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(54) **Indoor unit of air conditioner**

Innenraumeinheit für eine Klimaanlage

Unité d'intérieur pour dispositif de conditionnement d'air

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(56) References cited:
EP-A1- 0 985 994 **CN-Y- 2 459 575**
DE-U1-202005 005 913 **JP-A- 11 337 157**

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Description

Field of the Invention

[0001] The present invention relates to an indoor unit of an air conditioner, and more particularly, to an indoor unit of an air conditioner provided with a display device that allows memory expansion and includes a touch-screen allowing direct, easy and convenient manipulation thereof.

Description of the Related Art

[0002] An air conditioner is a device that keeps the indoor air cool or warm according to an air-conditioning purpose, and has an indoor-air purifying function.

[0003] In detail, the air conditioner is installed in an enclosed space such as vehicles, offices or homes to maintain the indoor air at a desired temperature by cooling or heating the indoor air, and circulate refrigerant in compression, condensation, expansion, evaporation stages of a cycle.

[0004] Also, besides the cooling and heating function, the air conditioner includes an air purifying function that sucks and filters contaminated indoor air, a dehumidifying function that makes humid air dry.

[0005] Recently, the air conditioner further including a display device on its front surface has been proposed. Through the display device, a user may check an operational state of the air conditioner and a process of inputting an operation command, with the naked eye.

[0006] However, the display device mounted on the related art air conditioner has the following problems.

[0007] First, the display device of the indoor unit of the related art air conditioner is not capable of displaying various images for representing various functions or various operational states of the indoor unit. That is, the display device has a limited display function.

[0008] Secondly, since a separate button or a remote controller should be provided for input of an operation command and an operation condition of the indoor unit, a manufacturing cost increases, and a loss of the remote controller frequently occurs.

[0009] Thirdly, the display device requires an LCD or a PDP to display various functions, various figures, or moving images, and therefore a size of a controller should be large enough to allow mounting of such a display device. In addition, when the size of the controller increases, the size of the display device itself also undesirably increases.

[0010] Fourthly, the aforementioned display device generates a large amount of heat causing damage to control components. The thermal damage causes malfunctioning of the indoor unit, which results in increases in a service cost of the indoor unit of the related art air conditioner and in user complains about products.

[0011] Finally, a memory is fixedly mounted on the related art controller, which makes memory expansion dif-

ficult. The memory capacity should be increased in order to display more various functions or signs on the display device including an LCD or a PDP. However, in the related art in which the memory expansion is difficult, the whole controller should be replaced when the memory capacity is insufficient. Replacing of the whole controller is very inconvenient, and lowers efficiency.

[0012] The aforementioned problems cause the indoor unit of the related air conditioner to increase a service cost, and increase user complaints.

[0013] DE 20 2005 005 913 U1 discloses an indoor climate control assembly with a display screen and a touch interface.

SUMMARY OF THE INVENTION

[0014] Accordingly, the present invention is directed to an indoor unit of an air conditioner that addresses one or more problems due to limitations and disadvantages of the related art, and provides an indoor unit of an air conditioner as set out in claim 1.

[0015] It would be desirable to provide a display device of an indoor unit of an air conditioner capable of receiving a command directly inputted through a screen of the display device, without providing separate buttons or a remote controller for command input.

[0016] It would be desirable to provide a display device of an indoor unit of an air conditioner capable of quickly releasing heat generated from the display device and thus preventing thermal damage to a control component by improving a structure of the display device.

[0017] It would be desirable to provide a display device of an air conditioner, which allows memory expansion according to the size or capacity of the display device.

[0018] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0019] Accordingly, the invention provides an indoor unit of an air conditioner, including: a body performing cooling or heating; a front panel provided in front of the body; and a display device mounted on the front panel. The display device includes a display assembly including a touchscreen allowing input of operational conditions of the body, and a display cover receiving the display assembly.

[0020] In another aspect of the present invention, there is provided an indoor unit of an air conditioner including: a body to which a heat exchanger and a fan assembly are mounted; a display assembly mounted on a front surface of the body, the display assembly displaying an operational state of the body and allowing input of operational conditions by screen touch; an assembly controller

controlling the display assembly; and a display cover receiving the display assembly and the assembly controller.

[0021] In a further another aspect of the present invention, there is provided an indoor unit of an air conditioner, including: a body; a front panel mounted on a front surface of the body; a display device comprising a display assembly displaying an operational state of the body and allowing input of an operational condition, an assembly controller controlling an operation of the display assembly, and an expansion module and an expansion socket provided to the assembly controller and allowing expansion of a memory or a use environment; and a heat exchanger and a fan assembly received in the body.

[0022] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] 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 perspective view of an exterior of an indoor unit of an air conditioner including a display device according to an embodiment of the present invention;

Fig. 2 is a perspective view illustrating an internal structure of the indoor unit of Fig. 1;

Fig. 3 is a perspective view of a front surface of a display device according to an embodiment of the present invention;

Fig. 4 is a longitudinal sectional view taken along line I-I' of Fig. 3;

Fig. 5 is an exploded perspective view of the display device; and

Fig. 6 is an exploded perspective view of an expansion pack mounted on a display device according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0024] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like

parts.

[0025] Fig. 1 is a perspective view of an exterior of an indoor unit of an air conditioner including a display device according to an embodiment of the present invention, and Fig. 2 is a perspective view illustrating an internal structure of the indoor unit.

[0026] Referring to Figs. 1 and 2, an indoor unit of an air conditioner according to the present invention includes therein a body 100 receiving a plurality of components, a front panel 110 coupled to a front surface of the body 100, a front frame 120 provided at the rear of the front panel 110, a right part 130 and a left part 140 respectively provided to lower portions of right and left sides of the front frame 120, a rear frame 150 coupled at the rear of the front frame 120, and a base frame 160 provided at a lower end of the body 100.

[0027] In detail, the front panel 110 has a quadrangular plate shape with a predetermined thickness, and tempered glass is formed at a front side of the front panel 110. The tempered glass is toughened glass produced as follows. The plate glass is heated, and then the heated plate glass is rapidly cooled. The rapid cooling causes compressive stresses in a surface of the glass and tensile stresses inside the glass. The tempered glass has three to five times greater bending strength and three to eight times greater impact resistance than those of the general glass. Also, the tempered glass has excellent heat resistance.

[0028] A front display window 112 is formed on the front surface of the front panel 110 to show a user operational states or environmental conditions of the air conditioner. In detail, a display device 300 (see Fig. 3) is received at the rear of the front display window 112, and the user recognizes contents displayed on the display device 300 through the front display window 112.

