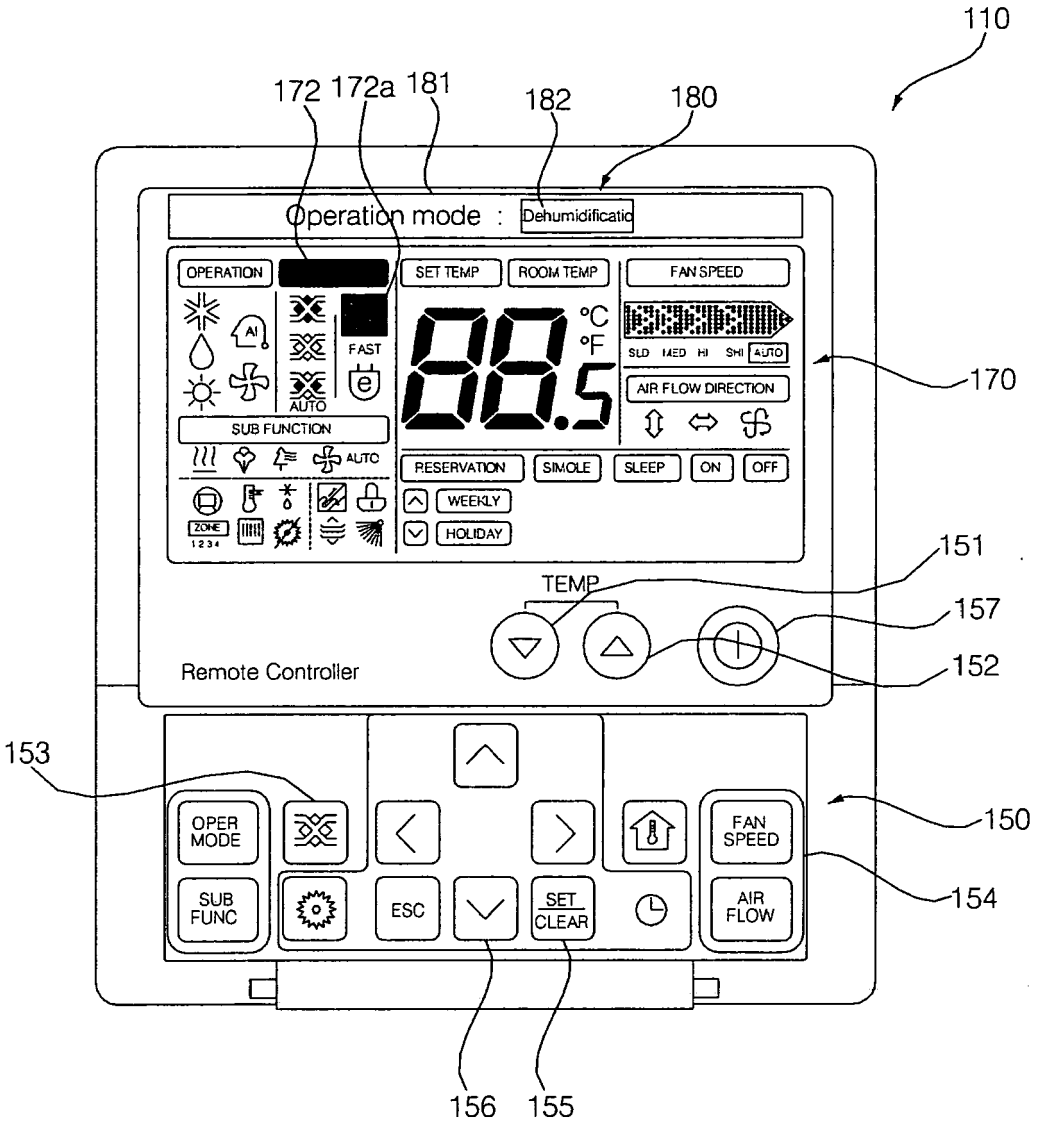

110
172
172a
181
182
180
Operation mode : Dehumidificatio
OPERATION
SET TEMP
ROOM TEMP
FAN SPEED
FAST
AUTO
SUB FUNCTION
AUTO
AIR FLOW DIRECTION
RESERVATION
SIMOLE
SLEEP
ON
OFF
WEEKLY
HOLIDAY
ZONE
1 2 3 4
170
151
TEMP
157
152
Remote Controller
153
OPER MODE
SUB FUNC
ESC
SET CLEAR
FAN SPEED
AIR FLOW
150
154
156
155