[0029] Also, a top outlet 122 is formed on a top surface of the front frame 120, and the air cooled or heated within the body 100 is discharged to a room through the top outlet 122. A discharge louver 124 is rotatably mounted on the top outlet to selectively open and close the top outlet 122.

[0030] Also, right and left sides of a front surface of the front frame are inclined rearward to form inclined surfaces. Front outlets 126 are formed in the inclined surfaces, respectively. The front outlet 126 is formed long in a vertical direction along the inclined surface, and a discharge vane 128 is provided to the front outlet 126.

[0031] In detail, upper and lower sides of the discharge vane 128 are hinge-coupled to upper and lower sides of the front outlet 126, so that the discharge vane 128 can be rotated to the right and left. Accordingly, as the discharge vane 128 rotates, the front outlet 126 is selectively opened and closed.

[0032] Also, side inlets through which the indoor air is sucked into the body 100 are formed at the left part 130 and the right part 140, respectively. In detail, a left inlet 132 (see Fig. 3) is formed at the left part 130, and a right inlet 142 is formed at the right part 140. A left suction

vane 134 (see Fig. 3) and a right suction vane (144) are rotatably mounted on the left inlet 132 and the right inlet 140, to selectively open and close the left inlet 132 and the right inlet 142, respectively.

[0033] The rear frame 150 is opened at the front, and a front edge of the rear frame 150 is coupled to the front frame 120, and rear edges of the left side part 130 and the right side part 140.

[0034] Also, the base frame 160 forms a bottom exterior of the body 100, and supports a lower end of the body 100. A front inlet 162 through which the indoor air is sucked is formed at a front surface of the base frame 160.

[0035] The front panel 110 is rotatably mounted on the body 100 to selectively shield the front surface of the body 100. That is, one edge of the front panel 110 is hinge-coupled to the body 100, so that the front panel 110 can be rotated frontward by the user.

[0036] The indoor unit of the air conditioner according to the present invention includes a front cover 114 mounted on a front surface of the front frame 120, a heat exchanger (not shown) received in the body 100, a filter purifying the sucked indoor air, and a fan assembly 220 sucking the indoor air.

[0037] In detail, a receiving groove 126 receiving a display device 300 to be described later is formed at a central portion of the front cover 114. The receiving groove 126 preferably has the same size as that of the display device 300.

[0038] An indoor heat exchanger performing heat-exchange between the sucked indoor air and a refrigerant is received at the rear of the front cover 114.

[0039] Also, the filter 210 includes a left filter 212 mounted on the left part 130, a right filter 214 mounted on the right part 140, a bottom filter 216 mounted on the base frame 160, and a dust filter 218 mounted in front of the fan assembly 220.

[0040] In detail, the left filter 212 removes dust and foreign substances from the air sucked through the left inlet 132, and the right filter 214 removes dust and foreign substances from the air sucked through the right inlet 142.

[0041] Also, the bottom filter 216 is formed by stacking a plurality of filters. The plurality of filters perform their own functions while removing dust and foreign substances contained in the air sucked through the front inlet 162.

[0042] The dust filter 218 is provided in front of the fan assembly 220 to re-filter the air right before the air is sucked into the fan assembly 220. In other words, the dust filter 218 re-filters the air from which the dust and foreign substances have been removed by the left filter 212, the right filter 214 and the bottom filter 216, so that cleaner air can be discharged to a room. The dust filter 218 removes dust and foreign substances contained in the air using an electrical characteristic.

[0043] A main controller 230 is mounted above the fan assembly 220 and the dust filter 218. In detail, the main controller 230 is a part for controlling the overall operation of the air conditioner, and includes therein a plurality of

control components to control the overall operation of the air conditioner. The main controller 230 is electrically connected to the display device 300 by a signal transfer part 240. Here, the signal transfer part 240 refers to a cable enabling electricity and a signal to be received and transmitted between the main controller 230 and the display device 300.

[0044] Also, the display device 300 is mounted on a rear surface of the front panel 110. In detail, a display assembly 310 (see Fig. 3) and an assembly controller 350 (see Fig. 3) are mounted in the display device 300. The assembly controller 350 is connected to the main controller 230 by the signal transfer part 240, and controls the operation of the display assembly 310.

[0045] The signal transfer part 240 penetrates a bottom of the display device 300, extends downward, is bent horizontally, and then, is connected inside the main controller 230. Thus, the neat and tidy connection of signal transfer part 240 can be made between the display device and the main controller 230, achieving the shortest distance therebetween.

[0046] Hereinafter, the construction and the operation of the display device 300 will be described in more detail with reference to accompanying drawings.

[0047] Fig. 3 is a perspective view of a front side of the display device according to an embodiment of the present invention, Fig. 4 is a longitudinal sectional view taken along line I-I' of Fig. 3, and Fig. 5 is an exploded perspective view of the display device.

[0048] Referring to Figs. 3 and 5, the display device 300 according to the present invention includes a display cover 301 having a quadrangular box shape opened at the front, a display assembly 310 displaying operational states and environmental conditions of the body 100, an assembly controller 350 including therein a plurality of electronic components for control of the display assembly 310, an external-device connector 370 for a connection with an external device, an expansion pack 500 provided to the assembly controller 350 for the expansion of a memory or support part required because of the connection with an external device; and a speaker 390 outputting music, melodies or the like received from an external memory device.

[0049] In detail, the display assembly 310 includes a command input section 320 displaying operational states or environmental conditions of the body 100 while allowing a user to input a command, and a case 330 surrounding an edge and a rear surface of the command input section 320 and protecting the command input section 320.

[0050] The command input section 320 includes a touchscreen 321 having a rough quadrangular plate shape; a liquid crystal display part 322 displaying information inputted through the touchscreen 321, or an operation state, an operation environment and the like of the body 100; a screen controller 323 controlling the liquid crystal display part 322; and a controller connection line connecting the screen controller 323 and the assembly

controller 350.

[0051] The touchscreen 321 allows a user to input a command by directly touching the touchscreen. In detail, when the user touches a letter or a figure displayed on the touchscreen 321 with a finger or a subject, specific data is processed by software stored for each selected letter or figure.

[0052] As for the touchscreen 321, infrared rays invisible to the human eye flow through the screen, forming many gratings in the screen, so that when the user touches a certain grating with a finger or a subject, the touchscreen can recognize a location where it is touched.

[0053] Also, the liquid crystal display part 322 is provided at the rear of the touchscreen 321. Since the touchscreen 321 is transparent, an image a user substantially watches is an image disposed on the liquid crystal display part 322. Various images necessary for operation of the body 100, and operational states and environmental conditions of the body 100 are displayed on the liquid crystal display part 322.

[0054] Also, the screen controller 323 provided to a rear surface of the liquid crystal display part 322 serves to apply a voltage or transmit light so as to form an image on the liquid crystal display part 322. That is, as liquid crystals of the liquid crystal display part 322 are arranged in various directions by the screen controller 323, a specific image is formed on the liquid crystal display part 322.

[0055] The touchscreen 321 is exposed to the outside through the front display window 112 and is mounted on allow external manipulation thereof, so that the user can manipulate the operation of the body 100 in person. The front surface of the command input section 320 has a size corresponding to that of the front display window 112.

[0056] The command input section 320, which includes the touch screen 321, the liquid crystal display part 322 and the screen controller 323, is received within the case 330.

[0057] The case 330 has a quadrangular box shape opened at the front, and a connection-line through hole 325 through which the controller connection line 324 passes is formed at a rear surface of the case 330. In detail, the controller connection line 324 penetrates the connection-line through hole 325 and connects the screen controller 323 and the assembly controller 350 together, so that the connection of the controller connection line 324 between the controllers 323 and 350 achieves the shortest distance. Accordingly, the display assembly 310 and the assembly controller 350 can be at the shortest distance therebetween, and therefore the size of the display device 300 can be minimized.

[0058] When the screen controller 323 forms a specific image on the liquid crystal display part 322 by a signal transmitted from the assembly controller 350 along the controller connection line 324, the user may watch the formed image through the touchscreen 321.

[0059] A front surface of the assembly controller 350 is placed behind a front surface of the display assembly

310. Thus, a rear surface of the front panel 110 does not interfere with a plurality of control components received in the front surface of the assembly controller 350, and also the assembly controller 350 can be operated more stably. The assembly controller 350 is spaced apart from a predetermined distance from the rear surface of the front panel 110, thereby ensuring easiness in mounting.

[0060] A plurality of memories are mounted on the assembly controller 350. The memories are divided into a dynamic random access memory (DRAM), a static random access memory (SRAM), a flash memory, and the like. The DRAM is the most common type of memory, and a memory module employing a DRAM chip plays the most important role in a main memory in many cases. Accordingly, a system uses the DRAM to temporarily store programs, data, or data transmitted from a processor or another peripheral device.

[0061] Also, the SRAM 352 is used for the assembly controller 350. The SRAM 352 uses memory cells arranged in a matrix form to store data. The SRAM 352 is five times faster than the DRAM, and does not need to be periodically refreshed unlike the DRAM.

[0062] Also, the flash memory 353 is used for the assembly controller 350. The flash memory 353 maintains data even when power is turned off. Also, the flash memory 353 is a high-density non-volatile memory device that can be electrically erasable and programmable. For those reasons, the flash memory 353 is suitable for a product that should achieve low power consumption and requires high-speed programming and frequent memory changes. Desirably, the flash memory 353 offers a higher execution speed than that of an auxiliary memory, achieves low power consumption, and has good shock resistance.

[0063] Since mass storage data should be processed to provide various images, the flash memory 353 may be considered optimum.

[0064] An expanded storage space and a data system are demanded to display various letters or images on the liquid crystal display part 322. Particularly, when an external device is connected for use, the expansion of the memory or the support part is required.

[0065] An expansion pack 500 is mounted on the assembly controller 350 for the expansion of the memory or the support part. The expansion packet 500 includes an expansion module 510, and an expansion socket 520 mounted on the expansion module 510.

[0066] In detail, as for the expansion module 510, various types of expansion modules 510 such as a memory module for memory expansion, a graphic module supporting graphics, a sound module supporting sounds, and the like may be used. The expansion module 510 is mounted on the expansion socket 520, to expand the memory of the assembly controller 350 or support environmental conditions for the use of the assembly controller 350.

[0067] The case 330 is mounted and fixed to an inner rear surface of the display cover 301. A mounting part

for mounting the case 330 to the display cover 300 is provided at the inner rear surface of the display cover 301 and the case 330.

[0068] In detail, the mounting part includes mounting ribs 332 protruding from both sides of the case 330, and case mounting bosses 340 protruding frontward from the inner rear surface of the display cover 301.

[0069] In more detail, each mounting rib 332 extends rearward from each side of the case 330 to a predetermined length, and is bent sideward of the case 330. A through hole 334 through which a coupling member such as a screw passes is formed in each of the mounting ribs 332. Accordingly, the coupling member such as a screw penetrates the through hole 334 and is inserted in the case mounting boss 340, thereby fixing the case 330 to the display cover 301. The mounting rib 332 is formed in plurality at both sides of the case 330. Preferably, the plurality of mounting ribs 332 are symmetrically formed at upper and lower portions of both side edges of the case 330.

[0070] As mentioned above, the bending of the mounting rib 332 contributes to minimizing impact applied to the command input section 320 when a user presses the touchscreen 321 to input an operation command or a drive condition of the indoor unit. In other words, since the mounting rib 332 is bent, the pressure occurring when the user presses the touchscreen 321 is offset by a predetermined elastic force of the mounting rib 332. Thus, damage to the command input section 320 is prevented.

[0071] A coordinate detector 400 is mounted on a rear surface of the case 330 to detect a location of a finger of a user touching the touch screen 321 on the basis of a signal transferred from the touch screen 321. In detail, the coordinate detector 400 is connected to the touchscreen 321 by a signal connection line 402, and calculates a coordinate of a pressed point on the touch screen 321.

[0072] The signal connection line 402 is formed of a flexible material, and may be connected to the touchscreen 321 through a connection line groove 302 formed at one side of the display cover 301.

[0073] Also, the assembly controller 350 is provided under the display assembly 310, and includes a plurality of electronic components on front and rear surfaces thereof. The assembly controller 350 is connected to the coordinate detector 400 by a coordinate transfer line 406, and is connected to the screen controller 323 by the controller connection line 324.

[0074] Accordingly, the assembly controller 350 controls the command input section 320 through the controller connection line 324, and controls the main controller 230 through the signal transfer part 240, thereby controlling the operation of the body 100 of the indoor unit.

[0075] A power supplier 420 receiving power from the assembly controller 350 is recessed upward from a lower side of the case 330. In detail, a coupling part such as a connector is coupled to the power supplier 420, so that the power supplier 420 receives power from the assembly

bly controller 350.

[0076] A mounting part for mounting the assembly controller 350 to the display cover 301 is provided at the inner rear surface of the display cover 301 and the assembly controller 350.