Fig. 9

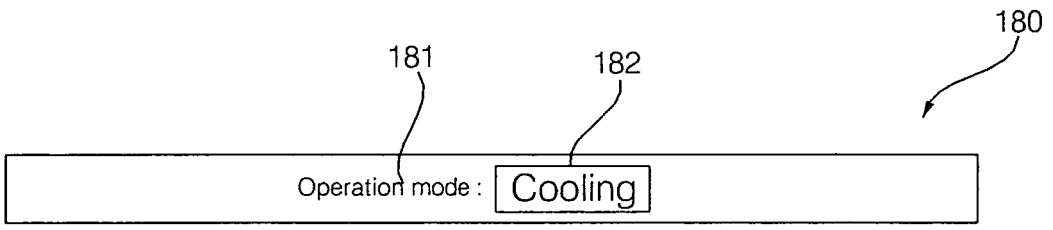


Fig. 10

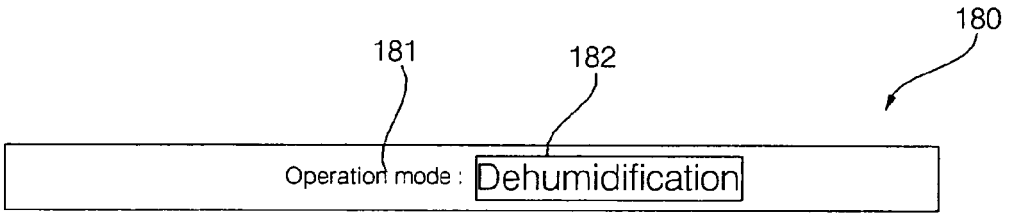


Fig. 11