[0077] In detail, the mounting part includes a coupling hole 351 formed at the assembly controller 350, and a controller mounting boss 360 protruding from the inner rear surface of the display cover 301. As a coupling member penetrating the coupling hole 351 is inserted in the controller mounting boss 360, the assembly controller 350 is fixed and coupled to the display cover 301.

[0078] The case mounting boss 340 fixing the case 330 is longer than the controller mounting boss 360 so that the case 330 can be placed in front of the assembly controller 350. The coordinate detector 400 is placed in a space formed between the display cover 301 and the case 330 by the mounting rib 332 and the case mounting boss 340.

[0079] An external-device connector 370 for connection with an external device is formed at one side of the inner rear surface of the display cover 301. In detail, the assembly controller 350 may receive data such as a music file from an external memory device through the external-device connector 370. Then, received sound information propagates to a room through a speaker to be described later.

[0080] The external-device connector 370 includes a speaker connection hole 372 for a connection with an external speaker, a USB connection hole 374 for a connection within a USB, and a card connection hole 376 for a connection with a card type memory. A gripping groove 378 is formed at a front surface of the external-device connector 370, so as to provide the user with a reliable grip of the display cover 301 in connecting or separating the external device. That is, the user may grip the external device with one hand while reliably gripping the gripping groove 378 on the display cover 301 with another hand.

[0081] A plurality of through holes 380 are formed at the inner rear surface of the display cover 301. In detail, the through holes 380 serve to rapidly release heat generated from the display assembly 310 and the assembly controller 350 to the outside of the display cover 301.

[0082] In more detail, when the body 100 operates and thus the display assembly 310 and the assembly controller 350 operate, the liquid crystal display part 322 of the command input section 320 supports graphic functions such as avatars, to display various types of graphic images thereon. However, when supporting the graphic function such as the avatars, the command input section 320 generates high-temperature heat. An increase in an internal temperature of the display cover 301 may cause damage to the electronic components mounted within the display cover 301. In order to prevent the damage to the electronic components, the aforementioned through holes 380 are formed.

[0083] Also, a speaker 390 is mounted at a lower side

of the display cover 301. The speaker is one exemplary component of a sound output device that outputs music or melodies received from an external memory device. In detail, the speaker 390 serves to output sound data received from the external memory device through the external-device connector 370.

[0084] In more detail, a speaker receiving rib 392 receiving the speaker 390 protrudes from the inner rear surface of the display cover 301. The speaker receiving rib 392 has the same shape, thickness and size as those of the speaker 390. A speaker hole 394 is formed at a portion of the inner rear surface of the display cover 301 receiving the speaker 390, so that music or melodies can be outputted to the outside through the speaker hole 394.

[0085] Also, a signal transfer part-guiding groove 242 is formed at a lower edge of the display cover 301. The signal transfer part 240 connected to the main controller 230 penetrates the signal transfer part-guiding groove 242.

[0086] Fig. 6 is an exploded perspective view of an expansion packet mounted on a display device according to an embodiment of the present invention.

[0087] Referring to Fig. 6, an expansion pack 500 according to the present invention includes an expansion module 510 and an expansion socket 520.

[0088] In detail, the expansion socket 520 includes an expansion slot 530 for mounting of the expansion module 510, and module fixing parts 540 for fixing of the expansion module 510 to the expansion slot 530.

[0089] In more detail, an upper portion of the expansion socket 520 is recessed to a predetermined depth, and the expansion slot 530 is arranged in the recessed portion thereof. A plurality of contact-point terminals 532 are arranged in a portion where the expansion slot 530 is formed. A bottom of the expansion socket 520 is fixed onto the front surface of the assembly controller 350.

[0090] Also, an insertion part 512 is formed at a lower end of the expansion module 510 and is inserted in the expansion slot 530. The insertion part 512 includes a plurality of contact terminals 514 for data transmission/reception. The contact terminals 514 contact the contact-point terminals 532, so that the data is transmitted and/or received.

Accordingly, the contact-point terminal 532 is formed of a conductor having a predetermined elastic force, and the contact terminal 514 is also formed of a conductor at the insertion part 512 of the expansion module 510. Thus, an electrical current flows as the contact terminal 514 and the contact-point terminal 532 formed of conductors contact each other, and therefore the data transmission/reception can be performed.

[0091] A plurality of memories are mounted at a central portion of the expansion module 510, and module grooves 516 recessed to a predetermined depth are formed at right and left side surfaces. The module fixing parts 540 are inserted into the module grooves 516, respectively.

[0092] In detail, the module fixing parts 540 are rotat-

ably provided at both side ends of the expansion socket 520. Each module fixing part 540 includes a fixing protrusion 542 extending upward, and a fitting protrusion 544 extending from a side of the fixing protrusion 542 toward the center of the expansion socket 520.

[0093] Thus, the expansion module 510 is inserted in the expansion socket 520 in a state where the module fixing parts 540 are spread out. When the expansion module 510 is completely inserted in the expansion socket 520, the module fixing parts 540 are rotated such that the fitting protrusions 544 are inserted in the module grooves 516, respectively.

[0094] The mounting of the expansion module 510 to the expansion socket 520 makes it possible to secure a data-storage space and support an external device, so that more various images and screens can be implemented on the liquid crystal display part 322.

[0095] An operation of the indoor unit of the air conditioner having the aforementioned structure will now be described.

[0096] To operate the air conditioner, a user applies external power to the body 100. When the power is applied to the body 100, letters or pictures representing operation menus are outputted to the liquid crystal display part 322. The outputted menu is displayed through the touchscreen 321. The user selects a desired letter or picture displayed on the touchscreen 321. The user may select the desired letter or picture by touching the touchscreen 321 with a finger or with a subject.

[0097] When the user touches the touchscreen 321, information on a portion the user touches on the touchscreen is transmitted to the coordinate detector 400 through the signal connection line 402. The coordinate detector 400 detects a coordinate of the portion the user touches on the basis of a signal transmitted to the coordinate detector 400.

[0098] The coordinate detected by the coordinate detector 400 is transmitted to the assembly controller 350 through a coordinate transfer line 406. Then, the assembly controller 350 determines which item the user selects on the basis of the received coordinate, and processes a corresponding command.

[0099] After determining which item the user selects and processing the corresponding command, the assembly controller 350 transmits a letter or a picture for a next operation to the screen controller 323 through the controller connecting line 324. Then, the screen controller 323 displays on the liquid crystal display part 322 the letter or picture received from the assembly controller 350.

[0100] The liquid crystal display part 322 displays an operational state of the body 100 operated according to the command processed by the assembly controller 350, and an operational environment of the body 100.

[0101] While the aforementioned operation is being repeated, the letters and the pictures displayed on the liquid crystal display part 322 are displayed on the front display window 112 through the touchscreen 321.

[0102] Expansion of a memory or a support part is demanded in order to diversify letters or pictures displayed on the liquid crystal display part 322, to process more letters or pictures, or to achieve interaction with an external device.

[0103] When the expansion of the memory or support part is required, a user or a service staff mounts the expansion module 510 to the expansion socket 520. In other words, the insertion part 512 of the expansion module 510 is mounted on the expansion slot 520 and then is fixed using the module fixing parts 540.

[0104] When the user manipulates an operation part provided at a front side of the display device 300 in a touchscreen type, and starts an operation of the body 100, the blower fan mounted in the fan assembly 220 is rotated and the rotation of the blower fan generates a suction force within the body 100.

[0105] The air in a space for air conditioning is sucked into the body 100 by the suction force. Then, the air for the air conditioning flows upward, heat-exchanging with a refrigerant so as to be cooled or heated. Herein, the refrigerant is a fluid flowing inside the indoor heat exchanger (not shown).

[0106] The air heat-exchanged while passing through the indoor heat exchanger (not shown) is discharged to a room through the top outlet 122 and the front outlet 126.

[0107] When applied inside the body 100, the power is applied to the main controller 230 to control the operation of the body 100. Also, the power is applied to the assembly controller 350 provided in the display cover 301 to control the display assembly 310.

[0108] The heat generated during the operations of the display assembly 310 and the assembly controller 350 is released to the outside of the display cover 301 through the through hole 380.

[0109] The indoor unit of the air conditioner according to the present invention allows direct manipulation using a screen of a display device.

[0110] Also, the display device of the indoor unit of the air conditioner according to the present invention is able to display various functions and various figures and thus display much information, so that a user can recognize various types of information. Also, the display of the various figures provides improved visual effects.

[0111] Also, the display device of the indoor unit of the air conditioner according to the present invention is configured to quickly release heat generated within the display device to the outside. Accordingly, damage or malfunctioning of electronic components is prevented.

[0112] Also, expansion of a memory and mounting of a support part is facilitated, and therefore more data can be stored, and support of an external device can be performed.

[0113] As the memory expansion and the support of the external device become possible, various images can be provided. Also, moving images can be implemented as well as a graphic image. Since the support of the external device can be made, the utility of the external de-

vice is improved.

[0114] A structure of the display device according to the present invention is expected to cut down a service cost and solve user complaints about a product.

5 **[0115]** As mentioned so far, a touchscreen is provided to a display device, eliminating a need for a separate input button. Also, heat generated within the display device is quickly released, and a data storage space can be secured.

10 **[0116]** It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the ap-
15 pended claims and their equivalents.

Claims

20 1. An indoor unit of an air conditioner comprising a body (100) including a heat exchanger and a fan assembly and performing cooling or heating, and a front panel provided to a front surface of the body, the indoor unit further comprises:

25 a display device (300) mounted on the front panel, wherein the display device comprises a display assembly (310) including a touchscreen (321) allowing input of an operational condition of the body and a display cover (301) receiving the display assembly;
an external-device connector (370) mounted on the display cover and to which an external device is connected;
35 a gripping groove (378) formed at a front surface of the external-device connector, so as to provide the user with a reliable grip of the display cover in connecting or separating an external device;
an assembly controller (350) provided under the display assembly and controlling the display assembly;
an expansion pack (500) provided to the assembly controller for the expansion of a memory or support part required because of the connection with the external device, and the expansion pack further comprising:

50 an expansion socket (520) provided with a contact-point terminal; and
an expansion module (510) detachably coupled to the expansion socket and provided with a connection terminal contacting the contact-point terminal to allow data transmission and reception with the expansion socket.

2. The indoor unit according to claim 1, wherein the

display assembly further comprises:

a liquid crystal display part (322) displaying operational conditions and states of the body;
a screen controller (323) controlling the liquid crystal display part; and
a case (330) receiving the liquid crystal display part.

3. The indoor unit according to claim 2, further comprising:

a mounting rib (332) extending from an edge of the case; and
a boss (340) protruding from the display cover and coupled to the mounting rib.

4. The indoor unit according to claim 3, wherein the mounting rib (332) extends rearward from the case and then is bent, and has a predetermined elastic force.

5. The indoor unit according to claim 1, wherein the display assembly is placed in front of the assembly controller (350).

6. The indoor unit according to claim 1, further comprising a coordinate detector (400) connected to the touchscreen and calculating a location of a pressed point on the touchscreen.

7. The indoor unit according to claim 1, wherein the expansion socket further comprises:

an expansion slot (530) receiving the expansion module;
and
a module fixing part (540) fixing the expansion module to the expansion socket.

8. The indoor unit according to claim 1, wherein the expansion module comprises:

an insertion part (512) received by the expansion slot;
and
a module groove (516) into which the module fixing part is inserted.

9. The indoor unit according to claim 1, further comprising a main controller (230) connected to the display device.

10. The indoor unit according to claim 1, further comprising:

a speaker (390) mounted on the display cover; and

a receiving rib protruding from the display cover and supporting the speaker.

11. The indoor unit according to claim 1, wherein the display cover comprises a plurality of through holes through which heat generated from the display assembly is quickly released.

Patentansprüche

1. Innenbereichseinheit einer Klimaanlage, umfassend einen Körper (100), umfassend einen Wärmetauscher und eine Ventilatoranordnung, und welcher Abkühlen oder Heizen durchführt, und eine an der Vorderfläche des Körpers bereitgestellte Fronttafel, wobei die Innenbereichseinheit ferner umfasst:

eine an der Fronttafel montierte Anzeigevorrichtung (300), wobei die Anzeigevorrichtung eine Anzeigeanordnung (310), umfassend einen eine Eingabe einer betriebsmäßigen Bedingung des Körpers erlaubenden Touchscreen (321) und eine die Anzeigeanordnung aufnehmende Anzeigeabdeckung (301), umfasst;
ein Externes-Gerät-Verbindungselement (370), welches an der Anzeigeabdeckung montiert ist und mit welchem ein externes Gerät verbunden ist;
eine Griffnut (378), welche an der Vorderfläche des Externes-Gerät-Verbindungselements ausgebildet ist, um dem Benutzer einen zuverlässigen Griff der Anzeigeabdeckung beim Verbinden und Trennen eines externen Gerätes bereitzustellen;
eine Anordnungsregelung/-steuerung (350), welche unter der Anzeigeanordnung bereitgestellt ist und die Anzeigeanordnung regelt/steuert;
ein Erweiterungspaket (500), welches mit der Anordnungsregelung/-steuerung bereitgestellt ist für die aufgrund der Verbindung mit dem externen Gerät benötigte Erweiterung eines Speichers oder Stützteils, und wobei das Erweiterungspaket ferner umfasst:

eine Erweiterungsfassung (520), welcher mit einem Kontaktpunkt-Terminal bereitgestellt ist; und
ein Erweiterungsmodul (510), welches lösbar mit der Erweiterungsfassung gekoppelt ist und mit einem Verbindungsterminal bereitgestellt ist, das das Kontaktpunkt-Terminal kontaktiert, um eine Datenübertragung und einen Datenempfang mit der Erweiterungsfassung zu erlauben.