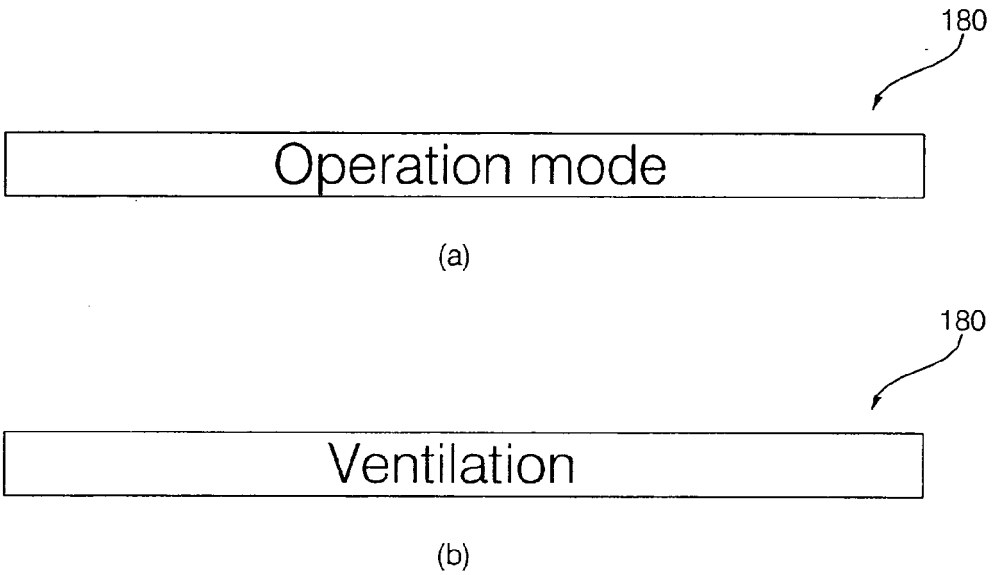


Fig. 12

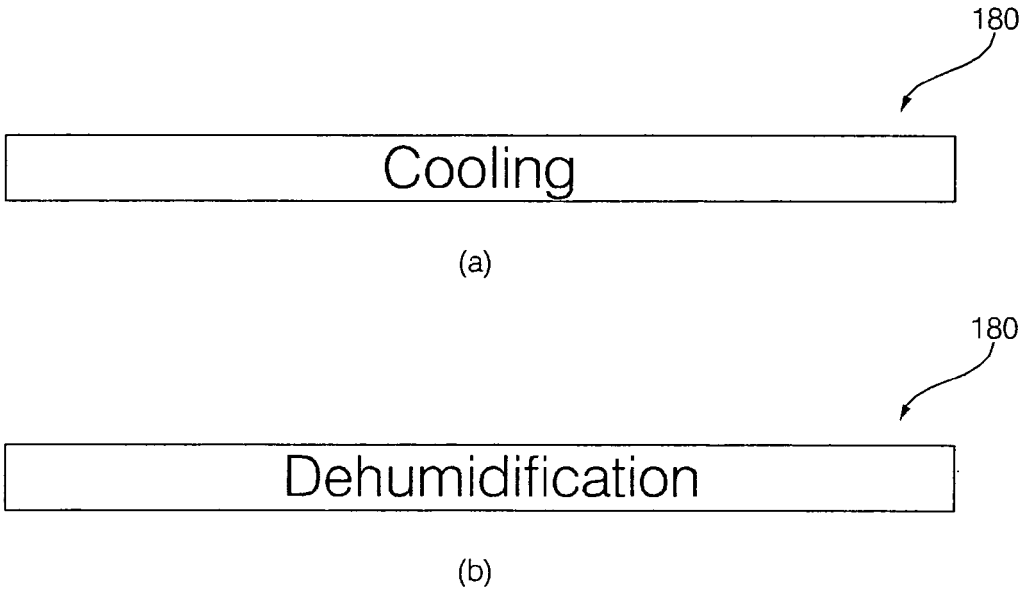
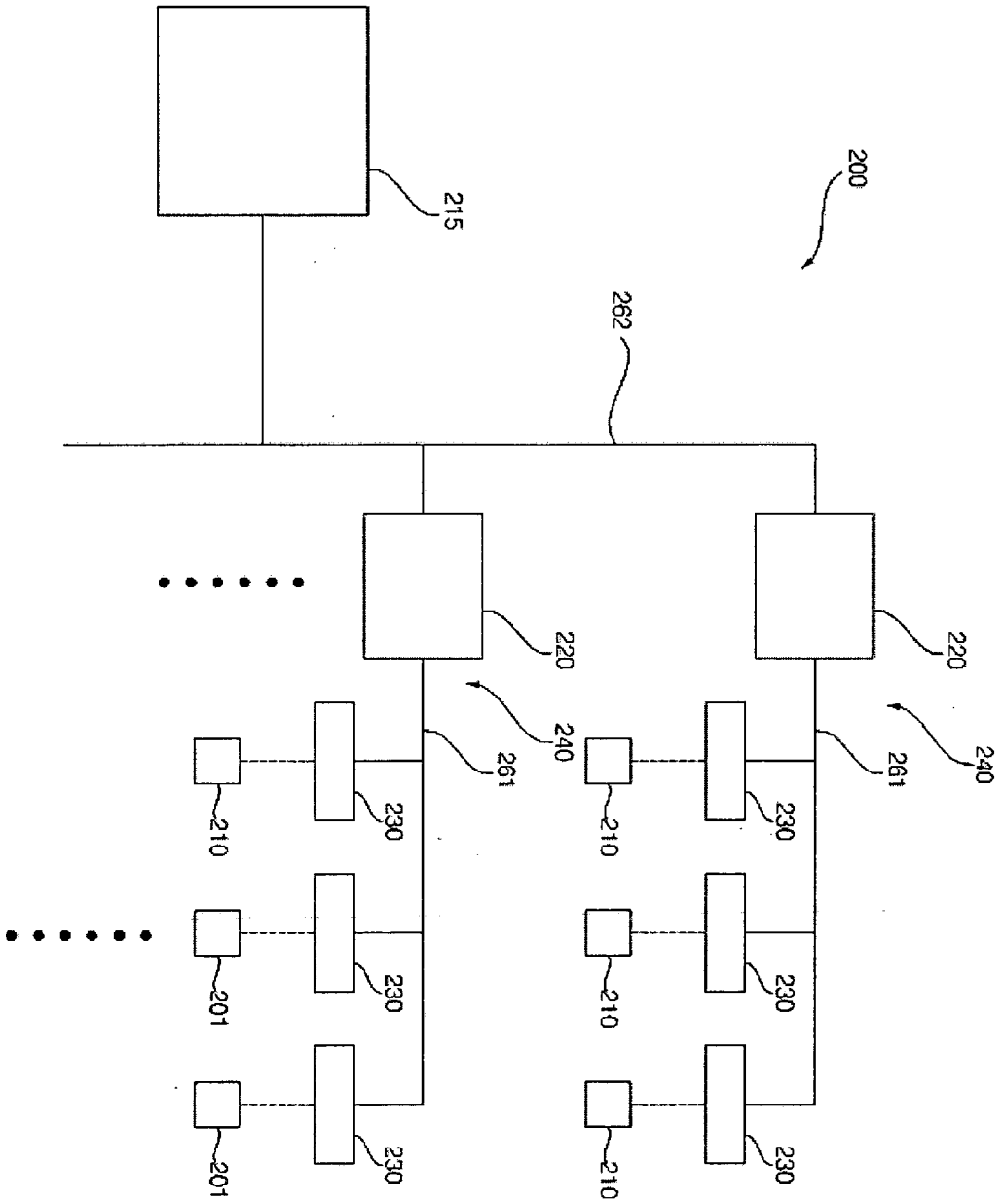