2. Innenbereichseinheit nach Anspruch 1, wobei die

Anzeigeanordnung ferner umfasst:

einen Flüssigkristallanzeigeteil (322), welcher betriebsmäßige Bedingungen und Zustände des Körpers anzeigt; 5
eine Bildschirmregelung/-steuerung (323), welche den Flüssigkristallanzeigeteil regelt/steuert; und
ein Gehäuse (330), welches den Flüssigkristallanzeigeteil aufnimmt. 10

3. Innenbereichseinheit nach Anspruch 2, ferner umfassend:

eine Montagerippe (332), welche sich von einem Rand des Gehäuses aus erstreckt; und einen Vorsprung (340), welcher von der Anzeigabdeckung hervorsticht und an die Montagerippe gekoppelt ist. 20

4. Innenbereichseinheit nach Anspruch 3, wobei sich die Montagerippe (332) rückwärtig von dem Gehäuse aus erstreckt und dann gebogen ist, und eine vorbestimmte elastische Kraft aufweist. 25

5. Innenbereichseinheit nach Anspruch 1, wobei die Anzeigeanordnung vor der Anordnungsregelung/-steuerung (350) angeordnet ist. 30

6. Innenbereichseinheit nach Anspruch 1, ferner umfassend einen Koordinatendetektor (400), welcher mit dem Touchscreen verbunden ist und eine Lage eines gedrückten Punktes auf dem Touchscreen berechnet. 35

7. Innenbereichseinheit nach Anspruch 1, wobei die Erweiterungsfassung ferner umfasst:

einen das Erweiterungsmodul aufnehmenden Erweiterungssteckplatz (530); und 40
ein das Erweiterungsmodul an der Erweiterungsfassung befestigendes Modulbefestigungsteil (540).

8. Innenbereichseinheit nach Anspruch 1, wobei das Erweiterungsmodul umfasst:

ein von dem Erweiterungssteckplatz aufgenommenes Einsetzteile (512); und 50
eine Modulnut (516), in welche das Modulbefestigungsteil eingesetzt wird.

9. Innenbereichseinheit nach Anspruch 1, ferner umfassend eine mit der Anzeigevorrichtung verbundene Hauptregelung/-steuerung (230). 55

10. Innenbereichseinheit nach Anspruch 1, ferner umfassend:

einen an der Anzeigabdeckung montierten Lautsprecher (390); und
eine Aufnahmerippe, welche von der Anzeigabdeckung hervorsticht und den Lautsprecher stützt.

11. Innenbereichseinheit nach Anspruch 1, wobei die Anzeigabdeckung eine Mehrzahl von Durchgangslöchern umfasst, durch welche von der Anzeigeanordnung erzeugte Wärme schnell abgegeben wird.

Revendications

1. Unité d'intérieur d'un dispositif de conditionnement d'air comprenant un corps (100) comprenant un échangeur de chaleur et un ensemble de ventilateur et réalisant le refroidissement ou le chauffage, et un panneau avant prévu sur une surface avant du corps, l'unité d'intérieur comprenant en outre :

un dispositif d'affichage (300) monté sur le panneau avant, dans laquelle le dispositif d'affichage comprend un ensemble d'affichage (310) comportant un écran tactile (321) permettant de saisir une condition opérationnelle du corps et un couvercle d'affichage (301) recevant l'ensemble d'affichage ;
un connecteur de dispositif externe (370) monté sur le couvercle d'affichage et auquel un dispositif externe est raccordé ;
une rainure de préhension (378) formée au niveau d'une surface avant du connecteur de dispositif externe, afin de fournir à l'utilisateur une préhension fiable du couvercle d'affichage pour raccorder ou séparer un dispositif externe ;
un contrôleur d'ensemble (350) prévu sous l'ensemble d'affichage et contrôlant l'ensemble d'affichage ;
un module d'extension (500) prévu sur le contrôleur d'ensemble pour l'extension d'une mémoire ou partie de support nécessaire en raison du raccordement avec le dispositif externe, et le module d'extension comprenant en outre :

un connecteur d'extension (520) prévu avec une borne à point de contact ; et
un module d'extension (510) couplé de manière détachable au connecteur d'extension et prévu avec une borne de connexion en contact avec la borne de point de contact pour permettre la transmission et la réception de données avec le connecteur d'extension.

2. Unité d'intérieur selon la revendication 1, dans laquelle le dispositif d'affichage comprend en outre :

- une partie d'affichage à cristaux liquides (322) affichant les conditions et les états opérationnels du corps ;
un contrôleur d'écran (323) contrôlant la partie d'affichage à cristaux liquides ; et
un boîtier (330) recevant la partie d'affichage à cristaux liquides. 5
3. Unité d'intérieur selon la revendication 2, comprenant en outre : 10
- une nervure de montage (332) s'étendant à partir d'un bord du boîtier ; et
un bossage (340) faisant saillie du couvercle d'affichage et couplé à la nervure de montage. 15
4. Unité d'intérieur selon la revendication 3, dans laquelle la nervure de montage (332) s'étend vers l'arrière à partir du boîtier et est ensuite courbée, et a une force élastique prédéterminée. 20
5. Unité d'intérieur selon la revendication 1, dans laquelle l'ensemble d'affichage est placé en face du contrôleur d'ensemble (350). 25
6. Unité d'intérieur selon la revendication 1, comprenant en outre un détecteur de coordonnées (400) raccordé à l'écran tactile et calculant un emplacement d'un point enfoncé sur l'écran tactile. 30
7. Unité d'intérieur selon la revendication 1, dans laquelle le connecteur d'extension comprend en outre : 35
- une fente d'extension (530) recevant le module d'extension ; et
une partie de fixation de module (540) fixant le module d'extension au connecteur d'extension. 40
8. Unité d'intérieur selon la revendication 1, dans laquelle le module d'extension comprend : 45
- une partie d'insertion (512) reçue par la fente d'extension ; et
une rainure de module (516) dans laquelle la partie de fixation de module est insérée. 50
9. Unité d'intérieur selon la revendication 1, comprenant en outre un contrôleur principal (230) raccordé au dispositif d'affichage. 55
10. Unité d'intérieur selon la revendication 1, comprenant en outre : 55
- un haut-parleur (390) monté sur le couvercle d'affichage ; et
une nervure de réception faisant saillie du couvercle d'affichage et supportant le haut-parleur.
11. Unité d'intérieur selon la revendication 1, dans laquelle le couvercle d'affichage comprend une pluralité de trous traversants à travers lesquels la chaleur générée à partir de l'ensemble d'affichage est rapidement libérée.

Fig.1

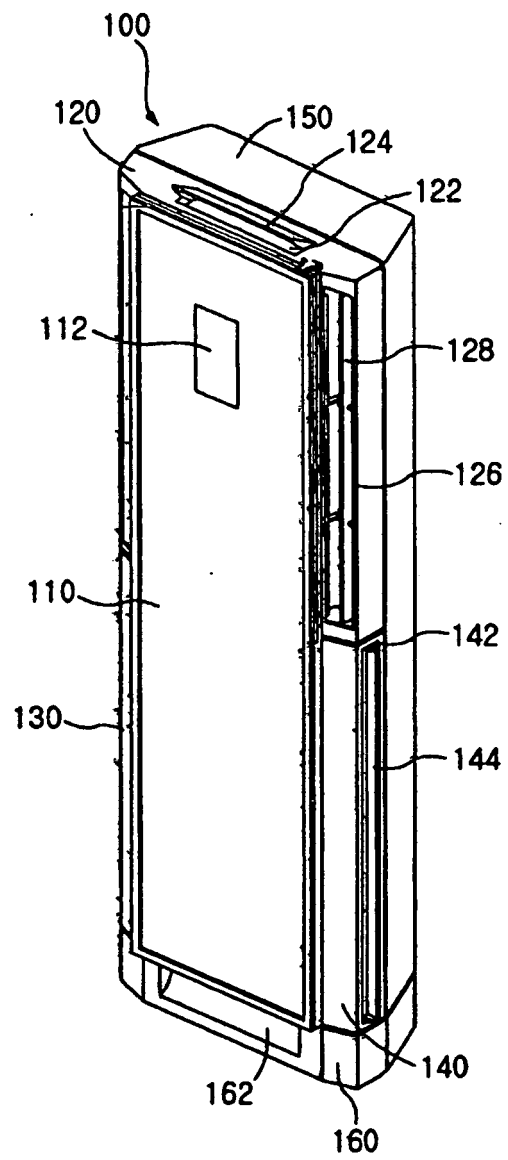


Fig.2

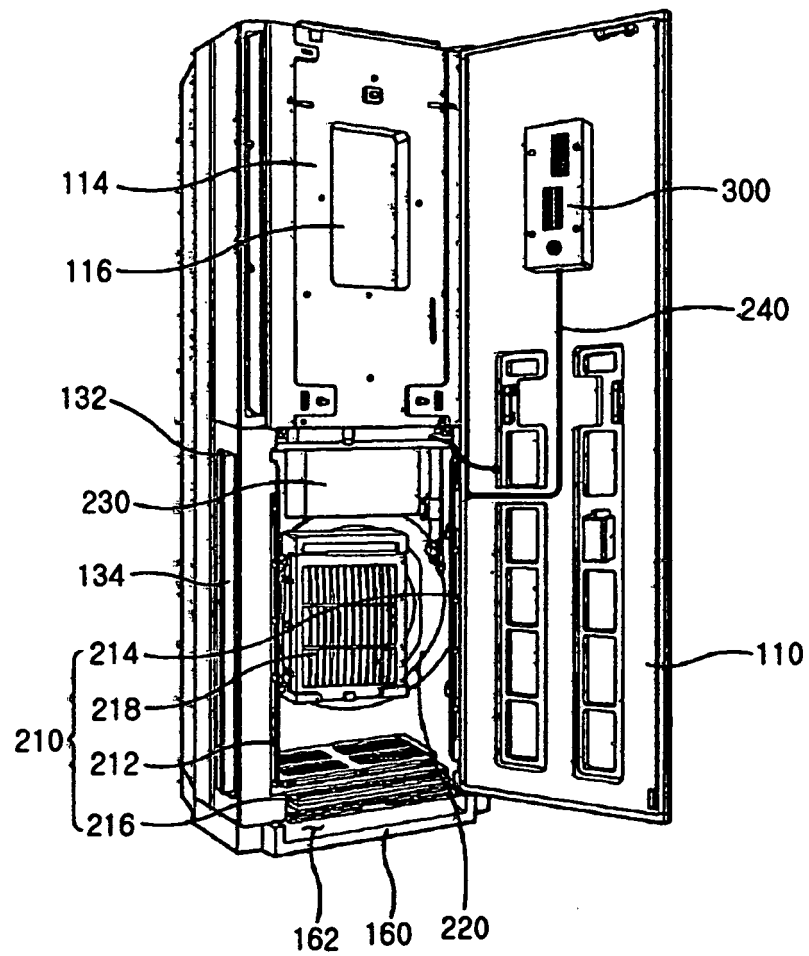


Fig. 3

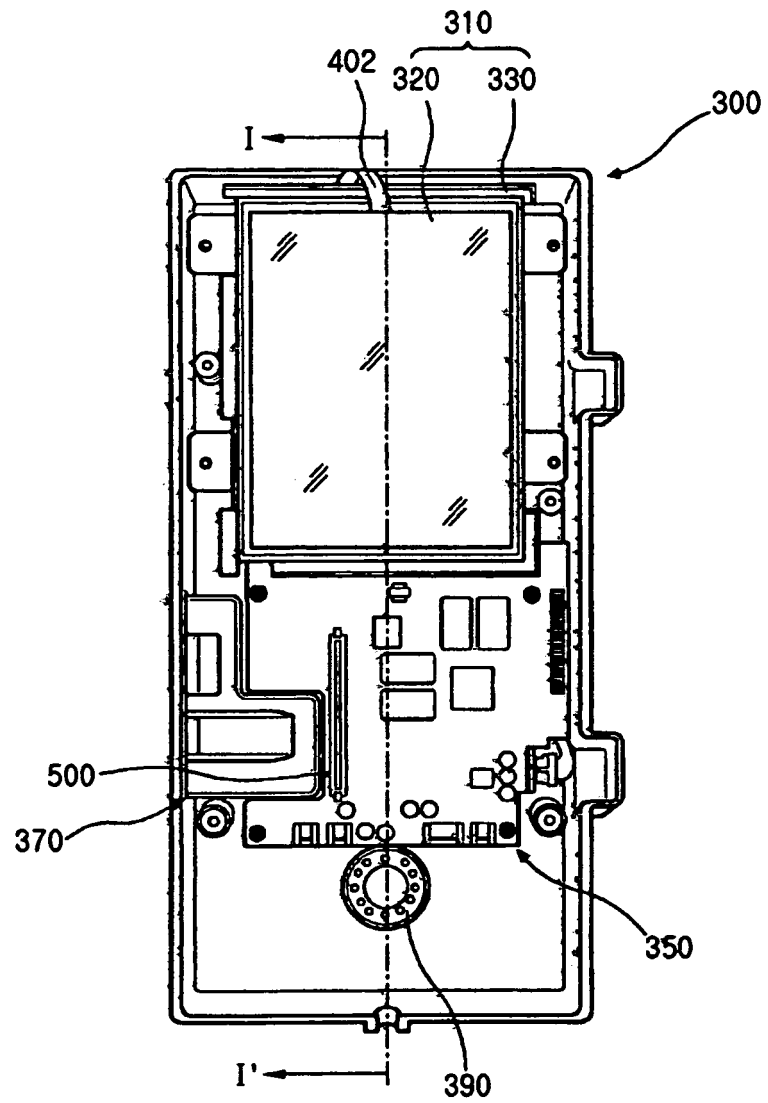


Fig.4

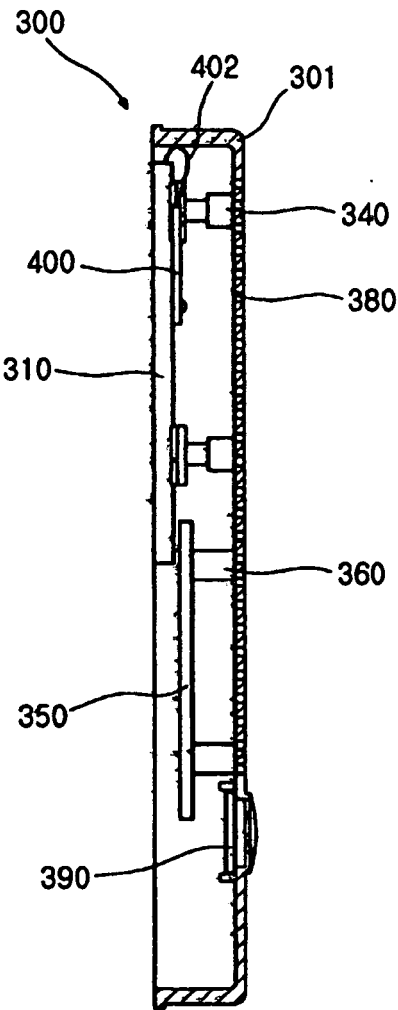