Fig. 13


215
200
262
220
220
240
261
240
261
210
230
210
230
201
230
210
230
201
230
210
230

Europäisches Patentamt
European Patent Office
Office européen des brevets

# EUROPEAN SEARCH REPORT

Application Number
EP 08 25 1886

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| X | EP 1 533 576 A (LG ELECTRONICS INC [KR]) 25 May 2005 (2005-05-25) * paragraph [0041]; figure 3 * | 1-12 | INV. F24F11/00 |
| X | EP 1 092 927 A (SHARP KK [JP]) 18 April 2001 (2001-04-18) * paragraph [0033] - paragraph [0037]; figure 4 * | 1-12 | |
| X | EP 1 811 241 A (LG ELECTRONICS INC [KR]) 25 July 2007 (2007-07-25) * paragraph [0103] - paragraph [0119]; figures 8,9 * | 1-12 | |
| X | WO 2006/121284 A (LG ELECTRONICS INC [KR]; LEE CHOONG HEE [KR]; AN CHANG WOONG [KR]; LEE) 16 November 2006 (2006-11-16) * the whole document * | 1-12 | |
| X | WO 2007/091825 A (LG ELECTRONICS INC [KR]; PARK JEONG-HWA [KR]) 16 August 2007 (2007-08-16) * the whole document * | 1-12 | TECHNICAL FIELDS SEARCHED (IPC) F24F |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 20 January 2009 | Valenza, Davide |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 25 1886

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

20-01-2009

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| EP 1533576 A | 25-05-2005 | AU 2004290768 A1 | 02-06-2005 |
| | | BR PI0416420 A | 16-01-2007 |
| | | CN 1621750 A | 01-06-2005 |
| | | CN 2752652 Y | 18-01-2006 |
| | | JP 2005156142 A | 16-06-2005 |
| | | WO 2005050096 A1 | 02-06-2005 |
| | | KR 20050049801 A | 27-05-2005 |
| | | US 2005109048 A1 | 26-05-2005 |
| EP 1092927 A | 18-04-2001 | AU 776223 B2 | 02-09-2004 |
| | | AU 6651900 A | 26-04-2001 |
| | | CN 1293340 A | 02-05-2001 |
| | | CN 1504696 A | 16-06-2004 |
| | | CN 1504695 A | 16-06-2004 |
| | | ES 2267442 T3 | 16-03-2007 |
| EP 1811241 A | 25-07-2007 | WO 2007083890 A2 | 26-07-2007 |
| WO 2006121284 A | 16-11-2006 | EP 1888973 A2 | 20-02-2008 |
| WO 2007091825 A | 16-08-2007 | CN 101017421 A | 15-08-2007 |
| | | KR 20070080293 A | 10-08-2007 |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82