Fig. 5

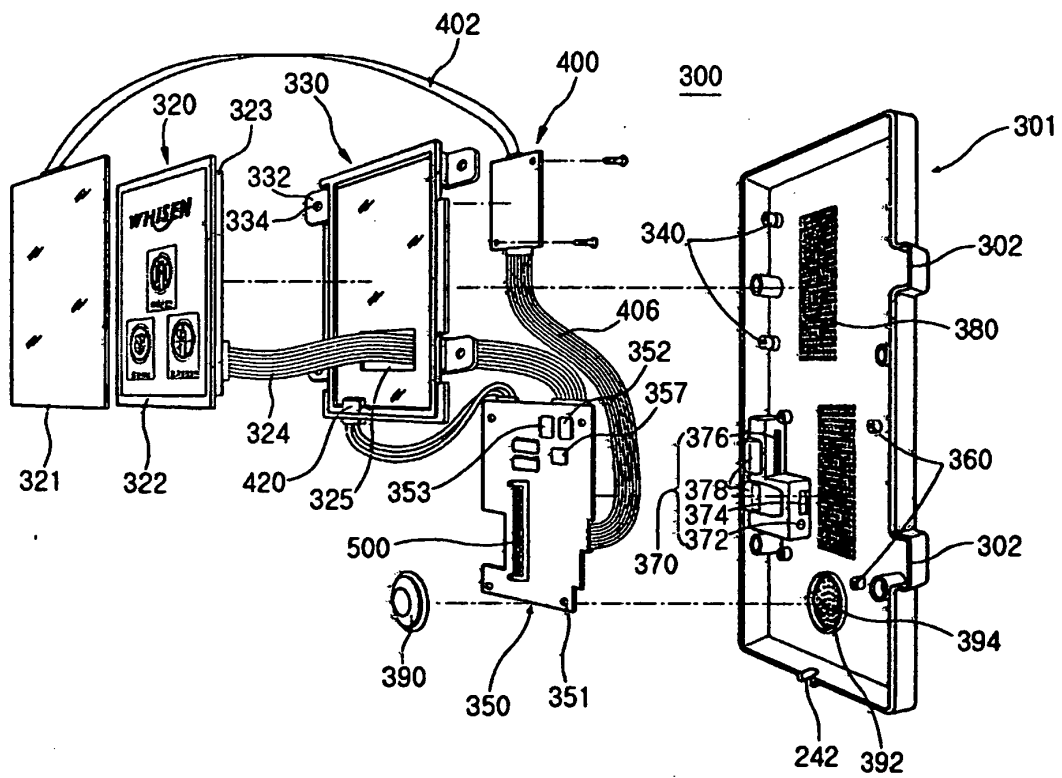
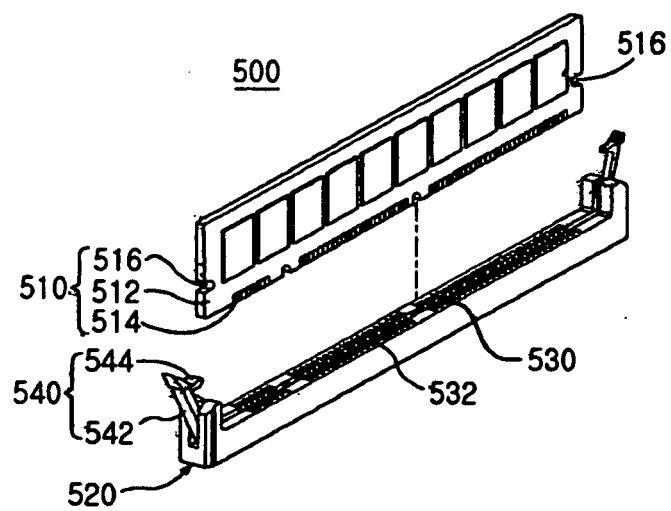


Fig.6



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- DE 202005005913 U1 [0013]